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BY

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REPRINTED FROM

The New York Medical Journal
for March 15, 1890.



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THE SURGICAL TREATMENT OF
MOVABLE KIDNEY,
WITH REPORT OF FOUR NEPHRORRHAPHIES.*

BY A. J. McCOSH, M. D.

FIFTEEN years ago a movable kidney was regarded merely as a surgical curiosity. The subject was scarcely mentioned in our treatises on surgery. Even to-day it is not accorded the thought and observation which it merits. Many physicians and surgeons still regard this abnormality as one of very infrequent occurrence. Men of large experience acknowledge that they have never recognized a case of movable kidney, and they are apt to attribute the occasional diagnosis of this condition by some of their colleagues to a special enthusiasm. That the importance of the subject is becoming more recognized is shown by the attention which it receives in medical journals and the increased space accorded to it in our text-books. This abnormality is certainly one that ought not to be called rare, nor ought it to be denied that not uncommonly a movable or floating kidney causes considerable annoyance and in a few cases great suffering. I am convinced, however, that it is a condition which is frequently overlooked, and that symptoms for

* Read before the New York Surgical Society, February 12, 1890.

which it is responsible are often attributed to other causes. Unless specially sought for, it will rarely thrust itself on the examiner's attention. When patients lie on the back the wandering kidney is apt to return to its normal position, and generally it is only when they roll over on the opposite side or assume the horizontal position that the dislocated organ makes itself felt. If the patient is aware of its presence, some movement will be made or some position assumed which often will bring the misplaced kidney into contact with the hand that searches for it. Another reason for frequent failure to diagnosticate this condition is, that in the female the symptoms produced often resemble those caused by disease of the uterus or its appendages. The examiner's finger finds some abnormality in one of these organs, the mind is satisfied with this, and, instead of looking farther, decides that here will be found the cause of all the symptoms. Two cases in my own experience illustrate this. In one the ovaries and tubes had been removed, in another an anteflexion of the uterus had been remedied by divulsion and a stem pessary. Neither patient had been benefited by these operations. Each possessed a movable kidney. A complete cure was accomplished in the one case by a bandage, and in the other by a nephrorrhaphy.

In the post-mortem room it is only those who look for this condition that will discover it. After death the kidney falls back into its normal position, where it remains, unless manipulated for a distinct purpose by the pathologist.

A distinction is generally adopted between movable and floating kidney. A "floating kidney" is covered by peritonæum which forms a mesonephron, and it floats about inside of the abdominal cavity. A "movable kidney" is situated, as it should be, behind the peritonæum, and its movements take place between this structure and the muscular parietes behind. The kidney may be mobile inside

the adipose capsule, which is distended into a large sac, or this capsule may remain adherent to the kidney and move with it.

It will not be amiss to give a few figures as to the frequency of these abnormalities. The greatest difference of opinion exists on this point. Lindner* states that one woman in every five or six possesses a wandering kidney. This is of course a very extreme view. Skorczewsky † examined 1,422 patients with reference to this condition, and out of 1,030 females found a movable kidney in 32, and in 392 males a similar condition in 3. In 3,652 autopsies made by Ebstein in the Charité in Berlin, a movable kidney was noted in five cases, or 1 in 732. In 5,500 autopsies conducted by Rollet in Oppolzer's clinic, 22 cases were noted. Doubtless the estimate from autopsy reports is too low, as no special examinations were made to ascertain if this abnormality existed.

By far the greater number of cases occur in women; thus, in 474 cases collected by C. Schütze, 405, or eighty-five per cent., were in females. The right kidney is more often affected than the left. Morris gives the proportion as 12 to 1. Both kidneys are displaced in one out of every twenty cases (Landau).

Floating or movable kidney is a condition not dangerous to life, in the majority of cases not of grave importance, and which only very rarely demands surgical interference. In not a few cases, however, the result has been a life of suffering or of chronic invalidism. It is as much the province of the surgeon to rescue patients from these states as to interfere for the cure of more dangerous maladies. Although denied by some that this condition ever causes suffering sufficiently severe to warrant operative interference, yet it

* Lindner, *Wanderniere der Frauen*, p. 2.

† Morris, *Diseases of the Kidney*, p. 27.

seems to me that every unprejudiced observer, especially he who meets with many cases of abdominal troubles, must acknowledge that he has seen patients in whom the diagnosis was unmistakable and in whom palliative treatment had failed to effect a cure. Surgeons, however, are not by any means agreed as to the propriety of operation for the cure of a wandering kidney. At the last meeting of the British Medical Association, in the discussion on nephrorrhaphy this difference was clearly brought out. During the past year both in France and Germany the subject has been frequently discussed with the same result.

Landau* and a few others maintain that a movable kidney is not a condition which ever demands surgical interference. They maintain that nephrorrhaphy is not only unjustifiable, but contra-indicated; that the movements of the kidney are compensatory and prevent obstruction of its blood-vessels and the ureter.

At the other extreme is the view of Keppler,† who considers that a wandering kidney is a condition always attended by danger, and advises in nearly every case its extirpation.

The moderate and more reasonable view, that surgical interference is demanded only in exceptional cases, is the one held by the great majority of surgeons. Operation is not, however, justifiable until all other curative means—such as bandages, etc.—have been tried and failed. They agree as to the propriety of surgical interference, but differ as to the operation to be preferred. On the one hand, nephrorrhaphy is recommended; on the other, nephrectomy. The greater weight of opinion is decidedly in favor of the former operation. By such men as Agnew, Guyon, Küster, Keen, Kummel, Laugenbuch, Morris, Richardson, Schede, Terril-

* Die Wanderniere der Frauen, Berlin, 1881.

