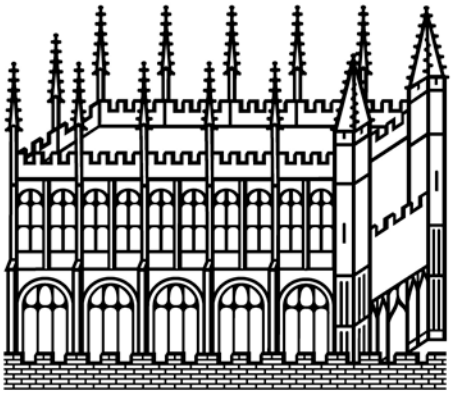

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ON MOVABLE KIDNEY

AND

OTHER DISPLACEMENTS AND MALFORMATIONS.

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The Diagnosis of Diseases of the Kidney amenable to Surgical Treatment. Alex. Macdougall, Glasgow. 1902.

The Cystoscope in Diseases of the Bladder and Kidney. 1906.

To Professor Wm Osler with the very Kind regards of the author.
6th November. 1907.

MOVABLE KIDNEY

AND

OTHER DISPLACEMENTS

AND

MALFORMATIONS.

BY

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PREFACE.

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THE following pages are devoted to a systematic consideration of the displacements and malformations of the kidney, and is the outcome of practical experience rather than the product of any special research into the literature of the subject. While the text is largely occupied with the record of observations and cases, every care has been taken to render the treatise complete in itself, although, being a clinical work, no attempt has been made to make it exhaustive.

The first chapter is devoted to the classification of the displacements and malformations of the kidney, and to the normal anatomy of the kidney, with special reference to the structures which retain the organ in position.

The second, third, fourth, and fifth chapters are occupied by a very full consideration of "Movable Kidney." The pathological anatomy is described, due notice being taken of the changes in the structures around the kidney which conduce to mobility of the organ, as well as the alterations in the relationship and structure induced by the displacement.

The etiology, progress, symptoms, and physical signs are carefully brought under notice and illustrated by characteristic cases. The treatment, both palliative and operative, is reviewed, and the conditions under which a case may be regarded as suitable for operation are clearly laid before the reader.

The sixth chapter is allotted to the subject of "Floating Kidney."

Displacements with mobility are described under two forms, the term "Floating Kidney" being limited to those cases in which there is a mesonephron and the kidney lies within the peritoneum so that it cannot be reached by operation without opening that cavity. A case in which nephrorrhaphy was performed is given at page 169. The term "Movable Kidney" is applied when the organ is movable outside the peritoneum. The importance of discriminating the one variety from the other when operative interference is contemplated is urged.

The last chapter deals with a very interesting class of cases, which have long been regarded as merely pathological or anatomical curiosities, but now, that operations upon the kidney are of daily occurrence, it is shown that the surgeon must make himself acquainted with all renal abnormalities. These fixed malpositions and malformations are treated systematically, and are freely illustrated by cases.

The reader will find at the beginning of the volume a

table of contents and a list of illustrations, and at the end an epitome of cases.

It is the pleasant duty of the author to own his indebtedness to Dr. John R. MacGilvray for preparing these tables as well as the index, to Dr. D. M'Kellar Dewar for his careful revisal of the proof sheets, and to Dr. L. R. Sutherland and Dr. G. H. Edington for the use of four illustrations (Figs. XV, XVI, XXI, XXIV). The other figures are from class diagrams made by the author, and, although rough, they may serve to illustrate the morbid conditions described in the text.

DAVID NEWMAN.

28 WOODSIDE PLACE,
GLASGOW, *October, 1907.*

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THE KIDNEY:

ITS DISPLACEMENTS AND MALFORMATIONS.

CHAPTER I.

CLASSIFICATION OF DISPLACEMENTS AND MALFORMATIONS OF THE KIDNEY—MOVABLE DISPLACEMENTS—ANATOMY.

ANOMALIES of the kidney have until recently been looked upon simply as pathological or anatomical curiosities; but now that many of the diseases of the kidney come to be placed under the surgeon for treatment by operation, all departures from the normal, whether in respect of number, form, size, or situation, must be considered of moment to those who have frequently to operate upon the renal organs. The amount of literature on the subject published within the last ten years is a testimony to this.

Since early times anomalies in size, situation, and form of the kidney have been recorded, but very often only as curiosities, and little attention was given by the authors to points of detail. Recently, however, the records of cases have been carefully given, and much interest has been shown in the subject from the surgical, as well as from the pathological, standpoint.

Vesalius, Spigelius, Duretus, Valsalva, and Sylvaticus were about the earliest authors to describe the anomalies we are about to consider; since their time many hundreds of cases

have been recorded, so that now we have a considerable basis to work upon.

We shall not endeavour to reconcile the various classifications of malpositions and malformations of the kidney which have been advanced from time to time.

If we simply study the cases recorded it will be found that they group themselves together, and may be naturally classified under the following heads :—

I. Displacements with mobility: 1. Movable kidney; 2. Floating kidney.

II. Displacements without mobility: 1. Congenital displacement without deformity; 2. Congenital displacement with deformity; 3. Acquired displacements.

III. Malformations of the kidney: 1. Variations in number: (1) supernumerary kidney; (2) single kidney—(*a*) congenital absence of one kidney, (*b*) atrophy of one kidney; (3) absence of both kidneys; 2. Variations in form and size: (1) general variation in form, lobulation, &c.; (2) hypertrophy of one kidney; (3) fusion of two kidneys—(*a*) horse-shoe kidney, (*b*) sigmoid kidney, (*c*) disc-shaped kidney.

IV. Variations in pelvis, ureters, and blood-vessels.

Displacements with Mobility.

Movable kidney differs from most other ailments in so far as the symptoms, as a rule, do not directly point to the displaced organ. The symptoms which are caused by or are coincident with movable kidney are very various, so that no particular series can be pointed to as typical; indeed, in the great majority of cases the mobility of the kidney is discovered in making a systematic physical examination of the abdomen, often without any view of detecting disease in the kidney. The most common complaints are abdominal

pain, gastro-intestinal disturbance, and nervous symptoms. The affection begins, as a rule, with indefinite complaints, such as languor, tendency to be easily tired, faintness and giddiness, and, as rest generally alleviates the suffering, the patient is inclined to remain in bed. In women there is frequently general anæmia and palpitation; not infrequently their sufferings are regarded as imaginary, and they are treated as "hypochondriacs," or are called "hysterical." Their suffering may go on for years without the true cause being discovered, until, perhaps by chance, an abdominal examination is made and a loose kidney is detected.

During natural respiration the diaphragm and the abdominal muscles communicate their movements to the kidneys; this can sometimes be felt with the hand in thin persons with lax abdominal walls, but it is best seen through a nephrotomy wound, when the kidney is not only observed to move down during inspiration and up during expiration, but the outer border is seen to be tilted a little forwards.

The fixture of the kidneys is very feeble on both sides, their movements are checked by the pressure of the surrounding organs, but they are not tied down or even suspended by ligaments like the organs within the peritoneum. Considering that man moves about in the erect posture, the marvel is, not that movable kidney occurs, but that it happens so seldom, as a penalty of our higher development. It is not found in the lower animals. Movement up and down to the extent of an inch or an inch and a half may be regarded as physiological, and probably aids active circulation of blood in the organ. In women who have borne large families the fixity of the abdominal organs generally becomes impaired, and a greater degree of mobility is permitted. Movable kidney is therefore a relative term.

As a morbid condition, although known since 1581,

and described carefully by Riolani in 1649, its clinical importance has not until comparatively recently been fully recognised. For a long time there was great diversity of opinion in regard to the physiological importance and therapeutic indications of displaced kidney, more particularly when the displacement was associated with mobility of the organ. The majority of observers regarded cases where the kidneys were permanently fixed in an abnormal position merely as anatomical curiosities of no clinical importance; but when the organ floated free in the abdomen, and gave rise to serious symptoms, it was not an uncommon occurrence to find that the surgeon considered the life of the patient so much in danger that he did not hesitate to extirpate the kidney. In regard to the latter condition, two extreme views were held by Keppler on the one hand, and Landau on the other. The former considered that a "movable" or "floating" kidney should be excised as soon as it was detected, and regarded it as a continual source of danger to the patient; while the latter went so far as to say that death did not result from this condition, and that in no case was nephrectomy justifiable.

During the last twenty years considerable attention has been directed to the mobile displacements of the kidney, not only by reason of the serious change in the structure and function of the kidneys which they may induce, but also on account of the numerous reflex influences upon other organs engendered by the displacement.

Displacements of the kidney with mobility have been designated by various terms. To this pathological condition the older writers apply the names "dislocation of the kidney," "displacement," "ectopia," "descent," "prolapse" of the kidney, while more modern authors refer to it as "wandering kidney," "floating kidney," or "movable kidney." The condition was described by Francis Pedemontanus towards the

end of the sixteenth century, but no special importance was attached to it by him. Riolani, nearly seventy years later, was the first to recognise its clinical importance, and in 1825 Baillie mentions several cases in which a movable tumour was discovered in the renal region in one or other side, and which had the general shape and size of a kidney, and the condition is also mentioned by Otto (1805), Meckel, and Portal. Aberle (1826) was the first to furnish a clear clinical description associated with accurate *post-mortem* records. King (1836) observed one such case, and even attempted to remove the movable mass; in this he was unsuccessful, but the woman experienced relief after the operation. Rayer (1846), in his classical work *On Diseases of the Kidney*, describes several cases, and Dietl (1864) followed with an estimate of the frequency of the condition, and also a description of the clinical phenomena. The first systematic treatise on the pathology and treatment of the condition was published by Rollet in 1866, and in more recent times Durham, Trousseau (1865), Fourrier (1875), Keppler (1879), Landau (1884), and the author (1888) record a considerable number of cases.

In presenting the subject I shall, in the first instance, refer to the general anatomy of the kidney as far as it has a bearing upon the abnormalities we are considering, and especially with reference to the natural movement of the kidney, and the means whereby excessive movements of the organ are restrained; and when this has been done I shall discuss the morbid anatomy, etiology, pathogenesis, progress, symptoms, physical signs, diagnosis, and prognosis. Under the latter heading the subject will be considered in its relationship to the general health, to secondary changes in the kidney, and to dangers to life. Treatment will then be discussed, palliative and operative, and the latter with special reference to the effects of nephrorrhaphy in improving the general

health, in relieving pain, morbid nervous phenomena, digestive disturbance, and urinary troubles, and rules will be laid down as to the desirability of operating, and the conditions which justify it.

Anatomy.—The measurements of the kidney may be stated as 4 inches in length, $2\frac{1}{2}$ inches in breadth, and $1\frac{1}{4}$ inch in thickness. The left kidney is generally longer, narrower, and thinner than the right. The shape of the kidney varies greatly in individuals, and also according to age. The normal fœtal kidney is distinctly lobulated, and this condition not infrequently persists in a minor degree in adult life, the surface of the organ being more or less deeply fissured and divided into distinct portions. The surface of the living normal kidney is of a greyish-red colour, but the exact appearance depends upon the quantity and the character of the blood contained in the organ. During life the colour is brighter red and more uniform than after death. *Post-mortem*, the changes in colour are rapid, and depend, even in the healthy organ, upon the cause of death.

The kidneys are convex on the upper, outer, and lower margins, and on their inner border they have a short abrupt concavity or notch—the hilum—into which the renal arteries enter, and through which the viens and ureter pass out. In consistency the kidneys are firm and elastic, but the parenchyma is brittle and easily torn. The anterior surface, while more round than the posterior, is somewhat like a flattened wedge. Frequently a prominence or rounded ridge extends across the anterior aspect, from which the surface slowly falls away obliquely, forming two indistinct planes. On the upper plane of the left kidney rests the stomach, the spleen, and the suprarenal body; on the right, the liver. The lower planes press upon the intestines (large and small), especially the

duodenum on the right side. They look slightly outwards and are partly covered by peritoneum. The posterior surface of the kidney is flattened, and is directed slightly inwards as well as backwards; it may also be marked by the pressure of the muscles when these are well developed and the adipose capsule deficient, and even the ribs and vertebræ sometimes leave impressions. The posterior surface is not covered with peritoneum, but rests upon the twelfth rib on the right side and the two lowermost ribs on the left; between the kidney and the transverse process of the first and second lumbar vertebræ are interposed the anterior layer of the lumbar aponeurosis, the quadratus lumborum, and the psoas muscles. Behind the kidney, but separated from it by the diaphragm, is the pleura, which descends as low as the upper surface of the twelfth dorsal vertebra and the lower margin of the eleventh rib.

In Figs. I and II (pp. 8, 9) are shown the relations of the anterior surfaces of the kidney right and left. Fig. I (p. 8) —*R*, right kidney; *A*, area of suprarenal body; *B*, area of liver; *C*, area of duodenum; *E*, area of small intestine; *F*, area of colon. Fig. II (p. 9)—*L*, left kidney; *A*, area of suprarenal capsule; *G*, area of stomach; *H*, area of spleen; *K*, area of pancreas; *L*, area of small intestine; *M*, area of colon; *N*, area of splenic artery.

It is to be observed, therefore, that the kidney does not lie directly in the vertical plane of the body, but the outer border of the kidney is rotated slightly backwards, so that the anterior aspect looks outwards as well as forwards; nor is the short axis of the kidney parallel with the horizontal axis of the body. The upper end of the kidneys, but especially that of the right organ, is rotated towards the vertebral column, and, as a consequence, the hilum looks slightly downwards as well as inwards. The hilum is about an inch and a half from

the middle line of the body, and the external border about two and a half inches farther out. To the surgeon, the structures which enter the hilum of the kidney are of considerable importance, as they form practically the pedicle in cases of nephrectomy, and their relationship is of moment in all operations on the kidney—they are the renal arteries, the veins and the ureters, the nerves and the lymphatics. The

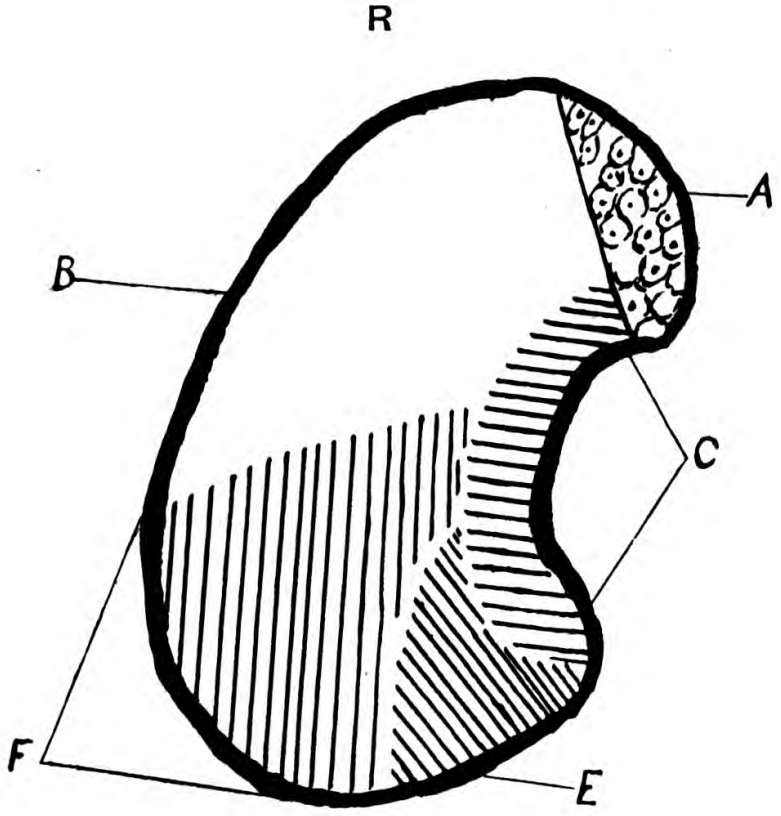

Fig. I.

vascular supply to the kidney is very abundant, the arteries being large in proportion to the size of the organ. The right artery is longer than the left. Both arise from the aorta about the same level; the right artery passes behind the vena cava, and just before entering the hilum it traverses between the ureter and the renal vein before breaking up into three, four, or five branches, to be distributed to the substance of

the kidney. The primary branches of the renal veins are usually four or five in number; they escape from the hilum of the kidney, and ultimately form a single renal vein, which lies in front of the renal artery and ends in the inferior vena cava. The left vein is usually a little higher up, and, having to cross the middle line in front of the aorta, it is longer than

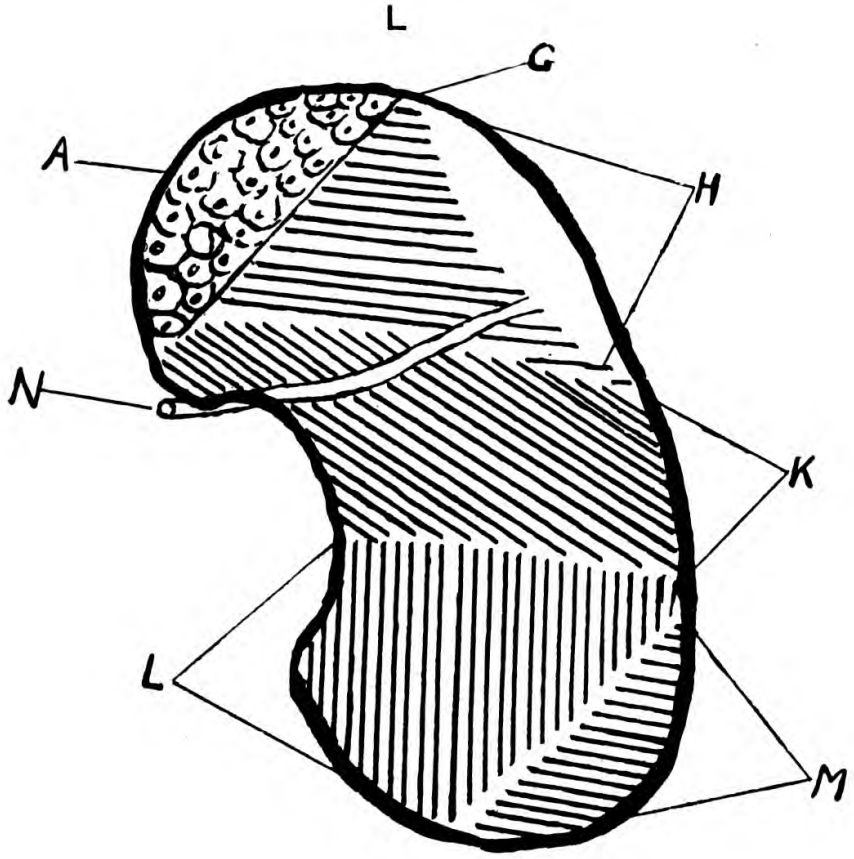

FIG. II.

the right vein. In its course it receives blood from the left spermatic vein, the left inferior phrenic vein, and from the veins of the suprarenal capsule. Although the kidney is very vascular it does not bleed very freely, except immediately after incision or puncture. This is explained by the fact that the vessels are almost devoid of anastomosing connections,

each division having only a distal communication with its fellows. It, like the lungs, heart, and spleen, is supplied by what Cohnheim called end-arteries; this fact has an important bearing, not only on the question of hæmorrhage during operations, but also upon all embolic lesions, especially the infective infiltrations of tuberculous and septic diseases.

The nerves of the kidney are small in size, but their connections are widespread and are derived directly from the renal plexus formed by filaments of the solar plexus, the outer part of the semilunar ganglion, and the aortic plexus; they are also joined by filaments from the lesser splanchnic nerve. From the renal plexus some filaments pass to the spermatic plexus and ureter. The nerves have numerous ganglia developed upon them, and they contain filaments both from the sympathetic and cerebro-spinal systems. They may be traced accompanying the renal arteries as far as their final ramifications, but the ultimate nerve endings have not been traced, so it is uncertain how they terminate; the circumstance that the nerves from the solar plexus form a dense network of ganglia and anastomosing filaments going to form the phrenic, cœliac, gastric, hepatic, splenic, superior mesenteric, spermatic, and inferior mesenteric plexuses, as well as the renal plexus, explains the many reflex symptoms met with in renal disease, or where the organ is enlarged or displaced.

If the ureter is traced upwards to the kidney it will be seen to expand as it enters the fissure into a funnel-shaped dilatation, which, however, loses its conical form. As viewed externally, the pelvis appears as if it were a single sac, but if a section is made of the cortex, and the parenchyma removed without opening into the cavity of the kidney, the pelvis as it enters the sinus will be found to divide into two or three primary branches, which in turn also subdivide and end in short truncated but wide branches; these are the calices

infundibula which receive the papillæ into their outspread mouths.

The coverings of the kidney are the outer capsule or tunica adiposa, and the inner or tunica fibrosa. These coverings will be found to be of considerable importance when we come to consider the question as to how the kidneys are retained in their normal position. I shall, therefore, describe them in detail, so that when we come to discuss the pathological anatomy and etiology of movable kidney the various points will be easily understood.

The adipose capsule is derived from the lamina fibrosa of the fascia propria peritonei, and is composed of loose tissue, which on reaching the kidney divides into two layers and contains a variable quantity of fat. These two layers divide, one passing in front of the kidney, between it and the peritoneum, to which it is united; the other, extending behind the pelvis and vessels, is in close contact with the posterior surface of the kidney, contributes largely to the fixation of the organ, and has been termed by Barthol the "ligamentum suspensorium renis." The perirenal fascia has an anterior and a posterior lamella, and these join to be inserted into the diaphragm. Fat is deposited both in front of and behind the posterior lamella. According to Zuckerkandl, the perirenal fascia is strengthened on the left side by numerous bands, remnants of the primitive fusion of the descending colon and the parietal peritoneum. Owing to the difference in the relationship of the colon, on the right side this additional support is wanting. The perirenal fat differs in colour and density from that found elsewhere, it is of a finer texture and a bright yellow colour, and so can be easily distinguished from the subperitoneal fat. As a rule, the adipose capsule is most abundant close to the hilum or on its posterior aspect. Through the mass of fat distinct strands of fibrous tissue pass

between the fibrous capsule and the perirenal fascia, but according to Delitzin and Wolkow they are not strong enough to give much support to the kidney; the bands seem simply to act as stays to maintain the organ in its relative position. When the upper strands are lengthened or wanting, the kidney falls forwards, and the upper segment is flexed upon the lower, producing a condition described by Potain under the name "anteversion of the kidney." While in the normal kidney these bands are with difficulty recognised, and their physiological importance may be questioned, in many cases of movable kidney the bands are very distinct; the question may, however, be raised whether the bands seen under such circumstances are normal or due to the stretching of the adipose capsule.

The fibrous capsule is formed of thin connective tissue which firmly and closely surrounds the kidney. The thickness of this capsule varies greatly, in some instances it is as thin as peritoneum, easily torn, and gives a very insecure fixture for sutures; while in other instances it is strong and firm, and is not easily torn. It possesses a certain degree of elasticity, so as to permit some stretching or shrinking, according to the vascular condition of the organ; it can, under normal conditions, be readily separated from the cortex, to which it is united only by minute processes of connective tissue and by small blood-vessels; in disease, however, the fibrous capsule may become considerably thickened and firmly adherent. The external layer is composed almost entirely of connective tissue, but the deeper or cortical layer contains some unstriped muscular fibres. From the surface the capsule follows the hilum, and passing inwards becomes continued along the bases of the pyramids with the strong external fibrous and elastic tissue of the calices and pelvis.

The kidneys, situated behind the peritoneum, one in each

lumbar region, are embedded in capsules of fat, and are retained in position by the vessels which pass to and from them. The right kidney is generally situated a little lower than the left, probably as a consequence of the vicinity of the large right lobe of the liver. The kidneys are placed on either side of the vertebral column, about the level of the last dorsal and upper two lumbar vertebræ. The position of the kidneys, however, is very liable to variation, both in health and in disease, and also according to the conformation of the skeleton. Perhaps no organs in the body vary more in their position than the kidneys. Their relative distance from the spine, or their position in relation to other organs, is observed to vary considerably. For instance, without any evident cause, one may be found close up to the spleen, quite touching the diaphragm and vertebral column, while the other organ is situated considerably below the crest of the ileum, and removed some distance from the spine. From observations made regarding this point, it seems clear that malposition of the kidney, within certain limits, is of frequent occurrence, and may exist without causing any disturbance. In 1,000 *post-mortem* examinations, 24 cases occurred where the position of one or both kidneys might be described as abnormal.

It is also observed that in many cases the posterior surface of the kidney is placed against the crura of the diaphragm, so that in such cases more than a half of the kidney lies, during full expiration, above the level of the lowermost limits of the pleura, so that during a deep inspiration the organ must necessarily be depressed through the action of the diaphragm. The lowermost limit of the pleura is on a level with the lower surface of the twelfth dorsal vertebra and the lower edge of the eleventh rib, and the anterior and lower surface of the posterior segment of the diaphragm rests upon the posterior and upper surfaces of the kidney, so that during

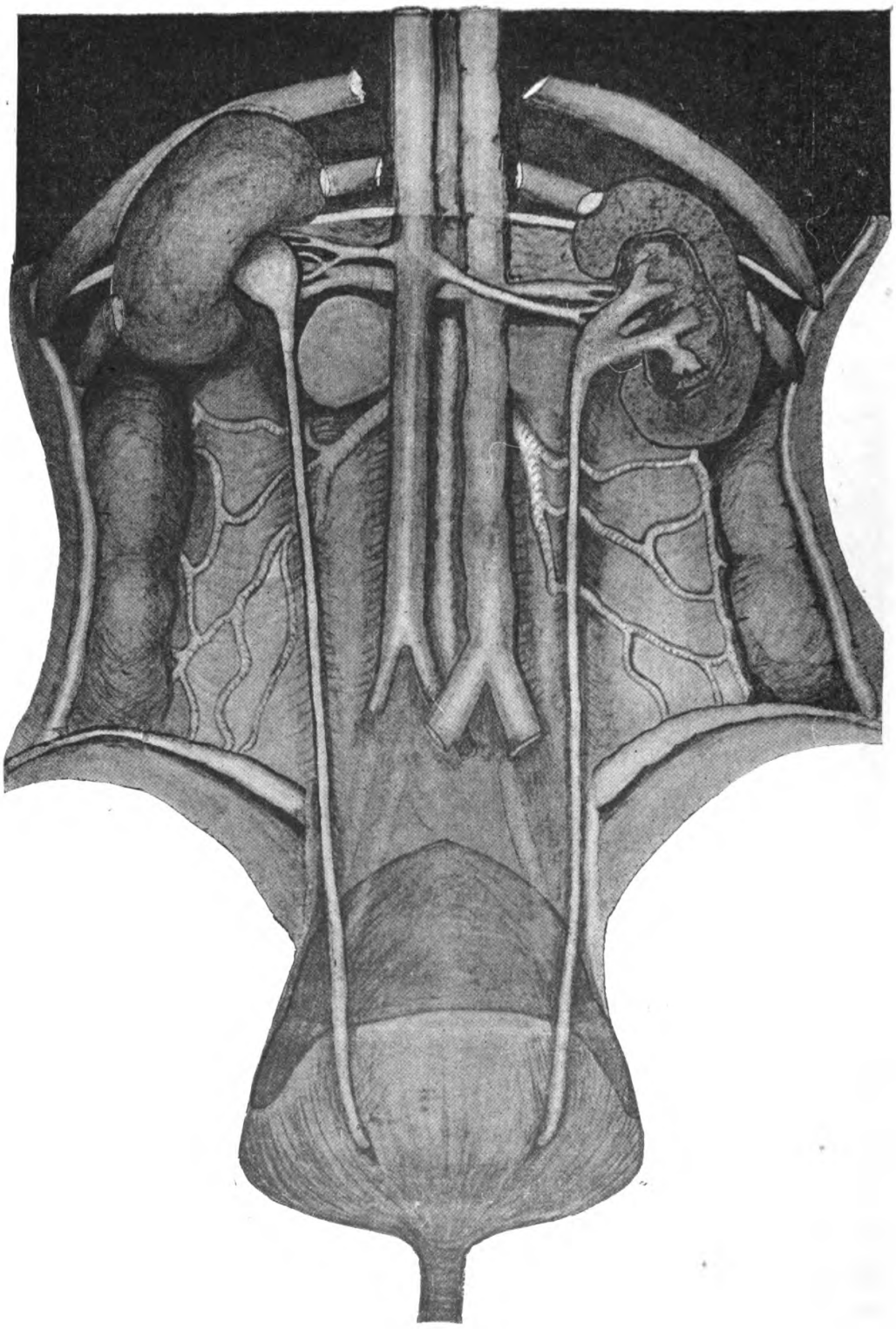

FIG. III.

deep expiration the kidneys, being pressed up, the margin of the lung is interposed between the surface of the body and the upper part of the kidney. This part of the lower margin of the pleura is practically a fixed line, and the degree to which the lung overlaps the kidney depends upon its position and its movements during respiration. The posterior surface of the kidney is also in close proximity to the quadratus lumborum muscle.

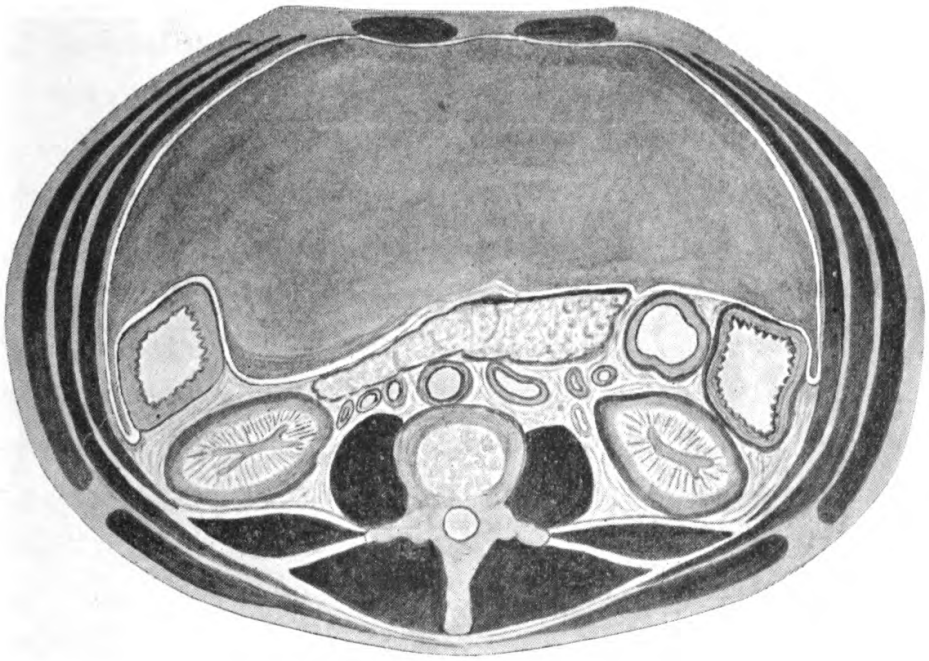

Fig. IV.

As a rule, the pelvis of the right kidney is situated on a level with the first lumbar vertebra or immediately in front of the lowermost limit of the last rib, while the pelvis of the left kidney is about an inch or an inch and a half higher up. Fig. III shows the position of the kidneys in relation to the parts in the abdomen posterior to the peritoneum. It represents the lumbar vertebræ and the sacrum removed, exposing the posterior aspect of the peritoneum. In the middle line is shown the aorta and the vena cava, giving off

the renal arteries, and receiving the renal veins. Posterior to the blood-vessels the pelves are shown, that of the left kidney being only freed from its surrounding fat, while that of the right kidney has been dissected out, so as to show the branching calices. The position is that in which the kidneys are usually found during full inspiration. Fig. III (p. 14) also shows the relative position of the ascending and descending colon, and the position of the ureters as they traverse from the kidney to the base of the bladder. Fig. IV (p. 15) represents the transverse section of the body at the level of the second lumbar vertebra: the right kidney has in front of it the duodenum, and the ascending colon lies in juxtaposition to its outer margin, and the top of the kidney lies against the under surface of the liver. The left kidney touches the peritoneum just under the fundus of the stomach; in front of it, and nearer the middle line, lies the tail of the pancreas; against its anterior and outer aspect the first part of the descending colon passes on, and on the upper two-thirds of its external border is in close relationship to the spleen.

The question may be asked, how are the kidneys retained in their position?

The first anatomical structures which suggest themselves are the renal vessels and the ureter. These structures prevent the kidney from moving away from the middle line, but they permit it to pass upwards, downwards, and forwards, while its descent inwards and downwards is opposed by the mesocolon. According to Landau, this last mentioned attachment is more efficient upon the left than upon the right side. It must also be remembered that the kidneys are protected from pressure by the bony cavity of the thorax, by the spinal column, and by the large bones of the pelvis. But while these anatomical factors may be mentioned, there is one already alluded to of much greater importance, namely, the adipose capsule. While,

it is true, that the fatty capsule serves to maintain the kidney in the normal position, a few cases have come under my observation where adipose tissue was entirely absent, and still the movements were not excessive. When corpulent persons emaciate rapidly, this capsule becomes very loose from absorption of adipose tissue, and its attachments to the kidney on the one hand, and to the surrounding parts on the other, become less firm than normal, and so may favour any tendency to undue movability. During health this adipose capsule permits of a certain amount of movement beyond that due to respiration; for instance, when the body comes to the ground with violence, the capsules yield to a limited extent, and immediately regain their former condition. The natural movements communicated to the kidney are very evident when the organ is exposed by an incision in the loin, and often amount to 4 or 6 centimetres. But, while it is depressed during inspiration, during expiration the kidney follows the ascent of the diaphragm, unless it is unduly loose, as in movable kidney or when enlarged, then the abnormal movement can be detected by the hand. Even under normal conditions the movement may be appreciated by bimanual examination in lean persons, whose costal walls are not too long or deep. As a rule, the movement is not so free in man as in woman, and this is accounted for by Deletzine and Volkoff (*Méd. Mod.*, 10th March, 1897), who show in the latter, that while its width at the inferior part is greater, the renal fossa is not so deep as in man.

When the abdomen is opened in a living animal, or in operating for disease, the viscera are pushed forward through the wound. This is partly due to contraction of the abdominal muscles, and partly to the expansion of gas within the hollow viscera. But the fact that the expansion of gas takes place is a demonstration that the intestinal gases are subjected to

greater pressure than that of the atmospheric air. This pressure must necessarily vary during the different periods of respiration, but putting aside the slight variations that must occur, we may describe this physical condition under the term of intra-abdominal pressure. By reason of this force the walls of the abdomen tend to retain the abdominal organs in position. If the abdomen be opened and the body raised erect, the liver and kidneys fall perceptibly on account of their support being removed. The abdominal organs are very loosely bound to the parietes, and their limiting structures or capsules are easily distended, either by an alteration in the vascular condition of the organ, or by morbid processes. Should the support resulting from the elasticity and resistance of the abdominal walls be removed, or, what amounts to the same thing, should the contents of the abdomen be suddenly diminished in amount, as after delivery, then the suspension of the organs rests with their anatomical attachments only, and it is evident that these structures are not of themselves capable of maintaining the kidney in position. The way in which pressure is exerted against the anterior surfaces of the kidneys has been studied by D. J. Cunningham and Kendal Franks, and they show how the kidneys are held in position by the resultant of two forces, the one pressing the gland downwards and backwards, the other pressing it upwards and backwards. "These impressed districts (Figs. I and II, pp. 8, 9) indicate pressure exercised on the anterior surface of the kidney in two directions, and the intervening eminence is the result of this counter-pressure. Upon the upper inclined plane of the anterior surface of the left kidney are pressed the suprarenal capsule, the stomach, and the spleen; these exercise a downward and backward pressure. Upon the anterior inclined surface of the left kidney the counter-pressure is produced by the intestine, which presses, as a rule, upwards and

backwards; on the right side the upper inclined surface is occupied by the liver, while in contact with the lower inclined area is the colon. In many cases the colic or inferior sloping surface presents a high degree of obliquity." The markings just referred to are most distinctly seen in muscular subjects devoid of any superfluous fat. In those who have lax abdominal walls the markings cannot be discerned. The circumstance that the inter-abdominal pressure is sufficient to mould the form of the kidney demonstrates that the support given to the organ during life must be considerable.

Chapter II.

MOVABLE KIDNEY—PATHOLOGICAL ANATOMY.

The pathological anatomy of the displaced kidney depends upon whether the ailment is what we call "movable kidney," or what has been termed "floating kidney." I consider that the former term should be limited to those instances in which the kidney is movable behind the peritoneum, and the latter to the cases in which there is a distinct mesonephron attaching the organ to the spine and permitting the kidney to move freely within the cavity of the abdomen, so that it cannot be reached by operation without opening the peritoneum. At present our attention will be limited to "movable kidney," of which I have seen over 180 cases, whereas of "floating kidney" I have been able to discover only two instances.

The pathological anatomy of movable kidney may be considered under the following heads:—

I. Changes in the condition of the adipose capsule.

II. Changes in the attachments, especially in the ligamentum suspensorium renis.

III. Changes in the condition of the peritoneum and in its relationship to the kidney.

IV. Alterations in the structure or relationship of the (*a*) ureters, (*b*) vessels, and (*c*) nerves.

V. Changes in the parenchyma of the kidney and the fibrous capsule.

VI. Changes in other abdominal organs.

The changes which take place when a kidney becomes movable are not necessarily limited either to its attachments or to its immediate surroundings. While in some cases there is no alteration in the structure of the organ, in the length of the vessels or the ureter, in many other instances serious changes may be discovered.

The changes in the surrounding structures may be divided into two kinds—those involving the adipose capsule and those affecting the attachments.

1. *Changes in the condition of the adipose capsule.*—In cases of slight mobility of the kidney there is nearly always some atrophy of the adipose capsule, and frequently the kidney moves freely within it. When the adipose capsule becomes atrophied, it permits slight mobility of the kidney, and this wasting is also the natural sequence to these movements of the organ. The capsule becomes distended, and may ultimately form a considerable sac.

The distension of the adipose capsule may lead to the peritoneum covering it being loosened from its position against the posterior abdominal wall. In another variety, the adipose capsule remains adherent to the kidney, and the movement is permitted from the peritoneum having become loosened, so as to form a pouch in which the kidney and its envelopes move more or less freely. We may therefore have three conditions —firstly, where the kidney moves in its adipose capsule, the capsule itself retaining its position; secondly, where the first-mentioned condition exists, and the capsule also has become movable; thirdly, those cases in which the capsule and kidney are adherent, but where the peritoneum and the attachments of the capsule to the posterior abdominal wall have become relaxed.

In health, one always finds the organ closely packed in

adipose tissue (Figs. V and VI), so that the retro-renal fascia (8) can be exposed only by cutting through a deep layer of fat (14) lying posterior to it (Figs. V and VI), and, after dividing the fascia, the firm fat (7) must be torn away before the kidney is reached. In movable kidney, while a considerable amount of fat remains, it is

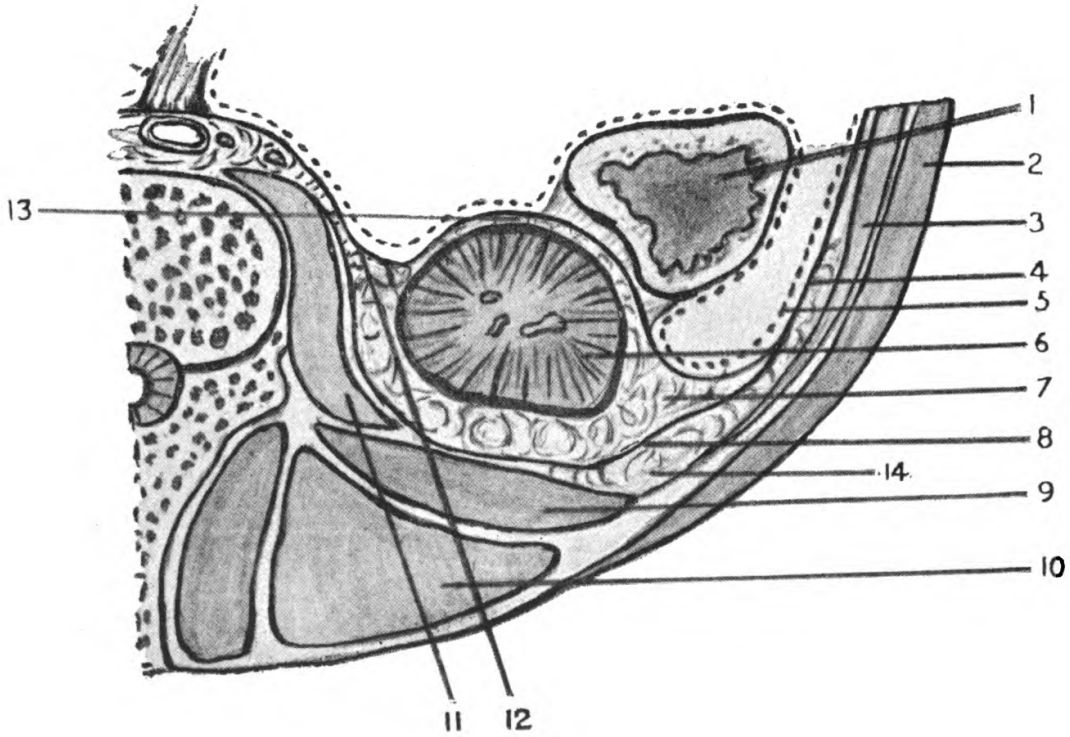

FIG. V.

1, Descending colon; 2, internal oblique; 3, transversalis; 4, subperitoneal fascia; 5, peritoneum; 6, right kidney; 7, fat within perirenal fascia; 8, posterior lamellæ of perirenal fascia; 9, quadratus lumborum; 10, erector spinæ; 11, psoas; 12, anterior lamellæ of perirenal fascia; 13, fat between perirenal fascia and kidney; 14, fat behind perirenal fascia.

loosely bound together, so that with the finger alone its meshes may be separated and the surface of the organ exposed. In many cases which have come under my notice, the absorption of fat has been very marked, and the sac in which the kidney moved had become so loose that it could be easily dragged out into the wound. Frequently,

in those of old-standing, the fat becomes infiltrated with loose connective tissue, which makes it tough and fibrous, so that when this altered capsule is stitched to the parietes, the kidney can be maintained in its position without suturing the organ itself.

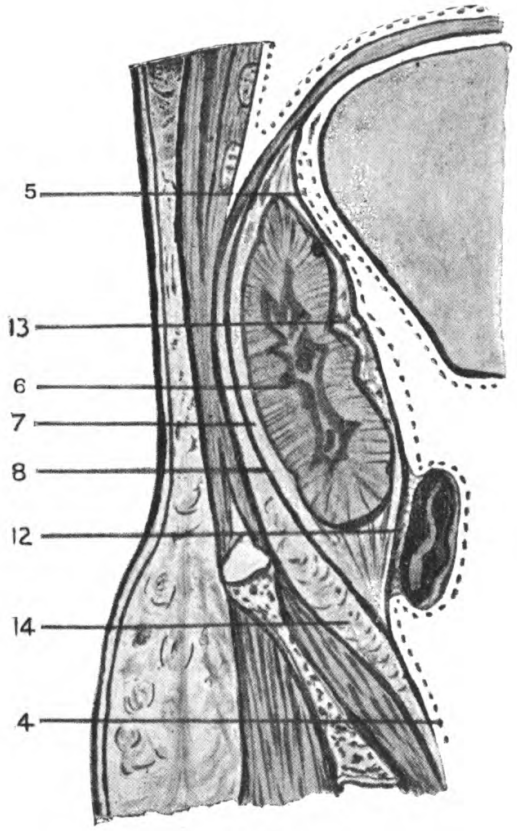

FIG. VI.

