An Address

ON

SOME PROBLEMS OF PROSTATECTOMY.

DELIVERED BEFORE THE HARVEIAN SOCIETY,
NOVEMBER 16TH, 1922,

BY

SIR JOHN THOMSON-WALKER, M.B., F.R.C.S.,
SENIOR UROLOGIST AND LECTURER ON UROLOGY, KING'S COLLEGE
HOSPITAL; SURGEON TO ST. PETER'S HOSPITAL.

MANY patients are strangely unwilling to undergo any treatment as a preliminary to operation, partly owing to the desire to get the operation over quickly, and partly to lack of understanding of the gravity of the post-operation complications. The more one sees of prostatic surgery the more one is convinced that many of the complications which follow prostatectomy, some of which may be fatal, are avoidable by treatment before the operation. I will discuss two of these complications.

1. BOWEL COMPLICATIONS.

Post-operative distension of the bowel may occur in all degrees of severity, from a slight flatulent distension with difficulty in getting the bowels opened after the operation, to a prolonged distension of the bowel ending fatally from pressure on the diaphragm and interference with the heart's action. It occurs also in all degrees of acuteness or chronicity.

The most striking example of an acute case that I have seen was a man of 60 with a full abdomen and flabby muscles, from whom I removed an enlarged prostate and a bladder growth. The operation was simple, and there was little bleeding. Progress was normal until the fourth day, when there was a sudden pain in the epigastrium in the early morning. This disappeared, but reappeared later, and the abdomen commenced to swell up. The distension became so acute that the skin was tense and glazed. After two hours' acute distension the heart became embarrassed and the patient died. A doctor related a case to me of a woman, aged 50, who suffered from distension of the abdomen uncontrolled by treatment for seventeen years, with about six periods, lasting two or three days, of intermission, during which the abdomen became flaccid. The urine contained pus and blood. *Post mortem* both kidneys were septic and contained stones. This is an example of the condition in its most chronic state. Between these two extremes are the common types, lasting for a few days to ten days. The post-operative cases are usually controlled by treatment, but may cause much anxiety and are occasionally fatal. This post-operative distension in urinary surgery is not confined to prostatic and bladder cases, for it is not uncommon during the first few days after kidney operations, and may occur in septic kidney conditions without operation.

In looking for a cause for the condition we must remember that in kidney operations the colon is stripped from its attachment to the kidney and below this, and there is sometimes a good deal of trouble in separating adhesions at the extraperitoneal aspect of the colon. When we remember also that in septic kidney conditions perinephritis is constantly present, and that this must involve the contiguous wall of the colon, there is no difficulty in recognizing that a local paralysis of the colon is likely to occur leading to distension with flatus, which spreads to other parts of the colon.

In prostatic cases so simple an explanation is not possible. In most of those I have seen the colon was distended, and constipation and hiccup were frequent, but in some cases the stomach was the organ affected, and the distension affected the upper part of the abdomen; in these vomiting of coffee-ground material is usually a symptom. Most of these are cases of enlarged prostate with back pressure on the kidneys, and in some of them, such as that which I have described, uraemic symptoms actually appear. It is likely, therefore, that uraemia may have something to do with causing the condition. But there are cases that occur in younger men without sepsis or uraemia.

Two elements, I believe, enter into the causation: one is flatulent distension of the bowel from intestinal fermentation, and the other is exhaustion of the sympathetic nervous system resulting from uraemia, intestinal toxæmia, or shock. Recently it has been suggested that post-operative dilatation of the stomach is due to dragging on the mesentery by the

small intestine dropping into the pelvis after the removal of large pelvic tumours (Borchgrevink).

Having recognized that such a condition may complicate prostatectomy, is it possible to foretell its occurrence and do something to prevent it? It is, I believe, possible to do so.

There are two different types of patient that are liable to this condition—a thin type and a stout type. Imagine a thin man of 60 with a sallow complexion. He complains of prostatic symptoms; the prostate is enlarged, and there is a varying amount of residual urine. Further investigation shows that he suffers from flatulent indigestion after meals, and has to be careful about his diet; his teeth are probably decayed and there is pyorrhoea; the tongue is coated. The abdominal wall is thin, and should lend itself to easy palpation; but the bowel is full of gas, the percussion note tympanitic, and abdominal palpation is difficult. The other type is a stout, flabby man of 50 or 60, often of the Jewish race. He is fond of rich, fatty foods, and is immoderate in his indulgence in them. The abdomen is prominent, rounded, and tense; there is no pyorrhoea nor decayed teeth. When you meet with an enlarged prostate with either of these types you may expect post-operative trouble from the bowel.