† Arch. f. kl. Chir., 1879, p. 520.

lon, Thornton, Weir, and indeed the majority of surgeons, nephrorrhaphy is considered a comparatively safe and satisfactory operation. There are a considerable number of others, however, who assert that it is a useless procedure and never results in a cure. L. Tait is an example of this class. At the British Association he declared that he looked back with inexpressible regret on the three cases in which he had been persuaded to perform the useless and unjustifiable operation of nephrorrhaphy "with the result that not one of the patients has been benefited in the least, and one of them has died under such circumstances that I think the operation might fairly be blamed for it. I shall have nothing more to do with fixing kidneys."* Lindner,† also, to a certain extent shares this view, and says that he would rather assume the risk of doing a nephrectomy than subject his patient to an operation which is not free from danger and where the result is so doubtful. Other surgeons of note advocate this same view.

The operation of nephrorrhaphy may often have failed to effect a cure. That such failure has resulted in a considerable number of cases is not denied. The operation has, however, effected a cure in many patients, and has ameliorated the sufferings of others. The operation is a comparatively safe one. The mortality is not over two per cent. Is the patient to be deprived of this chance for cure simply because certain surgeons are skeptical as to the beneficial results of suturing the kidney to the loin? Or is the misplaced organ to be extirpated by an operation the mortality of which is twenty-five per cent.? It seems to me that there should be only one answer to these questions, as there is ample proof that in very many cases nephrorrhaphy has been followed by most satisfactory results. The cases reported where permanent relief from suffering has

* British Med. Assoc., August, 1889.

† *Loc. cit.*

resulted in patients who have been under many years' observation by careful observers are now too numerous to be attributed to enthusiasm on the part of surgeon or patient, or to any mental effect produced by operation. While the condition of some patients who suffer from a dislocated kidney is serious enough to warrant an attempt at cure by nephrorrhaphy, in how many is it sufficiently grave to warrant the extirpation of that organ? (In thirty-six nephrectomies, collected by Lindner,* for movable kidney, nine died from the effects of the operation, equal to twenty-five per cent.) I should consider that there is no warrant for this latter operation until every other means has been tried and failed, and then only in the most desperate cases. An attempt should certainly first be made to fasten the kidney by means of suture. Should this attempt fail, it will be a question whether nephrorrhaphy should not again be tried. Numerous cases have been reported where a second nephrorrhaphy has resulted in cure, and, where failure has twice occurred, a third trial has been successful in more than one patient.

In the four cases where I have done nephrorrhaphy the diagnosis has been unmistakable, and every other means of relief for the three patients had been tried and failed.

CASE I.—Miss E., twenty-eight years of age, a German teacher, since girlhood had suffered dragging pain in her right loin. When she was sixteen it was so decided that she was taken to Professor Bartels, of Kiel, who diagnosed “floating kidney,” and ordered a bandage. This gave little or no relief, and was soon cast aside. Four or five years later she was taken to Paris. On recommendation of various surgeons, four or five different bandages were tried. These were soon discarded as useless. The only one which for a time gave relief consisted of a round pad at the end of a spring, like a hernial

* *Loc. cit.*, p. 45.

truss. This, also, was soon abandoned, as the kidney would escape beneath it and new distress was caused by its pressure. In 1882 I first saw the patient; she then complained of dragging, often cutting, pains in the right side of her abdomen extending down into the pelvis. Sometimes the pain would continue for weeks with but little intermission, and then for a time would almost entirely disappear. It was increased by bodily exertion and was more severe at her menstrual epochs. Occasionally the suffering was so great that she was obliged to remain in bed for days. The pain at night would often be as severe as during the day. Her other symptoms consisted of digestive disturbances. She often suffered from nausea and vomiting. Attacks of colic were frequent and severe. Flatulency was always present, and obstinate constipation existed. The diagnosis of movable kidney was made. The patient, after trying her bandages, etc., passed out of my hands for the next two or three years. On her return she reported that she had consulted numerous physicians, most of whom made light of her diagnosis of floating kidney. Among other methods of treatment employed was divulsion of the uterus and insertion of a stem pessary, which she wore for several months, to correct an antelexion of the uterus. During this time all her symptoms had increased in severity, especially after a fall, which she had received a few months before.

The patient, who is tall and very thin, was markedly anæmic. No *fœtor ex ore* (Lindner) was, or had been, perceptible. On physical examination, by a little manoeuvring on her part a hard, movable tumor was felt in the right side of her abdomen. This body could be grasped by the hand through the thin abdominal wall. It could be brought over to the median line and then down almost to Poupart's ligament. It was not sensitive to pressure. I examined the patient on many occasions, and in perhaps three times out of four could easily feel the tumor, while in the fourth instance every endeavor on the part of both would fail to dislodge it. The patient was anxious for operation, and entered the Presbyterian Hospital for nephrorrhaphy.

On April 8, 1888, the patient was etherized and placed on her

left side and belly. A vertical incision at the outer edge of the erector spinæ muscle was extended down to the circumrenal fat. This was found to be rather scanty. Through it the kidney could not be felt until pressure was made from in front by an assistant. The fatty capsule throughout its whole extent was torn through, and the posterior surface of the kidney was exposed. Its movements up and down on natural respiration were to the extent of an inch and a half; when the patient breathed more deeply their extent was two inches and a half. The slightest push when the assistant's hand was removed from the abdomen thrust the kidney out of sight. It was so unsteady that considerable difficulty was experienced in passing the sutures. A tenaculum thrust through its capsule quickly tore out. When somewhat steadied by the assistant's hand, I succeeded in passing the sutures. They consisted of four strong catgut threads passed through the capsule and a superficial portion of the cortical substance for a distance of about three quarters of an inch. They were then passed through the fasciæ and muscles of each side of the wound, but not tied until its deeper layers had been united by sutures of catgut. The sutures which had penetrated the kidney were then tied, bringing the organ firmly against the sutured fasciæ and muscles. The skin and cellular tissue were united, except in the lower fourth of the wound, which had been left entirely open, and at the bottom of which the lower end of the kidney could be seen. This was packed with iodoform gauze.

