SOME COMMON COMPLICATIONS AFTER PROSTATECTOMY

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The scope of prostatectomy has steadily increased year by year, resulting in many bad-risk patients being subjected to operation. Methods specially needed in these cases have already been described (Cosbie Ross, 1936). There has always been a proportion of cases with post-operative complications, but the increasing average age of the patient and the number with intercurrent medical conditions have made it necessary to take special precautions to deal with them.

We thought, therefore, that it would be of interest to investigate and record the complications in 100 cases of prostatectomy. These patients were not selected in any way. Wilson Hey prostatectomy was carried out in 65 cases, retropubic prostatectomy in 3, and cold-punch resection (perurethral) in 32.

It is our custom to perform retropubic, Wilson Hey, and perurethral prostatectomy according to the size of the prostate and other indications (Cosbie Ross, 1954). As it happens, in this series the Wilson Hey method preponderates over the retropubic, but this is coincidental, and the corresponding figures for the year 1952 were: retropubic, 16; Wilson Hey, 12; cold punch, 25; suprapubic with drainage, 9. A similar pattern emerged in other years when the number of transvesical and retropubic operations was more approximate.

The point we wish to emphasize is that the type of operation apparently makes no essential difference to the incidence of complications which may follow in the train of any of the modern procedures.

With modern methods of anaesthesia the danger period of prostatectomy has shifted from the actual operation to the first few post-operative weeks, and it is to some of the difficulties arising during this stage that we wish to draw attention.

It is not intended to deal with immediate or reactionary haemorrhage, as at the present time bleeding does not constitute the serious menace of the past. The modern operations, including perurethral resection, appear to cope fairly successfully with haemorrhage. None of the patients developed osteitis pubis. The post-prostatectomy flap or valve is rarely encountered now that operation is carried out under direct vision and trigonectomy performed.

Table I shows the preponderance of the aged in the series. The main complications were: incontinence (temporary), post-meatal stricture, persistent pyuria, epididymitis, and a temporary suprapubic leak.

Temporary Incontinence

Temporary incontinence is rarely mentioned in the literature, but it causes much distress and anxiety to the patient if it has not been explained to him that it is transient. There was no case of permanent incontinence in this series.

We have been convinced for some time that the incidence of this complication increases with age and that those over 80 are especially prone to the condition. Post-operative incontinence is almost invariably temporary, but in one of our patients it persisted for three to four months before recovery of satisfactory control. It is not generally recognized that continence is a relative quality and that the intravesical pressure increases as the patient rises from the recumbent position to sit up in bed (Tinckler, 1955). A further increase of pressure can be recorded as the patient stands upright, and a final increase on abdominal straining, coughing, etc. Stress incontinence may therefore be classified into four stages or degrees: stage 1, incontinence only on coughing or straining; stage 2, incontinence on assuming upright posture; stage 3, incontinence on sitting up in bed; and stage 4, incontinence when recumbent.

The type of operation performed appeared to have little influence on the incidence of incontinence, which occurred in roughly the same proportion in each type, although possibly less often in punch prostatectomy.

A simple method of sphincterometry has been used in all our patients exhibiting any degree of incontinence a week after removal of the catheter.

Technique of Sphincterometry

Sphincterometry is a technique for measuring the resistance of the urethral passage. Although the term suggests a measurement of the sphincter mechanism only, it is in fact a function of the total resistance to the movement of fluid along the urethra, probably conditioned more by sphincter action than by any other factor. There are, of course, other factors, such as the elasticity of the structures around the prostatic urethra. It has been shown that complete incontinence does not necessarily follow a pudendal-nerve block (Caine and Edwards, 1958) or division of the external sphincter (Cosbie Ross, Gibbon, and Damanski, 1958).

The armamentarium required is as follows: (1) A St. Peter's type urethral catheter, size 10F. (2) A Cunningham penile clip. (3) A manometer, constructed by affixing a glass tube to a piece of wood on which a scale is calibrated in centimetres. (4) An infusion flask containing sterile saline, preferably dyed with a little methylene blue to enable the fluid level to be more easily seen. (5) A glass Y-connexion and rubber tubing, incorporating a drip chamber connecting the infusion flask, manometer, and urethral catheter to the Y-piece.

It is a convenience to have the rubber tubing, glass connexion, and urethral catheter (together with a couple of towels and some gauze swabs) wrapped up in a large towel and autoclaved so as to be ready for use as required.