How can we prevent this complication and how treat it when it occurs?

In all such patients I recommend a course of four or five weeks' bowel treatment after the teeth have been carefully overhauled. This question of teeth is very important; it affects not only the bowel risks but also the pulmonary risk. Oral sepsis is the cause in some degree, if not wholly, of the flatulent dyspepsia of the first type of case. It may take five or six weeks or even longer for the dentist to treat the oral sepsis, and there may be considerable difficulty in getting the patient to consent to the dental treatment.

All these intestinal-risk patients, however, do not have decayed teeth and pyorrhoea, and the second type very often have good teeth. The bowel itself must therefore be treated.

I do not presume to instruct such an assembly as this in the treatment of flatulent dyspepsia. Let me mention, however, the lines of treatment that have been most successful in the prostatic cases I have seen. They are the restriction of starchy foods and green vegetables in the diet, bowel anti-septic treatment and bowel tonic treatment, and the avoidance of saline purgatives. Abdominal massage and electrical treatment of the bowel are also useful when the bladder is not distended.

Now let us turn to the post-operative treatment. In the average patient the immediate preparation of the bowel for operation consists in giving a dose of castor oil two nights before the operation and washing out the colon on the morning of the operation. It is, I think, not unusual at present to avoid purgatives altogether before a surgical operation, on account of the bowel disturbance that may be caused. While this may occasionally be good policy where only twenty-four hours is given for such preparation, I cannot but feel that a prolonged and careful treatment of the bowel is a much sounder surgical proceeding and should always be aimed at. After the operation the bowel is left quiet for three or four days, and then a dose of castor oil is given. This is done in order to avoid straining after the operation, which sometimes causes bleeding.

If after the operation the patient commences to show distension of the abdomen or vomiting of dark coffee-ground material, a purge (castor oil) must be given at once. In some cases the stomach is distended and there is persistent vomiting. Here the stomach tube should be passed and the stomach washed out. Sometimes large quantities of dark brown fluid are removed, and the washing will have to be repeated.

Borchgrevink, who looks upon dilatation of the stomach after abdominal operations as due to dragging on the mesentery causing obstruction at the duodeno-jejunal junction, recommends the prone position and elevation of the pelvis; and operation has been recommended with the object of raising the intestines from the pelvis and relieving the drag on the mesentery, and also of removing adhesions. I have not met with a case of post-prostatectomy distension where this procedure held out any prospect of success.

The more common cases have distension of the colon and hiccup, but no vomiting. Pituitary gland is a good drug in these cases, and ergot and strychnine may also be given. A high rectal tube should be passed and the colon washed out, and a tube left for several hours at a time in the rectum. When the patient is stout he should be made to lie on his side,

instead of being propped up in a sitting position, as the passage of flatus is facilitated by this position. Various enemata are given—soap and water, ox-gall, turpentine. Care is necessary in giving enemata of turpentine in old feeble patients. In a hospital patient I once saw sloughing of the whole thickness of the rectal wall in a circular cuff following a large turpentine enema.

2. KIDNEY COMPLICATIONS.

Of all the risks to which the sufferer from enlargement of the prostate is exposed those connected with the urinary tract are the most common and also the most frequently fatal. These complications are, however, the most amenable to treatment before operation. They are sepsis and renal inefficiency.

I will discuss renal inefficiency. The patient who suffers from an enlarged prostate has reached the time of life when some interstitial change in the kidney is not uncommon, but apart from those changes which result from the effects of obstruction in the renal tissue it is rare to find a case where chronic nephritis causes anxiety in connexion with prostatectomy. Occasionally such a case is met with, and the condition is much less amenable to treatment than that in which there are kidney changes due to back pressure alone.

With the gradual increasing obstruction of an enlarged prostate residual urine accumulates, and the tension within the bladder, ureters, and renal pelvis increases. This produces interstitial nephritis, the extent of which varies with the duration and degree of obstruction. The renal function in such cases is impaired. The patient suffers from a series of symptoms which are characteristic of this type of kidney disease. There is lassitude, headache, thirst, and loss of appetite. The skin is dry, the complexion sallow, and the tongue is dry, red, and glazed. Constipation is a common feature. In more advanced stages there is loss of flesh, buccal dysphagia, occasional vomiting, and the patient is drowsy during the day and restless at night. The most advanced stage is complete anorexia, and there is frequent vomiting, constant drowsiness with restless delirium at night, and finally coma and death. Twitching of the muscles in a slight degree may be present, but is not a marked feature, and convulsions are absent.