The operation was followed by no unfavorable symptoms. The urine was unchanged. The upper part of the wound, which had been sutured, united by primary union. The lower fourth filled up rapidly with granulations. The patient was kept on her back for two weeks, and at the end of the third week sat up. At this time nothing remained of the wound but a short sinus. At the end of the fourth week she was allowed to move about, but was cautioned against violent efforts for some time.

As soon as she left the hospital the patient felt that she was better. She experienced none of her old pains and suffered less from indigestion. The flatulency persisted for several months.

At the end of a year neither she nor I could feel the kidney, and no movement or effort on her part could dislodge it. She had gained twelve pounds in weight, and considered herself cured. I have seen her within the last week (twenty-two months since operation); she affirms that she has no pain, suffers but little from indigestion, and that her constipation troubles her but little. She is enthusiastic over the result of the operation.

CASE II.—Mrs. S., thirty four years of age, mother of two children, was kindly referred to me for operation by Dr. J. Lombard. Bandages and medical treatment had been tried in vain. Symptoms much the same as in last case, except that vomiting was more frequent and persistent. Belly rather fat but not pendulous. No fœtor ex ore. Bladder acted naturally. Urine normal. Patient was a working woman and desired operation, as, by reason of suffering, she was incapacitated from earning her living. The right kidney could be distinctly felt, was very movable, and not sensitive to pressure. In June, 1888, nephrorrhaphy was performed according to the same method as in Case I. An ample fatty capsule was found, and the kidney seemed to move inside this capsule, which apparently did not follow the kidney in its movements. Three sutures of catgut were used. After operation the patient had no untoward symptoms. At the end of a month the wound was healed and she was allowed to go out. I saw her again at the end of three months. Her pain had disappeared, and during the preceding two months she had never vomited, or even experienced nausea. The kidney could be indistinctly felt apparently in its normal position and firmly fixed. I have not seen the patient since, but at the end of six months from the date of operation she wrote saying she was a well woman.

CASE III.—Mrs. H., aged twenty-six, mother of three children, was kindly sent to me by Dr. T. G. Thomas. As a girl she occasionally suffered from attacks of severe pain in the right side of the belly. After marriage, attacks became more frequent and severe. During her first pregnancy her sufferings were much increased, and since the birth of her child had been gradually increasing in severity. The paroxysms were more violent, occurred more frequently, and continued longer. For two or three

months she might be comparatively comfortable, and then for an equal period her sufferings would be intense. Violent exertion would at once bring on an attack, and then for weeks she would be obliged to remain in bed, often for days under the influence of morphine. The pain she describes as gnawing in character and at times resembling severe "cramp colic." During this time she had been troubled with indigestion manifesting itself in flatulency and colic, occasionally nausea and vomiting. Since her first labor the patient had noticed a movable lump under the false ribs on the right side. She felt this before attention was called to it by her physician. She is positive that during her attacks of pain this mass increased in size and was exceedingly sensitive to pressure, which produced a sickish feeling. After the paroxysm passed off her right side would for days be tender. Often at night the pain was as severe as during the day. She had consulted numerous physicians, some of whom made the diagnosis of floating kidney, others of tumor of the bowel. Various kinds of treatment, including bandages, had been tried without benefit. During the last two years she had lost twenty pounds in weight. For six months she had been practically an invalid, scarcely venturing to leave the house, as any unusual movement resulted in an access of her pain. She had become much discouraged, was tired of life, and feared that she might succumb to the opium habit. With the hope that some operation might cure her, she came to New York from her home in Virginia. An examination was first made with the patient standing. The abdominal walls were found to be exceedingly lax. A solid, freely movable tumor was at once felt on the right side of her abdomen just below the ribs. This body could be grasped through the rather thin abdominal walls, carried to the left till it rested on the bodies of the vertebræ behind the umbilicus, and then back to its original position. When the patient lay quietly on her back it disappeared, and could be felt with difficulty. As she rolled over on her left side it became dislodged, and could be carried well to the left of the spinal column. Without difficulty an artery could be traced leading from the aorta to this movable body, where it terminated in a depression which, without doubt,

was the hilum of the kidney. These manipulations caused but little discomfort to the patient. The urine was normal. There had never been frequency of micturition. On examination a few days later, when complaining of considerable pain, the kidney was found sensitive to pressure, which produced a feeling of nausea.

