RETENTION OF URINE*

BY

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Retention of urine is a condition which may be fraught with great danger, either immediately or remotely, to life. In many cases it is merely a symptom of some graver lesion, whereas in others it is the active agent responsible for more serious mischief. This latter chiefly refers to chronic retention, for if the condition is acute remedial measures are promptly instituted, in which case pathological changes fail to develop.

Except in neurological lesions chronic retention is rarely an affection of women or of children, but is very common in elderly men. Unfortunately the condition may exist for years without being diagnosed, the chief culprit being the patient, for failing to report to his medical adviser changes in the frequency and character of his micturition. Even if these have been reported and adversely commented upon he may still delay when urged to seek further advice. In some cases the fault lies with the practitioner, who may hesitate to encourage his patient to further expense, but who unfortunately in many cases fails to realize the grave significance of chronic retention, and is often ignorant of the most modern methods of diagnosing the cause and its treatment. It cannot be too much emphasized that chronic retention of urine is a serious complaint, and is the indirect cause of many deaths of elderly men, deaths which could have been avoided with suitable and early treatment. Sir James Mackenzie did well both for the public and for the profession when he stressed the importance of initial and of little symptoms, but unfortunately, though none disagree with him, few carry out his teaching.

By retention of urine is meant an inability completely to empty the bladder by a voluntary act of micturition. This inability may be acute or chronic. In acute cases the bladder cannot even be partially evacuated, whereas in chronic cases, although micturition occurs, the bladder is never fully emptied. The condition must be differentiated from anuria or suppression of urine, when the bladder is empty owing to failure of the kidney to secrete and excrete urine, and therefore cannot void.

Catheterization may be necessary to establish a diagnosis of retention, although in most cases clinical symptoms and examination should suffice. In chronic cases the amount of residual urine present is of importance. By residual urine is meant that amount drawn off by a catheter after the voluntary act of micturition has ceased. In some cases this may be fallacious unless precautions are taken. Some nervous patients cannot empty their bladder while they are under observation, and others may have interrupted micturition—that is, they may pass a considerable quantity of urine, then the flow ceases for a few seconds, before complete evacuation. These variations of the normal must be taken into account before assessing by catheterization the quantity of residual urine present. By exercise and patience even prostatics can reduce the amount of their residual urine, if they will only overcome their false sense of shame at delayed and prolonged micturition. In these cases a penny spent at a public lavatory would more than repay itself.

Aetiology

The causes of acute retention are:

(1) Stricture.	(3) Impacted urethral calculus.
(2) Enlarged prostate.	(4) Ligature of penis.
(a) adenomatous.	(5) Nervous lesions.
(b) cancer.	(6) Urethritis.
(c) infection.	(7) Post-operative.

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Items 3, 4, 5, and 7 will be considered first, as they are, from a genito-urinary prognostic point of view, of minor importance.

Impacted urethral calculus generally occurs in children or young adults, and can be safely and immediately relieved by removal of the calculus, whether by forceps or by operation. Suprapubic drainage, with its attendant sequelae, should never be necessary. In these cases the discomfort of the patient is extreme, but the damage to the kidney is minimal.

Ligature of the penis is rare, and is generally carried out on himself by a mentally deficient patient. A patient has also tried in this way to prevent discharge when suffering from gonorrhoea. Severing the ligature is alone required to relieve the acute retention.

Nervous Lesions.—In injuries to the spinal cord or the brain acute retention may occur, and this can be readily remedied by means of a catheter.

Post-operative.—Acute retention may also follow certain operations, such as for piles or carcinoma of the rectum. In the case of piles the inability of the bladder to void is probably a reflex, but after abdomino-perineal resection of the rectum retention may be directly due to injury of the sacral and sympathetic nerves, instead of being merely a reflex, for the condition may last for weeks or months, regular catheterization being required.

Urethritis.—I have only once encountered retention due to this cause. It was in a soldier with acute gonorrhoea, and one was reluctant to pass a catheter. Suprapubic drainage was performed, and the retention was not only relieved but the urethral discharge ceased within a week, and the soldier was returned to duty much sooner than those others who were receiving the routine treatment for gonorrhoea.