Clinical symptoms are invaluable in the diagnosis of renal inefficiency, but there are cases where they are deceptive, and for over twenty years urinary surgeons have endeavoured to measure the renal function accurately by means of various tests. These have been very fully discussed of late, and I need not discuss them in detail.

The tests that I use at present in prostatic cases are the forced urea elimination test and the estimation of the blood urea. I have abandoned the colour tests in prostatic work, although I not infrequently use indigo carmine in kidney cases. The forced urea elimination is a valuable test of the renal function in these surgical cases, and comes nearer to demonstrating the full functional power of the kidneys than any other that we possess. The significance of the figures produced by this test is variously interpreted. The high figures require no discussion. A kidney which secretes 2 per cent. of urea and over is sound enough for any surgical procedure. It is the low figure that is of importance. What is the reduced urea concentration figure that becomes dangerous?

For some time I found in one of my hospitals that an able house-surgeon, keeping himself abreast of current opinion, was sending up a series of cases for bladder drainage by cystotomy as a preliminary to prostatectomy. These patients were then kept waiting for some weeks or months before the prostate was removed. This was on account of impaired renal function, the urea concentration being 1.4 to 1.6 per cent. Thus a very simple rule of thumb was developing—namely, urea below 2 per cent., drain the bladder and wait; above 2 per cent., single stage prostatectomy. This arbitrary rule did not appear to me to be justified, and I decided that unless some other factor contraindicating operation was present I would operate in all cases when the urea concentration figure was above 1 per cent. The results have justified this procedure. This does not, of course, mean that all cases with a urea concentration above 1 per cent. are suitable cases for prostatectomy; there are many other factors besides this urea concentration figure to be considered.

In cases where the renal function is severely impaired the blood urea becomes an important indication of the renal function. As Maclean points out, the figures given as normal for the blood urea—namely, 20 to 25 per cent.—are too low in dealing with old men, and a blood urea of 40 to 50 per

cent. may be present without indicating serious impairment of the renal function. I recently operated on a patient whose blood urea was 58 per cent., and who had been refused a single-stage prostatectomy on this account. The patient was in other respects a healthy man, and I disregarded the high blood urea. Recovery from the operation was uneventful.

The blood urea is dependent upon other factors than the urea elimination by the kidneys, such as the amount and composition of the food, the condition of the liver, and the circulation. This test should therefore only be used in conjunction with the urea concentration test. If used apart from the latter it is apt to be highly misleading. A high urine urea with a high blood urea means that the kidneys are healthy, but the supply of urea is excessive. A low urine urea with a low blood urea may mean a lowered renal function. A low urine urea with a high blood urea is significant of serious impairment of the renal function.

It is not possible to take these tests at their face value and use them in rule of thumb fashion as indications as to whether prostatectomy should not be performed in a given case, or to base a prognosis upon them. We have to remember that these tests tell us only the reading of the renal function at the time and under the conditions that the test was made. This does not exhaust the possibilities of variation of the renal function.

There are two important factors to be reckoned with in estimating the value of a low renal function reading—namely, temporary depression and permanent reduction of the function.

Let us take a man with an enlarged prostate and chronic retention of urine with the bladder distended to the umbilicus. The various tests show that the renal function is very inefficiently performed. Now if the decision in regard to operation and the prognosis are based upon the figures shown by these tests, a totally erroneous view of the case may be obtained. A large part of the depression of the renal function may be temporary and due to causes that can with surgical judgement and care be eliminated. What proportion of the reduction of the renal efficiency is due to the existing obstruction and back pressure on the kidney and what to permanent reduction due to chronic interstitial nephritis the tests do not show us, and until this has been ascertained no true clinical picture of the case can be formed.

Another fallacy that has always attended the tests of the renal function is the difficulty in estimating the total functional power of the kidneys. There is a large amount of reserve power in the kidney that is not brought into action under ordinary conditions. In normal kidneys the reserve power amounts to over 50 per cent. of the total renal function. This part of the renal function may be gradually encroached upon by destruction of the renal tissue by disease and the tests of the renal function may show little change. It is this potential renal function that is so important in estimating the risks in a doubtful case.