On November 19, 1889, the patient was etherized and placed on the belly with the lower extremities hanging over the edge of the table. A vertical incision was carried down till the perinephric fat was exposed. This appeared normal in quantity. Before the lumbar fascia had been opened the fat was seen moving up and down an inch or more with the respiratory movements. The finger pushed against this adipose capsule felt no kidney and met with no resistance till it felt the hand of an assistant pressing upon the front of the abdomen. At the upper and external part of the wound under the twelfth rib, on deep palpation, a solid body was felt which slipped out of reach as soon as the finger came into contact with it. The house surgeon, Dr. Sharpe, by manipulations through the abdominal wall, brought this body against the fat at the bottom of the wound. The adipose capsule was then torn throughout its whole extent, and the kidney, held in place by the assistant's hand, came into view. It appeared to be of normal size, color, and consistency. When pressure was relaxed it moved freely up and down with the respiratory movements, the tunica adiposa sharing to a great extent in its movements. When the assistant removed his hand the kidney slipped out of sight and reach. It was easily forced back into the wound, and its pedicle was so long and flexible that it could easily have been pushed entirely outside the wound. It was united to the lumbar muscles by seven catgut sutures passing directly under the capsule for a distance of about half an inch, and necessarily through a superficial portion of the cortical substance. Three of these inserted on the border at the inner side of the wound and three on the opposite border were united to the edges of the divided muscles and fasciæ. One catgut suture, passing under the capsule for about an inch and through the muscles on each side of the wound, was not tied until the different layers, with the

exception of the skin, had been united. This closure was effected only in the upper fourth of the wound, the greater part being left open and packed with gauze down to the kidney, which lay at the bottom. No bad symptoms followed. The wound rapidly filled with granulations. The patient was kept on her back for seventeen days and then allowed to turn on the side. At that time the kidney could be indistinctly felt on deep palpation, and appeared to be anchored somewhat external to its proper position.

On the twenty-first day the patient remarked that she could feel the kidney below her ribs, and that it was movable. She was not mistaken, for the obstreperous organ, or the lower end of it, was distinctly felt just below the last rib. It was movable to a limited extent only, much less than it had been before operation. Fearing that in the future the result would be unsatisfactory, if it was not already so, I advised a second operation, to which she consented.

CASE IV.—On December 10, 1889, the patient (same as Case III) was etherized and the old wound reopened. Considerable cicatricial tissue was present where in the former operation the fatty capsule had been found. On tearing through this, no kidney was seen or felt. While before this organ was easily forced into the bottom of the wound, this was now a difficult matter. Adhesions evidently bound it at the external edge of the wound, for its tendency was to slip outward and forward, and considerable force was needed to hold it in such a position that it could be fastened to each edge of the incision. It was very evident that it had formed some new adhesions of considerable firmness. Three silk sutures were passed through the substance of the kidney for, perhaps, three quarters of an inch at a depth of about half an inch. They were then brought out through the fasciæ and muscles on each side of the incision, and, after these latter had been united, were tied over them. The skin was then sutured, a drainage-tube at the lower end of the wound passing down to the kidney. The patient made a good recovery. She was kept on her back for two weeks, and at the end of the third week was allowed to sit up. She was sent home wearing a bandage, with a pad pressing against the region

of the kidney. The result was apparently satisfactory. The kidney could be felt somewhat external to its normal position, but it was firmly fixed, and could not be moved either by the patient or myself. Within the last few days I have heard from the patient (two months after operation), and she is entirely free from pain.

The results attained in these four cases are certainly encouraging. One patient, at the end of two years, is completely cured. In another, at the end of six months, the result was in every way satisfactory. In the third patient the first operation was apparently a failure; what the final result of the second operation will be can not yet be decided, but, at the end of two months, the outlook is favorable.

Before discussing the technique of the operation, a word as to the best form of bandage. In the majority of patients the one that gives the greatest comfort consists of a well-fitting abdominal bandage made, in part at least, of some elastic material. At the point where the kidney escapes under the ribs is fastened a pad, in size, shape, and consistency made to suit each individual case.

More elaborate forms of apparatus are used, but, in the end, are generally discarded to be replaced by this simpler bandage just mentioned. As a rule, it is not necessary to wear any support at night.

Since the operation of nephrorrhaphy* was first introduced by Hahn in 1880, a number of different methods have been employed for fixation of the kidney. Practically, all procedures are alike in one point—that they fasten the kidney to the lumbar muscles by means of sutures. They are unlike in the material of which the suture is composed and the tissues through which it passes. Experience alone

* Néphropexie (Le Dentu).

will determine which method is followed by the best results. The incision down to the adipose capsule is made as in other operations on the kidney. It may be either vertical or oblique, between the last rib and the crest of the ilium, external to the erector spinæ and quadratus lumborum muscles. The later steps of the operation differ to some extent according to the operator. These different plans may be divided into the following four classes :

1. The adipose capsule, opened or unopened, is united by sutures to the edges of the incision.

2. After freely opening the adipose capsule, the sutures are passed through the fibrous or true capsule of the kidney.

3. After free exposure of the kidney, the sutures are passed directly through its parenchyma.

4. A certain portion of the capsule proper is stripped off the kidney, and the sutures passing through its parenchyma bring the raw surface thus made directly in contact with the cut tissues in the loin. The sutures enter and emerge through the capsule just outside of the raw margin, and are then passed through the tissues on each side of the incision, which is closely united.

The first method is the one originally employed by Hahn.* Experience has shown that it has been less efficient than some of the more recent methods. This was the initiatory and somewhat experimental stage of nephrorrhaphy. As the operation has developed, the advance has always been in one direction—viz., that the sutures be passed in such a manner that they will take a deeper and firmer hold of the kidney.

The second method was next adopted. At one time or another it has been employed by almost every surgeon who has done many nephrorrhaphies, and while many of its re-

* *Contrib. f. Chir.*, 1881, p. 449.

sults have been admirable, still a number of failures have resulted. Until recently it was the method generally employed, but it is now being somewhat superseded by procedures which promise better results. An ample experience has established the fact that the kidney is in no way injured by the passage through its capsule of sutures. The occasional failures have apparently been due to tearing out of the sutures. Although generally passing through a superficial portion of the cortical substance as well as through the somewhat fragile tissue of the capsule, sufficient resistance is not offered by these structures to withstand the efforts of the kidney to free itself. The sutures will not accomplish their object unless they retain the kidney in place until it is firmly secured by adhesions. Even during the operation these stitches have torn out. Yet they ought to retain their hold for two weeks or longer, and this seems almost too much to demand from a tissue not tougher than the capsule of the kidney. When relapses occur, as they frequently do, a short time after operation, it seems reasonable to conclude that the sutures have cut their way out.