4, Subperitoneal fascia; 5, peritoneum; 6, right kidney: 7, fat within perirenal fascia; 8, posterior lamellæ of perirenal fascia; 12, anterior lamellæ; 13, fat between anterior lamellæ and kidney; 14, fat behind perirenal fascia.

II. *The changes in the ligamentum suspensorium renis* (Figs. V and VI, 8 and 12) vary in different forms of movable kidney. The perirenal fascia, which in health is a thin prolongation of the subperitoneal fascia (Figs. V and VI, 4), is the most important structure employed in retaining the organ in its normal position; divided

into two lamellæ (Figs. V and VI, pp. 22, 23)—the anterior (12) and the posterior (8)—the fascia in normal conditions is embedded in fat, the layer in front of the kidney (13) being thin, while that lying posteriorly (14) is usually thick. In cases of movable kidney, the lamellæ of the perirenal fascia may become greatly thickened and fibrous, and the sac formed by them considerably enlarged. After separating the layer of fat situated behind it (Figs. V and VI (14), pp. 22, 23), the fascia when exposed may be seen as a large loose fibrous sac, within which the kidney freely moves, only a small quantity of adipose tissue being interposed between it and the surface of the kidney (Figs. V and VI (7), pp. 22, 23). In such cases, the kidney may be fixed by simply diminishing the size of this sac.

III. *The peritoneum.*—As a consequence of distension, the adipose capsule loses its natural fixity, and becomes loosened from its position against the posterior abdominal wall. This is usually preceded by a yielding of the lamellæ of the perirenal fascia, but, as I have already pointed out, not necessarily so; the loosening of the peritoneum depends upon the degree of movement of the whole kidney and its immediate envelopments.

1. The kidney may only move up and down a little more than normal during respiration, so as to be easily felt with the hand.

2. The movement may be so great that the whole kidney can be felt below the costal margins during deep inspiration, but is again restored to its position during expiration.

3. The displacement may be so great that the kidney remains below the costal margin during expiration, and with the hand can be readily pressed into the pelvis, or across

the middle line, or may be rotated either on a vertical or a horizontal axis.

I have seen several cases of movable kidney in which there was no mesonephron, where the organ could, by an effort of the patient, be made to drop down into the pelvis, and when there I might fail to discover its presence by abdominal palpation, although I could make out its situation easily by vaginal examination; then, when raised out of the pelvis, the kidney could be pressed beyond the middle line or upwards beneath the diaphragm. Usually in such cases, when the kidney becomes rotated on its transverse axis, it is the upper pole that presents forwards or downwards, according to the extent of the rotation, and with vertical rotation it is, of course, the convex border that advances to the front.

IV. *Alteration in the structure or relationships of the* (a) *ureters*, (b) *vessels, and* (c) *nerves.*—(*a*) The ureter may be affected in various ways by the displacements and rotation I have just described. When the rotation is on the transverse or short axis, the upper pole of the kidney (Fig. VII (5), p. 26) may describe half a circle and present downwards, and the structures forming the pedicle—that is to say, the blood-vessels (6) and the ureter (2 and 4)—may be twisted together, so that, in some instances, the escape of urine is impeded, while in others the circulation of blood is interfered with. In the former, transitory hydronephrosis is induced. This is not a very common complication; I have seen only fourteen cases where the hydronephrosis was sufficiently large to be detected by the hand, but in many others, to judge from the symptoms alone, I have felt sure that occasional obstruction of the ureter occurred, while the kidney was displaced. A clear distinction must be drawn between those cases where, as a rule, the pelvis is not distended, and those where a more persistent swelling

becomes temporarily relieved by a sudden urinary discharge. With this limitation, it may be said that transitory or relapsing hydronephrosis is seldom observed. This may be due to the circumstance that in those cases the sac of the hydronephrosis is not often of sufficient size to be detected by the hand, and the symptoms, though acute, are of short duration, being soon

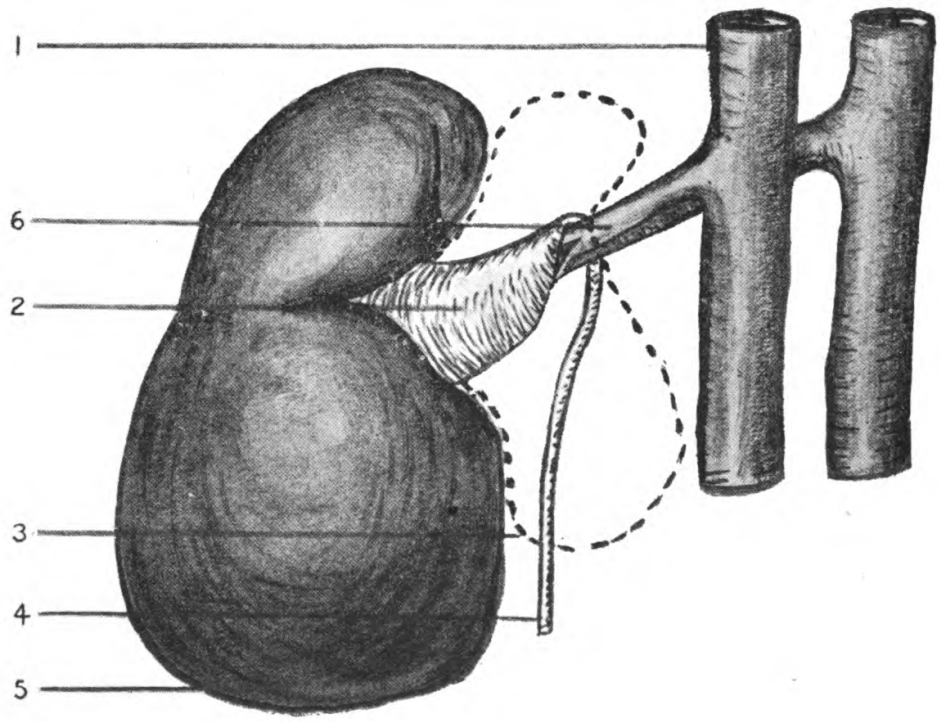

FIG. VII.

1, Vena cava; 2, pelvis of the kidney folded over the renal vessels; 3, position of pelvis when dilated; 4, ureter; 5, upper pole of kidney; 6, renal vein with artery behind it.

relieved by evacuation. Sudden accumulation and rapid subsidence of the swelling is an important characteristic of transitory hydronephrosis, and while on the affected side the pelvis is still filling and becoming more and more tense, on the healthy side there may be complete inhibition of the function of the kidney.

In movable kidney, obstruction to the escape of urine

through the ureter may happen in three ways—(1) the displacement of the kidney may consist of a rotation of the organ on its short axis, so that the ureter is twisted round the vessels; (2) there may be a sudden bending of the ureter at any part of its course; or (3) angular insertion of the ureter into the bladder may obstruct the passage of urine.

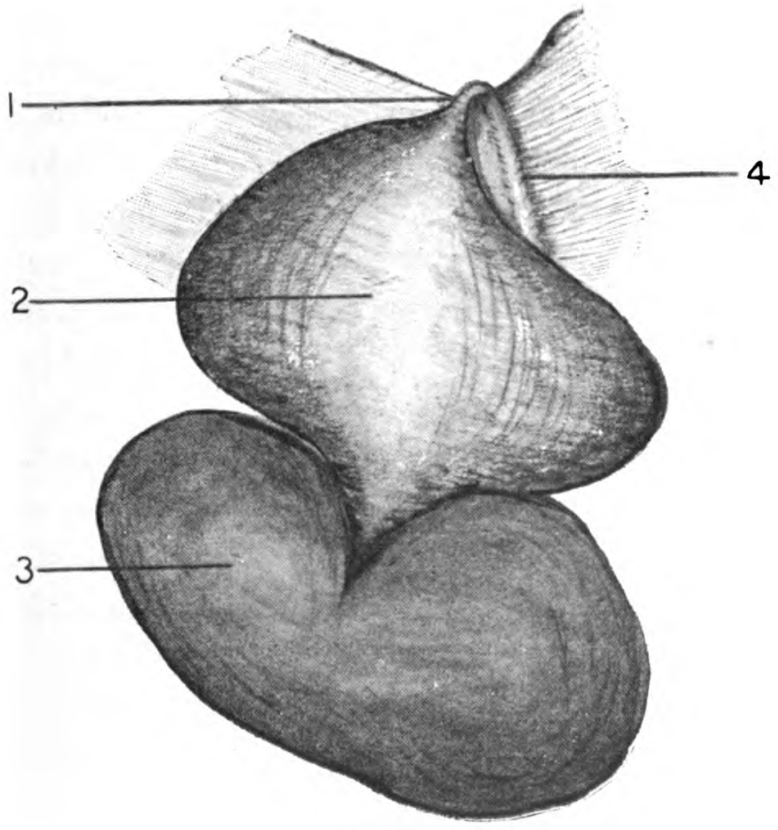

FIG. VIII.

1, Ureter folded over peritoneum; 2, dilated pelvis; 3, right kidney displaced downwards with its concavity looking upwards; 4, ureter with its anterior aspect covered by peritoneum.

Gigon (1856) attributed the hydronephrosis in movable kidney to the circumstance that, while in certain cases the kidney is free, its ureter is firmly bound down, so that the duct is prevented from following the gland when it is depressed, and thus a kink is formed which temporarily renders the passage of urine impossible. With this opinion, most

modern pathologists agree, whereas Simon and a few Continental writers, on the other hand, hold the opinion that the collection of fluid within the renal pelvis is caused by alteration in the relationship of the kidney and its duct. They assume that a temporary impediment having caused a hydronephrosis, the kidney becomes displaced, and, at the same time, the lower half of the distended renal pelvis compresses the first part of the ureter; or, if the pelvis be dilated more on one side of the point of origin of the duct than the other, the ureter is contorted, and the valvular obstruction created, which becomes permanent. As the accumulation increases, the kidney is pushed outwards and backwards, while the upper portion of the ureter comes to be situated anteriorly. Terrier, Baudoin, and Landau hold that frequently repeated displacements, twistings, and kinkings of the ureter in movable kidney are calculated to produce urinary obstruction and hydronephrosis, and maintain that this view is confirmed by the fact that the majority of hydronephroses of obscure origin are seen in women of considerable age, and on the right side.

But while, on the one hand, movable kidney doubtlessly leads to hydronephrosis, accumulations of fluid within the kidney may give rise to mobility of the organ. I have frequently seen, for example, cases of old-standing cystic degeneration of the kidney become movable, and the same course of events is not uncommon in cases of pyonephrosis and tuberculous disease, where the inflammation has not extended to produce adhesions in the perirenal tissues. This is most frequently seen when the subject of renal disease is also afflicted with chronic bronchitis or other pulmonary affections in which cough is troublesome.

In ten of the fourteen cases referred to above, the attacks of transitory hydronephrosis lasted for not less than six hours, some of the attacks extending over forty-eight hours; all were

associated with severe renal colic, and I think I may say, as a rule, that when the obstruction was due to rotation of the kidney on its short axis, the hydronephrosis was less prolonged than when caused by sudden bendings of the ureter in some part of its course.

1. *Kinking from rotation on its short axis.*—The following case illustrates very well, and is, indeed, the most marked and typical instance I have seen of transitory hydronephrosis from rotation of the kidney and twisting of the ureter:—

CASE I.—*Movable right kidney—Repeated and severe attacks of transitory hydronephrosis and albuminuria from rotating of kidney and kinking of the ureter—Cured by operation.*

Mrs. B., æt. 56, consulted me on 1st March, 1899, complaining of constant dull pain in the right lumbar region, extending, especially after exercise, across the abdomen and the thighs. This discomfort disappeared after rest in bed. When she limited herself to gentle exercise, it seldom interfered with her ordinary vocations, but she was prevented from travelling, or even from standing for any length of time, by a dread of bringing on what she called one of her "severe attacks of pain." The first time she observed any discomfort in the right renal region was in 1891, and this she attributed to a fall against the edge of the back of a dining-room chair, from house-steps, on which she was standing dusting pictures. The chair-back caught her immediately below the right costal margin, and caused so much pain that she became sick and had to go to bed. She was then 48 years of age, stout, and well nourished; had three sons and four daughters, all alive; and she enjoyed excellent health. After the injury, she remained in bed for a week, was treated by her medical

attendant in Dundee, and made an excellent recovery, as far as could be judged at the time. A month after the injury she travelled to London, and on arriving there, she had to go to bed at once in the hotel on account of a "sickening pain in the abdomen." With a night's rest she felt better, but not well, and after a day's shopping the pain recurred. From that time onward any prolonged exertion has been followed by some renal suffering, and now, unless when in bed, the pain is almost constantly present. For this alone the patient would not have sought surgical advice, but, in addition, during the last eighteen months she has been the subject of severe attacks of renal colic. This at first occurred only occasionally, say once in three to five weeks, but during the last six months a week has seldom passed without paroxysmal attacks of severe colicky pain.

Examination of the abdomen.—The walls being very flaccid, palpation was usually easy by reason of the absorption of adipose tissue, the patient having lost 34 lb. in weight within the last year. The right kidney was found to be movable, and could be easily pressed down into the pelvis and to the middle line in front. I sent the patient into a nursing home to be under observation, and while there she had an acute attack of renal colic. The attack began at 5 o'clock in the morning (20th March, 1899), and steadily increased in severity until midnight, and then suddenly, after the evacuation of a large quantity of urine, the pain was relieved. During the attack the kidney could be distinctly felt, and immediately above it a soft swelling, pressure on which elicited considerable pain. The other symptoms and physical signs of transitory hydronephrosis were present, but as this will be referred to hereafter, it will be unnecessary to detail them here.

23rd March.—The kidney was exposed, when it was found

to present the form represented in Fig. VII (p. 26). The upper part of the kidney was large and dilated, while the lower was small and atrophied, and this was so marked that it was made out by abdominal palpation prior to the operation. It was noticed that during the attack of renal colic the kidney had become rotated, so that the larger and upper end (5) was lowermost; therefore, before fixing the kidney, traction was made upon the very loose adipose capsule and the perirenal fascia. This caused the organ to regain its normal position, the upper pole rotating forwards and upwards.

The kidney being loose in a large perirenal sac, the preponderating size and weight of the upper end (5), which was probably a congenital condition, caused the upper pole to fall forwards and downwards, and, in doing so, the ureter was thrown over the renal vessels, and by being kinked an obstruction was produced, followed by dilatation of the pelvis, as shown by the dotted lines in Fig. VII (3) (p. 26).

2. *Obstruction from sudden bending of the ureter in some part of its course.*—This form of obstruction is believed to be the most common cause of transitory hydronephrosis in movable kidney. Curvature of the ureter can be shown to occur in the dead body when the kidney is displaced downwards. In dogs, Navarro and Tuffier have demonstrated that displacement of the kidney caused retention of urine in the pelvis, and Albarran affirms that, in catheterising the ureter in cases of movable displacement of the kidney, he has met with displacements which were removed by replacing the kidneys in their proper position.

While the peritoneum may become loosened from its attachments in the renal region and pouched forwards by the wandered kidney, the ureter may remain fixed by firm adhesions, so that when the kidney falls forwards and

downwards, the ureter becomes curved, and the angle becomes more acute as the organ descends lower and lower.

CASE II.—*Movable right kidney with hydronephosis from bending of the ureter—Cured by operation.*

Mrs. C., æt. 30, married, with three of a family, was admitted into a nursing home on 3rd November, 1901, complaining of pain in the right kidney of six years' duration. She was at one time moderately stout and plethoric, but during the three years prior to admission she had been losing weight and colour. Her daily duties consisted of housework and attending at the counter of a baker's shop, where she had to stand for many hours daily. No cause could be assigned for the pain, which seemed to have come on so gradually that the patient could not fix the date of the onset. At the beginning of 1895 she was in perfect health, but by midsummer she always suffered from dull aching pain in the lumbar region after long standing. Not until 1899 did anything like severe spasms of pain set in, but in May of that year (on 5th and 27th) distinct paroxysms of renal colic, lasting from four to nine hours respectively, occurred. From May, 1899, till November, 1901, she had severe attacks almost every month. These were relieved by rest in bed only, and were succeeded by sickness, nausea, and sometimes vomiting. The patient was kept under observation at the home for a fortnight, and instructed to take active exercise, so that during an acute attack the condition might be observed. The parietes were thin and relaxed, the right kidney was easily felt and found to be freely movable, slightly enlarged, and free handling produced pain, accompanied by sickness. During an attack which lasted ten and a half hours, the kidney was found to be lying at the entrance of the pelvis. Its convex aspect could be traced easily, but the notch could not be felt,

and above the kidney a vague mass, which contained fluid, could be traced with the hand. An attempt was made to replace the kidney, but this caused so much pain that an anæsthetic required to be administered; then the replacement was easily effected. On recovering from the anæsthetic, the patient passed a large quantity of urine, and the pain subsided. Nephrorrhaphy was performed, and since then there has been no recurrence of the symptoms. Fig. VIII (p. 27) shows the probable condition of matters, as far as it could be ascertained by physical examination under chlorofrom, and by what was seen at the operation.

3. *Obstruction by angular insertion of the ureter into the bladder.*—This must be a very rare cause of hydronephrosis in movable kidney, and can only be proved by a *post-mortem* examination or by a very extensive exploratory operation; and even when the nature of the obstruction has been proved, the question is still to be answered—Is the movable kidney the cause of the angular insertion, or has the obstruction, by producing a hydronephrosis, induced mobility of the kidney? The latter opinion is probably the reasonable one.

I have seen only two cases where I suspected this form of obstruction, one of which was the following:—

CASE III.—*Right movable kidney with transitory hydronephrosis from kinking of the ureter, cured by the operation of nephrorrhaphy.*

C. G., æt. 34, single, was admitted into the Glasgow Royal Infirmary on 1st November, 1895, complaining of a dull aching pain in the right loin, which commenced five years ago, and from then till now has steadily increased both in frequency and in severity. This pain was described as

being almost constantly present, but she also suffered frequently from paroxysmal attacks of severe colicky pain, which sometimes assume a very acute character.

During the acute attacks the patient was herself able to feel a distinct swelling in the lumbar region, which on pressure was very tender. These acute paroxysms of pain occurred only at intervals of several months at the onset of the disease, but as time passed they have become more frequent. At the present time they recur nearly every second day. The onset of the pain was gradual, but the relief was sudden. Her own description of the attack was as follows:—

"Suppose the pain begins to increase about 1 o'clock in the day, it steadily becomes more severe until about night (6 or 7 o'clock); at the same time the swelling in the loin gradually enlarges, and sometimes extends beyond the middle line in front; as the swelling increases so also does the pain."

During the period of enlargement the urine was scanty and highly coloured, and of high specific gravity. Suddenly a copious flow of pale-coloured urine took place, the swelling subsided, and the pain was suddenly relieved.

While the hydronephrosis was increasing, the patient was generally compelled to go to bed; but very soon she was unable to lie in the recumbent posture, and required to sit up with the thighs flexed on the abdomen, and the chest thrown well forward in order to relieve pressure.

On examination of the abdomen between the attacks, the walls were observed to be very flaccid. When the patient lay upon her back a distinct bulging was observed in the lumbar region on the right side, which on palpation was found to be quite soft, but on firm pressure, pain was elicited over a considerable area, extending from the crest of the ilium to the

ribs, and as far forward as the middle line. The amount of swelling varied greatly from time to time.

During the paroxysm of pain the swelling could be felt about 2 inches to the left of the middle line, between the umbilicus and pelvis, and extending downwards in the right iliac fossa to within an inch and a half from Poupart's ligament. During the intervals between the attacks of the pain, the right kidney could be found to be distinctly movable, with the excursion ranging from the position of the gall-bladder above to within 4 inches of the symphysis pubis below; at the level of the umbilicus the kidney could be pushed an inch and a half across the middle line. Beyond the condition of the kidney, the patient was absolutely healthy.

At midnight on 13th November, pain was very severe, and continued so till 11 P.M. the following day, when 40 oz. of urine of low specific gravity were passed.

Nephrorrhaphy was performed on 26th November, and since that date there has been no recurrence of the pain, nor has any accumulation of urine been observed in the pelvis of the kidney. The main point in the operation was to fix the kidney as high up as possible, and firmly, so as to stretch out the tortuous and elongated ureter.

In this case the operation was completely successful, and the patient is reported (October, 1903) still quite well, and free from any recurrence.

(*b*) The vessels of the kidney are generally elongated, even in the lesser degrees of movability, and, when the movements are free and the ailment one of old-standing, the lengthening of the renal artery and vein may be considerable—so great, indeed, that the kidney may be easily delivered through the incision in the parietes without much stretching of the pedicle.

The radius of movement corresponds with the length of the vessels from the aorta to the hilum of the kidney, and when the organ is displaced, the oblique position is the one most frequently assumed—the lower pole of the kidney (4) pointing inwards, while the hilum and pelvis (3) present upwards (Fig. IX). Less commonly, the hilum is turned

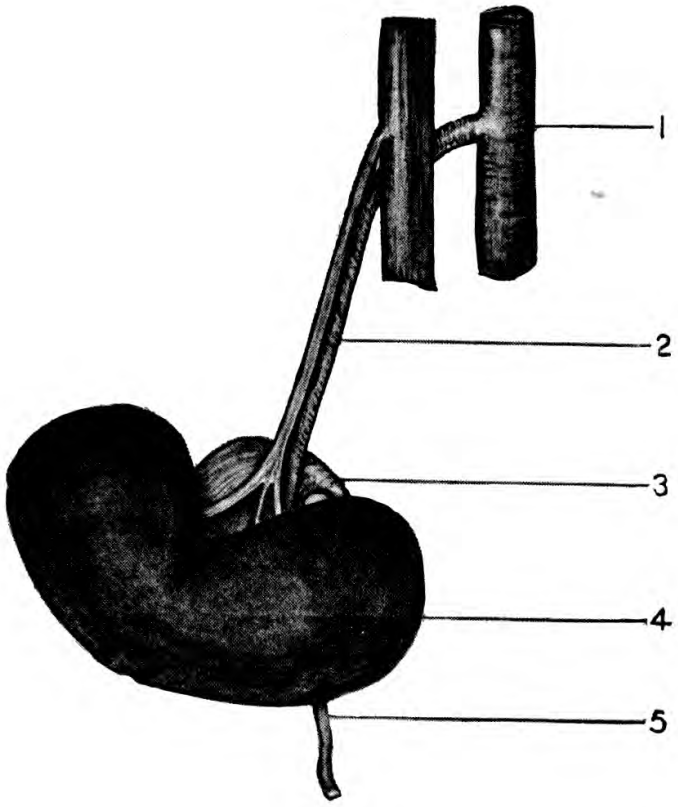

FIG. IX.

1, The aorta ; 2, the renal vein ; 3, the pelvis ; 4, the lower pole of the right kidney ; 5, the ureter.

backwards and downwards, while the convex surface rests upon the anterior abdominal wall. The origin of the arteries from the aorta is normal unless the condition has been congenital. The changes just referred to may be observed both on the operating table and at *post-mortem* examinations. I have seen a case where the vessels were fully $4\frac{1}{2}$ inches

in length in a case of movable right kidney. During life, the lax vena cava yields to the continuous tension made upon it by the renal vein, while the aorta remains more firmly fixed. This circumstance probably accounts for the fact that the artery is generally more elongated than the vein. It would be expected that this lengthening and stretching of the vessels would lead to thinning of their walls, but this is not seen, rather the opposite. Generally the walls both of the artery and of the vein are thickened. In movable kidney, the displacement of the organ may, firstly, cause the circulation to be interfered with by direct mechanical obstruction, by rotation of the loose kidney on its short axis, causing twisting of the vessels, and secondly, by displacement of the kidney downwards, stretching the vessels and causing acute angular curvature. As a consequence, either the arterial supply may be impaired or resistance may be offered to the venous return. I have shown above, and illustrated by Case I, how rotation of the kidney may obstruct the escape of urine from the pelvis; and, in the paper read before the Clinical Society, London, in 1896 (Clinical Society's *Transactions*, vol. xxx, p. 65), I endeavour to show and illustrate by cases how in movable kidney, by increasing the vascular tension, renal pain, hæmaturia, and albuminuria may be induced. Since that time, a considerable number of cases have confirmed the views then expressed. When the poles of the kidney are reversed by rotation on its short axis, not only is the ureter twisted and compressed over the vessels, but the artery and the vein may also be constricted.

Impediment to the *flow of blood through the artery is very rare.* The only case I have seen is one I recorded in the paper above referred to, and, on account of its unique character, it may be worthy of repetition.

CASE IV.—*History of injury causing movable kidney—Renal pain—Emaciation, and occasional suppression of urine from torsion of artery and ureter—No tube-casts, hæmaturia, or albuminuria—Cured by operation.*

N. O., æt. 49, came under observation in 1882. Prior to this the patient, who was at one time very stout, had been emaciating. He had suffered a good deal from chronic bronchial catarrh, attended with considerable muco-purulent expectoration which, on microscopical examination, was found occasionally to contain a few blood-corpuscles and a considerable quantity of pus. The physical signs were indicative of chronic bronchitis, accompanied by slight emphysema, without bronchiectasis.

The history of the case, as far as the movement of the kidney is concerned, dates from the beginning of the year 1882. He was out riding one day, when his horse stumbled, and he fell on his right side and fractured two of his ribs (the ninth and tenth left). He was kept in bed for a fortnight after the accident. During this time, he complained of pain on the right side, immediately below the edge of the liver. The practitioner attending him at that time suspected an abscess, and treated him accordingly. While he remained in bed, he did not notice any swelling or tumour on the right side, but after he got up he discovered a movable tumour seated in the hypochondriac region. At first he complained of pain in the right renal region, attended with vomiting, and sometimes followed by diarrhœa. The pain usually came on suddenly, and lasted for five or six hours. He noticed that if he took much exercise, or if the bowels were constipated, he was more apt to have an attack. When he took to bed the symptoms soon disappeared, but, on the other hand, if he continued to take even moderate exercise, the pain caused him considerable inconvenience.

He was greatly emaciated, and for a man the belly was loose and pendulous. Palpation of the abdomen revealed the presence of an oval swelling immediately under the lower edge of the liver, and about 2 inches from the umbilicus. The swelling could be freely moved about in the abdomen, and pushed down into the pelvis, upwards under the edge of the liver, and an inch to the left of the middle line. Percussion over the right renal region, or over the swelling, did not yield any satisfactory results, but when the right loin was examined, the kidney having previously been displaced, a distinct flattening could be made out. When the swelling was handled, a sickening sensation was experienced, resembling, as the patient informed me, the pain produced when the testicle is squeezed.

A careful examination was made with the object of detecting pulsation of the kidney or of the renal artery, as this case appeared to be a very favourable one for this purpose, on account of the thinness and looseness of the abdominal wall, but no trace of movements resembling pulsation could be made out.

The only other symptom worthy of notice was the occasional sudden suppression of urine, without any very evident cause, and without any apparent relation to the position of the right kidney. Sometimes it commenced without the organ being displaced, at least so far as could be detected by hand, and there was no increase in the size of the organ during the time this symptom was present.

The only explanation I can give for the scanty secretion of urine, is to suppose that the kidney was rotated on its short axis, so that the ureter and blood-vessels were coiled round one another, and the passage of blood to and from the kidney was thereby prevented. This condition would lead to a very marked engorgement of the kidney on the affected side, while

it might also induce reflex spasm of the blood-vessels in the opposite organ, and so bring on suppression, just as the use of a catheter may cause the excretion to cease for a time.

When the secretion again became active, the urine passed did not differ from what was voided at other times.

The following table will show the quantities and specific gravities of seven samples collected during one of the attacks. There was no urine passed between 11 A.M. on 28th and 1 A.M. on 29th November.

1882.	Quantity.	Sp. Gr.	Urea.	Remarks.
Nov. 28— 7 A.M.	10 oz.	1015	1·75 %	Slight deposit of urates.
,, 28—11 ,,	8 ,,	1017	1·85 %	,, ,,
,, 29— 1 ,,	3 ,,	1016	1·7 %	Considerable deposit of urates.
,, 29— 3 ,,	10 ,,	1019	1·9 %	,, ,, ,,
,, 29— 8 ,,	6 ,,	1014	1·5 %	No deposit.
,, 29— 1 P.M.	7½ ,,	1014	1·55 %	,,
,, 29— 5 ,,	10 ,,	1018	1·7 %	,,

At the time, the case was considered to be one of movable kidney, with torsion of the renal artery, without much obstruction to the venous return, as shown by the sudden suppression of urine, unassociated with hæmaturia, albuminuria, or the presence of tube-casts.

The patient refused to have an operation performed, and, at the time (1882), I was too uncertain in my views of the case to press the matter; but, the symptoms remaining unabated till 1888, I then performed nephrorrhaphy with a good result.

Interference with the venous return is one with which we are very familiar, and in movable kidney is probably the most frequent cause of pain associated with hæmaturia. This correlation has been observed in over 12 per cent of my cases, and in 7 per cent the hæmaturia has been noted as severe. It is not necessary here to dwell upon the symptoms

and physical signs to which obstruction to the venous flow may give rise; that will be dealt with farther on.

The pathology of these cases is easily understood. It is manifest that in such displacements of the kidney we have to deal with a passive hyperæmia of the kidney due to local causes. In some instances the obstruction may be entirely venous; in others, the arterial circulation may also be interfered with. It has been proved by experiments upon animals that when the venous flow is impeded the quantity of blood flowing through the kidney is diminished, and, as a consequence, the amount of urine excreted immediately decreases. Coincident with the diminution in quantity of the excretion there is a concentration of the urine, which soon becomes albuminous; and, should the hyperæmia be intense, blood-corpuscles, tube-casts, and even blood-casts may appear in the urine.

As the efferent resistance increases, the veins and the venous radicles surrounding the uriniferous tubules will become distended. This increased resistance to the flow of blood will lead to an augmentation of the blood-pressure within the glomeruli; but, at the same time, by diminishing the total quantity of blood flowing through the organ, the venous obstruction will cause retardation to the excretion of urine.

The absolute pressure of the blood in the glomeruli is only one factor in determining the quantity of urine excreted; the rapidity of the flow is of even greater importance, and the kidney being provided with a rigid capsule, the engorgement of the veins must produce considerable pressure upon the uriniferous tubules, and so augment the pressure of the fluid in Bowman's capsules. This compensates to some extent for the increased tension of the blood in the Malpighian tufts.

The backward fluid-pressure of the urine so produced doubtless induces an œdema of the organ, and probably a

partial absorption of the already secreted urine, as indicated by an engorgement of the lymphatic spaces; but, when the obstruction to the vein is removed, the venous radicles empty themselves quickly, and the œdema rapidly disappears. This happens only when the engorgement is of short duration; when it is prolonged or frequently repeated, serious structural changes will ensue.

As regards the passage of albumen and the corpuscular elements of the blood, long ago Mr. George Robinson, in a paper read before the Royal Medical and Chirurgical Society of London in 1843, demonstrated by experiments upon animals that obstruction to the renal vein caused both albuminuria and hæmaturia, and these abnormal constituents appeared in the urine within a very short time after the obstruction took place—in some instances within three or four minutes. Senator, also, by experiments, proved that, by obstructing the renal vein for a short time in a living animal, albumen and blood-corpuscles could be easily detected in the straight tubules, while Bowman's capsules were free; but, if the pressure were more prolonged, the mechanical hyperæmia caused blood to escape into the Malpighian capsules also.

From these experiments, it is easily seen how blood-casts, blood-corpuscles, and albumen may appear in the urine in the cases described above, and from other observations it has been shown that the slower the circulation becomes the larger will be the amount of abnormal constituents in the urine. Not only does venous obstruction produce those changes in the urine, but compression of the renal artery may also be followed by suppression of the excretion. Hermann and Overbeck demonstrated that even slight disturbance of the renal circulation causes suppression, which may last for a longer or shorter period according to the sensitiveness of the individual, and that albumen and blood may appear in the

urine for hours or days thereafter. We also know that arterial obstruction is an important cause of venous hyperæmia; and, with the possibility of having venous pressure combined with arterial disturbance of the circulation, we have in movable kidney a most productive cause of suppression of urine followed by hæmaturia and albuminuria.

I believe that not only in the cases referred to here, but in many others, the retardation of the glomerular circulation by venous engorgement is the chief factor in the causation of suppression of urine and some forms of albuminuria, and, consequently, relief of tension may give immediate ease to the patient, and restore the function of the kidneys.

The clinical phenomena can be easily understood when they come to be considered. The impediment to the circulation at once induces swelling of the substance and painful tension of the capsule; this induces degenerative changes in the parenchyma, and, if prolonged or frequently repeated, atrophy of the kidney follows. Fortunately, the kidney in the large majority of cases soon resumes its function. The pain compels the patient to go to bed, and while lying the kidney slips back to its normal position, and the strangulation is for the time relieved.

I will describe one or two illustrative cases when we come to consider the question of symptoms.

In 8 out of 180 cases which have come under my observation, albumen and tube-casts were present in the urine prior to the operation, and disappeared within a fortnight thereafter. In all these cases the fibrous capsule was freely incised, but not separated from the cortex. The fact that albumen and tube-casts were persistently present in the urine suggested the existence of Bright's disease, but the circumstance that these elements vanished after the operation led me to the conclusion that their presence was due to mechanical

interference with the circulation. How far this view is correct it is difficult to say. The explanation may be wrong, but the fact remains. I have seen undoubted cases of Bright's disease mitigated by operation, but even in these cases I have been convinced that the relief was due to relaxation of the vascular tension coincident with the malady.

Bright's disease is relatively more common in cases of movable kidney than in patients with their kidneys in place. As far as I can gather from published cases, and from my own observation, a little over 6 per cent of the cases of movable kidney present symptoms of Bright's disease, and, in the great majority of these, the mobility has been of old-standing.

(*c*) *Nerves.*—The displacements which cause so much deformity of the vessels and ureter cannot fail to displace and strain the renal nerves, and this probably accounts for much of the discomfort generally experienced by the patient; but, on account of the small size of the filaments involved, it is difficult to ascertain the exact pathological changes. Patients seldom die from movable kidney, or from the operations which are performed for its relief. My first case operated upon on 29th March, 1883, is still alive and well, and I have not had a death from nephrorrhaphy in an uncomplicated case of movable kidney—that is to say, a case that was free from sepsis, tuberculosis, or cystic disease. I have no doubt, as a consequence of rapid displacements of the kidney, certain inflammatory degenerative changes do occur in the nerves, and these, even after the kidney has been fixed by operation, may take a considerable time to return to their normal state; hence renal pain may persist even after the patient is convalescent from the operation and relieved of other symptoms. The following case seems to me to illustrate this well:—

CASE V.—*Movable right kidney with pain as a prominent symptom, which was not completely relieved till six months after nephrorrhaphy, probably as a consequence of degenerative changes in the renal nerves.*

Mrs. W., æt. 37, came under my observation in September, 1901, and presented all the usual symptoms of movable kidney, but none of those pointing to obstruction to the ureter or to interference with circulation. At the beginning of October I performed nephrorrhaphy at her own home. Prior to the operation pain was a prominent symptom for many months, and frequent attacks of dyspepsia made the patient's life miserable.

The right kidney was freely movable, and could be found as low down as the anterior superior spinous process on several occasions. While relieved of symptoms of gastro-intestinal disturbance and those referable to the urinary system immediately after the operation, four months subsequent to it the patient was conscious of what she described as "the old pains in the kidney," even although the kidney was firmly fixed, and no other symptoms of renal disturbance were present. Her suffering included crampy pains in the abdomen, dull aching pains in the loins, and pains along the great nerve trunks of the right leg. Two months later—that is to say, six months after the operation—these all disappeared without further treatment having been employed. Their disappearance was very gradual, but quite steady.

V. *Changes in the parenchyma of the kidney and the fibrous capsule.*—As a rule, the parenchyma of the kidney suffers little or no change in the early stages of this disorder, but if the malady is of some years' standing, various morbid conditions may be induced.

1. Those due to interference with the circulation.

2. Those following transitory hydronephrosis.

3. Secondary diseases, such as the various forms of sepsis, tuberculosis, cystic disease, and renal calculus.

The first morbid process produced by the passive hyperæmia and increased vascular tension, associated with movable kidney, is degenerative changes in the epithelium, and while the organ may be considerably increased in size for a variable length of time, the ultimate tendency is to atrophy. In the great majority of very old-standing cases I have found that the affected kidney is less than half the normal size, but probably this was physiologically redeemed by compensatory hypertrophy of the neighbouring organ. A case was admitted to my wards in the Royal Infirmary a few days ago (9th April, 1904), where at the operation the kidney was found to be greatly atrophied. It was about 2 inches in length, and measured not more than half an inch from the pelvis to the convex margin. The urinary secretion was quite normal, showing that the atrophy was compensated. If, prior to the operation, the patient has been allowed to have rest in bed for a week or two, very frequently in performing nephrorrhapy the kidney is seen to be soft and flabby and darker in colour than normal; but if the operation is performed without prolonged rest, it is found to be congested, of a dark chocolate colour, and when the fibrous capsule is incised the parenchyma pouts out through the opening.

The changes in the kidney substance secondary to transitory hydronephrosis are very similar to those induced by impairment of the circulation. When the ureter is suddenly and completely obliterated, a wasting of the parenchyma rapidly follows, and very little dilatation of the pelvis results. In incomplete occasional obstruction, hydronephrosis is induced for a limited time, and during the intervals the organ has an

opportunity of recovering itself; but if the attacks are frequent, or of long duration, wasting of the organ is certain to follow.

The pressure exerted by the urine, which accumulates behind the obstruction, leads to expansion of the calices and flattening of the papillæ. Gradually, as the hydronephrosis advances, the pyramidal portion becomes excavated, until, as seen in extreme cases, the whole organ is represented by a cyst, or by a series of cysts, separated from one another by septa of fibrous tissue. As the pelvic cavity and the capsule approach one another, the renal form of the organ is lost. The outer surface may become rough, irregular, and lobulated, the depressions between the lobules corresponding to the connective tissue septa within the sac, which indicate the remnants of the calices of the kidney. These pouches communicate freely with one another, and in most instances with the dilated pelvis, but in a few rare cases the sacs may be shut off from the pelvis by fibrous tissue. In movable kidney this extreme degree of hydronephrosis is very rare.

Secondary diseases, such as the various forms of sepsis, tuberculosis, cystic disease, and renal calculus, are not very uncommon in malpositions of the kidney. When the patient presents herself to the surgeon, and he finds on enquiry that she has been suffering for many years, and on examination discovers that the kidney is both movable and diseased, it is often difficult to determine whether the disease is the cause of the mobility, or the mobility of the kidney the cause of the disease. As far as I can learn from a study of the subject, and from what I have seen, all forms of misplacement, whether fixed or movable, lay the kidney open to attack. This has an important bearing upon the question of operative treatment; not only have we to bear in mind the present, but we have to look forward to the future prospects of the patient. In an article which was published in the *Glasgow*

Hospital Reports on "Malformations of the Kidney,"[1] I pointed out how liable misplaced kidney, but especially "single kidney," is to disease. I collected seven cases of "single kidney" in which calculus was present; these were published by Rhodius,[2] Jobi,[3] Rokitansky,[4] Rayer,[5] C. Julia Fontenelle,[6] Everard Home,[7] Sylvaticus.[8]

Chronic tuberculous and interstitial nephritis is also very common in "single kidney," and a few cases of hydronephrosis have been recorded, and one or two of pyonephrosis and abscess. Considering the great rarity of "single kidney," that is a goodly number.

Any condition which impairs the nutrition of the organ must diminish its resisting power to invasion by infective processes. A kidney which is constantly liable to disturbance of its vascular supply, as occurs in the crises of movable kidney, or to retention of its secretion, as in transitory hydronephrosis, becomes favourable to attack by micro-organisms, either septic or tuberculous. The factors which facilitate invasion of microbes to the kidney and the uninary tract are numerous. These were fully discussed by me in an article on septic diseases of the urinary tract published in the *Glasgow Hospital Reports.*[9] Pent up organic fluid is liable to infection in many ways, and so a hydronephrosis may easily

[1] *Glasgow Hospital Reports*, vol. i, p. 142.

[2] *Mantissa Anatomica*, *Observatio*, xxxii, 1661, p. 21.

[3] à Meek'ren, *Observationes Medico-Chirurgicæ*, Amstelodami, 1682, cap. xl, p. 169.

[4] *Lehrb. der Pathologischen Anatomie*, Bd. iii, 1861, S. 317.

[5] *Traité des Maladies des Reins*, tome i, 1839, p. 404.

[6] *Archives Générales de Médecine*, tome ii, 1824, p. 517.

[7] *Practical Observations on the Treatment of the Diseases of the Prostate Gland*, London, 1811, vol. i, p. 68.

[8] Cited by Lieutaud, *Historia Anat. Med.*, tome i, p. 284.

[9] *Glasgow Hospital Reports*, vol. iii, p. 354.

be converted into a pyonephrosis, a septic nephritis, or a pyelonephritis. This, however, is too large a question, and is beyond the limits of the present enquiry.

Conservative action may intervene. As a consequence of inflammatory changes around the kidney, the movable organ may become fixed in an abnormal position. Urag mentions instances in which the kidney became bound to the surface of the liver, the gall-bladder, and the transverse colon; and other observers have recorded cases where the wandering organ became ultimately fixed to the stomach or to the anterior abdominal wall. I have seen two cases where spontaneous cure occurred after mild attacks of perinephritis. The first case was that of a lady who had a movable kidney for many years, but suffered very little as a consequence. She was accustomed to take active exercise—cycling, hunting, and tennis. One day, while on the hunting field, she was thrown from her horse, and fell upon her right side, sustaining an injury to the right arm and severe bruising on the right side of the abdomen and chest. Three days after the injury she complained of great pain in the region of the right kidney. Considerable induration ensued, and there was tenderness over the part for fully three weeks, and probably considerable effusion of blood in the deeper structures of the lumbar region. She made an excellent recovery, and when I examined her six months afterwards, the kidney was firmly fixed between the costal margin and the crest of the ileum, probably an inch and an half below its normal position. The second case was almost exactly similar—it was that of a housewife, the wife of a working engineer. She had a movable left kidney which caused her trouble only occasionally, and, although advised to have a nephrorrhapy performed, she preferred to do without the operation, saying that her kidney, although away from its place, did not give her much trouble.

