LIGATURE OF THE RENAL VESSELS BY THE TRANS-PERITONEAL METHOD FOR THE CURE OF PERSISTENT URINARY RENAL FISTULA, WITH NOTES OF ONE SUCCESSFUL CASE.

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(1) Choice of Procedure: (a) Nephrectomy.—In the absence of well-known contra-indications, nephrectomy is commonly acknowledged to be a legitimate surgical procedure in certain of these cases. But where there is extensive matting of the kidney and perinephritic tissues to surrounding structures, nephrectomy may be extremely difficult, or even impossible. The severity of the operation, the risk to the patient from haemorrhage, shock, and damage to important organs and serous cavities, justify the authoritative admission that the maintenance of good drainage is then the sole resource, in the vague hope that at some future and quite uncertain date healing may occur.

(b) Subcapsular Nephrectomy; (c) Morcellement.—In other cases subcapsular nephrectomy, piecemeal nephrectomy or morcellement may be tried, but these operations are often followed by prolonged suppuration or by permanent fistula, owing to a portion of renal tissue having been left behind, as it frequently is.

(2) Disabilities attendant on a Persistent Renal Sinus.—Taking the case of a young and otherwise robust man, who has to earn this

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living, and who would find the expenses entailed by the purchase of voluminous and frequently-to-be-changed dressings, or of any special apparatus, quite beyond his resources; or taking, on the other hand, the case of a weakly patient, in whom the drain of prolonged suppuration would appreciably curtail life, the surgeon may well hesitate before coming to a decision as to which of these methods to adopt.

(3) Dangers and Difficulties of Nephrectomy.—In not a few cases death from haemorrhage alone has been the immediate result of operation.

Greig Smith recognised cases where the kidney and surroundings were so much altered that the kidney “could not have been removed from the body by any proceeding claiming to be regarded as surgical.”

Mr. Henry Morris admits cases “in which it was difficult even to dissect the organ away in the post-mortem room,” in which it is difficult or impossible to identify where kidney tissue begins and scar tissue ends (if, indeed, they are not inseparably blended), and in which, further, the closure of a urinary sinus is “sometimes impossible”; and other similar opinions could be quoted.

(4) Nature of Case for which Renal Vessel Ligation Performed.—It was upon a case of this nature that the operation which I devised was successfully performed. The patient was a short, thick-set, strong young man, otherwise healthy. Nine months before he came under my care he had sustained a rupture of the left kidney; his very short subcostal space was filled with scar tissue, and a sinus through which pus and urine were freely discharged. I made four attempts to perform nephrectomy, but had to abandon the operations, partly on account of furious haemorrhage, partly on account of the impossibility of distinguishing renal from surrounding scar tissue. (Notes of the case are given below.)

(5) No Precedent to go upon.—I have not been able to find any reference to ligature of the renal vessels as an operation to secure a definite surgical result per se.

(6) Experimental Ligation of Renal Vessels.—In various physiological publications and text-books, references are made to atrophy of renal epithelium and cessation of urinary secretion as a result of ligature of either the renal arteries or the veins. Dr. Beddard’s experiments on the frog (Journal of Physiology, vol. xxviii., 1902), even allowing for differences between batrachian and mammalian renal blood supply, lend support to the view that by ligature of the renal vessels the glomeruli of the whole kidney are cut out of the circulation, that complete ligature prevents spontaneous secretion of
urine, and that "cutting off the arterial blood-supply of the kidney
causes the epithelium of the tubules to degenerate rapidly." De
Souza (Journal of Physiology, vol. xxvi., 1900-1901) supports
Heidenhain's contention "that the amount of urine secreted is
directly proportional to the velocity of the blood-flow through the
kidneys," and suggests that probably a similar result might be
obtained by tying only the renal veins.

(7) Deductions from Laboratory Experience.—Reasoning on these
lines I concluded that if the renal artery and vein were ligatured
complete atrophy of the renal secreting tissue would be ensured,
and supposing the presence of urine to be the sole hindrance to
healing, that if once the secretion of urine within the limits of the
abscess ceased, then healing by normal granulation would follow.
And this, indeed, was found to be the case; the sinus healed, and
I had a letter only a few days ago, nearly two years after the opera­
tion, in which the patient says he remains quite well, is earning a
living, and that the sinus has never reopened.

(8) Significance of Blocked Urter.—In the notes of the case it
will be seen that evidence pointed to the conclusion that the ureter
had become blocked. It seems obvious that when this is so a renal
fistula can never heal spontaneously; it would be quite fortuitous
that a blocked ureter (excluding, of course, the case of a removable,
or movable, calculus) should ever again become patent. It is very
seldom advisable to undertake any surgical proceeding with the
object of re-establishing patency of a blocked ureter in old suppura­
tion cases, for a successful result, even if achieved, is not likely to
remain a permanent one.

