An Address

ON

ACHES AND PAINS OF RENAL ORIGIN.*

BY

ANDREW FULLERTON, C.B., C.M.G., F.R.C.S., F.A.C.S.,
SURGEON TO THE ROYAL VICTORIA HOSPITAL, BELFAST.

EVERY practitioner is confronted from time to time with the problem of aches and pains which raise a suspicion of some disorder of the kidney, and my intention in this address is to record my own difficulties in diagnosis, and the methods adopted to surmount them. I have gone carefully through the records of upwards of 1,500 successive cases of cystoscopy, of which I have notes, and picked out those in which pain was complained of, with a view to ascertain whether the condition of the kidney or ureter or the site of the lesion could be correlated with pain of a particular type or distribution. The results of these observations show, on the one hand, that the most extensive disease of the kidney may exist without any pain whatever, and, on the other, that a very slight departure from the normal may be associated with almost unbearable agony; also that a precisely similar condition may, in one patient, give rise to the merest local discomfort, and in another to pain of a severe character, radiating to the utmost terminations of the peripheral nerves. I have in my mind at the moment a man who used to bring in a small bottle a number of small calculi passed with the minimum of discomfort. Any one of these small calculi would be capable in another patient of producing the most intense renal colic.

Papin and Ambard in a recent article¹ give some interesting facts bearing on renal pain and its treatment, which will be referred to later. It will be convenient at this stage to review briefly the nerve supply of the kidney and its pelvis, based on Papin and Ambard's account.

The kidney receives its chief nerve supply through the renal plexus which accompanies the great vessels into the hilum. Branches also accompany the vessels to the capsule and accessory vessels, when the latter exist. The renal plexus comes off from the solar plexus, which is composed of a network of nerves and ganglia lying between the terminations of the great splanchnics of either side. The great splanchnic is formed by branches coming from the sixth to the tenth thoracic ganglia, receiving filaments (according to Beck) from all the thoracic ganglia above the sixth. It terminates in the semilunar ganglion, which also receives the pneumogastric and filaments from the phrenic.

The small splanchnic, which is sometimes double, is formed by filaments from the tenth, eleventh, and twelfth ganglia, and terminates either in the semilunar ganglion or passes directly into the renal plexus. The renal plexus is formed from branches issuing from the semilunar ganglia, the small splanchnics, and sometimes from the great splanchnics; it also receives a branch from the first lumbar ganglion. The plexus is composed of filaments and ganglia. The filaments follow the course of the vessels, around which they form a close network. In the kidney itself the nerves follow the blood vessels as far as their most remote terminations, and have been traced to the vascular tuft of the glomerulus. Other branches are distributed to the uriniferous tubules. Sensitive end organs have also been described in the muscular walls of the pelvis and calices, in the tunica adventitia and tunica media of the vessels, and in the capsule of the kidney. The nerves to the kidney itself are, with few exceptions, non-medullated, while those distributed to the pelvis and calices are for the most part medullated. The cells met with in the ganglia of the renal plexus are of the sympathetic type. It appears probable that renal pain proceeds from the sympathetic. According to Wundt the cells of the sympathetic oppose an obstacle to impressions, only overcome when these are of a violent nature. It is held by many authorities that painful sensations in the sympathetic system are really only perceived on quitting that system and gaining, by way of the rami communicantes, the posterior roots of the cord, and through these the cerebro-spinal centres. The result of this is that pain is often reflected along the course of nerves con-

nected with the corresponding rami communicantes. Section of the spinal cord between the eighth and ninth dorsal segments abolishes the sensibility of the kidney and ureter. Section of both splanchnics does not abolish the sensibility of either kidney or ureter. The pneumogastric takes no part in the conduction of renal pain.

We are now in a position to refer to the question of how far the kidney, pelvis, and ureter are sensitive to various stimuli.

Pressure on the normal kidney produces pain of a sickening character somewhat similar to, but much less severe than, that produced by pressure on the testis or ovary. When an operation is performed on the kidney under local anaesthesia manipulation of the organ produces pain.

The sensitiveness of the kidney to heat and cold has not been fully investigated, but would appear to be slight.

Puncture and section of the kidney are apparently not specially painful. Manipulations, however, carried out on the pedicle, and, especially, stripping back of the peritoneum, are attended with pain.

