THE SURGICAL TREATMENT OF NEPHROPTOSIS BY OCCLUSION OF THE PERINEPHRIC FASCIAL SAC (CAPSULAR OCCLUSION).

BY

C. B. LOCKWOOD, F.R.C.S.ENG.,

CONSULTING SURGEON TO ST. BARTHOLOMEW'S HOSPITAL, ETC.

DURING the recent discussion on nephropexy and its results the speakers laid special stress upon fixation by suturing, and no other method of curing a loose kidney seems to have been contemplated by any of them. "A successful operation was one which efficiently and permanently anchored the kidneys in their normal position, and was free from unpleasant sequelae such as pain, weakness of the scar, persistent sinus," etc. But a movable organ like the kidney is not in its normal position when it has been immovably fixed to the abdominal wall, and it is certain that a large proportion of the kidneys which have been fixed regain their mobility.

In 9 out of 14 St. Bartholomew's Hospital cases* seen by Mr. Blakeway the kidney had become loose again. But the following suggests that even 9 out of 14 was not a large enough proportion.

On clinical grounds, a woman, aged 59 and moderately fat, was supposed to have a stone in the right ureter. A skiagram showed the stone at about the level of the umbilicus, which strengthened the belief that it was in the ureter. Then Mr. Reid made a new and admirable skiagram, in which is seen the outline of the kidney, its hilum and ureter, and the stone in the upper part of the pelvis of the ureter. But this skiagram also revealed the fact, hitherto unsuspected, that the whole of the kidney was below the level of the twelfth rib. When I performed nephrolithotomy the kidney was well below the twelfth rib and not easy to secure, because it slipped about so freely. So that scientific x-ray investigation might show that the percentage of kidneys which become loose again after they have been fixed high up has been underestimated.

It would be interesting if an x-ray investigation of cases of nephropexy could be carried out so as to give scientific evidence of the position of the kidneys, and also whether they had begun to move again.

Dr. Harrison Orton took an x-ray photograph of a patient upon whom, eleven years before, I had performed nephropexy on both sides for Dietl's crises. The photograph was taken with the patient lying upon her abdomen, and shows both kidneys "in correct position," but the question of movement of the kidneys was not raised, because I was not then aware that after nephropexy the kidney might remain high up, but nevertheless move again with respiration.

The St. George's cases when seen gave no better results than the St. Bartholomew's ones; out of 8 cases of nephropexy the kidney had remained "absolutely fixed" in one.²

Mr. Mills,³ who examined 30 Birmingham cases of nephropexy, and who gives such a clear and judicial account of them, says significantly "that most of these kidneys that are fixed high up still move normally in respiration." Incidentally, speaking of low fixation, he says, "A kidney fixed in this position is rarely associated with a cure of the symptoms." I infer that in some of those in which the kidney was high up and moved, a cure of the symptoms had ensued.

Sometimes the kidney may regain its mobility although more than one attempt has been made to fix it. Two attempts had been made to fix the right kidney of a nurse, but in the end it was still loose, slipped about in the abdomen, and entered a ventral hernia. The kidney, too, had probably been damaged, for separation showed that it secreted only a quarter as much urine as the left, and that of poor quality. I found a small kidney with the remains of some silk sutures at its lower end. The kidney was removed, the gap in the abdominal wall closed, and a cure

ensued. It would be instructive to separate the urine in most cases of nephropexy. I surmise that the kidney which had had sutures put into it would not always function properly.

Although so many nephropexies have failed to immobilize the kidney, yet there is evidence that fixation is well within the range of surgery. But there is also evidence that the fixation may inflict grave injury upon the kidney. I have already mentioned a case in which two attempts had left the kidney small and inadequate, and two other cases of injury have fallen within my own experience. The right kidney of a woman had been partially decapsulated and sutured to the abdominal wall.[†] The pain and discomfort persisted and the patient became a chronic invalid. I found the kidney firmly fixed to the posterior abdominal wall, and partially embedded in inflamed tissues, much engorged, and its cortex inflamed. It was removed, and the pain cured. I took this step most reluctantly. The loss of a kidney is a severe penalty to pay for a nephropexy which had been a mechanical success but a clinical failure. The inflamed condition of the kidney seemed at the time to preclude any other course. An operation which relieved the symptoms without any risk to the integrity of the kidney would have been much better. On consideration it seems possible that the kidney might have been set loose, and an attempt made to perform the operation which I am about to describe.

