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Obstructive Suppression of Urine

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Obstructive Suppression of Urine

When a person ceases to void urine partially or completely he is said to suffer from either "retention" or "suppression". The term, "retention", referring to retention in the bladder, obviously implies that urine is secreted though it is not voided; while the term "suppression" suggests cessation of function in the kidneys themselves. Under the term "suppression of urine", however, there have been included many cases which differ entirely in their pathological cause and present an entirely different clinical picture from each other. Thus, for example, in one class of cases the kidneys cease to perform their function on account of acute inflammation of the organs themselves or on account of a general failure of function as in collapse; while in other cases it is not the function of the kidneys which fails, in the first instance at any rate, but some obstruction is placed upon the flow of urine between the mammillary processes and the bladder. To this latter condition various terms have been applied. Sir William Roberts, who first gave a complete account of such cases, described them under the term "obstructive suppression" in contrast to the more familiar suppression which he named "non-obstructive suppression".

...nary & Renal Diseases' ...d. p. 23 et seq.

Dickinson classifies suppression as renal and systemic and includes cases of obstructive suppression under the former category.

Urinary and Renal Affections vol. iii p. 1295.

Recent writers usually apply the terms "obstructive" and "non-obstructive" to the two chief classes of suppression.

The term "Anuria" has been applied to all classes of cases where there is interference with the flow of urine from the body.

Ralfe classifies both Suppression of Urine and Retention of Urine under the generic term "Anuria" and includes cases where there is obstruction in the Ureter under the term "Retention" thus making his classification depend upon performance or non-performance of function by the Kidneys themselves.

Diseases of the Kidney p. 451.

The term "Anuria" is also used with a less wide signification, as, for example, where Kelly says, "a retention of the urine may be caused by a distension of the bladder with blood-clots, and if the pressure from this source continues to increase, the urine may be even prevented from entering the bladder (anuria)"

Operative Gynecology vol. i p. 389.

The term "Anuria" is most commonly used with a qualifying adjective such as Calculous a obstructive.

Harris: "Surgical Diseases of Kidney and Ureter" vol. ii p. 147 and many others

On the whole, Ralfe's terminology would appear most accurate etymologically, but the terms "retention" & "suppression" are

now so generally used as referring to the presence or absence of urine in the bladder, where the flow of urine from the urethra has ceased, that it is convenient to classify all the cases, following Roberts, where the failure of urine is not due to retention in the bladder, as first, "obstructive", and second, "non-obstructive suppression".

In this Thesis it is proposed to discuss the subject of "Obstructive Suppression of Urine".

The subject is very briefly referred to in most of the text-books, and the condition is undoubtedly an uncommon one; but many points of interest and importance have arisen in recent years which have added to our information on the subject, and deserve attention.

The following case may be taken as fairly typical in Symptoms and Course.

Alexander Sow. Twenty-three years of age. Lawyer's clerk. Single. Oamaru. New Zealand. Came under observation on Thursday, Oct 17th 1901.

Complains of pain and tenderness on the right side of the abdomen and back, which have existed for two days since the morning of Oct. 15th.

Family History:—

Father and mother both alive and healthy; four brothers alive and well; one was for some time subject to asthma; another who had several attacks of haemoptysis in childhood, also occasionally complains of "tightness in the chest." All the brothers have a healthy appearance. No brothers or sisters dead.

Personal History:—

Patient has comparatively light work in healthy surroundings, and the home conditions are healthy and comfortable. He takes a large amount of exercise, and eats a mixed diet without alcohol; he smokes in moderation.

He has been for a number of years subject to periodic attacks of asthma. These attacks have usually been ushered in by the passage of large quantities of limpid urine; while towards the end of the attack there is usually a large deposit of urates continuing for a day or two. He has however been almost free from asthma for the last twelve months.

About a year ago he was seized with pain

and tenderness in the right loin; the pain was localised; it prevented him from working; and, for about forty-eight hours he did not pass any urine. On the third day he began to pass water as usual, and the pain gradually disappeared in a few hours. Since the attack a year ago he has had occasional slight pains and discomfort in the same region. At no time has he passed any gravel or blood in his urine. His general health for the past year has been good.

The present illness began on the morning of Oct. 15th, when he wakened with a pain in his side. The pain however did not prevent him from going to work as usual. Next day, on the 16th he was sick and vomited; the pain continued and he was unable to go to work. He passed a little urine shortly after midday on the 16th but he has not passed any since, nor has he had any desire to micturate.

Present Condition:—

The patient is short in stature, well-nourished and muscular. He has a healthy appearance and is very intelligent. Temperament somewhat nervous. Temperature 98·8°

The Alimentary System is normal. Tongue clean; appetite fair; the feeling of nausea

has passed off.

The Respiratory and Circulatory Systems are also normal. Pulse, 78, rather soft.

On attempting to palpate the Kidneys I found marked tenderness in the right hypochondriac and lumbar regions, which interfered with deep palpation. The abdominal muscles in these regions were rigid and some fullness was discernible in the region of the right kidney. The left kidney could not be felt. The bladder was found to be empty.

The Nervous System presented no abnormality. Headache was absent.

A warm bath, hot fomentations over the loins and warm drinks were ordered.

Oct. ~~Nov.~~ 18th. The patient said he felt much better; the pain had gradually abated. No urine had been passed. Had slept fairly well through the night.

Oct 19th. Patient feels quite well. Appetite fairly good. No headache nor sickness. No urine passed. On examining the patient today I could feel the right kidney distinctly enlarged and movable.

For some days the patient continued in the same condition. A diagnosis having been made of obstructive suppression of urine, probably due to calculus in the right renal pelvis or ureter, together with absence or atrophy of the left kidney, operation was proposed, but the patient

and his friends wished to wait for a few days.

On the morning of Oct. 23. the seventh day since anuria set in, one teaspoonful of urine was passed per urethram. The patient now began to fail in appetite with a feeling of nausea and a coated tongue; muscular weakness also began to make itself felt. The pulse was full and slow, varying from 60 to 70 per minute. The temperature varied between 97.5° and 98.2°. There was no headache and no disturbance of the nervous system beyond some slight restlessness.

Warm baths twice daily were now ordered; the bowels were kept open with repeated doses of Magn. Sulphat. and Liq. Ammon. Acetat. was also ordered

On Oct. 24th the patient complained of sleeplessness and nausea. He had vomited several times. The feeling of weakness had increased. Dry cupping was practised over the region of the Kidneys in the back. During the day three teaspoonfuls of urine were passed. It was pale & limpid. No blood, albumen, nor tube casts were present in it. The Sp. gravity as nearly as could be ascertained was 1005

On Oct. 25th. The patient complained of a feeling of great prostration; the vomiting was now troublesome; the stomach rejected everything.

The bowels had not moved for two days.
The pulse was regular; rate about 80.
Respiration normal. Temperature 97.5°.
There was no headache; pupils normal;
no drowsiness, nor delirium; no muscular
twitchings; intellect quite clear. The patient
said that he felt "well enough" except for weakness
and a feeling of nausea after swallowing anything.
Three teaspoonfuls of urine had again been passed.

Upon examining the abdomen I found some
flatulent distension, and the right kidney appeared
to be larger; there was a feeling of fluctuation when
one palpated the kidney between the two hands.

A pint of normal saline was injected
into the tissues of the sub-axillary region, but
this procedure only appeared to precipitate the
uraemic symptoms for more severe vomiting set
in shortly afterwards.

There had now been nine days of
anuria, complete except for the passage of
less than one ounce of urine distributed over three
occasions. Operation was agreed upon. During the
night the vomiting became exceedingly troublesome,
and the patient's mother observed occasional twitching of
his limbs and face. In the early morning
he was suddenly seized with a convulsion.
When I saw him shortly afterwards, he appeared
weaker, but there were no twitchings. The pupils were
not contracted; and his mind was perfectly clear.

The pulse was somewhat irregular at about 90 to 100.
On the morning of Oct 26th, ten days after the anuria had set in, I opened the right loin by the method recommended by Morris. The kidney proved to be very large, and the difficulty of handling was increased by the thickness of the muscular walls. The blood which flowed in making the incisions appeared darker than usual. The kidney itself was very dark ~~in a~~ and congested in appearance. The renal pelvis was somewhat distended with fluid. On palpating the pelvis and upper part of the ureter I could not feel any stone. I then opened the pelvis by incising its posterior wall and allowed the fluid to escape. On prolonging the external incision beyond the anterior superior spine parallel with Poupart's ligament, and palpating the abdominal portion of the ureter, I could not detect any obstruction. I then tried to pass a fine catheter into the ureter from above but was unable to do so; the pelvis appeared to be pouched in its lower part and the insertion of the ureter angular and lateral. As the patient was in a weak state, it seemed wise to abandon any further investigation of the cause of the obstruction, and be contented with relieving the anuria. Large drainage tubes were therefore inserted, and the wound

stitched up. Urine began at once to drip freely from the tubes and in a few hours flooded the bed. By evening a large quantity of urine had been discharged through the loin. The patient felt much better and had neither felt sick nor vomited since the operation.

Oct. 27th. Next morning the pulse was eighty per minute and the temperature 98.4°. The patient had obtained a quiet night's ~~rest~~ sleep and there was a marked improvement in his condition. the tongue was much cleaner and there was already some appetite for food. Large quantities of urine (estimated at several pints) had been discharged through the loin.

During the next seven days the patient continued to improve steadily: the free flow of urine through the loin continued, but none at all was passed per urethram. The wound healed with unusually little suppuration.

On Nov. 4th, nine days after the operation, I removed the stitches; the patient was now eating well and feeling well.

On Nov^r 5^th ten days after the operation, and on the twenty-second day after the anuria had set in, the patient for the first time felt a desire to micturate, and passed four ounces of urine. The Sp. gr. was 1014 & there were some pus cells present.

On Nov^r 6^th in the evening he again felt a desire to micturate, and passed some small blood clots in about one ounce of urine.

On Nov^r 7^th urine began to pass freely per methram, and much less was discharged through the loin. A close watch was kept upon all discharges both from the loin and the urethra, but no calculus was found at any time.

Nov^r 8^th Urine passing freely by the urethra

Nov^r 9^th Fifty ounces of urine by the urethra

Nov^r 10^th Ditto. Fistula closing.

Nov^r 11^th Urine has ceased to pass by the loin & the fistula is closed. Patient sitting up. Fifty six ounces of urine voided.

Nov^r 13^th Today the patient felt symptoms of indigestion and about midday had a severe rigor lasting for about an hour. The temperature which had remained normal since the day after the operation, when it was 99°, now rose rose rapidly to 103°, and the pulse rate was 120. Vomiting also occurred and the bowels were loosely moved.

For two days the temperature remained elevated and there were other symptoms of pus formation; no feeling of tenderness however could be elicited and the scar looked healthy.

Nov. 15th. The temperature, which was 103° at 8 a.m. gradually came down today to 100° and the pulse-rate also decreased from 112 to 95. Pus appeared in the urine. For several days there was pus in the urine but the temperature fell rapidly to normal and the patient's condition improved. During this attack there had been no sign of cystitis.