The patient empties his bladder immediately before carrying out the test. As some hospital beds sag in the middle it is useful to raise the patient's pelvis by placing a pillow underneath his buttocks. A drip stand is fastened to the foot of the bed and the manometer hung therefrom, the height of the manometer being adjusted

TABLE I.—Age Distribution

Age in years No. of cases	50-55	56-60	61-65	66-70	71-75	76-80	81-85	86-90
	5	8	18	21	22	19	5	2

so that the zero mark is level with the patient's symphysis pubis. With aseptic precautions the catheter is inserted into the anterior urethra until the resistance of the external sphincter is felt, and then withdrawn slightly. To prevent reflux around the catheter a Cunningham penile clip is applied to hold it snugly in the urethra. Finally, the tubing is connected up, ensuring that bubbles of air are displaced by thoroughly flushing the system with sterile water.

The object of the test is to determine the minimum hydrostatic pressure at which fluid will flow *freely* through the urethra into the bladder, and the reading is taken to be an index of the total resistance of the passage. It is ascertained by elevating the infusion flask and allowing saline to run into the bladder.

To begin with, the reservoir is held just above the level of the symphysis, then slowly raised, and the behaviour of the fluid passing through the drip chamber is observed. At first there is a steady drip until a level is reached at which fluid suddenly starts to flow in an unbroken stream. This indicates that all resistance has been overcome by the hydrostatic pressure, which is recorded as the height of the column of fluid in the manometer. By carrying out this procedure under x-ray screening, using 12% sodium iodide, the opening-up of the posterior urethra can be seen when the flow changes from a drip-rate to a steady stream.

Results obtained from this test on normal and on incontinent subjects are summarized in Fig. 1. Not unexpectedly the latter show less sphincteric tone than

FIG. 1.—Results from sphincterometry.

the former, although readings are somewhat variable. The minimal level of sphincter resistance which will ensure continence is approximately 80 cm. of water.

We have attempted to classify our patients with any degree of post-operative incontinence in the various age groups (Fig. 2); it was found that the older the patient the longer the incontinence appeared to linger (Table II).

TABLE II.—Duration of Incontinence and Age of Patient

Incontinence in Post-operative Days	Age of Individual Patients	Average Age
0-7	65, 73, 73, 57, 72, 76	69
8-14	70, 77, 74, 85, 59	73
15-21	78, 87, 70, 77, 79, 74, 80, 83	78
21+	84, 73, 69, 88, 72	78

All in all, incontinence is a troublesome complication which, in all probability, clears up in the course of weeks.

We have found perineal faradism and ephedrine helpful and sometimes use a Cunningham clip. In old and feeble patients it has been necessary to use Paul's tubing fixed to the penis with sleek strapping for the

FIG. 2.—Incontinence as a proportion of cases by age group.

first few days after removal of the catheter, and we can recommend the efficacy of this simple and easily applied device.

Post-meatal Stricture

Johnston (1953) pointed out that a stricture in this situation, approximately $\frac{1}{4}$ in. (1.3 cm.) from the external urinary meatus, was by no means rare, and occurred in 20% of patients irrespective of the type of prostatectomy. In the series of patients investigated by Johnston a red rubber Harris catheter was used during the post-operative period, whereas in the present series a latex two-way catheter was inserted in almost every instance. There was a marked drop of incidence of this complication, and it seems reasonable to attribute the improvement to the latex catheter, as otherwise the operative and post-operative conditions were identical. In the 100 patients under review post-meatal strictures were found in only two. It would seem that this particular complication has been largely eliminated by avoiding the use of red rubber catheters. Other factors, such as the size of the resectoscope or the catheter, the duration of post-operative catheterization, and the lumen of the urethra, although important, do not seem as crucial as the actual constitution of the catheter itself. At the same time it is important to exclude such a development, as the condition appears to respond well to early dilatation and may not tend to recur. It is our practice to pass a No. 20F catheter 10 days after operation, not only to collect a sterile specimen of urine for culture and sensitivity studies but also to exclude a stricture.

Persistent Pyuria

Pyuria constitutes one of the most perplexing and formidable complications after prostatectomy and also implies a criticism of present methods, as the number of patients with infected urine rises sharply during the immediate post-operative period (Miller *et al.*, 1958). In the present series 33 had urinary infection before prostatectomy. During the first four weeks after

operation no fewer than 83 were found to be infected in spite of the fact that it is our practice to set up the closed-drainage system in the theatre before the patient returns to the ward. Additional precautions include the enclosure of the penis and extremity of the catheter in a sterile chamber formed by a roll of "cellophane" secured above and below by sleek strapping. The catheter is usually removed on the fourth post-operative day.