While at work in her house the chair upon which she was standing upset, and she fell against the edge of the table. Very soon after the injury she suffered considerable pain, and there was marked collapse, indicating some serious injury, but the precise nature of this was difficult to ascertain. There was severe contusion in the left lumbar region, which may have been due to a rupture of the kidney, but this was not corroborated by the presence of blood in the urine, although there was evidence of considerable hæmorrhagic effusion deep in the lumbar region. I saw the patient at occasional intervals for a year after the accident, and when the swelling disappeared I was unable to discover any mobility in the kidney, which had been freely movable prior to the accident. Those two cases illustrate how a cure may occur as a consequence of accident, but one can also easily understand how the organ may be fixed by any inflammatory affection of the structures around the kidney. In fact, in operating we only imitate what may, under certain circumstances, be done by Nature.

VI. The changes in other abdominal organs are numerous and interesting, but it is not necessary to dwell at length upon them here. They will demand our attention when the question of etiology comes to be considered. Glénard regards movable kidney as simply one of the numerous instances of enteroptosis, and expresses the opinion that nephroptosis never exists alone; and he points out the frequency with which in the same person the liver, the intestine, and the kidneys are unduly lax and movable. Ewald, on the other hand, controverts this view, and Morris agrees with him. "The conclusion of Ewald is the one which will most commend itself to surgeons who see much of kidney surgery and 'movable' or 'floating' kidneys. My own personal experience is that

the persons who consult a surgeon on account of a wandering or a movable kidney, are as a rule free from undue mobility or ptosis of any other abdominal organ. I have only once been consulted, with the view to the question of the treatment of a mobile kidney, where the patient was considered to be the subject of enteroptosis. This patient was sent to me by a physician as a case of Glénard's disease. She was a woman with very lax abdominal wall, a very movable kidney, and a somewhat movable liver. She was quite relieved from all her symptoms, both renal and intestinal, by nephropexy, and remained well for several years after the operation."[1]

The strong objection to the view Glénard advanced is that in the great majority of cases of movable kidney seen by the surgeon, the other abdominal organs are not disturbed; and, on the other hand, there may be serious reduction in the internal abdominal pressure, and some displacement of viscera without any undue mobility of the kidney. In right movable kidney Girard observed changes in the vena cava; the vessel showed a distinct furrow at the spot where the kidney lay.

Stone in the bladder, gall-stone, and the other affections of the gall-bladder have been noted by Marchard and Weisker. Probably the most important changes are in the alimentary tract. In many instances the stomach is dilated and there is evidence of pyloric obstruction. The duodenum may also be affected. Hellar found it greatly enlarged in the pars perpendicularis. David Hepburn met with a case where the pars perpendicularis duodeni ran to the left.

"From the pylorus the duodenum passed to the right for a distance of 2 inches, when it came in contact with the left side of the gall-bladder and the upper or left border of the kidney.

[1] Morris, *Surgical Diseases of the Kidney and Ureter*, vol. i, p. 101.

"It immediately turned downwards and to the left and crossed the mesial line obliquely, appearing in the left iliac fossa close to the sacral promontory. . . . From the left iliac fossa the duodenum turned abruptly upwards for a distance of 2 inches in the vertical direction; here it again made a sudden turn, this time to the right and then became continuous with the jejunum. . . .

"Another interesting feature in the case under consideration is the direction of the commencement of the jejunum, which was to the right instead of the left, as in normal cases."

Chapter III.

MOVABLE KIDNEY—ETIOLOGY.

In discussing the etiology of movable kidney, I shall first state a few facts in relationship to statistics, thereafter review the various opinions which have been offered to explain the occurrence of the malady, and then shortly criticise the various views advanced.

The *etiology* of movable kidney is still uncertain. The first thing to ascertain is the relative frequency of the disease, but this is by no means so easy as may appear at first sight. The statistics from *post-mortem* records, although collected with great labour, are of little value. Even in well-marked cases, movable kidney is apt to escape observation after death, especially when it is the habit of the pathologist to remove the kidneys before the intestine, unless his attention be specially directed to the point. Hence the search in reports of autopsies gives one result, the inspection of dead bodies by one interested in the subject a very different record. A set of statistics I compiled gives 15 cases of movable kidney in 16,479 inspections. Ebstein and Neumann, whose figures are based upon 14,698 autopsies, record only 16 cases. My own observations in the inspection room of the Glasgow Royal Infirmary, while I was pathologist, give a percentage of 1·8 cases in which the kidneys were movable through an area of more than 3 inches. Movement was most frequently

observed on the right side, and usually was associated with emaciation of the body, a lax condition of the abdominal walls, and a looseness of the attachments and lengthening of the mesocolon on the right side, sometimes accompanied by lengthening of the renal vessels.

In estimating the frequency of movable kidney as observed in autopsies, it is well to remember a possible fallacy arising from the circumstance that the adipose tissue around the kidney becomes firm after death, so that, even in cases where the kidney was movable during life, it may become so fixed after death as to escape observation.

The frequency of movable kidney as observed during life gives a very different result from those just enumerated. It is variously stated by different writers, and seems to depend considerably upon the nature of the practice the observer is engaged in. Probably the two extremes are represented by Lindner on the one hand, who finds symptoms of movable kidney in every third or fourth woman he examines, and Senator on the other; he states the relative frequency as 1 case in 139 women patients. Küster says, "I possess now exact notes during my practice in Berlin, of which a considerable part were gynæcological cases and also surgical. These notes treat of nearly a period of three years, from the end of 1887 to the autumn of 1890, and describe the cases of 1,733 persons, 44 being movable kidney, giving 1 case of movable kidney in 39-40 patients. These 1,733 persons were 828 males, among whom 4 cases of movable kidney were observed, and 905 females, with no fewer than 40 cases suffering from that complaint, being 1 movable kidney in 207 among the males and 1 for every 22 persons among the females."

Edibohls records 90 cases in 500 women, and Mathieu, out of 306 women examined in hospitals, found movable kidney in 85, or 27 per cent. Glénard gives the percentage at 22.

Lindner and Küttner put the percentage in women at 20. In 1,422 whom he examined, Skorczewsky found that 32 females out of 1,030, and 3 males out 392, suffered from movable kidney. In 19 patients—2 males and 17 females (9 of whom had borne children)—the right kidney was movable; and in 11 patients—1 male and 10 females (6 of whom had borne children)—the left kidney was movable. Both kidneys were movable in 5 primparæ. That is to say, over all the cases examined, 2·5 per cent suffered from movable kidney; and in women alone 3·2 per cent, and in men alone 0·8 per cent. According to Oser, of Vienna, among the poor in Austria 10 per cent of the women who have borne children are affected.

In the cases which have come under my own observation, 86 per cent were in women and 14 per cent in men. Morris states that his own operation list shows 98 operations for movable kidneys, 88 being performed upon women and 10 on men; thus only 11·3 per cent were males, or 1 male to every 8·8 females.

The industries of the people, the hours of work, and other local circumstances may determine the relative frequency of movable kidney in each sex. Thus we find that in one country, or even in one department as distinguished from another, results are different.

According to Landau, both kidneys are involved in about 5 per cent of the cases.

In my experience, 8 per cent, or about 1 in 12, is nearer the mark. In women, the age at which this affection is most frequently met with corresponds to the child-bearing period and a few years succeeding it; thus, about 46 per cent of the cases were observed between the ages of 30 and 40 years, and 20 per cent from 40 to 50 years of age, and in all 81 per cent between the ages of 20 and 50.

Küster's results are a little different from these. He gives the following table:—

11–20 years,	4	cases.
21–30 „	25	„
31–40 „	36	„
41–50 „	25	„
51–60 „	10	„
61–70 „	1	„
Total,	101	„

And he remarks, "We find in these numbers that movable kidneys are *not* often found in people under 20, between 20 and 40 it is most frequent, and after 50 rare. Ebstein draws the following conclusion, that movable kidney is to be most frequently found at the period when women give birth. If I had anticipated that result of the discussion, I would rather have said that the frequent appearance of the malady is at that period in which vanity rules in women, and in which, among the working classes, the greatest wearing out of the body takes place. Those cases after 50 years have either been undiscovered for years, or have been discovered by chance."

The youngest child I have operated upon for movable kidney was a patient, aged 7 years, who also suffered from transitory hydronephrosis, and I have seen only other two cases under 10 years and other two between 10 and 20. Stiller also has observed cases in children below the age of 10; Rosenthal has collected twenty-six cases in young girls, and Guyon, Guinon, and Comby have also collected similar cases. Schutze has fully described three cases—one, that of a child, 6 months old, which undoubtedly was a congenital displacement. The remaining two were in children

under 10 years. In early life, Steiner saw the same malady three times, Reiss in Copenhagen once, and Keppler once. Lastly, Desnos and Barié noticed a left-sided movable kidney in a girl of 19 years of age, the cause of which was traced to a fall on the left side at the age of 2 years.

It is, therefore, clear that clinical examination of the abdomen reveals a very different result from what is gathered from *post-mortem* inspection. Probably this is due to the more careful examination during life, and to the fact, to which I have already alluded, that after death the adipose tissue becomes firm and fixes the kidney in the position it occupied at the time of death.

The more important facts said to be revealed by statistics, in respect to the causation of movable kidney, are, firstly, that the large majority of the cases are females, and that they have not only been the mothers of large families, but that the pregnancies followed one another in rapid succession; secondly, that many of the patients, previous to the kidney becoming movable, from some cause or another have rapidly emaciated; thirdly, that the right kidney is more prone to displacement than the left; and, fourthly, that displacement of the kidney is frequently associated with diseases of the female generative organs.

What, then, are the explanations which have been offered? Let us consider the first assertion, namely, that females are most liable to this disease, especially those who have borne large families.

The undue proportion of female cases, and the period at which the malady is most commonly seen, seem to indicate that *pregnancy* has something to do with the production of the affection, either by causing an undue looseness of the abdominal walls, as an effect of the expanding or contracting

uterus, or by the spasmodic voluntary muscular efforts during parturition.

In the upper and middle classes of society, women, after delivery, usually retain the recumbent posture for some time—long enough to allow the abdominal walls to regain their firmness and elasticity. It is otherwise with the poorer classes; they require, from necessity, to resume their occupations as soon as possible, not unfrequently within a short time after delivery, without proper regard to their condition. Now, it is persons in this very class who are most subject to displacement of the kidney. The great majority of the patients whom I have seen suffering from these diseases were poor, and had been subjected to the conditions just mentioned. In many instances the pregnancies succeeded one another so rapidly that the mother had no time to recover between these periods, and, consequently, progressive emaciation resulted. In such cases the peritoneum becomes stretched and flaccid, its union with the posterior abdominal wall loosened, and by the flaccid condition of the anterior abdominal muscles, pendulous belly ensued, the intra-abdominal pressure was thereby reduced, and so the kidneys practically came to be suspended by their anatomical attachments, which were rendered unable to fulfil their function properly.

Repeated pregnancies are said to cause movable kidney in two ways: by inducing pendulous belly, and thereby diminished intra-abdominal pressure, and by causing emaciation of the abdominal adipose tissue, and consequently decreased bulk of the adipose capsule of the kidney. The tunica adiposa deprived of its fat, the areolar tissue becomes loose, and its attachments to the kidney on the one hand, and to the surrounding parts on the other, become less firm than normal. When the emaciation is slow, a certain amount

of accommodation may doubtless take place; but when it is rapid, movable kidney is very likely to result. My later and fuller experience has induced me to doubt the importance of pregnancy as an etiological factor. Of this I have more to say.

From the circumstance that, during the *menstrual period*, in many cases of movable kidney the symptoms are aggravated—the patient suffering from increased renal pain, sense of weight and dragging, and an augmentation in the size of the organ—some observers have been induced to believe that congestion of the kidney during the catamenia is a cause of displacement. It has been asserted that the kidney becomes congested, increased in weight and volume, and that its attachments are thereby stretched during this period; after menstruation the congestion subsides, and the kidney regains its original size and weight. Doubtless, clinical observation shows, and anatomical research has proved, the intimate relationship existing between menstruation and the vascular supply to the kidney; but while this fact cannot be denied, it would be rash to assert that there is any intimate etiological relationship between the two conditions.

Dr. Sawyer proposed this theory for explaining the production of movable kidney. In the cases which he has seen, he has noticed the relationship existing between the menstrual period and the time when movement of the kidney commences. Herczel attaches some importance to the hyperæmia of the kidney during the monthly period, and Dr. Gueneau de Mussy adopts the same view, but adds that while he quite recognises that congestion may supervene—sometimes as a pathological condition and sometimes as an epiphenomenon in the malady we are now considering—it must be admitted to be neither a constant cause nor a necessary complication, because movable kidneys are not uncommon in men. In

many cases I have certainly seen an increase in the severity of the symptoms during the menstrual periods. In several, in which during the intervals the kidney seldom troubled the patient, at the illnesses the kidney was sure to become displaced and give rise to severe symptoms. In all cases the organ was increased in size and weight at these periods, and some patients, without the idea being suggested to them, remarked that they thought that their kidneys were heavier when they were ill. Glénard and Tuffier consider the painful movable kidney as only one indication of a general defect, and associated with a general lax condition of the attachments of other abdominal organs.

Becquet, Lancereaux, and Fourrier, as well as many others, admit the influence that menstruation has in the production of movable kidney; but Landau, though he admits the truth and value of Virchow's investigations, showing the close connection between the renal and uterine vascular supply, denies the direct relation of cause and effect between menstruation and movable kidney, because he thinks if the theory be true, "no woman who menstruates should fail to have a movable kidney." In saying so, Landau seems desirous of exalting his own theories by depreciating those of others.

By many writers on the subject great importance has been attached to the circumstance that in their experience *displacements or disease of the generative organs* are associated with movable kidney. When it is remembered that almost all the observers referred to are gynæcologists, the importance of the seeming relationship disappears.

It has been inferred that displacement of the uterus may act in two ways upon the kidney. It may, if prolapsed, drag upon the fundus of the bladder, and, through the ureters,

upon the kidney; or, by causing torsion of the lower end of the ureters, it may impede the passage of urine, and cause an accumulation within the pelvis of the kidney. This increase in weight, with alternate distensions and relaxation of the renal attachments, leads to displacement.

Landau and Becquet emphasise the importance of disease of the uterus and bladder in the production of movable kidney, and Heller has tried to prove by experiments that these organs, when displaced downwards, drag the kidneys from their normal position. Bartel was the first observer to direct attention to the co-existence of dilatation of the stomach, and Litten, in forty cases, found that twenty-two also suffered from displaced kidney.

Emaciation is an important factor in the etiology of movable kidney, and by inducing absorption of fat repeated pregnancies may in two ways predispose to the disease—by inducing pendulous belly, and thereby diminished intra-abdominal pressure, and by causing emaciation of the abdominal adipose tissue, and, consequently, decreased bulk of the adipose capsule of the kidney. The tunica adiposa deprived of its fat, the areolar tissue becomes loose, and its attachments to the kidney on the one hand, and to the surrounding parts on the other, become less firm than normal. When the emaciation is slow, a certain amount of accommodation may doubtless take place, but when it is rapid, movable kidney is very likely to result.

Emaciation may, however, lead to movable kidney independently of pregnancy. Some years ago, I paid special attention to the extent of movement to which the kidney is capable in emaciated patients. In examining the cadaver I have found that, in the great majority of rapidly emaciating diseases, considerable movement of the organs is permitted.

This was specially the case in such affections as acute phthisis, and in suppurative diseases generally.

As long ago as 1857, Oppolzer noticed that in patients suffering from movable kidney and dying from other diseases, the kidneys, when examined, were found to be healthy, but in these cases "there has been observable a deficiency in the cushion of fat and a lengthening of the renal vessels," and Dr. Adams published in the same year a letter in which he said, "I remember many years ago having been requested by Dr. Langmore to examine the body of an old lady who was said then to have 'slipped her kidney.' . . . The only peculiarity remarkable was that the kidney appeared bound down in its situation more loosely than usual, and the old lady, from having been very fat, had become somewhat thinner, and her integuments appeared very lax throughout. The condition of the kidney had nothing whatever to do with the cause of death." There is little doubt that an absorption of the fat surrounding the kidney will render the tunica adiposa more lax and loosen the attachments of the organ, stretch the renal vessels, and permit undue freedom of movement and prominence of the kidney. When emaciation has been very rapid, I have seen the kidneys so loosely attached that they could be easily drawn out in front of the spine without employing force sufficient to injure the connections. Even in patients who are not greatly emaciated in other parts, there may be a deficiency of the perirenal fat which undoubtedly conduces to movable kidney.

Dietl has drawn attention to the circumstance that the disappearance of the body fat is frequently a forerunner of the absorption of the perirenal fat. This is most noticeable in feverish maladies. It is also to be observed that, while the renal fat is the last to disappear during the acute stage of fevers, it is the quickest to return in convalescence. During

that period the patient is kept at rest in bed, the fatless kidney becomes fatted, and, before the general health is recovered, the normal padding of the kidney is well restored.

The *narrowness of the lower segment of the thorax* in women has been considered an important cause of movable kidney, and by some observers is supposed to be the reason of the prevalence of the disease in the sex. Weisker, Walkow, and Delitz have tried to demonstrate that in all cases of movable kidney there is a certain deviation from normal in the conformation of the posterior abdominal wall, and seek to show that the prevertebral niches in which the kidneys lie are unusually shallow, and thus favour displacement of the organ. I have looked into this question carefully, and have failed to see what they have seen. Becker and Lenhoff assert that they found in those who suffered from movable kidney, that the least abdominal circumference was smaller in proportion to the height of the individual than normal. M. L. Harris, in a recently published article in the *Journal of the American Medical Association*, discusses this question, and one of the conclusions he draws at the end of his paper is—"Movable kidneys occur in women with a particular body form, and practically all women with this body form have movable kidneys of greater or less degree."

Dr. C. Mansell Moullin, in the *British Medical Journal*, 10th March, 1900, makes the following remarks:—"The kidneys are maintained in position partly by the pressure in the extra-peritoneal space, partly by the way in which they fit into the lumbar recesses. Neither of these is sufficient without the other. Walkow and Delitz, in particular, have drawn attention to the importance of the shape of the lumbar recesses. This is best shown by taking plaster casts of the posterior wall of the abdomen while the body is suspended

vertically. In the male, they are deep, narrow, and pear-shaped, with the narrow end below. In the female, owing to the greater width of the pelvis, they are shallower and more cylindrical; and the difference in shape is almost always more marked upon the right side than upon the left. This I believe to be due to a slight degree of torsion of the lumbar spine. In right-handed people, there is usually a slight convexity towards the right in the dorsal spine. This entails an equivalent convexity towards the left in the lumbar region, and this, in its turn, necessitates a slight degree of rotation. The left transverse processes rotate backwards, and deepen the lumbar recess upon that side. The right rotate forwards, and make the lumbar recess proportionately more shallow.

"In a very large number of cases of movable kidney, there is definite flattening of the right lumbar region. This, of course, cannot possibly be due to absence of the right kidney. Abdominal nephrectomy does not cause it. It really means that the vertebræ have rotated slightly, and is an indication of the cause of the displacement of the kidney, not a consequence of it.

"The width of the lumbar recesses is one of the penalties which have followed the assumption of the erect attitude. If the history of the development of the renal organs in the race, as well as in the individual, is worked out, it is seen that originally they were distributed over the whole length of the head and body; and that by degrees, as their function became more specialised, they became concentrated together until, in their most perfect form, they constitute a pair of organs which, in the quadrupedal mammalia, are placed in a position of the greatest possible security. They lie close to the spine, immediately under the anticlinal vertebræ, almost in the central axis around which all movement of the trunk and limbs takes place. They are buried in two deep and narrow

recesses, protected by the lower ribs, and rest upon a horizontal sheet of fascia, which in its turn rests upon the peritoneal viscera. The slight degree of backward and forward movement which is necessitated by the action of the diaphragm takes place without the least risk, but with the assumption of the erect attitude, the greater portion of this security is lost. The backward and forward movement is altered to movement upwards and downwards, in the direction of the line of gravity. The peritoneal viscera and the supporting fascia lie in front, and not below. The lumbar recesses, instead of being deep and narrow, become broad. The convexity forwards of the lumbar spine helps to make them still more shallow. The pelvis, especially in the female sex, becomes wider, so that the lower end of the recess becomes more open, and then the development of right-handedness causes the transverse processes of the lumbar vertebræ, which lie under the floor of the lumbar recess, to rotate. From a position of the greatest safety, the kidneys are placed in one from which all security is gone; and it is not to be wondered at that comparatively trivial causes—an increase in the weight of the organ without a corresponding increase in the bulk, a sudden violent jerk, or a great lowering of the intra-abdominal pressure—can increase their normal range of mobility. The wonder is not that movable kidney occurs, but that it does not occur more often."

In reply to this theory, it may be pointed out that the amount of rotation of the lumbar vertebræ is very restricted, and that movable kidney is most common in a class of patients in whom their occupation does not involve right to left movements, whereas it is rare in others, such as mowers, joiners, and engineers, who are constantly working in a way to demand extreme and continuous movement of the body, with rotation from right to left.

The greater frequency of movable kidney on the right side seems, to some extent, to depend upon the difference in their *mode of attachment.*

Landau was the first to direct special attention to this point. He writes as follows:—

"1. The *upper end of the descending colon* lies higher, and is attached to the ribs further to the left and further down (*seitlicher und tiefer*), than the ascending colon. Whereas the ascending colon lies against the middle of the right kidney, the descending colon lies against the external convex border of the kidney. Hence it follows that the left kidney, although placed on the same horizontal level as the right, is fastened to the posterior abdominal wall both higher up and more firmly (*höher hinauf und stärker*) than the right.

"2. The *descending colon* and the *splenic flexure* are tauter (*straffer*) and shorter in their attachment to the posterior abdominal wall than the *ascending colon* and *hepatic flexure;* in other words, the mesocolon of the splenic flexure is shorter and tauter than that of the hepatic flexure. This indirect means of attachment is, therefore, stronger on the left than on the right.

"3. The ascending colon does not form a right angle with the *transverse colon* as the *descending colon* does, but an obtuse angle, or even forms a dependent loop before passing into the transverse colon.

"The reason for this peculiar behaviour of the ascending colon, which I have seen a few times in children and many times in adults, and which Sappey has described as normal, appears to me to be the upward movement of the fæces in the ascending colon, contrary to the action of gravity, and only effected by the peristaltic movements of the bowel. By this means the spot where the ascending becomes the transverse colon is gradually dragged downwards so

much as to form in extreme cases a fairly long loop, though it usually passes obliquely or with a curve into the transverse colon.

"But during the passage of the fæces from the transverse into the descending colon, the weight of the column of fæces and peristaltic action work in the same direction, no stagnation takes place in the splenic flexure, which maintains its original form. This difference between the hepatic and splenic flexures explains also in its turn how the right kidney has more room to descend than the left.

"4. The descent of the left kidney is opposed by the position of its vessels above the inferior or horizontal part of the duodenum. Moreover, the position of the aorta on the left side of the spinal column makes the left renal artery shorter than the right; this shorter attachment by means of the renal artery (which is naturally considered in this capacity before the thin-walled vein) renders the mobility of the left kidney the more restricted. Less stress must be laid on the circumstance pointed out by Oerum-Howitz, that the left suprarenal vein opens into the renal vein, while the right suprarenal vein opens directly into the vena cava, the left kidney (as opposed to the right) having thus an additional indirect connection with its suprarenal body.

"5. The left renal vessels are closely connected by cellular tissue with the head and neck of the pancreas, which thus furnishes an additional attachment to the left kidney, of which the right is destitute; for the right renal vessels lie bare, except for their peritoneal covering."

When considering the question of how the kidneys are retained in their position, I showed the importance of the *intra-abdominal* pressure being maintained. Hertzka, Landau, and Senator hold that the tension of the abdominal

parietes gives support to the kidneys, and that when it is withdrawn the kidneys fall down from their normal position. D. T. Cunningham and Kendal Franks show how the kidneys are held in position by the resultant of two forces, the one pressing the gland downwards and backwards, the other pressing it upwards and backwards. This subject has already been fully discussed.

The part which the *liver* plays in causing displacement of the right kidney has now to be considered.

The liver has no doubt been blamed for causing displacement on the right side, either from its own weight or by communicating the diaphragmatic movements. Although I believe the liver is largely to blame, the explanation of Cruveilhier, that displacement arises from the pressure of stays communicated through the liver to the right kidney, seems to me quite untenable. I would rather say that, as far as the pressure of stays is concerned, the right kidney is actually protected by the liver. It must be remembered that the right kidney does not lie below the liver when the body is in the erect posture, but really behind it, the posterior margin of the liver overlapping the kidney fully an inch and a half. The anatomical condition of matters is, therefore, as follows:— The posterior surface of the right kidney is practically in contact with the crura of the diaphragm and the great lumbar muscles, while interposed between its anterior surface and the anterior abdominal wall there is a large solid organ—the liver. Now, suppose that the patient strains the abdominal muscles, as during delivery, or in lifting a heavy weight, both the anterior and posterior abdominal muscles are brought into powerful action, the liver being pressed backwards by the anterior muscles, the kidney pressed downwards by the crura of the diaphragm, and forwards by the posterior abdominal muscles. Now, the resultant of these forces will act in a

manner similar to what takes place when one presses a bean between the finger and thumb—that is to say, the kidney will be pressed downwards. This seems to me a more reasonable explanation than any of the others which have been advanced. I would not, however, for a moment assert that other considerations are not to be entertained, such as the greater length of the renal vessels on the right side, and the fact that the ascending colon is not so firmly bound down to the right as the descending colon is to the left kidney. These and other slight anatomical differences have been made much of by Landau, who seeks to explain the different behaviour of the right and left kidney as regards mobility entirely by the differences in their mode of attachment. The interposition of a solid organ between the anterior and posterior abdominal muscles in the right hypochondrium, and the want of it in the left, fully explain, to my mind, the relative frequency of right and left movable kidney.

The frequency with which movable kidney is associated with disease involving enlargement of the organs cannot be regarded simply as a coincidence. For example, large cystic kidneys, those occupied by a tumour or by a calculus, become displaced probably by reason of their increased weight. Similarly, hydronephrosis may induce displacement, whereas in pyonephrosis the inflammation associated therewith produces adhesions to the surrounding parts.

Some writers, especially Linder, Küttner, Tuffier, and Albarran, believe that movable kidney is due to congenital causes. I have not observed any facts to support such a theory.

The immediate cause of movable kidney may be of a *traumatic* nature. Local injury must be recognised as a cause of movable kidney, as in not a few instances a fall

or a blow has originated what Landau terms "luxatio traumatica renis." Rayer, Henock, Le Ray, Feber, Küster, and many others have recorded cases. Case I was a good example of a fall inducing the displacement, and the following is another:—

CASE VI.—*Movable kidney caused by fall—Symptoms: severe paroxysmal renal pain, sickness and vomiting—No history of hæmaturia—Urine normal between attacks of colic—Operation—Kidney enlarged and engorged with blood —Cure.*

A. B., æt. 53, was sent to me by Dr. George S. Middleton, of Glasgow, whom he consulted along with his family attendant, Dr. James Laurie, of Greenock, in June, 1896, with the history that up till five years ago he enjoyed perfect health. One night he was called suddenly, and, while running on deck, he tripped over a hawser and fell very heavily on his right side, and was conscious at the time of having "twisted himself." The pain in the right lumbar region which followed the accident was severe, and, after lasting for a fortnight or so, gradually improved, but did not entirely disappear. From the time of the injury till two years ago, the patient had always noticed that, if he lay in bed upon his left side, on rising in the morning he suffered from a dull aching pain in the right lumbar region, which only became relieved when he walked about for a quarter of an hour or twenty minutes. Till the summer of 1894 this condition of matters continued, but about that time the pain became much more severe, the attacks were more frequent, and often lasted the greater part of the day, and did not readily disappear on walking about. In 1895, while at San Francisco, he was seized with a severe paroxysm of pain, which came on suddenly in the right renal region, extending down the groin

and to the testicle, and was accompanied by severe sickness, sweating, and vomiting. After this first attack, which from his description resembled renal colic, he had several others, and the longest interval between them was two months. Between the paroxysms of acute pain he suffered more or less from the old dull pain in the right renal region. In March, 1896, while in Hull, he suffered from a very severe attack, which lasted for over eight hours. This was the last previous to the operation, but they had become so frequent and severe that he was determined to have something done for his relief.

When examined, the patient was found to be a very well-nourished, healthy-looking man, the muscular development being so good that little could be made out by palpation further than that the muscular resistance was much greater in the right than in the left lumbar region, and pressure over the right kidney caused considerable pain.

The urine was at all times strictly normal when I examined it, but I had no opportunity of seeing it during a severe attack.

I advised an exploration by lumbar incision, to which he consented, and the operation was performed in a private home in Glasgow, in July, 1896.

On exposing the right kidney the cortex was found to be deeply injected with blood; the organ was enlarged and moderately movable. In separating the adipose tunic several large veins were torn, but no torsion of the ureter or vessels could be made out.

The patient made a good recovery.

In 23 per cent of my cases injury of some kind has been blamed for the onset of the displacement—sometimes a fall, a kick or blow in the region of the loin, sudden muscular

strain or severe pressure against the abdomen and lumbar region, violent horse exercise in women, severe and repeated attacks of coughing, a sudden twist or flexion of the body—to all these undue mobility has been attributed.

We may now shortly criticise the various views which have been brought forward to explain the etiology of movable kidney.

We may summarise the arguments advanced in order to show that pregnancy should be admitted as an important etiological factor in the production of movable kidney as follows:—

1. The forced contractions of the diaphragm and the muscles of the abdominal wall, exercised through the liver on the right kidney especially.

2. The sudden loss of intra-abdominal pressure following delivery, resulting from emptying of the uterus and flaccidity of the abdominal walls.

3. Too early resumption of the erect posture after delivery, and of physical labour without proper precautions.

Before the malady attracted much attention at the hands of the general practitioner or the surgeon, many women, mothers of large families, consequent upon rapidly repeated childbirth, found their way to gynæcologists, who generally discovered a lax condition of the abdominal wall, the accompaniment of movable kidney. But now that physicians, as well as surgeons, are fully aware of the importance of careful abdominal examination, the fact has gradually been revealed that movable kidney is very common, and that many unmarried women, and married women without families or with only small ones, suffer from the complaint. Thirty per cent of my adult female cases were unmarried, 8 per cent were married but had no family, and of the remaining

62 per cent only one in seven had a family of over five children.

These facts, I think, militate against the theory of repeated pregnancies being a fruitful cause of movable kidney. It is not an important factor in the production of the displacement, except in so far as it may induce emaciation and diminish abdominal tension. As to the influence exercised by the *catamenia,* I consider it is beyond doubt that there is an intimate connection between the generative organs and the kidneys, as manifested by the increase in the severity of symptoms during the menstrual period, but that the hyperæmia present at these times seriously conduces to displacement of the kidney has not been proved.

That displacement and disease of the generative organs coexist with movable kidney is no reason why they should be regarded in the relationship of cause and effect. The percentage of my cases in which uterine or ovarian disease existed was very small.

Rapid general emaciation and deficiency in the fatty capsule I regard as one of the most important causes of movable kidney, as shown both by clinical observation and by experience in the *post-mortem* room. It is true that in many wasting diseases the kidneys do not become movable—all the perirenal fat may disappear and still the kidney remain fixed; also, that movable kidney is met with in those who are not emaciated. But keeping these facts fully in view, I know that, coincident with other changes, which will be considered later on in connection with the ligamentum suspensorium renis, not deficiency in the fatty capsule, but absorption of fat previously deposited is one of the chief causes of the attachments of the kidney giving way. This does not occur in the acute fevers, where the patient is kept at rest in bed, but rather in connection

with diseases which do not prohibit a certain amount of bodily activity.

As I have indicated above, certain writers have attached great importance to what they believe to be deviations from the normal configuration of the posterior abdominal wall. As I have said before, I have looked for the abnormalities they describe, but have failed to find them. One change I have almost always found in operating upon movable kidney is stretching and detachment of the ligamentum suspensorium renis (Figs. V and VI, pp. 22, 23). The anterior and the posterior lamellæ become separated from one another, and so a considerable sac may be formed in which the kidney moves. At the same time the attachments of the perirenal fascia becomes loosened. This weakness of the ligamentum suspensorium renis I look upon as the chief predisposing cause of movable kidney.

The only other etiological factor worthy of attention is traumatism. M. L. Harris, in an article to which I have referred above, discusses the influence of trauma, and in the introductory passage he says—"The influence of trauma in the production of movable kidney is a subject of special importance to the railway surgeon who is so frequently called on to decide whether or not a movable kidney in a given case is the result of a certain injury or accident. It is a common belief of the profession, as well as of the laity, that a movable kidney is frequently the result of an injury. Most writers on the subject assign to trauma an important place among the etiologic factors, but few of them, indeed, offer any evidence, such as the report in detail of cases or of reasoning based on pathologic conditions found, in support of their statements. It is evident, therefore, that the statement has been passed on from one author to another without the subject receiving the careful attention which it deserves."

And at page 413 he says—"One will search the literature in vain for a satisfactory case in which a movable kidney was found soon after an injury, and in which the absence of the condition had been previously demonstrated by examination." I need only remark that before meeting with an accident people are not in the habit of submitting themselves for examination for movable kidney, and, without such a demonstration, I think Case I proves clearly that a movable kidney may result from injury. In fully 23 per cent of my cases a traumatism has been blamed as the cause, but while in some of these full proof has not been supplied, in many others it is clearly demonstrated. Of twenty-one cases which I published in my book on *Surgical Diseases of the Kidney* (p. 24), three were traced to falls. No doubt we must be careful in judging the relationship of cause and effect, because many people are very ready to trace their troubles to an injury; but when I find that no symptoms of movable kidney were observed prior to an accident, and that they became manifest soon thereafter, and are associated with the usual physical signs of movable kidney, I consider I am as fully justified in blaming the injury for displacing the kidney as I am in blaming a sudden strain for producing a hernia in a patient who had not previously been ruptured.

Chapter IV.

PROGRESS AND SYMPTOMS.

The *progress* and *symptoms* of movable kidney may now be considered. In many instances the progress is very slow, and often, indeed, the left kidney may be for a long time freely movable without giving rise to any symptoms directly referable to it. But when the organ on the right side is affected, generally, even in the mildest cases, the gastro-intestinal functions become more or less disturbed. The patient suffers from loss of appetite, flatulence, occasional sickness, vague pains in the abdomen, giddiness, faintness and languor, and is fatigued by the slightest exertion. The skin of the face in many cases becomes pale and soft, and the voice feeble. For a considerable time these may be the only symptoms, but the medical attendant finds that the patient does not respond to treatment even when carefully considered and diligently carried out. As time goes on the doctor becomes tired of the patient, and the patient dissatisfied with the doctor. She finds that rest in bed gives her relief. She seeks as much repose as possible; ere long, by her relations, and in many instances by her medical attendant also, her sufferings come to be regarded to a large extent as imaginary, and she is looked upon as a hypochondriac. Her sufferings may go on for years without the true cause being discovered, unless her medical attendant makes an abdominal examination. It is in these

slowly progressive cases that the nature of the malady is most likely to be overlooked.

In women between 20 and 35 years of age the displacement is most likely to give rise to functional disturbance in a severe form, while in younger persons and in those above the ages mentioned the symptoms are less likely to be marked.

In some cases the patient accidentally discovers the swelling in the renal region, without attention having been attracted to it by painful or other sensations. When, however, she has become conscious of its presence, or has been told by her doctor that one of the kidneys is movable, it is common to find that symptoms develop which are all referred to the condition of the kidney. In this way much difficulty is created. How far the statements of the patient are to be relied upon frequently taxes the judgment of the surgeon, but in diagnosis this very fact is of importance.

In a considerable number of women over 45 years of age an abdominal examination may reveal one or both kidneys to be unduly movable without causing the patient much inconvenience. The displacement is discovered in the course of a systematic abdominal examination, but the mobility is found to consist of a simple up and down movement of the organs. Subjective symptoms may be entirely absent, so slight as not to attract the attention of the patient or medical attendant, or they may be of a local character only. In such cases, the less that is said to the patient on the subject the better. If it even be hinted that the kidney is displaced, the patient soon finds other fellow-sufferers, and, by comparing notes, much harm may be done.

In the majority of cases the patient becomes conscious, often accidentally, of the presence of a movable tumour in the abdomen, and complains of a feeling of weight and uneasiness

in one or both loins. In the early stage of the disease the patient complains only of a feeling of weight or a sense of dragging, which at this period is probably the effect only of the displacement of the organ itself. Gradually the suffering becomes more acute, and the constraint upon the patient more marked, and from having simply a sense of uneasiness and discomfort, she begins to experience distinct feelings of pain, which are at first dull; they soon become gnawing, and induce continual feelings of restlessness while she is moving about, but they are relieved by rest. These feelings, induced by exercise and relieved by rest, are at first occasional. After a time—a few cases in weeks, in some in months, in others in years—the symptoms of displacement of the kidney advance, and the suffering of the patient can no longer be attributed to the mere displacement of the organ *per se*. It is when the attachments of the kidney are loosened and the movements become free that severe local pain is complained of by the patient, and this is probably due to the displacement producing congestion of the kidney, interruption to the escape of urine, traction upon the renal nerves, or dragging upon neighbouring organs.

In a large number of patients (in fully 75 per cent of my cases) symptoms which must be classed as due to gastro-intestinal disturbance were found to exist. In many instances the patient simply suffered from loss of appetite, epigastric pain, and nausea, and these discomforts were, as a rule, only present during the times that the kidney was displaced. But while in some cases the disturbance was slight, in others it was most severe—vomiting, diarrhœa, jaundice, and other symptoms of chronic or acute gastric catarrh. In many the symptoms were fully explained by the condition of the kidney, while in others it would be more reasonable to assume that the gastric disturbance and consequent emaciation, were

the cause of the renal displacement, rather than the effect. When, however, in cases associated with severe gastric symptoms the discomfort of the patient is relieved by maintaining the kidney in its normal position, it is demonstrated that the movements of the kidney are either directly or indirectly to blame.

These symptoms are not caused simply by direct pressure, for we know that large tumours may exist and move freely within the abdominal cavity without causing much, if any, reflex disturbance; it is more probable that they are due to dragging upon the renal vessels and nerves. When we call to mind the rich network of sympathetic ganglia and nerves which surrounds the kidneys and suprarenal capsules, we can easily appreciate how movable displacement of the organ may lead to painful sensations extending in many directions. Thus, in movable kidney, the pain may extend to the loins, abdomen, chest, thighs, along the ureters, or it may lead, as I have just mentioned, to disturbance of function as indicated by symptoms of gastro-intestinal irritation.

In a goodly proportion (15 per cent) of my cases, slight and occasional jaundice was noticed, seldom sufficient to cause much colouration of the skin, but recognisable by the change in the appearance of the conjunctiva and the presence of bile pigment in the urine. The appearance of this symptom was usually accompanied by an increase in the severity of the others. In respect to the presence of jaundice as an accompaniment of movable kidney, various explanations have been offered. Litten cites a case of Frerich's in which the jaundice recurred twice within two weeks, but only lasted for a few days; and he assumes that the symptom was due to temporary compression of the common bile-duct. This theory cannot explain the jaundice in many of my cases.

I am more disposed to think that the obstruction to the flow of bile was caused either by catarrh of the gall-duct or by gall-stone.

In 65 per cent of the cases, the patient suffered from more or less severe pain. The pain was usually of a dull character, dragging, constantly present while the erect posture was maintained, but relieved when the patient lay down. Occasionally there was the sense of something moving, as marked as the movements of the fœtus *in utero*. The pain was usually limited to the affected side, but in many instances it extended down the legs as far as the knee, to the chest, loins, or over the abdomen. On pressure, a peculiar "sinking sensation" was experienced—as one of my male patients expressed it, "much the same as when the testicle is pressed or bruised."

Besides these constant pains, severe paroxysms may occur resembling nephritic colic. These attacks are apt to follow upon severe exertion of any kind, but especially after much walking, sudden straining, long standing, or even protracted sitting in one position, and in females they frequently occur before or during menstruation.

The next class of symptoms which demand our attention are those arising in connection with the urinary system. They depend on torsion producing one of two conditions, viz., obstruction to the escape of urine, or retardation of the blood-flow. In fourteen cases there was evidence of the former condition existing, as manifested by transitory hydronephrosis, to such an extent that the swelling could be felt by the hand. The connection between movable kidney and the periodical emptying and filling of the sac of the hydronephrosis was shown by the appearance and disappearance of the tumour, as well as by sudden suppression of urine, followed by a copious flow.

From the clinical standpoint, which is the most practical one, we may classify cases under the following heads:—

1. Those in which the displacement does not give rise to much discomfort or functional disturbance, the mobility of the organ being discovered probably by accident.

2. Those in which gastro-intestinal symptoms are pronounced, and, after a time, induce marked neurasthenia.

3. Those in which ill-defined pain, generally abdominal, but not specially referable to the renal region, is the most marked symptom.

4. Those in which the pain is distinctly renal, and is associated with—

(*a*) Albuminuria only.

(*b*) Albuminuria and tube-casts.

(*c*) Hæmaturia, and in some, blood-casts.

(*d*) Transitory hydronephrosis.

(*e*) Pyonephrosis.

5. Those in which both local symptoms and reflex functional disturbance are marked.

While the above classification may serve as a useful one for practical purposes, it must be admitted to be imperfect—as all clinical classifications must necessarily be—in so far as there is no sharp separation of the various divisions, one class of cases merging imperceptibly into others. But if we take typical cases of each class they will be found to form distinct centres round which the classification may be grouped.

1. *Cases in which the displacement does not give rise to much discomfort or functional disturbance, the mobility of the organ being discovered probably by accident.*

These cases require very little consideration here.

In considering the pathology of the subject (p. 21 *et seq.*), it will be remembered that I divided movable kidney into

three classes, the first of which was those in which the kidney moves in its adipose capsule, the capsule itself retaining its position. Such cases probably belong to this class, or it may be the attachments of the kidney to the surrounding parts are so slight that the displacement of the organ does not cause any dragging or distortion of the neighbouring organs, generally only up and down movements being permitted. Doubtless, many cases in this division never come within the observation of the surgeon (only 9 per cent of my cases can be included in this division), but general practitioners constantly, in their routine examinations of the abdomen, discover them, and very wisely keep the information to themselves. When the patient comes to know that the kidney is too mobile, its evil effects are liable to be over-estimated. The presence or absence of symptoms does not depend upon the amount of movement. Very mobile kidneys are often met with in cases in which the symptoms are slight; in other instances, comparatively little movement may give rise to much discomfort and disturbance of function, and this is proved by the fact that if the kidney is fixed by an operation, the patient's health is restored. While many cases may belong to this class during the early progress of the disease, they may drift by neglect into the other more serious categories.

The following cases illustrate the above statements:—

CASE VII.—*Case of symptomless movable kidney discovered by abdominal examination—Effects probably by reason of the condition being revealed to the patient—Vague but continual abdominal pain—Loss of appetite—Severe flatulence—Inability to take exercise—Cure by rest.*

Mrs. J., æt. 48, from Wigtownshire, a well-nourished and well-developed woman, consulted me on 1st November, 1898,

on account of a moderately sized left femoral hernia, which caused her considerable trouble and required operation, and for which I performed a radical cure. She also suffered from a slight displacement of the uterus, endometritis, and a chronic vaginal discharge.