The improvement was now well maintained and by Dec. 15th the urine was normal and the patient was again in good health.

It is now over two years since the illness. The patient has been at full work, and with the exception of an occasional attack of asthma, keeps in good health. He has never again experienced any pain or discomfort in the region of the kidney. Upon examining him recently I found that the right kidney had retained the high position in which it was placed at the operation & was no longer movable. I could only just feel the lower end with difficulty beneath the costal margin. The urine was normal.

Obstructive Suppression of Urine

Etiology.

The causes of obstructive suppression of urine may be broadly classified as follows:

I. Simultaneous obstruction of both ureters

II. Obstruction of the ureter on one side together with one of three conditions on the other side, viz:

A. Absence of a second kidney.

B. Atrophy and non-performance of function by the other kidney.

C. A disorganized kidney with little functional power in which that diminished power is reflexly suppressed

III Interference with the blood supply of the kidneys or of the only functional kidney.

An interesting example of Class I is given in iii p. 953 Dickinson's work on 'Renal and Urinary Affections'.

A healthy-looking man of forty-nine was seized with anuria, and died after eight days illness. At the post-mortem examination a calculus, almost identical in shape and position was found in the pelvis of each kidney. The calculi were triangular in shape, lay with the apex projecting downwards into the upper end of the ureter, and were worn by long friction to fit accurately.

The structure of the left kidney was extremely congested. The glandular structure of the ~~left~~ right kidney was healthy, but in every other respect the description of the left kidney and the calculus it contained applied to the calculus and kidney on the right side.

Such a sudden coincident blocking of both ureters has been reported several times

Saundby: Lectures on Renal and Urinary Diseases, p. 403

Coincident blocking of both ureters is usually a gradual process and occurs in many cases of pelvic growths and other conditions to be mentioned later on.

Class II.

A. Entire Absence of a second kidney is a very rare condition.

Saundby found it ten times in 3108 post mortem examinations. Id., p. 403.

In an exact study of such cases, however, Morris states that in analyzing all the cases reported as examples of absence of a second kidney, it is necessary to discriminate between, (α) Unsymmetrical Kidney, i.e. entire absence of one kidney, (β) Solitary Kidney, i.e., fusion of the two kidneys into one mass, and, (γ) Atrophy, including Congenital rudimentary ~~atrophy~~ kidney, or Congenital atrophy. D., vol i, p. 36

On adding together 15,904 post-mortem d. vol i p. 39

examinations, he found that the proportion of cases in which there was congenital absence of one kidney was one in 2650.

Fused kidney (including the horse-shoe kidney) on the other hand was found about once in every 1000 cases. In some cases of horse-shoe kidney there are found two ureters; when such a condition exists, it is obvious that an obstruction to one ureter would not necessarily cause anuria.

Morris: ibid., p. 92. Vol. i

When only one kidney is present, and that an "unsymmetrical" organ, there would seem to be a considerable disposition to renal Calculus.

It is in Class II, (B) where the second kidney's function has been destroyed by pre-existing disease, or (C) where that function has been greatly diminished, that we find much the largest number of cases of complete obstructive suppression of urine.

Class III.

This class is most conveniently catalogued among the causes of obstruction because the symptoms described in the very few cases which have been observed are similar to those usually produced by obstruction of the ureters.

Thus Bradford in Gibson's "Text-book of Medicine" says, "In obstruction of the renal arteries, entailing complete necrosis of both

Gibson's "Text-book of Medicine" Vol. ii, p. 369

Kidneys, with complete suppression of urine, the patient may live for a week, as in cases of calculous obstruction, and present identical symptoms."

Dickinson quotes a case in which suppression, nearly complete for five days, accompanied the formation of a dissecting aneurism which involved the aorta and probably the renal arteries.

(id., iii, p. 1307, from L. Clin. Transns. vol 27.)

A remarkable case was reported by Bradford and Lawrence in the "Journal of Pathology and Bacteriology" in May, 1898.

The patient — a multipara — was delivered of a still-born child on Feb. 28th. 1896. She was sick after the confinement was over, and suffered from headache and slight drowsiness. She said she passed no urine from the time of her confinement until March 2nd. when two teaspoonfuls were drawn off. There were no fits or twitchings; the patient gradually got worse and died suddenly on Mar. 7th. At the necropsy, there was found to be necrosis of nearly the whole cortex of both kidneys. There was wide-spread endarteritis of the interlobular arteries, which were thrombosed, and had caused ~~thrombosis~~ necrosis of the convoluted tubules throughout the cortex.

Dickinson, ibid., iii, p. 1299.

Sudden and more or less complete obstructive suppression is a comparatively rare condition, and in nine cases out of ten is due to stone in one pelvis or ureter becoming impacted while after the other kidney has been previously incapacitated

Gradual obstructive suppression is more common, and is usually produced by external pressure upon the ureters by morbid growths.

The important distinction in the pathological result upon the kidney between cases of gradual and cases of sudden and complete obstruction, will be referred to under the head of Pathology. It is sufficient meantime to point out that while the former produces Hydronephrosis, the latter produces rapid Atrophy of the organ.

All causes of Hydronephrosis may be enumerated as ~~Causes~~ occasional or possible Causes of obstructive Suppression except ~~perhaps~~ those which only produce hydronephrosis secondarily to retention of urine in the bladder, as, for example, enlarged prostate. When suppression does occur in such cases it is the non-obstructive suppression of pyelo-nephritis.

We may now go on to consider in greater detail the individual Causes which may produce Suppression by obstruction.

External pressure upon the ureters is observed in:

Ovarian tumours.

Two cases of obstruction from Ovarian Cancer are recorded by Morris from post-mortem examinations at Middlesex Hospital. — Morris: ibid., vol. i., p. 406.

Ovarian cysts are frequently observed to produce pressure effects upon the ureters. Kelly found albumen and casts in 50% of his cases; presumably gradual pressure had produced congestion of the kidneys followed by albuminuria. A case is reported by Bernard Pitt in which absolute anuria was produced for sixteen hours by pressure from ovarian tumour combined with pregnancy. Relief of pressure by the birth of the child resulted in a rapid clearing up of the symptoms. — Kelly: ibid., vol. ii., p. 265. — B. M. J., 1903, vol. i., p. 138.

Uterine tumours.

Carcinoma. Uraemic symptoms are not uncommon in uterine cancer. *Blair found obstructive results of external pressure in 57 out of 93 post-mortem examinations of such cases. Kelly reports that in five out of eight inoperable cases of uterine cancer, there were uraemic symptoms before death. Patel in the Rev. de Chirurgie for Aug. 1901, refers in detail to the surgical treatment of anuria due to this cause. There are numerous examples on record where the anuria caused by pressure on the ureters — *[?] and Barbour, Journal of Gynecology, p. 467. — Kelly, ibid., vol. ii., p. 7. — B. M. J. Epitome 1901, vol. ii., 200.

...lts: Urinary and Renal Diseases.

in Cases of uterine Cancer, produced the symptoms characteristically associated with sudden & complete anuria such as results from calculus obstruction.

...rklen; 190 ...de sur l'Anurie p. 190

In a case recorded quoted by Merklen, where a woman died of uraemia it was not discovered till the necropsy that the cause of the uraemia was pressure upon the ureters from uterine Cancer.

Myoma. Several cases of single and double hydronephrosis and of death from uraemia have been recorded as due to this cause. Gusserow quotes cases from Jude Hüe, Murphy and Hanot. In a series of 100 hystero-myomectomies operated on by Kelly two cases were operated upon on account of periodical attacks of suppression. Among striking cases in which the uraemic symptoms were immediately relieved by operation may be mentioned one recorded by Tuffin (Gazette des Hôp. de Paris, Oct. 17. 1893) and another by Dauvergne (Echo Méd. de Lyon, April 15. 1902) Newman records an unusual case where the symptoms of obstruction were supposed to be due to a fibroid which was present, but at the p.m. examination a calculus was found as the real obstructing cause.

Hart & Barbour: 'Manual of Gynecology' p. 418

ibid., p. 418.

Kelly: ibid., p. 341.

B.M.J. 1894. vol. i Epitome, 154

Ibid., 1902, ii Ep. 66

B.M.J. 1900. i p. 954

There are instances cited of malignant disease in various other abdominal and pelvic

organs causing obstruction. Kelly records an interesting case of retroperitoneal pelvic Sarcoma in which the right ureter was dilated to a calibre of 1½ Cent.; and the same author mentions Cancer of the Coecum, Cancer of the ureter, and Cancerous infiltration of the broad ligaments as causes of obstruction. — ibid., vol. i., 448 — ibid., vol. i., 449.

Fenwick records a case of Cancer of the mesentery producing obstruction by pressure on the ureter. — B.M.J. 1899, vol. ii., p. 1107

Among simple tumours producing a like effect we find a case of fibroma recorded by Hadden in the Transactions of the Pathological Society (XXXVII, p. 301), in which the right kidney was entirely Cystic as a result of the pressure on the ureter. — Morris: ibid., i., 408

Kelly mentions Aneurism of the Iliac Artery, and Hydatid Cyst. — Kelly: ibid., 433

Morris mentions enlarged Lymphatic glands. — Morris: ibid., 408

Both Aneurism and Hydatid were found as by Saundby as causes of Hydronephrosis in his series of 3108 p. m. examinations. — Saundby: ibid., 409

Still confining ourselves to Causes external to the ureter itself we find a number of causes associated with fresh or old inflammatory action. Thus Scar tissue in the broad ligaments — Hart & Barbour: ibid., 364

has been found as a cause: also pericuteritis; omental adhesions to the pelvic brim; peritoneal bands; disease of the uterine appendages producing adhesions; Kelly: ibid., 433. vol i. Morris: ibid., i., 408 Newman: B.M.J. 1900, i. 953 Simpson: Glasgow Med. Journal. 1867 vol ii B.M.J. 1898. i. p. 262.

Pelvic abscess is mentioned by Kelly, Morris, and Newman; and Newman also mentions abscess of abdominal origin.

In connection with scar tissue, we find a curious example of pressure effects in these remarkable cases where intermittent hydronephrosis appears simultaneously with the menstrual periods: it would appear that the swelling of the pelvic organs which occurs at these periods produces pressure on the ureters where these are surrounded by old scar tissue in the pelvis as a result of former pelvic peritonitis or cellulitis. Gibson: Text-book of Med. vol. ii., p. 348.

Among curious causes of pressure we find blocking of the ureter by dilated rectum and sigmoid flexure of the colon. Cohnheim, quoted by Fagge, records the case of a rachitic boy of eleven with contracted pelvis in whom double hydronephrosis was produced by pressure of an enormously dilated rectum and sigmoid. Fagge: 'Text-book' vol. ii., p. 530.

Again Lagrave (quoted by Morris) found a kidney hydronephrotic from compression of the ureters by means retained in the half of a bifid uterus Morris: ibid., i., 410.