The third method, probably the one most generally adopted at the present day, was introduced for the purpose of avoiding this accident. The sutures are passed through a considerable portion of the substance of the kidney, and at such a depth that they completely control its movements. Inserted in this way, they do not appear to tear out unless tied too tightly. It has been thought that perhaps the presence of numerous threads in the midst of the secreting substance of the kidney might result in permanent damage to its structure. From their experiments on animals, Tuffier* and Vanneufville † have concluded that this need not be feared.

* *Études expérimentales sur la chirurgie du rein*, Paris, 1889.

† *De la néphrorrhaphie*, Thesis, Paris, 1888.

Experience also has shown that these sutures have no injurious effect. In a few cases after operation albumin has appeared in the urine, but has never persisted. Thus far the results have been most encouraging. In twenty-nine cases operated on according to this method, twenty cures, five improvements, and four failures resulted. (In twenty-two cases where the capsule alone was sutured the result in nine was cure, in seven improvement, and in six failure.)*

The fourth method is a comparatively recent one. Sufficient cases have not been reported, nor has long enough time elapsed, to allow of any decision as to the superiority of this procedure. Jordan Lloyd † operated according to this method in 1886. Tuffier ‡ and Guyon # advocate it. The former found that, in animals where the kidney deprived of its capsule was brought into contact with the cut muscles in the loin, the union resulting was far firmer than when the unbroken capsule was brought into apposition with the same structures. Several operations, followed apparently by good results, have been done according to this plan by Guyon, Tuffier, and others.

Although all operations may be classified according to one or other of these methods, there are many points of difference as far as the details are concerned.

First, as regards the treatment of the wound. This may be left entirely open to fill up with granulation tissue or may be closely united by one or more rows of suture. It is thought by many that the adhesions between the kidney and the loin will be firmer if the wound be allowed to unite by secondary intention. From a close examination of the

* See tabulated cases.

† *The Practitioner*, September, 1887.

‡ *Revue de chir.*, p. 932; *Arch. gén. de méd.*, 1889, p. 562.

Bull. de l'acad. de méd., Paris, Feb. 26, 1889.

histories of cases reported, it appears to me that equally good results are obtained when the wound is closed by sutures as when the open plan is adopted.

Second, as regards the sutures. Various materials have been used—catgut, silk, kangaroo tendon, silkworm gut, and silver wire. This is a very important point in the operation, and more experience is needed to determine which material is the best. While at first sutures were mainly of catgut, this is being more and more replaced by a thread that will prove more durable. For the past year or so operators of the largest experience have generally employed either silk or some strong animal ligature, such as kangaroo tendon. With this latter substance Morris, Gould, Gardner, etc., have obtained excellent results. If it can be shown that it is a harmless procedure to leave several threads of an unabsorbable material within the kidney, then the choice of suture will be in direct proportion to its durability. Tuffier and others have proved that in animals at least this may be done with impunity. Personally, I should prefer silk to kangaroo tendon. It is more reliable and more easily rendered aseptic. It may be that silkworm gut will be an admirable material. It has been successfully employed by Guermont-préz.

Third, as regards the structures to which the kidney sutures are fastened. They may be attached to the edges of the divided fasciæ and muscles which may or may not be united. They may be brought out through the entire thickness of each lip of the wound and be tied externally after the various layers of the incision have been united. In either case they can be taken out after the kidney is considered firmly fastened. It is generally believed to be better, however, not to remove them.

A number of operators, principally of the Italian school (Cecherelli, Bassini, De Paoli), also Duret, consider it wiser

to fasten the upper end of the kidney at a higher point than can be obtained by suture to the ordinary incision. To accomplish this, they have resected, in whole or in part, the twelfth rib, and sometimes the eleventh as well. To the periosteum of these ribs the sutures are united. Unless in exceptional cases, this appears to be a rather unnecessary procedure. It must certainly add somewhat to the dangers of the operation. This manœuvre was to some extent responsible for one of the deaths reported (Case XVII). The sutures have in a few cases been attached to the periosteum without removal of any portion of the bone.

By most operators the adipose capsule is sutured to the edges of the wound. Bryant,* Dunning,† and others lay stress on the importance of this step. If the fatty capsule be adherent to the kidney, a firm anchorage may by this means be secured; but if the kidney, as often happens, moves inside this capsule, then certainly the adhesion of this latter structure can not be of much service.

In an endeavor to collect all the cases of nephrorrhaphy which have been reported, I have succeeded in finding a record of one hundred and seventeen such operations. A detailed account, however, is given of only eighty-seven patients. The excellent pamphlet by Lindner and the recent able article by Frank have been of much service to me in this work. Many of the reports have been made at the expiration of a few weeks from the time of operation, and, as a patient ought not to be considered as permanently cured until a year at least has elapsed, it is impossible to draw any definite conclusions as to the relative proportion of successes and failures.

Out of fifty-six nephrorrhaphies collected by Frank,‡

* Med. Record, Jan. 12, 1889.

† Western Med. Reporter, October, 1888.