Compared with the kidney the pelvis and ureter are highly sensitive. The patient is often cognizant of the presence of the ureteral catheter in the pelvis of the kidney, and if the former is pushed too far pain may be produced. Hot and cold fluids introduced through the ureteral catheter are not clearly perceived as such. Distension of the pelvis, however, is very definitely painful. If more than 3 to 7 c.cm. of fluid are injected into a normal pelvis, pain resembling renal colic is, as a rule, provoked, and may at once be relieved by draining off the fluid injected. Pyelic pain may be very accurately studied by pyelography, or by simply measuring the capacity of the pelvis by the injection of fluid. The pain produced by distension of the pelvis commences in the subcostal region in the anterior axillary line. Tender points can be demonstrated by touch in the costo-lumbar, subcostal, para-umbilical, and iliac regions. These areas are those to which pain is referred by the cerebro-spinal nerves from impressions received by the sympathetic. Pain may be referred along the course of the nerves of the lumbar plexus towards the thigh, the testicle, or the labia majora, or it may be referred to the epigastrium or the renal region of the opposite side. Zones of cutaneous hyperaesthesia may be demonstrated by stroking or pinching the skin. The tenth, eleventh, and twelfth dorsal segments correspond in part to the kidney; the eleventh and twelfth dorsal and first lumbar correspond to the pelvis and ureter. Certain reflex phenomena such as nausea, vomiting, and pallor, with cold sweats, unassociated with disturbance of pulse or respiration, commonly accompany pyelic pain.

In pathological conditions the sensitiveness of the kidney and ureter may be profoundly altered. Papin and Ambard² classify renal and pyelic pain as follows:

1. That due to mechanical or traumatic causes.
2. That due to inflammatory conditions.

The mechanical causes are:

- A. Distension of the ureter, pelvis, and calices.
- B. Distension of the parenchyma in the capsule by congestion or oedema of the kidney.
- C. Contact of a foreign body with the walls of the pelvis or calices.
- D. Dragging of the pedicle of the kidney.
- E. Compression of nerves. Most of the pain is, however, reflex or of a toxic nature.
- F. Sclerosis of the kidney.

The inflammatory causes are:

- A. Lesions of the pelvis and calices, such as pyonephrosis.
- B. Lesions of the parenchyma, such as pyelonephritis.
- C. Lesions of the perirenal cellular tissue, such as perinephritis and perinephritic abscess.

These authors are of opinion that renal pain is usually, as a matter of fact, pyelic. In calculus, hydronephrosis, movable kidney, renal tuberculosis, cancer, and renal haematuria, obstruction of the ureter declares itself by renal colic due to distension of the pelvis. Pain in the kidney itself is generally of moderate intensity except in inflammatory lesions, when it may become very severe.

It is very instructive, when one is constantly seeing cases of urinary disease, to record in the patient's own words his description of the pain he suffers. A collection of such accounts is of great interest, especially if the case is followed to its termination by operation or in the post-mortem room. A study on these lines shows that the most varied pathological conditions may give rise to almost identical symptoms. This supports the suggestion that a common cause may be present in

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all—namely, distension of the renal pelvis from some obstruction. This obstruction may be a calculus, a kink, a thickened ureter, or a blood clot. Except when obstruction is present, there does not appear to be any positive pressure in the pelvis. A proof of this is that when for any reason an incision is made into the pelvis of the kidney—say, for the removal of a stone—close, accurate, watertight suturing is not absolutely necessary to prevent leakage. The urine seems to trickle down the walls of the pelvis, as rain down the roof of a house, and if no obstruction is present finds its way into the upper part of the ureter, where peristalsis begins and forces it towards the bladder. If the obstruction has not been relieved leakage will take place. It is reasonable to suppose that the peristaltic movements of the ureter, if excessive, may be painful, just as those of the bile ducts and intestinal tube may be. Efforts by the ureter to pass on a calculus or to overcome an obstruction are probably attended with pain, but an investigation of cases with the most intense renal colic, radiating even to the toes, shows that the obstruction is quite frequently at the uretero-pelvic junction, hardly, if at all, involving the ureter. It is, of course, possible that spasm, started in the pelvis, may be transmitted along the ureter, and one does observe movements at the ureteral orifice in certain cases in which there is no efflux.