Another series of Cases is associated with Displacements of the pelvic organs. Among Causes of Hydronephrosis found at necropsies made by Saundby is one of "occlusion of the ureter by dragging of procidentia uteri." Saundby: ibid., p. 409

Hildebrandt as quoted by Morris, considers Retroflexion of the Uterus an occasional cause, and he records such a case in his writing as Retroflexion. Morris: i., 410.

Newman mentions a number of Cases of obstruction due to displacement of pelvic organs causing torsion of the ureters. B.M.J. 1900. i., p. 953

Croom records a striking Case of Retroflexion and Retroversion of the gravid uterus, which was remarkable in many respects; the post-mortem examination shewed that "the right ureter opened into the compressed portion of the bladder and as a result of the blocking of the ureter at its entrance into the bladder, the passage of urine was entirely suspended, and consequent dilatation of the pelvis of the kidney took place. Croom: 'Retroflexion & Retroversion of Gravid uterus'. p. 15.

Of Cases Connected with the Bladder we find a Considerable number.

Two Cases are on record where complete suppression was caused by obstruction of both kidneys by a large vesical Calculus. One Specimen Morris: ibid., ii., 151.

is now in Middlesex Hospital museum, and that the other is that of Amsden quoted by Morris and others. 'Bulletins de la Société Anatomique.' 1875

Any form of vesical tumour may compress one ureteral orifice. These may be classified as:

a. Benign tumours such as papilloma, fibroma, adenoma, myxoma a dermoid cyst. Kelly: ibid., i., 389. Morris: ibid., i., 408.

Thus Silbermann, as quoted by Morris, mentions a case seen by him in a child ten years old, in whom hydronephrosis of the right kidney was caused by fibroma of the bladder. Berliner Klinische Wochenschrift xx., p. 518; 1883.

Morris himself had under his care two cases of villous papillomata causing hydronephrosis. Morris: ibid., i., 409.

b. Malignant tumours such as carcinoma or sarcoma.

Dickinson mentions two such cases, one recorded by Hutchinson, and another at St. George's Hospital, of encephaloid growth of the bladder, primary in that organ, which obstructed both ureters and caused anuria for ten days. Dickinson: ibid., iii., 1302.

Kelly mentions sarcoma as a cause. Kelly: ibid., i., 431.

Again inflammation, ulceration, abscess, or tubercular disease of the bladder may compress an ureteral orifice: or the villous outgrowth from calculous irritation may produce the same result. Morris: ibid., i., 408. Newman: B.M.J. 1900, vol. i., p. 953.

Morris states that he saw a case where

'a saccular in a thin dilated bladder (associated with, if not caused by, enlarged prostate) had produced great dilatation of the ureter from dragging upon and partly occluding the ureteral orifice'. The same author states that prolapse of the vesical orifice of the ureter has given rise to unilateral hydronephrosis." Morris: ibid., i., 409. ibid., i., 409.

'Thickened bladder walls' is mentioned as a cause of hydronephrosis by several authors. In this connection, an interesting cause of hydronephrosis was long ago pointed out by D. James of Edinburgh, viz. frequency of micturition. D. James showed how contractions of the bladder may prevent the flow of urine through the ureters. In D. James' case the cause of the irritable bladder and frequent micturition was phimosis, but, as Morris suggests, in referring to D. James' case, it seems probable that other cases of obstruction to the urethra, such as enlarged prostate and stricture, when they ultimately produce hydronephrosis, may do so by means of first causing irritable bladder, and hence frequent and straining micturition. Ed. Med. Journal, 1877, p. 135 and Nov. 1878. ibid., i., 411.

I was able to observe this firm contraction of the bladder very markedly in the case of a young man who was under my care last year, suffering from irritable bladder due to prolonged gonorrhoeal cystitis. In washing out his bladder

I had, at intervals, while the catheter was in the bladder to wait fully half a minute before the contracted bladder relaxed to allow any Coloris at all to enter it.

Causes, however, of obstruction to the ureters such as would produce increased frequency of micturition, although they may ultimately produce suppression by causing hydronephrosis in the manner suggested above, can hardly be catalogued among the causes of obstructive suppression proper; for, in such cases, when suppression does occur, it is really non-obstructive suppression due to gradual, bilateral destruction of the kidney substance following upon suppurative pyelitis.

It will be observed that by far the majority of cases in which external pressure produces obstruction of the ureter occur in the pelvic portion of the ureter; that fact is obviously due to the close relation between the ureter and the important pelvic organs, and the risk of compression against the unyielding bony pelvic wall.

A large number of causes of obstruction occur in the ureter itself. It is from such causes and especially where calculus is the cause that the most striking cases of obstruction suppression result. And it may here be repeated that ninety

per cent of all cases of sudden and more or less complete anuria occurring in apparent health are due to obstruction of one ureter by calculus when the corresponding kidney is the only one performing its function.

A large number of interesting and typical cases are on record and our knowledge of the condition of obstructive ~~knowledge~~ suppression is chiefly due to observations on such cases from the work of Sir William Roberts to the present day, when, not infrequently, cases which to all appearance would have been fatal, are relieved by operative procedures. An early case, related in full by Sir James Paget in the second volume of the "Transactions" of the Clinical Society is one of the most remarkable inasmuch as the patient, 74 years of age, passed little and then no urine and then lived through twenty-two days of complete suppression with the exception of the passage of a small quantity supposed to be about a pint. At the necropsy the right kidney was found dilated and the left which was hypertrophied and gorged with blood had its ureter blocked by a calculus two inches above the vesical orifice.

Dickinson: ibid. iii., 966 and others

Among the earlier cases which are fully recorded is the interesting one ~~recorded~~ referred to by Fagge

Fagge: ibid, ii, 527

in which a woman of 37 had the right kidney removed for calculi, and at a later date suffered from calculous anuria. After five days of suppression the same Surgeon (Lucas) cut down on the left kidney and removed a large impacted Calculus. The patient recovered and was well five years afterwards.

Many of the earlier cases recorded by Roberts, Dickinson and others appear to have occurred in elderly subjects of full habit of body such as are subject to 'gravel', but many cases are now on record at various ages from infancy onwards.

The small size of the stone which causes the obstruction is sometimes remarkable. In a typical case reported last year the stone was under three grains in weight, while in one of Roberts' cases the weight was one and a third grains. Mitchell Stevens: B.M.J. 1902, i., 709.

While Calculous anuria is commonly sudden and complete, there are, on the other hand, cases where anuria is the gradual result of the destruction of kidney tissue. As Morris in his recent work points out, 'the suppression may arise from a small Calculus slipping into the ureter and blocking its lumen, while the kidney itself is almost normal in structure · or on the other hand it may be the result of a total destruction of the renal secreting substance which has gradually taken place ibid., ii., 147.

giving rise to the "anuria calculense toxine" of Legueu. Between these two extremes there are many gradations, and the two conditions, viz. destruction of kidney substance and blocking of the ureter, may of course exist at the same time.

In a considerable number of the cases of calculous anuria it is a previously existing stone which has rendered the other kidney functionally useless and doubtless many cases of atrophied kidney where no stone is found were also, many years previously, cases of renal or ureteral calculus.

Newman gives a good clinical picture of a probable course of events. He says: "There is a history of repeated attacks of renal colic on one side, associated with the presence of hydronephrosis and other physical signs of obstruction. The symptoms become suddenly relieved coincident with the escape of a large quantity of clear urine and some gravel, and followed by slight and transitory haematuria. These symptoms are repeated from time to time, then suddenly cease; the last attack is more prolonged than former ones, and the relief instead of being sudden is slow. There is no abrupt rush of urine, no escape of gravel, and no transitory haematuria. A stone has become firmly impacted in the ureter, and this accident will be followed by rapid ~~atrophy~~ and complete

B.M.J. 1900, i, 949.

atrophy of the corresponding kidney and by hypertrophy of its neighbour. Years pass, these old attacks of nephritic colic are forgotten, but in the course of time the only working kidney becomes the seat of the old disease; a calculus forms in its pelvis, and passing down the ureter becomes impacted there, and may cause either complete occlusion, followed by anuria, or the plugging may be partial, and permit of the occasional escape of urine at intervals."

The position of the impacted calculus is noteworthy. In fifty-six cases analyzed by Morris, the situation of the calculi was as follows:— Morris: ibid., ii., 180.

1. In the renal pelvis and blocking the upper orifice of the ureter in seven cases. In four of these, both ureters were blocked at the renal orifice.

2. In the upper end of the ureter in thirty cases. Both ureters were blocked in five of these cases. In three there was another stone impacted lower down (two in the mid part and one near the bladder).

3. In the middle portion of the ureter in seven cases. In one case both ureters were blocked, and in two others there was a second blockage by a calculus higher up.

4. In the lower end of the ureter in ten

cases. In one of these there was an impacted stone also higher up, in three of them both ureters were obstructed.

5. In two cases complete suppression was caused by obstruction of both kidneys by a large vesical calculus.

The actual determining cause of calculous anuria has been often traced to some shaking movement calculated to shift a renal calculus from its usual position and so allow it to become impacted in the ureter.

A number of other foreign bodies besides calculus have been described as occasional causes of obstruction in the ureter though usually the obstruction caused by them is of short duration.

Among the more serious is Blood-clot. Death from obstructive suppression caused by an inspissated blood-clot impacted in the left ureter occurred in a case described by Butter. The suppression lasted for thirteen days. The right kidney was cystic and atrophied. Lancet. 1890 i. 179.

Most cases of ureteral obstruction due to blood-clot are traumatic in origin but other sources of profuse haematuria may produce a like effect. Renal tuberculosis does not usually produce profuse bleeding, but in a case which

was under my care, there was haematuria and the occasional passage of small clots for some weeks. There was no sign of bladder trouble. The determining cause of death was excessive haemorrhage. Unfortunately no post-mortem examination could be obtained.

Concretions of pus or muco-pus, hydatids, sabulous material deposited from the urine, and thick glairy matter secreted by the ureteral mucous membrane are all examples of foreign bodies mentioned by Morris as occurring in the ureter and possible causes of temporary obstruction. For example, Morris quotes from Chopart a case of death from anuria in a woman, aged seventy, in which both ureters were filled with and obstructed by "a glutinous, pasty, material which contained no calculus or gravel." ibid., ii., 474

He also mentions other cases where bodies have been introduced into the ureter from without, notably one where a piece of pipe stem, which was introduced by a man into his urethra found its way into one ureter and produced great dilatation by obstruction.

Diseases proper to the ureter are among the causes of its obstruction.

Cases where the irritation of a calculus has produced stricture followed by hydronephrosis are not very uncommon, and stricture may be Morris: ii., 429. ibid.,

Accidentally produced by ureteritis of various origins.

One case is on record where stricture was caused by the healing of a laceration in the cervix of the uterus after confinement. B.M.J. 1900. i., Epit. 459. (Dudley: Boston Med & Surg., Mar., 1900)

Among the cases of traumatic stricture of the ureter are a very few resulting from subcutaneous rupture, which have been carefully analyzed by Morris. Morris: ibid., ii., 332 et seq. ii., 364.

In one case of penetrating wound of the ureter there was complete suppression of urine for five days.