Stricture and Enlarged Prostate.—It is in these cases that acute retention is really of serious import. The seriousness lies in the lack of knowledge as to how long a condition of chronic retention had preceded the acute attack. If there had been no chronic retention then the treatment is easy and safe—namely, catheterization or cystotomy. If the patient is of the prostatic age, and a large or hard prostate is found to be present on rectal examination, then one should infer that the acute attack has been superimposed upon a chronic condition, in which case relief must be gradual and controlled. A similar line of treatment is necessary if the patient is elderly and gives a history of stricture. Acute retention due to stricture, if the patient is under 45 years, may safely be treated immediately and given complete relief.

Treatment of Primary Acute Retention

By this is meant acute retention not secondary to the chronic condition. The bladder and urethra being in a state of congestion and irritability, extra precautions should be undertaken against the introduction of infection, and non-operative measures should be employed first. These consist in free purgation, a morphine rectal suppository, and a hot bath. The patient should be encouraged not to strain, but to relax, and not to refrain from passing urine in the bath.

CATHETERIZATION

In many cases these measures succeed. Should they fail recourse must be had to the catheter. Before attempted catheterization the urethra must be locally anaesthetized. This is done by injecting with a 10 c.cm. Record syringe 2 drachms of an efficient local anaesthetic, clamping the meatus so as to retain the anaesthetic in the anterior urethra for about five minutes, massaging it back through the posterior urethra into the bladder, and then repeating the performance. The local anaesthetics

advised are 1/2 per cent. cocaine, 2 per cent. novocain, or 1 per cent. phenolaine. The last-named is more expensive, but has the advantage of being antiseptic as well as anaesthetic.

The addition of adrenaline to the anaesthetic solution helps to reduce the oedema and congestion of the urethra, but it must be used sparingly—not more than two drops of 1 in 1,000 solution to each 2 drachms—for the urethral mucous membrane, unlike that of the bladder, readily absorbs, and if too much adrenaline is used cardiovascular symptoms quickly ensue.

It is best to start with a medium-sized silver catheter, for obvious antiseptic and aseptic reasons, and if this fails the passing of smaller gum-elastic catheters may be tried. If no success is attained, then attempts should be made to pass filiform bougies with a screw top. If one of these passes a catheter can then be screwed on to the end and passed into the bladder, so relieving the retention. In a few cases it may be found that a small soft rubber catheter can be passed when rigid catheters fail, but the risk of infection with soft rubber catheters is so great that these should only be used in cases of acute retention as a last resource. In uncomplicated cases of acute retention the bladder may be emptied completely without any ill resulting.

To prevent instrumental infection 1 ounce of 1 per cent. silver nitrate solution should be injected into the empty bladder and left there.

SUPRAPUBIC PUNCTURE

Occasionally all attempts at catheterization fail, and relief by suprapubic puncture must then be given. If an anaesthetic is necessary local injection of 2 per cent. novocain will suffice. In many cases a long exploring needle is sufficient. This is thrust into the bladder, fixed with strapping, connected with rubber tubing, and the bladder then slowly evacuated. Once the bladder is emptied the oedema and congestion of the urethra and neck of the bladder subside, and next day a catheter can often be passed with ease, or the patient may micturate without undue difficulty. If this does not result and the bladder fills up again, then puncture with a curved trocar and cannula will be necessary. The cannula should be left in for several days, and the bladder drained suprapubically. To prevent infection the rubber tube from the cannula should be submerged in antiseptic in the collecting urinal.

