Section of Urology

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[*October* 23, 1947]

Modern Trends in Prostatic Surgery. [*Abridged*]

PRESIDENT'S ADDRESS

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SIR PETER FREYER was the first President of this Section of the Royal Society of Medicine (1920) and it is to him more than to anyone that we owe the earliest successful form of treatment for prostatic obstruction.

Freyer's operation held the field in Britain for twenty-five years. It was the operation of choice for the general surgeon but few achieved results comparable with those reported by Freyer (1901–09–11). Hæmorrhage and sepsis, at and following operation, and later obstruction, were common and generally the mortality rate was high.

In an endeavour to improve on the Freyer operation Thomson-Walker (1920) introduced an operation whereby an effort was made to control the bleeding at the operation, to lessen sepsis and to prevent post-operative recurrence of obstruction. Although in skilled hands it resulted in a diminished mortality and a greater freedom from complications this operation proved too complex for the average general surgeon, who continued to use the much simpler Freyer method.

About 1930 the treatment of prostatic obstruction was still unsatisfactory and the mortality in general hospitals was estimated to be about 20% although in special hospitals, such as St. Peter's, it was reported as 9·9% over a twenty-nine-year period but fluctuated in different years from under 5% to 14·5% (Thomson-Walker, 1936). From that time all our efforts have been directed to improving pre-operative, operative and post-operative methods in the hope that the incidence of mortality and morbidity might be lessened not only in a few special clinics but generally throughout the country. We are still, however, seeking a method which is simple, safe and sound. Some success has been achieved and to-day results generally show a definite improvement on those of twenty years ago. There is still, however, considerable divergence of opinion regarding the selection of operative procedure in the treatment of prostatic obstruction. Urologists should be thoroughly familiar with the various techniques: they can then adopt the method which they consider most suited to the patient, to their own skill, and to the particular circumstances.

I will now review the methods of treatment in vogue to-day and the conclusions concerning them at which I have arrived as a result of twenty-five years of urological practice.

(1) *The Freyer operation.*—This remains the most commonly practised method of prostatectomy among general surgeons, who frequently refer to the good results they have achieved with it. Whilst this may be so on occasion, on the average the post-operative discomfort, the long convalescence and the end-result surely indicate the undesirability of such a technique except where the poor physical condition of the patient necessitates a very short operation. Where a thirty- or forty-minute operation cannot be contemplated and in certain other cases governed by special factors, the Freyer operation, or rather its present modification, is of value. By "modification" I mean a moderate-sized incision, a quick and clean enucleation of the gland, adequate control of bleeding by a suitably sized Foley indwelling urethral catheter and closure of the bladder wall around a small or medium-sized Freyer drainage tube. This tube should be removed whenever the possibility of clotting is over, say in twenty-four hours, and after a further twenty-four hours the Foley catheter should be replaced by an indwelling No. 22 F size urethral catheter. These measures generally obviate the use of the suprapubic box. The wound heals rapidly, fistula formation is less likely or of short duration, and removal of the catheter on the tenth day generally ushers in natural micturition. I have found this the operation of choice in approximately 10% of my cases.

(2) *The Thomson-Walker operation.*—This improvement on the Freyer operation was first popularized by the late Sir John Thomson-Walker (1920, 1936). Since the advent of the closure operations I have ceased to use the Thomson-Walker operation and I see no useful place for it to-day.

(3) *Per-urethral resection.*—This method, in its present form, originated in America about 1930 and soon was acclaimed as the ideal treatment for all forms of prostatic hyperplasia. Not only were members of the medical profession swept off their feet by a wave of enthusiasm but the general public, having heard of the new method which obviated a "cutting operation", demanded it. Few now make use of it for every prostatic hypertrophy; most reserve it for the treatment of fibrous glands, the small subcervical adenomata and the case of obstructing carcinoma with impending or actual retention. In America the Mayo Clinic use it in preference to any other form of treatment and Emmett (1944) reports that for the ten-year period preceding 1942, 9,000 resections were performed there with a mortality rate of 1·1% and an average hospital stay of 8·6 days, only 3% requiring further resection at a later period for recurrence of obstruction. In England, Wardill (1947) also uses this method exclusively. He states that his cases are entirely unselected and that he has performed 537 resections during the twenty months prior to August 1947. 26 patients died (4·84%) and 58 required more than one resection (10·8%). On the other hand Millin (1946) after performing 219 resections discarded it, on account of late complications, except in the type of case I have specified. Chapman (1947) states that till recently he employed the method exclusively except for certain bad risk cases which were treated by permanent suprapubic drainage. He reports 379 cases with 24 deaths (6·3%). His present practice is to treat the large adenomatous prostate by suprapubic prostatectomy and 20% of his patients are now so treated.

There are two different methods of performing this operation: (1) by the McCarthy instrument using a cutting loop activated by diathermy electric current to excise the tissue, and (2) by the cold punch instrument, known as the Thompson resectoscope or punch, by which tissue is removed by a circular knife. The McCarthy instrument was first in the field and I gave it an extensive trial. Although of large size the shaft of the instrument required little movement in the urethra during the operation and thus I found the incidence of post-operative stricture was less than when using the punch instrument; its disadvantages were that the lens system, becoming clouded by blood, reduced visibility and made it difficult not only to recognize anatomical landmarks but to resect sufficient tissue and furthermore the operation tended to be prolonged as after each cut the telescope and cutting loop had to be withdrawn with the attached piece of tissue. I discarded the method when I acquired a Thompson punch which I found much simpler to use in that it permitted good visualization despite appreciable hæmorrhage and thus one was able to remove a large amount of tissue in a comparatively short time.

I have performed per-urethral resection on 26% of my cases and that includes a period of one year during which, to gain experience, I used the method almost exclusively: the results are shown in Table I.