The ureter has frequently been injured during surgical operations so that stricture and occlusion resulted. L. Landau relates a case in which while operating for carcinoma of the uterus he intentionally ligatured one ureter intending to perform nephrectomy later. This however proved unnecessary; convalescence was uninterrupted, although the daily quantity of urine was at first considerably less than half the normal. Six months later the occlusion of the ureter had given rise to no symptoms and there was no sign of hydronephrosis. Medical Review. 1901. p. 313 (Deutsche Med. Woch., Nov. 22., 1900. p. 749)

Such a result accords with the usual pathological result of complete ~~kidney~~ occlusion of the ureter from any cause. With the cystoscope the orifice of the right ureter appeared as a shallow depression.

According to Kelly, ureteritis, causing obstruction is common and he classifies such obstructive ureteritis as (a) ureteritis bacilli coli communis, (b) ureteritis gonorrhoica, and (c) ureteritis tuberculosa. He describes an instance of the latter where as a result of stricture due to tuberculous ureteritis the calibre of the ureter above the stricture measured one and a quarter inches. Kelly: ibid., i., 435.

A case of stricture of the ureter due to the irritation of a calculus came under my notice recently. Mrs S., aged 49, had suffered from symptoms of renal calculus on the right side for some years. Attacks of feverishness and pyuria were becoming frequent. I performed nephrolithotomy. The stone which lay in the renal pelvis weighed 240 grains. There was already some narrowing of the upper end of the ureter. Six months later as a fistula still remained discharging pus and small quantities of urine in the loin, ~~and as the kidney was~~ I re-opened the loin; and as the kidney was now in a much worse state of disorganization, I removed it. At the junction of the renal pelvis and the ureter a stricture was found which would barely admit a small silver probe. The patient then made a good recovery and is now in good health more than a

year after the second operation.

It must be observed that in many instances these causes of obstruction of the ureter under consideration really produce 'obstructive pyelo-nephritis' or 'surgical kidney', exactly as may result from retention due to enlarged prostate or stricture. The clinical condition produced in such a case is rather one of non-obstructive suppression than of simple obstructive suppression.

Primary tumours of the ureter are very rare, but when they do occur may be the cause of obstruction. Cysts, including two cases of pseudo-sperms, papilloma, sarcoma, and carcinoma are all described. There is a case in the Glasgow R.I. Museum described by Newman of a fimbriated papilloma of the ureter holding a calculus

Kelly: ibid., i., 433. Morris: ibid., ii., 480

B.M.J. 1900 i., 950.

An important cause of ureteral obstruction is a 'Kink' in the ureter of a movable kidney.

Special attention has been drawn to movable kidney as a cause of intermittent hydronephrosis by Newman. He and others have reported several cases where transient albuminuria and casts from congestion of

Lancet. 1896 i., 166.

the kidney have resulted from a partial obstruction due to kinking of the ureter. Edebohls has shewn that fixation of the kidney ~~Causes~~ Cures these attacks of intermittent hydronephrosis. The question however has arisen as to how far hydronephrosis may be the cause rather than the result of movable kidney. It has been suggested for example that such cases may be due to catarrh of the pelvis of the kidney with consequent swelling of the mucous membrane by which the opening of the ureter becomes narrowed. Saundby quoting the suggestions of Küster and Simon in this matter says: "During abundant secretion of urine, especially after drinking large quantities of ~~water~~ fluid, a disproportion must ensue between the amount secreted and that leaving the kidney, and retention follows. When the intra-renal pressure is increased the swollen mucous membrane which is movable on the submucous layer, slides down in the direction of the stream just as the mucous membrane of the bowel does in a hernia, and a fold is formed, which constitutes a growing obstruction to the outflow of the urine. When the distension reaches a certain degree, it produces a change in the position of the

B.M.J. 1902 ii., 1510.

Saundby: ibid., 410

Kidney and causes complete occlusion of the ureter".

Bazy attributes many cases of pain and particularly intermittent hydronephrosis to an abnormal congenital condition of the renal pelvis which, by frequently causing stagnation of the urine produces increased weight of the kidney with ptosis and mobility as a result. B.M.J. 1903. i., Epit. 183 (Rev. de. Chir. 1903)

It can be shewn experimentally that displacement of the kidney produces obstruction of the ureter; and Morris has referred to a pathological condition which he says is 'not seldom met with' by the surgeon in performing nephropexy, viz. 'a certain degree of flabbiness and softness of the renal tissue due to sacculation of the calyces from frequent moderate renal retention'. ibid., i., 98.

According to Bazy's theory such a condition may be the cause of the mobility for which nephropexy is performed while it is the result of a congenital abnormal condition of the renal pelvis.

In any case it is common enough to find movable kidney without any hydronephrosis at all. In a case of floating kidney on which I performed Nephropexy lately no 'flabbiness of the

renal tissue could be found, and there had never been any sign of kinking of the ureter although the kidney could be moved about freely in the right lumbar and iliac regions and also in the umbilical region so as to move beyond the middle line. The operation was performed on account of persistent dragging pains in the loin and after it had proved impossible to fix the kidney by external appparatus. It is curious that such cases of very freely movable kidney do not produce kinking of the ureter. It seems to me possible that cases of permanent kinking of the ureter with adhesions may be produced by irritation which occurs in the whole tract when a crisis of intermittent hydronephrosis has led to ptosis of the kidney, the hydronephrosis being the result of a congenital condition such as the large renal pelvis which Bagg refers to, and not primarily the result of the kink at all.

There are a number of congenital causes of obstruction of the ureter which may produce suppression in later life. It is not necessary here to discuss all the congenital causes of hydronephrosis. A narrowed urinary meatus for instance will

produce hydronephrosis by backward pressure. In a young man of twenty under my care, who had complained as far back as he could remember of constant irritability of the bladder with great frequency of micturition, the urine containing pus, I found the trouble to be caused by a peculiar congenital condition of the penis and urethra. There was a massive hypertrophied prepuce in a condition of solid oedema, while the glans penis was absent and the end of the urethra presented a minute meatus. After I had removed the mass of prepuce and made a new meatus, the patient was completely cured. Such a case would necessarily have produced bilateral hydronephrosis secondarily to frequent contraction of the hypertrophied bladder walls: but the ultimate result would have been gradual destruction of renal tissue rather than obstructive suppression.

There are however several congenital ~~condition~~ abnormalities which may ultimately produce obstructive suppression.

Newton Pitt shewed four specimens before the Pathological Society which, he considered, shewed aberrant renal vessels as a cause of hydronephrosis. In one of these the position of an aberrant vein, he believed, was such that a slight dilatation of the pelvis of the

B.M.J. 1894., i., p. 889.

Kidney was sufficient to cause the vein to compress the ureter between the pelvis and itself.

A similar and more probable cause exists where the ureter joins the pelvis at an acute angle. The sequence of events in such a case may be as follows. Some temporary distension of the renal pelvis occurs. As a consequence there is lateral pressure exerted upon the upper end of the ureter by the distended pelvis; hence further obstruction follows. The greater the distension of the pelvis, the greater is the pressure on the ureter and the more complete its occlusion. The smallest degree of ptosis of the Kidney in such a case would accentuate the valve-like obstruction of the ureter. And if congestion of the Kidney with consequent increase in weight and volume is produced, ptosis is more likely to occur. Still further, such a sequence of events is more likely to occur in the case of a hypertrophied Kidney whose neighbour has atrophied from previous disease, and the risk of complete obstructive anuria occurring is greatly increased.

In the case of Alexander Sow, whose clinical history I have described above, some such cause would appear to have produced

the obstruction. At the operation I found the pelvis distended with urine, and after opening it was unable to pass a fine catheter into the ureter owing to an apparent valvular condition produced by the acute angle at which the ureter entered the pelvis. A prolonged effort to find the opening & examine the condition more closely was impracticable owing to the critical condition of the patient, but it was at least evident that instead of the pelvis leading into the ureter at its most dependent part, the orifice was placed higher up on the pelvic wall.

No other cause for the obstruction could be found in this case; and it is noteworthy that the opening of the pelvis and the consequent free flow of urine by the loin with relief of all symptoms of suppression, did not result immediately in the restoration of the natural channel. Absolutely no urine was passed by the bladder for ten days after the operation, although the kidney continued to secrete very freely indeed. I had also taken care to replace the kidney as high up as possible in its normal situation, where it has since become anchored evidently by adhesions.

The natural inference is that the valve-like kinking of the upper end of the ureter became, as it were, undone, only after the

Congestion of the kidney had subsided. When the normal flow by the ureter had become restored the fistula in the loin closed with unusual rapidity.

What part pressure of the whole kidney played in this case is difficult to estimate. On the day before I operated, viz. nine days after the obstruction began, the kidney became distinctly palpable below the costal margin, and gave the feeling of fluctuation (described by Newman) although the actual hydronephrosis was but slight; it was movable, and I believe that the clearness with which it became palpable was due not only to Congestive enlargement, but that the increased weight produced a greater degree of mobility; and that as the patient got up and down out of bed (which he did frequently) the kidney descended further than formerly.

From a consideration of such cases, it appears that an abnormal Congenital Condition not sufficient in itself to cause suppression of urine or only sufficient to cause some degree of hydronephrosis by partial obstruction, may suddenly produce complete obstruction owing to a Concomitant Cause. Twists of the ureter on its axis, folds, reduplications & kinks, Contractions of the mucous membrane, narrowing

of the vesical orifice, abnormal opening of the ureter into the urethra instead of the bladder, and various other abnormalities mentioned by authors may all operate in this manner.

The question of Reflex suppression of function in one kidney when obstructive suppression has occurred on the other side is of importance, especially in relation to the matter of treatment. For if, in a case of obstructive anuria it were supposed that reflex suppression had occurred in the remaining kidney, one might be disposed to wait before calling in the aid of Surgery to relieve the obstruction, in the hope that the reflex suppression would pass off.

Does such reflex suppression occur? If so, does it ever occur in a sound kidney? From what we know of reflex suppression of urine from other causes one would expect a priori that the shock from sudden obstruction of a ureter would cause it. Temporary suppression from the passage of a catheter is well-known; though even that suppression has been supposed to be produced by the first Congestive Stage of a suppurative process. Obstruction of the bowel is known to cause suppression occasionally. An extreme example of such a case is quoted by Dickenson.

Dickenson: ibid., iii., 131). (Guy's Hospital Reports 1844, p. 378.

A boy of twelve years of age died from intestinal obstruction; during his illness five

days elapsed without any discharge of urine, and two more with only two and a half ounces. The diagnosis was confirmed at the post-mortem examination; the kidneys were described as full and soft.

I attended a case of gall-stone colic in which there was suppression for eighteen hours: the diagnosis was confirmed by the after history of the case.

Morris, speaking of calculous anuria, refers to "those cases in which the shock arising from the sudden blocking of the ureter gives rise to a reflex suppression in the opposite kidney, which, although functionally active, has suffered from previous disease, and so has become more susceptible to any nervous influence. Such cases, however, in which the suppression is prolonged for any length of time must be very rare; and indeed their very existence is questioned by some authorities." ibid., ii., 149.