The third case was that of a married woman who came under my care for an injury. After a sharp attack of appendicitis the appendix was removed. A year afterwards nephropexy was performed for right nephroptosis. For a year the result was all that could be desired. Then the kidney was loose again, with an aggravation of the former symptoms. The kidney was explored with the view of fixing it again, but had been damaged so much by the first attempt that it had to be excised. Mr. Ernest Shaw reported that "the kidney weighed 3 oz.; surface red, torn, and rough in parts. Lining of pelvis ecchymosed (?) from trauma at operation . . . apparently slight chronic interstitial nephritis."

It is probable that some kidneys loosen after nephropexy because their true capsule is too delicate and their tissues too soft to hold sutures, rather than from want of a firm fixation to the twelfth rib, arcuate ligament, diaphragm, or contiguous parts. Once, in attempting nephropexy, I encountered this condition of the kidney. On another occasion after a stone had been removed from a loose kidney it was so soft that sutures would not hold. Attempts to fix kidneys such as these are not only likely to fail, but must be fraught with danger to the integrity of the organ.

But can it be physiologically correct to immobilize a mobile organ? One would surmise that the movements of the kidneys are beneficial in promoting the secretion and flow of the urine, the circulation of blood and of the lymph. It is not to be supposed that the movements of the kidney are a mere accident. Presumably they fulfil some useful purpose. The mobility which kidneys regain after they have been fixed is a significant fact; on reflection that is what might be expected to happen when an attempt is made to immobilize organs which are naturally mobile.

It is probable that the continuous movements of the diaphragm loosen the kidneys after nephropexy, and the general movements and joltings of the body would assist. Mr. Mills found that most of the kidneys which had been fixed high up still moved normally with respiration, and that those fixed low down did not move on inspiration. Clearly the latter would be much less influenced by the movements of the diaphragm. Mr. Mills says that fixation low down is rarely associated with a cure of the symptoms.⁴

When the kidney moves with respiration it moves within the perinephric sheath or capsule. I am indebted to the admirable essay of Wilson and Howell⁵ for a clear and correct account of this structure, and one which accords with my own dissections and operations. Briefly, the perinephric fascia is a sac containing the kidney. "It forms a complete investment for the kidney except at its hilum and lower pole." At the lower pole the

* Two of the 64 St. Bartholomew's operations were done by me after the method described by the late Stanmore Bishop, and which I found unsatisfactory. (Mobile Kidney, with a Description of an Operation for Anterior Nephropexy, *British Gynaecological Journal*, 1907.)

† I was told after the method described by Sir W. Watson Cheyne. (Movable Kidney, with Details of an Operation for Fixing the Kidney, *Lancet*, April 24th, 1909, p. 1155 et seq.)

perinephric sheath is, those authors say,⁶ continued downwards and inwards, as a funnel-shaped prolongation, which was just exterior to the sacro-iliac joint. "Here there is a weakness in the perinephric sheath, and it is down this channel that the kidney prolapses, and, guided by the direction of the funnel, the organ soon assumes a position with its long axis directed downwards and slightly inwards." The lower part of the perinephric sac may contain fat, and if that departs the sac becomes too big for the kidney. It is generally believed that loss of weight may loosen the kidney and that the trouble may cease when the sufferer gets fat again.

The perinephric sheath does not move because it is continuous with the diaphragmatic fascia, the crus of the diaphragm, and is attached to the vertebral bodies. At its upper and inner part, where some of it passes behind the suprarenal body, the perinephric fascia is thick and strong. Here it is reinforced by a strong fibrous band, the true "suspensory ligament" of Wilson and Howell. To perform nephrectomy the kidney has to be withdrawn from its perinephric fascial sheath. In those who are strong and athletic the kidney is firmly upheld by the perinephric fascia. When performing nephrolithotomy on a muscular young man the left kidney was in a thick and tough fascial sheath, and when it had been freed from that it was still strongly held there—the twelfth rib had to be excised for the removal of the stone.

My own observations confirm the accounts given by Wilson and Howell, except that I do not think the downward prolongation is as constant as they imply.

The perinephric sheath is also held firm by its continuity with the transversalis fascia, with the sheaths of the quadratus lumborum and psoas muscles, and by its attachments to the vertebral column.⁷

The perinephric fascia supports the kidney and restrains its movements during respiration and during the movements of the body. Although the average weight of the kidney is only five or six ounces, nevertheless this small weight is not to be ignored. When the kidney is loose in its sheath it can be felt moving about according to the position of the body. Standing up it falls towards the pelvis; lying on one side it falls to the other.