On making a systematic examination of the abdomen, the walls of which were normal for a woman of her age, and containing only a moderate amount of fat, I found that both kidneys were freely movable, but in an upward and downward direction only—they could not be pressed towards the middle line. Occasionally the hernia seriously troubled her, and the vaginal discharge caused her inconvenience; otherwise she enjoyed good health, and complained of few or no abdominal symptoms.

She was the mother of four children, all alive, the youngest 10 years old. It was after her last delivery that the hernia troubled her (age then 38). At that time her weight was 12½ stones, and she maintained it till two years before I saw her. In 1894 she had an attack of influenza, and thereafter she gradually lost weight until the time she consulted me, when she weighed 10¾ stones, a loss in two years of over 24 lb. When I examined her the belly was not loose. On deep inspiration, both kidneys fell well below the costal margins, and when she was in the recumbent posture they returned to their normal position on expiration, but when she stood erect both organs remained down and could be easily palpated. When down, they left an area clear to percussion in the renal region, and a slight flattening could be made out. When the kidneys were handled, the patient experienced a distinct sickening sensation, but nothing amounting to pain.

While there were no symptoms pointing to gastro-intestinal disturbance, the appetite was not very good; she was anæmic, but this was largely attributed to habitual constipation. The

urine was normal in every respect, and varied little in quantity. As far as I observed, the patient appeared very quiet and placid, but the nurse told me that she was very nervous, and was controlled only in my presence, that she did not sleep well even after she had recovered from the operation, and that frequently she lost all restraint and took fancies regarding her health. Although she did not ask me, she was very anxious to know why I had made such a careful examination of her loins "although there was nothing wrong with them."

The patient made a good recovery from the operation, and the vaginal discharge was stopped, but no reference was made to the renal condition.

I did not see the patient again till January, 1902. When she entered my room, the first thing she said was, "Why did you not tell me my kidneys were movable when you examined me in the Home?" I said, "Before replying, permit me to ask you, Who told you that you have movable kidneys?" Then she told me that about a year ago she had consulted a doctor in London (a gynæcologist), and that in examining the abdomen he had found both kidneys movable, had told her of his discovery, and that since then she had suffered a great deal, and had been losing flesh rapidly. This was very obvious, as she now only weighed $9\frac{1}{4}$ stones, a loss of 21 lb. since 1898, and of 45 lb. since 1894. An abdominal examination showed the mobility to be just the same as in 1898, but the kidneys were more easily felt on account of the emaciation. The patient was now very anxious about her state of health, confessed that she had been brooding over it ever since she had been told of the condition present, and now she had a long list of ills to recite, and attributed them all to the displacement —loss of appetite and sleep, vague but almost continual abdominal pains, severe attacks of flatulence, inability to take exercise, lassitude, and want of interest in her family and

friends. There were no symptoms pointing to any urinary disturbance, but now she had most of the recognised subjective symptoms of movable kidney.

From what I saw of the patient in 1898, I was certain that the mobility was not disturbing the functions of the kidney or of other organs, and I was convinced that if she had not been told about the kidney condition she would never have suspected its presence, and would have continued to enjoy reasonably good health, but when the existence of the movable kidney was disclosed, the revelation caused her distress, and she magnified her suffering greatly. The patient was anxious for an operation, but I advised her against it until the effect of complete rest, of medicinal treatment, and of careful dietary was tried for two months at least, adding the assurance that the symptoms of movable kidney were very likely to diminish as a consequence of the treatment employed. This had the desired effect, she gained weight (15 lb.), the symptoms she complained of steadily diminished, and at the end of three and a half months she was as well as when she left the Home in 1898. She then willingly admitted that her illness dated from the time she was told that the kidneys were movable.

CASE VIII.—*Movable kidney causing little disturbance for years—Sudden development of acute symptoms—Operation —Complete relief.*

Mrs. I., aged 33, was admitted to the Glasgow Royal Infirmary on 3rd March, 1899. The first time the patient consulted me was at the Western Infirmary in 1891. She then suffered from occasional pain in the right lumbar region after much exertion, but with rest it soon subsided, and was not accompanied by any functional disorders.

On examination, the right kidney was found to be freely movable, but upwards and downwards only. As the

displacement was causing her very little trouble, an operation was not considered necessary; an air-pad was placed over the kidney, and kept in position by a broad abdominal bandage. The patient enjoyed good health until January, 1899, when the pain became pronounced, and lately she had been the subject of severe paroxysmal attacks lasting, as a rule, for two or three days. She said that the urine had always been scanty, but she had not observed any difference in the quantity before, during, or after the paroxysms. A month before admission, she was seized during the night with severe sickness and lacerating pain in the back, and this continued for nearly a week and then gradually passed off, but had been recurring at intervals since then. On all these occasions, the sickness and pain were very acute, and resembled in character the colic of renal calculus.

The urine was free from any abnormal constituent, but generally very high in specific gravity (1025 to 1030).

The patient was well nourished, and, beyond the attacks described above, enjoyed good health. The kidney was found to be very freely movable and very tender on pressure, and now could be easily pressed to the middle line in front and down into the pelvis.

Nephrorrhaphy was performed on 15th March, and the patient dismissed well on 14th April, 1899. Reported herself cured, 3rd May, 1900.

2. *Cases in which gastro-intestinal symptoms are pronounced, and after a time may induce marked neurasthenia.*

This division includes by far the greatest number of cases of movable kidney (fully 75 per cent of those which have come under my observation), and for this reason it is necessary to consider this category in detail. In many, the gastric disturbances may be part of the general condition which has

predisposed to movable kidney by interfering with the nutrition of the patient and so causing general emaciation. One must therefore be very careful to guard against the possible error of mistaking the cause for the effect. When, however, we find that pressure on, or movement of, the affected kidney causes sickness, nausea, or vomiting, and that these symptoms are at once relieved by complete rest, we cannot help seeing that there is some connection between the abnormal condition of the kidney and the functional disturbances of the abdominal organs. Many attempts have been made to explain the relationship between the gastro-intestinal symptoms and the displacement of the kidney. The disorders of digestion, the distension of the bowel and stomach, the sickness and the vomiting, have all been attributed to reflex disturbance of the nervous system from dragging upon the renal nerve.

The neurotic symptoms are manifested by hyperæsthesia, acute neuralgia, and in a few by what may be included under the term "reflex cramp." In many the abdomen is extremely sensitive to touch, and when the kidney is manipulated even gently the patient complains of pain out of all proportion to the force used. This pain is increased by movement, by standing in the erect posture, but when the patient is kept in bed for a few days hyperæsthesia becomes less marked. A careful distinction must be made between spontaneous pain and pain induced by pressure in the renal region. The former as well as the latter are influenced by rest. Spontaneous pain varies in character, but is usually dull and associated with a "sinking sensation." It extends in various directions, but is most marked in the renal region. It may extend to the symphysis pubis, to the knees, and even upwards to the chest, and may sometimes be mistaken for pain of hepatic origin in extending to the left shoulder. While hyperæsthesia is comparatively common, in a few instances I have noticed

more or less anæsthesia in certain parts. The following is an illustration of this category of cases:—

CASE IX.—*Old-standing case of movable right kidney—Marked gastro-intestinal symptoms—Severe renal pain—General abdominal hyperæsthesia, with anæsthesia of small area of abdominal wall—After operation, considerable improvement in general health, and disappearance of neurotic symptoms.*

A. C., aged 38, was admitted into the Glasgow Royal Infirmary on 6th January, 1902. She was a thin, ill-nourished, and highly neurotic woman. The history she gave was as follows:—

Eleven years prior to admission, the patient was exerting herself greatly by running up a hill. The night following, she was seized by what she described as an agonising pain in the small of the back, and this pain troubled her for several years, always coming on after exertion and during the menstrual periods. She consulted several doctors, and was told that she had displacement of the uterus and of the right ovary. For this she wore a pessary for about two years, which gave her some relief, but she never enjoyed good health, the pain described above continuing, although not so severe as formerly. About three years ago, she became conscious of "something moving in her right loin," and this has continued ever since, and has frequently caused her to feel faint. Since the sensation just mentioned appeared, she has been subject to attacks of indigestion, shown by severe flatulence, constipation, giddiness, ringing in the ears, and severe headaches. She never observed anything wrong with the urine, except that occasionally the quantities passed were extremely large. This was always accompanied or preceded by severe pain in the right loin, but neither she nor her medical attendant

noticed any enlargement of the kidney on the affected side, nor was the pain preceded by a sudden diminution in the excretion. The family history revealed nothing of importance.

Condition on admission. The patient is pale and thin, very nervous, and easily upset. The thoracic organs are normal. On palpation of the abdomen, the right kidney is found to be freely movable. It moves downwards almost into the iliac region, and when the patient lies upon her left side it falls towards and within an inch of the umbilicus, and when the slightest pressure is made upon the organ the patient complains of great pain and of what she describes as "a sickening, faintish feeling." The most marked feature is the extreme sensitiveness of the abdominal wall to touch, and this is especially so when a spot midway between the ensiform cartilage and the umbilicus is touched. At this point, the pulsation of the aorta is very marked, but when the patient is placed under an anæsthetic the pulsation subsides considerably. The sensitiveness of the abdominal wall was so great that it was impossible to make an examination by palpation without the use of an anæsthetic. On testing the surface sensation, there was an area immediately above Poupart's ligament which showed a considerable degree of anæsthesia. This area was triangular in form, the base of the triangle being Poupart's ligament, the internal limit corresponded to a line drawn between the symphysis pubis and a point an inch below the umbilicus, the external limit to a line between the above-mentioned point and the anterior spinous process of the ilium. But while in this area sensation was impaired, the abdominal wall above it was very highly sensitive to touch, even when the patient was warned that an examination was to be made. As far as could be ascertained by physical examination, the abdominal and pelvic organs were strictly normal. Nephrorrhaphy was performed on 15th January.

The kidney was found to be very small in size, measuring three inches by one by three-quarters. The cortex was very pale in colour, and the fibrous capsule was firmly adherent. The adipose capsule was entirely wanting, there being no fat interposed either between the abdominal wall and the ligamentum suspensorium renis or between it and the surface of the kidney. The fibrous capsule was separated from the kidney; it was stitched to the parietes, and sutures were also passed from the cortex of the kidney. The patient was dismissed well on 25th February following. She has reported herself at regular intervals since she left the hospital, and states that she is now enjoying much better health than formerly, and it has been noticed within the last six months that she is much less neurotic than formerly. The hyperæsthesia and anæsthesia have disappeared.

Various explanations have been offered of these so-called neurotic phenomena. Rollit attributes the symptoms partly to pressure upon the abdominal organs and partly to traction on the renal nerves. The latter is the most likely explanation of purely neurotic symptoms, such as anæsthesia, paræsthesia, and hyperæsthesia, and this is supported by the fact that the most marked instances of neurosis are in cases where the displacement of the kidney can in no way cause serious pressure upon abdominal organs, and, at the same time, fixing the kidney causes disappearance of the symptoms just referred to. Sometimes, but in very rare cases, one may be misled by the position of the area of the greatest intensity of pain. I have seen two instances where the pain over the region of the right ovary was so severe and persistent that the medical attendant suspected ovarian rather than renal disease, and many instances have come under my notice where the pains have been mistaken for that of appendicitis. While the purely neurotic symptoms are the source of much

unhappiness and discomfort to the patient, they are not so serious as the gastro-intestinal disorders. The sense of weight and feeling of fulness experienced after partaking of food, the difficulty in digestion, loss of appetite and disgust for food, cause serious interference with the health, and in order that the patient may be reasonably nourished, it is found necessary to keep her in bed. It has been supposed that the displacement of the right kidney brought the organ in contact with the duodenum so as to compress it, or, by inducing spasmodic stricture of the pylorus, to cause dilatation of the stomach. It is difficult to understand how the kidney can possibly press with so much force upon the duodenum in an upward or forward direction. Kendal Frank's explanation that the duodenum is dragged downwards and kinked by descent of the organ is more acceptable, but this presupposes that adhesions have formed between the capsule of the kidney and the organs within the abdomen, or that the form of movable kidney belongs to the second or third divisions made by me in discussing the pathology of the subject (p. 21): that is to say, cases where not only the kidney is movable within its capsule, but the capsule itself also has become displaced, or while the capsule and the kidney are adherent to the duodenum and intestine, their attachments to the posterior abdominal wall have become relaxed.

Kendal Frank classifies the symptoms of movable kidney in three groups—(1) Those symptoms which are common to both right and left movable kidney; (2) those symptoms which belong exclusively to the mobility of the right kidney; and (3) those symptoms which may be found when the left kidney is mobile.

In the second group he includes the symptoms now under consideration, and which are recognised under the term gastric crises, and he explains the etiology in the following way:—

"In many cases when the kidney slips, its attachment to the duodenum may be so slight and lax, or the surface in contact with the duodenum may be so small, that the kidney disengages itself from the duodenum, and may become freely movable in the abdomen, without in any way interfering with the gut. Under such circumstances we have, what is a not uncommon experience, a freely movable kidney presenting no symptoms—a condition very difficult to explain on the usual theories laid down.

"If, on the contrary, the surface of contact between the kidney and duodenum be extensive, when the kidney loses its usual support and begins to descend behind the peritoneum it gradually drags the duodenum with it, and, as in the instance in which I had the good fortune to observe what occurred, the duodenum kinks, and the temporary condition is induced very similar in its symptoms to what we find in stricture of the pyloric end of the stomach. This view is further strengthened by the fact that marked dilatation of the stomach is found in some of these cases.

"These gastric symptoms, I believe, are not found when the left kidney is alone at fault."

On the other hand, Muller Warnek believes that the kidney when it becomes displaced presses against the perpendicular portion of the duodenum which, being firmly fixed by its mesentery, when it is pressed upon, cannot become readily displaced, consequently its lumen becomes diminished, and a certain amount of obstruction to the escape of the contents of the stomach induced. This stoppage or obstruction, he believes, gives rise sooner or later to gastric catarrh or even sacculated expansion of the fundus of the stomach. The accumulated contents undergo fermentation, and all symptoms of pyloric constriction follow. I have seen several instances where marked dilatation of the stomach has been associated

with movable kidney, and in three instances the disease was mistaken for stricture of the pylorus, and in one the patient was recommended by a well-known surgeon to have an operation performed upon the stomach; but this is not to be wondered at, seeing that in forty cases of dilatation of the stomach observed by Litten, twenty-two also suffered from misplaced kidney (page 7). In these instances, I felt convinced that the distortion of the duodenum was not due to pressure by the kidney upon the first part of the intestine, but rather to the dragging of adhesions. Warnek's theory has been supported by Malbranc, who considers that he has been able to verify the views by clinical observation.

CASE X.—*Movable right kidney associated with chronic dilatation of the stomach and marked gastro-intestinal disturbance—Symptoms relieved by operation.*

Miss D., aged 33, consulted me in June, 1903. She was ill-nourished, pale, and in very poor health. She stated that in 1898 she fell going downstairs, by slipping on a stair-rod which was loose, the edge of a step coming in contact with her right loin. At that time she was well-nourished, although she suffered from occasional attacks of bronchitis. Soon after the injury she began to experience pain in the right renal region, but while the suffering was never very severe, she was seldom free from it, except when at rest. The pain was not at first attended by any digestive disturbance, but early in 1899 she began to complain of constipation, vague abdominal pains, and frequent attacks of flatulence, and within the last eighteen months, at first occasional, but subsequently frequent, attacks of vomiting, the vomited matter consisting of undigested food. Sometimes the attacks of vomiting were followed by diarrhœa and the presence of large quantities of bile pigment in the urine. When I saw

the patient for the first time, the stomach was greatly distended and contained a considerable quantity of gas and fluid, and she complained of distinctly localised pain in the epigastric region, immediately below the ensiform cartilage, also pain in the back, in the middle line between the sixth and eighth dorsal vertebræ. This pain was sometimes very intense, burning or stabbing, sometimes spasmodic or colicky. It usually came on shortly after meals, about twenty minutes to half an hour, but sometimes it was delayed for a longer time, especially if the patient lay down after taking food. It lasted for several hours, and when severe usually was relieved only by vomiting.

When the patient first came under my treatment, she was unable to take more than small quantities of food in the simplest form; anything beyond milk diet and soup jellies was almost certain to bring on the symptoms described above. The right kidney was found to be freely movable. It could be moved towards the middle line, but not quite to it, pushed down into the pelvis, upwards under the edge of the liver, but generally it lay under the right costal margins, about an inch and a half from the middle line in front. The stomach was so much dilated that before considering the question of an operation upon the kidney, it was thought advisable to wash out the stomach regularly with a syphon. This treatment was followed out for six weeks, and the patient was kept in bed. At the end of that time, she was able to take a reasonable amount of food, and had gained weight, but whenever she assumed the erect posture for any length of time the old symptoms recurred. In September, the kidney was explored and found to be moderately enlarged, of a deep, chocolate colour, the fibrous capsule was slightly adherent, and the adipose capsule was considerably diminished in amount. The organ was fixed in the usual way, the patient

made a good recovery, and when seen last in April, 1904, she had regained weight and was enjoying comparatively good health. The digestive functions were improved, the pain had disappeared, and vomiting ceased.

3. *Those in which ill-defined pain, generally abdominal, but not specially referable to the renal region, is the most marked symptom.*

This group is a large one, and probably would be still larger, were it not that movable kidney is not thought of or searched for as a cause of the suffering. The patients are usually young women, from 25 to a little over 30 years of age, who have lost weight, and have suffered from imperfect health, but have no symptoms pointing to any definite disease. The pain is seldom or never severe. The point from which it seems to radiate is halfway between the lower end of the sternum and the umbilicus, but there is no tenderness on pressure at the epigastrium, so often observed in the pains of gastric disorders. In this group, the pain does not in any way resemble renal colic, not being due to obstruction to the escape of urine, but rather to be attributed to traction on the nerves supplying the kidney or to pressure upon those lying close to it. The pain is generally dull, and may amount rather to what the patient describes as an "unendurable sense of weakness" in the abdomen and a "tired feeling in the back." The pain often extends down the thighs, and is not infrequently mistaken for "sciatica" or "lumbago," or may be attributed to "rheumatism of the muscles" or "disease of the hip-joint." The pain, however, is not limited to the sciatic nerve, but extends occasionally in the course of the anterior crural. It is unattended with pain on pressure of the nerve trunks, and is accompanied by frequent desire to micturate. The pain is not influenced by exposure to damp or cold, nor is it increased

by pressure over the painful part. There is no loss of motor power, nor is there atrophy of muscles. It is increased by exercise, and relieved by rest—especially in bed. It is not prone to exacerbations during the night, nor is it increased by standing or pressure over the hip-joint. From time to time there may be digestive disturbance, especially if the patient has been taking much exercise of a rough kind. While the pain varies from day to day, there are intervals of rest and complete comfort. During the time that the pain is most severe, there may be a feeling of nausea, the pulse is not affected, the temperature is unaltered, while, after the attack passes away, there may be a sense of utter prostration. Medicinal treatment may relieve any digestive disorders when carried out along with rest in bed, and the pain may pass away, but as soon as the patient begins to move about again, the old troubles all return. This occurs time after time. The patient loses courage, and, thinking that no one "understands her complaint," she becomes resigned to her fate, and goes on suffering until the renal condition is revealed and an operation performed. The following case is a typical illustration of this particular class :—

CASE XI.—*Movable right kidney—Sickness and severe general abdominal pain during four years—Later, pain in right renal region—Cure by operation.*

Mrs. M., aged 29, was admitted to the Glasgow Royal Infirmary on 5th October, 1900. She was moderately well nourished. She stated that her illness commenced four years prior to admission, when she began to suffer from pain on the right side of the abdomen in front, and extending to the opposite side and down the thigh. This pain was so severe at times that it caused her to double herself up, and frequently to faint. At the same time, she had a distinct

feeling of sickness and an inclination to vomit. These attacks came on about once a month, and generally in the mornings when she got out of bed, but during the last eleven months they have occurred as frequently as once a week. These pains did not extend to the renal region until about two months prior to admission. She then began to complain of a dragging pain in the back, which from that time has been almost always present more or less; also, she observed that the quantities of urine varied considerably, sometimes being very small, at other times very large in quantity. She herself discovered a swelling in the right iliac region, and she recognised that pressure upon this swelling induced the pain of which she complained. The right kidney was found to be freely movable on the right side of the abdomen, above and to the inner side of the anterior superior iliac spine, but it did not readily slip into the loin, being more inclined to pass directly upwards. Even when the patient was lying on her back, the kidney was found to lie immediately behind the anterior abdominal wall, usually at a point about midway between the anterior superior spinous process and the umbilicus. Nephrorrhaphy was performed on 12th September, 1900, and the patient was dismissed well on 5th October.

In this case, till within two months of the operation, the pain was not specially referable to the renal region, and when it became so it was coincident with symptoms of obstruction to the urinary flow. At the operation, considerable difficulty was experienced in laying hold of the kidney through the lumbar incision, and it was found to be firmly adherent to the mesocolon. It was enlarged in size, and the pelvis was considerably dilated. The adipose capsule was movable along with the kidney.

4. *Those in which the pain is distinctly renal, and is associated with—*

(*a*) Albuminuria only.

(*b*) Albuminuria and tube-casts.

(*c*) Hæmaturia, and in some blood-casts.

(*d*) Transitory hydronephrosis.

(*e*) Pyonephrosis.

This series forms one of the most interesting groups in that the pathology is clearly defined, and the most satisfactory results are attained by treatment. A circumstance I have observed, and one that is worthy of note, is that in these cases there are no signs of a neurotic tendency. In all, the symptoms are simply those due to mechanical obstruction to the circulation or to the escape of urine from the kidney. The first three symptoms, namely, albuminuria, the presence of tube-casts, and the appearance of blood, are clearly due to the obstruction of the circulation; whereas the two latter, hydronephrosis and pyonephrosis, are due to the obstruction to the urinary flow. When considering the pathology we pointed out the changes that take place when the kidney becomes movable, and attention was directed to the effects produced by twisting of the vessels, the nerves, and the ureter. Impediment to the flow of the arterial blood to the kidney is very rare; an account of the only case I have seen will be found at p. 38, where the full history of the case (Case IV) is given and the pathology discussed, so that it is not now necessary to add any further remarks.

In all cases that belong to this group the pain is referred to the region of the kidney as the site of its origin or of its greatest intensity, but in severe cases the pain radiates far beyond the lumbar region. When the displacement is such as to obstruct the venous return only, the suffering comes on gradually, and is of a steady, dull, aching character. When it

is so complete as to cause hæmaturia, the renal pain may begin very suddenly, simulating renal calculus, and may be accompanied by severe gastric disturbance, nausea, and vomiting. Occlusion of the ureter causes more severe pain than obstruction to the venous return, is associated with more or less swelling from distension of the pelvis, and is accompanied by retention of urine. When the obstruction to the venous return is slight and of short duration, the only changes observed are a diminution in the quantity of the excretion and the presence of albumen; but if the obstruction be serious and prolonged, tube-casts may be found in the deposit, and the organ is increased in size. Torsion of the renal vessels and of the ureter may lead to one or more of the following symptoms:—

1. Albuminuria with or without tube-casts.

2. Hæmaturia, sometimes coincident with blood-casts in the urine.

3. Dull, aching pain in the renal region almost constantly present, and associated with occasional paroxysms of colic similar to that produced by calculus. But while the paroxysmal pain, the hæmaturia, and the general gastric disturbance are similar in character and in mode of onset to what is observed in calculous disease of the kidney, in addition to, and frequently coincident with, the symptoms just mentioned, there is sudden diminution in the quantity of the urine. The subsidence of the renal pain is soon, but not immediately, followed by copious flow of urine of high specific gravity, instead of low as in transitory hydronephrosis. The hæmaturia associated with blood-casts in the urine, and the renal pain concurrent with sudden appearance of albuminuria and tube-casts, are important circumstances in forming a diagnosis.

Impediment to the escape of blood along the veins produces increased vascular tension, indicated by pain, in most

cases by slight, but in a few by considerable, increase in the size of the kidney, and in many cases by reduction in the quantity of the excretion.

When frequently repeated over a long period, venous obstruction is certain to lead to atrophy of the organ, but, fortunately, the sickness and pain induced by the condition forces the patient to take rest in bed, thereby the normal position of the kidney is restored, and the twisting of the pedicle rectified. In the majority of my cases of torsion of the veins, the paroxysms of pain were associated with sudden and transitory albuminuria, diminution, but seldom with suppression, of urine.

CASE XII.—*Severe pain and tenderness on pressure, with a little increase in the size of the kidney—Diminution in excretion—High specific gravity of urine—Albuminuria and tube-casts.*

D. R., an electrical engineer, aged 35, consulted me on 5th November, 1901, presenting symptoms and physical signs of right movable kidney. He was anæmic and emaciated, but beyond the symptoms referable to movable kidney, he said that he enjoyed good health. His heart was normal. While at work in November, 1899, he strained himself by lifting a heavy weight; this he blamed for his present trouble, and from his accurate account of what occurred I am convinced that his explanation was correct. Liable to frequent and severe attacks of paroxysmal pain, he was advised to see me with a view of having a calculus removed from his right kidney. Cystoscopic examination proved the bladder to be strictly normal, there were no changes in the appearance of the ureteral orifices, and *x*-rays failed to show the presence of a stone in either kidney; but the presence of well-marked movable kidney encouraged the belief that the displacement

was to blame. To confirm this I kept the patient under observation for six weeks, allowing him to take free exercise. During that time he had two attacks which I was able to observe and note details regarding the excretion of urine. While resting he had no inconvenience, but if he took active exercise, such as walking, driving, or playing outdoor games, he was certain to suffer. The paroxysms came on suddenly and lasted from eighteen to twenty-four hours, and were accompanied by sickness, nausea, vomiting, and severe headache. I carefully watched the urine, each sample being examined. The following table shows the condition of the urine during one of the attacks:—

Date.	Time.	Quantity, in ounces.	Sp. Gr.	Remarks.
1902.				
Feb. 2	6 P.M.	10	1015	No albumen, no tube-casts.
,, ,,	11 ,,	15	1014	No albumen, no tube-casts.
,, 3	8 A.M.	16	1020	No albumen, no tube-casts.
,, ,,	1 P.M.	8*	1024	
,, ,,	9 ,,	7	1030	Albumen in considerable quantity, and tube-casts, epithelial and hyaline; no blood.
,, 4	6 A.M.	8	1028	
,, ,,	1 P.M.	6	1028	
,, ,,	6 ,,	5	1025	
,, 5	12·30 A.M.	18	1018	
,, ,,	3 A.M.	20	1016	Trace of albumen, no tube-casts.
,, ,,	5 ,,	16	1010	
,, ,,	8·30 ,,	12	1010	No albumen.

* Pain set in at 11·45 A.M., and at 1 P.M. was very severe, and continued till 6·30 P.M. on 4th February.

It will be observed that prior to the attack from 6 P.M. on 2nd February till 8 A.M. on 3rd February, 41 oz., or about 3 oz. of urine per hour, were excreted, and the specific gravity was between 1015 and 1020. From 1 P.M. on 1st February till 6 P.M. on 4th February, 26 oz., a little under 1 oz. per hour. The specific gravity varied from 1024 to 1030, and the urine contained albumen, epithelial and hyaline tube-casts, but no blood. After the pain passed off, the albumen diminished in

quantity and disappeared in a little over twenty-four hours. Cure was effected by fixing the kidney.

In all the cases of movable kidney in which albuminuria has been observed in consequence of torsion of the pedicle, the sequence of events has been similar to those observed in the above case. In a paper published in 1896, I drew attention to this subject, and illustrated it by several cases.[1]

In cases of movable kidney, albuminuria may be met with where it is not simply due to vascular disturbance, a direct result of the displacement, but rather to organic changes in the organ itself. Bright's disease is not uncommon in such cases, but it is easily detected, even in its early stages, from the cases above referred to, by the fact that the albuminuria is persistent, not transitory. The great distinction between albuminuria in Bright's disease and that of surgical diseases of the kidney is in their causation. In the latter, the albuminuria is due to some local injury to the kidney, some direct interference with its circulation, or the local action of microbes, and consequently, the general symptoms mentioned below are seldom observed; whereas in Bright's disease the renal lesion is only a part of the disorder. The toxic material being in the blood, all organs suffer more or less, but the kidneys, being the most active excretory organs, their functions become impaired early in the course of the illness, and the structural changes in the renal parenchyma are often the most pronounced feature of the malady. If the disease is advanced, morbid changes in other organs are indicated by signs and symptoms which furnish a means of estimating the diagnostic importance of the albuminuria, The persistence of albuminuria is one of

[1] "Cases Illustrative of the Relationship of Movable Kidney to Transitory Hydronephrosis and Intermittent Albuminuria and Treated by Operation, *Transactions of the Clinical Society of London*, vol. xxix, p. 55.

the most important points, and can be easily ascertained by examining the urine regularly day by day, at different hours of the day. When albumen is found to be present in but slightly varying quantity in a patient beyond 40 years of age, in the absence of well-defined pain in the lumbar region it may generally be presumed that the albuminuria is the result of some form of Bright's disease; and, should the urine be almost constantly pale in colour, of low specific gravity, and deposits granular or epithelial tube-casts, then the diagnosis of organic disease of the kidney is distinctly strengthened. The effects of rest are most marked in cases of albuminuria which are not due to Bright's disease. In cases of movable kidney, albuminuria generally disappears in a few days after the patient has taken to bed, and conversely exercise and work at once induce an increase. When the albuminuria is due simply to passive hyperæmia, the amount of albumen varies from day to day, while the urine is scanty, deeply coloured, and of high specific gravity. On the other hand, in cases of chronic Bright's disease, while the quantity of albumen may likewise vary, the excretion is generally abundant, of a pale colour, low specific gravity, and there is not only a relative but also an absolute diminution in the quantity of urea and the other urinary ingredients.

In about 6 per cent of my cases of movable kidney, symptoms of Bright's disease have been observed, but in nearly all the mobility of the kidney has been of very old standing. In some of these, I am convinced that the albuminuria has been diminished and the symptoms mitigated by operation, and in others the albumen has completely disappeared from the urine.

Hæmaturia has been observed in 12 per cent of my cases, and in 7 per cent the bleeding has been severe. This pronounced symptom is a consequence of interference with the

venous flow from torsion of the renal vein. The pathology of this subject has been very fully discussed already. I shall only cite two cases in illustration. The most marked case which has come under my observation was one which I operated upon in 1896.

CASE XIII.—*Severe paroxysmal renal pain and hæmaturia without gastric disturbance—Occasionally blood-casts in urine, frequently tube-casts, and sometimes albumen independent of blood—Movable displaced kidney—Cured by operation.*

T. L., æt. 50, an ironmoulder, was admitted to the Glasgow Royal Infirmary on 30th January, 1893, complaining of severe pain in the region of the left kidney, shooting downwards and forwards in front of the abdomen. These paroxysms of pain usually came on after exercise, and lasted for several minutes at a time, while during the six months prior to admission he almost constantly suffered from an aching pain in the left side. At the onset of the attacks of paroxysmal pain, the urine was of a dark red colour and contained a large quantity of blood, but gradually the quantity of blood diminished and the urine became bright red.

The patient was a very well-nourished man, short in stature, weighed 14¼ stones, and very stout, so that an examination of the renal region with the hand did not reveal anything—even firm pressure applied to the part did not give pain—and no increased muscular resistance could be made out. During residence in hospital the patient was kept strictly in bed, and from 30th January till 6th March he only complained of the dull aching pain; he had no paroxysmal attacks, and no hæmaturia nor albuminuria. He was readmitted on 8th May, 1893, having suffered from several attacks since he left the hospital in March.

On 10th May, the following note was made:—"Until the present time the symptoms all pointed to the presence of a stone in the left kidney. The pain was clearly increased by exercise and relieved by rest, and so also was the hæmaturia. Yesterday he had an attack of renal colic and hæmaturia, and the following is a note of the condition and quantity of the urine:—

1893.	Ounces of Urine.	Remarks.
May 9, 6 P.M.	12	Urine clear; traces of albumen; a few tube-casts. No pain. Sp. gr. 1013.
,, 9, 10 P.M.	4	Pale urine. Sp. gr. 1020.
,, 9, 11 P.M.		Severe paroxysm of pain in left side.
,, 10, 5 A.M.	6	Urine dark porter colour. Sp. gr. 1024. Blood abundant. Blood-casts. Pain still continues severe.
,, 10, 8 A.M.	18	Pale red, blood-stained urine. Sp. gr. 1008. Pain gone.
,, 10, 12 NOON.	15	Trace of blood only. Small quantity of albumen. Sp. gr. 1011.
,, 10, 7 P.M.	9	Clear urine. Sp. gr. 1015. No albumen; no tube-casts."

The presence of blood-casts in the urine suggests the source of hæmorrhage as being in the renal substance rather than the consequence of a calculus in the pelvis of the kidney.

19th May, 1893.—The patient remained well, and since 8 A.M. on the 10th inst., there has been no pain; and no blood, tube-casts, or albumen since 7 P.M. on the same day.

The presence of blood-casts in the urine was observed for the first time on 10th May, and gave quite a new aspect to the hæmaturia, which, prior to this time, was regarded as due to the presence of a stone in the left kidney.

The patient remained well till 1st June, when he left the ward, not having had any recurrence of pain or of hæmaturia.

Readmitted, 22nd June, 1896.—Since leaving the hospital in June, 1893, the patient has suffered more or less pain in the region of the left kidney, which is increased by exercise and relieved by rest in bed. The pains and the hæmaturia present the same characteristics as formerly, but now there is considerable tenderness on palpation at a spot midway between the crest of the ilium and the last rib on the left side. On account of the stoutness of the patient, palpation fails to reveal the condition of the left kidney.

Considering that rest in bed only gave temporary relief, and that the patient was incapacitated from following his occupation by the frequency of the attacks, he was advised to submit to an operation for the purpose of ascertaining the precise condition of the left kidney, and if possible of relieving it permanently.

On 29th June, an incision was made down to the left kidney, when it was found to be moderately movable, displaced upwards and forwards, and rotated on its short axis, so that the lower margin of the organ pointed forwards.

The adipose capsule was freely separated from the fibrous covering of the kidney, and a considerable portion of the loose fat removed. The fibrous capsule was then incised, stripped off the cortex for half an inch on either side of the incision, and stitched to the parietes. A large drainage-tube was inserted, and the deep parts of the wound kept open for ten days, after which it was allowed to heal.

In this case the symptoms—viz., paroxysmal renal pain increased by exercise and relieved by rest, hæmaturia, tenderness on palpation in the left renal region—all pointed to calculus in the kidney, but the presence of a few tube-casts, traces of albumen without pus or blood, indicated that the morbid condition affected the tissue of the kidney, while the occasional appearance of blood-casts pointed to the origin of

the hæmorrhage. At the operation, a sufficient explanation was found. The rotation of the kidney so that the lower margin presented forwards must have caused the ureter and blood-vessels to be coiled round one another, and so impeded the circulation of blood. As a consequence, more or less severe passive hyperæmia was produced, varied in degree according to the precise position occupied by the kidney at different times.

The patient reported himself on 2nd November, 1896, and stated that while occasionally he has had slight pain in the cicatrix, he has had no return of the old renal pain, nor has any blood appeared in the urine. A specimen of urine examined was free from albumen and tube-casts.

While hyperæmia from venous obstruction is common, *hydronephrosis*, to a degree sufficient to cause a perceptible swelling in the loin, is comparatively rare.

Temporary obstruction of the duct in movable kidney gives rise to symptoms exactly similar to those found in transitory hydronephrosis from other causes.

From a pathological standpoint, I have already drawn attention to transitory hydronephrosis and pyonephrosis as complications of movable kidney. They are not of pathological interest only; they are met with frequently enough to demand our attention also from the clinical side. I have already shown that displacement of the kidney may lead to impediment to the flow through the ureter in various ways:—(1) By kinking from rotation of the kidney on its short axis; (2) by obstruction from bending of the ureter in some part of its course; and (3) by occlusion of the lumen of the duct through angular insertion of the ureter into the bladder. Cases were given illustrating each of these conditions. As stated above, I have seen only fourteen cases where the hydronephrosis was

sufficiently large to be detected by the hand as a distinct swelling in the lumbar region. But judging from the symptoms observed in many other cases, I have little doubt that occasional and slight obstruction of the ureter occurs frequently, lasting, however, only for a short time—too short a time to allow much fluid to accumulate. The duration of undoubted cases of transitory hydronephrosis varies considerably. In ten of the fourteen cases just alluded to, the duration was not less than six hours. In some, the attacks extended over forty-eight hours, and in a very few lasted for days. As I have already demonstrated in published cases,[1] while the pelvis of one kidney is becoming distended, the function of the opposite organ may be suddenly inhibited, as shown by complete suppression. Examples of reflex inhibition of the functions of the kidney are numerous. For example, unilateral obstruction due to the presence of a calculus in one ureter may cause complete anuria, which may last for a considerable time. In some, the inhibition of the function of the healthy kidney occurs at once; in others, it is only when the hydronephrosis on one side reaches a certain point that the kidney on the opposite side fails to act.

The following case is an example of an acute transitory hydronephrosis in which inhibition occurred at once:—

CASE XIV.—*Acute hydronephrosis from torsion of the ureter in a case of left movable kidney—Complete suppression of urine for nine days—No uræmic symptoms—Operation—Cure.*

J. A., a domestic servant, aged 25, was admitted to the Glasgow Royal Infirmary on 17th October, 1904, when she stated that five weeks prior to admission she for the first time

[1] *Renal Cases*, 1899, p. 39, published by James Maclehose & Sons, Glasgow.

suffered severe pain in the left lumbar region, but when questioned more closely she admitted having had frequently slight attacks of pain in that quarter at an earlier date. They were not, however, so severe as to preclude her from performing her daily duties as a domestic servant. Within the last month she had occasionally to seek relief by lying upon her left side in bed. There was neither difficulty nor pain in micturition. A week previous to admission the pain became much more severe, and the patient was strictly confined to bed. While constantly present, occasionally the pain got suddenly worse, and shot in various directions, but principally to the opposite lumbar region. The patient states that since the acute pain came on she has passed absolutely no urine, and on dressing to come to the hospital she noticed that her left side was greatly swollen.

On admission, there was marked distension of the left lumbar region, which was very tender on pressure, and in front of the swelling the kidney could be distinctly felt. The patient's general condition was fairly good, and there were no symptoms indicative of uræmic poisoning. The pulse was 80, the respirations were 18 per minute, and the temperature normal. A catheter was introduced, and the bladder was found to be empty. Heart and lungs normal.

18th October.—Dr. Newman examined the patient to-day, and found the pelvis of the kidney occupied by a large hydronephrosis. The sac extended from the costal margins to the crest of the ilium, and forwards to within an inch and a half of the middle line. The right kidney could not be felt with the hand, and there was no pain elicited on pressure, whereas on the left side the slightest pressure caused the patient intense suffering. A catheter was again introduced without any urine being obtained; and the patient has passed no urine since admission.

21st October.—On the morning of the 19th inst., patient passed urine for the first time since admission. It contained a slight trace of albumen, and on standing a mucous deposit containing leucocytes was thrown down. On the 19th inst., 35 oz. of urine was passed, and on the 20th inst., 30 oz., but, while urine was escaping from the bladder, the hydronephrosis steadily increased in size, so that this morning Dr. Newman opened the hydronephrosis from behind. At the operation, it was evident that the cyst had ruptured posteriorly very shortly prior to the kidney being incised. A considerable quantity of the fluid had escaped into the perinephritic fat, and this becoming distended formed loculi which, however, were easily separated and opened with the finger. The dilated pelvis of the kidney was exposed, but no calculus could be found either in the pelvis or in the ureter; the kidney was seen, however, to be freely movable. The fluid which escaped contained 1·7 per cent of urea.

23rd October.—On the 21st (the day of the operation), the patient passed 48 oz. of urine from the bladder, and at the same time a large quantity drained away from the wound. The urine from the bladder contained a considerable quantity of albumen, but no tube-casts. The albumen continued present in steadily decreasing quantities for about a week, and by the end of that time the wound had almost completely healed, and very little urine then escaped from it. The patient was dismissed well, and the wound healed on the 18th November.

The interest of this case is in the circumstance that, almost immediately after the obstruction to the left ureter occurred, the action of the neighbouring organ became suspended, and although this continued for seven days, there was not the least evidence of toxic poisoning, either as indicated by general symptoms, by the character of the tongue, the pulse, or the temperature. The swelling, when first examined at the time

of admission, was distinctly fluctuant although very tense, but on the morning of the operation, while the swelling was larger in size, the tension had become somewhat relaxed. This led me to suspect that rupture might have taken place, and urged me to perform nephrotomy at once.

As a rule, transitory hydronephrosis of one kidney is not associated with immediate suppression of the function of the opposite organ. The suppression usually only follows after a considerable interval of hours, or even of days. The suppression may be followed by albuminuria, and this may be limited to the urine which is excreted by the kidney opposite to the one which is hydronephrosed. Again, in cases of transsitory hydronephrosis, the excretion of the opposite kidney may not be stopped, but only altered in character, the most marked changes being increase in the specific gravity and the presence of albumen. This is illustrated in the following case:—

CASE XV.—*Movable right kidney—Hydronephrosis—No suppression of urine—Albuminous urine from the left kidney only.*

A. C., æt. 37, enjoyed perfect health up till February, 1900, when she slipped on ice and received a severe bruise over the right lumbar region by falling against the edge of a snow box. Following the injury, she was confined to bed for a few days, and made what was thought to be a good recovery; but, as soon as she began to move about freely, she experienced pain in the right renal region, at first vague and slight, but as time passed steadily becoming more severe. In the following summer she began to complain of symptoms of gastro-intestinal irritation, such as nausea, attacks of vomiting, and occasional diarrhœa, ailments from which she was entirely exempt prior

to the accident. At the end of September, I was called to see her on account of an acute attack of renal colic which lasted for three hours only, and had passed off before I arrived. On palpation, I found the right kidney to be freely movable towards the middle line, downwards as far as the iliac crest, but no enlargement could be detected. The urine was clear, and beyond a trace of albumen nothing abnormal was detected. The albumen disappeared next day, and continued absent; the urine was examined morning and evening, and instructions were given that, should the pain recur, all samples of urine passed should be kept separately. The next attack of severe pain occurred on 15th October, when I was at once sent for. The patient said that she had been walking in the morning, and shortly after she returned home the pain began (12·30 P.M.), and continued increasing till the time I saw her (2 P.M.). On palpating the kidney, it was found to be slightly increased in size and resting at the level of the crest of the ilium. At the onset of the pain, after passing 8 oz. of urine, the patient took to bed, and she felt easiest when she was lying upon her back with the knees elevated. When, however, the pain had considerably increased (8 P.M.), she could no longer lie on her back, but she sat up in bed with the chest thrown well forwards and the knees tightly drawn up and held by the arms. At 10 P.M. the swelling was very marked in the right lumbar region, and filled up the whole space between the costal margin and the iliac crest, and extended forwards to within 3 inches of the umbilicus. A third of a grain of morphia was given at 6 P.M. without much effect, and the same dose was repeated at 10·15 P.M. Hot baths and gentle massage were prescribed.

