FIFTH EDITION

Transurethral Resection

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Preface

Thirty-three years ago, when the first edition of this book was written, throughout Europe nearly all prostates were operated on by one of the open methods. Transurethral resection was rarely performed, regarded with suspicion and carried a considerable morbidity. Since those days everything has changed, and there have been many improvements and refinements in the operation and the investigation and preparation of the patient, while a whole new range of alternative methods of management have been introduced. The senior authors welcome the fresh input of their younger colleague John Reynard, who has already made his reputation at the growing edge of urology. One thing has not changed: transurethral resection is difficult to learn and to teach, and this book is aimed at the newcomers to urology who wish to learn how to do it safely.

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Chapter 1
History

The ancients, who thought that the bladder was divided by a horizontal septum, knew little about obstruction at its outflow, though Galen must have divided the prostate and bladder neck regularly when performing lateral lithotomy[1]. Oribasius of Pergamum, writing his synopsis at the command of the Emperor Julian in the fourth century AD, proposed to cut through the prostate by a perineal incision in cases of retention of urine where it was impossible to pass a catheter, considering that the risk of fistula after this operation was preferable to death from unrelieved retention. Ambroise Paré seems to have been aware of the entity of bladder neck obstruction, and devised catheters with a sharp cutting cup at the tip with which pieces of the bladder neck could be torn away (Fig. 1.1). Morgagni, Valsalva and Bartholin all wrote on the subject[1–3], but it was John Hunter who demonstrated, in a series of specimens, the progressive effects and complications of prostatic obstruction. One of these was a classic example of obstruction by enlargement of the middle lobe[4] which his brother-in-law Everard Home subsequently published and claimed as his own original observation—plagiary soon denounced by his contemporaries[5] (Fig. 1.2).

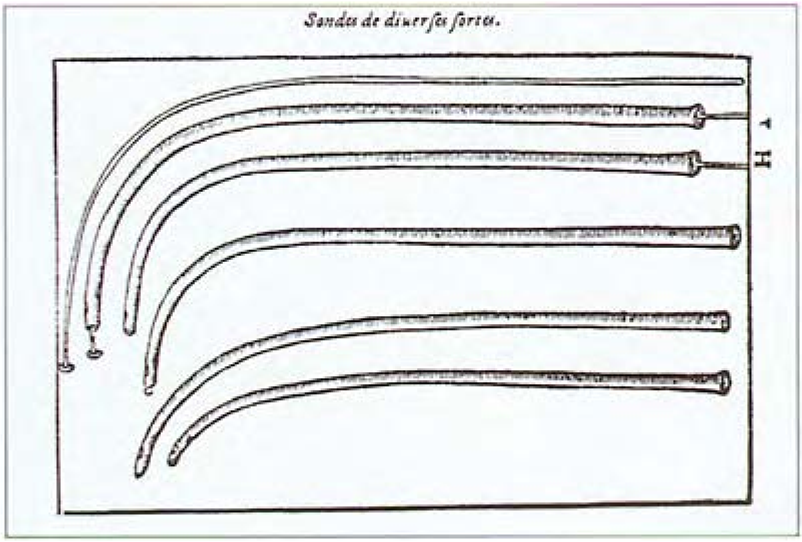

Figure 1.1 *Catheters armed with cups for removing 'carnosities' from the*

urethra and possibly also the bladder neck. Ambroise Paré 1510–1590.

Figure 1.2 *John Hunter's specimen showing a large middle lobe. Courtesy of the Trustees of the Hunterian Museum, the Royal College of Surgeons of England.*

As for treatment, there was only the catheter and men were admitted to hospital to be 'schooled' in how to pass it. Even at the end of the nineteenth century the mortality of catheterization was still as high as 20% in the first 6 months[6].

Probably the first surgeon to attempt an open division of the bladder neck was Sir William Blizard in about 1806 (Fig. 1.3) who described a patient in the London Hospital who lay with an indwelling catheter and subsequently died with an abscess in each lateral lobe of the prostate[5]. Blizard reflected that:

> This person might have been successfully treated by dividing the prostate with a double gorget cutting on both sides introduced in the usual way on a staff into the bladder. It would have relieved the immediate distress, and might have laid the foundation for a cure. This is not a speculative remark. I have several times performed such an operation in cases of disease of the

> prostate gland which I have thought within its scope of relief, with complete success.

Of Blizard’s contemporaries, Guthrie (Fig. 1.4) at the Westminster Hospital, with an international reputation for the conservative treatment of limb wounds before and after Waterloo, noted the role of the bladder neck in outflow obstruction:

> No greater error has been committed in surgery than that which supposes the third lobe, as it is called, of the prostate to be the common cause of those difficulties in making water which occur so frequently in elderly people and sometimes in young ones. I do not deny that a portion of the prostate does enlarge and project into the bladder, preventing the flow of urine from it; but I mean to affirm that this evil takes place more frequently, and is more

Figure 1.3 *Sir William Blizard. Courtesy of the President and Council of the Royal College of Surgeons of England.*

Figure 1.4 *Sir George James Guthrie. Courtesy of the President and Council of the Royal College of Surgeons of England.*

> effectually caused by, disease of the neck of the bladder, totally unconnected with the prostate, than by disease of that part[5].

Understanding the nature of the 'bar at the neck of the bladder', Guthrie devised a means of dividing it which would be less traumatic than Blizard's perineal incision. He ordered a sound to be made for him with a concealed knife which could be projected to cut through the 'bar, dam or stricture' without injuring the adjacent parts (Fig. 1.5). It is often said that Guthrie had in mind the kind of bladder neck stenosis which may occur

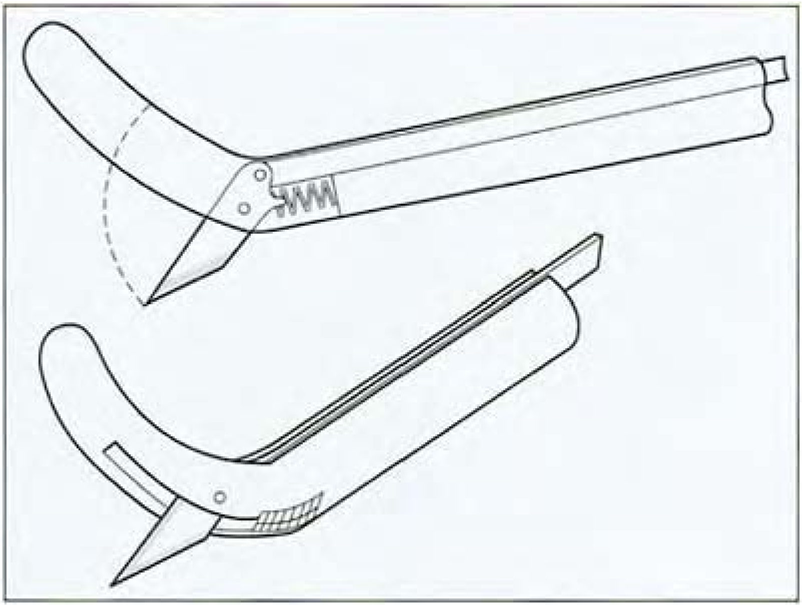

Figure 1.5 *Guthrie's concealed knife, based on his description.*

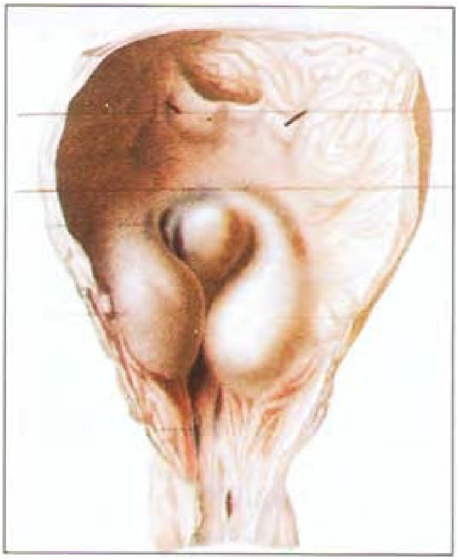

Figure 1.6 *Guthrie's prostate specimen, supplied to him by Goldwyer Andrews of the London Hospital.*

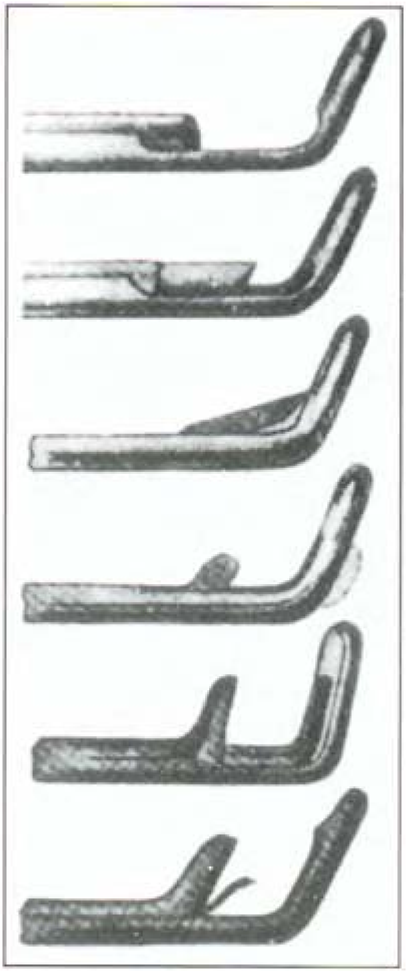

Figure 1.7 *Concealed knives devised by Civiale and Mercier.*

without enlargement of the prostate, but in his illustration (Fig. 1.6) of a specimen lent to him by Goldwyer Andrews, Blizard's colleague and successor at the London Hospital, it is clear that he was thinking of typical middle lobe enlargement, and the concealed knife was intended to cut the ring of bladder muscle that imprisons and traps the adenoma.

Concealed knives similar to that of Guthrie were later devised by Civiale and Mercier[7] (Fig 1.7). Mercier claimed to have done 300 successful operations—a figure doubted by Guyon[8]. Years later, when Hugh Hampton Young devised his punch, he generously gave credit and priority to Mercier[9].

Inevitably any kind of incision or cold punch resection was more or less blind and bloody: to overcome these defects surgery had to wait for the application of electrical engineering to urology. The first step was taken by Bottini[10], who devised an instrument like a lithotrite whose male blade was heated by direct current to burn a channel through the neck of the bladder (Fig. 1.8). There was no bleeding until the slough came away, but it was still blind, and it was difficult to know exactly which tissues were being burnt. Bottini claimed to have done 57 cases with two deaths and 12 failures[10].