Newman, speaking of transitory hydronephrosis, says that while "the renal pelvis is filling on account of sudden occlusion of the ureter, there may be on the healthy side complete inhibition of the function of the kidney. But while anuria may last sometimes for days, it is hardly ever so prolonged as to endanger the life of the patient." B. M. J. 1900 i., 954

Reflex paralysis of function from nervous influences is common enough and numerous striking cases are on record. For example the following

case is very interesting in such a connection.

A healthy young woman consulted me on account of dimness of vision. On going out to milk the cows in the morning she had noticed the dimness, and was told that her left pupil was very large. I found ophthalmoplegia interna of the left eye, mydriasis and complete paralysis of accommodation both being present. The right eye was normal. She was sure that both her eyes were of natural appearance on the previous evening before she went to bed; she had never suffered from any affection of the eye previously and had never used atropine or other 'drops'. After careful enquiry and examination, the only cause which I could find for the sudden ~~fal~~ paralysis was a carious upper canine on the same side of the face which had been bothering her for a few days. The tooth was extracted. No other treatment was adopted and in two days the eye was normal.

In the case of the urinary secretion, according to Starling, there is no proof of the existence of secretory nerves to the kidney, but on the other hand, 'the urinary secretion is extremely susceptible to variations in the pressure and velocity of the blood in the renal vessels,' and 'these latter are under the direct control of the nervous system by means of vaso-dilator

Schafer's 'Text-book of Physiology,' i., 660-1

and vaso-Constrictin nerve fibres.

In some of the experiments on dogs which have been made to investigate the effects of reflex stimuli, such as stimulating the distal end of the vagus, anuria has been produced; for but probably in such cases the anuria thus caused is associated with a general fall of blood pressure throughout the body and is comparable to the anuria which occurs in human beings in that general failure of function which precedes death.

Loeb, at the suggestion of Israel, made a series of experiments on the influence which an increased pressure in one ureter would have on the excretion in the opposite Kidney. When pressure in the right ureter reached about 200 mill.s of mercury, excretion in the left Kidney absolutely stopped. If the pressure was taken off, the Kidneys recovered themselves.

"Untersuchungen über reflectorischen Anurie" Pflügers Archiv. Physiolog., 1901 quoted by Hinder. Austral. Med. Gazette. 1903. p. 197.

In a case described by Hinder in which he operated for complete anuria which had existed for thirty hours he found the right Kidney enlarged but no cause for the anuria could be discovered except reflex suppression of function due to the state of the left Kidney. The left Kidney had been operated upon twelve months before for Stone and a suppurating fistula was still discharging through the loin. This patient

Austral. Med. G. 1903. 199.

while Convalescing after the operation for anuria had another attack of Complete Suppression which lasted for twenty-four hours and then repeated itself.

Heider also quotes one of Israel's cases as shewing the effect of one Kidney upon the other. It was a case of intermittent hydronephrosis. Every time that hydronephrosis was present and with it a rise in the intra-renal blood pressure, a condition of anuria was gradually established. Directly the pent-up fluid was drawn off, the affected Kidney began to secrete, and a profuse excretion came from the other Kidney.

Finally, Ceron in his Thesis on "Oliguria and Anuria due to Traumatism", has collected six cases of more or less Complete anuria after injury to one Kidney alone, the other organ, as proved by him in five cases being uninterfered with and normal. Only one of the six cases recovered.

"De l'Oliguria et de l'Anuria" (Morris: ibid., i., p. 175.)

From a consideration of these various facts and observations we must conclude that reflex arrest of function in the second Kidney occasionally occurs as a result of sudden obstruction to the excretion from the first, even when the second Kidney is sound; but that such arrest of function is of brief duration and not likely in itself to

cause death. On the other hand, when the second kidney is so disorganized by previous disease that its function is already greatly interfered with, the reflex arrest of its function may continue for a longer period, and possibly till death ensues from anuria. If, in any individual instance, the flow of urine does not become re-established by the third day we may assume that a second kidney is not present, or is atrophied, or is in a state of great disorganization.

Pathology.

The pathological result upon the kidney of a block in the ureter varies according to whether the block is gradual and partial or sudden and complete.

Hydronephrosis results from a gradual and partial or intermittent obstruction

Atrophy results from a complete obstruction.

In hydronephrosis the dilatation of the pelvis of the kidney is followed by dilatation of the calyces and lastly absorption of the kidney substance. The papillae are effaced, the pyramids flattened and finally the cortex too may disappear.

Histologically, the alterations in the shape of the epithelium take place owing to the pressure upon it. Increase in the connective tissue also takes place and thus the secreting power is gradually reduced, while the walls of the arteries also participate in the fibrous change. The final result is atrophy of all the elements and reduction of the kidney to a mere shell.

But the atrophic change after sudden & complete obstruction is of a different kind. According to Bradford, "in a considerable number of cases the presence of calculi

Gibson's Text-book of Medicine. ii, 366

in the pelvis leads to the complete suppression of urine without producing any very marked anatomical changes in the kidney, during the short time (seven to twelve days) that life persists, and in some such cases the suppression is not associated with the presence of any pent-up urine in the renal pelvis, true suppression being produced.

In the case of Alexander Sons the pelvis of the kidney was distended with urine to the extent of about one ounce: the kidney itself was not opened but the external appearance was that of hyperaemia.

In Bradford's experiments upon dogs, the ureter was ligated and divided near the bladder. After an interval varying from eleven to forty days, the distended ureter was drained through an abdominal opening. At periods varying from seven to fifty days after the second operation the animals were killed, and the kidney investigated. Some dilatation of the kidney invariably followed the first operation, but after draining a condition of atrophy ensued. The kidney re-assumed its shape but was much smaller than normal, being but one third or one fourth of the full size. To the naked eye the organ presented a natural appearance, B.M.J. 1897. ii., 172.

the medulla and cortex occupying their proper position. Microscopically the kidneys presented no increase of fibrous tissue. Some tubules had disappeared; in others epithelium had been in part shed; but the main cause of the atrophy was crowding together of the tubules, and more especially the small size of the cells lining them. The renal cells had also lost all their granules, their protoplasm being clear and glass-like; the nuclei stained well.

Some such process probably takes place in a human kidney when the ureter is suddenly obstructed. Kidneys in various degrees of atrophy as a result of ureteral blocking are found post-mortem. On the other hand it appears unlikely that a marked degree of atrophy results from obstruction, though complete, which does not last more than ten days. In the case of Alexander Sore, where obstruction was complete for ten days, recovery followed operation, and the patient is alive and well today, two years after, with a normal excretion of urine. In this case there can be no doubt that the kidney in question is the only secreting one; had the failure of the left kidney to secrete been merely due to reflex inhibition its recovery would

would have followed the resumption of action in the part of the right kidney, but as a matter of fact no urine flowed by the bladder for ten days after the operation, i.e. for twenty-one days altogether.

The most interesting pathological question in the matter of suppression of urine concerns the difference between the symptoms and cause of obstruction and non-obstruction suppression.

Newman holds that the early appearance of symptoms of toxic poisoning in the anuria of organic disease of the kidney is explained by the circumstance that during a long period prior to the actual suppression of urine there has been a steady impairment in the elimination of waste products, and a gradual storing up of toxins in the system, so that when the kidneys stop working the poisoned state of the circulation cannot be relieved sufficiently by the complementary action of other organs, such as the skin, the lungs or the alimentary tract.' B.M.J. 1900 i., 951.

An obvious difficulty in accepting such an explanation is the fact that profound nervous phenomena of uraemia such

as Convulsions and Coma occasionally develops so quickly in the case of acute nephritis. In such cases the kidneys may have been previously healthy, and therefore there was no 'steady impairment in the elimination' of waste products and a gradual storing of toxins in the system, 'during a long time period prior to the actual suppression.' In nephritis also the suppression is seldom complete; a few ounces of urine at any rate whose percentage of urea is usually comparatively high is usually passed, and yet Convulsions may come on within a day or two. In contrasting a case of a previously healthy individual who develops acute nephritis where there is a small excretion of urine containing urea with that of a patient suffering from obstructive anuria where suppression is complete, why is it that in the first we may actually observe profound manifestations of a poisoned state of the nervous system within a day or two, while in the second, a week or longer may pass without any such manifestations appearing?

One theory which has been advanced to afford an explanation is based on the hypothesis of there being an 'internal secretion' on the part of the kidneys

Mitchell Stevens: B. M. J. 1901, i., 710.
Graham Crookshank Lancet, Sept. 18, 1897.

besides its excretory action. If the kidney possesses other functions besides a purely excretory one, such functions are likely to be interfered with in Acute Nephritis while in obstructive Suppression, these functions may at first at any rate continue to be exercised. Thus it may be that the kidney as part of a defensive mechanism of the body, renders certain waste products (which have been thrown off by the tissues and are circulating in the blood) harmless or less harmful. The kidney in obstructive anuria may continue to ~~se~~ secrete urine containing these waste products in their less harmful form, and they are then reabsorbed into the circulation.

Such a theory while it is attractive enough as a solution of the pathological question, does not appear to be based as yet upon any solid physiological ground. The exact manner in which ~~urine~~ the secretion of urine is effected is not yet definitely settled. According to the Bowman-Heidenhain theory, the secretion of urine is due to the activity of two sets of cells, those lining the glomeruli, and those lining the convoluted tubules, and the ascending loop of Henle; each set of cells secretes its specific part of the urine. According to recent modifications

Schäfer's Text-book of Physiology i. 658.

of the Ludwig hypothesis the urine is first secreted (largely or exclusively by a physical process) in the glomeruli, and then concentrated by means of absorption in the urinary tubules.

Contending physiologists support either hypothesis.

Bradford's experiments shew that when one kidney of a dog is removed and a large wedge-shaped piece of the other excised, there is increase instead of diminution in the quantity of both water and urea excreted. From such a fact one might suppose that the kidney has other functions than excretion to perform. But further direct experimental proof in support of the supposed 'internal secretion' is required.

Nevertheless it is hard to believe that such different types of clinical symptoms as are found in obstructive and non-obstructive suppression can be caused simply by the retention of urea in the blood.

While the original mechanical theories of Uraemia of Owen Rees, Traube, and ~~Rilliet~~ Rilliet, have been given up, the chemical theories are both various and unsatisfactory.

According to Saundby, uraemic symptoms may supervene in spite of the ibid., 66.

elimination of a normal quantity of urea; and in experiments on animals, large quantities of urea have been injected without doing any harm. In spite of the large number of experiments and investigations into the cause of the uraemia of Bright's disease, we must conclude that the toxic agencies which produce the well-known nervous phenomena have yet to be identified.

Some recent views on the etiology of eclampsia are interesting in this connection.

H. Oliphant Nicolson ascribes to the thyroid gland a primary role in the production of the pre-eclamptic stage. He says that by the inadequacy of the thyroid and parathyroid glands, "the process of nitrogenous metabolism, instead of resulting in the formation of urea, ceases with the production of intermediate substances, which when absorbed, excite the symptoms of a toxaemia".