10th October.—The patient passed a tolerable night under the influence of two-thirds of a grain of morphia, but when she was seen at 8·30 A.M. to-day, the swelling and pain had

considerably increased. The nurse stated that at 7 o'clock A.M. the patient had been very sick. Half a grain of morphia was administered.

17th October.—As no relief has been obtained by medical treatment, and the patient is now much exhausted by pain and want of nourishment, no food having been retained since yesterday morning, an operation was performed to-day. The kidney was exposed and incised. Thirty ounces of urine was evacuated, and the organ fixed.

1900.	Quantity in Ounces.	Sp. gr.	Remarks.
Oct. 15, 8·30 A.M.	12	1017	Normal.
12·30 P.M.	8	1014	,, pain began.
4 P.M.	6	1020	Trace of albumen, gradually increasing in amount from 4 P.M. on the 15th till 12·30 A.M. on the 18th October. The urine removed from the hydronephrosis was normal, sp. gr. 1010, and did not contain albumen.
9 ,,	7	1022	
,, 16, 4 A.M.	5	1024	
10 ,,	6	1024	
3 P.M.	7	1022	
9 ,,	4	1026	
,, 17, 6 A.M.	8	1024	
12 NOON (Operation)	5	1026	
6 P.M.	7	1018	
,, 18, 12·30 A.M.	12	1012	
6 ,,	11	1008	No albumen.

The patient made a perfect recovery, and enjoyed good health thereafter.

Regarding the character of the urine in this case as contrasted with the one immediately preceding it, note may be taken of the circumstance that while the hydronephrosis was accumulating in the right kidney, the left kidney continued to perform its functions, with, however, a sudden and maintained rise in the specific gravity of the urine, also a steadily increasing trace of albumen in that eliminated from the bladder, while the fluid removed from the hydronephrosis by operation was free from any abnormality, the specific gravity, however, being low, namely, 1010.

The two cases just described illustrate the more persistent forms of obstruction. In the majority of cases, however, the impediment to the escape of urine is of short duration, and has been described under the term, "transitory hydronephrosis" or "intermittent hydronephrosis." Such cases I fully discussed some years ago at the Clinical Society of London.[1]

By becoming infected by pyogenic organisms, a hydronephrosis may become converted into a pyonephrosis. The conditions which predispose to and the factors which excite an invasion of the kidney by microbes, were considered in a discussion which I had the privilege of introducing at the meeting of the British Medical Association in Edinburgh in 1898, and this subject was more fully elaborated in a paper published in the *Glasgow Hospital Reports*, vol. iii, p. 354. In movable kidney, the danger of septic infection is not great. While I have seen a considerable number of cases in which suppuration of the pelvis or of the renal substance have co-existed with mobility, in one instance only have I seen a pyonephrosis develop from a hydronephrosis while the case was actually under observation. The case being, in my experience, unique, it may be worthy of record.

CASE XVI.—*Old-standing movable right kidney—Occasional attacks of transitory hydronephrosis—Sudden infection by bacillus coli and streptococcus pyogenes.*

J. C., aged 61, the mother of nine children, was seen by me first in 1896, and then presented the usual symptoms and physical signs of a freely movable right kidney. At that time she had, however, few attacks of severe pain, but she suffered from most of the milder inconveniences of the displacement. The first attack of severe pain which could be clearly referred

[1] *Clin. Society Trans.*, 1896, vol. xxix, p. 55.

to ureteral obstruction occurred on 7th July, 1899, and lasted for five hours. From that date until the end of 1901, she suffered from several recurrences, the duration of these varying from three to ten hours. No pus was discovered in the urine, although it was regularly and carefully examined, until 10th February, 1902, when a distinct muco-purulent deposit appeared, coincident with a subsidence of the renal swelling. For her relief an operation was advised, but this she declined. A fortnight later, however, complete obstruction occurred, and relief becoming imperative, the distended pelvis was incised and 28 oz. of purulent urine was evacuated, and on bacteriological examination it was found to contain bacillus coli and streptococcus pyogenes. The patient, who was greatly reduced in strength, made a very slow but an ultimately satisfactory recovery.

5. *Those in which both local symptoms and reflex functional disturbance are marked.*—This class includes the most severe cases of movable kidney. Not only are the gastro-intestinal symptoms pronounced and the functions of the kidney markedly interfered with, but in some there may be symptoms indicative of more remote reflex functional disturbance, as exemplified by derangement of the circulation or respiration, or of alterations in sensation. In one case, I have observed complete anæsthesia of the mucous membrane of the bladder, and the patient was unable to micturate spontaneously for several weeks. These remote reflex symptoms are regarded and designated by some observers as "purely hysterical," a term the exact import of which has not, as far as I am aware, been defined. It is one commonly used to imply an attempt to counterfeit disease on the part of the patient. Does it not really, in most instances, serve as a convenient cloak for the ignorance of its creator when he is confronted

with numerous and perplexing symptoms, of the intimate pathology of which he has little knowledge? These remote reflex symptoms of movable kidney may be seen in patients who have very perfect mental control, and in whose case the suggestion of either partial or complete suspension of inhibitory mental influence at any time could not be entertained. But while this is true in some cases, in many others the patients are distinctly devoid of self-control and given to exaggerate their suffering, and sometimes even to mimic diseased conditions. It is therefore extremely difficult for the surgeon, unless he makes a very careful study of the individual case, to say how far the reflex phenomena are actual or assumed, but to conclude that in all instances they are the result of morbid mental conditions is very apt to lead one into serious error.

CASE XVII.—*Movable right kidney—Hæmaturia from right kidney only—Painful micturition without disease of the lower urinary tract—Severe pain in renal region—Marked attacks of dyspnœa — Disappearance of symptoms after operation.*

Mrs. M'G., æt. 30, housewife, was admitted to the Glasgow Royal Infirmary on 11th June, 1897, complaining of pain on the right side of the abdomen and of difficulty in micturition.

Patient states that twenty-one weeks prior to admission she was suddenly attacked by pain in the bladder. This was of a scalding character, and occurred both during the act and for some time thereafter. At the same time she noticed that the urine was very high in colour, as if it contained blood. Two days later she was seized with sudden severe pain in the right side of the abdomen and in the lumbar region. Accompanying the pain there were sickness and vomiting. The symptoms

were aggravated by movement, but while at rest she obtained relief. After being present for about two months the pain suddenly disappeared, and at the same time her urine became natural in colour. This interval from suffering lasted only for a week, when the pain returned, and the blood reappeared in the urine. Since then the pain had come and gone five times. Since the onset of the illness the patient has lost flesh considerably.

There was nothing special in the family history. The lungs and heart were healthy. Beyond the pain referable to the urinary tract, the patient suffered from marked dyspeptic symptoms, namely, flatulence after taking food, sickness, headache and occasional vomiting, painful defæcation, and constipation. She was anæmic and emaciated.

On admission the urine was amber coloured, and there was a trace of albumen. Blood and sugar absent. A considerable quantity of mucus was deposited with a few leucocytes and epithelial cells, but no tube-casts.

15th June.—A cystoscopic examination made to-day showed several small blood clots near the opening of the left ureter, but otherwise the bladder was healthy. The uterus was found to be enlarged, and there was tenderness over both ovaries. No mobility of the kidney could be detected.

20th June.—An examination made to-day showed the right kidney to be freely movable and distinctly enlarged, and when pressed upon, even gently, considerable pain was complained of.

The most interesting feature in the case was that when the kidney was displaced the patient almost immediately suffered from marked dyspnœa, the face became livid, and the pulse slow and feeble.

In an attack she had to-day immediately after the examination (from 10 to 11 A.M.) the respirations numbered 38 per

minute and the pulse 60 per minute. This condition of matters lasted for about thirty-five minutes, then the attack slowly passed off, the respirations at 11·15 A.M. being 20 and the pulse 78 per minute. On enquiring into the history of the case more minutely in respect to such attacks, it was found that she had eight prior to admission, and, as far as could be made out, these occurred only when the kidney was displaced.

21st June.—This morning blood appeared in the urine, and when a cystoscopic examination was made it was found to be escaping from the right ureter only. The mucous membrane of the bladder was perfectly healthy.

25th June.—Nephrorrhaphy was performed to-day.

She was dismissed well on 3rd August, and reported herself on 26th August, when the kidney was found to be firmly fixed in the lumbar region somewhat closer to the spine and lower down than normal. She again returned on 27th September, and reported that there had been no return of the pain, of the hæmaturia, or of the breathless attacks.

From the history of the case, and from what was seen by examination, it appears that the painful micturition as well as the attacks of dyspnœa were reflex phenomena. The bladder was healthy, and blood was seen to proceed from the right ureter only, while both the lungs and heart were normal. If clots had formed, one could explain the pain in the bladder as the consequence of obstruction; but on no occasion, as far as could be ascertained, was there any evidence of actual impediment to the escape of urine, and although clots were seen adhering to the bladder close to the orifice of the right ureter, these were so small that they would not obstruct the urethra.

The following case, although the symptoms are very different in character, is capable of a similar explanation:—

CASE XVIII.—*Movable right kidney, with onset of symptoms characterised by marked respiratory and digestive disturbance —Local symptoms at first trivial.*

The patient I saw at Uppingham, with her family physician, and he told me that when he was asked to see her in October, 1902, the first symptoms were those of acute gastro-intestinal disturbance. On making an abdominal examination, he found the right kidney freely movable, but the patient did not complain of pain in the renal region, and the urine was found to be strictly normal. Dr. Lyon Smith regarded the case as one in which the gastro-intestinal disturbance was due to the displacement of the right kidney. He ordered rest and the application of an abdominal bandage and kidney air-pad, with the result that she enjoyed good health till May, 1904. He noticed that the symptoms were present only while, or immediately after, the kidney was displaced; and he maintained, and in this I agree with him, that there was no "hysterical" element in the case.

The patient was an extremely quiet, sensible woman. Dr. Lyon Smith wrote to me, saying—

"In May of this year I was called hurriedly to see her, on account of a 'suffocative attack.' I found her walking about the room very flushed and anxious looking, breathing very quickly (about 80 shallow inspirations per minute; pulse very small and thready, 110 per minute). The attack resembled one of angina, except that the face was flushed rather than pale."

The heart and lungs were free from any organic disease. During June and July, while the patient was permitted to move about, and the kidneys occasionally became displaced, these attacks were frequent; but with complete rest they soon disappeared, and with medicinal treatment her general health improved. The conclusion Dr. Lyon Smith came to was that

"the suffocative attacks were caused by the movements of the right kidney setting up a sudden disturbance of the sympathetic nervous system," and when the kidney was kept at rest the attacks ceased.

The patient came to Glasgow, and I had her under observation for over three weeks, and from what I saw I am convinced that Dr. Lyon Smith's explanation is correct. We are very familiar with gastro-intestinal symptoms as a result of movable kidney, but marked respiratory disturbance is uncommon. I have seen a few instances similar to, but much less marked, than the two cases just described, but in most of them the patients were easily excited, and in many, if not in all, I was unwilling to admit the possibility of reflex irritation. In this case, and in the one preceding it, I think we have clear examples of reflex functional disturbance directly resulting from the displacement of the kidney.

Chapter V.

PHYSICAL SIGNS, DIAGNOSIS, AND PROGNOSIS.

The *physical signs* observed in movable kidney vary much in individual cases. If the patient be much emaciated and the kidney freely movable, a tumour of characteristic renal form may be felt, and when the patient assumes the elbow-knee position sometimes its outline may even be seen resting against the anterior abdominal wall. At the same time, a flattening or depression in the corresponding lumbar region may be observed. In a certain number of cases, even where the symptoms are marked, the kidney may not be detected by the hand, and the condition present can be demonstrated by an exploratory incision only. In many instances—in short, stout persons—I have diagnosed the condition from the symptoms alone, operated, and found the kidney freely movable. In other instances, a very movable kidney may be discovered on one occasion, while at a later examination nothing abnormal can be felt. It is a safe rule never to be satisfied with one examination, and not to declare that the kidney is not movable because it cannot be detected on a particular occasion. Palpation may not only show the kidney to be movable, but it may also prove the kind of displacement present. Whether it becomes rotated on its short axis, or simply moves upwards, downwards, or inwards, in many instances the hilum presents upwards and inwards, as represented in Fig. VIII (p. 27), or it may be turned downwards

and inwards. When the patient lies on the opposite side to that of the movable kidney, the convex border of the organ is generally tilted towards the middle line while the posterior aspect looks directly outwards instead of backwards. When the kidney is rotated on its short axis generally the upper pole presents forwards, or the kidney may turn a somersault, the upper pole hanging downwards as represented in Fig. VII (p. 26). From various causes the size of the organ may be altered. Generally, enlargement takes place, and this may arise either from passive hyperæmia, a result of venous obstruction, from hydronephrosis or pyonephrosis, from tubercular disease, or from cystic degeneration.

The sensation communicated to the hand by the movable kidney can scarcely be mistaken for any other swelling. The kidney forms an oblong, hard, and resisting mass, the lower extremity is rounded, the surface very smooth; it is easily pushed in various directions—downwards, upwards, and laterally—and glides with great facility into the lumbar region. In most cases, the abdomen is so flaccid that the organ can be easily grasped by the hand, and when it is manipulated a sickening and peculiar faint sensation, frequently accompanied by pain shooting down the thigh and lower part of the abdomen, is produced. When the hand is applied to the postero-lumbar region, a depression may be felt when the kidney is displaced, but when it is thrust back to its normal position the natural sense of resistance in the renal region is restored. On the other hand, in some instances the space vacated by the kidney becomes filled up by fat, and so the normal sense of resistance is maintained. While some patients have the power, by muscular effort, to throw the kidney out of its place, in others, when the organ has been restored to its normal position, it is sometimes difficult to displace it again. This circumstance is frequently of diagnostic

value. In a considerable proportion of cases the kidney may occupy the iliac fossa, so that considerable displacement may exist without any foreign body being felt through the abdominal parietes.

Palpation is most effectually carried out by placing the patient in the supine posture, with the knees drawn up and chest slightly elevated, so as to relax the abdominal muscles. Occasionally it is necessary to palpate with the patient lying prone, turned on one side, sitting, or standing erect. It is always well to divert the patient's attention from the examination, engage her in conversation, and occasionally ask her to breathe deeply. By so doing the muscles of the abdomen are rendered lax. The hands of the surgeon should be warm, and, to begin with, the examination should be made with the whole hand laid flat on the abdomen. With steady pressure, gradually increasing in degree, but varying from time to time—not by a sudden push with the points of the fingers—one hand should be pressed deeply into the interval between the crest of the ileum and the costal margins behind; while, in front, the other hand is opposed to it, so as to grasp the parts, at first gently, afterwards firmly, between the two hands. By bimanual palpation conducted in this way, the size, form, position, and consistence of the organ can be made out, or the presence of fluctuation ascertained. This examination should be made, first, with the patient lying on his back, afterwards lying upon his face, and, if necessary, in the elbow-knee position. If the kidney is easily felt by palpation, the conclusion may be come to that the organ is either enlarged or displaced, or both. It is most easily felt during full inspiration. Examination should first be made without the use of an anæsthetic in order to ascertain the degree of muscular resistance and the amount of tenderness or pain produced by pressure, and, if there is much

more muscular rigidity and pain over one kidney than over the other, the fact should be noted. Before examination, the bowel should be carefully cleared out by a laxative and by enemata, to remove fæcal accumulations in the ascending or descending colon which may seriously interfere with the examination.

On percussion over the renal region posteriorly, when the kidney is displaced a tympanitic note may be elicited, but a dull note is not got over the displaced kidney, but rather a muffled tympanitic one. This, of course, is due to the fact that anteriorly the kidney is covered by a layer of bowel.

The note obtained on percussion over the renal region in cases of movable kidney showed me how unreliable percussion is as a means of diagnosis as to the position of the organ, unless it is considerably enlarged. In displacement of the kidney without enlargement, very little difference was observed in the percussion note; by this means alone it would be impossible to tell when the kidney was in an abnormal position and when it was in its proper place. The sense of resistance on percussion, and the feeling communicated to the hand when it was applied to the region, give more trustworthy results.

The value of the percussion note heard over the lumbar region depends upon the amount of emaciation, and whether the displacement is on the right or left side; and when it is remembered, as long ago pointed out by Skoda, that the bulk of a normal kidney had little to do with the diminished resonance in the lumbar region, one is prepared to admit that, in the majority of cases, percussion fails to give reliable information.

If, however, some morbid process has caused enlargement or distension of the movable kidney, the normal resonant area of the loin will be encroached on from behind. The patient should

be examined recumbent, in the vertical position sitting, or standing erect. The renal enlargement can very often be accurately limited by percussion, but in some instances—for example, in cystic kidney—a resonant note may be obtained even where the enlarged kidney is easily felt with the hand; and while it is very easy to fix a clear limit by palpation, an area of diminished resonance may gradually pass to that of complete dulness.

The respiratory movements may influence the position of the kidney—deep inspiration generally presses it down, and forced expiration causes it to ascend, while the posture of the body tends greatly to alter its situation. When the patient sits up the kidney falls towards the pelvis; when she lies on her sides the kidney inclines towards the middle line or away from it as the case may be; and if she assumes the supine posture the organ passes back to its proper place.

The following description of the movements of the kidney I received from a doctor who suffered from movable kidney for many years. My patient writes:—

"I think you wanted me to state the degree of mobility of my kidney during respiration. I can demonstrate this to myself very readily—much better, indeed, than another man can feel it, since I have a double guide—the sensation in my fingers and the sensation in my kidney.

"1. In the erect position, (1) with the kidney down, its lower border can be felt on a level with the anterior superior spine of the ileum. Tranquil respiration causes a scarcely perceptible vertical movement, just recognisable by the fingers placed lightly over the lower edge of the kidney, while forced respiration in this position produces a movement of nearly an inch. (2) With the kidney up in its normal position, and kept there by the tips of the fingers of both hands pressed from the front deeply into the lumbar region along the lower border

of the liver, the kidney is felt moving very distinctly during ordinary respiration, and the fingers have to be kept well pressed backwards to retain it *in situ*. Even then it tends to escape outwards (*i.e.*, to the right) with each inspiration. On forced inspiration, again, it descends with such energy that the fingers are pushed forwards until a certain point is reached, when it slips suddenly from under them and gets into its abnormal unsupported position. This descent is accompanied by a tendency to the right, and, I think, by a certain amount of rotation, bringing its convex border downwards towards a horizontal position.

"2. In the recumbent (supine) position it falls spontaneously under the ribs, and takes up nearly its normal site. In this position the respiratory movements have much less effect on it, but forced inspiration still causes a distinctly perceptible descent. When the fingers are deeply pressed in under the lower costal border, so as to replace it fully, the movement on inspiration is much more decided.

"The extreme vertical range of the kidney movement (in any position) between complete expiration and full inspiration is about $1\frac{1}{2}$ inch."

Beyond hydronephrosis and pyonephrosis it is not here necessary to consider the physical signs of movable kidney when the organ is diseased as well as mobile.

When the pelvis becomes distended, the organ tends to become fixed, or less movable than under ordinary circumstances. The physical characteristics are those of a renal swelling, but, in addition, fluctuation can be made out or a wave impulse may be felt. As the swelling increases, so also does the suffering, but frequently, before the hydronephrosis has attained a size sufficient to attract attention, the obstruction is relieved—indicated by a subsidence of the pain and a sudden and copious discharge of urine of low specific gravity. This

is quite characteristic of transitory hydronephrosis, but after the pelvis has become empty, the kidney may remain very tender for some days.

Pyonephrosis is a comparatively rare occurrence in movable kidney. The physical signs are similar to those just described as characteristic of hydronephrosis, but the nature of the fluid which escapes and the constitutional symptoms accompanying the malady are sufficient to clear up the diagnosis. In pyonephrosis, the kidney is not only enlarged, but it is also very tender to the touch, and the suffering of the patient is in excess of what is usually seen in simple hydronephrosis; there are sudden exacerbations of pain, and these are generally associated with a diminution in the amount of pus in the urine, with fever and vomiting. A free discharge of purulent urine precedes a subsidence of the acute symptoms. There is a sudden reduction in the size of the swelling, and the patient is relieved only for a short time.

As a general rule, the *diagnosis* of movable kidney is easy. The symptoms are generally characteristic, and a movable swelling can be felt under the costal margin, which presents the peculiar renal form, is sensitive to the touch, and has a marked tendency to slip upwards underneath the ribs. When complicated by the presence of other abdominal tumours or enlargements, errors are apt to arise. Not uncommonly, the movable kidney is atrophied as a consequence of the disturbed circulation, but on the other hand it may be enlarged from passive hyperæmia or from distension of the pelvis by retained excretion. Movable kidney is one of those conditions which are very apt to be overlooked, simply because it is supposed to be rarely met with in practice, and, though generally recognised as a possible accident, yet the contingency is occasionally not taken into consideration in diagnosing the case. I have had

cases sent to me as instances of movable kidney where, on detailed examination, the malady has proved to be entirely different—for example, an enlarged gall-bladder, a movable spleen, malformation of the liver, enlarged mesenteric or lumbar lymphatic glands, a fæcal accumulation, an abscess, a malignant tumour of the colon, or a pedunculated tumour of the ovary.

The diseased condition with which movable kidney is most apt to be confounded is enlargement of the gall-bladder. The physical signs which distinguish a distended gall-bladder from a movable kidney are these—the position which it occupies, the fact of the lower part of the tumour being more freely movable than the upper, of the lower end being more rounded and less resistant to pressure, and the presence of an occasional sensation of fluctuation; if, in addition to these, there be evidences of obstruction to the gall-ducts, such as jaundice, the absence of bile in the stools, &c., then the probability is in favour of the swelling being a distended gall-bladder. It can be felt at all times against the anterior abdominal wall, whereas a movable kidney occasionally eludes detection. A gall-bladder containing calculi is harder than the kidney, whereas a simple distended gall-bladder without calculi is softer. When the symptoms are not sufficiently characteristic to establish a diagnosis, tapping of the gall-bladder has been recommended by some observers. Such a proceeding is not only highly dangerous, but is unreliable, as frequently the contents of a distended gall-bladder are so altered as to be unrecognisable. In these difficult and doubtful cases, an exploratory incision should be made and the true nature of the case established, when it can be treated according to the special requirements. It should be borne in mind that movable kidney and distended gall-bladder are not infrequently present together in the same

person—indeed, some observers maintain that the two conditions have a certain etiological relationship one to the other.

Movable spleen may be distinguished from a kidney by the fact that it lies immediately beneath the anterior abdominal wall, and over it the percussion is dull. It is easily movable in an upward direction, and there is also a clear area to percussion between it and the spine. I have seen several examples where movable spleen has given rise to doubt, but the diagnosis has always been easily cleared up by careful percussion.

Abnormalities of the right lobe of the liver may complicate the diagnosis of right movable kidney. In cases where the patient has been in the habit of tight lacing, a portion of the lower part of the right lobe of the liver may become almost isolated from the main body of the organ and may move backwards and forwards. I have seen only one instance of this kind, where the right lobe of the liver was elongated in a tongue-shaped process, which extended almost down to the crest of the ileum. The right kidney was freely movable, but could only be palpated through this thin mass of hepatic tissue. This led to the belief that the movable kidney was much enlarged. At the operation, the kidney, while movable, was found to be little increased in bulk, and the apparent enlargement was fully explained.

Enlargement of the mesenteric glands and tumours of the omentum are often difficult to distinguish from movable kidney. Their movements, however, are generally limited to the middle third of the abdomen. They are usually rounded in form, and nothing corresponding to the hilum can be detected. There is not the usual sickening pain produced by pressure, nor is there evidence of the absence of the kidney from its normal position. The percussion over the swelling is dull, and it does not slip into the

lumbar region as a movable kidney does. In tuberculosis the glandular enlargement affects both sides, and is accompanied by evidence of tuberculous disease in other parts. The swelling is not limited to the renal region, but extends across the aorta, the impulses of which are communicated to the anterior abdominal wall.

Fæcal accumulations, fæcal and perityphlitic abscesses, are not likely to be mistaken for movable kidney; but on one occasion I met with a case where the diagnosis was rendered very difficult. While the physical signs and some of the symptoms clearly indicated the presence of a fæcal mass in the upper part of the ascending colon, there were also indications of a transitory hydronephrosis, which recurred on five separate occasions. The mass within the colon was about the size of a normal kidney, but more rounded in form. The mass softened and disappeared after treatment, when the right kidney could be easily felt, and a *x*-ray photograph demonstrated the presence of a small calculus in the right ureter. When first examined, the case was thought to be one of movable kidney with transitory hydronephrosis.

Cancerous tumours of the pylorus, although sometimes very freely movable, are not likely to be mistaken for movable kidney, although instances have been sent to me where the resemblance between the two conditions has been rather striking, and where the gastric disturbance was attributed to a renal condition rather than to a pyloric; and, conversely, I have heard of instances where the distended stomach, so frequently found in movable kidney, was attributed to pyloric obstruction, and an operation proposed. While in such, fortunately rare, instances confusion may arise, in the larger proportion of cases there is no difficulty. One characteristic of cancer of the pylorus is that on no occasion can the tumour be made to disappear as the swelling

can be in movable kidney. In old persons, tumours of the upper part of the ascending and of the descending colon may be readily mistaken for movable kidney when the physical signs alone are considered. I have seen a carcinoma of the upper part of the descending colon so freely movable that several experienced physicians and surgeons mistook it for a movable kidney, and, in the absence of symptoms pointing to derangement of the functions of the alimentary tract, the diagnosis for many months remained obscure. The diagnosis was completed by an exploratory incision and the tumour was removed.

Small pedunculated ovarian tumours, such as fibro-myomata, located either on the surface or in the substance of the ovary, may lead to some difficulty in diagnosis. The size and form of the mobile body, the possibility of tracing the tumour to its attachment, and the tendency to increase in size or remain stationary, will help to clear up the case. When the ovarian tumour is large, a mistake in diagnosis is not likely to be made. When small it may be freely movable, and a certain diagnosis may be difficult. The signs of most value are the superficial situation of the growth, its tendency to steadily increase in bulk, and dull percussion anteriorly; also the fact that the subjective symptoms are not marked, lead one to presume that the growth is of ovarian origin. In ovarian cysts both loins are resonant, the intestine being almost invariably behind the swelling. In a few cases the intestine has been found fixed to the anterior surface of an ovarian cyst, and, on the other hand, occasionally in a very large hydronephrosis the intestine may get behind the bulk of the fluid; consequently, the presence of resonance in front does not preclude the possibility of an ovarian cyst, nor its absence that of a renal swelling. Excepting these rare cases, the position the intestine occupies in relation to the swelling

is the most reliable guide in diagnosis. Ovarian tumours make their appearance in the lower part of the abdomen, a little to one side of the middle line, whereas in the cases of transitory hydronephrosis in movable kidney, the swelling extends from the lumbar region downwards and forwards. I have never seen even the smallest ovarian tumour, solid or fluid, where the swelling could be reduced into the loin behind the ribs.

The *prognosis* may be considered under three heads—

1. As regards the danger to life.
2. In relation to general health.
3. In respect to morbid changes in the kidney.

Keppler regarded movable kidney as a direct menace to life, and under this conviction he recommended very heroic measures. In this he was wrong, and consequently his influence has done much harm. Naturally, serious men considered his propositions, and in rejecting them were induced to go too far in the opposite direction. I have not had a case of movable kidney where death has been the result of the displacement. Keppler claims two. These were regarded as cases of simple movable kidney, it being proved that at least there was present no other malady than the displacement of the kidney.

The disturbance and discomfort induced by movable kidney depends upon many circumstances. Those who lead sedentery lives, and who can take care of themselves, suffer little in health. The abnormal mental derangement commonly associated with movable kidney may, however, unfit the patient for social life; and while not unfrequently the medical attendant may have little regard for what he calls "hysteria" or "hypochondriasis," to the patient her troubles are very real. I have seen several cases where insanity has resulted,

and Keppler describes a case where the patient shot himself during a fit of melancholia six years after the first appearance of the disease. Patients who have to lead active lives, find their movements and activity severely hampered by the suffering induced by bodily exercise; and as time passes matters become steadily worse, until ultimately they are compelled either to seek relief by having the kidney fixed, or by relinquishing regular occupation. The majority of patients lose flesh, and become anæmic and flabby. While the tendency is for the movements of the kidney to increase, and the functional disturbance of other organs to become more pronounced, there is also in a large proportion of cases, by a loosening of the attachments of the other abdominal viscera, a degree of enteroptosis. In such cases the symptoms of chronic gastritis and dilatation of the stomach become more marked, and the patient may also suffer from prolapse of the rectum, bladder, and uterus, flaccid reducible hernia, or displacement of the liver and spleen. The movable kidney, by causing kinking of the bowel, may also lead to obstruction, or by dragging upon the gall-bladder or the duodenum may induce jaundice. On the other hand, rotation of the kidney or extreme displacement, by obstructing the escape of urine or by impeding the circulation, may produce degenerative or inflammatory changes in the pelvis or parenchyma of the affected organ, such as hydronephrosis, or by septic infection, pyelitis, pyonephrosis, or pyelo-nephritis. Mobility of the kidney also renders it more liable to such diseases as stone, tuberculous disease, or cystic degeneration. Those in whom the "nervous" or "hysterical" elements are highly developed are looked upon as the least favourable cases. Doubtless, in many the suffering may appear to be magnified, and we may require to wait a considerable time before we see any good results from treatment, but as far as my experience goes

these are by no means hopeless cases. Very often, in the long run, excellent results are obtained, although the immediate result of the operation may be disappointing. If the patient be carefully watched and cared for, a gradual and steady improvement may be observed, which, after months or perhaps years, eventuates in a good recovery to health.

The *treatment* necessarily depends upon the requirements of the individual case, and upon the class to which it belongs. I may here repeat the classification which was given when we were considering the question of symptomatology.

1. Those in which the displacement does not give rise to much discomfort or functional disturbance, the mobility of the organ being discovered probably by accident.

2. Those in which gastro-intestinal symptoms are pronounced, and, after a time, induce marked neurasthenia.

3. Those in which ill-defined pain, generally abdominal, but not specially referable to the renal region, is the most marked symptom.

4. Those in which the pain is distinctly renal, and is associated with—

(*a*) Albuminuria only.

(*b*) Albuminuria and tube-casts.

(*c*) Hæmaturia and, in some, blood-casts.

(*d*) Transitory hydronephrosis.

(*e*) Pyonephrosis.

5. Those in which both local symptoms and reflex functional disturbance are marked.

The essential element in all *palliative treatment* is rest. When it can be got, not only may relief be obtained, but if prolonged and complete rest in bed can be carried out, a cure may be effected. To patients suffering from this affection, all forms of exercise involving active and sudden movements of the body, such as running, dancing, jumping,

or travelling over rough roads, must be strictly forbidden, and even long continued standing or walking should be avoided. In many cases of movable kidney the displacement is due to the absorption of circumrenal fat, sometimes as part of a general emaciation, at other times due to local causes. Rest in bed with general massage, omitting any manipulation in the region of the kidneys, together with carefnl dietary, may induce not only a re-deposit of subcutaneous fat, but may also, by padding out the structures round the kidney, lead to the organ becoming fixed in its normal position. I have seen a considerable number of cases, especially in emaciated young women, where this mode of treatment has given excellent results. The difficulty I have experienced has been to induce them to remain in bed long enough to effect a complete cure.

In the first class it has been asserted that, seeing there are no symptoms, no treatment is required; but, as I have demonstrated above, negligence in this respect may lead to much harm. So far as the physical condition is concerned, the evident indication is to endeavour to replace the organ in its normal position, and to keep it there. With the patient in the recumbent posture, the kidney should be replaced by manipulation and gentle pressure. This is usually very easily accomplished; the difficulty is to keep it in position without exerting undue pressure upon it or upon the neighbouring parts. Various methods have been proposed—tight bandages or belts round the abdomen, with a pad over the kidney to give the pressure more pointed effect; elastic bandages applied in a similar way, and trusses, have all been employed for the purpose of fixing the kidney by external support. It is only in a few cases that firm pressure is bearable. In many the suffering is increased by pressure, and the patient frees herself of the appliances as soon as possible.

Corsets are of the greatest value when fitted in a proper way. They may be made of jean or of elastic material, must surround the abdomen completely, extend from the line of Poupart's ligament to the level of the nipples, and while fitting the body accurately and firmly they must not press unduly on any part. In order to fit closely along the line of Poupart's ligament without causing discomfort to the patient while in the sitting posture, it is necessary to make a gap over the symphysis pubis by having the busks shaped so as to form an arch. For many years I have employed an elastic corset made by sewing strips of elastic bandage together, united in the middle line in front by means of steel slips or busks similar to those used in fixing corsets, but these slips require to be specially made in order that the corset may come sufficiently low down to give full support to the lower part of the abdomen. Whether the corset be made of elastic material or not, great care must be taken in adjusting the corset properly in the following way:—

The patient should have the bowels well moved every morning; then, before getting up for the day, she should slip over the lower extremities and upwards round the abdomen a tight fitting silk or woollen jersey, apply over the region of the kidney an air-pad, and then buckle over it the corset or elastic bandage. The air-pad is so made that it may collapse while the patient is putting on the bandage; after the bandage has been adjusted the pad is inflated by means of a tube carried to the mouth, and provided with a stop-cock. These pads are made by Messrs. Hilliard & Son, Renfield Street, Glasgow. It is a matter of great importance that the elastic bandage or corset should be thoroughly well fitted and accurately applied. This cannot be insisted upon too forcibly. I have known many instances where the patient derived benefit when I supervised the application of the bandage

myself, or when it was looked after by an experienced nurse; whereas when it was undertaken by the patient herself, or by friends, the bandage proved useless. Whether band or truss be employed, it is necessary that it should fit and be applied in such a manner that the patient can keep it on continually without discomfort. Even although the symptoms disappear for the time being, if the patient suffers from pressure of the appliance she is certain to discontinue its use before long. Such treatment is only palliative, and may be adopted with advantage in the first class of cases only. Even in these the patient should be warned that the employment of mechanical supports is simply an endeavour to supply a want, and the result cannot be guaranteed. Unfortunately, in knowing this the patient is liable to refuse to wear the bandage or belt where there is no prospect of producing a complete cure.

There are many instances where the patient cannot bear any form of mechanical appliance on the abdomen, and this is specially so in class 3. Pressure seems, in fact, to increase rather than to alleviate the suffering. The organ is fixed so long as the pressure is applied, and is thereby prevented coming in contact with or dragging upon other organs in the abdomen, and in this way gastric troubles are for the time being relieved. But while these symptoms become less, their relief is more than compensated for by an increase in the renal pain induced by continual pressure upon an irritable kidney.

When severe symptoms are not alleviated by other means, or when the patient has comparative comfort only when strict attention is paid to certain rigorous conditions, the irksomeness of which renders her life miserable and useless, then the urgent demands of the patient make it necessary that something should be done to cure the disease. When the patient is able to move about, or to sit up in comparative comfort with the

assistance of a bandage or corset, she may not be disposed to consider the question of operation, but it is otherwise when little or no relief is derived from the milder modes of treatment. When severe pain is experienced, extending to the lower part of the abdomen, and along the course of the crural nerves, the loins and thighs, increased by any exertion or even by movements in bed, sometimes amounting to paroxysms resembling renal colic, and occasionally accompanied by fainting, sickness, and persistent vomiting, then I do not see why the only chance of relief should be denied to the unfortunate sufferer. Clearly, to my mind, an operation should be advised when severe symptoms are not relieved by rest in the recumbent posture or by mechanical appliances.

Before considering the question of operation, it may be advisable to say a few words respecting certain palliative measures which have been proposed. Electricity, friction, cold baths, and massage have all been recommended; they are absolutely useless. When a "renal crisis" occurs, indicating strangulation of the kidney, violent renal pain, sickness, frequent micturition, enlargement and excessive tenderness on pressure over the renal region—complete repose in bed should be advised during the attack, and this may be assisted by the application of hot poultices made with boiling water containing carbonate of ammonia (30 grs. to the oz.), fomentations, hot air bags or hot sitz bath, by the application of anodynes over the seat of pain, or the administration of morphia by subcutaneous injection or as a suppository. Dry-cupping, or the application of leeches, I have found beneficial in extreme cases of renal colic. In cases of acute transitory hydronephrosis, dilatation of the large bowel with a hot saline solution produces almost immediate relief, but to attain this end very full distension of the colon is necessary. It is most readily obtained in the elbow-knee position. In other cases palpation of the

abdomen in the position just referred to may give relief by untwisting the kinked ureter.

Once the tone of the abdominal muscles has been lost it is very difficult to restore it, but every endeavour should be made to improve the general health by the administration of tonics, the careful regulation of the diet, by moderate exercise, and by a quiet and regular mode of life. Regulation of the bowels is a point which must be carefully attended to, as any accumulation invariably aggravates the inconvenience of movable kidneys. Where there is marked evidence of gastro-intestinal disturbance, it is necessary to treat the condition not only on general principles, but with special reference to the cause.

Operative treatment.—Nephrectomy, the premier operation for movable kidney, was first performed through a lumbar incision by Gilmore, in December, 1870, upon a negress, aged 33, in the fifth month of pregnancy, and the patient made a good recovery. The operation remained unimitated until March, 1878, when Martin, of Berlin, performed an abdominal nephrectomy for painful right movable kidney. His second operation was performed in August, and his third in November of the same year. All were successful, and for some years subsequent to the date mentioned, nephrectomy was repeated by numerous surgeons with varied results.

In my book on *Surgical Diseases of the Kidney*, p. 62 *et seq.*, I give the statistics of nephrectomy for movable kidney up till 1888, and at p. 65 I made the following remarks :—

"The foregoing table shows the number of nephrectomies performed for movable kidney. Of these 30 operations, 21 patients recovered, and 9 died. In 17 cases the excised kidney was normal. Abdominal nephrectomy was performed 24 times (this includes two cases in which both the lumbar

and abdominal incisions were employed), and the lumbar operation was adopted in the 6 remaining cases. Of the former, 3 deaths occurred as a consequence of uræmia or suppression of urine, 2 from septicæmia, while collapse, chronic peritonitis, œdema glottidis, and retention of urine, each account for 1 death. The case of Dr. Polk should hardly be included in the statistics of abdominal nephrectomies, the operation, strictly speaking, being an extra-peritoneal one, and the movable kidney the only one of which the patient was possessed. All the patients upon whom lumbar nephrectomy was performed recovered. The mortality, 30 per cent, although not so high as in nephrectomies performed for other diseased conditions, is sufficient to prevent extirpation of the kidney being resorted to, except in extreme cases. It is a fact worthy of note that in the 10 cases last recorded, there have been no deaths."

Since 1888, for movable kidney only 12 nephrectomies have been performed. Those added to the 30 cases included in my statistics give 42 cases in all, with 11 deaths, lumbar nephrectomy giving a mortality of 9 per cent, and abdominal nephrectomy a mortality of over 32 per cent. The mortality of 30 per cent in all is too disastrous to be faced in proposing an operation for a disease which does not cause death, consequently nephrectomy for movable kidney is now universally condemned, even although in the 10 cases last recorded there have been no deaths. In cases of movable kidney where the organs are the seat of organic disease, unless the diseased condition be strictly limited to the movable kidney, the operation seems unjustifiable on the ground of the very high mortality; and where the case is one of uncomplicated movable kidney, then extirpation should not be thought of till nephrorrhaphy has been tried and failed. Nephrectomy is to be recommended only in cases where such diseases as

extreme hydronephrosis, pyonephrosis, pyonephritis, tuberculous disease, stone, or malignant tumour have become engrafted on the movable kidney, or where the mobility has been induced by the diseased state of the organ. In movable kidney the site of cystic degeneration, nephrectomy has always been fatal. It is not right to excise such an important organ as the kidney before making an endeavour to save it by a less heroic operation. Excision should only be employed when all other measures have failed and life is seriously threatened, or where there is complete degeneration of the movable kidney. When excision is to be performed, it should be done through a lumbar incision. Twenty years ago, nephrectomy as an operation for movable kidney was superseded by a much more successful surgical procedure, namely, nephrorrhaphy. When I saw my first case of movable kidney in 1880, with the late Dr. Yair, of Kilcreggan, I proposed not to excise the kidney, an operation I then knew to have been done several times for the disease from which she was suffering, but to stitch it to the abdominal wall. At that time, however, I did not feel justified in advising her to have the operation performed, as I still entertained the hope of some relief being derived from external appliances, and, besides, the operation had never been performed to my knowledge. Stitching the kidney by means of sutures to the abdominal wall seemed in itself a less dangerous operation than excision. In 1874, Dowell, of New Orleans, attempted to fix the left kidney by passing a hair suture through the cortex and the abdominal parietes, and allowing it to remain *in situ* for three months. The operation, however, was unsuccessful, and the kidney was ultimately excised.

Dr. E. Hahn published, in the *Centralblatt für Chirurgie* for 23rd July, 1881, his first two cases. "In one case there was a strong suspicion that in one kidney, and possibly not

the floating one, there was a calculus, while in the other both kidneys were movable."

His first operation was performed in April, 1881, upon a woman, æt. 38, unipara, who suffered from severe pain, associated with movable displacement of the right kidney, and with a suspicion of a renal calculus on the right side. In the second case, the patient suffered from similar symptoms, and both kidneys were found to be movable, the right however, more so than the left. The first case was quite successful, the second partially so.

The operation consisted of cutting down upon, but not opening, the capsule of the kidney, by an incision made along the edge of the sacro-lumbalis muscle, from the lowermost rib to the crest of the ileum. The adipose capsule was drawn into the wound and stitched to the muscle and fascia by six or eight catgut sutures.

In one of his cases the kidney became movable after the operation, and in order to get greater fixity, he subsequently recommended opening the capsule and stitching it to the more superficial tissues at a point corresponding to the lowest limit of the area of mobility, so as to avoid straining the adhesion with the patient standing upright. The operation promised to be capable of removing all the disagreeable symptoms resulting from mobility of the kidney; by the posterior incision the peritoneum was not opened, and, above all, the patient was not deprived of any urine-secreting tissue. The only fault it appeared to have was that, as carried out in the earlier cases, it did not fix the kidney securely enough. This was doubtless due to want of knowledge in pathological details, all cases being operated on in one way. In cases where the kidney is not movable within its adipose capsule, but simply floats behind the peritoneum, firm stitching of the capsule to the parietes may be sufficient, but when the

adipose capsule has become separated and forms a sac in which the kidney moves freely, something more requires to be done. In my first case I found that, on opening the adipose capsule, the kidney was easily pushed backwards and forwards within it. I then found it not only necessary to stitch the edges of the adipose capsule to the wound in the abdominal walls, but also, in order to secure the kidney, to pass two sutures through the cortex and fasten them externally by means of buttons. As far as I can ascertain, this was the first occasion on which, in performing nephrorrhaphy, sutures were passed through the cortex of the kidney. At that time, the surgeon dreaded wounding the kidney for the fear of inducing uncontrollable hæmorrhage. The details of my first operation will be found in the *Glasgow Medical Journal* for August, 1883.