So the perinephric fascia not only restrains the movements of the kidneys during ordinary respiration but also during respiratory efforts and during joltings and shakings of the body. When the kidney becomes loose the perinephric fascia does not yield at its attachments. Its sac becomes too capacious, and then the kidney begins to have a wide range of movement within it.

This was clearly seen during an operation which I performed in December, 1896. A woman aged 42 suffered from intermittent hydronephrosis. The right kidney was loose, with a considerable range of movement. It felt enlarged, and was very tender. Inasmuch as the woman looked ill, and had become thinner, Mr. A. W. Lemarchand felt suspicious lest the kidney had a growth in it. The kidney was exposed by an incision through the right semilunar line. The hepatic flexure of the colon was at the iliac crest. The right lobe of the liver was 2 in. below the costal margin. The kidney was normal, but moved about freely within the perinephric fascia. It was easily pushed up, and kept in a high position by two silk sutures, which closed the opening which had been made in the perinephric fascia, and which also fastened it to the abdominal wall. My note says that those sutures seemed to fix the kidney, but clearly they did not fix the kidney, but only prevented it from falling again, its former receptacle having been obliterated. It was still a movable organ, but not a loose one. During this operation I found the liver much in the way; the incision would not have been made through the semilunar line had there not been reason to suspect a growth in the kidney.

Mr. A. W. Lemarchand reports that after this operation the symptoms disappeared, and the patient was well in June, 1902, five and a half years after the operation.

Later (December, 1906), after exploring the left kidney, which was very loose, the usual fixation was made by stripping its capsule and fastening it to the diaphragm and arcuate ligament. In addition, two stout silk sutures were inserted through the perinephric capsule at the lower end of the kidney and fastened to the abdominal wall. After this the kidney was 2 in. above the iliac crest and

very strongly held. I now think the sutures which held the perinephric sheath would have sufficed. That would have obviated the risk of damaging the kidney by stripping its true capsule.

After these experiences, I began to treat loose kidneys by occluding the loose and too capacious perinephric sac or bag.

THE OPERATION RECOMMENDED.

The steps of the operation have been as follows: The patient is placed in the usual position for nephrotomy with a sandbag or an inflatable air cushion between the table and the flank. An oblique incision is made about an inch below the twelfth rib, not quite parallel to it, but more in the direction of the fibres of the external oblique. The incision begins behind at the outer border of the erector spinae, and is carried forward for four or five inches. The length of the incision depends upon the thickness of the abdominal wall. The muscles are split in the direction of their fibres. No nerves are divided, and the bleeding is trifling. The fascia transversalis having been opened the kidney is sought for. I have found this step, usually a troublesome one, made quite easy by rolling the patient over until the wound faces the table. Then the finger is passed over the kidney to separate the perinephric fascia from the colon and peritoneum, and the perinephric fascia is taken between the finger and thumb at the lower end of the kidney, which is squeezed upwards within its sac. When the kidney has gone up as high as is judged necessary, the perinephric fascia is clamped at its lower end with pressure forceps, and ligatures of No. 2 or 3 twisted silk are passed round it with a curved needle. I have passed two and sometimes three of these silk sutures about half an inch apart. The ends of these ligatures are left long and used to fix the perinephric fascia to the abdominal wall. Before applying the pressure forceps the perinephric fascia is felt between the finger and thumb to make sure that the ureter is not being taken in. When the perinephric fascia has been ligatured the lower end of the kidney is at about the level of the twelfth rib and moving a little with respiration.

Unless it is necessary to explore the kidney it is better not to open the sac of the perinephric fascia. A case has been mentioned of a rather stout, elderly woman in which a stone was situated in the hilum of a loose and prolapsed kidney. The perinephric fascial sac had to be opened for the extrusion of the kidney. The opening was rather troublesome to close, especially as the perinephric fascia was thin and loose and had much fat about it. On the other hand, no difficulty whatever was met with in closing the opening after removing a stone from the pelvis of the kidney of a young woman with well developed muscles and firm tissues. Three chromic gut sutures were used to close the hole in the perinephric fascia and to obliterate the lower part of its sac. The kidney, which had been unusually loose, was then supported with its lower end just below the level of the twelfth rib, and four years afterwards was judged on clinical grounds to have remained there. During the four years the patient had led a very active life, her chief amusement being lawn tennis. I regret to have been unable to get an x-ray photograph taken.