Many years ago Albarran tried to estimate the reserve renal function by giving diuretics and observing their effect upon the renal function tests then in use. The method was not, however, successful. The forced urea elimination test comes nearer to estimating the reserve function than any other test that we possess.

The decision to operate or to refuse operation in a case of enlarged prostate with impaired renal function rests upon the judgement of the surgeon, and not on the dicta of the laboratory. What the surgeon requires is as accurate an estimate as possible of the renal function at the time of the test. This estimate is most usefully set out in terms of urea elimination and urea retention.

The compilation of formulae is, I think, unnecessary. Maclean uses a urea concentration factor, to obtain which he divides the figure of the urea in milligrams in 100 c.cm. of urine by that in 100 c.cm. of blood. This factor should normally be 60 to 80. When the urea efficiency is somewhat impaired it may be only 30 or 40. If below 20 the condition is generally bad, and if below 10 it is usually severe. I prefer the plain figures of the blood and urine urea with a note as to any likely fallacy that may have affected the individual figures.

When formulae are used various corrections and modifications begin to be added, each with a possible margin of error, until finally we get formulae like those of Koranyi or Ambert, so overburdened by corrections as to have little or no real clinical value.

It is not necessary for a successful prostatectomy that the renal function should be perfect or even approximately perfect. A reduced renal function may be quite adequate for the operation, and the laboratory figures of the renal function tests form only one factor in estimating the prognosis for operation among many, which include the general build and constitution of the patient, the weakness and soundness of other organs, experience of the operator, and, above all, those who will have the immediate care of the patient after the operation and the surroundings in which recovery from the operation will take place.

TWO-STAGE OPERATION.

The next question that naturally follows on the estimation of the renal function is whether a one-stage or a two-stage operation should be done.

The advantages claimed for a two-stage operation are: shock reduced; less haemorrhage; sepsis reduced; relief of back pressure; and time allowed for the kidneys to resume their normal function.

The disadvantages of the two-stage operation are: two operations and two anaesthetics; increased time in hospital or home; enucleation of the prostate more difficult owing to rigidity of the abdominal wall; post-operative hernia more frequent.

The two-stage operation has now become very common, and in some parts of America it is the only method practised in all cases.

The disadvantages of the two-stage operation are very obvious and are of such a nature as to appeal to the patient. There must therefore be some very definite advantages in the method before it can be adopted.

In the ordinary straightforward case the two-stage operation is certainly not safer than the one-stage operation. Shock is not a factor in uncomplicated prostatectomy. Rough handling, long exposure of the patient from unmethodical technique, and inadequate anaesthesia may produce it, but these are individual to the surgeon and will as likely attend a two-stage as a one-stage operation.

It is said by some surgeons that they get less haemorrhage in a secondary than in a primary one. Where there is severe cystitis and engorgement of the prostate and prostatic urethra from recent retention of urine this may be so; but in the average case, and in any case where adequate measures for the control of haemorrhage are taken, this is not so and no advantage from the preliminary cystotomy in this respect need be expected. In my own practice I select three very definite types of case for the two-stage operation. These cases form a small minority of the cases of prostatic enlargement, and my routine practice is to perform a one-stage operation.

The cases in which I prefer a two-stage prostatectomy are: (1) chronic urinary retention; (2) sepsis; (3) cases in which catheterization is difficult or impossible and some serious complication, such as bronchitis or pneumonia, is present.

1. Chronic Urinary Retention.

This is recognized as a very dangerous condition. One-stage prostatectomy in these cases is a fatal operation, from suppression of urine due to the sudden fall in urinary pressure. Intermittent catheterization, followed by prostatectomy after some time, is more successful, but it is a dangerous procedure at the best. The danger lies in the introduction of sepsis. With the sudden fall in urinary pressure at the time of catheterization and the rise of pressure during eight or ten hours after the infection very readily ascends to the kidney, causing septic pyelonephritis.

If the bladder is drained it must be slowly emptied and when empty the pressure kept at zero by continuous drainage. This may be carried out by the retained catheter, and if it is possible I prefer it to a preliminary cystotomy, for the intravesical pressure can be let down very gradually, no anaesthetic is necessary, and there is no interference with what will later be the operative area. But the catheter drainage is not always possible. The patient is occasionally intolerant of the catheter, or the urethra may be unsuitable for the retained catheter, or clots or mucus from the bladder may persistently block the catheter. Cystotomy will then be necessary for the drainage of the bladder. This may be carried out under local anaesthesia or under gas and oxygen.