TABLE I

Type of patient	Number	Died	Mortality percentage
Private.. ..	69	7	10·14
Hospital ..	86	8	9·3
Total	155	15	9·6

My reaction to the operation, using the cold punch, is that I dislike the large size of the instrument which is stated to be size 30 F but which actually is often size 32 F and thus too large for the normal urethra. A smaller instrument is made but it is much less effective and seldom used. Many of my cases developed severe urethral stricture as a result of the passage of the large instrument. How could it be otherwise when one considers the tightly fitting instrument in the urethra with its constant piston-like movement against the delicate urethral mucosa? It is true that stricture formation can be partially obviated by inserting the instrument through a urethrotomy opening in the bulb but most of us would hesitate to perform this additional, even temporary, mutilation. A further difficulty I found with the instrument was in determining when a sufficiency of tissue had been resected. Time and again I considered that I had removed all obstructing tissue only to find a few days later that the patient still had difficulty in micturating freely or even that retention was still present. A further resection was then carried out and indeed at times resection was necessary on three separate occasions. I believe that this is not an uncommon occurrence but I am willing to admit to some inexperience. Presuming a man to be an ordinary skilled instrumentalist how many resections should be necessary before he could expect to achieve reasonable perfection? I have heard various estimates of from one hundred to three hundred but that seems an immensity of suffering to inflict in the pursuit of even a moderate degree of skill by this method! But there are other defects and the most important of these are hæmorrhage and sepsis. The operation cannot be performed without very considerable blood loss which siarts with the first cut and is continued for several hours following it. The blood loss can be made good by transfusion although that is only necessary in a few cases but to prevent

clot retention the bladder must be washed out at short and regular but increasing intervals for some hours following operation. To my mind this is one of its most unattractive features as instead of the patient being permitted to rest quietly and sleep in his bed during post-operative hours, he is continually disturbed by the rapid filling and emptying of the bladder every few minutes. Furthermore in the odd case a return to theatre for re-examination and coagulation of bleeding points may be required. The application of a solution of "thrombin topical" to the bleeding surface may lessen or remove this sequel to the operation and early reports on its use for this purpose are encouraging.

Sepsis is another and not uncommon complication following this type of operation but the introduction of the sulphonamides and penicillin has undoubtedly lessened its incidence. Recurrence of the obstruction is an acknowledged possibility which may occur at a later period in an appreciable number of cases and a permanent incontinence though rare in the hands of the expert may be a serious complication to those less skilled. Thus I have concluded that, at least so far as I am concerned, per-urethral prostatectomy in the presence of a large adenomatous gland is a much more serious procedure than the radical suprapubic operation and that the results are less satisfactory. I now confine the use of this operation to the types of obstruction to which I have already referred.

(4) *The Harris operation* (1927, 1929, 1933).—My experience with this operation ts shown in Table II.

TABLE II

Type of patient	Number	Died	Mortality percentage
Private ..	188	8 (2 cardiac failure, 1 uræmia, 1 recurrence of cerebral thrombosis, 2 mesenteric thrombosis, 1 cerebral hæmorrhage one month later, 1 retroperitoneal infection)	4·2
Hospital ..	130	4 (1 phthisis two months later*, 2 excision of bladder tumour+prostatectomy, 1 uræmia six weeks after leaving hospital*)	3
Total	318	12	3·7

*These two cases are, strictly speaking, not operation deaths. If they are excluded the hospital mortality is reduced to 1·5% and the total mortality to 3·1%.

The few modifications I have made in the original technique are I think of importance and have contributed to the results achieved. They are that the anterior transverse suture is passed widely, deeply, and tangentially to the cavity which the needle should not perforate: it should just miss its front wall. I think this stitch is a great factor in controlling hæmorrhage. The second transverse suture transects the cavity and should also be passed widely and deeply and parallel to the first suture but ample room must be left for the indwelling catheter which must not be gripped tightly and in fact the reconstructed internal urethral meatus must admit easily the tip of the index finger. Another modification is that I close the bladder in three layers making a completely air- and water-tight union. Features of Harris' original description which I should like to stress are:—first that the bladder should be empty before it is opened as not only is this procedure much simpler than opening it when full but it lessens contamination of the wound in cases where the urine is already infected; secondly, that the cavity left after removal of the prostate must be smooth and without tags or excrescences, in other words the enucleation must proceed through the line of cleavage and any tags must be excised; and thirdly, the trigonal stitch must be passed from immediately below and behind the mid-point of the inter-ureter bar and then brought forward under the floor of the prostatic cavity which it may enter at any point beyond, that is distal to, the edge of the trigonal flap. The object to be achieved is the fixing down of this flap and the idea that the suture must pick up the posterior edge of the torn urethra, whilst advantageous, is unnecessary. In connexion with the passing of this trigonal stitch two criticisms have been made. First, concerning perforation of the rectum, a catastrophe which I have never met nor have I heard of it occurring in other hands. I have heard fear of it expressed by many but I do not believe that its occurrence is possible if a correctly curved boomerang needle is used. Secondly, cases are on record where a ureter has been occluded by the trigonal stitch. I would point out that no operation is foolproof and that both ureter mouths must be visualized and the stitch passed at a point immediately behind the inter-ureter bar equidistant from the ureters. With this obvious precaution it is practically impossible to include or compress either ureter. Drainage should be by indwelling urethral catheter only but it is imperative to successful drainage that the catheter should be of 22 F gauge with an internal calibre of not less than 15 F. Its tip should be cut off after being passed and before closure of the bladder and it must be adjusted

so that all its "eyes" will lie within the bladder and none within the prostate cavity as otherwise clot from the cavity may enter and occlude it; the position of the "eyes" is such as to secure adequate and immediate drainage of blood. I fix this catheter by a suture stitched to the wall of the catheter near its tip. One end of the suture is then attached to a large curved needle which should perforate the bladder wall from within at a point about 2 in. lateral to the line of the bladder incision where it is pushed through to the skin surface; the other end of the suture is similarly brought out on the skin surface on the opposite side. After closure of the abdominal wound a thin rubber tube, of a length sufficient to bridge the gap between the cutaneous exit points of the ends of the suture, is threaded on one end and the two ends are then loosely tied.