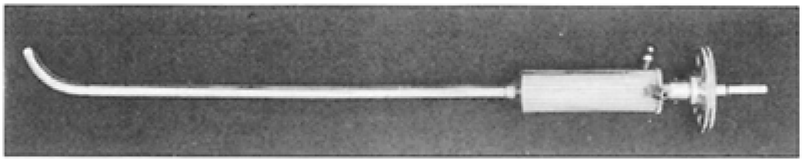

Figure 1.8 *Bottini's instrument for heating the prostate. Courtesy of the Institute of Urology.*

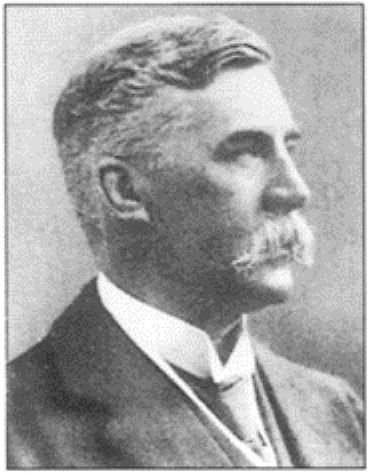

Figure 1.9 *Edwin Hurry Fenwick.*

Bottini's work was taken up by his contemporaries. Fenwick (Fig. 1.9), Chetwood and Wishard all attempted to improve Bottini's instrument, but the results were unimpressive[11–13]. 'No permanent good ever came of it', wrote Reginald Harrison of St Peter's Hospital[14], who preferred to open the bladder or perform urethrotomy so as to be able to dilate the internal meatus with his finger. If the patient was unfit for either of these procedures, then he was to be given a permanent suprapubic tube of the improved pattern then being introduced by Buckston Browne[14].

At the end of the nineteenth century the standard treatment at St Peter's Hospital was still 'catheter schooling', supplemented by vasectomy (since this was believed to lead to testicular atrophy, and in turn to shrinkage of the prostate[6]). Looking back on these years, Frank Kidd[15] noted that up to 8% of men treated in this way would be dead of uraemia or infection within a month.

It was in this climate that enucleative prostatectomy by the suprapubic or perineal route was introduced[7]. First recorded at St Bartholomew's Hospital in 1884[16] it was independently developed by Goodfellow in Tombstone, Arizona (1885)[17], McGill in Leeds (1887)[18], Mansell-Moullin at the London Hospital (1892)[19], Fuller in New York (1895)[20] and Freyer at St Peter's (1900)[21] (Fig. 1.10). Thanks very largely to Freyer's enthusiasm and energy the transvesical or Freyer operation

Figure 1.10 *Sir Peter Freyer.*

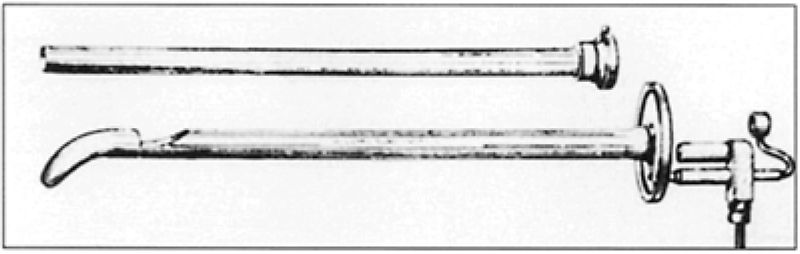

Figure 1.11 *Hugh Hampton Young's punch.*

soon overtook all other forms of treatment, but even the pioneers in the field were concerned that the amount of tissue removed ‘is often so small that it seems ridiculous to have to perform suprapubic operation for its removal’[22].

It was this concern which led Hugh Hampton Young, one of the pioneers of perineal prostatectomy, to look again at Mercier’s concept of using a sharp tubular knife, like a cork-borer (Fig. 1.11). ‘I called my instrument a prostatic excisor and the operation excision. The internes promptly dubbed the instrument ‘the punch’[22]. The first punch was very simple and without any means of haemostasis: this was only possible thanks to the development of diathermy[23].

Soon after the discovery that very high-frequency alternating current did not excite nerve or muscle, the heating effect at the site of contact would be used to cauterize warts on the skin, and by 1910 Beer was using the same current through a cystoscope to cauterize ‘warts’ in the bladder[24]. The electric cystoscope, pioneered in Germany by Nitze, and introduced to the UK by Fenwick, was now in general use, although it had taken Fenwick a decade to overcome the early prejudice against it. Fenwick was once laughed off the rostrum at the Medical Society of London for suggesting that the electric cystoscope was anything more than a gimmick, since every proper surgeon knew that the right way to explore the bladder was with a finger introduced via the perineum[25].

With the early operating cystoscopes and the early spark-gap diathermy machines one could produce a controlled Bottini burn at the neck of the bladder, although it took a series of sittings before a sufficiently large channel could be burned away. This method was developed in New York by Stevens[26] and Bugbee[27], and in France by Luys[7,28] (Fig. 1.12).

Young’s approach was far more bold: he tried to cut away the tissue, and then stop the bleeding with the diathermy (Fig. 1.13). This combination of the cold punch with diathermy haemostasis was rapidly developed by Young, Braasch, Bumpus and Caulk[29] until by 1930 Caulk reported that he could resect 85% of his cases with the punch, and had only one death in 510 cases[30]. The ‘cold punch’ had arrived. It did, however, have a major

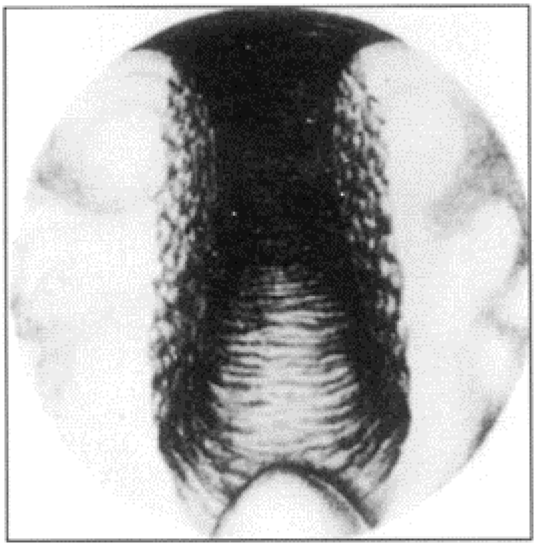

Figure 1.12 *'Forage' of the prostate. From Luys (1935)*[28].

Figure 1.13 *Gershom Thomson's combination diathermy and punch. Courtesy of the Institute of Urology.*

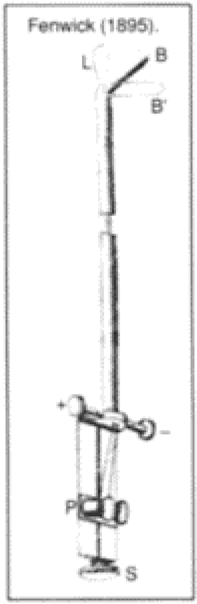

Figure 1.14 *Fenwick's 'galvanic écraseur'.*

drawback: the surgeon's view was obscured just as the tissue was being cut off, and this made it difficult and even dangerous to use.

A different principle was being developed at the same time, using a hot wire to cut through the tissue. As early as 1895 Fenwick[11] had designed a 'galvanic écraseur' with a wire snare, heated white hot, to cut through the projecting parts of the middle lobe (Fig. 1.14). In practice it is difficult to cut through the prostate with a hot wire: it drags, sticks and carbonizes. Loop resection was not a practical possibility until 1926 when Maximilian Stern[31] tried out the new powerful radio-frequency valve diathermy machine invented by Wappler. Stern described how this more powerful current would create 'a luminous ring or halo which causes eruption of cells in its path as the loop is advanced, leaving no

Figure 1.15 *The Stern-McCarthy resectoscope. Courtesy of the Institute of Urology.*

carbonized tissue either on the loop or the cut surface of the gutter it leaves in the tissues'[31]. It may not have carbonized the tissue, but neither did it stop the bleeding. For a time urologists would use two machines: Wappler's new valve 'endotherm' for cutting, and the old-fashioned spark-gap diathermy for haemostasis. Eventually, enterprising manufacturers supplied both circuits in one box with variable current outputs that allowed the surgeon to cut or coagulate as necessary.

To Stern's diathermy system was soon added the 'foroblique' telescope devised by McCarthy, and the combination became the Stern-McCarthy resectoscope, a sturdy and reliable instrument, which is the prototype of all the present-day instruments (Fig. 1.15).

By 1930 hot-wire or cold-punch instruments were available to any surgeon who would take the trouble to learn how to use them. At first the aim was limited, to cut a groove through the middle lobe, or to excise small glands and little fibrous bladder necks where there were only 5 or 10 g of tissue to be taken away.

It was in the Middle West that transurethral surgery really grew up. By 1936 Thomson and Buchtel of the Mayo Clinic[32] reported 200 cases from whom they had removed more than 20 g of tissue. Five years later in Minneapolis Creevy did not consider a prostate 'large' unless he had removed more than 30 g[33] and it was not long before the concept of transurethral resection had been entirely changed. No longer was it the intention to perform a kind of forage of the gland, but to remove the adenoma right down to the capsule in a way that was no less complete and no less thorough than that of the surgeon's finger at transvesical prostatectomy.

Detailed accounts of how to perform a complete transurethral prostatectomy were published in 1943 by Reed Nesbit of Ann Arbor[34] and Roger Barnes[35] of Los Angeles, but by now the Second World War was raging and at least in Europe there were other matters to occupy the attention of surgeons, and there was a hiatus in the development of transurethral surgery.

Between the two World Wars, transurethral resection using the cold punch had been taken up with enthusiasm by Wardill in Newcastle who, like Lane in Dublin, had been to the Mayo clinic to see for himself[36]. Hot-wire resection had been taken up by Canny

Ryall and Terence Millin at All Saints[37,38], Kenneth Walker[39] at St Paul's and Ogier Ward at St Peter's but their efforts were hampered by the unreliability of their diathermy equipment. As Millin was later to confide, 'My personal experiences with TUR commenced in 1930 and by 1949 I had carried out some 2000 TURs. By 1940 my percentage was 80% approximately but with the introduction of safer open prostatectomy the percentage declined to less than 10% in the years before I retired'[40].