The operation is completed by bringing the abdominal muscles together with chromic gut sutures, and suturing the skin with silk-worm gut.

This operation hardly takes more than half an hour, and is followed by very little shock, pain, or vomiting, and in these respects contrasts favourably with the operations which I have done to fix the kidney. The patients have hardly suffered more than they would have done after radical cure of hernia. After the operation I follow my usual routine after abdominal operations—namely, three weeks in bed, three weeks on a couch, six weeks' gentle exercise.

Although I have not been able to learn that a similar operation has been performed by others, yet it is difficult to suppose that a proceeding which seems to fulfil the pathological conditions so well can have been overlooked.

Surgeons have, doubtless, been deterred from dealing with the perinephric capsule by the emphatic condemnation which has been meted out to that course. For instance, Sir Henry Morris in his admirable work⁸ writes:

In one particular, however, all operators are now agreed, namely, that the original plan of Hahn, and every modification

of it, whereby only the perinephric tissue—the fibro-fatty investment of the kidney—is shortened and fastened to the parietes, is useless or at any rate uncertain, and therefore unsatisfactory.

But Hahn,⁹ in the two operation cases which he described, did certainly not aim at the occlusion of the perinephric fascial sac. As I read his account, it appears that, after the kidney had been approached through an oblique lumbar incision, the "capsula adiposa" was pulled backwards into the wound and fastened there with six or eight catgut sutures, and the wound packed with carbolic gauze. It is difficult to see how this proceeding could adequately and permanently diminish the size of the too capacious perinephric capsule, and it is not surprising that it was abandoned.

Nephroexy has been sparingly performed in London hospitals—on an average, ten per annum in each of four large London hospitals (St. Bartholomew's, St. Thomas's, Guy's, St. George's)—because it is looked upon as a serious operation, which for a time makes the patient very ill, which may not cure the symptoms, and which may damage the kidney and weaken the abdominal wall.

Occlusion of the perinephric fascial sac is not a severe operation, does not injure the kidney in the least, and, as the abdominal wall is split and brought together again, it is not likely to be followed by ventral hernia.

I now give some of the results of the few operations which I have done.

Four years ago I performed nephrolithotomy upon a young married woman. Her right kidney, besides having a stone in its pelvis, descended below the level of the umbilicus and slipped about very freely, so that after the abdomen had been entered as far as the peritoneum by splitting the muscles in the flank it was exceedingly difficult to secure. After the removal of the stone the perinephric fascial sac was occluded with three chromic gut sutures. Four years after this operation the right kidney could not be felt, although in the meantime the patient had been leading a rather strenuous life—lawn-tennis being her chief amusement. So, then, occlusion of the perinephric fascial sac suffices to keep the kidney up.

A neurasthenic patient who was operated upon more than a year ago has been seen. The right kidney cannot now be felt. The patient says that she has had great benefit from the operation. "The backache and dragging are gone, and I can now walk about again and ride in trains and buses." In addition to the pain of backache this patient had symptoms pointing to intermittent hydronephrosis. She had had other operations done before, and says she suffered much less from the kidney operation than from any of them.

Another patient with backache, dragging, and symptoms pointing to intermittent hydronephrosis has been entirely freed from these symptoms, but only three months have elapsed since the operation.

A children's nurse, aged 38, was operated upon in April, 1909. I have been unable to see her, but in December, 1913, she wrote: "I am most grateful to be able to write you that I have now no trouble whatever from the kidney which was operated on. I rapidly recovered my strength, went back to my usual work, and have gone on ever since without a rest." Before the operation she had had severe crises with pain, vomiting, and blood in the urine. The presence of a calculus was suspected, but none could be found, although the kidney was explored.

As regards intermittent hydronephrosis, a remark made by Wilson and Howell¹⁰ is to be noted. "The portion of the ureter (about two inches) within the perinephric sheath is free to follow the kidney in all its movements, and thus a kink may be produced at its point of exit from the perinephric sheath," which does not yield. Mr. Alfred Johnson¹¹ has conclusively shown the truth of this.

So occlusion of the perinephric fascial sac in cases of nephroptosis cures the symptoms caused by the dragging upon the renal plexus, the obstruction of the renal veins, and the kinking of the ureter. A kidney which had been loose and prolapsed had, owing to kinking of the ureter, become a thin-walled cyst, distended with urine, and it had to be removed.