After closure of the bladder sulphathiazole powder is freely applied to the deep and superficial parts of the wound and also to the skin edges. A small tube is left to drain the prevesical space and the abdominal wall is closed around this by two silkworm sutures supplemented by a few Kifa clips. The wound is sealed by elastoplast over a few layers of gauze and this dressing is not disturbed for five days but a small hole in the centre of the elastoplast permits drainage from the prevesical tube and its withdrawal in forty-eight hours. Absorbent wool retained by a binder and easily changed covers the elastoplast. Finally the bladder is irrigated through the catheter and when the return is pink-coloured the bladder is emptied and 4 oz. of a 10% sodium citrate solution are instilled and the tube spigoted till the patient is returned to bed; following which 10 oz. of normal saline solution is administered rectally and the catheter connected to a bedside drainage flask by rubber tube. Later 1/6 grain of morphia is administered hypodermically. That is practically all the immediate after-treatment necessary but it is important that a nurse should watch that the urine continues to drip into the sterile bedside bottle. Irrigation of the bladder through the catheter is not permitted unless the urine fails to drip. If this should occur the nurse may force 2 oz. of saline solution, by means of a syringe, through the catheter and at once forcibly aspirate the amount inserted. If she fails to get a return the sister or house surgeon must be called but this is seldom necessary. Clot retention is uncommon and in most of the patients in which it has occurred it has been possible to clear the catheter by vigorous suction using a 2 oz. glass syringe. Where this fails, as it has on a few occasions, the catheter must be withdrawn, a Bigelow cannula inserted and the clot removed by an evacuator. I have found this method efficacious and in my experience it has never been necessary to reopen the bladder for clot retention. On the following morning patients treated by this operation feel and look well and are generally sitting up in bed reading their newspapers. Complications are practically unknown. The catheter is withdrawn whenever the urine is clear, usually in from six to eight days, and never later than the tenth day and following that natural micturition is re-established, the wound at that time having healed by first intention.

Patients after this operation may sit up out of bed in twenty-four hours but I never force a patient to get up against his will and usually he does not do so until the day on which the catheter is removed. The urine always shows some infection, generally a slight bacilluria following the operation but this can be cleared up in about a fortnight by treatment with sulphonamide.

The picture I have drawn is one which can be expected in any case where the general condition of the patient is fairly satisfactory and the urine sterile before operation. Where the urine is not sterile or where prolonged catheter or suprapubic drainage is required pre-operatively the urine takes longer to become sterile and a small quantity may leak through the suprapubic wound for a few days after withdrawal of the catheter.

I have found this operation with immediate closure of the bladder most satisfactory. I cannot understand why most surgeons still leave a suprapubic tube in the bladder as I believe that not only is that unnecessary but harmful. Fear of clot retention in the presence of a slight ooze from the prostate cavity is responsible for the practice but I would point out that a catheter such as I have described can clear the bladder of any trickle of blood and complete hæmostasis is unnecessary. During the past two years I have never failed to close the bladder at operation and I would go so far as to state that to-day any prostatectomy technique which entails leaving the bladder open even for a short period is undesirable.

There is one further alteration in Harris' original technique which has a considerable bearing on the comfort and rapid uneventful convalescence of the patient and which I regard as of importance and that is that the suprapubic wound should be small, transverse in direction, and situated one fingerbreadth above the pubis. After incising the skin and superficial fascia transversely, the linea alba is divided vertically from the pubis upwards for 2 in. The space thus gained when the recti are separated is amply sufficient for the operation. The opening into the bladder is made high and vertically and should not be larger than will admit the index and middle fingers. With a wound of this type the patient has no post-operative discomfort from his wound and the healing of the skin and subsequent

scar would fill many a plastic surgeon with envy. The only advantage of the long vertical mid-line incision is that a finger in the rectum is unnecessary (a matter of no importance) and visualization for spectators is somewhat easier.

Recently a good deal has been heard about patients suffering from bladder spasm following operation. After the Harris operation bladder spasm is almost abolished and certainly it is unusual for patients to complain of anything more than slight discomfort. The late results are perfect as I have determined by a yearly follow-up of 180 consecutive private cases over a thirteen-year period.

(5) *The Wilson Hey operation.*—In 1945 Wilson H. Hey advocated a revolutionary procedure. In cases of acute and chronic retention of urine he condemned slow decompression and urethral instrumentation as primary factors in causing infection with resulting post-operative uræmia. He advised immediate prostatectomy as being the best drainage operation and described his method by which, after enucleation of the prostate, the prostatic cavity was opened widely into the bladder by removal of the trigone up to the ureter mouths and inter-ureter bar, almost complete hæmostasis being effected by diathermy coagulation. He stressed the absolute necessity of passing the urethral catheter from the bladder outwards and of closure of the bladder wound if sepsis was to be avoided. The catheter is removed as soon as possible, usually about the third day. His operative technique is marked by the most strict aseptic ritual and he believes that by his method prostatectomy can be performed aseptically with resulting accelerated healing and that the urine, if sterile pre-operatively, remains sterile.