One critical factor was that the more powerful diathermy machines were commandeered from hospitals to be used to block enemy radar[41] and even 10 years later few hospitals were equipped with diathermy that would cut under water. The other factor was that, after the Second World War, the returning surgeons were greeted with the news that Millin himself, protagonist of transurethral resection, had almost given it up in favour of the retropubic operation. The new operation was simple, easy to teach, and easy to learn: coupled with the introduction of aseptic measures and the sulphonamides, open prostatectomy became much safer[42]. The fact that it was still nothing like as safe as transurethral resection was ignored[6]. Even as late as 1960, Salvaris[43] pointed out that in 1200 open operations at St Peter's Hospital the mean weight of prostate was only 42 g. His article was turned down by British journals, and eventually only found its way into print in Australia.

With the exception perhaps of those who were fortunate enough to work in Dublin with Lane[36], any young surgeon who wished to learn transurethral resection had to go to North America. There we encountered a whole new world of astonishing urological expertise. Resection of a 50 g prostate was routine: the bleeding was stopped completely, and patients went home within a few days: what a difference from the grisly procedure with which we were familiar back home. On our return Geoffrey Chisholm, Joe Smith and other converts began to practise and preach what we had learned[36]. But change was slow: there was still a shortage of effective diathermy equipment, the telescopes were dim and the lighting unreliable. The operation continued to be very difficult to teach.

Figure 1.16 *Harold Hopkins.*

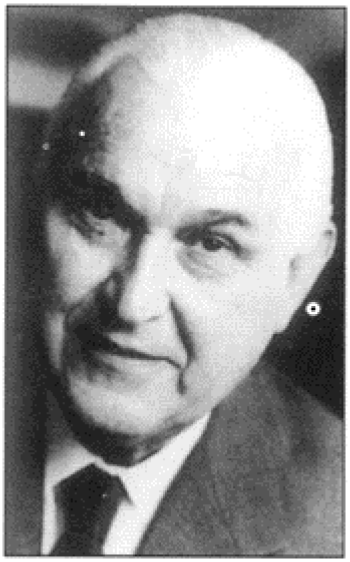

Figure 1.17 *Karl Storz.*

Then came the three inventions of the late Harold Hopkins (Fig. 1.16) which were to change transurethral resection completely. The first was the rod-lens telescope, which owed its development to the imagination and enterprise of Karl Storz (Fig. 1.17). The second was the flexible glass fibre light cable, which provided limitless, unfailing illumination. The third was the coordinated flexible glass cable which made it possible for a pupil to watch the operation.

Thanks to these improvements and to the increasing confidence in transurethral surgery, another equally important development in urology crept in: transurethral resection of bladder tumours. From the early 1930s small papillary tumours were coagulated with cystoscopic electrodes but when they were too large to be 'fulgurated' it was necessary to open the bladder and remove them with a diathermy snare after which the base was sown with radon seeds or tantalum wire[44]. Today these operations have been completely given up.

These changes have come about entirely due to the advances made in urological instruments. When today we sit down to resect a bladder tumour or a prostate we should remember with gratitude those 'grand originals' who struggled so hard to make it possible[45].

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Chapter 2
The instruments

When a government purchases a modern missile, it speaks in terms of a ‘weapons system’, implying not only the rockets but all the complex electronic guidance systems and maintenance arrangements that go with them. So, also, with a resectoscope it is wise to think of the entire weapons system: the light source, the diathermy equipment, and the closed circuit television system.

The resectoscope

Several different instrument systems are available today and the trainee should take the trouble to use as many different resectoscopes as possible. When purchasing one, especially when it comes to equipping a department, it is even more necessary to think in terms of a ‘weapons system’. Bear certain points in mind: all these instruments are very expensive, and all resectoscopes can be made to do good work in the hands of an expert. It is humiliating to recall that 50 years ago the master resectionists of the Middle West were removing 100 g an hour with a filament-lit Stern-McCarthy. An expensive tennis racket does not guarantee victory at Wimbledon. If you do have to use an unfamiliar resectoscope it is no more difficult than adjusting to a new car: you do not have to learn to drive all over again.

Interchangeable equipment

The diagnostic flexible cystoscopy, of course, stands by itself, but the indications for using a rigid cystoscope nearly always imply that something else will be done. You may need to catheterize a ureter, biopsy a suspicious lesion, resect a tumour, incise a bladder neck, incise a urethral stricture or crush a stone. You must be able to go ahead and do any of these things without having first to fiddle with different light leads and water connections. The first requirement then is for a complete kit of interchangeable instruments.

Service

The instrument system you finally choose will depend on several factors. First will be the amount of money you or your hospital can afford: but no less important should be the question of after-sales service. You must be able to get rapid and efficient service from a manufacturer’s agent who has a representative in your own city, who visits your hospital regularly, knows you and your operating theatre team, and has won a reputation for promptness and reliability. It is no good buying a Rolls-Royce if their nearest agent is in Ruritania.

Spares

Make sure you have an adequate number of spare parts. It is reckless to embark on a resection and be held up because the lamp in the light source has blown and there is no spare; because water has got into the telescope and you can no longer see; because the last loop has broken, the end of the resectoscope sheath has become dangerously worn, or the diathermy machine has broken down. There must always be an adequate number of spares of the things that often go wrong, e.g. light leads, lamps, resectoscope loops and sheaths. Your hospital should always have several spare telescopes and at least one spare diathermy machine.

Telescopes

The story of the invention of the rod-lens telescope by the late Professor Harold Hopkins (Fig. 2.1), and of its development by Karl Storz, is now well known and has been told elsewhere[1]. What is not so well known is the reason why so many resectionists use a 30° rather than a forward-looking or 0° telescope (Fig. 2.2). Sixty years ago, because there was a tiny lamp at the end of the telescope, it was necessary to have a slightly angled line of vision: it was a matter of necessity, not choice. However, it did make it slightly more easy to see the floor of the trough from which a chip of prostate had been taken. Newcomers to the art of transurethral resection will find it easier to use a 0° telescope from the beginning.

Sheaths

The early sheaths were made of bakelite, later of fibreglass and similar plastics which were apt to crack and split. Today sheaths are always made of steel, with an insulated tip made of plastic or ceramic (Fig. 2.3).

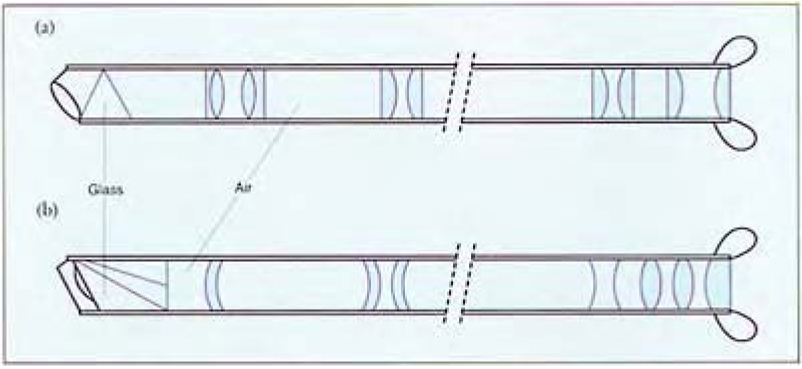

Figure 2.1 *(a) Conventional telescope. (b) Hopkins' rod lens telescope.*

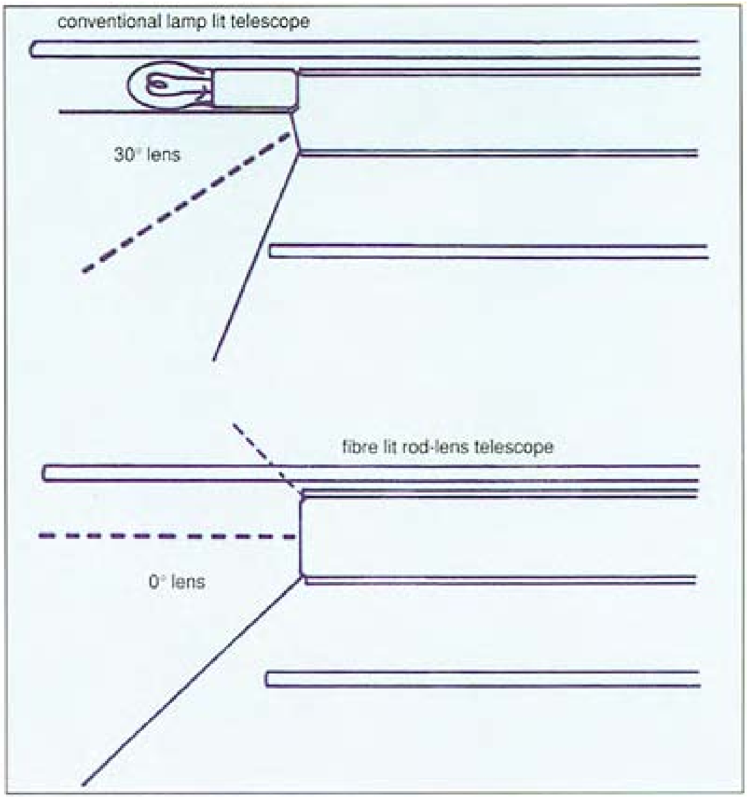

Figure 2.2 *The filament lamp at the end of the telescope necessitated the use of a 30° telescope.*

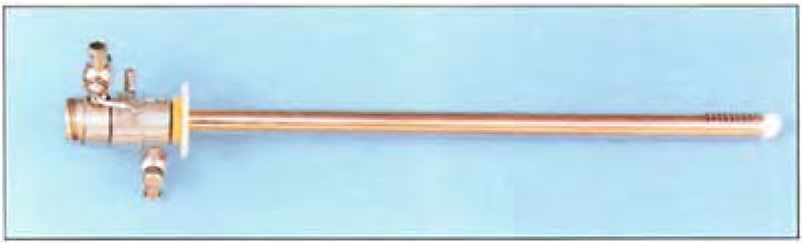

Figure 2.3 *Steel sheath with ceramic tip.*

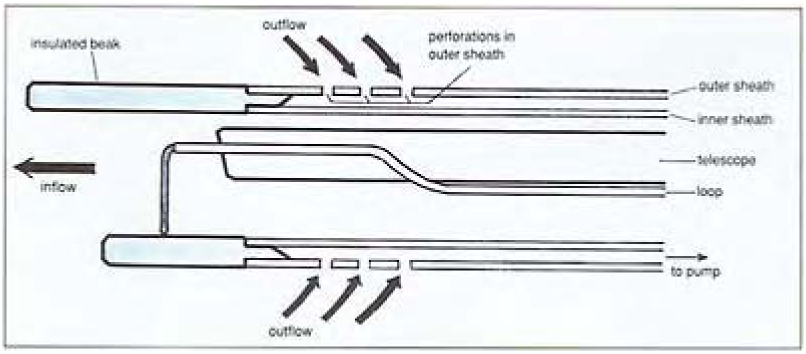

Figure 2.4 *Iglesias's continuous irrigation.*

Iglesias devised a continuous flow resectoscope[2] which allowed the irrigating fluid to be continually circulated in and out of the bladder to avoid build-up of pressure inside it, and to keep the field clear at all times (Fig. 2.4). A continuous flow resectoscope is particularly useful when resecting larger bladder tumours and to keep the field clear when demonstrating an operation.