What should be done can only be determined when the kidney is exposed. The objects are (1) to reduce the size of the cavity in which the kidney moves; (2) to fix the kidney and the walls of the sac to the abdominal parietes; and (3) to form adhesions between the kidney and the capsules surrounding it. When the adipose capsule is very loose and the kidney moves freely within it, the whole of the fatty capsule should be removed before stitching the edges of the fibrous capsule to the wound in the parietes. By doing this, the chances of future mobility are lessened. The divided fibrous capsule should be stitched firmly to the deep edges of the wound in the loin. Gut sutures passed through the kidney become destroyed very rapidly. The living renal tissue seems to have an unusual power of absorption. The portions which pass through the skin, fascia, muscle and even granulation tissue may remain firm and strong, whereas the parts in contact with the renal tissue soften and quickly become absorbed. The sutures through

the kidney fulfil the part of keeping it in position for a short time, only ten days at the most. To form adhesions between the kidney and the parietes, the deep surfaces of the wound must be kept apart, and the space between the kidney and the parietes well packed with gauze, which must be retained for ten or twelve days, until its presence has induced a certain amount of local irritation. The gauze at first creates an oily discharge—fat escapes from the perirenal adipose tissue. This continues for about a week, followed by a pink-coloured discharge, which consists of fat bubbles, red blood corpuscles, and leucocytes. When the matter becomes abundant only about the ninth or tenth day, the gauze may be removed.

Between serous surfaces union readily occurs and leucocytosis is rapid, but between a movable kidney and its surroundings the process is slow and can only be obtained by considerable mechanical irritation. This fact has not been sufficiently recognised. Nature's method of fixing a movable kidney is by inducing a perinephritis. Our method should be the same—only, let us keep control. Nature uses septic processes; we must limit ourselves to mechanical. The former may cure after causing the patient much suffering and not a little danger to life, but it is our endeavour to cure without the dangers of septic infection. Without some kind of irritation, granulation tissue does not form. To effect a cure, granulation tissue is required. So long as this is recognised, the means adopted are of secondary importance.

According to some writers, nephrorrhaphy has not been so successful in its ultimate results as was at one time anticipated. This failure I believe to be largely due to the incompleteness of the operation, the surgeon being in many instances satisfied by stitching the capsule of the kidney to the abdominal wound, whereas, in order to form a complete

and firm adhesion, it is necessary to divide the fibrous capsule, stitch its free margins to the wound in the parietes, and while the external lips of the wound in the abdominal wall are accurately brought into position, the deeper parts should be kept separate, either by a large drainage-tube or by a plug of gauze, in order that a considerable mass of granulation tissue may exist between the exposed surface of the kidney and deep part of the wound. By doing so, a strong and firm cicatrix is formed, which holds the kidney in position.

My own results have been very satisfactory, and are as follows:—

In 75 per cent the kidney remained firmly fixed, but in 10 per cent of these a second operation required to be performed. In 16 per cent the operation was partially successful; in 9 per cent no benefit was derived. In $1\frac{1}{2}$ per cent the operation proved fatal.

The advantages of nephrorrhaphy over extirpation of the kidney are very obvious, so much, indeed, that perhaps it is scarcely necessary to state them. They are, however, as follows:—

1. In nephrorrhaphy the organ is not removed, so secreting tissue is not diminished in amount, as it is in excision, and there is therefore no danger of removing, as has been done, the only kidney the patient may be possessed of.

2. The mortality in excision, even in cases where the remaining kidney was healthy, is not very encouraging (30 per cent), whereas in nephrorrhaphy the mortality is only a little over 1 per cent.

3. Nephrorrhaphy may be performed when both kidneys are movable, or when one is diseased.

4. In stitching the kidney to the abdominal wall, the peritoneum is not opened, as it is in the anterior operation for excision, where the membrane is incised at least twice.

5. Extirpation is only permissible where nephrorrhaphy has failed and where the patient's life is still seriously threatened, when the movable kidney is diseased and the fixed kidney healthy.

We may now consider nephrorrhaphy as regards improvement in general health, in the mitigation of pain, its effects upon the digestive organs and nervous phenomenon, and its power of relieving hydronephrosis and hyperæmia of the organ.

Beyond the direct effects of the operation, the rest in bed, the careful nursing, the restricted diet, and the systematic general massage, all have a beneficial effect, and if the patient is careful to carry out instructions the benefits should be lasting and permanent. But not unfrequently in young active women, the discomforts having disappeared, the restraint appears to them to be too exacting. The patient when she begins to move about is apt to be over-confident, and she is tempted to exceed the bounds of discretion. Even although she is duly warned against over-indulgence in exercise or in food, I have frequently had the following experience. Let me state as briefly as possible a case typical of this class:—

The patient, aged 32, the mother of five children, the eldest aged 8 years, complained of symptoms of movable kidney of five years' standing. Prior to the onset of symptoms the patient was well nourished, but when first seen by me she was ill nourished, suffered from constipation, vague abdominal pains, frequent attacks of flatulence, sometimes accompanied by vomiting of undigested food, and had renal colic at irregular intervals of from two to eight weeks. There were characteristic physical signs of movable kidney and of dilatation of the stomach. Nephrorrhaphy was performed

on 3rd January, 1900, and the patient was well on the 18th February. She continued to carry out instructions as to diet, restricted exercise, and so forth for four months, during which time she enjoyed good health, gained weight to the extent of 12½ lb., and she was able to take food well. At the end of June she asked leave to play tennis in a "mild way" or to take "short cycle rides," but permission was refused. Her petitions were repeated several times and met with the same reply, and after a fourth refusal to permit active exercise I heard nothing from her for eighteen months. She then returned and told me that her stomach had become very troublesome, her indigestion as bad as ever, and she was candid enough to say that she considered that the operation had been a failure. On inquiry I found that not only had she been playing tennis actively and cycling considerable distances, but she had also been over-feeding, and on one occasion after a long cycle run she admitted having eaten after a good meal fully 1 lb. of honey. Notwithstanding her complaints as to pain and indigestion she looked remarkably well, and weighed 18 lb. more than she did immediately prior to the operation. Her appetite, she said, was often inordinate. A few days' complete rest, return to restricted diet, and moderate exercise, and her complaints disappeared. This is a type of case of which I have seen many.

There are other cases in which the good effects of the operation may not be fully manifested for many weeks or even for months. How can we expect immediately beneficial results to follow nephrorrhaphy in cases where there has been long standing gastro-intestinal irritation? Not only have the functions of the digestive organs been impaired for many years, but the general health has also become seriously deteriorated. Time is required for restoration. Because

the benefits are not immediate some sceptics refuse to credit nephrorrhaphy with the beneficial results we claim for it, and have endeavoured to convince us that the good which follows is simply the effect of the rest and nursing immediately preceding and following the operation. As far as my experience goes in the classes 3, 4, and 5, while rest gives relief for a time, the result is never permanent, whereas where an operation has been performed followed by rest excellent results are obtained.

The improvement in the functions of the digestive organs depends generally upon two circumstances—the duration of the disease and the care with which the patient carries out after-treatment. When of old standing, with pronounced symptoms, the recovery is slow; but in looking over the large number of cases which I have operated upon in which gastro-intestinal symptoms have been noted as pronounced (fully 75 per cent), I find that almost all of them have improved in this respect, and in close upon two-thirds the digestive troubles—pain, flatulence, sickness, and constipation —are noted as having disappeared. When the neurotic phenomena are due to pressure of the displaced kidney upon one or other of the abdominal organs, or to traction upon the renal nerves, fixation is followed by disappearance of the symptoms. In about 70 per cent of my cases distinct benefit has been derived from the operation; in 12 per cent improvement has been noted; while 18 per cent are recorded as having received no benefit in this particular respect.

The cases in which the benefits of the operation are most marked are those belonging to the fourth class, namely, those in which the pain is distinctly renal and is associated with albuminuria, tube-casts, hæmaturia, or transitory hydronephrosis—that is to say, in cases where the pain is simply due to mechanical obstruction of the circulation, or to the

escape of urine from the kidney. It is very important, before answering the patient's inquiry as to the benefits likely to accrue from the operation, for the surgeon to satisfy himself as far as possible as to the precise cause of the pain, and it should also be borne in mind that, while the pain is distinctly renal in movable kidney, it must not necessarily be due exclusively to the displacement. I have operated upon cases of movable kidney containing stone, a tuberculous focus, or tumour. I think it may, however, be safely asserted that when in a case of movable kidney of this class the pain does not at once disappear after the organ has been fixed in position, that the diagnosis has not been complete, and that some lesion of the kidney or of a neighbouring organ has been overlooked. The pain may be due to disease in the opposite kidney (reno-reflex).

In movable kidney complicated by hydronephrosis or by passive hyperæmia, the consequence of torsion of the renal pedicle, the operation has in all my cases been successful. In the former the obstruction is at once removed, the pelvis ceases to swell, and slowly the ureter is restored to its normal lumen. In the latter, reduction in size is more gradual, but in the end quite remarkable. I have seen a kidney which at the operation was found to be fully two and a half times its normal size contract to just a little over its proper proportions within ten days. In prolonged and severe cases of obstruction to the venous return the recovery is slow—that is to say, in cases in which, prior to the operation, blood-casts, blood, and albumen have been present in the urine. After the kidney has been fixed the abnormal constituents disappear. Within twenty-four hours no blood-casts may be found; within two days the blood may disappear, but usually the presence of a small quantity of albumen persists for a time. In respect to the disappearance of albumen after nephrorrhaphy,

the question of the co-existence of Bright's disease must be remembered. In 6 per cent of my cases other symptoms of Bright's disease were observed, and in nearly all of them the mobility of the kidney was of old standing.

A circumstance which must be borne in mind in endeavouring to anchor the kidney is that, once the physiological supports of the organ have become stretched it is beyond our power to restore them to their normal state. We cannot repack the adipose capsule, nor can we tighten up the lax ligamentum suspensorium renis, consequently fixation must be attained by inducing either primary or secondary union between the surface of the kidney and that of the parietes. No one can deny that a small number of unsuccessful cases are met with, namely, cases where the kidney remained anchored for some months after the operation, but the fixity was not permanent. This I believe to be due (1) to the surgeon depending upon sutures to fix the kidney, and (2) to the improper selection of cases. The principle underlying successful anchorage of the kidney was pointed out by me long ago,[1] namely, that our endeavour must be to arrange the conditions of the operation so that a considerable granulating mass is formed between the surface of the kidney and the deeper part of the wound. The sutures play only a temporary part; indeed, some operators discard them entirely. Nephrorrhaphy frequently fails to give permanent relief because the principles underlying the operation are not fully appreciated by the operator. In many instances he has been satisfied by removing a portion of the fatty capsule and suturing its edges to the lips of the wound. Such an operation is generally futile, unless in the cases where the ligamentum suspensorium renis is simply relaxed and thickened; but even in these cases such a procedure is not to be relied upon.

[1] *Glasgow Medical Journal*, August, 1883, p. 122.

However tightly it may be stitched at the time, the soft capsule gradually stretches and ceases to fix the organ. In other instances failure is due to depending upon sutures alone. They are passed through the cortex of the kidney without removing the fatty capsule thoroughly. Whatever suture may be used, it very soon lacerates the friable parenchyma of the kidney and becomes loose, even in cases in which the renal tissue appears to be unusually tough and offers a distinct resistance to the needle. The suture may cut in the act of tightening, while catgut sutures, even when prepared by the chromic acid process, become softened quickly in the highly vascular renal tissue. To this point I have already referred.

I shall first consider the various methods of operating, and afterwards offer some observations as to the selection of cases suitable for surgical intervention. The methods of operation may be divided into two classes—(*a*) Those in which the operation is performed without decapsulation, and (*b*) those in which the operation is performed with decapsulation.

(*a*) *Methods without decapsulation.*

Many early nephrorrhaphies were performed without removing the capsule; but, as frequently the operation proved ultimately unsuccessful, this method has been practically abandoned. Although not now practised, it may be of interest to describe the methods briefly in order to follow the development which has taken place during the last twenty years.

The earliest operations were performed in Germany by Hahn, Küster, Esmarch, and Dalhaes, all of whom reported cases in 1882. The first in Italy was performed by Bassini, of Pavia (1882); the first in America by Weir, of New York (1882); the first in Britain by the author (1883); and the

first in France by Bazy (1885). Most of these operators, as well as their immediate followers—Ceccherelli, Duret, Gardner, Vuillet, Albarran, Von Bergmann, Iwrié, Ghanozzi, and Morris—operated without decortication, simply cutting down upon the capsule of the kidney, dragging the adipose tissue into the wound, and stitching it to the muscles and fascia. Hahn, however, soon found that this method did not succeed, and so he recommended more secure fixation by opening the adipose capsule and stitching the fibrous capsule to the wound. Bassini passed the sutures through both the fatty and the fibrous capsules. In my first operation I advanced further by not only dividing the adipose capsule for a distance of $3\frac{1}{2}$ inches, and so exposing the convex border of the kidney, but I also passed two thick chromic catgut sutures deep into the cortex of the kidney so as to include its whole thickness, while at the same time the free edges of the capsule were stitched to the deep edges of the wound. A large drainage-tube was passed between the convex margin of the kidney and the deep part of the wound. This method is now practically the one followed by the great majority of surgeons. Ceccherelli, at a later date, also passed sutures (four) into the cortical substance at the upper pole, and tied them round the twelfth rib, and three into the kidney at its lower pole, and fixed them to the deep edges of the wound in the parietes. The method suggested by Vallied (1895), which I have employed once or twice, is to understring the kidney capsule with a length of tendon from the erector spinæ of the patient; but the advantages of this method I have been unable to appreciate. It involves two wounds in place of one. The kidney is exposed; then through the skin and fascia an incision is made parallel to the spinous processes of the lumbar vertebræ down to the erector spinæ, the slip of tendon, 10 inches long, is then dissected out, cut across at its

upper end, and pulled through the wound. The free end is now threaded through the mass of muscle intervening between the two wounds, then passed under the fibrous capsule of the kidney on its posterior aspect. It is then returned through the muscular septum, and sutured to the erector spinæ muscle. The idea is that the living tendon takes the place of the dead suture. Albarran recognised at an early date the importance of separating the fatty capsule from the kidney before attempting to fix it. His method rests upon the mode of suturing which was specially advised to prevent the suture from cutting through the renal cortex when the knot was tightened. He passes a double suture, and at each end a double knot is made so that when the time comes to tighten the suture over the muscular edge of the wound, the pressure is not against the kidney, but against the knot previously tied.

(*b*) *Those in which the operation is performed with decapsulation.*

In cases of movable kidney the seat of a pyonephrosis or of an abscess, when the fluid has been evacuated spontaneously or by operation, as a general rule the kidney becomes firmly fixed by inflammatory adhesions. So also have I found a cure follow operations upon the kidney for such conditions as calculus and tumour or curetting for tuberculous disease. Since 1889, in a small proportion of my cases, I have simply removed the whole of the perirenal fat, laid bare the surface of the quadratus lumborum and psoas muscles, and packed the space around the kidney with gauze. The skin and subcutaneous tissue is accurately sutured over the plug of gauze except at the posterior margin, where an opening is left, with the end of the gauze lying in it, so as to act as a drain and to allow of the withdrawal of the tampon. The

gauze is allowed to remain *in situ* for eight or ten days for the purpose of causing any remaining adipose tissue to break down and be discharged, also in order to excite adhesive inflammation. The tampon causes the ill-nourished adipose tissue to liquefy. After the fourth day, from a wound a quantity of yellowish-red fluid escapes along the side of the gauze. This fluid, on examination, is found to be composed of serum and oil globules, mixed with a few red blood corpuscles. When the gauze is withdrawn on the eighth or tenth day, the cavity of the wound should be carefully irrigated, and a small strip of gauze or drainage-tube inserted. The principle on which this method of operating is based is that the broad band of fibrous tissue developed between the organ and the parietes is more likely to anchor the kidney firmly than when the healing by primary union is aimed at. This idea practically underlies all the methods under which nephrorrhaphy is performed without sutures, also some methods in which sutures are used.

By the method of Jaboulay the adipose capsule is divided, and, after the redundant parts have been cut away, the free margins are sutured to the parietes, while the space between the adipose capsule and the fibrous capsule is packed. Sann removes the fatty capsule and places a tampon around the lower pole of the kidney only, while Deaver includes both the upper and lower poles. Biondi and Dowens have practically similar methods. It may be observed that in all the above-mentioned methods the fibrous capsule has been left intact. In a certain number of cases it is advisable not only to expose the kidney by removing the adipose capsule, but also to denude the cortex of its proper fibrous capsule, so that the highly vascular parenchyma of the kidney may be brought into direct contact with the muscular structures of the parietes. The thin, smooth, almost non-vascular fibrous

capsule is ill fitted to form firm and permanent adhesions with the surrounding tissues. When the cortex is denuded of a portion of the fibrous capsule, and a raw surface of muscle exposed, totally different conditions obtain. These surfaces are well adapted to fulfil our purpose. This method has been always associated with suturing of the kidney or of the free margins of the fibrous capsule. By incision of the fibrous capsule, partial denudation of the cortex, and suturing of the fibrous capsule to the parietes, I fixed several movable kidneys prior to and during 1896,[1] but, in addition, always used a gauze packing or a large drainage-tube.

Arbuthnot Lane,[2] along with Dr. J. W. Washbourn, published a case in which "he freely exposed the kidney, which was very movable, by a lumbar incision, and after removing carefully all the fat, fascia, and areolar tissue which intervened between the kidney and the muscular wall of the abdomen, he made a considerable number of incisions through the capsule covering the posterior surface of the kidney radiating from its centre, so that this portion of the capsule was subdivided into about ten triangles, the bases of which corresponded to the margin of the kidney. These were stripped off the organ, and were left connected to it by their bases only. Each of these triangular processes of capsule was twisted so as to prevent it tearing, and to each a silk ligature was attached. This formed a secure attachment, and much strain could be exerted on each ligature without the section of capsule to which it was attached showing any sign of yielding.

"At regular intervals, corresponding to the attachments of the segments of the capsule, small incisions were made through the transversalis muscles and superjacent structures,

[1] *Transactions of the Clinical Society of London*, vol. xxx, p. 67.

[2] *Ibid.*, vol. xxv, p. 213.

and through each a ligature with the attached portion of capsule was drawn. The adjoining ligatures were then tied firmly together. By these means the posterior surface of the kidney, bared of its capsule, was retained immovably in firm, accurate, and immediate contact with the transversalis aponeurosis and muscle, and the cut margins of the more superficial muscles, by the several anchoring processes of the capsule."

Tuffier's method has very much the same object in view, but he adopts a different method of procedure. Having exposed the kidney by an incision nearly vertical, 3 inches from the lumbar spines, the fatty capsule is opened and separated from the organ along the convex border. One catgut suture is passed through the cortex at the lower and another at the upper pole of the kidney, so as to fix the organ between the deep lips of the wound. The fibrous capsule is then incised and peeled off, so as to expose the raw surface of the cortex. A third suture is then passed through the middle of the kidney, the suture through the upper pole is fixed to the periosteum covering the lower surface of the twelfth rib, while the middle and lower sutures are fixed to the deep aponeurosis, the kidney is fixed below its normal position, the muscular wall is stitched in layers, the skin united by silk-worm-gut, and the wound allowed to heal by first intention, no drainage-tube or packing being employed. On the other hand, Jacobson considers that, on account of the friable character of the renal parenchyma, sutures passed through the substance of the kidney cannot be relied upon to hold for a sufficient length of time. He therefore recommends suturing of the fibrous capsule to the lumbar fascia without the employment of a drainage-tube or packing. He says:—

"The kidney having been exposed, it is gently withdrawn through the wound, surrounded by aseptic sponges, while an

incision is made with a very light hand all along the convex border from end to end. Unless the utmost gentleness is taken in the last step, the tissue of the organ itself will certainly be incised, causing free oozing. With the handle of a scalpel or a blunt dissector a flap of capsule is then deliberately but gently stripped off the kidney up to a point about halfway along its lateral surfaces, so as to raise a sufficient flap for the sutures to find a holding in. The flaps having been raised, they are sutured with medium-sized sterilised silk to the aponeurotic and subcutaneous edges of the wound. To get a firm and permanent holding, each suture should take up plenty of capsule on the one side, and a sufficient grip of the lumbar fascia on the other. I generally use upwards of twenty sutures, perhaps twelve in one flap and eight in the other. One word of caution should be added. This method of anchoring is so efficient that, unless care is taken, it is possible to fix the kidney actually in, and not beneath, the lips of the wound."

Edebohls suggested a slightly different method of suturing, which has its advantages. It is as follows:—

"Pass four suspension or fixation sutures of forty-day catgut through both the reflected and the still attached capsule proper, close to their line of junction. Two sutures are placed on the anterior face of the kidney, one at the middle of the upper and one at the middle of the lower half of the organ. The two other sutures are placed at corresponding points of the posterior surface of the kidney. Each suture runs parallel to the long axis of the kidney, and is passed through the reflected capsule close to the line of reflection, then through the underlying attached capsule, and along beneath the latter between the capsule and the kidney substance for a distance of 2 to 3 centimetres, when it again emerges through the attached and reflected layers of the

capsule. Use the Hagedorn needle, with the broad surface running flatwise between the capsule proper and the kidney substance, to avoid penetration of the latter.

"Pass the kidney with the eight free suture ends hanging from the capsule proper back into the body. Pass each suture end in succession through the abdominal parietes from within outward, four to the inner and four to the outer side of the incision, each suture piercing the tissues at a distance from its fellow of the opposite surface equal to the antero-posterior thickness of the kidney. The sutures to the inner side of the incision will pierce the retracted sheath of the quadratus near its edge, the quadratus itself, and the erector spinæ; the outer sutures will traverse the transversalis fascia and the latissimus dorsi."

The methods just described aim at inducing immediate union between the surfaces of the kidney and the parietes. I have tried all those methods, and, while in most instances a good result has been obtained, I feel satisfied that, in the majority of cases, aiming at union by granulation is the proper object we should have in view. Undoubtedly healing by granulation is a slower process than healing by immediate union, but the ultimate result justifies the sacrifice of a little more time in bed.

The length of time a patient should be kept in bed after nephrorrhaphy has been variously stated by different surgeons. As far as my own experience goes, I think it always safe to allow the patient out of bed on the fourth or the fifth week. No doubt in many instances an earlier date might be fixed; but the patient having submitted to the inconvenience of an operation, a few days longer in bed is not a great tax, while it secures more complete union between the displaced kidney and its surroundings. There is nothing special otherwise in the after-treatment of nephrorrhaphy.

We may now consider the conditions under which a case may be regarded as suitable or unsuitable for operation.

I. Nephrorrhaphy should not be recommended in cases where the symptoms distinctly referable to the mobility of the kidney are a small part of the trouble.

(*a*) In movable kidney complicated by enteroptosis, an operation should not be recommended unless it can be clearly shown that serious symptoms are directly due to the displacement of the kidney. For example, in a case of general relaxation of the abdominal walls following frequent pregnancies, where the whole of the contents of the abdomen occupy a lower and more anterior position than normal, associated with chronic dyspepsia, constipation, and symptoms of uterine displacement, and perhaps with hernia and hæmorrhoids, nephrorrhaphy should not be attempted unless the displacement of the kidney is causing symptoms of torsion of the pedicle.

(*b*) When movable kidney is associated with a highly nervous temperament, all palliative means should be employed before suggesting an operation. But it must be remembered that in neurotic patients the suffering arising from movable kidney is often exaggerated. Also mobility of the kidney in many instances not only determines the origin and distribution of the pain, but in like manner is itself a fruitful cause of hypochondriasis. When the neurotic phenomena are due to pressure of the kidney on other abdominal organs, the question of nephrorrhaphy may be considered; but the patient or her friends should be carefully warned that the operation may not be successful.

(*c*) When long-standing dyspepsia and chronic constipation are present, or when chronic uterine or ovarian disease, or chronic organic disease of the kidney co-exists with mobility of the organ, nephrorrhaphy should not be performed.

(*d*) In those cases in which displacement does not give rise to much discomfort or functional disturbance, the mobility of the organ being discovered probably by accident.

II. Nephrorrhaphy should be recommended—

(*a*) In all cases of uncomplicated movable kidney in which the pain is distinctly renal—in which renal crises occur repeatedly and are well marked, and are referable to a definite cause.

(*b*) Where there is evidence that the displacement causes twisting of the pedicle of the kidney, as indicated by paroxysmal renal pain, and the presence of such abnormal constituents in the urine as albumen, blood, pus, or tube-casts.

(*c*) In cases in which gastro-intestinal symptoms are pronounced while the patient is active, but relieved while she is at rest, the operation should be advised as a curative measure.

Chapter VI.

FLOATING KIDNEY.

I DIVIDED movable displacement of the kidney into two forms. In one, the organ was described as being movable behind the peritoneum—*movable kidney;* in the other, the kidney was attached to the spine by a mesonephron, and lay within the cavity of the peritoneum, where it might move to the extent of its mesentery—*floating kidney.*

The distinction here drawn between movable and floating kidney was adopted by Sir William Jenner in his *Clinical Lectures on the Diagnosis of Extra-Pelvic Tumours of the Abdomen.* He says:—"I told you that the kidney is moved a little by the respiratory movements. Sometimes it can be moved by the hand, and this much more frequently than you would suppose. A movable kidney is one thing, a floating kidney is another. We very rarely see or feel a floating kidney. I have never met with one after death, though I have felt in a patient what has been supposed to be one. A floating kidney is a kidney that has a mesentery—a fold of peritoneum attaching it very loosely to the spine. A floating kidney, therefore, can be moved about to a considerable extent—to the extent of the length of its mesentery. A movable kidney can only be passed up and down a little; it slips a little under your fingers."

In a report by a committee of the Pathological Society of

London, appointed to enquire into the matter of displaced, movable, and floating kidneys, the following passage will be found:—"Looking at the matter of kidneys unduly movable, we think it well to divide them into two varieties. The first form is that in which the organ may be moved to some extent beneath the peritoneum. A certain degree of this mobility is not very uncommon. It will be found to be present in a considerable number of subjects, if as soon as the body is opened, the kidneys be handled without the removal of any of the organs. The amount of movement possible is not commonly greater than an inch or two upwards and downwards. Occasionally, however, a flaccidity of the peritoneum exists to a much greater extent, so as to allow the kidney to move under the peritoneum over a space described in one of the reports sent to us as a circle having a diameter of 8 or 9 inches. In the second variety, the peritoneum passes over the posterior surface of the kidney, forming a kind of mesonephron.

"From the evidence which has been laid before us, it appears that these so-called floating kidneys may depend upon either of the above states; that the peritoneum may be flaccid and loose to such an extent as to allow the kidney to move under it, so as to come in contact with the wall of the belly; or to leave its natural place and pass to or below the brim of the pelvis; or, indeed, in some cases, to encroach upon the opposite side of the belly. A like movableness or floating of the kidney may be due to the presence of a mesonephron, already spoken of. It will, therefore, be seen that the terms movable and floating kidney must not be used as strictly corresponding to two anatomical varieties, since a kidney without a mesonephron may give rise to all the clinical phenomena shown by one with a mesonephron. Both these anatomical varieties merge by insensible degrees into one

another; and these two expressions, movable and floating, can only be used as implying different degrees of the diseased state, which, according to its extent, may give rise to a slightly mobile or an extremely mobile kidney."

Floating kidney is no doubt less common than movable kidney, but whether the peritoneum remains loose or becomes united around the kidney does not in any way increase or diminish the pathological importance of the displacement, although, from a surgical point of view, the former must be regarded as more dangerous than the latter condition. Both varieties appear in certain cases to be equally troublesome to the patient. Several cases of floating kidney have been recorded. I may mention two of these, where it is distinctly stated that a mesonephron was found to be present. Dr. William Henderson, in the *Medical Times and Gazette*, 1859, vol. ii, p. 501, states, in reference to a case of his, that, "on examining the abdomen, the right kidney was found to be perfectly movable, and was suspended, as it were, by a prolongation of the peritoneum enclosing the kidney, and forming a distinct mesentery, which allowed it to move in all directions."

That this case was not only of pathological but also of clinical importance is obvious from its history. "She still complained of the shooting pain occasionally passing through the abdomen, and which she referred to the tumour. These pains being entirely distinct from the constant pain caused by the diseased vertebræ, I was at that time led to suppose the tumour to be of a malignant nature, and probably connected with the mesentery or omentum. . . . The tumour at this time could not be discovered, and any effort on her part to cause it to protrude was attended by the same shooting pain passing through the abdomen."

Dr. Priestley has described a case in the same journal for

14th May, 1857, p. 262, where, at the *post-mortem* examination, "the peritoneum was found reflected over the posterior surface of the kidney, giving it thus a mesentery, and allowing it very considerable motion in the right side of the abdomen; and in the *Glasgow Medical Journal* for October, 1883, Dr. J. Lindsay Steven narrates a case where there was a renal mesentery. "On proceeding to examine the abdomen in this case, the lower end of the right kidney was found projecting forwards quite through the intestines, so as to be visible without disturbing them. Upon seizing it, it was discovered to be freely movable in a radiating manner, the centre of movement corresponding to the attachment of the renal vessels, and that part of its internal border extending from them to its upper extremity. On turning aside the parts, the suprarenal capsule was seen in its normal situation immediately beneath the posterior border of the liver, and, on letting the kidney fall back into its normal situation, it was found to lie quite an inch and a half below the level of that organ. In the movements of the kidney the suprarenal capsule was not in the least affected, and that it was not at all dragged downwards was proved by the fact that, on removing it along with the kidney and abdominal vessels, a small portion of the liver remained adhering to it. In this case there was quite evidently a partially formed renal mesentery, its line of attachment corresponding to the upper half of the internal border and a small area of the upper portion of the posterior surface of the kidney—the movements of the lower part of the organ being thus much more free than those of the upper. There was no peritoneal sac in which the organ was moving, as the peritoneum was very firmly adherent to the organ all round, except at the part where the mesentery passed off to attach the kidney to the posterior abdominal wall."

From the remarks quoted from Sir W. Jenner's lecture, it

would appear that he bases his diagnosis between movable and floating kidney upon the amount of mobility observed. "A floating kidney can be moved about to a considerable extent—to the extent of the length of its mesentery. A movable kidney can only be passed up and down a little; it slips a little under your fingers." The committee of the Pathological Society also used the degree of mobility as a means of distinguishing between the two conditions, although they were aware that an equal amount of movement may result from either state. The clinical distinction may be difficult, but, as far as the anatomy is concerned, the two varieties are easily and clearly separated from one another. The importance of discriminating between the one variety and the other is all the greater when operative interference is contemplated. In the case of the movable kidney, the organ may be got at from behind without opening the cavity of the peritoneum, whereas in floating kidney (where there is a mesonephron) the kidney lies within the cavity, and cannot be reached without entering the peritoneum.

Objection has been raised to my division of the subject. As a matter of custom, both terms are used synonymously by most writers. Clinically, the diseases are not distinguished from one another. Morris, in his excellent work on *Surgical Diseases of the Kidney and Ureter* (p. 95), remarks:—"A 'floating kidney' is one which, whether it possesses a mesonephron or not, moves freely forwards—so as to rise or 'float' towards the anterior abdominal wall—as well as vertically and laterally; this 'forward' movement or 'floating' makes the distinction between it and the 'movable kidney;' it is not possible to distinguish until the abdomen is opened, or the kidney is exposed through the loin, whether a 'floating kidney' has a mesonephron or not." And again, at p. 97, he says:—"For convenience of description the terms 'movable'

and 'floating' kidney will be used indiscriminately, except when one or the other type is specially referred to; it will then be designated by the term 'movable behind the peritoneum,' or 'floating kidney without a mesonephron,' or 'floating kidney with a mesonephron,' as the case may be." It is only after the abdomen is opened that the presence or absence of a mesonephron can be demonstrated. It is necessary, however, from the surgical standpoint, particularly when operative interference is contemplated, carefully to separate the two conditions from one another. In movable kidney, the organ can be exposed without opening the peritoneum, whereas in floating kidney it cannot. These varieties of displacement are recognised, not only by being distinct anatomically, but also by their etiology being different. Floating kidney is always a congenital condition, whereas movable kidney is usually acquired. Oppolzer and the earlier writers on the subject looked upon elongation of the renal vessels as a proof of the affection not being acquired; they, however, did not distinguish between the two forms, but grouped all displacements of the kidney associated with mobility in one class.

Floating kidney, as already stated, is always a congenital condition, and the existence of a mesonephron is not uncommonly associated with other malpositions of the peritoneum or of other abdominal organs. The following case, reported by Mr. Durham, illustrates this point:—

"Upon opening the abdomen of J. C., æt. 34, it was at once noticed that the left kidney was situated lower down and nearer the middle line than usual; the descending colon was also nearer the middle line, and formed no sigmoid flexure in the left iliac fossa, but passed across the last lumbar vertebra, and entered the pelvis on the right side of the sacrum.

"Upon slightly pressing the kidney, it slipped at once into its normal situation, and, upon further examination, it was found to be movable to a most remarkable extent. By changing the position of the body, or by gentle manipulation, the kidney was caused to pass, according to circumstances, quite up under cover of the ribs, across to the front and slightly to the *right* side of the bodies of the vertebræ, or down into the iliac fossa. This mobility appeared to depend principally upon the unusual disposition of the peritoneum which was associated with the misplacement of the colon. Instead of passing over the anterior surface of the kidney, and then forming the descending mesocolon, the peritoneum from the side of the spinal column only just touched the lower part of the inner border of the kidney, and then, having been reflected over the descending colon, touched the lower part of the outer border of the kidney, as it passed on to line the side of the abdominal cavity; and again, the 'lesser sac of the peritoneum' extended behind the spleen, and as low down as the upper border of the kidney. Thus, the kidney, instead of being fixed in its position by a single layer of peritoneum over its anterior surface, was placed, as it were, in the middle of three diverging layers, none of which could afford much support.

"Before any of the viscera were injured or removed, the trunk of the subject was exhibited to the Society, and careful diagrams were made of the disposition of the viscera and of the various positions which the kidney could be made to assume by mere motion of the body.

"Upon dissection it was found that there was little or no fat in the lumbar region, and that the kidney was consequently only surrounded by very loose cellular tissue. To this circumstance, doubtless, must be attributed in great part the remarkable prominent appearance of the kidney when the

abdomen was laid open. The renal artery was somewhat longer and thinner than usual. The kidney itself was rather small, but of perfectly healthy structure. No other anatomical peculiarities than those already described were met with. No history of the recognition of the mobility of the kidney during life could be obtained."

It would, indeed, be difficult to explain how a mesonephron, properly so-called, could be formed otherwise than congenitally unless by supposing that the displaced kidney has pushed before it a fold of peritoneum, the surfaces of which have become adherent around it, and united to each other along the line of the renal vessels. That such a condition might arise as a result of localised peritonitis seems possible; there are, however, no cases recorded where there is any evidence of this having taken place. When inflammation has occurred in cases of movable kidney, it has in most instances led to an adhesion of the layers of the peritoneum, not only to the kidney and to one another, but also to the surrounding parts, the result being that the kidney ceased to be movable, and became fixed in an abnormal position.

The point of importance to be attended to in connection with floating kidney is that it cannot be reached by an operation from behind without opening the peritoneum, and is therefore not so favourable for nephrorrhaphy as movable kidney. This should be borne in mind while operating. It is not possible, however, previous to the operation, to distinguish by physical examination, the two conditions.

Some authorities have expressed the opinion that floating kidney is more freely movable than movable kidney, and use this as a basis for diagnosis. This is an error. In not a few cases of movable kidney the organ can be pushed with perfect freedom up under the ribs, down into the pelvis, and for a short distance across the middle line. What greater freedom

of movement could be shown? It is true that in some instances of movable kidney the excursion may be limited to an up-and-down motion in a plane parallel to the lumbar muscles. This is seen when the sac in which the kidney moves is formed by the adipose capsule without the capsule being detached from its seat behind the peritoneum. Where, however, the peritoneal covering has become raised from the posterior abdominal wall, less impediment is offered to movement, and so what was clearly at first a case of movable kidney gradually may assume the physical signs of the more mobile form, and may pass, according to some observers, from the class of movable kidneys into that of floating ones.

Fortunately, floating kidney is a very rare condition; but, nevertheless, it must not be entirely overlooked where an operation is contemplated for the cure of the more common variety of displacement with mobility.

The following case is, as far as I can ascertain, the first one in which nephrorraphy was performed for a mobile kidney with a mesonephron, and to this condition I would like to see the term floating kidney limited:—

The patient, C. A., was advised to consult me by Dr. Palton Petrie, of Strathaven, and in his account of the case he informs me that "the patient is aged 37, single, housekeeper in her father's house. Her general condition of health was never quite satisfactory, and during the past three years she has been getting steadily worse, and within the last three months she became unfit to perform her household duties. There was considerable abdominal disturbance, characterised by a feeling of distress rather than of pain, and at times considerable quantities of mucus were passed *per rectum*, evidently due to a subacute colitis. On examination of the abdomen, there was distinct tenderness along the course of the transverse and

descending colon, and Dr. Petrie, on palpating in the right renal region, found the kidney to be freely movable. The pulse was very feeble, and the patient suffered from great 'nervous prostration.' At this time Dr. Petrie kept her in bed for three or four months, with considerable advantage, so that she was able to be removed to Dunblane, where she remained a fortnight. During her residence at the hydropathic establishment there she was subjected to high-frequency electrical treatment with the view of improving the condition of the bowel, but owing to the mobility of the kidney the treatment was not pushed, and she returned home for the purpose of consulting me as to the question of operation.

"In her school days the patient suffered greatly from headache, the attacks sometimes being of two or three days' duration. They were always preceded by a very uncomfortable feeling about the waist, which passed up her back, and culminated in a severe headache. She was very fond of active exercise in childhood, but if this was indulged, it was certain to be followed by sudden and violent reaction, so as to make her feel completely exhausted, and the attacks of headache were certain to follow. When 16 years of age she had abdominal swelling of a few days' duration, at first at irregular, but afterwards at regular intervals. Shortly after this, on account of her mother's death, she, being the eldest daughter, had to undertake the household duties for the family, consisting of her father and six brothers. After eight years of this work, with occasional complete breakdown, her health became so much impaired that she was quite unfit for any work; and on account of the pain in the right kidney she found it necessary to wear her corsets both night and day. She also suffered from sleeplessness. At this time she was ordered to remain in bed for three months, and with that treatment considerable improvement occurred. Since that

time she enjoyed rather better health than previously, until within three years ago. She has always had to guard against the slightest over-exertion or sudden excitement."

When I saw the patient on 16th June, 1903, I found her pale, emaciated, and highly "neurotic." She complained of what she described as "abdominal distress," which really meant a sense of weight and dragging in the right loin, with occasional attacks of severe sickening pain, which were induced by any exertion or sudden movement of the body. Digestion was very feeble, and appetite poor, but she informed me that she was now rather better than before she went to Dunblane. On examination of the abdomen, I found the right kidney freely movable; it could be pushed well beyond the middle line in front and down into the pelvis, and upwards under the ribs, but when it was once reduced to its normal position it remained there, and could not be readily disturbed unless the patient walked about for some time. Deep inspiration sometimes forced it downwards, and then it would suddenly shoot from the margin of the thorax towards the umbilicus. On palpation, the whole organ could easily be caught up in the hand, and its form traced. The kidney was unusually firm, a little smaller than normal, and the slightest pressure of the hand caused sickening pain. So long as it was not pushed under the costal margin it could be rolled from side to side freely, and very often suddenly slipped out of the hand in a downward direction. The percussion over the kidney gave a dull tympanitic sound, and in the loin, whether the kidney was replaced or not, there was a deficiency of resistance compared with the opposite side.

On 18th June the ordinary incision was made through the parietes in the lumbar region, but the kidney could not be found in its normal position, and when pressed up to the depth of the wound by the hand it was found that in order to

reach the organ the peritoneum required to be opened. On opening the peritoneum, a careful examination was made, when the kidney was found to have a distinct mesonephron, and showed the organ to be surrounded by peritoneum on all sides. An incision was made through the peritoneal layer covering the kidney, the fibrous capsule was split, and the kidney parenchyma brought into position at the edges of the parietal wound. There was no fatty capsule. Four sutures were inserted into the kidney, and the depth of the wound packed with iodoform gauze. The patient made an uninterrupted recovery, gained rapidly in strength, the appetite steadily increased, and she was dismissed from the Sandyford Home on 10th August.

Dr. Petrie, writing to me on 1st October, says that "since the patient returned home she has gradually improved, is sleeping better than she has done for years, and the right kidney seems securely anchored. She is looking altogether healthier and plumper, and is able to take a short walk daily without discomfort."

Chapter VII.

FIXED MALPOSITIONS AND MALFORMATIONS.

While a knowledge of the symptoms, diagnosis, and treatment of movable displacements of the kidney are of interest and of practical importance to the general practitioner, departures from the normal in respect to situation, form, size, and number are not merely pathological curiosities. To the surgeon who desires to protect his patient and himself against catastrophes in the operating room, an acquaintance with these abnormalities as well as with the malformations of the kidney is a necessity.

Renal abnormalities may be divided into three classes:—

I. Displacements without mobility. 1. Congenital displacement without deformity. 2. Congenital displacement with deformity. 3. Acquired displacements.

II. Malformations of the kidney. 1. Variations in number; (1) supernumerary kidney; (2) single kidney—(*a*) congenital absence of one kidney, (*b*) atrophy of one kidney; (3) absence of both kidneys. 2. Variations in form and size; (1) general variation in form, lobulation, &c.; (2) hypertrophy of one kidney; (3) fusion of two kidneys—(*a*) horse-shoe kidney, (*b*) sigmoid kidney, (*c*) disc-shaped kidney.

III. Variations in pelvis, ureters, and blood-vessels.

With respect to the relative frequency of the different abnormalities Mr. Henry Morris states:—

"I have collected fifty-four cases of various malformations which were published in the several American and English journals during the ten years 1883-1893, an analysis of which shows the following relative frequency of the different kinds of abnormalities usually met with:—

"11 were cases of congenital absence of one kidney.
"8 congenital atrophy or ill-development of one kidney.
"1 congenital atrophy or ill-development of both kidneys.
"8 horse-shoe kidney.
"9 misplacements of one kidney.
"2 congenital polycystic kidney.
"2 malformation of the ureter.
"2 congenital hydronephrosis (1 double, 1 due to pressure of the ureter by a branch of the renal artery).
"5 double ureter (in 2 cases the doubling was on both sides).
"2 absence of ureter (in 1 case the kidney was a collection of small cysts).
"2 solitary conjoined kidney.
"1 atresia of vesical orifice of ureter.
"1 atrophy following obliteration of ureter of non-congenital nature."

I. Displacements without Mobility.

1. *Congenital displacement without deformity of the organ is by no means uncommon.*

When a normally formed and developed kidney becomes displaced, as a rule the organ is only unduly mobile, but if the displacement occurs prior to birth, the presumption is that the gland becomes fixed in its new situation. If the kidney becomes fixed in a position in which it is not submitted to undue pressure from any side and where there is no

interference with the blood supply or impediment to the escape of urine, the natural form of the kidney may be preserved.