Renal pain or pyelic pain may be so slight as to pass almost unnoticed, or it may be of the most violent character. It may remain in one spot, or it may radiate widely. It may start suddenly or gradually, and may terminate in the same way. It may only last for a few seconds, or it may continue for hours. It may occur in attacks, with intervals of complete or comparative freedom, or it may be more or less constant. It may come on during exercise, or when the patient is resting quietly in bed. It is variously described as a sense of discomfort, an ache, a gnawing or burning sensation, a bursting feeling or a feeling of fullness, a stab, a tearing or cutting sensation. The intensity of the pain is no index whatever of the severity of the lesion. A minute calculus may produce the most severe agony, whilst one the size of a chestnut may give very little indication of its presence. A very slight kink of the ureter may produce more pain than an extensive hydronephrosis.

The direction of the radiation of the pain is, as a rule, towards the lower extremity, generally to the groin, the testis, or labia majora, sometimes into the upper part of the thigh, more rarely to the knee and the leg, even as far as the toes. Occasionally, however, radiation takes place towards the upper extremity, to the shoulder, arm, and fingers. Not infrequently the pain radiates to the opposite renal region, and occasionally is felt solely on the presumably healthy side. Reference has already been made to reflex nausea, vomiting, pallor, and cold sweats. A special variety of pain is that seen in some cases of movable kidney, and called Dietl's crises. The pain in these cases may be due to torsion of the pedicle, kinking of the ureter, or dragging upon the pylorus, gall bladder, or other abdominal structure. It may be suggestive of an acute abdomen with rigidity, or may be of the type already referred to in discussing distension of the renal pelvis.

A typical attack of renal colic is so characteristic that a diagnosis of something pathological in the kidney or ureter is justified, and yet the surgeon will occasionally encounter cases in which every examination that can be made fails to establish a diagnosis, and one is driven to inquire whether extrarenal conditions may not in exceptional cases give rise to colic that is with difficulty distinguished from that due to renal causes. It is important to ascertain if the site of the pain or areas of hyperaesthesia—lumbar, subcostal, para-umbilical, iliac, etc.—give any clue to the position of the causative factor. My own observations lead me to the conclusion that it is unsafe to predict from these symptoms alone the situation of the lesion. In back pressure from an enlarged prostate, for instance, pain is often complained of in the lumbar region. Pain in the iliac region may indicate the presence of a stone in the lower ureter, but is quite often present with a stone in the pelvis of the kidney. When the lesion is near the vesical end of the ureter (for example, a calculus) frequency of micturition is often complained of, but this symptom may be entirely absent in these circumstances and be present when a calculus is lodged in the renal pelvis. Pain of renal origin must be looked upon in many cases as referred pain, and its distribution as not necessarily giving any clue to the location of the lesion in the urinary tract.

Methods of Investigation.

Abdominal examination may discover displacements, deformities, or enlargements of the kidney, swellings in the renal region, tenderness, rigidity, or areas of hyperaesthesia. Rectal and vaginal examination may detect a calculus in the lower end of the ureter, thickening of the latter, undue tenderness, or other abnormality. Examination of the spermatic cord may disclose the presence of a varicocele suggesting renal tumour if on the right side. The urine will, of course, be carefully investigated by chemical, microscopical, and bacteriological tests. The absence of any demonstrable departure from the normal, however, does not, by any means, exclude the kidney. A small aseptic stone may be present without giving rise to any abnormal constituent such as blood, pus, or albumin. In certain cases of hydronephrosis the urine may be normal to the usual tests, and in pyonephrosis the affected ureter may be blocked at the time of examination. A tumour of the kidney may be present without showing any abnormality of the urine. X-ray examination, if thorough and efficient, will demonstrate alterations in the position, shape, and size of the kidney, besides showing the presence of opacities. Cystoscopy may demonstrate alterations in the shape, size, and surroundings of the ureteral orifice, and changes in the rate, rhythm, and character of the efflux. Ureteral catheterization will show the character of the urine from each side and any alteration of the relative specific gravities. The latter test, which I will call the specific gravity test, has been of great service to me for diagnostic purposes. Shortly stated, I find that with unilateral disorders of the kidney the specific gravity on the affected side is diminished in a large proportion of cases. If there is a difference in specific gravity on the two sides, even if no other sign is present, the chances are that the kidney which secretes the urine of lower specific gravity is pathological. A low specific gravity does not necessarily mean a seriously damaged kidney. It may be due to reflex diuresis from a small fragment of stone or from early disease. On removal of the cause (if removable) the specific gravity returns rapidly to normal.