From time to time one comes across a patient with a particularly long urethra, such that a normal length resectoscope will only just reach inside the bladder or prostate. In this situation having a long resecto scope (Fig. 2.5) in your armamentarium can be very useful.

Lighting

Modern flexible fibre-lighting is the result of another of Hopkins' inventions. Each glass fibre is coated with glass of a different refractive index, so that light entering at one end is totally internally reflected and emerges at the other. Repeated use of the cable results in fracture of the small glass fibres and gradually the cable transmits less light. Clumsy

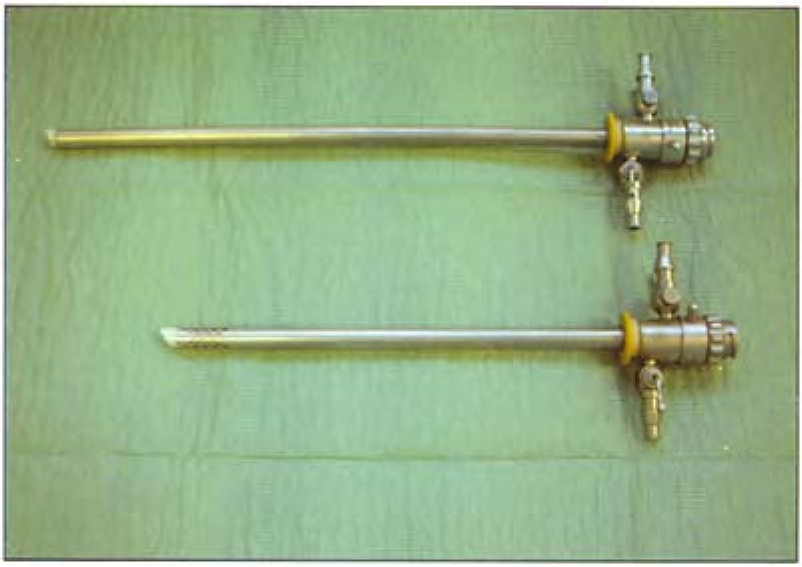

Figure 2.5 *An extended length resectoscope adjacent to a normal length resectoscope.*

handling accelerates this process of wear and tear, but in time every cable must be replaced and there must always be spares.

Where the light lead is plugged into the source it becomes very hot and must be insulated to prevent staff handling the cable from getting burnt (Fig. 2.6). Absorption of the light at the other end of the cable by dark green drapes may result in local heating and even smouldering of the cloth which may give the patient a burn (Fig. 2.7), so that when

Figure 2.6 *Where the light cable joins the light source it gets very hot and must be insulated.*

Figure 2.7 *If the light cable shines on a dry sterile drape it can smoulder and give the patient a burn.*

not in use the end of the cable must always be kept well away from the patient.

It is equally important, when using some of the very bright light sources that are used for television, for the surgeon to safeguard his own retina: only the booby looks at the sun, and one must never allow the full intensity of the light reflected from the bladder to enter one's eye without interposing the teaching attachment or the beam splitter.

The handpiece

Nothing gives rise to more personal fads and fancies than the particular design of the resectoscope handpiece. There are many to choose from, and no one design is outstanding. What you need is a handpiece that is strong, will stand up to wear and tear, and will go on working smoothly in spite of much use. It is irritating and sometimes dangerous when a handpiece sticks or jams in mid-cut.

Many surgeons today work with one finger in the rectum and there is an advantage in a spring action which returns the loop to the starting position without action on the part of the surgeon. There are also advantages in having all the cables on rotating attachments, so that the instrument can be rotated without obstructing or entangling the water pipes, light or diathermy cables.

Light sources

There are many different light sources on the market today. Curiously, they all come with a rheostat to allow the light input to be varied, even

Figure 2.8 *Modern, lightweight camera system. Courtesy of Olympus.*

though everyone uses the maximum intensity the light can provide. Far more important than a rheostat is that there are plenty of spare lamps, and that everyone in the operating room team knows how to change them. Flash for endoscopic photography is useless.

Teaching equipment

Every surgeon is always a teacher, but to teach endoscopic surgery one must have the right equipment. Teaching attachments have been superseded today by a new generation of lightweight chip cameras that attach directly to the eyepiece of the telescope (Fig. 2.8) (see Chapter 3).

Diathermy

Transurethral resection requires a powerful diathermy machine which can both cut tissue and stop bleeding under water. If your budget is limited, economize on the resectoscope rather than the diathermy. Some of the diathermy machines which are adequate for haemostasis in general surgery will not cut under water.

Many of us take diathermy for granted: there is a big box with two pedals and some dials. When it does not work we ask the nurse to turn up the current. This is often exactly wrong, and diathermy is such an important part of the work of the urologist that he or she must understand its principles. The following account is intended to help the surgeon, even though it may occasionally offend the electrical engineer[3,4].

When an electric current passes between two contacts on the body there is always a certain increase in temperature in the tissues through which the current flows. This increase in temperature depends on the volume of tissue through which the current passes, the resistance of the tissues and the strength of the current. The stronger the current, the greater the rise in temperature.

When a direct current is switched on or off, nerves are stimulated and muscles will twitch. If the switching on and off is rapid enough, as with the Faradic current of a dynamo, there is the sustained contraction familiar to the physiology class as the ‘tetanic contraction’.

If the frequency of the alternating current is increased beyond a certain critical level, there is no time for the cell membrane of nerve or muscle to become depolarized and nerves and muscles are no longer stimulated. The critical frequency depends to some extent on the strength of the current; with small currents it is of the order of 10 000 cycles per second (10 kHz). In practice much greater frequencies are used, from 300 kHz to 5 MHz, which today are generated by transistorized valve circuits.

With frequencies as great as this a very large current can be passed through the patient without exciting nerves or muscles, and it is then possible to exploit the heating effect at the points of contact. If one

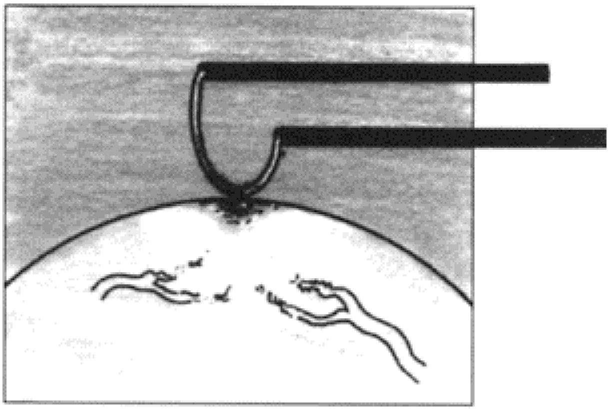

Figure 2.9 *The working electrode—the diathermy loop—is thin, so the heating effect is maximum. The coagulating current cooks the tissue for some distance around the loop and congeals the blood vessels.*

contact is made large, the heat is dissipated over a wide area and the rise of temperature is insignificant. Such a contact is the earth or neutral electrode under which the rise in temperature is only 1 or 2°C: it is the other end which concerns us, the working electrode or diathermy loop. This is kept deliberately thin so that the heating effect is maximum (Fig. 2.9).

The effect of the diathermy current on the tissues depends on the heat that is generated under the diathermy loop. The effect of heat on tissues is well known to us from everyday experience in the kitchen: when cooking an egg, at first the albumen turns white and shrivels as it coagulates. Then the egg fries, blackens and (in air) may smoke, crackle and eventually catch fire.

These changes are indeed seen in everyday open surgery, though even here it should be noted that good haemostasis depends on poaching, not roasting. It is the drying, coagulation and distortion of small blood vessels and plasma proteins which seals them. This requires only ‘white coagulation’. Blackening and smoke are unnecessary and cause needless tissue necrosis.

If the current is increased to raise the temperature still further there is an explosive vaporization of intracellular water in the tissue. In transurethral resection this additional rise in temperature is achieved by a spark, the result of ionization of the water between the electrode and the tissue[3]. The electrode does not actually need to touch the tissue. The sparks explode the cells into steam, but their energy does not reach the deeper layers, so the cut is a clean one, and the blood vessels underneath are not sealed. The cutting current is a pure sine-wave current (Fig. 2.10).

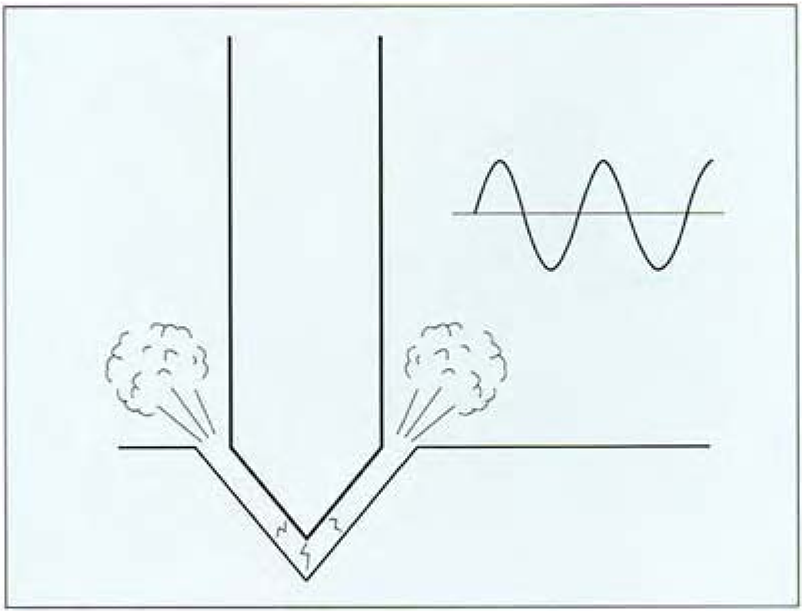

Figure 2.10 *Cutting current: a continuous sine wave.*

Coagulation is achieved in general with short bursts of sine waves which give longer sparks, but with intervals between them to allow the tissue to cool: the result is sustained heating which leads to poaching rather than explosion of the tissue (Fig. 2.11).