CASE XIX.—*Fixed displacement of the right kidney above Poupart's ligament simulating a perityphlitic abscess—Operation.*[1]

The patient was admitted to the Glasgow Royal Infirmary on 2nd November, 1894, complaining of pain in the right iliac

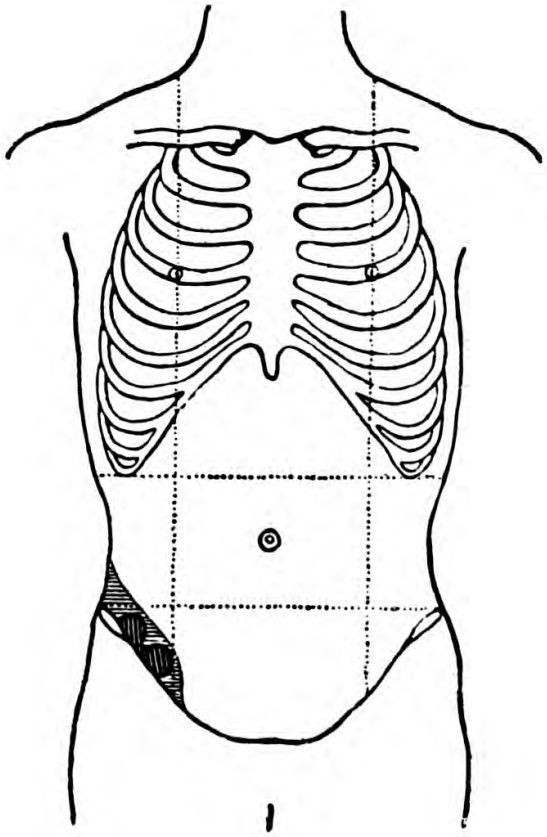

FIG. X.

region. In September, 1890, he began to complain of pain in the lower dorsal region, but although the pain continued with

[1] This case is published in detail in the *Scottish Medical and Surgical Journal*, vol. i, No. 1, p. 53.

more or less persistence, he continued at his work till the winter of 1893. It then became so severe that he went to bed and remained there for over a month. He first felt pain in the abdomen about this time, and for six months after this he could walk about only with the aid of two sticks; the swelling in the abdomen he noticed about seven months before his admission. There was a slight fulness of the abdomen in the right iliac and lower lumbar regions, and a rounded swelling was felt passing upwards and backwards. It appeared to be fluctuant. The dulness on percussion did not exactly coincide with the opinion formed of the size of the swelling as made out by palpation; it was obtained over an area of about 2 inches in breadth running parallel with Poupart's ligament. The swelling was cut down upon, and as soon as the muscles were cut through the sense of fluctuation was lost. The incision was then enlarged, when the swelling was found to have a rounded outline with a distinct hilum towards the inner and upper aspect, and being semi-elastic, but firm, immediately suggested a displaced kidney (Fig. X, p. 175).

A very thick adipose capsule was dissected through and the kidney exposed. It was quite immobile. There was no enlargement or hydronephrosis. The condition of the ureter could not be made out. The wound healed in a few days, after which the sense of fluctuation was again deceptive as on admission.

CASE XX.—*Left kidney displaced downwards and forwards in a patient upon whom lumbar colotomy was performed.*

The patient was admitted to Sandyford Nursing Home early in 1897 suffering from malignant disease of the rectum, and it was resolved to perform a lumbar colotomy.

On making an incision from the lower border and tip of the last rib on the left side to a point half an inch behind the centre of the crest of the ilium, the upper border of the left kidney presented itself at the lowermost limit of the incision. When first felt by the finger in the wound some doubt was entertained as to the nature of the hard mass, but by drawing aside the surrounding adipose tissue, the renal cortex was easily recognised. The kidney, as far as could be made out, was normal in size and form, except that the surface was slightly lobulated (Fig. XI, p. 178).

CASE XXI.—*Right kidney displaced downwards and rotated on its antero-posterior axis — Shortened ureter entering upper aspect of bladder.*

The patient was admitted to the Glasgow Royal Infirmary in September, 1887, and died from severe abdominal injury with rupture of the liver and spleen.

At the *post-mortem* examination the right kidney was found to be displaced and firmly fixed; the pelvis of the kidney looked upwards, inwards, and forwards, while the convex aspect of the organ rested upon the brim of the pelvis. The kidney was normal in shape and size, and the vessels were natural in their distribution, with the exception that both the renal artery and vein were elongated, while the right ureter was shortened and entered the bladder close to the upper aspect of that viscus. The left kidney, with its vessels and ureter, was strictly normal (Fig. XII, p. 178).

In the three cases above described, where the kidneys occupied abnormal positions, the fixed misplacements were not associated with any deformity of the organs.

2. *Congenital displacement with deformity.*

The alteration in the form of the kidney seems in some

instances to depend upon the situation occupied by it, as, for example, in a case described by M. Aubé where the left kidney was found between the common iliac arteries, close to their origin from the aorta. Pacoud narrates another, in which a kidney was found situated in the pelvis between the

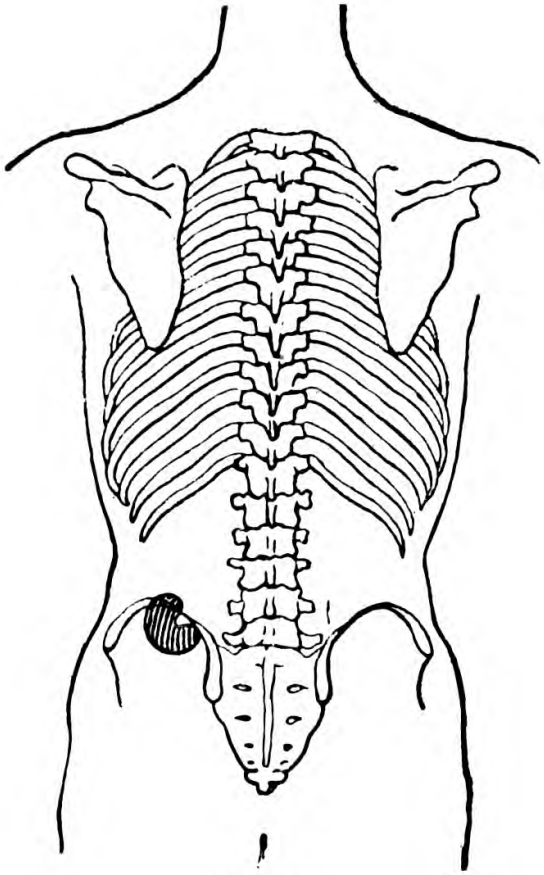

FIG. XI.

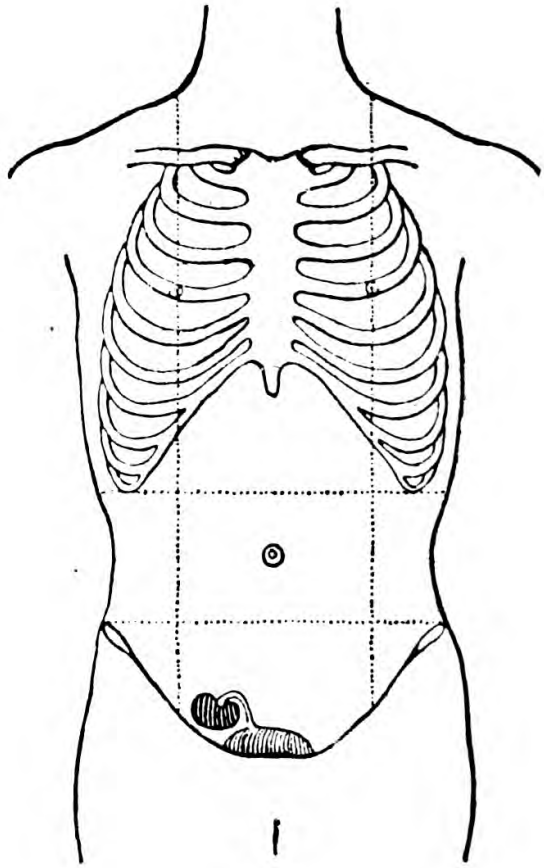

FIG. XII.

rectum and bladder, and somewhat similar instances have been described by Drouin, Bellini, Andral, Bonet, and others.

In my own cases, and in those referred to by these observers, alteration in form of the displaced organ undoubtedly to some extent depended on the situation occupied by it. For example, in M. Aubé's case the kidney was flattened, and its anterior surface divided into three parts by

two depressions formed by the passage of the two arteries. As a general rule, malpositions of the kidney are associated, particularly when the displacement is congenital, with some deviation from the normal in regard to the position of the large intestine and peritoneum, and not uncommonly the distribution and number of the blood-vessels and the course and length of the ureters are found to be abnormal. Roberts states that in twenty-one cases of congenital malposition of the kidney which he was able to collect and compare, the abnormality was in every instance confined to one kidney, and the left kidney was much more commonly affected than the right (left, fifteen; right, six). Most frequently the kidney was found lying obliquely on the sacro-iliac synchondrosis. In some cases the organ was fixed beside the uterus, or transversely between the rectum and the bladder, or across the prominence of the sacrum.

As a rule, the displaced organ has its long axis vertical or slightly oblique, but it may also occupy, as illustrated by a case published by Carslaw,[1] a transverse position. In this case the left kidney was found lying on the fourth and fifth lumbar vertebræ, and the long diameter was, transversely from right to left, 3 inches. The kidney was divided into two lobes by a fissure running on the anterior surface almost vertically. The ureter was double, one branch coming from each lobe, but these united while still in the hilum of the kidney. Two arteries supplied the kidney, one from the aorta and a second from the right common iliac, and corresponding with each artery there was a vein.

These congenital displacements will be more fully described under malformations of the kidney. At present we may give the following cases in illustration of the subject:—

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[1] *Glasgow Medical Journal*, vol. xxxi, p. 381.

CASE XXII.—*Right kidney at the brim of the pelvis—Anomalous distribution of blood-vessels—Deformity of the kidney.*[1]

The right kidney was found lying on the brim of the

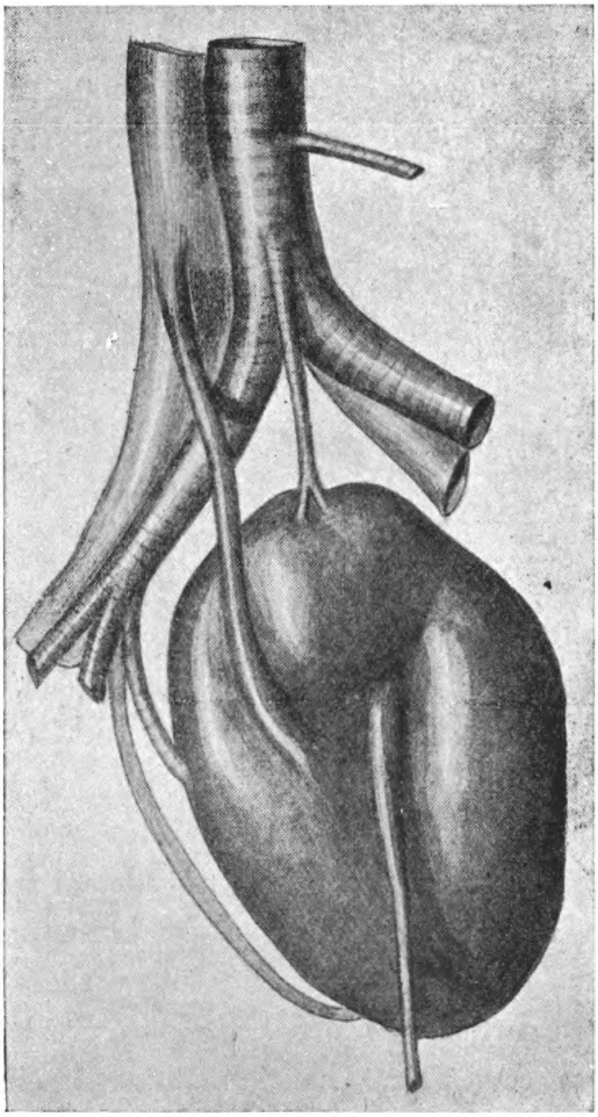

FIG. XIII.

pelvis. The anterior aspect of the organ is convex, the posterior surface slightly concave. The front of the organ is marked by a deep groove extending from its upper to its

[1] Royal Infirmary Museum, series vii, No. 2.

lower extremity. This groove is, roughly speaking, **Y**-shaped, the right limb of the **Y** being longer and deeper than the left. At the upper limit of the former an artery enters the kidney directly from the aorta, and before entering the substance of the organ it divides into two branches of equal size. In the centre of the groove, where the two limbs of the **Y** join, the pelvis of the kidney is seen, and the ureter passes directly down from it. From the kidney, close to the uppermost limit of the pelvis, a large vein passes directly to the vena cava. The posterior aspect of the kidney is flat or slightly concave, and is penetrated by two vessels, one a vein which passes from the kidney up its lowermost margin to the common iliac vein, and the other an artery which arises from the common iliac artery and penetrates the kidney at the union of the lower and middle thirds.

CASE XXIII.—*Malposition of both kidneys, one to the right of the promontory of the sacrum, the other in the iliac fossa—Right kidney small and with no hilum.*[1]

In this case the kidney was found to be situated about half an inch to the right of the promontory of the sacrum, and the left kidney was discovered in the left iliac fossa 2 inches to the left of the sacro-iliac synchondrosis. The right kidney was small in size and so altered in shape that there was no hilum, and the ureter passed from the lower aspect of the organ. The parenchyma of the kidney was normal in appearance, and the arteries, two in number, came off from the aorta about 1 inch above its bifurcation. The left kidney was normal in every respect except its position. There was no evident cause for the abnormality; the other abdominal organs were practically normal, and there was no indication of inflammatory or other mischief within the abdomen.

[1] Newman, *Surgical Diseases of the Kidney*, p. 7.

CASE XXIV.—*Right kidney flat, oval in form, and situated at the brim of the pelvis, supplied with two arteries—One ureter from its anterior aspect.*[1]

In this case the right kidney was situated at the brim of the pelvis, half in the cavity and half out. The preparation was removed from the body of a man, aged 61, who died of erysipelas in the Royal Infirmary.

The right kidney forms a flat oval body about the normal size. It is marked by three grooves on its anterior aspect, which correspond to the line of the entrance of the blood-vessels and exit of the ureter. The organ is supplied by two

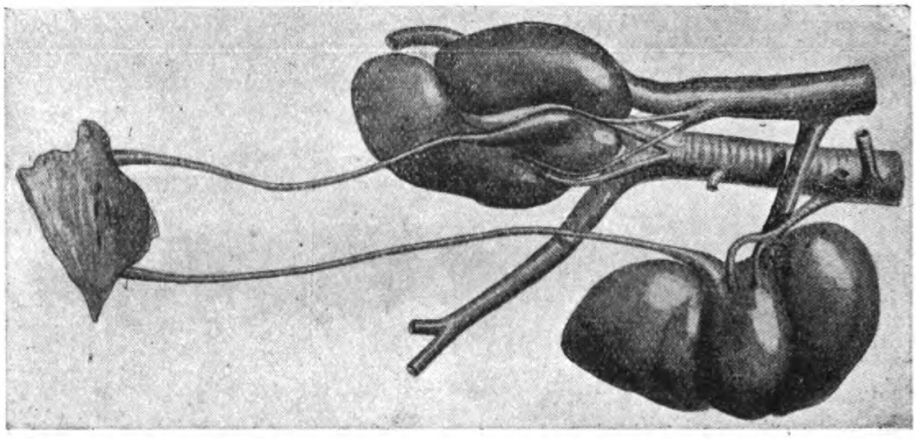

FIG. XIV.

arteries which pass off from the aorta in the middle line in front, just above the bifurcation. These vessels pass slightly to the right and enter the kidney on its anterior aspect, about one-third from the upper border. The arteries lie each in a separate groove as they pass along the upper third of the kidney, and the grooves demarcate a triangular piece of the organ. The right renal vein passes to the vena cava about 1 inch above the level of the bifurcation of the aorta, and the vein passes from the kidney along the same groove as the

[1] Royal Infirmary Museum, series vii, No. 1.

arteries enter it; the ureter also arises from the anterior aspect and passes down in front and has a somewhat tortuous course to the bladder, as if it were too long for the distance to be traversed. The right suprarenal capsule was in its normal position close to the liver. The right kidney was firmly fixed in its abnormal position. No other irregularities were discovered in the vessels. The inferior mesenteric artery came off just above the bifurcation of the aorta.

The left kidney was normal in size and in its relations, but it showed a distinct tendency to lobulation, the anterior aspect of the organ being marked by three distinct grooves.

Two specimens very similar to the above will be found in the Western Infirmary Museum, and they are described in a recent paper by Dr. L. R. Sutherland and Dr. G. H. Edington.[1]

In the first case the right kidney, which was found lying at the brim of the pelvis, is greatly altered in form and in relations. The posterior surface is flattened, showing a groove accommodating the right common iliac artery. The anterior surface shows four prominent lobules surrounding the hilum, from which the pelvis springs; the ureter is normal. Two veins emerge, one on either side of the hilum; the left passes upwards in front of the aorta to empty into the left renal vein, while the right empties directly into the inferior vena cava. The right kidney is supplied by two arteries which arise separately from the anterior aspect of the aorta, and pass in grooves to the upper part of the hilum (Fig. XV, p. 184).

In the second case the right kidney was found at the level of the bifurcation of the aorta, and to the right of that vessel. In this case also the hilum is situated anteriorly, and the blood-vessels, three in number, arise directly from the aorta.

[1] *Glasgow Medical Journal*, February, 1898.

The veins unite to form a common trunk, which empties into

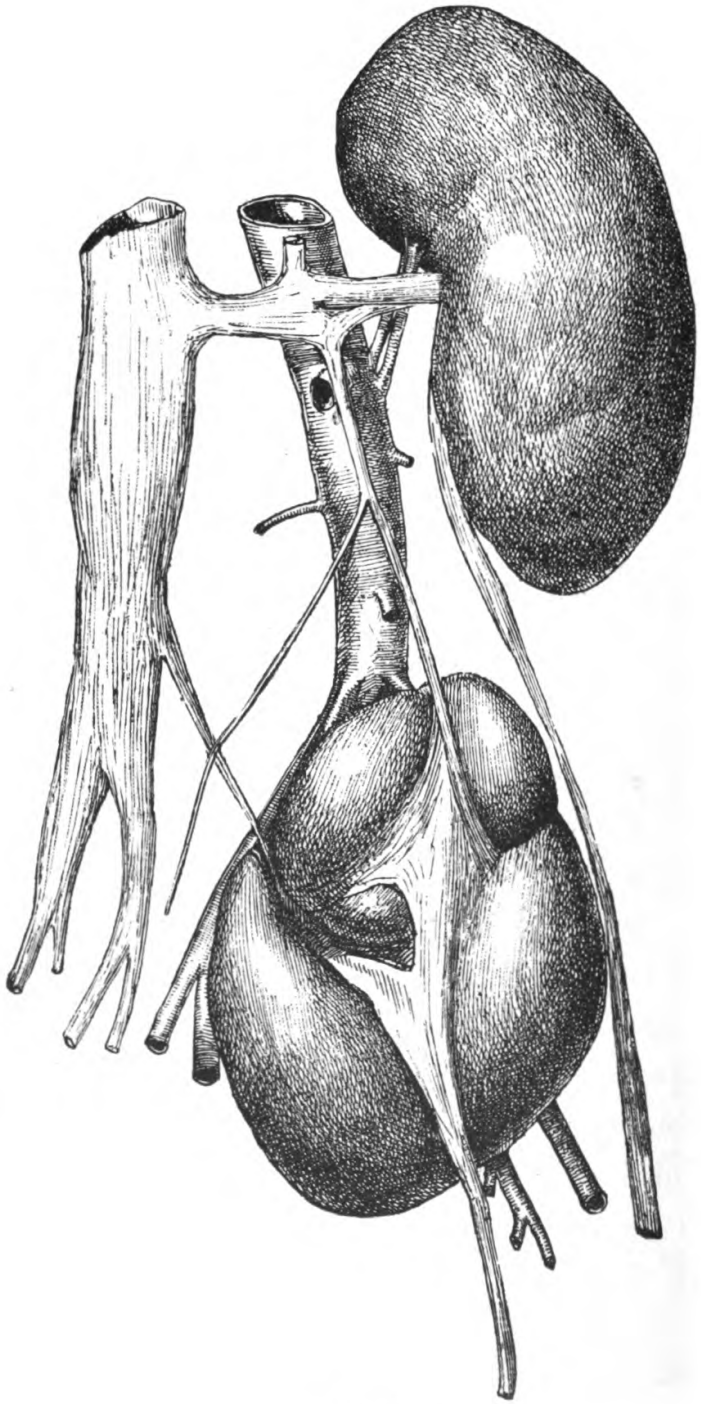

Fig. XV.

the vena cava above the junction of the common iliac veins.

The pelvis is bifid, and the two limbs pass from the kidney at different levels, the left one being the higher. The ureter comes from the lowermost limit of the united pelvis. It passes downwards and inwards, lying in a shallow groove on the anterior surface of the lower lobe (Fig. XVI).

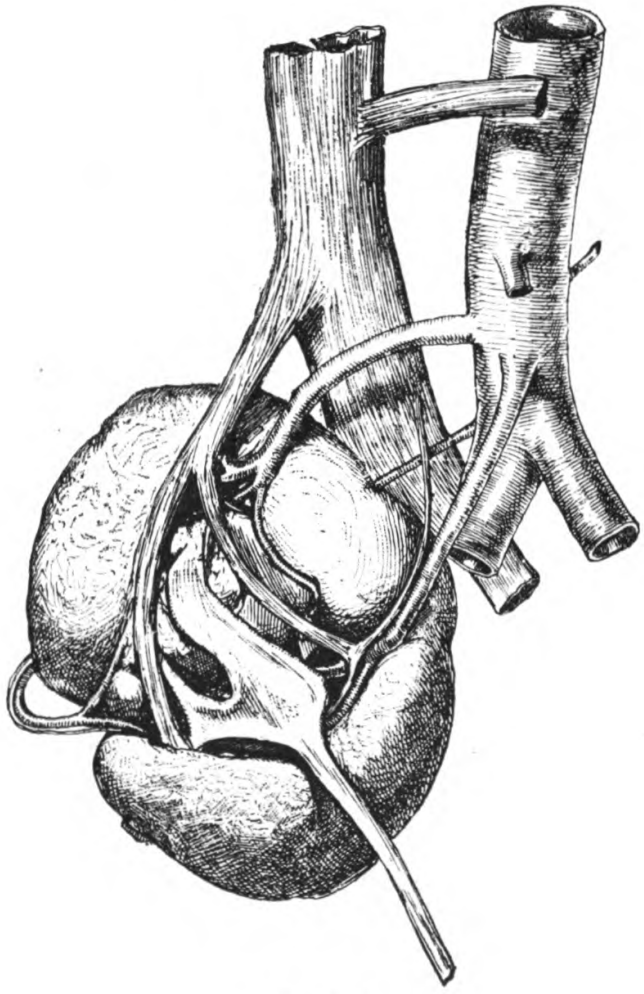

FIG. XVI.

These remarkable cases of malposition of the kidney seldom give rise to serious symptoms, and generally escape observation during life.

Cases, however, have been recorded where the misplaced kidney has been mistaken for an abdominal tumour, or, in the

female, has from its position in the pelvis become a serious obstacle to parturition.

3. *Acquired displacement of the kidney.*

Besides being liable to congenital malposition the kidney may be displaced upwards, downwards, or laterally from the enlargement of other organs, such as the liver, spleen, suprarenal capsule, or pancreas, or from the pressure of tumours near them. When the right kidney is depressed by an enlarged liver—not an uncommon accident—it is most usually rotated on its short axis, the hilum is turned downwards, and the upper portion of the kidney is more depressed. Rayer mentions an instance where the right kidney was forced down by an enlarged suprarenal body, and cites a case of Hohl's where the kidney, situated deeply to the inner side of the psoas muscle, offered an obstruction to parturition by retarding the passage of the child's head; Laennec also describes a case in which the right kidney was pressed downwards to the opposite iliac crest by a greatly enlarged liver; and Morris mentions an instance where the left kidney was depressed on to the brim of the pelvis by a large cyst in its lower part, which contained a pint of yellow fluid. The cyst had dragged the kidney down, and itself occupied the greater part of the pelvic cavity.

Case XXV.—*Acquired displacement of the right kidney by a perinephric abscess.*

In a case of perinephric abscess upon which I operated in 1890, on opening the abscess by a lumbar incision, after the pus was evacuated great difficulty was experienced in finding the kidney. By enlarging the incision upwards the kidney was discovered with its convexity looking upwards and lying close to the diaphragm, while the pelvis was turned

downwards. The kidney was quite denuded of adipose tissue, so that its contour could be easily made out; the organ was firmly fixed in its abnormal position, probably by inflammatory adhesions, and, as far as could be discovered by examination with the finger, the upper border of the kidney was resting on the vertebræ, while the renal blood-vessels and ureters must have been elongated.

Many similar cases have been recorded where the kidneys have been displaced in one direction or another and anchored by their vessels and ureter. The displacements naturally cause rotation of the organ on its short axis.

Probably the most important fixed displacements, either congenital or acquired, are those where the kidney comes to occupy the cavity of the pelvis, or where the organ is placed in such a position as readily to be mistaken for an abdominal tumour.

When the kidney has been displaced and occupies the cavity of the pelvis, the swelling may possibly be made out by a rectal or vaginal examination, but in all cases the diagnosis is extremely difficult, as in many instances the organ is not only displaced but also malformed, so that the normal reniform outline is lost as a guide in diagnosis. When, however, the normal shape is maintained it is an important aid to the diagnostician, and when superadded to the presence of a reniform swelling in an abnormal situation there is a loss of the usual fulness and resistance in the loin, a suspicion of misplacement of the kidney may be aroused.

Fixed malpositions of the kidney have seldom been diagnosed, as they almost never give rise to symptoms or even to inconvenience during life. Up to the present time most of these anomalies have been discovered after death, but now that operations upon the kidney are of frequent

occurrence, the clinical aspect of the subject is likely to be more fully recognised.

II. Malformations of the kidney. 1. Variations in number: (1) supernumerary kidney; (2) single kidney—(*a*) congenital absence of one kidney, (*b*) atrophy of one kidney. 2. Variations in form and size: (1) general variations in form, lobulated kidney; (2) hypertrophy of one kidney; (3) fusion of two kidneys—(*a*) horse-shoe kidney, (*b*) sigmoid kidney, (*c*) disc-shaped kidney.

II.—Malformations of the Kidney.

1. *Variations in number:* (1) *Supernumerary kidney.*—Supernumerary kidney is extremely rare. It must be considered simply as an anatomical curiosity, and consequently very little requires to be said regarding the condition. Although very few instances have been met with where more than two kidneys exist in the human subject, still cases have been recorded by Rayer and other writers where a supernumerary gland has existed. We have only seen one instance of this anomaly; it was at a *post-mortem* examination which was made many years ago upon a gentleman who died from malignant disease of the ascending colon. As no record was kept beyond what was sent at the time to the family attendant, I am unable to give details, but, from a clear recollection of the case, I can say that lying close to the upper margin of the left kidney there was a small pear-shaped body, supplied by a branch of the renal artery, and having a distinct ureter which passed into the left ureter half an inch below the pelvis of the left kidney. Sections of this mass were examined microscopically, and found to be healthy renal tissue. The mass was completely separated from the kidney proper, being united to it only by the little ureter.

A case is recorded by Watson Cheyne,[1] in which, while performing a laparotomy, he discovered a well developed but movable third kidney on the right side at the brim of the pelvis. It had a separate blood supply from that of the right kidney, and had a ureter of its own. Another example of third kidney, 2 cm. in length and 1½ cm. in breadth, is recorded by the Surgeon-General of the Marine Hospital Service of the United States (1885, p. 148). It was found lying in the hilum of the left kidney, and was attached by its ureter to that of the left kidney.

This anomaly may be regarded as an extreme variety of segmentation of one of the kidneys. Generally when a supernumerary kidney has been seen, it has been found to lie close to a normal kidney, but in order to be placed in this class of malformations, the part ought to be so separated as to possess distinct vessels and have a ureter of its own, which, however, always unites with the ureter of the normal kidney before it reaches the bladder.

The absence of one kidney is not so common as is generally believed. From statistics collected by Morris, a total of 15,904 *post-mortem* examinations gave only 6 cases of absence or extreme atrophy of one kidney, or a proportion of 1 in 2,650 cases. Dr. R. F. Weir, of New York, places it at 1 in 5,000; Sangate, 3 in 5,348; and Menzies, 2 in 1,790 autopsies. Probably the mean fixed by Morris of 1 in 2,400 bodies is very close to the mark.

That one kidney may be absent is a matter of great importance, in view of an operation such as nephrectomy, and should the patient possess any malformation or deformity of the external genital organs, special care should be taken to make certain that he is possessed of two kidneys. Malformations of the kidney are, as far as I have seen, often associated

[1] *Lancet*, 1899, vol. i, p. 215.

with defects in the generative organs, or with abnormalities, such as webbing of the fingers and toes, supernumerary digits, abnormal distribution of arteries, cleft palate, a hare-lip, &c.

(2) *Single kidney.*—The anomalies which have been included under this term have been so various and so entirely different, even in their main characteristics, that it is difficult to avoid confusion, and at the same time follow the classification at present adopted.

The existence of so-called "single kidney" was known to many of the older writers, such as Vesalius, Duretus, and Eustachius, but Morgagni, in 1769, was the first writer to classify these abnormalities of the kidney into two groups, namely, those instances in which two organs had become coalesced; and, secondly, those where only one kidney had developed; but unfortunately to both of these conditions he applied the term "solitary kidney." Then, following upon Morgagni, Rokitansky limited "solitary kidney" to those cases in which the malformation was due to the fusion of two organs, of which the lowest degree is seen in "horse-shoe kidney," and the highest in those instances in which the two kidneys approach one another more and more, and form one "disc-shaped" organ, lying in the median line, and provided with a double ureter. To the other class of kidneys where there is a "right or left kidney which is normal in regard to position and formation, and occasionally rather enlarged, its fellow being deficient," he applied the term "unsymmetrical kidney." We do not understand why two kidneys fused together as in horse-shoe kidney, where the two organs may be united only by a narrow band (see Fig. XII, p. 178), and having distinct sets of vessels and ureters, should be spoken of as a "solitary" or "single kidney," any more than that the double monsters, Eng and Chang, should be considered as one

individual. So much confusion has arisen regarding the use of the terms "unsymmetrical kidney" and "solitary kidney," that it would be well not to employ them. For example, "sigmoid" kidney, a condition where two kidneys are fused together, as shown in Fig. XVI (p. 185), and occupying one side of the body, has been described under the heading "solitary kidney," even although the mass was provided with a double set of vessels and two ureters.

Under the term "single kidney" we purpose only to include those cases in which one active organ is found, either as a consequence of atrophy or from congenital absence of its neighbour. The other abnormalities, such as "horse-shoe kidney," "sigmoid kidney," and "disc-shaped kidney," may be considered under the general heading of "fused kidney."

A careful distinction must be drawn between "single kidney" due to congenital defect of development of the opposite organ, and those instances in which a kidney has become wasted and functionally useless as a consequence of disease while its neighbour has undergone compensatory hypertrophy.

In the former instance no trace of the kidney or of its ureter or blood-vessels is found, as shown in Fig. VIII (p. 27), while in atrophy of one kidney as a consequence of disease the rudimentary kidney and its vessels are as a rule represented.

The following specimens illustrate (*a*) congenital absence of one kidney:—

CASE XXVI.—*Complete absence of the left kidney, ureter, and vessels—Compensatory hypertrophy of right kidney.*

On 23rd June, 1885, we made a *post-mortem* examination on a patient, Mrs. H., aged 53, who was admitted to the Royal Infirmary under the care of the late Dr. Scott Orr, and died

from tubercular ulceration of the bowels and secondary tubercular peritonitis (Fig. VIII, p. 27).

The right kidney was normal in its position, but the whole organ was greatly enlarged, weighing 12½ oz., and measuring

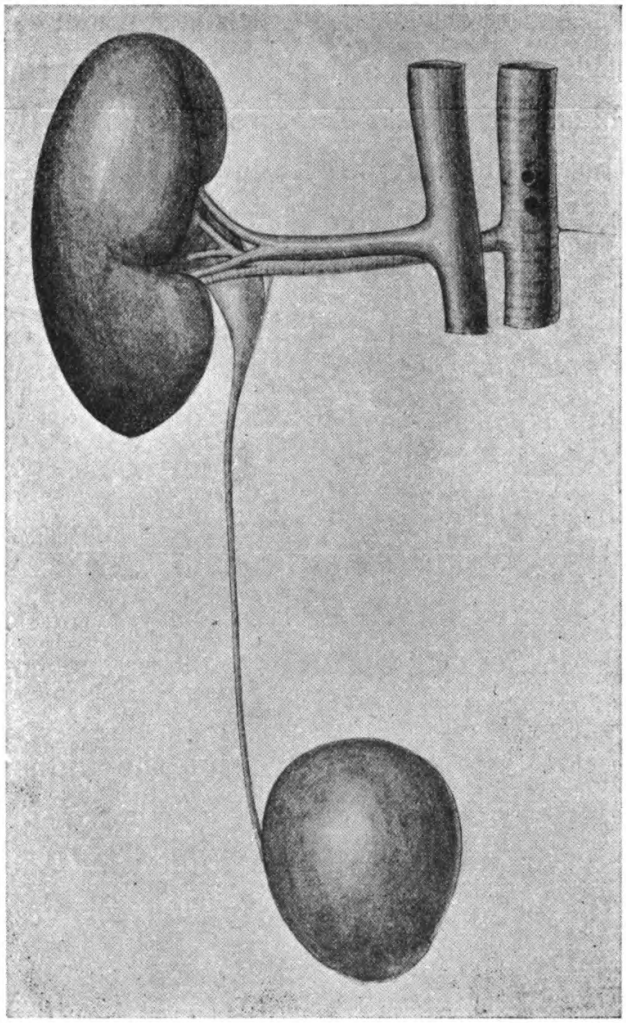

Fig. XVII.

5 inches in length and 4 inches in breadth. All the parts of the kidney were proportionately increased, the right ureter and pelvis were strictly normal, and the kidney was supplied by one artery and one vein, both of which were normal in their course and distribution. The right suprarenal body was

normal in size and situation; the left suprarenal body was found under the last left rib and was normal in size and structure. No trace was found of the left kidney or of its vessels and ureter, and no opening into the bladder could be discovered corresponding to the entrance of the ureter.

The microscopic examination of the enlarged kidney was gone into very carefully, and the inquiry was a most interesting one, showing very clearly how compensatory hypertrophy takes place.

The minute changes occurring in compensatory hypertrophy we have described elsewhere. They do not demand attention here further than to say that, as far as could be made out, the increase in the size of the kidney was due to an augmentation in the bulk of the glomeruli, and to an elongation and increased convolution of the uriniferous tubules, rather than to any numerical hyperplasia.

The changes taking place in compensatory hypertrophy have been carefully studied by Eckardt, Ebstein, Guttmann, Polk, and others.

CASE XXVII.—*Congenital absence of the left kidney, vessels, and ureter.*

The specimen about to be described was placed in the Museum of the Glasgow Royal Infirmary by Dr. J. Lindsay Steven, and in the *Catalogue* is described by him as follows:—[1]

"The preparation shows the right kidney with the bladder and the right ureter. A most careful search at the time of the *post-mortem* examination failed to find any trace, in the body, of the left kidney or ureter; the left suprarenal capsule was normal in appearance and situation, and perhaps slightly enlarged; the right renal artery had normal characteristics; the left was scarcely thicker than a stout thread,

[1] Glasgow Royal Infirmary Museum, series vii, No. A6.

and was lost in the tissue of the left renal region. The right ureter was quite normal; no left ureter could be found after careful search. The patient was a boy, aged 11, who suffered from morbus coxarius, complicated by tubercular disease of the lungs."

The case and specimen described above illustrate single kidney due to the congenital absence of one organ.

The following cases show how (*b*) one kidney may atrophy or become functionally inactive, either as a consequence of want of growth, or from disease in early life.

FIG. XVIII.

CASE XXVIII.—*Extreme atrophy of the left kidney with double pelvis but single ureter.*[1]

I have no details of the *post-mortem* examination in this

[1] Glasgow Royal Infirmary Museum, series vii, No. 9.

case. The kidney tissue is almost completely destroyed, and the whole organ is about the size of a walnut. The pelvis is branched, and there is no hilum; the upper limb of the pelvis springs from the inner and upper aspect of the atrophied organ, while the lower limb arises from the lower border of the kidney. Both limbs unite about an inch and a half below the level of the kidney, each branch is of sufficient size to admit the little finger, and after uniting form a channel three-quarters of an inch in diameter. Below this the pelvis gradually narrows and forms a ureter which is a little wider in lumen than normal. In the preparation the vessels have not been preserved (see Fig. XVIII).

CASE XXIX.—*Atrophied kidney, the renal tissue being almost entirely replaced by fat.*[1]

The patient from whom this specimen was removed was under my care in 1887. He suffered for many years from chronic cystitis, and ultimately died from cardiac disease complicated with passive hyperæmia of the lungs.

At the *post-mortem* examination the right kidney was found to be in a state of moderately advanced chronic interstitial nephritis, but up to the time of his death there were no symptoms pointing to renal incompetency. The kidney weighed 10 oz. The left kidney, as represented in Fig. XIX (p. 196), weighed half an ounce, very little renal tissue could be found in the mass, and what remained was completely embedded in firm fat. In this case the fat appeared to have developed outside the kidney, pushed its way into the interior of the organ by the hilum, and so spread towards the periphery of the organ.

The following specimen was placed in the Museum by

[1] Glasgow Royal Infirmary Museum, series vii, No. 13.

Dr. J. Lindsay Steven, and he has allowed me to make use of it:—

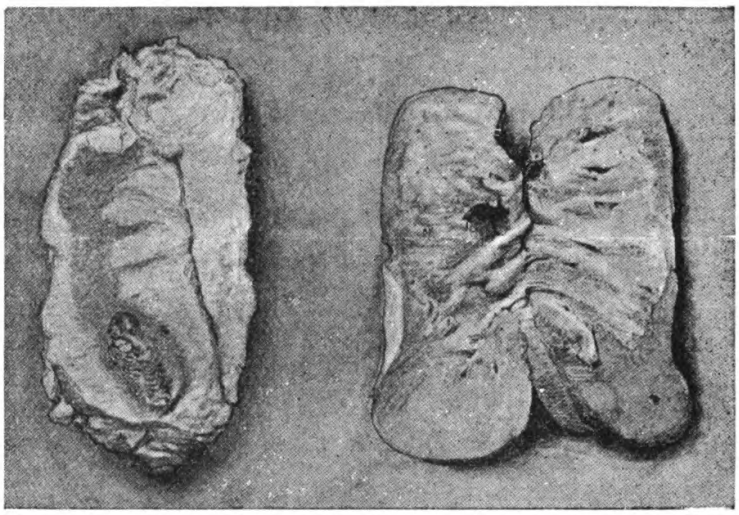

FIG. XIX.

CASE XXX.—*Atrophy of the right kidney with compensatory hypertrophy of the left kidney — Disease of the suprarenal capsules.*

The following is Dr. Lindsay Steven's note in the Museum *Catalogue*:—

"Both kidneys are preserved, the right only weighed 1 oz., the left 7½ oz. The organs were obtained from the body of a man suffering from spinal caries. The small right kidney was embedded in a mass of adipose tissue, and at its upper extremity there was a small cavity with smooth walls, the size of a hazel-nut, filled with pultaceous material. The ureter of this kidney was considerably thickened, and its lumen was practically obliterated. The urinary bladder was much hypertrophied. The left suprarenal capsule was enlarged and was converted into a cream-coloured structure, but little tissue of normal appearance remained. The right suprarenal presented similar appearance."

The left kidney was healthy.

In the Royal Infirmary Museum there are many other specimens illustrating atrophy of the kidney as a consequence of disease.

Bright's disease and tubercular lesions are undoubtedly the most frequent causes of wasting of the kidney, and it is not uncommon in very chronic cases of interstitial nephritis to find both kidneys weigh less than 2 or $2\frac{1}{2}$ oz. Such cases are, however, beyond the scope of this paper.

Again, renal atrophy as a consequence of obstruction to the ureter or from endarteritis cannot be considered at present. It is to cases of congenital atrophy, or wasting of the kidney in early life, that we desire more especially to direct attention, and the cases described above appear to come under this category.

We may now consider some general questions connected with "single kidney," whether due to congenital defect or to complete atrophy of the neighbouring organ. It is of interest to observe that "single kidney" is not peculiar to the human subject, but has been seen in the lower animals also. Sutton, amongst others, states that this condition occurs in such animals as hens, horses, and sheep, and I have observed it in one instance in a calf. In these animals, as in man, the single kidney has been observed to have undergone increase in bulk.

The following points in connection with single kidney may be considered:—

1. Duration of life of the individual.
2. Size of the kidney, compensatory hypertrophy.
3. Form, position, and side affected.
4. Sex and age of the individual.
5. Liability of a single kidney to disease.

6. Condition of the kidney, ureters, and vessels on the affected side, and on the side of the single kidney.

7. Malformation of the other organs.

8. Position of adrenal body.

1. *Duration of life of the individual.*—The absence of one kidney, especially when compensated for by augmentation in size and by increased functional activity of its neighbour, does not seem to seriously influence the duration of life, so long as there is sufficient renal tissue left in the remaining organ to fulfil the function of life, as doubtless we are endowed, in the normal state, with considerably more renal tissue than is necessary for even active and vigorous life.

In the *post-mortem* room kidneys containing very little active secreting tissue are frequently found in the bodies of individuals who have, as far as is known, never suffered from any symptoms of renal insufficiency.

The following table shows the age at death of seventeen cases of single kidney when death occurred after the age of 60 years was past:—

8	persons	died	between	60–65 years.
1	,,	,,	65–70	,,
4	,,	,,	70–75	,,
2	,,	,,	75–80	,,
2	,,	over	80	,,
17				

It can be easily understood, however, that in an individual with only one kidney, if that kidney becomes affected by any serious malady such as obstruction to the ureter, thrombosis, or any local inflammatory infection, the risk to life is greatly increased by the existence of only one organ. In single kidney compensatory hypertrophy is the rule when the

individual survives through the term of infancy, but even in the fœtus considerable enlargement of the kidney has been seen. Morris mentions an instance of this in "a well-formed fœtus born at full time," where "a right kidney only was present, and was twice its natural size; the ureter was much dilated."