Hey classified patients into four groups relative to their condition at the time of operation. Group I were what he called perfect cases of any age with no marked systemic disease and residual urine up to 6 oz.—operation mortality 2·1%; Group II had mild systemic disease with residual urine up to 15 oz. and a blood urea of under 80—mortality rate 6·76%; Group III had marked systemic disease with residual urine of 1 to 5 pints and blood urea varying between 80 and 200—mortality rate 16·1%; Group IV all showed evidence of cardiorenal failure and had blood urea over 200—mortality 66·6%. Only 6 cases out of 335 were refused operation because death was too imminent. Over the whole series the operation mortality was 6% but in Groups I and II combined it was 3·4%.

After visiting Hey in Manchester I tried his methods but my experience of them is small. In the more serious cases (Hey's Groups III and IV) in which prudence indicated preliminary rest, restorative measures and slow decompression, 2 out of 4 patients died and I wondered if slow decompression and a two-stage operation might not have given a different result. For the ordinary prostate case (Hey's Groups I and II) the Harris operation to which I was accustomed gave better and more pleasing results in my hands so I returned to it. In spite of that I admire Hey's pioneer work. His conclusions regarding the dangers of sepsis from any form of bladder drainage must I think be conceded but in that connexion I cannot see how the retrograde passage of the urethral drainage catheter, on which he places stress, can have great bearing as *pre-existing* organisms in the urethra are going to ascend to the bladder sooner or later while a catheter remains in situ and thus it matters little whether the catheter is passed in the normal manner or as Hey recommends.

(6) *Retropubic prostatectomy.*—Millin (1945) was responsible for another revolution but this time mainly from the operative angle. He has described an extravesical method of prostatectomy which he has named retropubic prostatectomy and although he may not have been the first person to have thought of removing the prostate by the retropubic route he certainly was the first to devise a workable and relatively simple technique. The method he advocates has all the benefits of exposure and accessibility to the gland given by the perineal approach but is without the dangers of septic contamination and post-operative urinary incontinence inherent in that method. The operation has now been practised for two years and Millin has recently reported a series of 1,700 cases operated on by 16 surgeons, all of whom had carried out more than 50 operations, with an overall mortality rate of 5·3%. His own operative mortality in 439 cases is 4·75% (Millin, 1947*a*). It is as yet too early to dogmatize about final results but if Millin's present technique is carried out there would appear to be little chance of late complications. To one accustomed to prostatic surgery Millin's operation is not unduly difficult. My troubles concerned post-operative hæmorrhage and fistula. After completion of the operation I was surprised to note that the dressings required changing once or twice during the first six hours owing to their becoming saturated with blood. This occurred after every operation despite the most meticulous hæmostasis and despite the fact that no fall in blood-pressure had occurred during the operation. On only one occasion was it serious and that patient died of a sudden hæmorrhage into the prevesical space five hours after the operation in spite of the wound immediately being reopened and gauze packed and a rapid blood transfusion given. Generally I considered that there was a much greater blood loss from the prevesical drainage tube in the early post-

operative hours than occurred following the Harris operation. Other troubles from hæmorrhage occurred in cases where the bladder neck had to be resected widely. This resection left an opening into the bladder much larger than the catheter so that any bleeding from the prostate bed tended to ooze back into the bladder where it clotted and this often led to the catheter becoming blocked, and indeed on two occasions evacuation of the clots by the Bigelow evacuator was necessary. I have no doubt that this was the result of inefficient hæmostasis in the prostate bed and bladder neck and it shows the necessity for the identification and ligature or coagulation of all bleeding points. I cite this as a warning to those trying the operation. Another trouble was leakage from the suprapubic wound after withdrawal of the catheter. With a pre-operative sterile urine the suprapubic wound healed by first intention in all cases and after withdrawal of the catheter there was no ooze of urine from the wound but it was otherwise in some cases with a pre-operative bacilluria. These patients micturated normally after withdrawal of the catheter but most of them showed some leakage from the wound which persisted for from two or three days to as long as twenty days. In the same type of infected case treated by the Harris operation the fistula closed in a much shorter time. My nursing staff and my assistants concluded unanimously that the results we achieved by the Harris technique were on the whole better than by the Millin method. That finding may be peculiar to myself and detracts in no way from my admiration for this excellent method of prostatectomy and indeed I may, through later experience, use this technique more frequently.

The following table of my results with this technique is not a true reflex of the operation and only one death, which I have already described, can be attributed to the operation itself. At the time I was doing a series of retropubic operations I became temporarily imbued with Hey's teachings and I thought that if Hey's operation was suitable for use as a drainage operation in the very poor risk case with chronic overflow incontinence and high blood urea there appeared little reason why the retropubic operation should not prove equally satisfactory. Two of the deaths were accounted for by that view. The other deaths were due to coronary thrombosis in one and cerebral thrombosis in the other.

TABLE III

Type of patient	Number	Died	Mortality percentage
Private.. ..	6	2	33·3
Hospital ..	24	3	12·5
Total	30	5	16·6

(7) *Perineal prostatectomy.*—This method of prostatectomy has never achieved popularity in this country although in America it had and still has a considerable vogue. Its main disadvantage is the possibility of urinary incontinence due to interference with the external sphincter. In the treatment of early carcinoma the route is a good one but the site of the wound is in an area exposed to septic contamination and thus the retropubic approach of Millin appears preferable (Millin, 1947*b*). My own experience of the operation is too small to be of any value.

(8) *The two-stage operation.*—By the two-stage operation I mean a preliminary cystostomy and bladder drainage as a first stage followed at a shorter or longer interval by removal of the prostate as a second stage. Any form of bladder drainage means urinary sepsis and thus it follows that, if at all possible, preliminary drainage should be avoided and post-operative drainage limited to the shortest possible time. Having admitted that, one has to consider the condition of the patient and his urinary tract and determine what will be safest and best for the particular case. The two-stage operation is undoubtedly a safer procedure for the inexpert but for the specialist the one-stage operation is in my opinion much to be preferred from all points of view. I find that I have performed a two-stage operation in approximately 6% of all cases.