'Journal of Obst. & Gynaecology', July, 1902 quoted by Fothergill: 'Practitioner', Feb. 1903

Herzott describes a case which lends evidence to such a theory.

A cretin during a natural labour had a succession of typical eclamptic seizures although there was never more than a trace of albumen in the urine.

Herzott: Annales de Gyn. et d'Obstét. 1902 Vol. LVIII. p. 1 (vide also 'Practitioner' Feb. 1903.

Fothergill has brought forward some therapeutic evidence which supports Nicolson's

theory. It may be that the toxaemia which produces eclampsia can be produced by some inadequacy on the part of a defensive mechanism, in which the thyroid, the liver and the kidneys are all factors. The case of the cretin quoted above exhibits a breakdown in the defensive mechanism on the part of the thyroid. Failure of renal function may explain other cases. In the uraemia of nephritis failure of renal function may mean failure to render harmless certain toxic matters eliminated by the tissues; whereas in simple obstructive suppression, in which there is no inflammation of the kidney tissue, the defensive function of the kidney continues for a time although excretion has ceased.

Symptoms.

The Symptoms produced by obstructive suppression of urine are of a very striking character. The clinical picture which is associated in the mind of an observer with uraemia due to suppression of urine such as occurs in Bright's disease is not only useless but misleading when a case of obstructive suppression has to be diagnosed. The latter being much the rarer condition, it is important to bear in mind the contrast in the symptoms.

Cases of obstructive suppression had been recorded previously, but it was Sir William Roberts, who, in devoting a chapter of his work on 'Urinary and Renal Diseases' to such cases, drew special attention to the subject, differentiated the two typical classes of suppression, and gave a clear account of the symptoms of the less common class.

Other writers have since referred to the subject; Merklen in his 'Etude sur l'Anurie' (Paris. 1881) gives a clear and concise description of the usual symptoms and course of obstructive suppression.

It has been sometimes remarked of recent years that the contrast between the two classes of cases referred to above has

been over-emphasized. Doubtless there are numerous cases which are not quite true to the contrasted types given; cases of obstructive calculous anuria, for example, may occasionally present ordinary uraemic symptoms; and on the other hand, there are cases of suppression due to Bright's disease which do not present the ordinary symptoms of uraemia at any rate at an early stage; so that in a case of anuria, absence of such uraemic symptoms cannot be regarded as absolutely pathognomonic of obstructive suppression.

A case in point was reported by Hadley recently. A woman, aged forty-two, had total suppression for eight days. "She lived three days in hospital, during which she passed absolutely no urine. . . . She took plenty of milk, complained of nothing, and was bright and cheerful to the end. At her death she was talking to her friends whilst taking some milk, when suddenly her breathing ceased, although there had been no previous dyspnoea. There was never any headache, drowsiness, twitchings or mental incapacity, and the vomiting was only trifling, and did not prevent a good amount of milk being taken. The pulse ranged between 80 and 95 per minute, while the temperature, although it once rose to 100·2° was usually at a lower

B.M.J. 1902 May 10th

or below normal. A Complete post-mortem examination was made. There was no stone or other obstruction in any part of the urinary tract which was quite healthy from the pelvis of the kidney to the urethra. The Kidneys shewed acute nephritis of short duration.

Notwithstanding exceptional Cases such as this the fact remains that in a well-marked case of obstructive Suppression, the train of events which occurs when anuria has set in is remarkably distinct from the Course of ordinary uraemia

The symptoms of individual Cases are of Course largely modified by the concomitant pathological Condition. Thus, in a Case of Calculous anuria, there may be symptoms due to suppurative pyelitis; or where the obstruction of the ureter is due to outside pressure such as that Caused by Cancer of the uterus, the symptoms of the anuria may be masked by those of the more prominent disease. There is also a difference in the Course of the symptoms dependent upon whether the obstruction has been gradually produced or is sudden in onset. This is no more than we should expect from

the difference in the pathological result upon the kidney itself which has been already described.

The typical symptoms of sudden obstructive anuria are as follows:

A man who is apparently in good health ceases to void urine. He may never have had any symptoms of urinary trouble previously. As a rule there are sensations of discomfort or pain in the lumbar region more marked on one side or another. The pain however may not be acute enough to debar the patient from following his ordinary occupation and may entirely disappear in the course of a few days or a few hours. It is the absence of the customary flow of urine and sometimes of even any desire to micturate which brings the patient to the physician for advice. For about a week all goes well. There is nothing to warn the patient of impending danger beyond the anuria. The other important functions of the body appear to be little interfered with. The patient may be able to eat, his tongue is clean & the bowels act naturally; his pulse, respiration and temperature are about normal; his skin

acts normally; he is able to move about; and, most remarkable of all, his nervous system appears to be unaffected. There is no interference with his special senses and his intellect remains perfectly clear. In short, the patient for some days appears to be quite well. This is the so-called period of tolerance. Such a state of affairs usually continues for the larger part of a week. The first untoward sensation is usually a gradually increasing feeling of muscular weakness. Then the alimentary system becomes affected; appetite fails, the tongue becomes coated, and not infrequently vomiting becomes troublesome. Other important functions of the body begin to suffer. Respiration becomes slow and laborious; the pulse is slow and full at first while later it becomes irregular. Apparently both cardiac and respiratory muscles are participating in the general access of weakness. The body-temperature is lowered. The nervous system is now distinctly interfered with and muscular twitchings appear; the pupils are contracted; a feeling of drowsiness is not uncommon; to the end however the intellect may remain unclouded, and the profound disturbances of the nervous system, such as

Convulsions and Coma, which are so characteristic of uraemia in general, are here noticeable in many Cases only by their absence. The outstanding feature of the Condition is Complete prostration and when the fatal issue arrives, which usually happens in two or three days after the period of tolerance has passed, it Comes suddenly from Cardiac or respiratory failure. The patient may actually be engaged in Conversation within a few minutes of the end.

Such is a brief picture outlining the Symptoms and Course of a fatal Case of Complete obstructive Suppression of urine.

We may now Consider these Symptoms and their modifications in greater detail. In the first place the previous history of the Case may present features of interest and importance. A history of renal Colic, lumbar pain and haematuria with ~~of~~ on previous occasions will often be obtainable in Cases of Calculous obstruction. In other Cases, which are not Calculous, a history of previous attacks of lumbar pain may be found, and we may learn that during such attacks there was more or less anuria. In the Case, for example, of Alexander

Soon, I was informed that during an attack of lumbar pain and tenderness which occurred a year before, no urine was passed for forty-eight hours.

Among recorded cases where no previous symptoms could be discovered one of the most remarkable is reported by Jennesson. In his case there was anuria for fifteen days; uraemia supervened on the tenth day and the patient died on the fifteenth; this patient suffered no pain when the anuria came on, nor could any history of previous symptoms be elicited. According to Jennesson's words, "Je trouvai ce malade avec toutes les apparences de la santé, ne souffrant nulle part, ne se plaignant que d'une chose de ne pas uriner depuis dix jours. ~~Je percutai~~ .... Malgré l'insistence de mes questions, toutes les réponses du malade furent négatives. Il n'avait jamais eu de colique néphrétique, jamais d'hématurie, rien présenté, en un mot, qui indiquât l'existence de lithiase urique."

Soc. méd. des hopitaux, 1878. (Quoted by Merklen: ibid., 148)

Again, in other cases of anuria where the suppression has supervened gradually, we find a history of hydronephrosis; or we may find a history of other symptoms, not

connected with the urinary system, which have been produced by an obstructing growth.

In short, in a number of cases of obstructive suppression that condition is quite a secondary one, though it may actually be the final cause of death.

At the beginning of the attack itself, pain is the rule though not an invariable one. The pain is of a dull, continuous character, unlike that of renal colic, and is situated in the lumbar region, being usually distinctly worse on one side than the other. In the same region and most noticeable when one hand is placed behind and one in front we find local tenderness. The pain and tenderness are as a rule of comparatively short duration, lasting for a few days, and sometimes only for a few hours till the so-called period of tolerance follows. While pain is a common early symptom, distress from constant or frequent desire to micturate occurs in a smaller number of all cases. Such desire may exist in the entire absence of urine in the bladder; or occasionally but a few drops of blood-stained mucus are voided. On the contrary, where the obstruction is not quite complete, an unusual appearance is presented by the urine. It is pale, of a low specific gravity, deficient in urea,

and usually non-albuminous. Hippocrates' statement that 'persons affected with calculus have very limpid urine' is particularly applicable here. This peculiar state of the urine is very characteristic of incomplete obstruction, and in cases which recover, the first urine voided as the obstruction is overcome presents the same appearances. It is not an uncommon occurrence in obstructive suppression to find occasional remissions, urine being passed in larger or smaller quantity and almost always presenting the peculiarities noted. Sometimes a few epithelial casts and red blood corpuscles are to be found, but more frequently none are present and the urine is also particularly free from albumen. Such are characteristics of urine secreted under pressure. Where occasional remissions occur the course of the attack tends to be prolonged, as will be shewn presently, but not to a great extent.

During the tolerant period, after the excited pain has subsided, any disturbance of the great functions of the body is, as we have seen, unusual.

In a certain number of cases the alimentary system is the first to suffer. After a few days, the appetite begins to fail; nausea, eructations, constipation and a white furred tongue follow. As the tolerant period runs into

the uraemic, these Symptoms become aggravated. Vomiting is then the rule and is often severe. In the Case described above (of Alexander Law) the retching and vomiting were excessive for twelve hours before the operation, i.e. on the tenth day. In reading the large number of Cases collected by Merklen and those recorded in the journals since, I have found vomiting to be of very common occurrence at some period of the attack & most frequent in the last stages. The stomach appears then to be extremely irritable so that even liquids are quickly rejected. When this Symptom is severe, the end is usually not far off. Weber mentions profuse Salivation as a Symptom in one Case. Towards the end, the tongue becomes dry and brown. Diarrhoea is ~~not~~ of rare occurrence. The muscular Coat of the bowel appears to participate in the general muscular failure of the later stages & Constipation is the rule. An extreme degree of meteorism may occur towards the end. Dickenson states that when the bowels do act towards the end, the motions are dark & peculiarly offensive

Merklen: Ibid., 30.

Ibid., iii., 159

The Circulatory System like the others presents no indications of an early stage of the impending danger. The pulse is normal, unless some Concomitant Condition is present

to affect it. Thus, if Suppurative phlebitis is present, it affects the pulse; or if the initial pain is severe, the pulse may be quickened.

During the tolerant period a slow full pulse is characteristic. As the later stages come on, it remains slow but becomes feeble & frequently irregular and intermittent; and it is often with sudden cardiac failure that the scene closes. Post-mortem examination usually reveals totally uncontracted ventricles.

Merklen calls attention to epistaxis as an occasional Symptom, and quotes a case recorded by Julio de Fontenelle, & where that Symptom was severe. Saundby also describes a case where it occurred. ibid., 28. Saundby: ibid, 62

Oedema appears to be quite an exceptional occurrence. Roberts calls attention to its absence; it was absent in my case described above and is not referred to in most of the reports of other cases. I have seen, but there are a few cases among those collected by Merklen in which it was present from a slight degree of oedema about the malleoli to a true general anasarca. The Condition is apparently attributable to venous stasis.