Treatment of Secondary Acute Retention

If the acute retention is superimposed upon chronic retention, then the prognosis is not so favourable. An estimation of blood urea and of plasma cholesterol will give some indication of the efficiency of the kidney and of the power of resistance to infection. A low plasma cholesterol is often present in acute retention, but this is not so serious as when it accompanies chronic retention. Its relation to kidney efficiency is not yet accurately known, but a low plasma cholesterol is associated with diminished resistance to sepsis, and this is all-important when surgical intervention is called for. A high blood urea does not necessarily indicate impending uraemia, which sometimes occurs when the blood urea is low. Blood urea is not an accurate indicator of renal efficiency, for it varies much according to the fluid intake, excess of vomiting, or diarrhoea. It is helpful, however, when other kidney tests cannot be applied, and if the blood urea is round about 50 mg. per 100 c.cm. the risks of surgery appear justified.

In the type of acute retention we are now considering immediate and complete emptying of the bladder should never be attempted. The bladder must be decompressed

slowly, or the effect on the kidneys will be disastrous. A steady watch must be kept on the pulse and general condition of the patient, and if necessary some fluid must be run into the bladder so as to raise the intravesical tension. If the tongue is dry and the patient drowsy and restless, an intravenous injection of 20 per cent. glucose may be necessary to ward off an attack of uraemia. Acute retention in elderly men suffering from stricture or enlarged prostate is a very serious condition.

If medical measures such as those previously mentioned fail to give relief, then the urethra should be anaesthetized and the smallest possible catheter passed. This should be tied in, and the urine allowed to drain away drop by drop. According to the condition of the patient it may take from one to three days completely to empty the bladder. If a larger catheter has been tied in not more than one to two ounces of urine should be drawn off every hour until the bladder is empty. In some cases—for example, stricture—catheterization may be impossible. It will in this event be necessary to insert a small trocar and cannula or an exploring needle into the bladder suprapubically. Rubber tubing is then connected to the cannula or needle, and slow decompression established.

After the acute attack has been successfully treated further investigation may be attempted and the appropriate treatment given. Whenever drainage by catheter or tube is being carried out urinary antiseptics should be given, either pot. cit. and acriflavine, or hexamine and ac. sod. phosphate. Their value is not very great, but they appear to be of use in some cases. Fluid intake should be increased to encourage diuresis. This not only rids the body of uraemic poisons, but is the best form of bladder lavage. Neither cystoscopy nor urethroscopy should be attempted until the patient is well recovered from his attack of acute retention.

In the treatment of chronic retention of urine the chief difficulty lies not in the removal of the mechanical cause, but in the complications that are present or may ensue. These are renal failure, sepsis, and a morbid cardiovascular system.

Tests for Renal Efficiency

The tests for renal efficiency are many and varied, but only four will be considered here. The easiest is the fluid test, which is largely used in Canada, and can be employed in general practice without much inconvenience. It consists in a forced intake of fluid, with subsequent measurement of the output. If these two approximate then the kidney is fairly adequate to deal with its work. It is not too reliable a test, however, for the function of the kidney is not to eliminate merely fluid, but also solids.

The other test, which is largely depended upon by physicians, is the blood urea test. In elderly men a blood urea of 50 mg. per 100 c.cm. is normal, but there are many non-renal factors which may alter this figure. It varies with diarrhoea, vomiting, and fluid and protein intake. Half the kidney may be destroyed before the blood urea rises from renal causes; therefore the test is only of value in gross lesions of the kidney. De Wesselow has pointed out that the blood urea may be high if the body is desiccated or if the protein intake is high, even if the kidneys are normal. However, in the absence of obvious causes of desiccation, and with normal diet, although uraemia is not caused by the presence of urea in the blood, yet the chemical substance in the blood which is responsible for uraemia is increased if the blood urea is high. It may be mentioned that the blood urea rises with suprapubic drainage, but not with catheter drainage.

The most important chemical test is the urea concentration test of McLean. Normally only a fraction of the kidney need function to serve the needs of the body, but this test necessitates the whole kidney working, and so, if it is unsatisfactory, one realizes how little renal reserve there is. The test consists in giving no fluid after 10 p.m., emptying the bladder in the morning, and then giving 15 grams of urea and 100 c.cm. of water. The urine is collected after the first, second, and third hours, and the quantity of urea estimated. As urea may act as a diuretic it may be necessary in some cases to estimate the percentage of urea in the fourth-hour specimen also. If in the second hour 2 per cent. urea is eliminated, then the kidneys are adequate to withstand any operation that may normally adversely affect them. A figure of 1.5 per cent. or less in the second or third hour precludes any operation such as a one-stage prostatectomy, unless the cardiovascular system and the general clinical condition of the patient are obviously so good as to negative a poor chemical test. Recently a modification of Ambard's formula—namely, the urea clearance test of van Slyke—has been introduced, but it does not appear to be more reliable than the simple chemical test of McLean.