The length of the interval between the preliminary cystotomy and prostatectomy depends on the condition of the kidneys; of this the clinical symptoms and the urea tests

are the guide. The improvement may be rapid, and ten days may suffice for the kidneys to regain an almost normal secretion. On the other hand, weeks or months may elapse before the renal function has so far recovered that the prostatectomy may be safely performed.

2. Sepsis an Indication for a Two-stage Operation.

The combination of sepsis and uraemia from back pressure is known as urinary septicaemia, and there are all degrees of severity of the condition. In some cases of enlarged prostate with urinary infection the bladder is the seat of the infection and the kidneys are very slightly involved. In other cases there is chronic septic pyelonephritis.

In any case cystotomy is the proper method of treatment. Catheter drainage is worthless, for the catheter becomes blocked with mucus and pus, the outlet is not sufficiently free, and the washing cannot be carried out in sufficient volume to be effective. Suprapubic cystotomy is performed and a catheter tied in the urethra. Continuous irrigation is installed and may be carried out for as long as necessary. Continuous irrigation for a week or ten days will clear up the cystitis which is not complicated by some local condition such as stone or diverticulum, or which is not secondary to renal infection. Even when pyelonephritis is present very definite improvement is noted in the renal symptoms when the cystotomy and irrigation are established.

If the renal infection is moderate a stage will be reached when it is safe to perform prostatectomy. But where serious bilateral pyelonephritis is present the preliminary improvement is not maintained, the urine contains a heavy deposit of renal pus, and the symptoms of urinary septicaemia gradually increase and the patient dies.

3. Difficult Catheterization and Serious Complications.

The third indication that I accept for the two-stage operation is when there is urgent necessity to relieve the bladder, but there is some complication which makes prostatectomy dangerous. There is no such thing as an urgent prostatectomy. The only urgency in a case of enlarged prostate is to empty the bladder and to provide for drainage. The permanent removal of the obstruction can wait until the patient is in a fit condition for a serious operation.

In most of these cases it is possible to empty the bladder by catheter, and in a case of enlarged prostate I have drained a bladder by retained catheter during the whole course of an attack of lobar pneumonia followed by septic arthritis of the shoulder-joint. But there are cases where it is not easy or possible to do this, either from the difficulty of passing the catheter or of retaining it. In such cases suprapubic cystotomy will overcome the difficulty and place the patient in a position to undergo treatment for the extra-urinary complications. Apart from these classes of case I see no necessity to divide the operation of prostatectomy into two stages.

EARLY OPERATION.

Fortunately the cases in which a two-stage operation is necessary are becoming fewer than they were some years ago. The two-stage operation is almost always an attempt to repair the mistakes of earlier neglect or unskilful treatment.

In a previous address I ventured to recommend early operation, and was called to task for advocating operation on every old man with a slight increase in the frequency of micturition. This was quite a mistaken view of my meaning. What I suggested then and would like to insist upon now is that every old man with increased frequency of micturition should be carefully examined to see if this frequency is due to changes in the prostate which give rise to obstruction.

Frequent micturition in old men is too often looked upon as the physiological accompaniment of advanced age, and no examination is considered necessary. I believe that this symptom in old men is always the result of a pathological condition, and although the changes in the prostate which produce it do not in the majority of cases progress so as to cause obstruction, still there are a large number of cases where there is advancing obstruction and yet frequent micturition remains the only or the most prominent symptom. In the latter the obstruction may, from the neglect of this symptom, be allowed to advance to a dangerous degree.

Wherein lies the Necessity for Early Operation?

We have from time to time reports in the medical press by enthusiastic operators who have successfully operated upon old men of 80 or 90 years, and it is in the experience of all

urinary surgeons that prostatectomy can be successfully done in extreme old age. We know from experience that prostatic patients who are desperately ill, sometimes apparently moribund, from renal failure due to chronic urinary obstruction or from urinary septicaemia, may with proper strategy in treatment and prostatectomy be restored to health in an almost dramatic manner.

But there is another side to this question. The dangers of prostatectomy in a man over 80 are, other things being equal, undoubtedly much greater than those of an average man of 60. We cannot therefore be indifferent to advancing age as an argument in favour of prostatectomy early rather than late.