The routine administration of antibiotics immediately after the operation does not seem to influence the tendency to infection. In the earlier period of our investigation it was customary to give 500,000 units of penicillin twice a day and 1 g. of streptomycin once a day by the intramuscular route. The discontinuance of this regime was not followed by any perceptible increase of infection. We discarded this procedure partly because of the reports of patients developing fatal colitis under such a regime (Webster, 1958), and partly from the experience of colleagues, who appeared unanimous in considering that the umbrella method was of little value (M. Boyd, 1957, personal communication). It is difficult to explain this frequent development of post-operative infection. It has, however, been shown that in the paraplegic bladder it is difficult to render the urine sterile by means of antibiotics for more than a brief period if there is any dilatation of the ureter or hydronephrosis (Cosbie Ross, Gibbon, and Damanski, 1957). All of our patients had a pre-operative intravenous pyelogram, and many showed evidence of hydronephrosis and hydroureter. We have therefore attempted to correlate the incidence of post-operative infection with back-pressure on the upper urinary tract. This is shown in Table III. The figures suggest that

TABLE III.—Pre-operative I.V.P. Findings and Persistent Pyuria

Pre-operative I.V.P.	No.	No. with Sterile Urine within 6 Months
Normal	68	14 (20%)
Showing definite dilatation of urinary tract	25	3 (12%)

if the patient had a normal intravenous pyelogram before operation he is twice as likely to achieve a sterile urine six months after prostatectomy as a patient with pre-operative evidence of back-pressure on the upper urinary tract. It is obvious that this is not the only factor, but it might well be of considerable importance.

A brief study of the bacteriology was not without interest, and the following points seemed to us the most

important: (1) Infection reached its peak within four weeks of the operation and then progressively diminished with each month. At the end of six months 50% of patients had sterile urine (Fig. 3). (2) *Escherichia coli* and *Proteus vulgaris* (in this order) preponderated both before and after operation. Other organisms were found less frequently, and appeared to be of much less importance (see Table IV). It should be noted that proteus infection appears to rise sharply after prostatectomy.

TABLE IV.—Urinary Infection

Pre-operative urine		33 infected cases
<i>E. coli</i>		16
<i>Proteus</i>		7
<i>Bact. aerogenes</i>		4
<i>P. pyocyanea</i>		4
<i>Staph. pyogenes</i>		2
Post-operative 0-4 weeks		83 cases
<i>E. coli</i>		40
<i>Proteus</i>		36
<i>Bact. aerogenes</i>		3
<i>Ps. pyocyanea</i>		3
<i>Staph. pyogenes</i>		—
No pus or organism		1 (1.2%)
Post-operative 6-12 months		20 cases
<i>E. coli</i>		6
<i>Proteus</i>		—
<i>Bact. aerogenes</i>		3
<i>Ps. pyocyanea</i>		—
<i>Staph. pyogenes</i>		1
No pus or organism		10 (50%)

These figures of post-operative infection follow closely the experience of other writers, notably Caine (1953), who found that the majority of the patients after prostatectomy showed evidence of infection, the infection generally clearing up within two to four months of the operation. The surprising feature is that the post-operative infection does not seem to have diminished in spite of the fact that various factors to which it has been attributed have largely been eliminated in the present series. For example: (1) So far as possible, the passage of a catheter before operation has been avoided. (2) Preliminary suprapubic drainage was carried out on only 11 occasions, this being necessary owing to coronary thrombosis, hemiplegia, and other serious acute medical conditions. (3) The routine preliminary intravenous pyelogram and the cystoscopy carried out immediately before operation have made it unlikely that a diverticulum has been overlooked. It has been our practice to remove a large diverticulum when performing the prostatectomy. (4) It has been suggested that the lower end of the ureter might be damaged in performing the trigonectomy. In order to avoid this possibility we have located the ureteric orifices with a probe as a routine measure before resecting the "posterior wedge." (5) A catheter is passed on the tenth post-operative day in order to exclude stricture formation.

Our view is that, in addition to the back-pressure on the upper urinary tract, post-operative infection is often due to the fact that there is inevitably a large granulation-lined cavity, which requires several weeks to epithelize. It is during these first four weeks, while epithelization is taking place, that infection reaches its peak.