The fourth test—namely, the time interval of reaction of indigo-carmin following a 10 c.cm. intravenous injection—being more of interest to the cystoscopist than to the general practitioner, need not be enlarged upon.

Sepsis and the Cardiovascular Condition

The conditions to be noted here are inflammation of the kidneys and bladder, or perineal abscess. The last always occurs proximal to a stricture, and is generally associated with some degree of extravasation of urine. The treatment is simple—namely, incision of the abscess, retrograde catheterization, a tied-in catheter, and drainage. Inflammation of the kidneys is a serious factor when treatment of obstruction has to be considered. Should the condition be merely one of pyelonephritis much may be done by antiseptic medication and forced diuresis, if necessary combined with catheter or suprapubic drainage, to render future operative procedures comparatively safe. If, however, as not occasionally happens, there is a small but bilateral pyonephrosis, the risk of any operation other than a permanent suprapubic drainage is very high.

Cystitis which is not renal but is obstructive in origin can easily be remedied by lavage and drainage. If drainage is necessary over a long period the suprapubic is always preferable to urethral catheterization, and continuous irrigation is preferable to intermittent. In many cases, even when the cystitis is secondary to a gross renal lesion, this method of continuous suprapubic drainage will so mitigate the risk of exacerbating sepsis as to justify a line of treatment shortly to be mentioned.

In all cases the urine should be examined for sugar, and if any is found insulin should be administered and the patient put on an appropriate diet. It is difficult to abate sepsis in the bladder or kidney if glycosuria is present, and it must be remembered that prior to the introduction of insulin it was rare for a prostatic to recover from operation if he were suffering at the same time from diabetes. He generally died from sepsis or coma.

The cardiovascular system is all-important when one is treating elderly men suffering from chronic retention of urine, and one rarely finds it as satisfactory or as healthy as one would like. It is the condition of the myocardium rather than the presence of valvular disease which causes anxiety. Of the two, low blood pressure, below 120 mg. of mercury, is more serious than high blood pressure. Although haemorrhage—for example, after a prostate

operation—is greater in cases of low blood pressure, there is not much greater risk from this source, because haemorrhage can be treated and controlled. The seriousness of low blood pressure is the greater tendency to cerebral thrombosis and pulmonary embolism. Both these are more prone to occur if the bladder is septic, because of the close proximity of the prostatic plexus of veins. To prevent venous stagnation the patient should be given gentle massage, and be encouraged to move his limbs while lying in bed. Deep breathing exercises are also very beneficial, and the patient should also be given stimulants.

Diagnosis and Treatment of Chronic Retention

The chief symptoms of chronic retention are frequency of micturition, a poor urinary stream lacking in force, and dribbling. Pain is seldom a feature in adults, unless cystitis or urethritis be present, but it is often very noticeable in a child, in whom also at the same time the hypogastrium may be distended. In elderly men the symptoms may only be those of chronic uraemia—namely, headaches and thirst—but a history of frequency, especially nocturnal frequency, may be elicited in answer to direct questions. This frequency is often incontinence with overflow, in which case the bladder will be found distended, sometimes even up to the umbilicus. Although this is a feature commonly found in lesions of the nervous system, it may accompany chronic and progressive enlargement of the prostate, or chronic stricture. The symptoms of chronic retention are of little aid in arriving at an accurate diagnosis of the case. They merely indicate the necessity of fuller and further investigation. In all cases cystoscopy and urethroscopy are essential before mechanical causes can be eliminated. The spinal anaesthetic test, combined with x rays, is not so informative in vesical derangement as it is in bowel lesions. A neuromuscular dysfunction can only be assumed to be present in the absence of demonstrable mechanical obstruction, and in cases where no definite lesion of the nervous system can be shown to exist.