METHOD OF SELECTION OF OPERATION

In my clinic in the Western Infirmary, Glasgow, we divide cases of prostatic obstruction into two classes:

Class I consists of those cases where preliminary drainage is unnecessary and a single stage operation can be safely performed.—The criteria we consider necessary for this are (1) There should be no palpable bladder distension or if distension is present it should not reach beyond a point midway between pubis and umbilicus. (2) The urine should not be grossly infected. (3) There should have been no recent urethral instrumentation apart from an indwelling urethral catheter. (4) Serious calculous disease should be excluded by X-ray examination. (5) Intravenous urograms should show that both kidneys are functioning

equally and that there is no gross hydronephrosis or hydro-ureter. (6) Renal function tests should not show a marked deficiency; a blood urea of 50 mg.% is regarded as satisfactory. (7) Urinary output should be about 80 oz. daily. (8) The cardiovascular apparatus should be found to be satisfactory on examination by a physician well cognizant of the amount of strain imposed by each of the possible prostatic operations.

Class II is made up of patients who do not qualify for Class I.—These patients are treated by urethral catheter drainage and are either quickly or gradually decompressed as may seem advisable. The majority of those who survive become fit for a closed method of prostatectomy within two weeks but if, at about that time, they have not done so then a suprapubic tube is inserted into the bladder and the patient is discharged from hospital. Such a patient is put under the care of his own doctor but attends our out-patient clinic at monthly intervals for re-examination. Whenever he shows improvement sufficient to allow prostatectomy he is readmitted and the operation carried out.

The principal hazard in the relief of prostatic obstruction occurs immediately after the patient commences treatment or even before treatment is instituted. Table IV shows this clearly and it proves that many patients are presented for treatment either at a late stage in the disease or even when death is already imminent. It provides a serious warning of the dangers of delay.

TABLE IV.—MORTALITY FROM PROSTATIC OBSTRUCTION

	Number	Died
Total number of consecutive cases admitted to hospital with prostatic obstruction..	260	31
A.—Treated by prostatectomy (all methods)	187	16
B.—Treated by drainage alone or receiving no treatment ..	73	15

Few patients who survive drainage fail ultimately to satisfy the criteria we consider necessary for safe prostatectomy and indeed our records show that, excluding prostatic carcinoma, less than 5% have been condemned to a permanent suprapubic tube. Commonly we have patients referred to us who have worn a suprapubic tube for months or years and have been refused prostatectomy elsewhere on account of their poor general or urinary condition. I believe there are few more distressing conditions for a patient than to be condemned to permanent bladder drainage and thus it often happens that such a patient will plead for relief even when fully aware of the considerable risk to life which, in his case, may be attached to radical operation. With careful pre-operative treatment it is surprising how many of these "elderly wrecks" can be given a new lease of life by a rapidly performed Freyer type of operation. A closure operation or any operation requiring more than ten minutes anæsthesia is usually unsuitable.

TABLE V.—PROSTATECTOMY BY ALL METHODS

Private and Hospital

Prostatectomies (all methods)	Died	Mortality percentage
589	41	6·96

CONCLUSIONS

In the first place I should like to make it clear that in my opinion there is at the present time no single operative procedure suitable for all types of prostatic obstruction and I maintain that the type of operation should be adapted to the conditions presented by the patient. Many factors govern the choice, such as the condition of the prostate itself, the state of the urinary tract, the configuration and general health of the patient, his age and infirmities and especially the condition of his cardiovascular system. Thus it comes about that I view with misgiving the assessment of the difficult case by the surgeon alone; the prostate case can present such complex medical problems that if the best is to be done team work is essential and the team must include a physician experienced in the examination and treatment of this type of case. Another important factor in determining the type of operation is the "set up" of the hospital or clinic in which it is to be performed. It is wrong to undertake the treatment of prostatic obstruction except in a modern clinic where every aid, scientific, instrumental and human, is available. Except in dire emergency, a hardly conceivable condition in prostatic surgery, or in very exceptional circumstances, the urologist should refuse, for the reasons I have mentioned, to operate away from his own hospital clinic or nursing home. The general body of practitioners and the general public have such an experience of badly planned and performed prostate operations, with mortality in the region of 20% and a shocking morbidity, that the evil day of seeking or taking advice is deferred till conditions have so deteriorated as to make a perfect result unlikely. Only now with a better technique and better resources are we beginning to break through the

crust of professional and lay resistance to early treatment and thus I maintain that there must be no setback in the position.

Complications and Sequels of Prostatectomy

In recent years a good deal has been written about the complications and sequels of prostatectomy.