Then in regard to the back pressure and the septic cases. The return to health, although dramatic, is at best a comparative one. A careful review of these cases after operation will show that the tale of sepsis does not usually cease with the recovery from the operation. There are still attacks of pyrexia from exacerbation of chronic pyelonephritis, and there may be recurrent attacks of epididymitis, although the continual absorption of toxins kept up by the obstruction has been eliminated by the operation. Even after the removal of the obstruction these patients are never in the condition of health that they would have been had they been able to avoid altogether the period, sometimes extending into years, of urinary sepsis and back pressure. There can, I think, be little doubt that the duration of life in these patients is shortened as a result of the permanent damage done during that time. It is to avoid this period of sepsis and back pressure that I advocate early operation.

It is a common argument that the catheter may first be tried, and then if it fails operation may be performed. Failure here means sepsis of a severe type, often with the inability on the part of the patient or the practitioner to pass the catheter, owing to the increased size of the prostate or the tortuosity of the urethra. When this stage has arrived the damage from sepsis has already been done and is in part, if not wholly, irreparable. Catheter life is commenced with the certainty that in the great majority of cases infection will occur, and the prognosis, immediate and remote, in a patient with enlarged prostate and urinary infection is infinitely worse than that in a patient with enlarged prostate without infection.

A second point in favour of early operation is the "silent" prostate with chronic urinary retention.

Cases are met with where a patient complains of nocturnal incontinence as the only urinary symptom, and on examination the bladder is found distended to the umbilicus. The minor symptoms of uraemia are often present but may have been overlooked. It is not infrequent to find in these cases that the prostate was examined some years previously on account of frequent micturition and was found moderately enlarged, but the symptom subsided and the patient noticed nothing further in regard to the bladder until nocturnal incontinence commenced. These cases are among the most dangerous and difficult to treat in prostatic surgery.

The only way to prevent the development of so grave a complication is to examine all cases of frequent micturition in old men thoroughly, and keep them under observation. If residual urine is found operation should be recommended.

A third reason why operation on an enlarged prostate should not be indefinitely delayed is that malignant changes may take place in a prostate the seat of simple enlargement.

We meet with this change in two forms. In one a large elastic movable prostate shows at one part, on rectal examination, a firm inelastic area on the surface of one lobe, often towards the base. On enucleating the prostate the capsule at this part strips with difficulty, and a layer of leathery capsule is left behind. On microscopic examination this part of the prostate shows malignant changes, while the rest of the enlarged gland shows the usual appearance of cystic adenoma.

The second type of case is where an enlarged prostate shells out satisfactorily and appears to be simple, but the pathologist reports that some part in the interior of the gland shows the histological changes of malignant growth. The number of these cases in the total number of prostatectomies is not great, but it is sufficiently large to make them a factor in advocating early operation. In 100 consecutive cases of prostatectomy for simple enlargement of the prostate the pathologist reported that 16 showed areas of malignant change, and 14 were doubtful but were labelled "precancerous." Most of these were prostates of large size. In 11 there was nothing in the clinical examination to raise a suspicion of malignancy. In 4 there

was a small firm area in the region of the seminal vesicle on one side, and in one case the prostate was rather firm in consistence.

Early operation requires definition. I regard all cases of enlarged prostate when the gland is causing sufficient obstruction to produce residual urine of one ounce or more on several examinations as requiring operation. There are some exceptional cases where a large elastic prostate does not produce residual urine. In these cases I also advocate operation. In cases where frequency of micturition is the only symptom, and there is no residual urine and no prominent enlargement of the prostate I do not think operation is necessary.

TYPE OF OPERATION.

The operation that Freyer described was a blind operation. The bladder was opened through a small suprapubic incision and the prostate was pushed up by a finger in the rectum while the other hand pushed down the abdominal wall, and the prostate was reached and enucleated with the forefinger. Bleeding was controlled by washing through a catheter with silver nitrate solution. A large tube was placed in the suprapubic wound for four or five days and then removed and the wound allowed to heal.

While recognizing the success and wide application of this operation I have pointed out certain defects to which it is liable. To remedy these defects I have suggested and practise an operation so much modified that I think it may fairly be regarded as a different operation from that practised by Freyer.

The defects to which I have referred are:

1. Certain difficulties in connexion with the abdominal wall.
2. The method of controlling haemorrhage.
3. The frequency and persistence of sepsis.
4. Post-operative obstruction.

Watching Freyer for many years, and practising this operation myself, I have found that in certain cases a considerable amount of force is required to push the abdominal wall downwards towards the pelvis sufficiently far to reach the prostate. This is due either to the thickness of the abdominal wall or to rigidity from spasm of the recti muscles. A hard struggle on the part of the operator and deep anaesthesia are necessary to overcome this difficulty.