As regards treatment, cases fall into two groups:

1. If the cause of the retention is an organic lesion of the nervous system, then repeated catheterization or suprapubic drainage will be necessary.
2. If the cause is a neuro-muscular dysfunction relief may be obtained by sympathectomy.

The act of micturition is a complex reflex, involving both the bladder musculature and the two sphincters. The mechanism is diphasic. The filling phase, purely involuntary, is accompanied by dilatation of the bladder and contraction of the internal sphincter. The emptying, or detrusor phase, chiefly voluntary, occurs when the sphincters dilate and the bladder musculature contracts. There are three sets of nerves involved—namely, the hypogastric, the pelvic nerves, and the pudic nerves. The hypogastric is derived from the presacral nerve, which is composed of branches from the first, second, third, and fourth lumbar sympathetic ganglia, and from the intermesenteric plexuses. The fibres are both pre- and post-ganglionic. The filling phase is dependent upon motor stimuli from the presacral sympathetic nerve to the internal sphincter and inhibitory impulses to the bladder muscle. The detrusor phase is controlled by the pelvic nerves, which carry motor stimuli to the bladder muscle and inhibitory impulses to the internal sphincter. The pudic nerves chiefly excite the external sphincter and the accessory muscles of control.

In the absence of any demonstrable organic nervous lesion or of any mechanical obstruction to free micturition, division of the presacral nerve is often curative of a chronic retention. In the presence of a sacral cord lesion it may also be effective. Cystoscopy is of some assistance. In nerve lesions the bladder is finely trabeculated, due to atony, whereas in prostatic or stricture

cases the trabeculation is coarse. The services of a neurologist may be necessary to exclude organic nerve lesion. A Wassermann test should be taken, to exclude syphilis and tabes. Urethroscopy will often suggest the presence of tabes, for then the sphincter is lax and the upper portion tends to fall down on the urethral orifice. These types of cases are often associated with overflow incontinence—that is, the bladder is always over-full due to chronic retention, and the excess urine simply dribbles away. Permanent drainage by a de Pezzer catheter will then be indicated. Chronic retention may be a sequel of abdomino-perineal resection of the rectum, and may last for six or eight weeks, during which time repeated catheterization will be necessary. It is due to trauma of the nerves innervating the bladder—to the clearing out from the hollow of the sacrum and the pelvis all possible cellulose-lymphatic tissue. If this major operation is successful the inconvenience of the resulting retention is of minor importance, seldom lasting more than two or three months, and causing no permanent damage.

Dilatation

The treatment of chronic retention which is secondary to stricture of the urethra is simple—namely, gradual decompression of the bladder followed by dilatation of the stricture. There are two methods of dilatation—rapid and slow. In special circumstances the first may be preferable. It consists in performing an internal urethrotomy, followed by the passing of Clutton's bougies up to size 28/32. Treatment must be continued, at decreasing intervals, otherwise the stricture will re-form.

When possible, gradual dilatation should be the operation of choice. A filiform bougie is passed through the stricture into the bladder, to serve as a guide. On to the end of the filiform bougie is then screwed a larger bougie, which is passed through the stricture. On withdrawal the procedure is repeated with bougies of increasing calibre, until a size No. 8 French passes. After this, at weekly intervals, gum-elastic bougies are passed until size No. 22 French passes easily. Then the gum-elastic bougies are discarded in favour of Kollmann's dilator. This also must be passed at weekly intervals, being screwed to a higher gauge on each occasion, until finally it can be registered to 45 without undue discomfort or causing haemorrhage. After this the weekly intervals can be increased until ultimately twice a year will be sufficient. This should be continued for the rest of the patient's life. In America two days are selected which cannot be forgotten—namely, New Year's Day and Independence Day. The bi-annual dilatation with Kollmann's 45 or Clutton 28/32 is very important, for many patients, having been brought to this stage of dilatation, have thought themselves cured, and in consequence have failed to attend for treatment until three or four years have elapsed. In many of these it has been found that the stricture has so contracted that the whole course, beginning with filiform bougies, has had to be repeated.