Epididymitis

Vasostomy waxes and wanes in popularity, but it is an undoubted fact that the incidence of epididymitis is greatly reduced by the small operation. Caine (1954) reports an incidence of 25% when the vasostomy is omitted, compared with 7% when the operation is performed. It has been our practice to carry out vasostomy in all cases except in punch prostatectomy, the incidence in the present series being 7%. We do

FIG. 3.—Prostatectomy and urinary sepsis.

not consider that vasostomy can be dispensed with until such time as post-operative infection has been eliminated. Incidentally, we agree with Caine's view that the administration of antibiotics after operation has no prophylactic value whatsoever. (Epididymitis occurred in equal numbers in the antibiotic and non-antibiotic group.)

We have also attempted to evaluate two methods of performing vasostomy: division and ligation *vis-à-vis* the application of diathermy forceps to the vas. The diathermy method was used as a routine on the left vas, whereas the right was divided and ligated. It was concluded that there was little to choose between the two procedures, but that, on balance, the division and ligation method appeared to be the more satisfactory.

Temporary Suprapubic Leak

In the present series there was no case of incisional hernia, a fact we attribute to the routine use of a transverse suprapubic incision. In fact, since adopting this incision several years ago only one incisional hernia has been seen, and we do not think that it is justifiable to perform prostatectomy through a vertical midline incision in aged and debilitated patients. On the other hand, in 27% a suprapubic leak developed. The leak was of a temporary character and healed after a few days' catheter drainage. Only in one patient was it found necessary to excise and resuture the wound. Urinary leaks occurred especially in aged and feeble patients who had concomitant medical diseases, such as coronary or cerebral thrombosis, or who presented with the troublesome combination of chronic uraemia and secondary anaemia.

In an attempt to prevent this complication it is our practice to suture the bladder wall with three rows of continuous suture in the Wilson Hey operation, and to suture the prostatic capsule with two rows of sutures in the retropubic operation, using an eyeless needle on No. 1 twenty-day catgut.

Conclusions

The increasing number of aged and feeble patients submitted to prostatectomy inevitably produces a group of post-operative complications which require special investigations and special treatment.

In an attempt to evaluate these complications a study has been carried out in a series of 100 patients subjected to prostatectomy.

A temporary incontinence was noted in approximately a quarter of the present series. A simple method of "sphincterometry" was used in the assessment of this incontinence.

Post-meatal stricture appears to have been largely eliminated by discarding the red rubber catheter. With the use of a latex catheter only 2% developed a urethral stricture.

Post-operative infection continues to be the most obstinate problem, *E. coli* and *Pr. vulgaris* preponderating. It is suggested that back-pressure and hydronephrosis before operation are factors in encouraging infection. It is also pointed out that the peak period of infection occurs during the first four weeks, during which the prostatic cavity is in the process of epithelizing.

The incidence of epididymitis with vasostomy was 7% in this series.

A temporary suprapubic leak occurs in a proportion of patients, and is probably due to a lack of healing ability in elderly and debilitated patients.

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TOILET TRAINING AND ENURESIS

BY

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It has often been claimed that a major factor in the production of enuresis is the method of toilet training. Some workers—for example, Anderson (1930), Stockwell and Smith (1940), and Bakwin (1949)—found that most enuretics had received insufficient training, but others followed Huschka (1943), who incriminated coercive methods, including early training. Bostock and Shackleton (1951, 1952) supported Huschka at first, but in 1956 they claimed that early training alone was fundamental when they discovered that some enuretics had received gentle training.

Controls using normal children had been rarely studied in sufficient numbers to establish a pattern with which enuretics could be compared. In the U.S.A., for example, Despert (1944) could compare 60 normal children with 14 bedwetters, but found early training rare in both groups. In two larger series, Davis and Havighurst (1946) found that bowel training began in the lower classes below the age of 6 months in 23% of cases, and Klatskin (1952) reported that it began under the age of 1 year in 66%. The largest survey in this country revealed a marked difference. Douglas and Blomfield (1958) found that 60% of 3,990 children, in all social groups, born in 1946 began to be "potted" within the first two weeks of life but that enuresis occurred more often with those who began later.

Sufficient conflict of opinion exists both as regards the ages at which toilet training begins and as regards its relationship to enuresis to justify reassessment and at the same time to present additional data. It was felt to be particularly misleading to study the enuretic outside the context of the family unit with respect to toilet training, since a comparison with the dry siblings was thought essential.

Method and Scope of Investigation

Children were defined as enuretic who were still wet at night at the age of 4 years in the absence of any discoverable organic cause.

Their mothers were closely questioned personally regarding the age at which toilet training was begun, whether it was carried out strictly or not, whether it was resisted or resented, and the ages at which bladder and bowel control were achieved, if at all. The position of the child in the family was noted, and the same questions