The method of controlling haemorrhage in Freyer's operation is primitive and unreliable, and would not be tolerated in any other operation of first importance. Even with every care sepsis was a frequent complication. I shall discuss sepsis later.

In a previous article I described 16 cases of post-operative obstruction following Freyer's operation. Such cases are of sufficiently frequent occurrence to demand some measure of prevention.

Open Operation

The operation I perform commences with a suprapubic incision sufficiently long to allow the right hand to pass completely within the muscular abdominal wall and sink into the pelvis. This entirely disposes of the difficulty of approach due to spasm of the recti muscles, and, further, it obviates the necessity for introducing the finger into the rectum, for the enucleating finger now reaches the apex of the prostate without difficulty.

I undercut the skin on either side of the wound for the introduction of supporting mattress sutures at the end of the operation.

The bladder is opened and the prostate enucleated with the gloved forefinger and removed from the bladder. A catgut suture is placed in each lip of the bladder wound and the patient raised into the Trendelenburg position. The catgut slings are held up and my bladder retractor introduced. This gives a full view of this opening in the bladder base through which the prostate was removed.

All tags, folds of bladder mucous membrane, shreds and semi-detached plaques of capsule, or nodules of prostate and loose strips of urethra are carefully removed. The posterior lip of the opening is examined, and if a definite fold overhangs the prostate cavity a wedge with the base at the edge of the fold and the apex in the middle line is cut out of this.

A haemostatic stitch is introduced on each side of the neck of the cavity with special bladder needles, and a continuous suture of fine catgut is introduced from the right side round the posterior edge and finishing on the left side. This suture includes the mucous membrane of the bladder, the torn edge

of the sphincter vesicae, and the upper torn edge of the remains of the prostate capsule if, as frequently occurs, this is defined.

Haemorrhage is usually controlled by these sutures. If it still continues, a spouting vessel may be seen deeper in the cavity, and this is clamped and crushed. If, as rarely happens, the bleeding continues, and if there is much venous bleeding from the ascending limb of the prostatic plexus in the anterior wall of the cavity, the catheter is drawn well into the bladder and the prostatic cavity packed carefully round this with iodoform gauze. A tube rather smaller than the large Freyer tube is placed in the bladder. The retractor blades are changed and used to separate the recti and expose the anterior surface of the bladder. The bladder wound is closed up to the tube with a continuous suture. A small prevesical tube is introduced and the retractor removed. Two catgut mattress sutures are placed through the rectus sheath and recti, and a continuous catgut suture through the cut edge of this sheath.

The objects of this modification of the operation are:

1. To eliminate the difficulty of approach to the prostate.
2. To control bleeding.
3. To reduce sepsis.
4. To prevent post-operative obstruction.

SEPSIS.

I have elsewhere¹ discussed haemorrhage and post-operative obstruction, and will here deal more fully with sepsis.

We have long ago left behind the form of sepsis due to staphylococcal infection, where the wound became encrusted with phosphates and healing was delayed and difficult. These infections were undoubtedly due to insufficient preparation of the skin of the patient and of the surgeon's hands, or to instruments. The form of sepsis that occurs during convalescence and after prostatectomy is an infection with *Bacillus coli* or a mixed infection with *Bacillus coli* as the dominant organism.

I. One factor in its production was the rectal finger, combined with the difficulty of approach due to a small abdominal wound. Changing the enucleating hand when one hand has been used to push up the prostate from the rectum must be a dangerous procedure even where washing and a change of gloves has been made. Such a technique would never be tolerated in an intraperitoneal operation, and it ought equally to be abolished in an intravesical operation. Apart from the change of the enucleating hand, the subsequent steps of the operation necessitate the use of both hands, and the danger of infection is equally great at this part of the operation.

In addition to carrying infection there is, I believe, a danger of direct infection through the rectal wall and the wall of the prostate cavity, due to damage done by forcible manipulation between the rectal and the enucleating finger.

The entire elimination of the rectal finger, and making an abdominal incision sufficiently long to give free access to the prostate so as to permit of gentle enucleation, is, I believe, an important means of prevention of sepsis.

II. A second factor in the causation of sepsis after the operation is the presence of partly detached shreds of mucous membrane and prostatic capsules, prostatic nodules, and strips of urethra. These necrose and form a culture ground for bacteria, and are often discharged some time after the wound has healed as phosphate encrusted masses. In the open operation they are completely removed.