‡ *Loc. cit.*

twenty-one patients had been under observation for a year or more. The result in eleven of these was permanent cure, in four decided improvement, and in six failure. Out of eleven cases where the sutures passed through the parenchyma of the kidney, nine were cured. Morris* claims seven successes out of ten cases. In the one hundred and seventeen cases recorded below, three deaths have occurred. One of these, however, can not be attributed to the operation, as an ileus, supposed to be due to a floating kidney, existed before operation, and was unrelieved. The fatal result in another patient (Case XVII) can only in part be attributed to the nephrorrhaphy; a pleurisy followed, due to attachment of sutures to the twelfth rib, but it was complicated by a fatty heart and atheromatous arteries. In the third case septicæmia resulted from passage of a suture through an old embolic infarction in the kidney.

Of the eighty-seven detailed cases, thirty-two patients had been under observation for one year or longer. In fifteen of these radical cure resulted, in four decided improvement, and in thirteen failure. As has been stated, it is not just to compare these figures with the total number of cases, for in a large proportion the permanent result is unknown.

Relapses generally occur within the first few weeks after operation, and therefore it is reasonable to suppose that the majority of patients who are well at the end, say, of three months will be permanently cured. A comparison of the results at this period ought to be of some value. There are sixty-two patients whose condition at the expiration of three months is stated. In thirty-two a cure had been effected, in fourteen decided improvement had resulted, and in thirteen no benefit had been derived from the operation. In

* Brit. Med. Assoc., August, 1889.

twenty-nine of these cases the sutures had been passed through the parenchyma of the kidney, with the result that twenty were cured, five improved, and four unimproved. In twenty-two of the same cases the capsule alone was sutured, and the result was nine cured, seven improved, and six unimproved.

CASES OF NEPHRORHAPHY.