(9) The Presence of, and Final Cessation of, Urine in the Dis­
charge from Sinus.—At this point I may say that it remains a
matter for regret that I did not have some estimate made from
time to time during the healing period of the urinary constituents
in the discharge from the sinus, for the purpose of comparison with
similar analyses made before operation. The presence of urine in
the discharge was only too obvious before the operation. After
the operation for the first few days the discharge was scanty and
smelt faintly of urine. Then, on the fifth day, a large amount of
discharge came away in which the smell of urine was not apparent;
nor was it ever again present, the discharge appearing as a clear,
odourless serous fluid. Healing was complete on the fifty-seventh
day after operation. Apparently, then, atrophy of urine-secreting
epithelium occurred within five days or so.

(10) Pathology of the Cessation.—It must remain a matter for
speculation whether infarction of the whole kidney occurred, or
whether a more gradual process of atrophy took place. The urine
appearing in the discharge for the first few days may well have
been a residuum remaining in the various recesses of the abscess.

Having stated the indications for, and the object of the pro-
cedure adopted, one or two points remain to be considered as to
(1) technique; (2) advantages; (3) limitations of the operation.

(11) Technique.—(a) The technique is rather obvious, but
remembering the possible existence of accessory or abnormal renal
afferent vessels, a search should be made along the aorta to a
limited but reasonable extent for these; Zondek found accessory
arteries in five out of fifteen subjects examined.

(b) Asepsis can only be assured by avoiding the suppurating
area at all costs; this is effected by keeping as far from the kidney
as possible, and as close to the aorta and vena cava as is safe to
apply a ligature.

(c) Access to the renal pedicle, in abdominal nephrectomy, is
claimed to be safer when made through the outer layer of the
mesocolon by reason of less danger to the colic blood supply; to
follow this route, however, would almost certainly open up the
septic area, and, moreover, the colon may be found inseparably
united to the kidney. In my case no evil resulted from approaching
the renal vessels through the inner mesocolic layer, and this notwith-
standing that a search was made for accessory renal afferent vessels.

(12) Advantages.—Properly carried out there is little or no risk
either from haemorrhage, shock, or sepsis. As regards (a) haemor-
rhage, this method is in great contrast to any form of piecemeal
nephrectomy; (b) it is an aseptic operation, which nephrectomy
would certainly not be; (c) subcapsular or piecemeal nephrectomy
is at best a very severe operation; ligature is not so, and shock
should not occur; there is inappreciable risk as regards possible
damage to the colon or other surrounding organs and serous cavities
(septic infection).

(13) Limitations.—Ligature of the renal vessels may be a very
simple proceeding or may be insuperably difficult, and of course
there may occur cases where the kidney is so closely adherent to
the aorta or the vena cava as to make it impossible to apply a
ligature to the vessels. Greig Smith mentions a case where “the
aorta and vena cava were so adherent to the kidney that it was
found impossible at the autopsy to dissect them apart.” I take it
that such a condition would be easily recognised through a suffi-
ciently free opening in time to save a blunder. But in the case of
the right kidney it might still be possible to ligature the artery by
getting at it behind and to the left side of the vena cava, pushing the
latter vessel aside for the purpose of access. Ligature of the artery alone would suffice, on laboratory experience, to bring about atrophy of the renal epithelium; the right renal vein is so short (about one inch) that there would always be danger of opening the septic area in trying to isolate it for purposes of ligature. In the case of the left kidney the renal vein would be accessible, and ligature of this alone should bring about a similar result. Von Bergmann mentions a case of Schede's in which an elastic ligature necessarily included a part of the vena cava (vol. v., p. 400).

Consultations and Advice.—An unusual procedure of this sort was naturally not undertaken without first asking the advice of others whose experience would be of great value.

Firstly, on several occasions Sir Charles Ball very kindly saw the case with me. He quite acquiesced in the view that a further attempt at nephrectomy would not be justifiable, and when at a later date I suggested ligature of the renal vessels he agreed that, though there was no precedent to go upon, it would be worth trying. Finally, I showed the case to him when the sinus had quite healed.

To Professor W. H. Thomson, of Trinity College, Dublin, I put the question of the probable result in man of ligature of the renal vessels, and he argued that, from laboratory experience, immediate cessation of urine secretion might be anticipated, and then, at an early date, atrophy of the kidney should follow.

I had the great advantage of the valuable assistance and wide experience of Mr. W. S. Haughton, Surgeon to Stevens' Hospital, Dublin, at two of the attempted nephrectomies, and on each occasion he agreed that the profuse hemorrhage justified abandonment of the operation.

At the final operation (ligature of the renal vessels) I was fortunate in securing the presence of Mr. Atkinson Stoney, Senior Demonstrator of Anatomy, Trinity College, Dublin, and Surgeon to the City of Dublin Hospital.

My gratitude to these gentlemen and to several officers of the Corps who helped me on many occasions is not easily expressed.