III. There is a tendency for stagnant urine, blood clot, and mucus to collect in the prostatic cavity, and for infection to spread along the column of urine in the tube or alongside the tube from the skin after the operation.

The following measures are used to combat this source of sepsis:

A catheter is tied in the urethra with the eye in the prostatic cavity, and the cavity and bladder are freely irrigated through the catheter daily. Or the urethra and prostatic cavity and bladder are irrigated by Janet's hydrostatic method.

Should there have been sepsis before the operation, or anything to suggest that infection has taken place after the operation, continuous irrigation of the prostatic cavity and

bladder with antiseptic solution is carried out by connecting a reservoir to the catheter and draining the Hamilton Irving box into a pail. The continuous irrigation is continued for several days. As a routine a gauze bag filled with large boracic acid crystals is placed in the Hamilton Irving box and renewed twice daily.

With this attention to detail infection has steadily declined in my cases.

IV. Before leaving this subject of sepsis I should like to say a word in regard to the persistence of sepsis which was present before the operation.

There are three important sources of persistent sepsis—namely, pyelitis and pyelonephritis, diverticulum of the bladder, and seminal vesiculitis.

Time does not permit me to deal with these fully, but a short reference may be made to seminal vesiculitis. I believe that in a large proportion of the cases where sepsis persists after prostatectomy this persistence is due to seminal vesiculitis. I have in a number of these prostatic cases removed the seminal vesicles through the floor of the bladder, and will describe the operation fully elsewhere.

It would prolong the prostatectomy too greatly to dissect the seminal vesicles in every septic case at the end of the prostatectomy, but I think the possibility of doing this should be kept in mind.

In two cases of prostatectomy with severe sepsis unaffected by any pre-operation treatment I incised the seminal vesicles through the floor of the bladder by an incision radiating from the centre of the posterior lip of the prostatic opening backwards and outwards to just internal to the ureteric orifice. In these cases I found the vesicles full of pus.

The question should, I think, be raised, in cases of sepsis persisting after operation in spite of energetic treatment, as to whether the vesicles are the source of the infection and if a transvesical operation for their removal should not be done.

ANAESTHESIA.

The patients who are submitted to prostatectomy present many difficulties to the anaesthetist, and I will not venture to encroach on his province.

I may, however, make some remarks from the point of view of the surgeon. A considerable proportion of the prostatic cases have a high blood pressure or some degree of myocardial change. Many have emphysema and some have bronchitis.

A pure ether anaesthesia is not suitable for these cases on account of post-operative lung complications. A mixture of chloroform and ether suits them better, but with this also one fears the possibility of post-operative lung troubles.

Gas and oxygen produces a rigid abdominal wall that interferes with the surgical manipulations. This is of less importance in my open operation, where the enucleating hand works inside the muscular abdominal wall and does not require to push it inwards to reach the prostate.

If gas and oxygen is used the patients should have a large dose of morphine, as they suffer greatly from pain on coming round at once at the close of the operation. Where the blood pressure is high, and especially in a case where there is a cerebral haemorrhage, gas and oxygen is an unsuitable anaesthetic owing to the rise of blood pressure it produces.

The anaesthetic which I prefer is spinal anaesthesia with a modified dose of stovaine and just sufficient C.E. to render the patient unconscious. This form of anaesthesia has less severe after-effects than any other, and my colleagues Dr. Hughes and Dr. Shipway have given it for me as a routine method for several years. The most potent objection to this form of anaesthesia is the fall in blood pressure, amounting to 20 to 40 mm. of mercury.

This fall is generally compensated by turning the patient into the Trendelenburg position, but the pressure may again drop at the end of the operation when the horizontal position is resumed. Where the arteries are very rigid and myocardial changes are present this fall in pressure may lead to circulatory failure during the twenty-four or thirty-six hours following the operation, and in such cases I think it is better to avoid spinal anaesthesia.

Local anaesthesia, even when thoroughly carried out, is not a satisfactory method for prostatectomy. The enucleation of the deeper part of the prostate and the tearing of the urethra cannot be carried out painlessly by this method.

¹ *British Journal of Surgery*, 1923, vol. vii, No. 28, p. 525; *BRITISH MEDICAL JOURNAL*, August 27th, 1921; *Lancet*, 1921, 1, p. 1008.