(1) *Hæmorrhage.*—(*a*) *At operation:* It seems hardly possible to perform prostatectomy without blood loss to the extent of from a half to one pint. Some patients bleed more than others but in all cases efforts must be made to minimize this loss. I have found that rapid but gentle enucleation of the gland, adhering rigidly to the line of cleavage with minimal tearing of tissue, limits the bleeding. Immediately the gland mass is freed and displaced from the prostatic cavity but before its removal from the bladder, I rapidly pack the cavity with gauze freshly wrung out of hot 1 : 1,000 acriflavine solution. This minimizes further bleeding while retractors are placed and the succeeding stages prepared. When all is ready the gauze is removed, any tags excised and the hæmostatic suture placed and tied. This takes five to ten minutes to accomplish and any further blood loss is trifling. I consider that this limitation of bleeding is one of the features of the Harris operation as I practise it and accounts for the lack of shock, rapid recovery and sense of well-being experienced by the patient within twelve hours of operation. Blood transfusion I rarely find necessary or desirable. In operations where bleeding is not fully controlled by suture, ligature or coagulation, a Foley type of catheter is useful. Recently attention has been focused on the use of "thrombin topical", and oxidized absorbable gauze, as hæmostatic agents in the prostate cavity. The former is injected into the cavity and the latter used as packing (de Vries and Buchanan, 1947) or as a covering for a dilatable bag (MacDonald and Powell, 1947). I have no experience of these hæmostatic agents in prostatic surgery and though they are probably unnecessary for the Harris, Hey or Millin operations, in transurethral resection or the Freyer operation they may prove of considerable value. Bandler, Roen and Stept (1947) have reported on 50 cases of per-urethral resection who received an injection of 10 c.c. of a solution containing 10,000 units of "thrombin topical" through an undistended Foley catheter into the prostate cavity immediately following the operation. Five minutes later the catheter balloon was distended and inserted into the cavity. The catheter was then clamped for one hour, after which it drained continuously. Irrigation was contra-indicated and unnecessary, post-operative bleeding being practically abolished. Chapman (1947) has used this technique in 36 cases, reports that irrigation is unnecessary and that the urine remains only blood tinged for a few days. He had no case of clot retention and he considers that the gain in comfort of the patient and convenience to the nursing staff was enormous. This means of eliminating bleeding may abolish most of the blood loss following the per-urethral and Freyer methods of prostatectomy, and it seems worthy of trial.

(*b*) *Reactionary:* The special No. 22 F rubber urethral catheter adequately drains off the slight ooze of blood which follows a Harris prostatectomy. The urine remains deeply blood-stained for twenty-four hours after which the hæmorrhage diminishes but as a rule it continues for four or five days—varying in degree from patient to patient. Clot retention following closure operations is rare and is best treated by removing the catheter, evacuating the clots by Bigelow evacuator and reinserting the catheter without necessarily removing the patient from his bed.

(*c*) *Secondary:* There appears to be some discrepancy in medical literature regarding the time of onset of secondary hæmorrhage. I would define it as hæmorrhage occurring from seven to fourteen days after operation and generally due to sepsis. I have found it to occur rarely, in fact my records show only 2 cases following the Harris operation. Both commenced a few hours after withdrawal of the catheter on the tenth day and in neither was sepsis a marked feature. Treatment by evacuation of the clot by Bigelow evacuator and reinsertion of a catheter for forty-eight hours was successful and convalescence was not delayed. When I say that the condition is a rare one I refer to massive hæmorrhage and not to a slight tinging of the urine with blood during the period within which secondary hæmorrhage might occur. This trivial secondary hæmorrhage is common and can be entirely disregarded, disappearing spontaneously within a few hours.

(2) *Sepsis.*—I do not believe that it is possible for any patient undergoing prostatectomy to escape some degree of septic infection. Indeed Riches and Muir (1933) reviewing all prostatectomy cases in the Middlesex Hospital between 1924 and 1931 found infection to be one of the commonest post-operative complications and the incidence of ascending infection to be appreciable. Recently Skyrme Rees (1947) has shown that over 50% of deaths following prostatectomy are due to severe sepsis in the urinary tract. The sulphonamides have proved of the greatest value in prophylaxis and treatment. Penicillin is said to be less useful owing

to various degrees of inactivation in the presence of some of the common organisms producing urinary sepsis, but in their absence it holds an important place and even in their presence may prevent pyelonephritis (Yates Bell, 1947) by acting as a remote barrier to the spread of infection. Either or both of these drugs should be used prophylactically and therapeutically. Their use has almost revolutionized prostatic surgery by removing fear of sepsis following the closure operations and already many report a very striking decrease in operative mortality (Yates Bell, 1947; Morson, 1947 *a*, *b*).

In cases where infection of the urine following operation persists after fourteen days of sulphonamide treatment, I give weekly courses of a mandelic acid preparation and sulphonamide alternately. This generally cures but in patients with a long history of prostatic obstruction and in whom pre-operative sepsis was marked the condition may be extremely intractable.

(3) *Suprapubic fistula.*—Reference to fistula formation following the Millin operation has already been made. Fistula following the Harris operation is uncommon. 77% heal by first intention, and in the remaining 23% healing is complete in about twenty days. In my cases no fistula persisted or required any form of secondary operation. In patients treated by the Freyer technique, where a suprapubic tube is used for drainage, fistula formation persisted for over fourteen days in about 75% of cases and in these the average time of closure was thirty days. No permanent fistula resulted from any type of operation and obviously such a condition persisting over months should not occur.

(4) *Post-operative urethral stricture.*—Reference has already been made to the incidence of severe stricture following per-urethral resection by the Thompson resectoscope; it is one of the great disadvantages of that operation. In no case did it occur after the Millin operation and in only a very few cases was there a minor degree of stricture following the Harris operation. Urethritis due to an indwelling catheter is also a common cause of this condition.

(5) *Incontinence.*—Incontinence following the Millin, Hey or Freyer operations has not occurred. Following the Harris operation a temporary total incontinence occurred in 1·4%. At first this puzzled me but cystoscopy showed it to be due to sloughing of tissue caused by over-tightening of the transverse sutures in the prostate cavity. This slough, about 1 cm. in diameter becoming partially impacted in the bladder outlet, interfered with sphincter action. The condition was completely cured with the passage of the slough which occurred naturally in all cases and caused no secondary hæmorrhage or after-effects.

(6) *Epididymitis.*—Every prostate operation should be preceded by bilateral vasectomy. This procedure takes four minutes and is done through bilateral small 1 cm. incisions in the scrotal skin. In no instance have these wounds failed to heal by first intention. In spite of this, epididymitis of minor degree has been known to occur but is uncommon. An inflammatory thickening of the cord proximal to the site of vas resection has occurred in 10% of prostatectomy cases in which there was marked urinary infection, but has gradually disappeared after a few days.