The temperature of the body is usually normal or slightly elevated at first; or it

may of course be affected by concomitant conditions. Characteristically however it is low and becomes lower during the anuria. Towards the end it is usually subnormal, ranging from 96° to 97.5°

The Respiratory System is normal till the later stages appear when the breathing tends to become embarrassed, apparently due to the respiratory muscles sharing in the general muscular enfeeblement. The respiration is often hurried, or slow, panting and laborious. Failure of respiration may then be the actual cause of death. As a rarity, blood-stained expectoration has been reported by Foissac & Paget. Merklen: ibid., 30.

The integumentary system is normal in the early tolerant stage, but towards the end of that period, the skin is usually moist and clammy and heavy perspirations may occur. The sweat has not the urinous odour which is often found in other urinary diseases such as vesical retention, and Roberts draws particular attention to this point; Roberts says that neither breath nor skin have any ammoniacal odour, but in a case which Mavis refers to, where anuria had existed for nine days, the breath smelt strongly ammoniacal twelve hours before death; and I observe that in a

Case reported by H. Vernon, both the breath & the ward (in which the patient was lying) smelt strongly of urine, although the case was one of absolute suppression & not of retention. In this case also there was some oedema about the face. B.M.J. 1894. i., 1304.

Other abnormalities of the skin have been noted. Merklen, quoting earlier observers, records pruriginous eruptions as of rare occurrence, and one case of erysipelatous swelling of the whole body.

The nervous system is usually normal in the early stages and occasionally as we have seen remains practically unaffected throughout. It need not be further emphasized, that it is this freedom from profound nervous phenomena such as are so common in uraemia of Bright's disease, that distinguishes the whole attack. Often for a week while absolutely not a drop of urine is excreted, there is no appearance of toxic phenomena presented by the nervous system. Usually, however, towards the end of the week of tolerance, some ~~slight~~ nervous symptoms make their appearance. The patient becomes restless and sleepless; sometimes he may be drowsy but his sleep is disturbed by agitated dreams. A sense of lassitude creeps over him and he becomes

depressed in spirits. About the seventh a eighth day, as a rule, a it may be a day a two later, more distinct nervous phenomena appear. Muscular twitchings and tremors occur in various parts of the body; the pupils usually become contracted, & and restlessness increases. Increase of the knee-jerks has been observed. Within the next day a two as death approaches, the intellect which has been markedly unclouded hitherto, may become dulled. The patient then lies in a torpid, depressed state of mind. Occasionally, though rarely, there is a low muttering delirium. In a few cases there are hallucinations, but usually the patient can be roused to comparative mental clearness, while in quite a number of cases the ~~patient can be roused to comparative mental clearness~~ mind remains clear throughout. In a few cases convulsions occur and coma may supervene before death. Towards the end also the muscular twitchings may give place to an apparent state of paralysis in the limbs; in one of Roberts' cases the patient said he could not feel his legs. The contraction of the pupils is often extreme in the final stages.

Gibson: 'Text-book of Medicine' ii., p. 368.

The general aspect of a patient suffering from obstructive anæmia may undergo very

striking changes. While in the first week of tolerance the general appearance is that of health, a great change frequently occurs with the onset of the final stage. Within twenty-four hours the countenance becomes anxious and haggard; the face seems to shrink, and the patient seems to age almost suddenly.

In describing the above symptoms and cases of cases of obstructive suppression, the so-called period of tolerance has been spoken of as lasting about a week, but it must not be supposed that the fatal symptoms are always delayed for so long a period. Roberts states that the duration of life is as a rule from nine to eleven days, but on reading the reports of various cases on record one finds considerable variation in the duration of the illness. Thus Dickinson records a typical case of calculous anuria fatal on the fifth day; and another similar case fatal on the sixth day. On the other hand we have such cases as that of Jenneson, already referred to, in which the anuria was complete except for two c.c. voided on the tenth day; in that case death did not occur till the fifteenth day. ibid., iii., 953 and 959.

~~Where hydronephrosis is present prolongation~~

There is a doubt as to how far slight occasional remissions in an otherwise complete

attack of anuria tend to postpone the fatal issue. In some of the unusually prolonged cases of Calculous anuria recorded, such remissions have occurred. Thus in Sir James Paget's case (Transact. Clin. Soc. ii., 1869.) the attack was prolonged over twenty-two days with the exception of a quantity estimated at about a pint on the thirteenth day. It is noticeable that the urine then voided was albuminous. On the other hand in some of the rapidly fatal cases small quantities have been passed at intervals; but such urine is almost always pale, limpid, of low specific gravity (ranging from 1004 to 1008), containing very little urea, and no albumen unless a little blood is present. Roberts cites a case (Ibid.) which was probably one of Calculous obstruction where the patient died of uraemia on the fifteenth day although a daily average of two pints of urine was passed. The specific gravity however was only 1006 indicating a secretion under pressure. From these various facts we may reasonably conclude that the duration of an attack of complete obstructive suppression is only influenced by remissions in so far as the urine voided at the intervals contains the usual excrementitious matter proper to urine.

The symptoms of obstructive anuria do not vary much with the cause of the obstruction

except in so far as that cause produces complete or gradual and incomplete anuria. Sudden and complete anuria is most characteristic of calculous obstruction but as we have seen, is by no means confined to that condition.

Roberts cites a case of sudden and complete anuria due to cancer of the uterus; the typical symptoms of obstructive suppression were present; the anuria continued for seven days, the flow of urine returned upon the eighth day, and the patient lived for four weeks after.

Marklen quotes a similar case observed by Mm. Debove and Dreyfous in which there was no remission for seventeen days and another by Tournié in which suppression was absolute for twenty-one days. Ibid.

In the majority of cases, however, where the anuria does not appear suddenly and completely and where consequently hydronephrosis has developed, the symptoms and course of the disease are irregular; and obviously the symptoms due to the primary condition mask those of the anuria. Further, accurate observation in such cases is often difficult. For example, in Cancer of the cervix with an abundant serous or ~~Sanguineous~~ sanguineous discharge, the fact that anuria has supervened may be easily overlooked, until the symptoms of

the final stage make their appearance.

The most prominent symptom which calls attention to the urinary condition is severe and obstinate vomiting. But drowsiness, muscular twitchings, convulsions, contracted pupils, Coma, falling body-temperature, and embarrassed respiration, are all symptoms of the uraemic complication which may appear in cancer of the uterus and other pelvic growths.

In such cases too that urinous odour which, as we have seen, is but seldom perceptible in sudden & complete obstruction of the ureter, may be present. The condition is that of urine in a state of retention, viz. pent-up in the dropsical kidneys and the odour may make itself perceptible from the skin & breath in consequence.

Even where the suppression has become complete remission is more likely to occur when the obstruction has been gradually produced as in cancer of the uterus. In all cases hydronephrosis appears to prolong the illness. Rayer cites a case of calculous obstruction of twenty-five days duration in which the only remission was a slight one on the tenth day. At the post-mortem examination a hydronephrotic sac was found after death containing

'Traité des Maladies des Reins' t. iii., p. 490. vide Murchison: ibid., 150

nearly eight pounds of urine.

When recovery takes place in a case of obstructive suppression the first urine passed has the peculiarities of urine secreted under pressure, though to a less degree than the urine passed during the actual attack. It is pale and in excessive in amount and of a comparatively low specific gravity. In Sir James Russell's case nearly ten litres of urine were passed in twenty four hours. The excess in quantity usually continues for several days after the obstruction has been relieved.

'Med. Times & Gazette' May & Nov. 1880 vide Merkelin's collection of Cases. p. 170.

Prognosis.

The prognosis in cases of obstructive suppression is always very grave. Most authors, following Sir William Roberts, state that a fatal issue may be expected in from nine to eleven days. Dickinson says that death usually occurs in the course of the second week. As we have already seen however, there are ~~longer~~ cases of longer duration on record. In one fatal case mentioned above, the anuria, except for one interruption, lasted for a period of twenty-two days. Again in a number of reported cases death occurs at an earlier period. Frequently such a result is determined by a prior condition. As Ralfe says, 'in cases in which the obstruction is brought about by a previous disease of the urinary passages, and there has been long standing pyelitis or cystitis, a fatal termination will probably occur much earlier owing to the supervention of suppurative nephritis, though even in these cases the patient may survive five or six days'. Ibid. Ibid.

In one well-known case of obstruction anuria when a patient, nineteen years of age, was deprived by operation of her only kidney, Polk: N.Y. Med. Feb., 1883

life lasted nearly twelve days.

Spontaneous recovery occurs in a minority of cases. Jessop mentioned the case of a man who had twice had complete anuria for ten days; sudden recovery occurred on both occasions and the patient continued to have good health. B. M. J. 189 ii., 1370.

Among calculus cases Legueu states that out of fifty-six cases, spontaneous recovery took place in twenty-eight and a half per cent (28.5%). Morris states that of forty-eight cases not operated upon, 20.8% recovered; but that of forty-nine cases operated upon 51% recovered Morris: ibid., ii., 154.

The number of cases of complete and sudden anuria due to other causes than calculus is very small. The temporary anuria which occasionally occurs from the kinking of the ureter of a movable kidney, with reflex suppression of the other kidney does not usually last longer than a few hours. It is different in those cases in which an active second kidney is absent. For example in the case of Alexander Sons which I have described ~~where~~ where there was complete anuria without calculus, death was imminent on the tenth day when the operation was performed.

Speaking generally we may say that the chances of recovery in obstructive Suppression diminish with the prolongation of the attack; and that with rare exceptions recovery does not take place after ten days of anuria.

Contraction of the pupils and twitchings of the muscles indicate a rapid termination to the attack.

A free action of the bowels, the passage of large quantities of flatus, the passage of a calculus or blood-clot, often usher in recovery; an abundant polyuria makes it more probable.

Where anuria supervenes in a case of pelvic tumour, recovery from the attack may occur for a brief period; but only, as a rule, to reappear at an early date.

In the remarkable case of cancer of the uterus recorded by Mm. Debove and Dreyfous, the anuria continued without any remission for seventeen days when partial recovery took place.

Soc. méd. des hôpitaux 188 and Merklen ibid., 180.

Generally, however, the anuria which somewhat frequently supervenes in such cases as cancer of the uterus is rapidly fatal owing to the debilitated condition of the patient.

Diagnosis.

The diagnosis of obstructive suppression of urine is usually self-evident.

Retention of urine is easily distinguished by passing a catheter into the bladder.

As we have seen cases are on record in which nephritis has produced similar symptoms to that of obstruction but as a rule, though not invariably, in nephritis, puffiness of the face or swelling of the ankles occurs in within twenty-four hours, while the urine, which is seldom entirely suppressed, is of high specific gravity and contains albumen in abundance and tube-casts.

Any urine, on the other hand, which is secreted against pressure, has the peculiar characteristics already referred to.

Anuria due to shock usually passes off as soon as reaction is established. When anuria occurs in such conditions as perforation of the intestinal tract, other symptoms and physical signs of these conditions are present.