Conclusion.—In conclusion, though in the first instance this operation was performed when nephrectomy had been attempted and found impossible, I should not hesitate to employ renal-vessel ligation in the future as a substitute for nephrectomy where this latter operation promised great difficulty, and the likelihood of such severe hemorrhage as might suffice to turn the scale between life and death in an exhausted patient. Moreover, as a preliminary to a subsequent nephrectomy (a septic operation), aseptic ligation
of the renal vessels would be sound surgery, though I claim that nephrectomy would then be unnecessary, as the ligature would be followed by rapid and permanent cure. Ligature of the renal vessels is surely a great improvement on any form of subcapsular piecemeal nephrectomy or morcellement. The former is a simple, the latter a very serious procedure, and both effect the same result.

While quite conscious of the imperfect support that a single successful case affords to a new method, the very rapid, satisfactory, and permanent cure so obtained seems to warrant my bringing the subject before the notice of the Fellows of the Society with some confidence that it may be deemed worthy of criticism at least, and possibly of some degree of approval as to its suitability in cases of a similar nature.

_Brief History of Case._—C. M., aged 19.

September 14th, 1902.—Admitted. Kicked at football previous day. Severe pain in left loin.

October 2nd.—Large abscess opened close to left iliac crest; let out pus and urine. Diagnosis: Rupture of (?) kidney or ureter.

January 21st, 1903.—Extensive empyema evacuated; previous abscess still discharging pus and urine.

April 4th.—Abscess explored. It extended forward amongst abdominal muscles to near umbilicus, upwards to left pleural cavity, backwards and upwards to left kidney area, downwards into pelvis. Pus in vesical urine. Diagnosed ruptured kidney.

June 8th.—Sent to Dublin for nephrectomy.

June 21st.—Pyuria; pus and urine discharging from sinus in loin.

July 17th._—Operation._—Attempted nephrectomy; abandoned owing to profuse hemorrhage; removed five calculi.

August 6th.—Scar in eighth intercostal space opened spontaneously.

November 10th.—Skiagraph; shadow of calculus in kidney.

November 12th.—Empyema scar again opened spontaneously, having remained closed six weeks.

December 1st._—Operation._—Attempted nephrectomy; abandoned owing to inadvertently opening peritoneum and inability to define limits of kidney tissue; three calculi removed; very profuse hemorrhage.

March 6th, 1904.—Skiagraphed; further shadow of calculus.

March 15th._—Operation._—Two calculi removed; profuse hemorrhage, therefore gave up attempt at piecemeal nephrectomy; unable to clamp pedicle; collapsed and critical condition for many hours.

September 26th.—Cathelin's separator. Right ureter urine acid,
clear, no pus or blood, no albumen. Left ureter urine neutral, opaque, "smoky," pus and blood-cells.

November 17th.—No pus in urine; free discharge of pus and urine from sinus. **Operation.**—Attempted nephrectomy; began by peeling peritoneum from scar tissue; opened peritoneum inadvertently, at once closed; further separation impossible; removed large calculus from (?) pelvis of kidney, having a rounded process of shape and size of ureter, one third of an inch long; kidney tissue and scar quite inseparable; very severe haemorrhage. Saline transfusion adopted.

November 18th.—Sudden profuse haemorrhage, threatening life; condition very critical for some hours; haemorrhage controlled by gauze packing.

January 29th, 1905.—Urine (vesical) clear, neutral, no trace of albumen; no pus or blood-cells.

May 2nd.—Urine clear, normal; no shadow of calculus visible; abundant urine and pus from sinus. Cathelin's separator. Right ureter, urine clear, normal; none collected from left ureter.

June 13th.—**Operation.**—Laparotomy by Lennander's incision. Some difficulty in finding renal vein, owing to enlarged lymph glands; vein ligated, then renal artery tied and divided. No accessory afferent vessels found.

August 9th.—Sinus in loin completely closed.

August 15th.—Discharged quite well.

May 24th, 1907.—Letter to say patient remains quite well. Sinus has never reopened or given any trouble.

Until the last operation it had been necessary to apply every day four or more very voluminous dressings; even these were often quite insufficient to take up all the urine and pus, his bed and clothes occasionally becoming soiled. There was not the least tendency to heal, nor did the amount of discharge and urine ever tend to lessen until after the final operation.

**Postscript.**—Since writing the above I have come across the following *(Trans. American Surg. Assoc., vol. xiv., 1896, p. 312)*: Mr. Keen, in a paper on "Traumatic Lesions of the Kidney," when referring to haemorrhage in subcutaneous rupture of the kidney, says: "Bobroff has advised to arrest the haemorrhage by simple ligature of the renal vessels without nephrectomy, basing his conclusions on experimental grounds, which show that necrosis does not necessarily follow. I am not aware of any case in which this has been carried out in the human subject, and I should certainly not be disposed to recommend it. **If the vessels are ligated the kidney will probably not remain functional, and is at least liable to necrosis or atrophy.**"
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