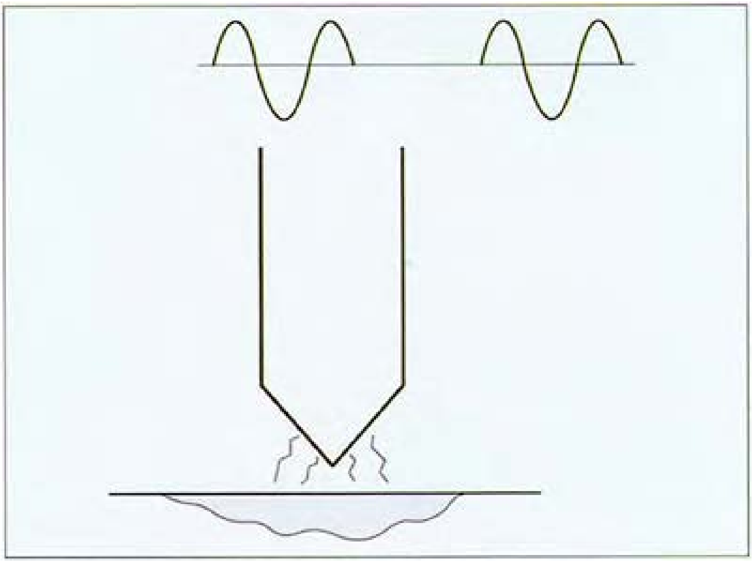

Figure 2.11 *Coagulating current; short bursts of sine waves produce local heating and coagulation.*

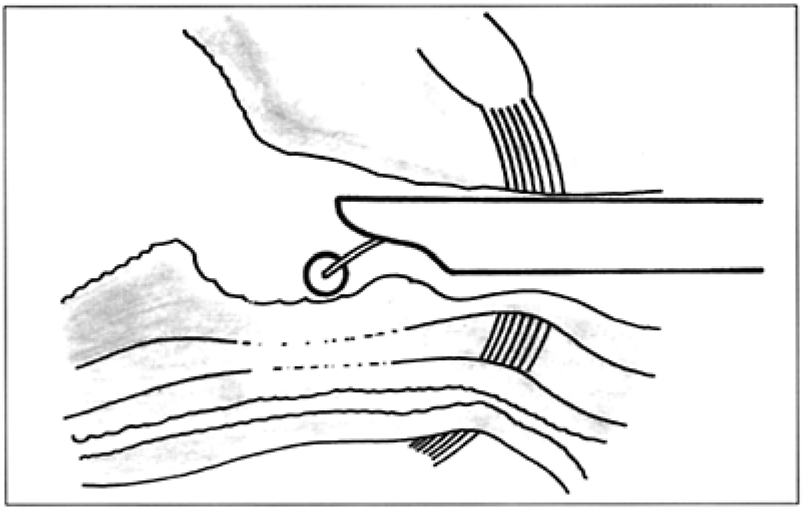

Figure 2.12 *Too much coagulation with the roly-ball electrode can cause destruction of deeper tissues, e.g. the sphincter.*

By designing the solid-state generator to deliver a mixture of pure sine-wave ‘cutting’ and interrupted bursts of sine-wave currents for ‘coagulation’ a current can be designed to allow a combination of cutting and coagulation—the ‘blended’ current[3].

If a large electrode is used (as with the big roly-ball) there is a danger that the deeper layers of tissue will be cooked, since the heating effect is proportional to the square of the diameter of the contact. This must always be kept in mind when using the coagulating current in the vicinity of the sphincter (Fig. 2.12).

If the current does not seem to be stopping the bleeding, do not make the common mistake of asking for the current to be increased. The problem may be that it is sparking and causing explosion (cutting) of the underlying tissue. Turn it down.

Diathermy burns

If current returns to earth through a small contact rather than the broad area of the earth pad, then the tissues through which the current passes will be heated just like those under the cutting loop. If the pad is making good contact, the current will find it easier to run to earth through the pad and no harm will arise even when there is accidental contact with some metal object.

The real danger arises when the diathermy pad is not making good contact with the patient. It may not be plugged in, its wire may be broken (Fig. 2.13) or, in the older type of earth plate, the conductive jelly may have dried out. Under these circumstances the current must find its way to earth somehow, and any contact may then become the site of a dangerous rise in temperature.

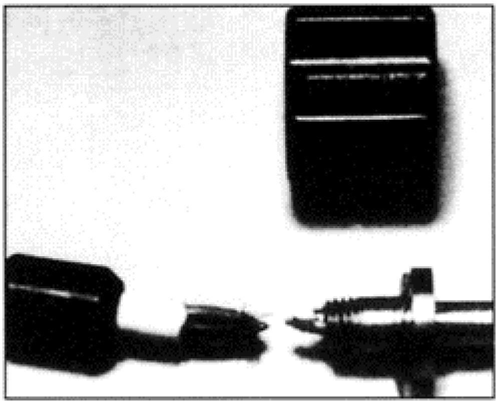

Figure 2.13 *The wire may be frayed inside its insulation; always check the circuit from pad to diathermy machine if the loop does not cut.*

It follows that if the diathermy does not seem to be working, the first thing that the surgeon must *not* do is to ask for an increase in current. Instead, check that the diathermy plate is making good contact with the skin of the patient; check that the lead is undamaged; check that the resectoscope loop is securely fixed to the contact (Fig. 2.14). Many modern diathermy machines have a warning circuit which sounds an alarm when there is imperfect contact between the earth plate and the patient (Fig. 2.15). Others have a very low capacitance between the diathermy machine and earth, so that if the earth plate is not attached the current finds it easier to run to earth than through the patient: the surgeon finds the loop does not cut, but the patient cannot be burnt.

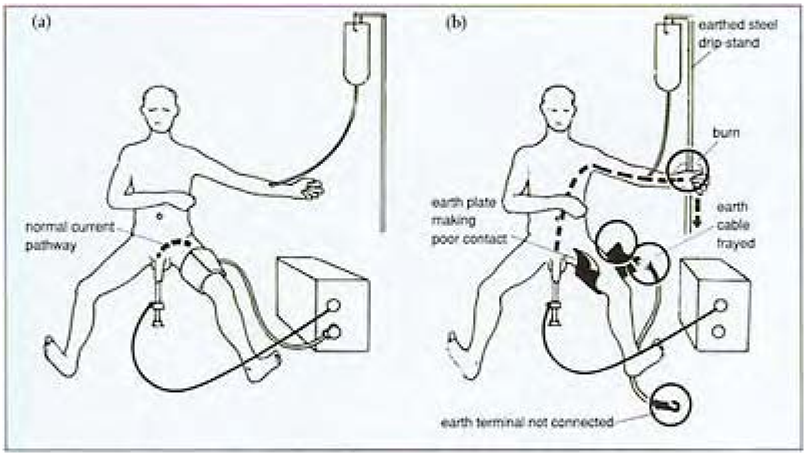

Figure 2.14 *(a) Normal current pathway from loop to earth plate.*

(b) If the earth circuit is interrupted, current will find its way via any accidental small metal contact and cause a burn.

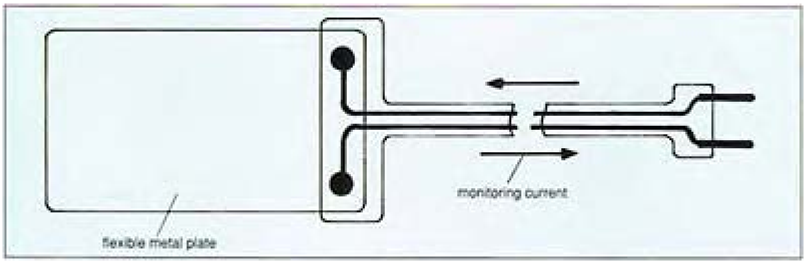

Figure 2.15 *Safety circuit incorporated in dry plate; if the circuit is interrupted there is a warning signal, but this does not mean that the plate has been applied to the patient.*

Pacemakers

An increasing number of elderly men come up for prostatectomy with pacemakers (Fig. 2.16). Four types are in common use[5,6]:

1. Fixed-rate pacemakers for patients with permanent heart block: these stimulate the ventricle at a constant rate.

Figure 2.16 *The Medtronic EnPulse™ pacemaker.*

Photo courtesy of Medtronic, Inc Inc.

2. Demand pacemakers, which detect ventricular contraction, amplify it, and feed it back to the ventricle. Only if the ventricular impulse is too weak to be detected will the pacemaker deliver its own regular beat.
3. Atrial synchronous pacemakers have one electrode in the atrium which detects a contraction arising there, and a second electrode in the ventricle to supply it with the amplified impulse. If the atrial contractions become too frequent a fixed-rate system takes over.
4. Atrioventricular sequential pacemakers stimulate the atria at a variable but appropriate rate.

The earlier demand pacemakers could sometimes be deceived by the diathermy current into delivering a rate of stimulation that was dangerously high. Several potential problems can occur with the modern devices:

1. Pacemaker inhibition. The high frequency of diathermy current may simulate the electrical activity of myocardial contraction so the pacemaker can be inhibited. If the patient is pacemaker-dependent the heart may stop.

2. Phantom reprogramming. The diathermy current may also simulate the radio-frequency impulse by which the pacemaker can be reprogrammed to different settings, so-called phantom reprogramming. The pacemaker may then start to function in an entirely different mode.
3. Pacemaker damage. The internal mechanism of the pacemaker may be damaged by the diathermy current if this is applied close to the pacemaker.
4. Ventricular fibrillation. If the diathermy current is channelled along the pacemaker lead, ventricular fibrillation may be induced.
5. Myocardial damage. Another potential effect of channelling of the diathermy current along the pacemaker lead is burning of the myocardium at the tip of the pacemaker lead. This can subsequently result in ineffective pacing.