Calculi seem rather common in loose and prolapsed kidneys. I have met with this association in 5 cases of nephrolithotomy. It is, however, difficult to know whether the presence of the stone causes the looseness of

the kidney or whether the looseness of the kidney causes the stone. I suspect the latter is usually the case, but clearly it is desirable, after removing a stone from a loose kidney, to complete the operation by occlusion of the perinephric fascial sheath.

There are grounds for suspecting that loose kidneys are more liable to infection, either through the blood stream or by way of the ureter. Clinical histories are not very reliable, but I have removed a tuberculous kidney which had been loose for many years. Ascending colon bacillus pyelonephritis was severe and persistent in the case of a female with nephroptosis on the right side. The left kidney was in normal position, and did not suffer. Such considerations as these suggest a wider field for the treatment of nephroptosis by an operation which seems to be efficacious, is not severe, and does not endanger the kidney.

REFERENCES.

- ¹ *Proc. Roy. Soc. Med.*, vol. vii, No. 4, February, 1914, p. 137 et seq.
- ² Mr. Raymond Johnson, *Lancet*, January 24th, 1914, p. 245. ³ *Loc. cit.*, p. 130. ⁴ *Loc. cit.*, p. 139. ⁵ *Movable Kidney*, London, 1908, p. 12 et seq.
- ⁶ *Loc. cit.*, p. 12. ⁷ See also Morris, *Surgical Diseases of the Kidney and Ureter*, vol. i, p. 4 et seq., Figs. 2 and 3. ⁸ *Loc. cit.*, vol. ii, p. 221.
- ⁹ *Centralbl. für Chir.*, 1881, No 29, p. 450. ¹⁰ *Loc. cit.*, p. 13. ¹¹ *Proc. Roy. Soc. Med.*, vol. vii, No. 4, p. 150.

THE USE OF AN APERIENT BEFORE X-RAY EXAMINATION OF THE INTESTINE IN CHRONIC CONSTIPATION.

BY

RICHARD GOMPERTZ, AND MAITLAND SCOTT,
M.B., M.R.C.S., L.R.C.P.

From the X-ray Department, Duff House.

It does not appear to be certainly known to radiographers whether or not the presence of faecal accumulations in the last portions of the large gut influences the rate of passage of the mixture of bismuth and food in any constant manner.

If there be such an influence, it would seem that the gut should always be emptied by an aperient before an x-ray examination is made, in order to obtain comparable results in different cases. Some writers advise an aperient, whilst others do not mention it. Search in those books and journals to which we have had access has not afforded any definite evidence on the point; as it seems to be of some moment we have, therefore, at the suggestion of Dr. Spriggs, endeavoured to investigate it.

Four adult men, who had all suffered for many years from chronic constipation, for which there did not appear to be any cause in the nature of mechanical obstruction, were observed, the same procedure being employed in all.

Two series of photographs were taken in each case; the first series was not preceded by an aperient; in the second the bowel was emptied by a dose of castor oil on the night before the bismuth meals. Observations were made immediately at 4, 6, 12, 24, 36, and 48 hours after the bismuth breakfast, and at other times when necessary.

The following is a summary of the findings in the 4 cases:

1. The first case was one of delay in the stomach and colon. In the first series of skiagrams, before which no purgative was taken, the stomach emptied in about nine hours, and the transverse colon, which was reached in seven hours, not till 100 hours.

In the second series (after castor oil) the stomach emptied about one hour earlier, but the delay in the colon was not appreciably affected.

2. The second case was one of spastic constipation of the descending colon, the passage through the stomach and small intestine being normal. The stomach was emptied in four and a half hours and the caecum reached in four hours. The stasis in the large bowel was especially marked in the caecum.

On comparing the two series of skiagrams, it was found that the bismuth passed rather more rapidly in the first series than in the second one (after castor oil).

3. In the third case also the delay was in the large intestine, but here we found that the second series (after castor oil) showed a slightly more rapid passage of the bismuth.

4. The fourth case was one of moderate delay in the caecum, but the total time which the bismuth took to traverse the entire bowel was not abnormally long; the caecum was not quite emptied in thirty hours, while the bismuth had entirely left the rectum in forty-eight hours.

In this instance there was practically no difference to be noted between the two series of skiagrams.