No.	Operator.	Reference.	Sex and age.	Side.	Sutures passed through.	Result.	Remarks.
1	Küster.	Verhandl. deut. Chir. Cong., 1882.	.....	.....	Adipose capsule (opened).	R.	At end several months marked improvement; kidney fixed.
2	Küster.	Lindner, Wanderniere der Frauen.	F., 27.	R.	Parenchyma (1 silk); capsule (7 catgut).	R.	At end several years permanent cure.
3	Küster.	<i>Ibid.</i>	F., 35.	R. & L.	Parenchyma (silk and catgut); both kidneys.	R.	Symptoms persisted, although kidneys firmly fixed.
4	Küster.	<i>Ibid.</i>	F., 52.	R.	Parenchyma (4 silk and 2 catgut).	R.	Cure at end of several years.
5	Küster.	<i>Ibid.</i>	F., 34.	R.	Parenchyma (silk & catgut).	R.	Failure; relapse in six months.
6	Küster.	<i>Ibid.</i>	F., 26.	R.	Parenchyma.	R.	Failure.
7	Esmarch.	Verhandl. deut. Chir. Cong., 1882.	F.	R.	.....	R.	At end of few months, decided improvement.
8	Delhaes.	.....	F.	R.	Parenchyma.	R.	Decided improvement.
9	Bassini.	Ann. univ. di med. e chir., Milano, 1882; Lindner, <i>loc. cit.</i>	F., 27.	R.	Parenchyma and fastened to 12th rib.	R.	Cure at end of few months.
10	Newman.	Glasgow Med. Jour., 1883, p. 831.	F., 43.	R.	Parenchyma.	R.	Cure at end of three months.
11	Weir.	N. Y. Med. Jour., Feb., 1883.	F., 33.	R.	Capsule (2 catgut).	R.	Complete cure at end of two years.
12	Weir.	Personal communication.	.....	.....	"Tuffier's method."	R.	Failure; in 6 mo. nephrectomy.
13	Swenson.	Frank, in D. med. Wochenssch., 1889, p. 173.	F., 21.	R.	Parenchyma.	R.	Cure; short observation.
14	Agnew.	Med. News, Jan. 29, 1887.	M., 32.	R.	Capsule (animal suture).	R.	Cure at end of 3 months.
15	J. Greig Smith.	Lancet, 1884, ii, 10.	F., 39.	R.	Kidney scarified; no sut.	R.	In 45 hrs.; pleural cavity filled with fluid; atherom. arteries; fatty heart.
16	Gardner.	Austral. Med. Jour., 1885.	F., 45.	.....	Parenchyma (2 kangaroo tendon).	R.	Result satisfactory at end of 7 weeks.
17	Cecherelli.	Rivista clin., Bologna, 1888, p. 290; Lindner, <i>loc. cit.</i>	F., 28.	.....	Capsule to 12th rib.	D.	Result good at end of few weeks.
18	De Paoli.	Gaz. clin. Torino, 1885; Lindner, <i>loc. cit.</i>	F., 30.	R.	Capsule (12th rib resected) and to periost., 11th and 12th ribs.	R.	At end of several months no improvement; kidney firm.
19	Ghinozzi.	Raccogliore med., 1886; Lindner, <i>loc. cit.</i>	M., 20.	L.	Adipose capsule fastened to 12th rib.	R.	Complete cure at end of 9 months; kidney firm.
20	Lauenstein.	D. Chir. Cong., 1882.	.....	.....	.....	R.	Improvement at end of 6 mos.; kidney still movable.
21	Lauenstein.	D. med. Wochenssch., 1887, p. 26.	F., 42.	R.	Parenchyma (5 catgut).	R.	Improvement slight at end of 18 months; kidney firm.
22	Kümmel.	Arztl. Verein zu Hamburg, 1887; Lindner, <i>loc. cit.</i>	.....	.....	Capsule.	R.	Failure; nephrectomy at end of few months.
23	Kümmel.	<i>Ibid.</i>	.....	.....	Parenchyma.	R.	Complete cure at end 18 mos.
24	Kümmel.	<i>Ibid.</i>	F., 60.	R.	Parenchyma, tore out; capsule strip'd off & sutur'd.	R.	Cure at end of few months.
25	Kümmel.	<i>Ibid.</i>	.....	.....	Parenchyma.	R.	Improvement; not cure.
26	Schede.	<i>Ibid.</i>	F.	.....	.....	R.	Result good at end of few wks.
27	Schede.	<i>Ibid.</i>	F.	.....	.....	R.	At end of 3 months result satisfactory.
28	Schede.	<i>Ibid.</i>	F.	.....	.....	R.	Improvement; hernia of kidney followed.
29	Hahn (Schüler)*	Centralbl. f. Chir., 1881, No. 29; Lindner, <i>loc. cit.</i>	F., 38.	R.	Adipose capsule.	R.	Compl. cure at end several yrs.
30	Hahn (Woyack)†	<i>Ibid.</i> , Frank, <i>loc. cit.</i>	F., 28.	R.	Adipose capsule.	R.	Complete cure at end of 7 yrs.
31	Hahn (Woyack).	Frank, <i>loc. cit.</i>	Same pat. as No. 30.	L.	Capsule.	R.	Cure complete at end of 9 mos.
32	Hahn (Woyack).	<i>Ibid.</i>	2d op. on No. 30.	R.	Capsule.	R.	Cure complete at end of 4½ years; kidney fixed.
33	Schüler.	<i>Ibid.</i>	F.	R.	Adipose capsule.	R.	Cure at end of 2 years; kidney slightly movable.
34	Ehbert.	<i>Ibid.</i>	F., 35.	R.	Capsule.	R.	Failure; nephrectomy at end of 1 year.
35	Bölke.	<i>Ibid.</i>	F., 32.	R.	Adipose capsule.	R.	Cure at end of 2 years; kidney firmly fastened.
36	Graefe.	<i>Ibid.</i>	.....	L.	Capsule.	R.	Failure; relapse at end of 6 months.
37	Dunning.	West. Med. Reporter, 1888, Oct.	F., 44.	R.	Adipose capsule.	R.	Partial success.
38	Dunning.	<i>Ibid.</i>	F., 54.	R.	Adipose capsule.	R.	Failure; no improvement.
39	Dunning.	<i>Ibid.</i>	F.	R.	Adipose capsule.	R.	Complete cure at end 20 mos.
40	Kazmierowski.	Frank, <i>loc. cit.</i>	F., 32.	R.	Capsule.	R.	Improvement at end of 15 mos.
41	Kazmierowski.	<i>Ibid.</i>	F.	.....	.....	R.	Great improvement; kidney fixed at end of 13 months.
42	Ludwig.	<i>Ibid.</i>	F., 51.	R.	Capsule.	R.	Cure at end of 2 months.
43	Wabnitz.	<i>Ibid.</i>	F., 46.	R.	Capsule.	R.	Complete cure at end 3 years.
44	Kloski.	<i>Ibid.</i>	F., 23.	R.	Capsule.	R.	At end 48 h., cause unknown; op. done for symptoms of illness, which were unrelieved.
45	Grünberg.	<i>Ibid.</i>	F., 28.	R.	Capsule.	R.	Improvement; kidney fixed.
46	Henckel.	<i>Ibid.</i>	F., 36.	R.	Parenchyma.	R.	Improvement; kidney fixed.
47	In clinic of Mayländer.	<i>Ibid.</i>	F., 35.	R.	Capsule.	R.	Failure; kidney fixed.
48	In Oberlinhaus, Nowawess.	<i>Ibid.</i>	F., 30.	R.	Capsule.	D.	Improvement slight; intermittent hydronephrosis persisted.
49	Berger.	<i>Ibid.</i>	F., 40.	R.	Capsule.	R.	
50	Wegner.	<i>Ibid.</i>	F., 29.	R.	Parenchyma.	R.	
51	Krause.	Frank, <i>loc. cit.</i>	F., 31.	R.	.....	R.	

* Attributed by Frank to Schüler.

† Cases 30, 31, and 32 are attributed by Frank to Woyack.

CASES OF NEPHRORHAPHY—(Continued).