It was formerly recommended that a magnet was placed over the pacemaker to overcome pacemaker inhibition and to make the pacemaker function at a fixed rate. This can, however, result in phantom reprogramming. For demand pacemakers, it is better to programme the pacemaker to a fixed rate (as opposed to demand pacing) for the duration of the operation. Clearly, input from the patient's cardiologist is required for this eventuality.

The other precautions are not difficult (Fig. 2.17):

1. The patient plate should be sited so that the current path does not go right through the pacemaker. Ensure that the indifferent plate is

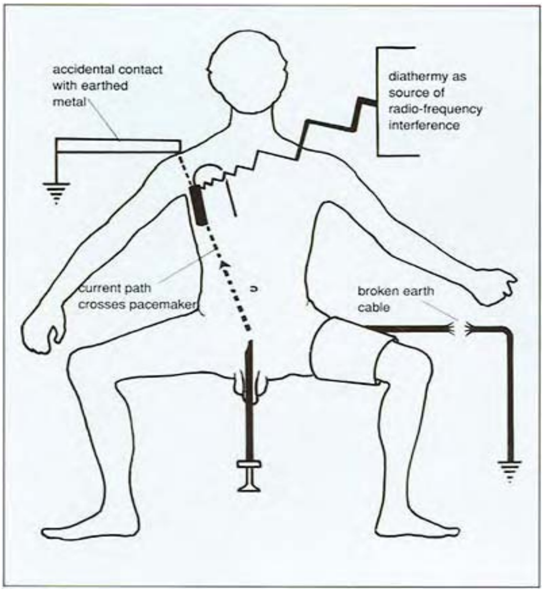

Figure 2.17 *Hazards to be avoided when using diathermy in a patient with a pacemaker.*

correctly applied, as an improper connection can cause grounding of the diathermy current through the ECG monitoring leads, and this can affect pacemaker function. The indifferent plate should be placed as close as possible to the prostate, e.g. over the thigh or buttock.

2. The diathermy machine should be placed well away from the pacemaker and should certainly not be used within 15 cm of the pacemaker.
3. The heartbeat should be continually monitored, and a defibrillator and external pacemaker should be at hand.
4. Try to use short bursts of diathermy at the lowest effective output.
5. Give antibiotic prophylaxis (as for patients with artificial heart valves—see Chapter 4).

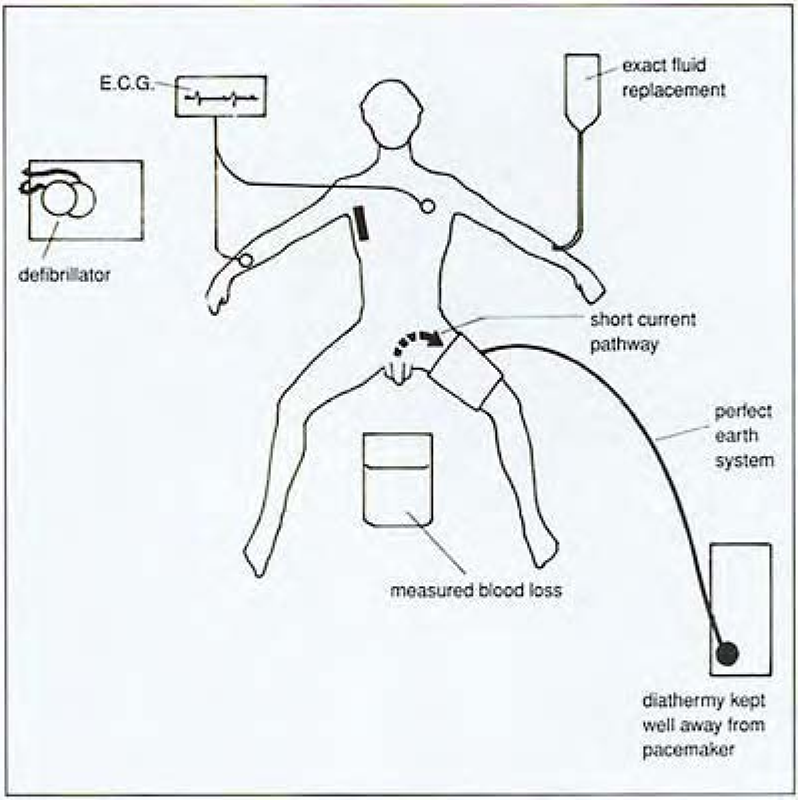

Figure 2.18 *Precautions to take when performing TUR in a man with a pacemaker.*

6. Because the pacemaker-driven heart will not respond to fluid overload in the normal way, the resection should be as quick as possible, and fluid overload should be avoided (Fig. 2.18).

Sterilization

The instruments used in urological surgery should, in theory, be no less sterile than those used to operate on the eye or the brain. There is only one way to guarantee the destruction of all known microorganisms, and that is by heat. The ideal method is to put all the instruments through an oven or an autoclave, as is the normal practice for haemostatic forceps and retractors. There are also many parts of the ordinary urological armamentarium, e.g. the metal cystoscope and resectoscope sheath, the taps, obturators, etc., which could and should ideally be sterilized by heat. Modern cystoscopes and resectoscopes including components such as light leads are autoclavable. Standard autoclave regimens heat the instruments to 121°C for 15 minutes or 134°C for 3 minutes. Another commonly used method of sterilization is to soak instruments in formaldehyde solutions. Both methods are entirely acceptable in countries without access to some of the more modern autoclave or liquid sterilization systems.

Theatre autoclaves such as the ‘Little Sister’ are no longer used in the UK, because they cannot guarantee sterility of the instruments. Central Sterile Supply Units (CSSUs) are used nowadays for sterilizing the majority of urological surgical instruments. The ‘turn-around’ time of instruments sterilized in CSSUs is inevitably several hours. As a consequence, it is important to have a large enough number of resectoscopes available such that an operating theatre list can be completed without requiring instruments to be sterilized in between cases.

Cameras cannot be autoclaved. Two alternatives are available to prevent transmission of microorganisms between patients. A camera sleeve can be used to prevent contamination of the camera with body fluids. Alternatively, modern cameras can be sterilized between cases in solutions such as Tristel. This is an aqueous solution of chlorine dioxide which is aldehyde-free. There has been a move away from these latter agents (such as formaldehyde) because of health and environmental concerns. Tristel kills bacteria, viruses (including HIV and hepatitis B and C), spores and mycobacteria.

Sterilization and prion diseases

Over the last few years there has been much concern about the potential for transmission of variant Creutzfeldt-Jakob disease (vCJD) between patients via contaminated surgical instruments. vCJD is a neurodegenerative disease caused by an agent known as a prion. Other examples of these neurodegenerative prion diseases include classic CJD, kuru, sheep scrapie and bovine spongiform encephalopathy (BSE). The infectious agent in these diseases is a prion protein (PrP). Variant CJD and BSE are caused by the same prion strain, and represent a classic example of cross-species transmission of a prion disease.

Prions are not readily destroyed by conventional methods of sterilization, using for example, standard autoclave regimens of 121°C for 15 minutes or 134°C for 3 minutes. Similarly, ethylene oxide, formaldehyde and chlorine dioxide are ineffective against prions. There is evidence that classic CJD may be transmitted by neurosurgical and other types of surgical instruments, because normal hospital sterilization procedures do not completely inactivate prions[7]. However, it is not possible at present to quantify the risks of transmission of prion diseases by surgical instruments. In a case-control study of *sporadic* CJD, having had two or more surgical procedures in the past was associated with an increased risk of developing CJD, although there was no association with a particular surgical procedure or anatomic site[8]. This must be put in perspective. Iatrogenic CJD remains rare, with 267 cases reported worldwide up to 2000[9].

The risk of transmission of CJD may be higher with procedures performed on organs containing lymphoreticular tissue such as tonsillectomy and adenoidectomy, because vCJD targets these tissues and is found in high concentrations there. For this reason there was a move towards the use of disposable, once-only use instruments for procedures such as tonsillectomy. However, these instruments have been associated with a higher postoperative haemorrhage rate[10] and as a consequence ENT departments in the UK are no longer obliged to use disposable instruments.

The dilemma then, is how to minimize the risk of transmission of CJD by surgical instruments, while containing costs. Clearly, a policy of disposing of all surgical instruments after only one use is completely impractical, but continuing with current practice may not be regarded as acceptable. In the UK, the Advisory Committee on Dangerous Pathogens and Spongiform Encephalopathy[11] provides advice on appropriate methods of cleaning and sterilization of surgical instruments. This advice stresses that it is not only the process of sterilization that removes infectious agents from surgical instruments, but also the *pre-sterilization process of cleaning* the instruments. Prions are particularly resistant to conventional chemical and thermal decontamination, and it is therefore possible that dried blood or tissue remaining on an instrument could harbour prions that will not then be killed by the sterilisation process. Once proteinaceous material such as blood or tissue has dried on an instrument, it is very difficult subsequently to be sure that the instrument has been sterilized. The chance of leaving such tissue on an instrument can be reduced by prompt cleaning after use, initial low temperature washing (<35°C) with the use of appropriate detergents and an ultrasonic cleaning system to remove and prevent coagulation of prion proteins. This is then followed by a hot wash and air-drying, and only then is thermal sterilization carried out.

The use of ultrasonic cleaning is particularly important for hollow surgical instruments such as resectoscopes, where it can be difficult to remove all the attached debris within the lumen of the instrument. Sonic cleaners essentially ‘shake’ attached material from the instrument. The latest models of pre-sterilization cleaning devices—automated thermal washer disinfectors—are designed to perform all of these cleaning tasks in one unit.

While prions are not readily destroyed by conventional autoclave regimens, pre-sterilization cleaning followed by longer autoclave cycles at 134–137°C for at least 18 minutes (or six successive cycles with holding times of 3 minutes) or 1 hour at conventional autoclave temperatures may result in a substantial reduction in the level of contamination with prions. There is some evidence that a combination of pre-sterilization cleaning, autoclaving and chemical treatment may be effective in reducing the risk of contamination with prion agents[12]. Enzymatic proteolytic inactivation methods are under development[9].