Combined with ureteral catheterization, the subcutaneous, intramuscular, or intravenous injection of dyes, such as indigo-carmin, or phenolsulphonaphthalein, may give valuable information. The time of the appearance of these dyes in the urine, the amount present in the specimens collected by ureteral catheter, and the time taken for their elimination will assist in clearing up many doubtful cases. The ureteral catheter will further demonstrate patency or narrowing of the ureter, and, by injection of fluid, the capacity of the renal pelvis. By the opaque catheter or bougie opacities discovered by radiography may be accurately located, and, if stereoscopic radiograms are employed, their position relative to the ureter and kidney accurately defined.

Finally, by pyelography the shape and size of the pelvis and calices, the presence and relations of foreign bodies, and the position, direction, and calibre of the ureter may be demonstrated with the greatest accuracy. I now use almost exclusively sodium bromide solution for this purpose. This is run in through the ureteral catheter into the pelvis of the kidney until the patient complains of slight discomfort. A radiogram is then taken, which shows with great accuracy the shadow of the pelvis and ureter.

Should these methods fail to establish a diagnosis, or for any reason be unavailable, and the surgeon be in doubt between a renal and an abdominal lesion, it may be necessary to explore. For this purpose I have in a few cases employed an oblique abdominal incision extending from the mid-axillary line just below the costal margin to the iliac region parallel to the fibres of the external oblique. The anterior part of the incision opens the peritoneal cavity, and the posterior part allows of the retroperitoneal exploration of the kidney and ureter. In this way the appendix, caecum, colon, liver, gall bladder, spleen, stomach, duodenum, tubes, ovaries and uterus, as well as the kidney, may be explored with relatively little trauma to the abdominal wall.

The possibility of disease of the spinal column or cord should always be borne in mind. Spinal caries, aneurysm of the aorta involving the vertebrae, tumours involving the spinal column or cord, and locomotor ataxy may give rise to pain closely simulating renal colic.

It now remains to mention some types of renal disorder commonly met with in practice which are attended with pain. Pain due to accompanying bladder conditions will not be discussed.

Renal Calculus.

Undoubtedly the most frequent cause of renal pain and renal colic in its worst form is renal calculus. Looking over the notes of 72 consecutive cases I find that pain was present at some time or another in all but two. The pain was of the most varied character. In one it was very indefinite on the affected side, and also was present on the sound side. A large phosphatic stone weighing $1\frac{1}{2}$ oz. was removed from the pelvis of the right kidney. In another the pain was so slight that the patient, a young woman, was treated for fifteen years for Bright's disease. This was "cured" by the removal of a calcium oxalate stone from the pelvis of a movable right kidney. On the other hand, a patient with a small phosphatic stone the size of a pea, lodged in the pelvis of the left kidney, complained of "frightful" pain radiating to the groin and knee, associated with vomiting and rigors. The patient actually "yelled" with the pain in the knee.

The radiation of the pain in these calculus cases varied greatly. Most usually it radiated towards the groin, testis, or labia majora, frequently over the buttock, or down the inner or outer side of the thigh, sometimes into the penis, sometimes down the leg as far as the heel or toes, and occasionally all over the abdomen. In one case it started in the left renal region, radiated right up the back to the shoulder and back of the head. The patient was relieved by the passage of a small stone. A patient in whom a small stone about the size of a melon seed was removed from the right ureter near the bladder behaved like a madman during attacks of pain which, starting in the kidney, radiated to the testis. Another patient complained of cramp-like pain in the lower abdomen, and passed some small, irregular calculi about the size of split peas. Another felt "something snap in the kidney." A calculus was subsequently removed from the renal pelvis on the affected side. In a patient with calculi in both kidneys the pain was now on one side and now on the other, and radiated on both sides into the leg. The following rather rare case is worth recording:

The patient, a woman, suffered severe renal colic from the passage of a gummy material containing the characteristic spherules of calcium carbonate. The pain first affected the left side and radiated into the leg. There was rigidity and tenderness in the left loin. The urine contained a copious deposit of white material, thought to be pus, but which proved on microscopical examination to be an almost pure deposit of calcium carbonate. X-ray examination was negative. A few days later the patient had severe pain in the opposite kidney, again with the discharge of calcium carbonate. Reduction of the calcium content in the diet effected a speedy cure.