2. *Size of the kidney, compensatory hypertrophy.*—In estimating the degree of compensatory hypertrophy in recorded cases, care must be taken to exclude instances where the single kidney has become enlarged by disease; for instance, Morgagni describes a case where one kidney was functionally inactive, while its neighbour was ten times the normal size, and he mentions another case where a single kidney weighed 35 lb. Again, Rhodius[1] records a case in which a kidney was so enlarged as to give rise to the suspicion of pregnancy. Eustachius, Vesalius,[2] Poupart,[3] Perrin,[4] Breschet,[5] and other old writers have recorded similar cases, in all of which it is very evident that the enlargement was due to disease rather than to a true hypertrophy of the organ. It may be said that when the single kidney is increased to much more than twice the normal size the enlargement is not entirely due to compensatory hypertrophy.

In true compensatory hypertrophy the kidney is found to be homogeneously enlarged in all its parts, and seldom, if ever, weighs more than two normal kidneys. Take, for example, other organs. Sometimes hypertrophy occurs in cases of

[1] Rayer's *Maladies des Reins.*

[2] *De Corporis Humani fabrica*, lib. v, cap. 10.

[3] *Histoire de l'Academie royale des Sciences, Paris*, anneé 1700, p. 35.

[4] *Journ. de Med. de Chirur. et de Pharmac.*, Novembre, 1760, tom. xiii, p. 431.

[5] *Medico-Chirurgical Transactions*, 1818, vol. ix, p. 437.

congenital non-inflation of one lung, the neighbouring organ being increased in bulk; so also in the liver, when one portion becomes atrophied another may undergo hypertrophy. So many cases of compensatory hypertrophy in single kidney have been recorded that it is impossible to mention more than a few of them, but, for the sake of reference, I may give the following:—Duckworth,[1] Macdonald,[2] Palma,[3] Brackenburg,[4] Northrup,[5] Davis,[6] Pollock,[7] Hewett,[8] Gubbin.[9]

On the other hand, it does not always follow that because one kidney is undeveloped or functionally useless, the other organ must be considerably enlarged. Instances of single kidney, normal in size, have been seen by Turner,[10] Mayor,[11] Hamy,[12] Bostrom,[13] Brown,[14] and many others.

3. *Position, form, and side affected.*—In the absence of one kidney the remaining organ may (as in Fig. XVII, p. 192) occupy its normal position in the loin. This is usually the case in atrophy of one kidney from disease. Dr. P. W. Macdonald [15] described a case in which the right kidney and ureter were absent, while the left kidney was normal in position, and had

[1] Pathological Society's *Transactions*, vol. xx, p. 232.
[2] *Lancet*, 30th May, 1885.
[3] *Präger med. Wochenschr.*, 1891, xvi, Jahrg., No. 33, p. 380.
[4] *Lancet*, 1891, vol. ii, p. 869.
[5] *Medical Record*, New York, vol. xxxii, p. 608.
[6] *British Medical Journal*, 1885, vol. ii, p. 397.
[7] *Lancet*, 1863, vol. ii, p. 622.
[8] *Lancet*, 1863, vol. ii, p. 622.
[9] *British Medical Journal*, 1883, vol. i, p. 115.
[10] *Edinburgh Medical Journal*, February, 1865, p. 687.
[11] *Bulletins de la Société Anatomique de Paris*, 1876, p. 592.
[12] *Journ. de l'Anatomie et de la Physiol.*, 1884, p. 193.
[13] *Beiträge zur Pathol. Anat. der Nieren*, Heft i, 1884, p. 36.
[14] *Journal of Anatomy and Physiology*, vol. xxviii, p. 198.
[15] *Lancet*, 30th May, 1885.

a normal ureter entering the bladder in the ordinary situation. Similar cases have been described by Gubbin, Peacock, Lorain, and Gruber. Single kidney, when due to want of development of its neighbour, is more likely to be misplaced and altered in form.

In many cases, however, the single kidney remains normal in shape as well as natural in size, and, even in those cases where there is considerable hypertrophy, the renal form is strictly maintained, the organ being simply increased in all its dimensions. Indeed, alterations in form are not common. In some cases, however, the organ is much elongated; in others disc-shaped, angular, or relatively thickened, and not uncommonly lobulated. Dr. M. Watson[1] described a case of congenital absence of one kidney, in which the remaining organ was normal in size but circular in form, the surface was distinctly lobulated, and the kidney was situated close to the brim of the pelvis.

Polk[2] also describes a case of single kidney where the organ was displaced into the iliac fossa, while Marzolo[3] records an instance where the right kidney was found lying on the right sacro-iliac synchondrosis. Weisbach[4] and Lombroso[5] published instances in which misplaced kidney was associated with other abnormalities. The side most frequently affected is the left, especially in male subjects; in the female the right and the left kidneys are equally liable to the malformation.

4. *The influence of age and sex.*—The abnormality is found twice as often in males as in females, a circumstance which

[1] *Edinburgh Medical Journal*, 1874, vol. ii, p. 13.

[2] *Lancet*, 1883, vol. i, p. 514.

[3] *R. Ins. Veneto di Sc. Elettere*, 1879.

[4] *Wiener medicinische Wochen.*, 1867, No. 2, S. 20.

[5] *Gazzetta Medica Italiana*, February, 1860.

may be accounted for by the fact that necropsies are more often procured in the former sex than in the latter. About 10 per cent of the specimens published were met with in the body of the fœtus or in newly-born children, and, in most of these cases, the anomalous condition of the kidney was associated with some other congenital deformity, such as imperforate anus, deformities of the bladder, uterus, ovaries, &c.

In individuals who have lived notwithstanding the deformity of the kidney, there is nothing remarkable to note regarding their age at the time of death, the mortality being almost equally distributed up to 60 years of age; over that age, as already shown, seventeen cases are recorded.

5. *Liability to disease in single kidney is marked.*—Chronic nephritis, renal calculus, tubercular disease, hydronephrosis, pyonephrosis, and abscess being the most common maladies met with. Morris[1] says—"Probably, as has been above stated, there is a tendency to chronic albuminuria in early or young life in persons with one kidney atrophied." . . . "When only one kidney exists, and that an 'unsymmetrical' organ, there would seem to be a considerable disposition to renal calculus. Of the twelve cases of 'unsymmetrical' kidney collected by Mosler, death was due more or less directly to calculus in the pelvis or ureter in nine of them; in the other three, cancer of the bladder and rectum involved the ureter, nephritis, and the consequences of obstruction due to congenital phimosis, were respectively the causes of death. In the case of cancer (Tulpius), a calculus had been passed *per rectum* in early life, and there was an opening from the ureter into the rectum through which part of the urine escaped."

[1] *Surgical Diseases of the Kidney and Ureter*, vol. i, p. 72.

I have collected eight cases of "single kidney" in which calculus was present. These were published by Rhodius,[1] Jobi,[2] Rokitansky,[3] Rayer,[4] C. Julia Fontelle,[5] Everard Home,[6] Sylvaticus.[7]

Chronic tubercular and interstitial nephritis is also very common, a few cases of hydronephrosis have been recorded, and one or two of tubercular disease, pyonephrosis, and abscess.

6. *The condition of the kidney, ureters, and blood-vessels on the affected side.*—In cases of congenital absence of one kidney the ureters and renal vessels on the affected side are absent, or only represented by a cord of fibrous tissue, and in all cases where a rudimentary ureter has been found, the opening into the bladder has been obliterated. Indeed, single kidney due to want of development may be distinguished from that caused by disease and atrophy by the condition of the ureters and the blood-vessels.

When "single" kidney is the result of disease, the condition of the diseased kidney varies very considerably—it may be represented only by a mass of fibrous tissue, a small congeries of cysts, or a nodule of fat. Sometimes the kidney is very small, and occasionally lobulated; there may be remnants of renal tissue remaining, and the ureters may be either occluded, patent, or even dilated. The appearance of the wasted kidney

[1] *Mantissa Anatomica, Observatio*, 1661, xxxii, p. 21.

[2] à Meek'ren, *Observationes Medico-Chirurgicæ*, Amstelodami, 1862, cap. xl, p. 169.

[3] *Lehrb. der Pathologischen Anatomie*, 1861, Bd. iii, S. 317.

[4] *Traité des Maladies des Reins*, 1839, tom. i, p. 404.

[5] *Archives Generales de Medecine*, 1824, tom. ii, p. 517.

[6] *Practical Observations on the Treatment of the Diseases of the Prostate Gland*, London, 1811, vol. i, p. 68.

[7] Cited by Lieutand, *Historia Anat. Med.*, tom. i, p. 284.

depends upon the causes of atrophy, which are either sudden and complete obstruction to the passage of urine from the pelvis, or obliteration of the renal artery at an early period of life. Frequently we meet with greatly wasted kidneys as a consequence of disease late in life, as, for example, in tubercular lesions, or in chronic inflammatory affections attacking one kidney only. These, however, do not come within the scope of this paper.

The pelvis and ureter of the "single kidney" are seldom much altered, and are never double, as has been described by some authors. Cases of kidney provided with double pelves, double ureters extending to and entering the bladder at different points, must be looked upon as examples of "fused kidney" rather than of true "single kidney." In many congenital cases, however, the arteries and veins are anomalous in their distribution, and as might be expected are collectively larger in size than normal.

Dr. M. Wilson [1] describes a case of congenital absence of the right kidney where the left organ was enlarged, circular in form, and lobulated on the surface, and situated close to the brim of the pelvis, in front of the common and external iliac arteries of that side, with which it was in contact. Its duct, which was enlarged at the hilus, so as at first sight to resemble a cyst, gradually narrowed, but continued to be of greater calibre than usual throughout its course, except at the point of entrance into the bladder, where it assumed the normal size. The left renal artery came off from the point of bifurcation of the aorta, passed obliquely downwards and outwards, resting on the front of the left common iliac artery, and entered the upper extremity of the kidney, having previously divided into two branches. Dr. W. F. Menzies [2] describes a

[1] *Edinburgh Medical Journal*, vol. xx, part i, p. 13.

[2] *Journal of Anatomy and Physiology*, vol. xxi, p. 111.

case of "single kidney" in which he states that the arterial supply was as follows:—

"Just above the bifurcation of the aorta a branch was given off from the anterior aspect, and ran to the inferior internal corner of the kidney, entering it about a quarter of an inch from the edge of the posterior surface. From the right common iliac a third renal artery took its origin, and entered the organ in close proximity, but inferior to the former. The middle and inferior sources of supply were long straight vessels of similar lumen to the superior."

Similar anomalies of the circulation in "single kidney" have been noticed by Hebb,[1] Strube,[2] Macdonald Brown,[3] Macdonald,[4] Duckworth,[5] Th. Tourtual.[6]

7. *Malformation of other organs*, such as the rectum, the bladder, the uterus, the vagina, and the ovaries, frequently accompany congenital defects in the kidney. This is not to be wondered at when we remember the close embryonic relationship of these parts, but this is a subject which is rather beyond the scope of this paper.

8. *The position of the adrenal body* on the affected side varies considerably. Sometimes, where the kidney is small or altogether wanting, the adrenal body is natural in size and normal in position; on the other hand, however, commonly the

[1] *Transactions of the Pathological Society of London*, 1885, vol. xxxvi, p. 281.

[2] "Ueber Congenitale Lage- und Bildungsanomalien der Nieren," *Virchow's Archiv*, 1897, Bd. 137.

[3] *Journal of Anatomy and Physiology*, vol. xxviii, p. 197.

[4] *Lancet*, 1885, vol. i, p. 979.

[5] *Transactions of the Pathological Society of London*, 1896, vol. xx.

[6] *Zweiter Anatomischer Bericht u.s.w.*, Munster, 1833, S. 69.

adrenal body is misplaced, and undoubtedly in a few instances may not be present; or, again, the "single kidney" may have two adrenal bodies, as in a case published by Liebmann,[1] where a "single kidney" lying in the pelvis had two adrenals associated with it. Brumer[2] states that in forty-eight cases of "single kidney," which he had collected, the adrenal bodies were only absent in five.

Absence of both kidneys is found in the lower grade of monstrosities only, and, according to Beclard, this anomaly is most frequently met with in acephalous monsters. Chaussier[3] showed a fœtus in which the urinary bladder, kidneys, and uterus were entirely absent, and Mayer[4] also published an example where the same organs were wanting. These cases may be of great interest from the embryological standpoint; and from the physiological side they are also of interest, as illustrating that the most important functions of life may be preserved *in utero*, without the presence of any renal tissue; but they are of no practical value to the surgeon.

II. Variations in Form and Size.

1. *General variations in form: Lobulation.* — Slight changes in shape from the typical normal kidney are by no means uncommonly met with in the *post-mortem* room.

It is a curious coincidence that within a few weeks of one another I have had occasion to treat two cases (one sent to me by Dr. Joshua Ferguson, Paisley, the other by Dr. M'Kenzie Brown, Beith) of malformation and very marked

[1] *Centb. für Chir.*, 1887.

[2] *Virchow's Archiv*, vol. lxxii, p. 344.

[3] *Bull. de la Faculté de Méd. de Paris*, 1810, p. 35.

[4] *Journal des Progrès*, tom. iv, p. 281

lobulation of the kidney, demanding operation on account of suffering similar to that occasioned by renal calculus. In both cases stone was suspected by the patient's medical adviser, and by me prior to full examination. In both cases *x*-ray photography failed to show the presence of stone, and on exploration the organs were seen to be very small in size and deeply lobulated. I have failed to find instances of similar conditions discovered during life and giving rise to severe pain.

In the more marked instances the organ may be elongated so as to become sausage-shaped, or it may be increased in thickness and globular in form, resembling the shape of the kidney in the fœtus. In a few cases the kidney has been found to assume the discoid shape. These variations, from what we may assume as the normal type, are often unassociated with any other anomaly; but when an abnormal condition exists, such as malposition of the kidney, atypical distribution of vessels, or malformations of other genito-urinary organs, then lobulation of the kidney is more frequent in occurrence, and more marked in degree. In the fœtus and in young children slight lobulation is seen, but usually after the first year of life the lobules become fused, and are no longer apparent, unless in exceptional cases. In some of these the separation of the lobules may not be very distinct on the surface of the organ, but if a vertical section of it be made the original lobulated condition of the gland is seen. The persistence of this fœtal condition is generally more marked at the anterior than at the posterior aspect of the kidney. A section of the kidney shows the medullary substance arranged in wedges, which forms the pyramids, separated from one another by the columns of Bertini. These pyramids correspond to the embryonic lobules of the kidney, though several lobules may fuse together in one pyramid.

2. *Hypertrophy of one kidney.*—Hypertrophy of one kidney is not often met with independently of some condition which has produced a functional weakness of its fellow.

Hypertrophy of both kidneys is, however, often seen in cases of diabetes insipidus, and perhaps also in diabetes mellitus.

Enlargement of one kidney only may, however, occur independently of any functional inactivity or structural defect of its neighbour. The kidney may go on increasing in size beyond the normal limit, just as we may have excess of growth in one limb, or undue growth of individual fingers or toes, of the tongue, the larynx, or the lower jaw.

CASE XXXI.—*Simple hypertrophy of the left kidney only —Right kidney normal in size and appearance.*

At a *post-mortem* examination upon a man, 36 years of age, who died from fracture of the skull, I found the right kidney to be normal in weight, $6\frac{1}{2}$ oz., while the left weighed $10\frac{3}{4}$ oz. The man was of average height, and weighed $11\frac{1}{4}$ st. Both kidneys, on microscopic examination, were found to be typically healthy, with the exception of the histological elements of the left kidney, which were uniformly enlarged, as has been observed in cases of compensatory hypertrophy.

3. *Fusion of two kidneys.*—(*a*) Horse-shoe kidney; (*b*) sigmoid kidney; (*c*) disc-shaped kidney. The amount of fusion that takes place between two kidneys varies greatly. We may have the two organs united together across the vertebræ, at their lower extremities, by a narrow, thin, and flat isthmus, which may be formed of connective tissue only, as illustrated in Fig. XX (p. 210), or the union may be made up of kidney parenchyma. These are the lowest grades of coalescence, and from these we meet with all degrees of fusion until we reach a condition where the two kidneys become

completely incorporated in one another, so as to form either one disc-shaped organ (Fig. XXV, p. 219), generally situated in the middle line, or an elongated body on one side of the spine, the sigmoid kidney (Fig. XXIV, p. 216); but in fused kidney, however unshapely the renal mass may be—the renal form may be entirely lost on both sides, the hilum may be absent, the pelvis may be distorted, and the blood-vessels most irregular in their distribution—there is still one feature in all its varying forms, namely, that they all possess evidence of two ureters, and not one only, as in true examples of single kidney.

We will first consider the lower degrees of fusion, and afterwards will give instances where more complete incorporation of the two organs has taken place.

(*a*) Horse-shoe kidney is the most common form of fusion. The two organs are joined together at their lower ends, sometimes by a simple band of tissue, as, for example, in Figs. XX and XXI (pp. 210, 211). In other instances the union is more complete, while the renal form of the two lateral segments may not be retained, as in Fig. XXII (p. 212). Or again, as in Fig. XXIII (p. 213), not only may the renal outline be considerably distorted, but there may also be marked lobulation, as well as anomalous distribution of the blood-vessels or deformity of the pelves and ureters.

CASE XXXII.—*Horse-shoe kidney, united by an isthmus of fibrous tissue at the level of the bifurcation of the aorta —Renal form well retained.*[1]

Horse-shoe kidney from the body of a man who died of pneumonia; the isthmus which unites the lower ends of both kidneys to one another is about 1 inch broad, and is situated in front of the bifurcation of the aorta; that vessel is

[1] Glasgow Royal Infirmary Museum, Series VII, No. 3.

unusually small in size. The right ureter arises from the pelvis by two distinct channels, and passes downwards in a groove which is more distinctly marked than the corresponding one on the left side. The left ureter occupies a similar position, but the pelvis from which it arises is almost normal in form.

. The blood supply is by five arteries, which pass off directly from the aorta. Two arteries supply the right segment,

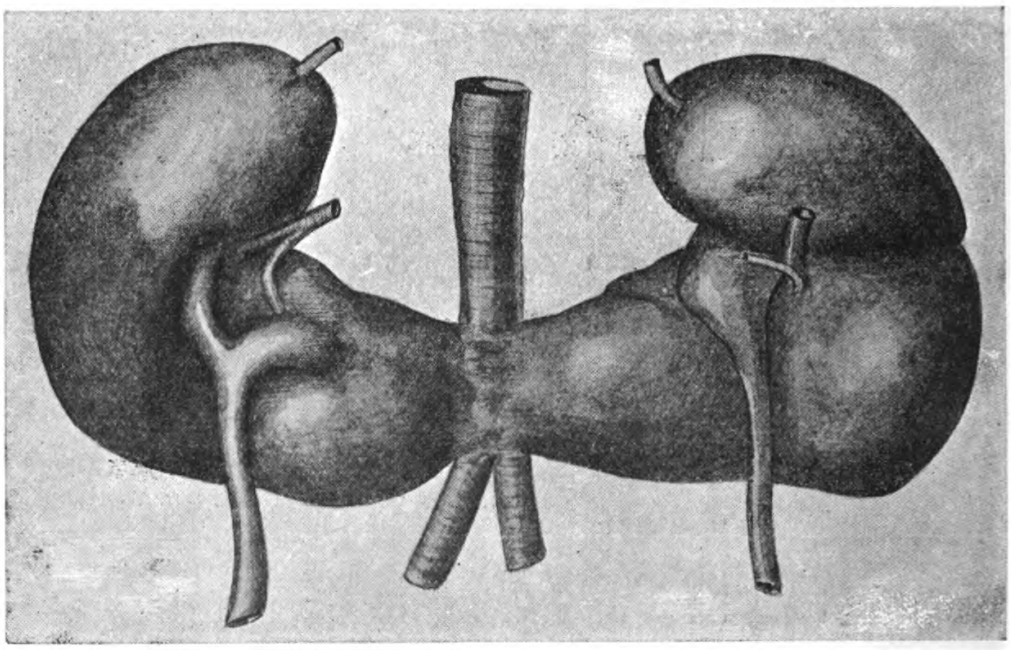

Fig. XX.

while the left is supplied by three. Considering the anomalous distribution, the arterial supply is wonderfully symmetrical. On both sides an artery passes directly to the upper and convex aspect of the kidney, while the other arteries pass into the kidney at the hilum. In the specimen the veins have not been preserved (Fig. XX).

Drs. Sutherland and Edington published in the *Glasgow Medical Journal* (vol. xlix, p. 89) an example of horse-shoe

kidney where the departure from the normal is even less than in the case just referred to. In their case the two kidneys are united by an isthmus of renal tissue which measures 1·3 cm. vertically, and 3 mm. antero-posteriorly. Both kidneys, however, are distinctly lobulated (Fig. XXI).

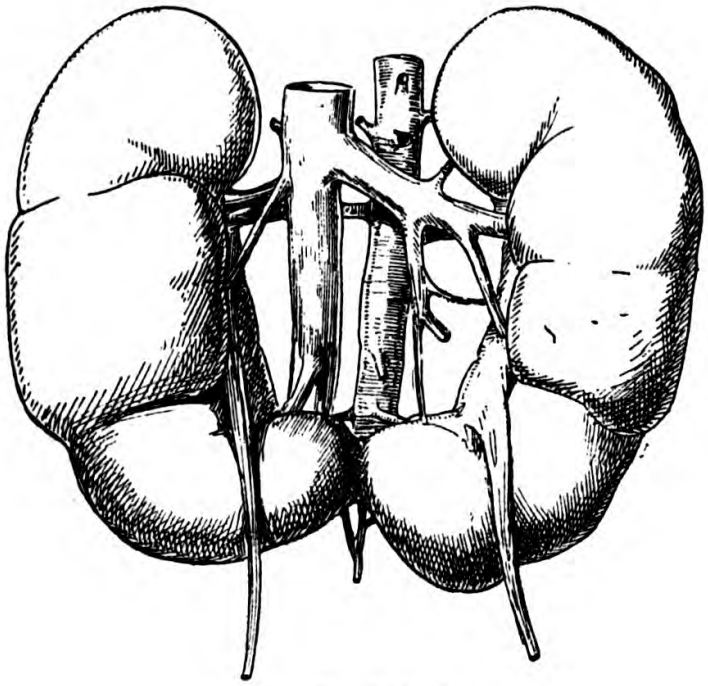

FIG. XXI.

CASE XXXIII.—*Horse-shoe kidney with lobulation and complete fusion of both kidneys, malformation of pelves, and anomalous distribution of blood-vessels.*

Both kidneys retain to some extent their renal form, and are united at their lower ends by a distinct lobule, which is marked off by two deep grooves. On the right side the pelvis is not greatly malformed, but on the left it is abnormally small, and is separated into two distinct branches, one passing to the upper, the other to the lower part of the organ. The right segment receives one artery, while the left is supplied by two, one entering at the hilum, the other close

to the upper end of the kidney. Both renal veins pass out at the hilum (Fig XXII).

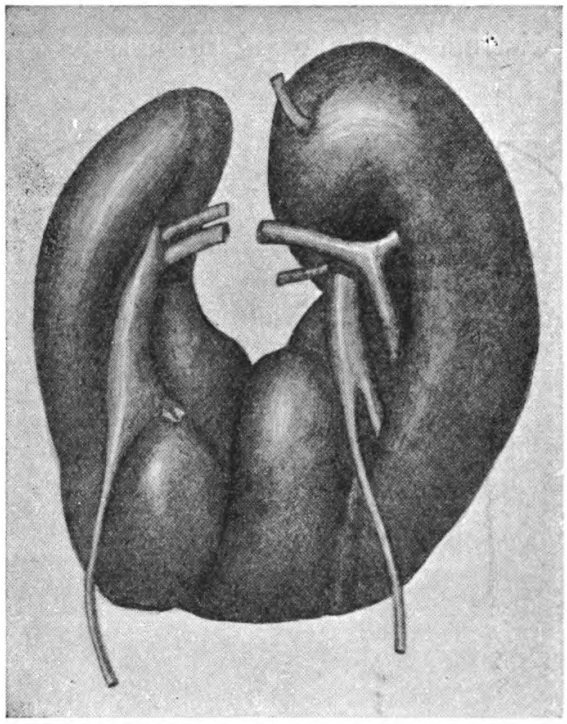

FIG. XXII.

CASE XXXIV.—*Horse-shoe kidney with complete incorporation of the two organs—Lobulation of both segments, the ureters deformed, and anomalous distribution of the blood-vessels.*[1]

The two kidneys are completely united at their lower ends, and the whole renal mass, although lobulated, is, roughly speaking, uniform in diameter, and in this respect contrasts with the previous specimens.

When removed from the body the mass weighed 15½ oz. The arteries, which are small in size, sprang direct from the aorta, and the veins passed to the vena cava direct. On the

[1] Royal Infirmary Museum, Series VII, No. 4.

right side three arteries enter the kidney on its upper aspect, while the left segment is supplied by an artery which enters the deformed hilum on the right side. Three venous trunks unite to form one vein before the blood is emptied into the vena cava, while on the left side one vein only leaves the kidney from the hilum. On the right side the pelvis is divided into three distinct branches, which unite at the lower limit of

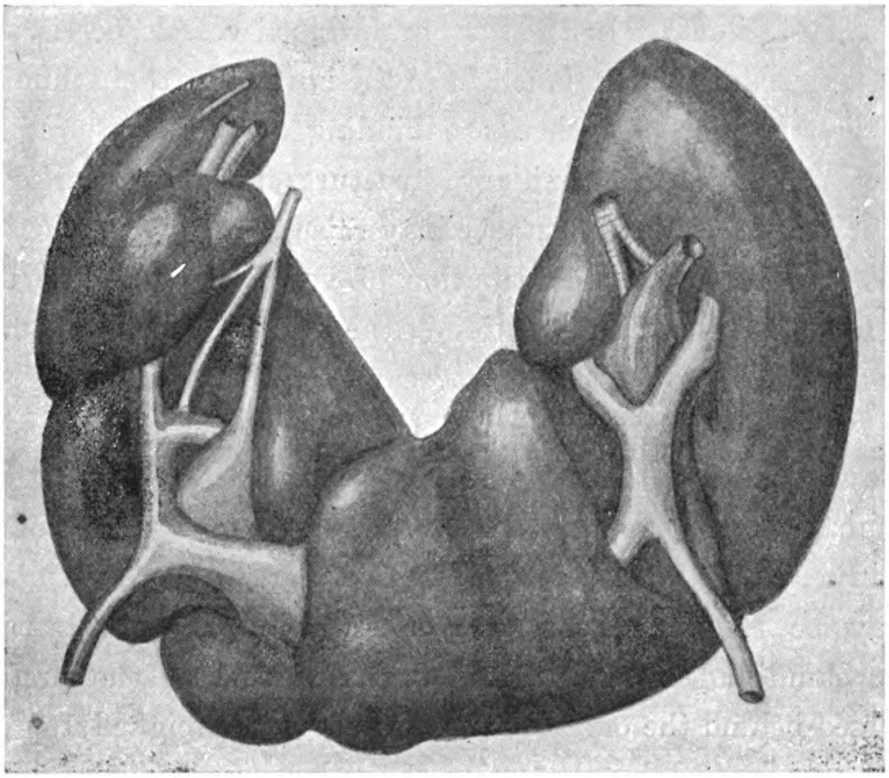

Fig. XXIII.

the horse-shoe to form the right ureter. On the left side the pelvis is also segmented into three parts, forming roughly with the ureter the appearance of a St. Andrew's cross. The ureter passes downwards in a deep groove on the anterior aspect of the horse-shoe (Fig. XXIII).

As a rule, the horse-shoe kidney rests on both sides of the

spinal column, but lower down than normal, the isthmus generally crossing the vertebral column about the level of the bifurcation of the aorta. The band of union is almost always at the the lower extremity, so that the concavity of the horse-shoe presents upwards. Cases, however, have been recorded where the union was found to be at the upper, in place of the lower, ends of the organs. It has been already shown that the bond of union between the two segments may be slight, or may be very intimate. In the former, the blood-vessels, pelvis, and ureters seldom depart much from the normal in their number or distribution; but when the binding of the two organs is very complete, the auxiliary structures also are markedly anomalous. This circumstance may raise the question whether or not the anomalous distribution of vessels may be regarded as a cause of the malformation of the kidney. The pelvis may be divided into several separate cavities, which unite to form the ureter some distance from the hilum. Monquiot[1] publishes a case where a kidney was placed transversely across the lumbar vertebræ, and had four pelves, four ureters, and as many arteries and veins. Whatever the other deformities may be the ureters seldom pass behind the renal mass. Durham,[2] however, describes a case in which the ureters passed behind the organ. The united mass weighed 13½ oz., and was formed by the union of the lower extremities. The structure of the kidney is described as normal.

Sutherland and Edington describe an interesting example of horse-shoe kidney, in a male child, where there was a pyonephrosis limited to the left segment. On this side the pelvis was greatly dilated, and there were cavities representing dilated calices, which largely replaced the renal tissue, and still contained remains of pus. The left half of the isthmus

[1] *Journal des Savants*, 1878, Mai 16me.

[2] *Guy's Hospital Reports*, 1860, p. 407.

showed a similar lesion; the right side of the specimen and the corresponding portion of the isthmus were normal.

Morris[1] describes and illustrates a most unusual form of fused kidney, and one with which I am not familiar. The two kidneys lie together, as if the hilum of one kidney was placed against the outer convex aspect of the other. The following is his description of the specimen:—

"The two kidneys formed an irregularly-shaped mass, which weighed 13 oz., and was lying on the front of the promontory of the sacrum. It was not an ordinary horse-shoe, for the vessels and ureters were arranged most unusually. The central part of the mass was fissured by a sulcus, in which the ureter for the left kidney coursed downwards and the vein for the same upwards, passing into the vena cava just above the junction of the two iliacs. In the right half of the mass the ureters and vessels, instead of being situated centrally, were on its outer side, the ureter being in front of the vessels as in the left, and as is usual in fused kidneys. The arterial supply in each consisted of two or three arteries for each half of the mass, about the size of radials derived from the common iliac arteries, and entered the lower part of each kidney. The suprarenal capsules were in their normal positions. The renal substance to the naked eye was healthy."

(*b*) *Sigmoid kidney.*—Sigmoid kidney is an end to end fusion of the two organs. In this anomaly both kidneys occupy one side of the body only; but while the condition is unilateral, it cannot be properly included under the term "single kidney."

The following specimen from the Museum of the Royal Hospital for Sick Children, given to me by Dr. Lewis R. Sutherland, illustrates very beautifully a typical sigmoid

[1] *Surgical Diseases of the Kidney*, 1885, p. 96.

kidney. I may quote his description of it in the *Glasgow Medical Journal* for February, 1898, p. 95:—

"*Fusion of kidneys in a female child.*—The fused mass, which measures 11·5 cm. in length, presents an elongated reniform outline, and is possibly formed by the superposition of one kidney on the other, as represented in the accompanying sketch (Fig. XXIV).

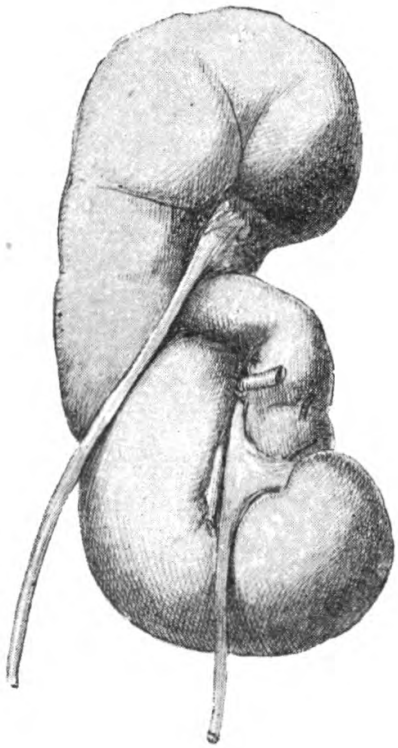

Fig. XXIV.

"The anterior surface of the mass is irregularly lobulated; the posterior surface is smooth. There are two distinct pelves, one above the other, each in its own hilum. The upper hilum presents antero-internally; the lower anteriorly.

"The ureters, which are of normal dimensions, pass downwards and outwards from the corresponding pelves, and lie in grooves on the anterior surface of the mass. The upper

entered at the right, the lower at the left angle of the trigone. The bladder was normal. The vascular relations were not fully determined.

"The suprarenal bodies were normally disposed. An examination of the generative organs was not made. Microscopic examination of the fused mass shows normal renal tissue.

"The specimen was removed *post-mortem* from a girl, about 7 years of age. The mass occupied the right renal region, and was distinctly palpable in life (G. H. E.). There was no trace of renal tissue found on the left side.

"*Note.*—The appearances suggest an incomplete union of the kidneys—the smaller (lower part of the mass) representing the left; the larger (upper part) the normally placed right kidney.

"From the relations of the lower ureter and pelvis inversion of the left kidney may possibly be inferred, as well as coalescence with the anterior surface of the inferior extremity of the right kidney. (Royal Hospital for Sick Children.)"

Almost precisely similar specimens are described by Dr. G. Broesike,[1] of Berlin, and by Dr. A. Birmingham.[2]

Sigmoid kidney may be regarded as intermediate between horse-shoe kidney and disc-shaped kidney. The first-mentioned fusion is very complete, while in the latter only the lower extremities of the organs are united. They differ also in the circumstance that the disc-shaped kidney and the horse-shoe kidney are most frequently placed in the middle line, while in sigmoid kidney one kidney is transferred to the opposite side, where it is joined to the lower or inner part of

[1] *Virchow's Archiv*, November, 1884.

[2] *Dublin Journal of Medical Science*, vol. xc, p. 47.

the opposite organ. Probably sigmoid kidney is the rarest form of fusion.

(*c*) *Disc-shaped kidney.*—Disc-shaped kidney is applied to those instances where incorporation of the two organs is very complete, as, for example, in the following case—an illustration of which has been given to me by Drs. Sutherland and Edington :—

"*Fusion of kidneys in a male infant—Hypospadias—Umbilical hernia sac.*—The kidneys form a mass of approximately reniform outline, measuring 6·5 cm. vertically, 3 cm. laterally, and 2·5 cm. antero-posteriorly. The anterior surface shows distinct lobulation; the posterior surface is smooth (Fig. XXV).

"The hilum faces anteriorly or antero-internally, a small amount of renal substance being situated towards the middle line behind. Emerging from the hilum are two distinct simple pelves, one above the other. This is corroborated on making a section of the mass. The lower ureter passes to the right side of the trigone, and is crossed anteriorly by the upper ureter on its course to the left side of the trigone.

"There are three sets of renal arteries:—(1) An upper, entering the upper end of the hilum; (2) a lower, entering the lower end of the hilum; and (3) a third vessel supplying the intermediate parts. Branches (1) and (3) arise from the lateral aspect of the aorta, one above the other at the crossing of the renal vein. Branch (2) arises from the anterior aspect of the aorta to the right and below the origin of the inferior mesenteric artery. The renal vein is formed mainly by three tributaries emerging from the upper and middle portions of the hilum. It crosses the aorta in the normal situation of the left renal vein. There is entire absence of corresponding renal vessels on the right side.

"The specimen shows further the obliterated hypogastric arteries, and a portion of persisting urachus likewise obliterated. The bladder is normal (shown turned downwards and forwards in the figure).

"The specimen was removed *post-mortem* from a male

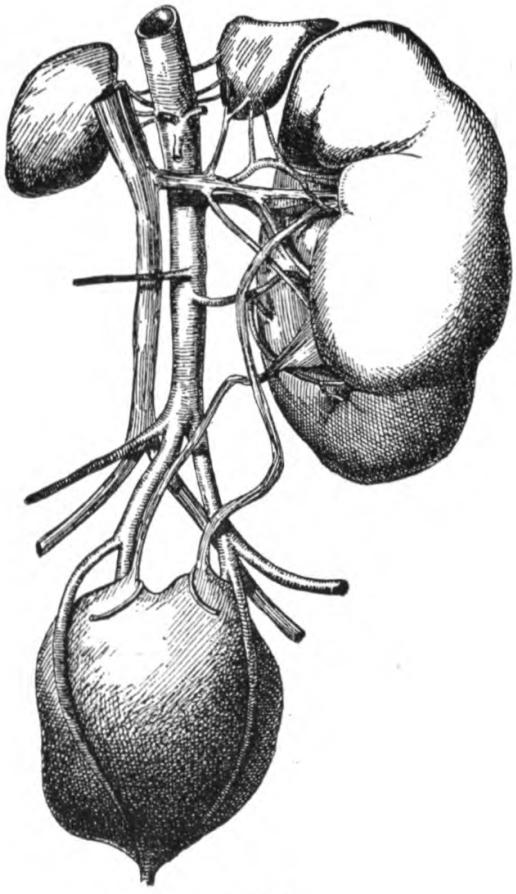

FIG. XXV.

infant, aged 2 months, who died of acute broncho-pneumonia.

"The 'fused kidney' occupied the left side. There was entire absence of kidney on the right side. The right suprarenal body, however, was present, as shown in preparation, but markedly flattened out on the under surface of the diaphragm. The left suprarenal body occupied its normal

position. Both suprarenal bodies were supplied by vessels arising directly from the aorta, the left receiving in addition two twigs from the highest renal artery. The left suprarenal vein emptied into the left renal vein, the right suprarenal vein directly into the inferior vena cava. Microscopic examination shows a normal structure. The vasa deferentia, vesiculæ seminales, and testes were normal. There was fairly well-marked hypospadias. There was also a small umbilical hernia sac.

"*Note.*—The relations of the ureters to one another, and the origin of the lowest renal artery, are compatible with the possibility of the lower half of the mass having occupied a position to the right of the median line. (Royal Hospital for Sick Children.)"

III. Variations in the Pelvis, Ureters, and Blood-vessels.

Malformation of the pelvis and ureters is fairly common, but these are generally of little importance.

The pelvis and upper 2 inches of the ureter are very frequently abnormal in cases of misplaced or malformed kidney, but even where the kidney is normal in position and in form the ureters may be deformed. These abnormalities have been already fully illustrated in the foregoing cases, in some of which the pelvis has been seen to be double or in several divisions, each of which may have a separate connection with the ureter.

The ureter may be double only for a short distance in its upper part, but in rare instances it has been found so throughout its whole course. We have seen a double ureter extending to within 2 inches, and cases have been described where it has extended to within 1 inch, of the bladder.

Mr. John Wood[1] describes such a case. He says "that in a male subject four ureters were discovered emerging from the hilum of each kidney; they united after proceeding about 4 inches towards the bladder, forming a pelvis from which sprang the ureter proper. On section of one kidney the hilum was found occupied by a quantity of fat and connective tissue, embedded in which the ureters could be traced to the infundibula communicating with the calices and pyramids; thus there was no pelvis within the hilum, but the calices united to form infundibula of which these ureters seemed to form a continuation, and they became united in a pelvis some distance from the kidney."

Cases also have been described by Thomson, Coen, Richmond, Longé, Féré, Josso.

It may be safely said that no abdominal arteries are more irregular in their distribution than are those which supply the kidneys. They may vary in number, in their source of origin, or in the mode in which they enter the kidney. Cases have been recorded where both renal arteries have originated from a common stem arising from the front of the aorta, or the renal blood supply may be augmented by branches from the internal, external, or common iliacs, from the suprarenal artery, from the hepatic artery, or from the middle sacral.

The mode of entrance of the arteries also varies. They may pierce the kidney at the hilum, or may enter at any part of its surface, but most commonly abnormal vessels are found at the upper extremity of the organ. Again, the renal arteries may give off branches to the diaphragm, to the ascending colon, to the liver, or to the pancreas.

These irregularities in source, number, and distribution are

[1] *Transactions of the Pathological Society*, London, vol. vii, p. 261.

well-known, and have been fully described by Professor M'Alister.[1]

Professor Joseph Coats showed a specimen at the Glasgow Pathological and Clinical Society,[2] which has some bearing upon the subject we are now considering. The specimen was one of hydronephrosis, where constriction of the ureter was caused by the pressure of an abnormal renal artery.

Professor Coats says—"The kidney has been supplied by two principal arteries. This artery has four branches, three of which pass into the kidney along the anterior border of the pelvis, whilst the fourth has passed rather downwards and backwards. In its passage this artery has encountered the ureter, and has crossed the latter shortly before its insertion into the apex of the pelvis. There is a deep groove produced by the artery, beneath which the ureter passes. The two rounded bulgings which here conceal the parts are respectively the dilated first part of the ureter and the apex of the pelvis. The dilated piece of ureter could be brought out by pulling on the ureter, and it was then seen that, at the place where the artery crossed the ureter, the wall of the latter was greatly thinned, the muscular coat being apparently destroyed."

We placed in the Museum of the Royal Infirmary a peculiar abnormality of the kidney associated with a malformation of one ureter. The left kidney is about 2 inches longer than normal, and is divided by a deep groove into two distinct parts; the upper, the larger, and the lower, the smaller part, are each provided with a distinct pelvis and ureter, but the ureters join about 2 inches from the lower border of the organ.

[1] *Journal of Anatomy and Physiology*, vol. xvii, p. 250.

[2] *Transactions*, vol. iii, p. 277.

Prognosis and Diagnosis.

While the number of cases of fixed malposition or malformation of the kidney now upon record is considerable, only in a few persons has inconvenience been occasioned during life; indeed, in the great majority of instances the morbid condition has been discovered only after death. In single kidney, so long as the organ remains free from disease and the ureter continues patent, the health of the individual is not interfered with so far as the renal functions are concerned. The danger is the plugging of the only ureter. It must be remembered that this danger is much greater in cases of malformed kidneys than in normal organs; their greater liability to disease and the greater disposition of calcareous matter to become deposited in badly developed kidneys is well known in cases of horse-shoe kidney and fused kidneys, there being two independent pelves and ureters. The risk of plugging of one ureter is not much greater than when the kidneys are normal in size and form. The displacement does, however, increase the risks to disease, and so renders the tenure of life uncertain. When one kidney is absent, the remaining organ is usually enlarged, and the increase in bulk may be detected by palpation, especially in thin subjects. The cystocope and ureter catheters afford valuable information by showing the condition of the orifices of the ureters, or by ascertaining the degree of activity of the kidneys. In cases where there is considerable wasting of one kidney, the urinary shoots from the atrophied organ are small in size and few in number as compared with those from the opposite organ.

In one of my cases of undeveloped and lobulated kidney, the proportion of shoots from the two kidneys were as 1 to 16. In single kidney one ureter orifice only can be seen. When

the two kidneys are fused into one mass, it may be felt by palpation through the abdominal parietes in front, or in the pelvis by rectal or vaginal examination. An important point to bear in mind is one to which I have already referred, namely, that persons who have congenital malformations elsewhere are more prone than others to the diseases we have just been considering. Consequently, if nephrectomy should be deemed necessary in persons having deformities, special care should be taken to ascertain the functional activity of the opposite organ before the kidney is removed.

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REFERRED TO IN THE TEXT.

—o—

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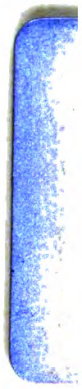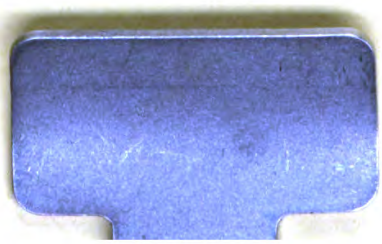
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