For urological instruments, such as those used for TURP and TURBT, the risks of transmission of prion diseases are not known and at the present time current sterilization techniques continue to be used. Following good practice by ensuring that the instruments are thoroughly washed and inspected before sterilization should be continued, until it becomes clearer whether iatrogenic prion transmission is a real threat.

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Chapter 3
Closed circuit television for the urologist

Closed circuit colour television (CCTV) is now widely used by urologists in the UK. Few urological surgeons now crane their necks to put an eye to the telescope of their instruments, preferring to sit comfortably looking at the colour monitor conveniently placed in front of them (Fig. 3.1). They thus protect their cervical discs[1] and lessen the risk of facial contamination by blood and irrigant[2].

Urological trainees receive formal training in monitored transurethral resection, as courses are run regularly around the country using CCTV for endoscopy. The improved technology of the miniature chip camera

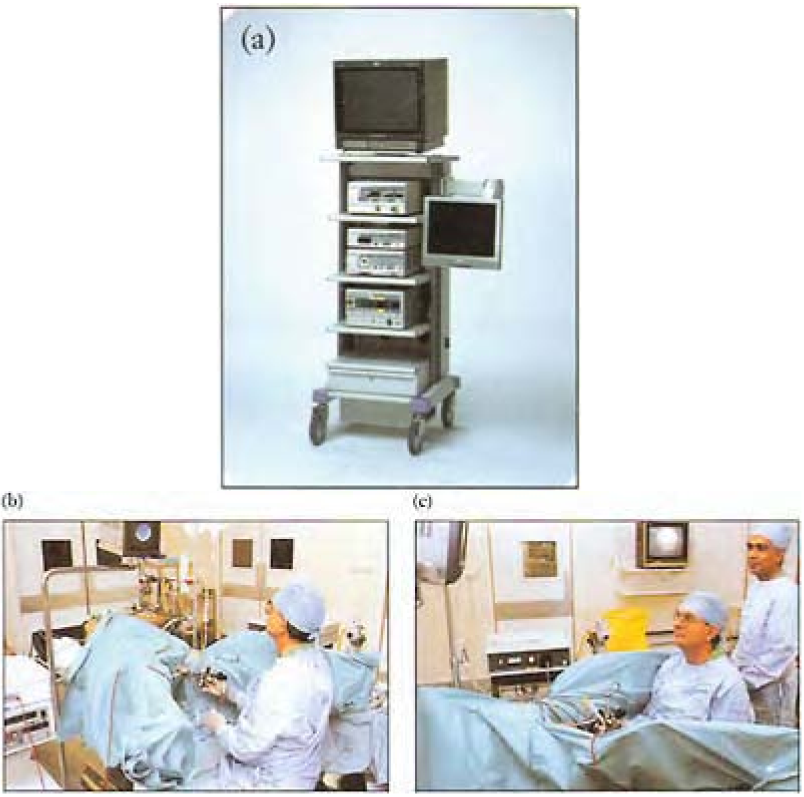

Figure 3.1 *(a) KeyMed modern equipment rack. A modern, large*

monitor allows the surgeon and other theatre staff a clear view of the operation. Courtesy of KeyMed.

(b) One monitor is placed over the patient.

(c) The second monitor is on the wall.

provides such an excellent image that it is now possible to see on the TV screen as much detail—perhaps even more—than one can see by looking directly into the telescope of the instrument. Not only transurethral resection can be done as a ‘monitored’ procedure, but all varieties of urological endoscopy—urethroscopy, cystoscopy, ureteroscopy and pyeloscopy—are done more easily and effectively using the CCTV camera and working from the monitor.

The urologist who wishes to set up CCTV for use in the operating theatre is faced by a bewildering choice of television equipment. Many manufacturers provide comprehensive packages and it is difficult to choose between them on any grounds other than cost. Ask yourself six basic questions:

1. What do you think you want?
2. What do you think you need?
3. Where will you get it from?
4. Should you buy a package?
5. How much will it cost?
6. What will it cost to run?

What do you think you want?

It is clear that a CCTV set-up in the operating theatre is worthwhile. Apart from saving your neck and helping to protect you from infection by hepatitis and HIV viruses by lessening the risk of facial contamination, CCTV enables you to teach trainees and demonstrate endoscopic technique to theatre personnel. But which parts of the rather expensive system are vital and which are luxuries? You must decide what you want to achieve. The basic wish is to project an image of what the telescope sees onto a TV screen. This may be for a number of reasons. Staff who work in an operating room where almost all the operations are invisible to anyone but the surgeon find it boring. Being able to see what is going on kindles interest. They can see which instrument is going to be needed next and thus anticipate your wishes. There may be students or junior staff to teach. Perhaps you would like to make videotapes, CDs or DVDs for teaching or demonstration purposes[3]. Above all, you may simply want to protect your health. All these are valid reasons to consider the installation of CCTV in the urology operating theatre, but it can be difficult to differentiate between need and luxury.

What do urologists need?

To use CCTV in an operating theatre you need:

1. The usual endoscopic and diathermy equipment.
2. A light source with sufficient output to permit the use of a TV camera; a dim light provides a poor TV image. Your eye can accommodate a dim light because it is an infinitely more efficient optical instrument than the camera.
3. Fibreoptic cables capable of conducting the higher intensity illumination from the light source to the endoscope without suffering heat damage.
4. A good quality telescope. All telescopes deteriorate with use; endoscopic TV needs a really clear telescope. A hazy telescope gives a poor TV image, even if your eye copes adequately.
5. A TV camera.
6. A video monitor or monitors.
7. Some form of constant irrigation system. It is perfectly possible to use CCTV with intermittent irrigation, but constant irrigation enables the watcher to see an uninterrupted operation.
8. Some sort of trolley or cabinet to contain the camera and its ancillary works. This is not essential, but video equipment is expensive and relatively fragile and a trolley is a good way of protecting your investment.

The above list does not include any recording equipment; recording the TV image is not a necessity. It is something to which most urological surgeons will come, but not until they have mastered the general technique of CCTV for endoscopic surgery and have decided what they wish to record and why. This will be discussed later.

Light sources

A suitable general purpose high output light source—high intensity tungsten, metal halide or xenon arc—can be purchased from the urological instrument dealer without difficulty. Tungsten light sources put out between 50 and 150 watts and suit many modern chip TV cameras, but are at the lower end of the spectrum of suitability for CCTV and may not give the best images under adverse operating conditions. Metal halide sources usually operate at 250 watts and xenon arc sources at over 300 watts. Any of these can be used as the standard endoscopic illumination, whether the TV is being used or not, so it is not necessary to have a conventional light source as well. However, a word of caution; high-powered light sources produce light of such intensity that the heat produced can burn holes in surgical drapes, or in patients, if the cable is left unattended (Fig. 3.2).

The lamps are expensive and benefit from a little thought and care; do not turn them off at the end of each operation, as maximum wear on the light source occurs each time it is activated. Lamps will last longer if they are turned on at the start of the list and left on until the last case is

Figure 3.2 *If the light cable shines on a dry sterile drape it can smoulder and give the patient a burn.*

finished. Always keep a spare lamp and ensure that you know how to change it so that the teaching session does not come to an untimely halt due to a burned out lamp.

As an alternative to a general purpose light source, it is possible to buy a 'dedicated' light source designed to work with a specific TV camera; these come as part of various CCTV 'packages'. The advantage of these dedicated metal halide or xenon arc sources is that they are linked electronically with the camera to produce an image of standard brightness. Feedback from camera to light source gives more light when the field is dark and reduces the light to prevent highlight and flare when the subject matter is over-illuminated. It is a more expensive option than a general purpose light source and it has been the authors' experience that general purpose light sources work well enough, especially if minimizing the capital outlay is important.

Light cables

Armoured, specially insulated, or fluid-filled light cables are widely available. They work just as well with low light intensities, so if CCTV is going to be used one might as well standardize all the cables to be capable of carrying high intensity light, particularly if you plan to use only a high intensity light source. Ensure that the cables are in good condition for TV work; broken fibres and the inevitable melt damage which occurs at the source terminal of the cable are important causes of a poor TV image.

Figure 3.3 *A direct coupled camera. Courtesy of K.Storz.*

Telescopes

It goes without saying that only rod lens telescopes are suitable for TV work. The slow deterioration of a rod lens telescope from normal regular use is imperceptible to the eye until it is very advanced, as the eye is an altogether superior optical instrument to any TV camera. By the time a telescope looks dim to the eye, it is probably incapable of transmitting an image which the TV camera can visualize at all. You must use a telescope in 'new' condition if CCTV is to be used.

Trolleys

It is essential to house the delicate CCTV equipment safely. This can be in the wall of the operating room, with long cables to the camera, or it can be in a mobile trolley or cabinet, perhaps with an extensible arm to support the 'resecting' monitor (Fig. 3.1). The less it is necessary to manhandle the equipment the less the risk of accidental damage. It is advisable to be able to lock the equipment into its housing, not only to prevent theft, but also to reduce the incidence of malfunction due to knob-twiddling by TV 'experts' or by accidental alteration of switches.

Constant irrigation systems

Constant irrigation with continuous removal of the irrigant during prostatic or bladder tumour resection keeps the TV image constant and makes it easier for an observer to follow. This can be achieved by an irrigating resectoscope sheath (the authors' preference) or a suprapubic cannula system. Intermittent irrigation means that the teaching process has to be interrupted every time the bladder fills and has to be emptied, making the teaching less effective and the operation slower because the surgeon has to find his place again after emptying the bladder.

Cameras

A modern three-element (each element now being a chip, formerly a tube) television camera produces the best image with regard to colour, crispness and resolution, but it is a bulky piece of equipment which does not lend itself to use in an urological operating room without a squad of assistants, cannot be coupled directly to the endoscope because of its size and has to be used through a jointed beam splitter. There is inevitable rotation at the joints with consequent loss of orientation of the TV image.

Modern single-chip cameras are small enough to fit directly onto the endoscope eyepiece without making it too clumsy to manipulate. They produce a remarkably clear image, with excellent depth of focus and colour reproduction. They can also be made waterproof, to allow disinfection by soaking. If the surgeon wants to operate by direct vision, using a beam splitter, this is not jointed and the problems of image orientation are minimal.

Basically only four chips are commercially available for chip cameras, so whatever camera one buys it will have one of them. They all have very similar performance. What else one gets will depend on what the manufacturer has decided to provide. A hand-held camera purchased in the High Street shop has all its working parts in one box—so it is relatively bulky—much too big for the urologist's purposes. In an endoscopic camera the chip has been separated from the works and connected by a cable.