No.	Operator.	Reference.	Sex and age.	Side	Sutures passed through.	Result.	Remarks.
52	Morris.	Ann. of Surg., 1887, p. 289.	F., 41.	R.	Cortical substance (1 heavy catgut).	R.	Cure, and kidney firm at end of 8 months.
53	Morris.	<i>Ibid.</i>	F., 56.	.....	Parenchyma (2 silk sutures removed 12th day; capsule (2 catgut).	R.	Result fairly good at end of 5 months.
54	Braun.	Lindner, <i>loc. cit.</i>	F., 27.	R.	Cortical substance (1 silk); adipose capsule (7).	R.	Complete cure at end of 1 year.
55	Braun.	<i>Ibid.</i>	F., 35.	.....	.....	R.	Result good at end of 5 weeks.
56	Schwertfeger.	Inaug. Dissert., Greifswald, 1886; Frank, <i>loc. cit.</i>	F.	R.	Capsule.	R.	Symptoms persisted; kidney firmly fastened; patient had locomotor ataxia.
57	Von Tischendorf.	Centralbl. Chir., 1887.	F., 32.	R.	Cortical subst. and around 12th rib; laparotomy for cholecystomy.	R.	Complete cure; kidney fixed at end of 4 months.
58	Wilcox.	Ann. Surg., 1888, p. 192.	F., 24.	.....	Adipose capsule.	R.	Improvement great at end of 4 months; kidney firm.
59	Stonham.	Lancet, 1888, ii, p. 109.	F., 34.	R.	Parenchyma (1 silk); capsule (2 silk).	R.	Perfect cure at end of 9 mos.
60	Richardson.	Boston Med. and Surg. Jour., 1888, June 14.	F., 36.	R.	Capsule (4 silk).	R.	Cure at end of 8 mos.; kidney fastened 2 in. lower than normal position.
61	Duret.	Bull. acad. de Belgique, 1888, p. 440.	F., 33.	R.	Capsule and cortex of kidney and to periost. of 11th and 12th ribs, which had been resected.	R.	Perfect result at end of 5 mos.
62	Duret.	<i>Ibid.</i>	F., 39.	.....	Same method as Case 64.	R.	Decided improvem't at end of 4 m.; kidney slightly movable.
63	Turgard.	Bull. méd. du Nord, Lille, 1887, p. 344.	F.	R.	Adipose capsule.	R.	Failure; followed by nephrectomy.
64	Gilmore.	Bull. méd. du Nord, Lille, 1887, p. 344 (in report of commission).	.....	.....	Capsule.	R.	Cure at end of several months.
65	Lloyd.	Practitioner, 1887, Sept.	.....	.....	Parenchyma; capsule peeled off and sutured.	R.	Failure; followed by nephrectomy.
66	Hager.	Berl. klin. Wochenschr., 1889, p. 33.	F., 22.	L.	.....	R.	Cure at end of 8 mos.; kidney fastened 2 in. lower than normal position.
67	Warfoinge.	Schmidt's Jahrbuch, 1885, pp. 108, 203.	.....	R.	Parenchyma (silk).	R.	Perfect result at end of 5 mos.
68	Gould.	Lancet, 1888, ii, p. 674.	F., 28.	R.	Cortical substance, 2 kangaroo tendons.	R.	Decided improvem't at end of 4 m.; kidney slightly movable.
69	Gould.	<i>Ibid.</i>	.....	.....	Parenchyma; capsule removed in few days.	R.	Failure; followed by nephrectomy.
70	Gould.	<i>Ibid.</i>	Same pat. as No. 65.	.....	Parenchyma, kangaroo tendon.	R.	Cure at end of several months.
71	Terrillon.	Ann. malad. organ. genito-urin., vii, p. 469.	M., 57.	R.	Adipose capsule, as kidney could not be forced into wound.	R.	Sympt. continued; probably due to calculi; r't kidney had been extirpated because movable.
72	Terrillon.	<i>Ibid.</i>	F., 42.	L.	Capsule and cortical substance.	R.	Result satisfactory at end of few months.
73	Guernonprez.	Report by Terrillon, Bull. de l'acad. méd., 1889.	F., 37.	.....	Parenchyma (silkworm gut).	R.	Perfect cure at end of 2½ mos.
74	Keen.	Med. News, 1889, p. 431.	F., 35.	R.	Capsule (silk).	R.	Failure; at end of 3 mos. relapse.
75	Rosenberger.	Report by Wagner in Schmidt's Jahrbuch, 1889.	F., 22.	R.	Capsule sutured to peritoneum (7 silk).	R.	Result satisfactory; short observation.
76	Langenbuch.	Deut. medic. Wochenschr., 1889, p. 325.	F., 19.	R.	Parenchyma (4 sutures).	R.	Great improvement end of 5 m. Result satisfactory; short observation.
77	Langenbuch.	Deut. med. Wochenschr., 1889, p. 325.	F., 43.	R.	Parenchyma.	D.	On 5d day, septicæmia; suture passed through old embolic infarction in kidney.
78	Guyon.	Bull. de l'acad. de méd., Paris, 1889, p. 239.	F., 54.	R.	Parenchyma and around 12th rib (4 catgut).	R.	Complete cure at end of 9 mos.
79	Guyon.	<i>Ibid.</i>	F., 20.	R.	Parenchyma (catgut).	R.	Cure; short observation.
80	Mears.	Ann. Surg., 1889, p. 241.	F., 29.	R.	Cholecystomy at same operation.	R.	Cure; short observation.
81	Dodd.	Drummond in Lancet, Jan. 11, 1890.	M., 38.	R.	.....	R.	Majority of cases were satisfactory.
82	Bryant.	Med. Record, Jan. 12, 1889.	M., 28.	R.	Adipose capsule.	R.	Results satisfactory.
83	Hume.	Report by Drummond, Lancet, Jan. 11, 1890.	F., 31.	R.	.....	R.	Results not satisfactory.
84-97	Küster.	Berl. kl. Wochenschr., 1889. Discussion on Frank's paper.	.....	.....	No details given except all details not given except all	R.	Results not satisfactory.
98-105	Morris.	Discussion in Brit. Med. Assoc., Aug., 1889.	.....	.....	.....	R.	Results not satisfactory.
105-108	Tait.	<i>Ibid.</i>	.....	.....	.....	R.	Results not satisfactory.
109-113	Bruce Clark.	<i>Ibid.</i>	.....	.....	.....	R.	Results satisfactory.
114	McCosh.	.....	F., 28.	R.	Capsule.	R.	Complete cure at end 22 mos.
115	McCosh.	.....	F., 34.	R.	Capsule.	R.	Cure at end of 6 months.
116	McCosh.	.....	F., 26.	R.	Capsule.	R.	Partial failure.
117	McCosh.	Same pat. as No 116	Parenchyma.	R.	At end of 2 months results satisfactory.



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