Similarly one sees occasionally cases of renal pain due to the passage of crystals of calcium oxalate, and probably other insoluble salts in the urine may cause pain. In many of these cases of renal calculus frequency of micturition, especially during the attacks of pain, was complained of. This was apart from any associated cystitis or other bladder affection. Reflex vomiting, pallor, and cold sweats were exceedingly common in the severe attacks.

Tuberculous Kidney.

It must be emphasized that renal pain is not a cardinal symptom of tuberculous kidney. Looking over the notes of 117 consecutive cases I find that pain was complained of in 56 cases only—that is, in less than half the number. Even in advanced cases pain may be entirely absent. In most of the painless cases there was thickening of the ureter, and, in many, very extensive destruction of the kidney substance. In one case, though the pelvis was enormously dilated and the ureter resembled a piece of small intestine, pain was not complained of. Even with a large perirenal abscess pain may be absent. In the painful cases the symptoms resembled those occurring in renal calculus, but were rarely so severe. It was described as an ache, or a soreness more or less constantly present, or a feeling of fullness on the affected side. Attacks of renal colic were, however, not uncommonly met with, but these rarely attained the intensity of those due to calculus. A few patients stated that the pain started in the bladder and radiated up into the kidney on the affected side. Some complained of "soreness" in both kidneys, and in a few the pain was on the side opposite to the seat of disease. Radiation of the pain was somewhat similar to that found in calculus. In one case the pain radiated to the shoulder on the affected side. Vomiting and pallor, with sweats, were less frequent than in the case of stone.

The pain in tuberculous kidney is probably due to intrapelvic pressure, but the chronicity of the disease allows of

more gradual distension than in the case of stone. At times, however, the passage of thick pus or debris down the ureter may suddenly increase the pressure in the pelvis and give rise to colic. The thickened, rigid ureter, so frequently present, is hardly capable of spasm.

Pyelitis.

Pain is a very frequent symptom in pyelitis. Thus out of 75 cases which I have noted pain was present in 59, or almost 80 per cent. In the acute cases with rigors and fever, vomiting, pain, and tenderness, with, perhaps, palpable swelling of the affected organ, and muscular rigidity were commonly present. The pain was more fixed and constant than in calculus and tubercle, and was not generally so severe as in calculus. Even in acute cases, however, pain may be entirely absent. In chronic cases pain is often absent, and the affected kidney is only discovered by cystoscopy or ureteral catheterization. In one case in which inspissated pus was squeezed out from the ureter, no pain was complained of. In a few cases renal colic was present, the pain radiating to the groin, testis, or even to the leg or foot, but the type was generally much less severe than that seen in calculus. The following case, in which the kidney was explored, is a good example of acute unilateral pyelitis.

A married woman, aged 32, had repeated rigors, with fever, sweating, rigidity, and acute pain in the right lumbar region. The right kidney was tender and painful. *Bacillus coli communis* was found in the urine. On exploration the kidney was congested and enlarged and the pelvis was dilated.

The local pain and tenderness in these cases are probably due to swelling of the parenchyma of the kidney and distension of its capsule. When colic is present it is no doubt due to the passage of purulent coagula along the ureter.

Hydronephrosis and Pyonephrosis.