Suppression following the passage of a catheter can usually be closely associated with its cause.

The diagnosis of the cause of the

obstruction may be difficult. The previous history may throw light on the question. Thus previous attacks of renal Colic or the passage of Calculi are common in Calculous anuria; intermittent hydronephrosis and movable kidney may have given previous evidence of their presence in other cases.

In uterine cancer a previous history is usually forthcoming. Again abdominal palpation, rectal and vaginal examination, will reveal the cause in most cases of pelvic growth; or calculus in the lower end of the ureter may be palpable.

Radiography may reveal a calculus.

In a few cases of calculous anuria there is difficulty in diagnosing on which side the obstruction exists. Usually, pain and tenderness are a sufficient guide. Where such evidence cannot be obtained, careful palpation will discover greater hardness from retraction of the abdominal muscles on the side last affected, or a fulness on one side owing to the kidney of that side having become hypertrophied consequent upon atrophy of the other kidney from previous mischief. Or, again, rectal or vaginal examination may give evidence of the obstructing cause on one side or the other. There will always remain

a few cases where a diagnosis of the cause cannot be definitely arrived at.

Mixed cases of combined obstructive and non-obstructive anuria will present themselves, while cases are on record which presented all the symptoms of calculous anuria, but proved to be of a different nature. For example, Morris records a case, in which he operated upon both kidneys for supposed Calculous anuria, and found no obstruction whatever, but polycystic disease, both kidneys and liver shewing cystic degeneration. of Dickinson. Ibid., iii., 15

Ibid.

Treatment

The treatment of obstructive suppression may be said to be in a transition stage. Each year there is a growing tendency to substitute surgical for medical treatment. Twenty years ago medical measures alone were employed. Hot local applications, such as poultices and fomentations, warm baths, warm drinks, diuretic and anti-spasmodic drugs were commonly used; firstly to relieve the pain which is common in the earliest stages; and secondly to abate spasm in the hope that the obstruction if it were calculous, would pass on to the bladder. Diaphoretic and purgative measures were used in the hope of averting uraemia and prolonging life. Roberts found that external manipulation of the renal region and of as much of the course of the ureter as is open to external pressure, produced in two cases, a transient flow of urine. Change of posture, blows upon the sacrum, and various active movements were used. Dickinson thought that digitalis was more effective than any other drug, and in his book published in 1885, ~~Stokes~~ says, "when all other expedients have been exhausted, and so much time has passed without escape of urine, as to leave

little hope of natural relief, Surgery offers a chance of rescue. In the 1891 edition of Fagge, after reference has been made to such measures as those mentioned above, we find it stated with regard to calculous obstruction, "it does not appear hopeful to employ hot baths &c:" There is however one method of treatment which seems to have yet been attempted but which deserves a trial; it is that of cutting down upon the kidney in the loin, and incising the ureter in the renal pelvis, so as to allow whatever fluid may have collected there to escape. .... Such an operation may not indeed be justifiable during the first few days after the suppression of urine has set in, on account possibly of spontaneous recovery, but there certainly can be no objection to it when, at the end of a week, muscular twitchings begin to appear?

Surgical intervention had been strongly recommended by Rayer and again by Civiale in 1856. When nephro-lithotomy became to be practised, attention was drawn to nephrotomy as a means of relieving anuria, and Morris recommended the treatment in 1884. Clement Lucas in 1885 had a very successful case when he removed a calculus on the fifth

day of anuria in a case of Single Kidney, the other kidney having been removed by himself on a former date. He was able to shew the patient in perfect health six years later. B.M.J. i., 103

Several cases of Surgical ~~tre~~ intervention since that time have shewn the value of this form of treatment, and Morris, in his recent book (of 1901) speaking of calculous anuria, says, "an operation ought in my opinion to be performed as soon as the anuria is established and the diagnosis satisfactorily made."

Anuria, as we have seen, is usually ushered in by more or less lumbar pain. Treatment may therefore be directed in the first instance to the relief of that pain. A warm bath and copious warm drinks are useful means of relief. Hot poultices or hot fomentations over the loins may follow the bath. If the pain be severe and especially if it be of spasmodic character, one sixth of a grain of morphia may be administered hypodermically. Cupping may also be practised for the relief of a dull severe pain. If the cause of obstruction is diagnosed to be Calculus, it is possible that diuretic drugs, external manipulation, change of posture and various movements may be of service, on the assumption that the obstructing calculus is small and may pass the ureter.

Such treatment should not however be continued more than two a three days. By that time the chances of cure, spontaneously or by medical means, are rapidly diminishing. Even when the other kidney whose previously weakened function had been reflexly abolished by the sudden obstruction of the first, has resumed secretion, it would be unwise to leave the patient with the obstruction in his ureter. Surgical intervention therefore is called for.

When the obstruction is due to kinking of the ureter of a movable kidney, one a two days is long enough to wait before operating. By such a time, there is an opportunity for the other kidney to start work and relieve the anuria, Surgical intervention however if it can be employed with reasonable safety, is of advantage in any case. It relieves the anuria, and if possible removes the cause either by removing a calculus or other obstruction or by fixing the movable kidney.

It appears useless in the earlier stages of anuria to have recourse to purgatives and diaphoretics in order to treat the uraemia which has not as yet manifested itself

Surgical intervention should not be delayed, on account of the tendency to sudden death in such cases if operated on at

a late stage of the illness. There are several cases on record where the patient has died during or immediately after an operation for the relief of anuria at the later stages owing to sudden heart failure; for example in a case described by Heinder, when operation was performed after eight days of anuria, the patient died very suddenly from heart failure during the operation. 'Austral. Me May, 19

Again, the medical attendant who is alive to the actual condition of affairs, will not be deceived by the apparent perfect health of the patient who is suffering from obstructive suppression. Patients and friends are apt to reject the idea of operation on that account, and it will be the duty of the attendant to affirm with confidence the danger of the position and the growing certainty of impending death. Most cases which are operated upon at an early stage are successful. In calculous anuria, the percentage of recoveries for all cases operated upon, late and early, collected by Morris was 51% compared with 20.8% of those not operated upon; and it may safely be affirmed that the percentage of recoveries would be much higher if operation were uniformly undertaken at an earlier stage after the diagnosis has been made. ibid., ii.,

With regard to the operation

indicated, it must be remembered that the operation is undertaken to relieve the anuria and not primarily to remove the cause. Especially is that the case when operation has been deferred to a late stage. To open the kidney in the loin is a comparatively simple proceeding, involving but little risk in itself; if an obvious cause of obstruction can then be removed, that should be done. Otherwise it is sufficient to save the patient's life by establishing a fistula and postpone more radical measures till a later time.

The treatment of the anuria, it must be emphasized is to establish an artificial outlet for the urine in the loin. The treatment of the obstructing cause depends upon the nature of that cause. A difficulty may arise in a few cases in deciding which loin to open. In most cases the symptoms of pain and tenderness will indicate with sufficient clearness which side was last affected. It may be known that the other side is seriously affected with Calculus and that frequent attacks of Renal Colic have occurred on that side, but such knowledge is no indication for opening that side. It is quite possible that the function on that side is but temporarily in abeyance, but it is also likely that at

its best, the secretion on that side is very scanty owing to old-standing mischief.

The side on which pain and tenderness is most recent is the side to open. The kidney which has been least injured is the kidney which will benefit most from nephrotomy, and from which most relief to the anuria will ensue.

If the patient is quite unable to tell which side was last affected, careful abdominal examination may afford information. The cystoscope and the ureteral catheter are of no assistance in complete anuria; but examination of the abdomen may discover a large kidney, indicating hypertrophy compensatory for previous atrophy of the other kidney; or one may find contraction of the abdominal muscles on the affected side. It must be rarely that the surgeon is quite in doubt in the matter, and in such a case it seems advisable to explore one kidney and if that kidney is judged to be without function, to go on and explore the other.

When operation is not permitted and uraemic symptoms are supervening, it is possible that life may be prolonged for a brief period, by promoting elimination of the products of metabolism by means of the bowels and skin; for this purpose, hot baths, diaphoretics drugs and purgatives may be used. The

difficulty which usually arises, however, is the extreme irritability of the stomach, when uraemia has once set in. Saline injections have been tried, but without the reason or the encouraging results of their use in eclampsia.

One matter which requires notice is the necessity for the medical attendant to avoid being misled by the passage of small quantities of pale urine such as is excreted against pressure. No relief, or very little, is afforded to the condition of suppression by such excretion; and operation should not be postponed unless the excretion of pale urine becomes free and persistent.

In cases of obstructive suppression due to pelvic growths, the indications for treatment may be to remove the growth. Mr Bernard Pitt shewed a case before the Medical Society of London in which anuria and threatening uraemic symptoms occurred in a case of ovarian tumour with pregnancy. For thirty-eight hours only one ounce of urine was passed. Mr Pitt removed the pregnant uterus and the tumour together as it proved impossible to separate them. The result was a free excretion of urine and complete recovery. It appears uncertain in this case whether the cause of the obstruction was caused

B. M. J. i., 13

by pressure on the ureters or on the renal veins.

Again Mackenrodt operated for so-called inoperable Cancer of the uterus on account of suppression of urine; the suppression was cured and the patient was alive three years and three months afterwards. ('Monats. f. G... und Gyn... May 19... (B. M. J... 1901, ii.,...

In a case related by Dauvergne, a woman who had suffered from uterine fibroid for eight years suddenly developed symptoms of anaemia. Delore performed panhysterectomy with immediate relief of the anaemia. ('Echo Mé... April 19... (B. M. J. 1902, ii...

Such cases are instances of relieving the anaemia and removing the cause at the same time.

As we have previously seen, Cancer of the uterus, in quite a large proportion of cases, sooner or later, causes obstructive suppression by pressure on the ureters in the pelvis, and the question arises whether nephrotomy is ever justifiable in such cases to prolong life where it is impossible to remove the cause. Undoubtedly in certain cases life might be considerably prolonged by such means, and the treatment has been recommended. But it appears doubtful whether the discomfort of a fistula in the lumbar region added to the trouble of the cancer itself would be chosen by any patient in such a condition. In Cancer of the rectum, colotomy is performed. But the cases are not quite (Patil: 'Rev. ... Aug. 19... (B. M. J. ... 1901, ...

parallel. Colotomy frequently affords great relief to the pain caused by the cancer, as well as having the effect of prolonging life. But nephrotomy in Cancer of the uterus can only prolong life.

There is a prophylactic treatment of obstructive anuria which must be referred to, viz. the treatment of hydronephrosis which may occur in one kidney while the other is still sound and able to carry on the excretion of urine.

If, in any case, hydronephrosis can be diagnosed (whether there is a tumour or not) and a distinct Cause of obstruction such as Calculus is suspected, it would appear wise to explore by lumbar incision, and remove the Cause of the obstruction. Otherwise the affected kidney is likely to go from bad to worse till all secretion has ceased. When that occurs the patient becomes dependent upon one kidney, and the risk of obstruction Suppression of urine in future is greatly increased.