(7) *Urethritis.*—This rarely occurs post-operatively where there has been no pre-operative urethral drainage. If it does occur the catheter is at once withdrawn and intensive sulphonamide treatment instituted. In a patient treated by a closure operation where the catheter has had to be removed in the early post-operative period all the urine may be passed *per urethram* but, on the other hand, part may ooze through the suprapubic wound. Extravasation or serious complications have not occurred but a suprapubic fistula may form and may take a week or two to heal. Should urethritis develop during pre-operative drainage the catheter may have to be withdrawn and the operation performed by the two-stage method, but if intensive penicillin-sulphonamide treatment is instituted at once the infection may be aborted without necessitating removal of the catheter. Taken all over, urethritis has been uncommon in our hands largely on account of two factors, first, the institution of routine chemotherapy during the period of catheterization, and secondly because catheterization is performed with great care and gentleness. The catheter itself is anchored in position by the pipe-cleaner method, or a small self-retaining catheter of Foley type is used. Furthermore, while the catheter remains in the urethra a gauze dressing soaked in acriflavine 1 : 1,000 surrounds the glans penis and the first centimetre of the protruding catheter; this dressing is changed daily. Furthermore I believe it is important that the catheter should be a loose fit in the urethra to permit drainage of mucus, also that it should be held steady and not allowed to move: this is achieved by surrounding the penis with gamgee which along with the catheter is strapped to the thigh. While the catheter remains in the urethra the patient is not allowed to walk about although he may sit on a chair.

(8) *Pulmonary embolism.*—This occurred occasionally following all forms of prostatectomy till about two years ago. Only one case was serious, the patient dying within a few minutes on the third day following an open diathermy resection of a fibrous prostate. The others

were of trivial type, the embolus signifying its presence by a sharp pain in the chest and a rise in temperature, followed for a few days by a blood-tinged sputum; the condition resolved rapidly. Two years ago our consulting physician advised the administration of strychnine by mouth (5 minims of liq. strych. hydrochlor. dil. t.i.d.) for two days before operation, and for the days immediately following the operation that drug administered hypodermically, 1/30 gr. being given first followed by 1/60 gr. four-hourly during the succeeding twelve hours, after which administration by mouth may be resumed. Since then we have had no case of embolism, probably due to the effect of the strychnine on the circulatory and respiratory systems. In addition a knee pillow is forbidden and, on complete recovery from the anæsthetic, the patient is taught deep breathing exercises which are carried out at stated periods daily. He is also instructed to move about in bed and limb exercises are prescribed.

Recently articles have appeared in America describing prophylactic surgical treatment for a possible post-operative thrombosis. According to Allen (1947) any patient over 65 years of age who is to be confined to bed for some time should have bilateral superficial femoral vein ligation performed especially when a varicose condition of the veins of the leg exists. The even more drastic procedure of ligature of the inferior vena cava is recommended by Thebaut and Ward (1947) in the case of patients who have suffered one or more small pulmonary emboli. These procedures seem fantastic judged by experience in this country but conditions elsewhere may be different: surely as Bauer (1947) has stated, heparin or dicoumarol should prove equally effective. Prolonged operations probably encourage thrombosis and embolism, thus limitation of operation time is very important.

(9) *Osteitis pubis.*—4 cases have been reported by Yates Bell (1947) and 2 by Riches (1946). The incision which I employ for prostatectomy involves splitting of the linea alba right down to the pubes and possibly on occasion this might cause a wound of the periosteum which is thus exposed to infection from septic urine contamination but even so osteitis pubis has never occurred in my practice and thus Riches' suggestion that the condition is probably caused by lymphatic spread from a low-grade pelvic cellulitis may be correct. The condition is obviously one of some rarity and is likely to disappear with the more general use of chemotherapy.

(10) *Œdema of the penis.*—This occurs in a few cases following both the Millin and Harris operations. It may be due to interference with the venous return by sutures or ligatures which occluded tributaries of the deep dorsal vein, but as a rule rapidly disappears and is of little significance.

(11) *Meteorism.*—The occurrence of this condition following prostatectomy seems to be not uncommon in the experience of some urologists. I have only seen it in minor degree and it has never caused much trouble. Its occurrence may be the result of inefficient pre-operative preparation and the type of anæsthesia employed. The transverse incision and gentle treatment of the small part of peritoneum exposed at operation are probably factors in lessening its incidence and severity.

Treatment

(*a*) *Pre-operative.*—As the average age of the patient coming to prostatectomy is about 67 years his tissues generally show signs of deterioration and thus he cannot be treated as one in the prime of life. Irrespective of age or fitness I consider that he should spend two or three days resting quietly in bed, becoming acquainted with nurses and sick-room hygiene. A good night's rest in the new and strange surroundings is assured by the administration of a mild sedative and the strychnine, as described, administered. Intravenous urography, blood urea estimation, &c., are performed during this time. Cystoscopy or other urethral instrumentation should have been carried out previously or, if not, should be left till the patient is on the operating table where it can be performed immediately prior to the commencement of the operation. The surgeon personally must examine the patient and decide which type of operation is indicated. On no account must this be left to a house surgeon.

(*b*) *Post-operative.*—Post-operative treatment has already been described and I would only add that on leaving hospital patients are required to report at six-weekly intervals as I do not regard cure to be complete until the urine is sterile and micturition normal; this may be a policy of perfection not always achieved but it is nevertheless desirable.

Carcinoma

So far I have dealt only with simple conditions of the prostate gland but unfortunately carcinoma of the gland is also a common cause of obstruction. Its incidence compared with simple enlargement is stated to be 1 : 5 but in my own experience it has been 1 : 6. Time does not permit a detailed consideration of this disease but I would like to make a few general observations.