In hydronephrosis and pyonephrosis we have the conditions most favourable to the development of renal colic—namely, obstruction and distension of the renal pelvis. As might be expected, therefore, pain is a frequent symptom in these affections. Out of 37 cases examined, pain was present in 31, and doubtful in 2. The pain, like that due to calculus and tuberculous, varied very much in character and distribution. A very frequent history was that of pain and a tumour in the side, associated perhaps with vomiting. It is noteworthy that the radiation of the pain resembled very closely that seen in renal calculus. Now, in a large proportion of the cases the block was present at the uretero-pelvic junction, and did not involve the ureter itself, yet the pain was very similar to that said to be due to the passage of a calculus along the ureter, and attributed to spasm of the latter. Some of the cases of hydronephrosis were associated with an abnormal renal artery running to the lower pole and crossing the ureter. Hurry Fenwick attributed the pain in these cases to spasm produced by the artery acting as a bowstring to the ureter. This spasm might itself cause pain or, by narrowing the ureter, produce intrapelvic pressure, which, as we have tried to show, is the main cause of renal colic. A curious circumstance is that in some of these cases of hydronephrosis the pain is of recent onset, though the state of the kidney found at operation justifies the assumption that the condition has been present for years. The patient may have been perfectly free from pain from his youth, until suddenly he is seized with violent colic. Operation reveals a kidney reduced to a shell. Why, then, has pain not been present before? An explanation that suggests itself is that while very gradual distension spread over perhaps a number of years may be painless, a time comes when the uretero-pelvic junction becomes sufficiently kinked from the disturbed relations of the parts, caused by dilatation of the pelvis, to cause a more or less complete block. Pain is then felt, and is only relieved by the release of fluid from the dilated pelvis. In some cases hydronephrosis or pyonephrosis is accidentally discovered by palpation of the abdomen, and in others, again, there is a history of attacks of pain extending over twenty years or more.

The pain in certain cases of hydronephrosis and pyonephrosis may rival in severity that found in renal calculus, as in the following:

A man, previously healthy, began, at the age of 23, to suffer from paroxysms of renal colic. Before admission to hospital he had had three attacks at five months' intervals. The pain started in the left lumbar region and radiated towards the iliac fossa. During the attacks the patient became weak and vomited. The

urine was clear, amber, acid, specific gravity 1020, free from albumin, blood, pus, and micro-organisms. There was some tenderness in the left lumbar region but the kidney could not be palpated. X-ray examination was negative. Here was a patient with typical attacks of severe renal colic with no definite physical signs, and with normal urine—a state of affairs occasionally seen and practically always attributed to stone. Cystoscopic examination showed no change in the bladder or ureteral orifices. Catheters were introduced into each ureter, but no flow could be obtained on the affected side until the catheter had been passed as far as the renal pelvis. Then a large quantity of fluid was obtained. The specific gravity of this specimen was 1005, as against 1025 on the sound side. Sodium bromide solution, a large quantity of which was accommodated without pain, was run into the renal pelvis on the affected side. Radiography demonstrated great dilatation of pelvis and calices, and operation revealed a large hydronephrosis.

Renal Tumours.

Pain may be entirely absent in cases of renal tumour. It was present in 11 out of 18 cases recently examined—that is, in about 60 per cent. It was described as a soreness, a dragging pain, pain and tenderness, or severe renal colic. In one case the patient had what was described as "terrible" pain radiating down the leg and accompanied by vomiting and the passage of clots. In another case in which there was no visible blood in the urine, the patient complained of pain radiating to the outer side of the ankle. The tumour proved to be a malignant adenoma.

There are various factors which may contribute to the production of symptoms in renal tumours. The tumour may drag on, or involve, adjacent structures; by distension of the renal capsule it may cause pain; the pelvis may be partially or wholly filled with growth; the veins may be blocked with it; blood clot may be present and give rise to acute renal colic during its passage down the ureter, or detached portions of growth may act in the same way. Most of my cases who had pain suffered from renal colic of various degrees of intensity, and in most of them the cause appeared to be blood clot in the pelvis or ureter.

Haematuria.

In some cases of haematuria the blood is poured out in such small quantity that time is allowed for intimate admixture with the urine, and pain may be absent. In others the bleeding is so profuse that clotting does not take place until the blood reaches the bladder. In others, again, clotting takes place in the pelvis or ureter, and produces the well known symptoms of renal colic. After the passage of the ureteral catheter, when blood is drawn, it is not uncommon for acute pain to occur. No doubt in such cases the mucous membrane of the ureter is rendered more irritable by the trauma inflicted. Sometimes this pain closely simulates that produced by renal calculus. The amount of blood drawn does not seem sufficient of itself to account for it. That idiosyncrasy plays a part is shown by the fact that in some patients the smallest clot may produce very severe symptoms, while in others no discomfort is felt. This holds good in all forms of renal disorder in which pain is a common symptom.

Movable Kidney.