It must be emphasized that a stricture is never cured. It can be dilated, and kept dilated, only so long as the patient remains under treatment. Therefore, for the good of the kidneys the patient should be impressed with the necessity of re-attendance. The symptoms of stricture—namely, delayed, prolonged, and straining micturition—are merely inconveniences. It is the effect of back pressure on the kidneys, causing impaired renal function, and of ascending infection from stagnant urine, that are the real dangers in faulty treatment of urethral stricture. To prevent, and if necessary correct, stricture formation, every gonorrheal patient should be under observation for two or three years after his initial urethritis has been ostensibly cured.

Enlarged Prostate

In the treatment of chronic retention due to enlarged prostate the stages are: gradual decompression of the bladder, attempts to improve kidney function by drainage, the amelioration of sepsis, and then removal of the cause.

The first has already been described. Drainage of the bladder by a retained catheter, except as a temporary measure, is not recommended. It soon gives rise to urethritis, and sometimes to epididymitis. Only drainage by a de Pezzer catheter or tube can be relied upon to give adequate relief to the kidneys. This drainage in favourable cases may last a fortnight, but often months of drainage will be necessary before it is safe to operate. Chief guidance is given by renal function tests and the condition of the cardiovascular system, which have already been discussed. To mitigate sepsis suprapubic drainage and free lavage are the remedies chiefly to be relied upon. In the presence of marked sepsis any operation on the bladder is doomed to failure, and may leave the patient in a worse-off condition than before. Sepsis is often the cause of contracture of the bladder neck following prostatectomy and of persistent suprapubic vesical fistula. Prolonged drainage, lavage, and abundance of patience will often enable a successful operation to be carried out with good prospects of complete relief and cure.

The different types of prostatic operations need hardly be discussed, except to enumerate them in an ascending order of merit—namely, the perineal, Freyer's, Walker's, and Harris's. The chief indication for a perineal prostatectomy is a fibrous prostate complicated by prostatic calculi. Suprapubic prostatectomy should never be attempted unless the urea concentration is from 1.8 to 2 per cent. in the second hour, due allowance being made for diuresis. Operative difficulties arise when a Walker or a Harris operation has to be done in two stages.

The operation of choice in prostatic obstruction is endoscopic resection by the MacCarthy method. In "good risk" cases—that is, where the second hour urea concentration is approximately 2 per cent., the mortality is practically *nil*, whereas in "bad risk" cases, with a urea concentration of about 1.4 per cent., the mortality is no greater than that of good risk cases in the major operation. Endoscopic resection is the safest, and a satisfactory operation in the majority of cases, irrespective of the size of the prostate, although there are naturally certain types of case which are more prone to give 100 per cent. good results. The fibrous prostate should always be treated by resection. In many cases of suprapubic prostatectomy chronic retention has persisted. In some cases this has been due to a faulty operation, in others to a faulty selection of cases for the operation. In these cases a final trimming by resection may have to be undertaken. Prior to resection, a complete cystoscopic and urethroscopic examination is necessary to enable the operator to visualize the amount of tissue which it is necessary to remove. The ideal cases for resection are the fibrous prostate, the middle-lobe enlargement, and early general enlargement.

It follows that if patients are to get the best benefit from modern treatment they must be seen by the urologist in their early stages. The essential symptom of chronic retention is frequency, especially nocturnal frequency. Too often patients are first referred to a urologist when they are about 65 years of age, when they give a ten- to fifteen-year history of frequency, when the prostate is palpably enlarged and the cystoscope reveals marked trabeculation of the bladder. This is a state that, with modern methods of diagnosis and treatment, no patient should be allowed to attain. The risk of delay is renal failure because of back pressure, and this can be prevented. The future lies with the general practitioner, who appraises symptoms before signs.