I think it is our duty as teachers to impress upon students the importance of making a digital examination of the rectum in as many patients as possible so that they may learn to distinguish the normal from the abnormal prostate, an art only acquired by experience. To the expert, diagnosis of prostatic carcinoma by rectal palpation is usually not difficult but I have been impressed by the frequency with which an obvious carcinoma has been missed by experienced surgeons; the reverse is equally true, and many cases labelled carcinoma have been proved to be non-malignant. Inflammatory conditions or calculi are often responsible for this error. Disturbance of the acid serum phosphatase is too uncertain to make it of value as a diagnostic aid. In many of my cases this has been found to be within normal limits when the patient had an advanced carcinoma of the prostate with multiple bone metastases. Statistics regarding the incidence and treatment of cancer are of no value unless the diagnosis is confirmed histologically. When a cancerous condition of the prostate is diagnosed by rectal palpation I am of opinion that even total prostatectomy will generally fail to avert a fatal issue and this applies equally to the more heroic partial excision of bladder, seminal vesicles, and prostate. In considering treatment for these patients one must bear in mind Morson's finding as a result of his experience in a large Local Authority hospital where patients may remain for years. He states that when treatment consists of nothing more than efficient nursing care and suprapubic drainage the expectation of life after diagnosis has been made is about three to five years (Morson, 1936). To provide efficient nursing care is difficult but if it can be secured one should consider whether the result likely to be achieved by a long and dangerous operation is worth while or the risk justifiable. The administration of stilbœstrol often results in a shrinkage of the growth followed by natural micturition and thus operative procedures to relieve retention such as cystostomy or per-urethral resection may be delayed or avoided. It is my impression that the cases of carcinoma of the prostate likely to be cured are those in which the disease is buried within an adenomatous gland and in which the presence of the growth has been unsuspected and only proved at routine histological examination of the excised gland. It thus appears to me to be most unwise to perform the severe operation of total prostatectomy as a routine procedure on the chance that cancer might occur in that part of the prostate left after simple enucleation. Lowsley (1940) believes that total prostatectomy should be done more often than at present. He uses the perineal route and advises it in early cancer, chronic pyæmia, intractable chronic fibrosis, calculosis and certain cases of tuberculosis and adenoma of the prostate. In this country Anderson (1947) states that to those cognizant of perineal prostatectomy the operation is not difficult and the post-operative course is remarkably smooth but that there is a slight risk of incontinence. He has only done a very few cases and thus as yet is not in a position to form any conclusion as to its usefulness.

Anæsthesia

The part played by recent advances in anæsthetic methods in relation to prostatic surgery has resulted in a considerable lowering of operation mortality.

At present I prefer induction by intravenous pentothal sodium, the anæsthesia being maintained with cyclopropane and minimal quantities of ether. Lately relaxation has been increased by the coincident use of d-tubocurarine chloride with excellent results, ether being omitted. Maintenance of normal blood-pressure during operation is of importance in any major procedure, but especially is this so in operations designed to permit immediate bladder closure, as more than a trivial fall in blood-pressure may obscure bleeding points resulting in subsequent hæmorrhage and clot retention.

Some years ago most prostatectomies were performed under spinal anæsthesia with coincident risk of a sudden and often uncontrollable fall in blood-pressure. With this method bleeding points, as already indicated, are obscured just when they should be visible and could be controlled and, in addition, the patient often exhibits signs of shock. Wilson Hey prefers spinal anæsthesia but emphasizes that it should never reach as far as the umbilicus, upward extension being controlled when light anæsthesia reaches a point midway between the pubis and the umbilicus. He maintains that if the anæsthesia is so restricted the fall in blood-pressure is minimal, 30 mm.Hg being the maximum permissible. I have found that the maintenance of such a level of anæsthesia presents considerable difficulty and much prefer general anæsthesia as described.

The anæsthetist must have opportunity to study each patient before operation with a view to assessing his general condition, fitness for the proposed procedure, and such factors as may influence the choice of anæsthetic. Generally speaking anæsthesia requires to be maintained for approximately one hour during which time the pulse should remain regular and the blood-pressure show little or no variation. There should be few after-effects; vomiting or nausea occurs in only a small minority of cases and chest complications are almost unknown.

I have to acknowledge my indebtedness to Dr. J. A. W. McCluskie, Dr. W. B. Kyles and Dr. H. H. Pinkerton, physician, bacteriologist and anæsthetist respectively, for their co-operation and team work in the treatment of my cases of prostatic obstruction over a period of many years and to Mr. W. A. MacLennan and Mr. W. Laird Milne for their skilled surgical assistance and to Mr. A. I. L. Maitland for painstaking investigation of case records.

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[*November*, 27, 1947]

The following specimens were shown:

(1) **Carbuncle of Kidney;** (2) **Horseshoe Kidney (Right Half) with Pyonephrosis;** (3) **Renal Tuberculosis.**—Professor R. J. WILLAN.

Solitary Cyst of Kidney.—Mr. E. W. RICHES.

Metastatic Abscess of the Kidney.—Mr. GEORGE LARKS.

"Mixed" Kidney Shadows (Two Cases).—Mr. HAROLD DODD.

Renal Hypoplasia.—Mr. ALEX. E. ROCHE.

Calcification in Renal Tuberculosis (Three Cases).—Mr. J. H. CARVER.

Duplication of Ureter in a Child of Nine Months with Ectopic Pyo-ureter.—Mr. J. D. FERGUSSON.

Vesical Calculus.—Mr. H. WYNFORD JONES.

Paraphimosis of the Clitoris.—Professor R. J. WILLAN.

Large Adenomatous Prostate Removed Retropubically.—Mr. I. JACOBSON (for Mr. S. I. LEVY).