Pain is often present in cases of movable kidney, but this condition is so commonly associated with other manifestations of visceroptosis that it is difficult sometimes to apportion the blame between the various organs concerned. On the right side especially it may be impossible to differentiate symptoms of appendicitis, mobile caecum, and other abdominal affections from those due to displacements of the kidney, and mistakes in diagnosis are often made. In such cases I have found ureteral catheterization and pyelography useful. Most usually, if any difference is seen in the specimens from the two sides it is a diminished specific gravity on the affected side—due, no doubt, to a reflex unilateral diuresis. Rarely, the specific gravity is raised on the affected side—due, perhaps, to delay and increased absorption of fluid from slight kinking of the ureter. Pyelography may show some alteration in the pelvis or change in the calibre or direction of the ureter. The following case is a good illustration.

A man, aged 27, previously healthy, had a sudden severe pain in the left lumbar region, radiating to the groin and testicle. He also felt sick and vomited, and complained of a constant desire to micturate, passing only a few drops at a time. He had several similar attacks. The urine was free from albumin and pus, but contained a few red blood cells. The specific gravity of the

specimen on the affected side was 1005, as against 1015 on the sound side. Pyelography showed a sigmoid bend on the ureter just below the renal pelvis on the affected side. No calculus was seen, but the kidney was tilted and lower in position than normal. Nephropexy straightened out the ureter, fixed the kidney in its normal position, and cured the patient.

Other Causes of Renal Pain.

One must always bear in mind that renal pain may be due to some condition of bladder or urethra. Carcinoma of the bladder, a papilloma at a ureteral orifice, an enlarged prostate, or stricture of the urethra may cause renal pain on one or both sides from back pressure. Besides these there are some rarer conditions occasionally met with which are accompanied with renal or pyelic pain. Such are certain forms of chronic nephritis, infarcts, hydatid cyst in which small cysts are sometimes passed, giving rise to attacks of renal colic, other cysts of the kidney, and horseshoe kidney.

As a confession of failure, due no doubt to faulty methods in the past, I am bound to admit that I have only too frequently seen cases of renal colic in which I have been unable to trace the cause. In some of these the urine has been perfectly normal and x-ray examination negative. In a certain number the only indication of a renal origin has been a diminished specific gravity on the affected side. This may have been due to a small undetected calculus, a narrowing or kinking of the ureter, an accessory renal artery, or some other obscure condition which reflexly alters the blood supply of the organ. In other cases every method of diagnosis has been tried, with the sole result of excluding gross lesions. Recent advances in our methods of examination will reduce the number of undiagnosed cases and add to the satisfaction of all concerned in the investigation and treatment of these elusive complaints.

TREATMENT.

Cases of renal pain will be dealt with, of course, by removal of the cause, when this is possible. Papin and Ambard's point out, however, that in certain cases of painful nephritis, small hydronephroses, and renal neuralgias of ill defined character the only treatment which, up to the present, has been applied has been either insufficient or excessive. While decapsulation, temporary nephrotomy, and nephropexy are insufficient to effect a cure in a large proportion of cases of this sort, removal of the kidney is too drastic a step. In these circumstances they have devised an operation which relieves the pain and yet conserves the kidney. This consists in resection of the nerves of the kidney. The pedicle is carefully exposed, the nerve filaments accompanying the vessels are defined, seized one by one with dissecting forceps, and torn across by slipping under each a probe-pointed director. The authors state that it is not difficult to distinguish the resistant nerves from the softer lymphatics. Before the operation can be considered complete the vessels should have been stripped of all the nerve filaments surrounding them. In order to expose certain of the fibres it is necessary to pass between the different branches of the vessels. The renal vein is in danger of being torn unless care is taken. Should this accident happen, a delicate suture should be used to close the opening. In all cases the kidney is fixed in position by flaps of capsule, and a small drain is placed at the lower end of the wound. The authors publish detailed accounts of six cases so treated, with complete relief in five. After this operation the patient suffers much more than after any ordinary operation on the kidney, even nephrectomy. There is, however, no urinary trouble, neither polyuria nor marked oliguria. Things are just as they are after any operation outside the urinary tract. In these patients specimens of urine taken from the enervated kidney differed little from those collected from its fellow of the opposite side.

In conclusion, it is apparent that the idea running through this address is that the pain we have been discussing is due in a large proportion of cases to distension of the renal pelvis. Treatment should be directed towards removing the cause, and involves, in some instances, ablation of the kidney. In selected cases it may be possible to relieve the patient by interrupting the nerves carrying the painful impressions.

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