Some camera manufacturers use a 12 volt system to power the camera for reasons of safety. Some put in zoom fitments. Some include colour bar generators. Some have automatic light balance. However, the signal processing is going to be what the chip manufacturer supplies so that, on the whole, modern chip cameras have fairly comparable performance and the urologist must look for what he wants.

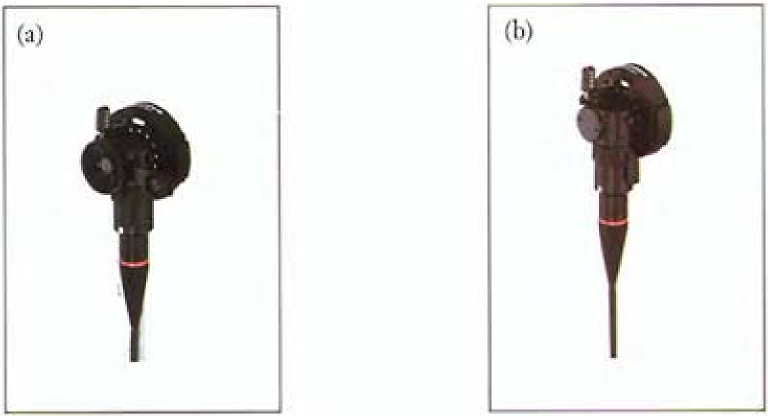

Figure 3.4 *(a) Modern lightweight camera system with a right-angled beam splitter. Courtesy of KeyMed.*

(b) Many modern cameras have no eyepiece, so the image can only be viewed on the monitor. Courtesy of Olympus.

Cameras may be made to couple directly onto the telescope eyepiece (Fig. 3.3), or may be attached via a right-angled beam splitter (Fig. 3.4a). Many modern cameras have no eyepiece (Fig. 3.4b), so the image can only be viewed on the monitor. A direct coupled camera will rotate with the telescope so that the image will rotate on the monitor. To keep it still the camera must be held steady and not rotated with the endoscope; this needs an extra hand. As most urological surgeons like to use both hands on the endoscope this is inconvenient. A fitted beam splitter is more convenient as it will either swing on the eyepiece or have an inbuilt rotation point that keeps the camera steady in relation to the telescope, so that the image is always kept the right way up.

A camera sleeve should be used to prevent contamination of the camera with body fluids. Alternatively, more modern cameras can be sterilized between cases in solutions such as chlorine dioxide.

Monitors

Video monitors come in all sizes and qualities. As a general principle, the picture will be clearer and sharper if a monitor is purchased rather than a television set. So, if the salesman tells you that the 'monitor' can be used as a television set, you know you will not get the highest quality picture, however convenient it may be to watch the tennis when things get tedious. The size and number of monitors provided in the operating room is a personal (and financial) choice. It is the authors' experience that it is unwise to have a monitor with a screen measuring less than 28 inches. This can easily be suspended above or adjacent to the patient's abdomen for ease of use (Fig. 3.1).

Recording equipment

There is now a wide variety of digital recorders available for saving both still and 'Video' footage of endoscopic procedures. The images may be saved in a variety of formats including on Zip discs, CDs and DVDs or as printed images (Fig. 3.5). These images can then be incorporated into lectures or simply saved as a record of what you saw at the time of surgery and what you did. What do you want to record? What will you do with the recordings when you have made them?

If a recording is needed for the records then a still printer is required—for something like a bladder tumour, for instance. But it is difficult to show the whole of a bladder tumour on one print if it is more than 1 cm across. It is necessary to take a long view of a sizeable tumour to keep it in frame. The human eye can cope with the inverse square law, being a better optical instrument, but the video camera cannot, and a large object cannot be illuminated adequately to produce a video image suitable for printing. The still video printer is still an expensive luxury and only one of the new digital recorders will provide prints that are good enough for publication (as in this book) but are mightily expensive as well as being prodigal of computer space.

If the requirement is to keep a tape or CD for a medico-legal record, the tape must be complete and unexpurgated. It will therefore be long (and boring to watch) and a consideration will be the cost of the videotape or other recording format and the problem of storage. Videotape intended for lectures or teaching requires some method of editing the tape so that it is concise and interesting. That means at least another

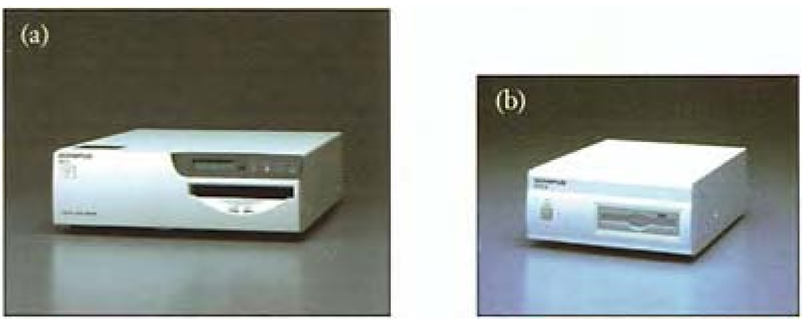

Figure 3.5 *Modern recording equipment. Colour video printer and drive for recording images on Zip discs. Courtesy of KeyMed.*

video cassette recorder, and it is not possible to get a tidily edited tape simply by cross-recording from one tape to another by using two VCRs. To edit a videotape properly requires an editing suite in which a computer links and controls the two VCRs. Videotape editing involves rerecording the scenes to be kept, in the order that is required, on a second tape (unlike ciné film editing when the film is physically cut with scissors and rejoined). Without computerized coordination of the two VCRs the end result is uneven and the joins between the re-recorded scenes are obtrusive. Such an editing suite is expensive, but you must have access to one because you must do the editing yourself, or supervise it personally, to achieve the result you require. Editing is made considerably easier in this era of digitalized images where sections of the recording can be cut and pasted as required.

The urologist setting up CCTV in the operating room should postpone the purchase of recording equipment until the system is installed and running. You may never want to record. Prints are of no great value. Making a videotape is time-consuming: it takes at least an hour and a half of editing and sound recording time to create 15 minutes of final tape, in addition to the time spent making the original video recording. It is also very expensive.

The best advice for the urologist seeking to put a CCTV system into the operating theatre is to try out all the equipment that is available from all the firms that sell it. See how each performs in your hands in your own operating room; decide what suits your requirements, and purchase as your budget permits. Since the cost of individual items of equipment is comparable wherever they are purchased it is more important to find out which firm will offer service and repair arrangements. Find out if the equipment has to go to Alaska for repair, or if it can be done locally, because one may take longer than the other. And wherever it does go, will the firm provide a loan replacement part to keep the CCTV system in action?

Should the urologist buy a CCTV package?

CCTV for the urological surgeon is provided by specialist suppliers. Most of these suppliers will provide a package which usually consists of their camera and beam splitter, a light source (which may or may not be dedicated) and a VCR. In many cases the package is enclosed in a trolley or cabinet of the supplier’s own design, often of a modular pattern that can be varied to accommodate special requirements.

Most suppliers are open to negotiation as to the exact contents of their package. Most offer alternative format VCRs, or will leave it out of the package altogether. Some offer still image recorders. Most will agree to exclude the light source if the surgeon already has a suitable one, although the dedicated light source suppliers make the point that their camera works best with its own dedicated light source.

There are suppliers who will come to see what is required and are then prepared to put together a package to suit your requirements, subject to including their camera in the package. For this it is necessary for you to know what you want and to have had some experience in the use of CCTV, which might perhaps be called ‘second generation’ CCTV usage. Of course, if you do have experience in the use of CCTV and know all about electronics, go shopping for the necessary components and put together your own package and so save money. However, few surgeons have such expertise and you will find that the suppliers offer a good deal with good performance from most of their packages. The vital thing is to have an extended trial of the package on offer before purchase—if the supplier will not agree to this then go elsewhere.

How much does it all cost?

The cost of CCTV for urology will depend on where you work and whether the equipment is made locally or has to be imported. The most expensive equipment is not necessarily the best for your particular purpose. Look at the equipment that is available in your area; make sure that it is really what you want; compare the costs and try each set of equipment out. Discover the servicing arrangements on offer. You will then be in the best position to purchase a system which works for you and is within your budget.

What are the costs of running a CCTV system?

It is important to have a clear idea of what it will cost to run a CCTV system in the urology operating room or department. Once purchased and installed, electronic equipment is not expensive to run. The consumption of electricity is minimal. Some parts of the system have batteries which need to be replaced from time to time at nominal cost. If recording is to be done the cost of tapes must be added. Apart from these considerations there are no significant revenue implications of running a CCTV system, which is important information for the purchaser, whether this be the urology department, the Supplies Officer of the hospital or a charity providing the equipment. If good equipment is purchased and reasonable care is taken of it, it will cost no more to run than a domestic TV or hi-fi system.

It is essential to plan ahead in order to replace your equipment as time goes by because it will wear out and occasional unexpected breakdowns will occur. So keep spares where possible, particularly a light source lamp, and maintain a reserve of cash so that it is possible to replace parts rapidly and so keep the set-up going. Buy your equipment from someone who will offer a prompt and reliable repair and replacement service: you may wish to take out a service contract, but watch the price and be prepared to bargain.

Equipment with knobs attracts fiddlers like flies to rotten meat, and manufacturers seem impelled to fit multiple knobs on the front of all TV equipment for sales reasons. This lures the fiddler, who is usually a self-professed expert on all matters televisual. When the knob-fiddler has maladjusted everything in sight it can appear that the system has broken down. If the supplier is then called in to rescue the situation it can be expensive for what is actually simple adjustment. So wage war on fiddlers: fit locks, close doors, put up notices and, most important of all, learn how to do the adjustments. Anything which can be locked away after being set up and is thus invisible is an advantage.

Enthusiastic dusters are also a potential problem, changing the setting of a switch at the flick of a wrist. Dust covers and lids help, but take care not to operate electronic equipment under its plastic cover because it may overheat and malfunction. Likewise do not keep electronic equipment in a cold place and expect it to work instantly in a warm room, condensation being a potent cause of malfunction.

Diathermy and other interference

Diathermy interference is a mysterious and troublesome phenomenon which has plagued every urologist who has tried to set up CCTV in the operating theatre. Diathermy machines produce radio-frequency waves which get transmitted around the theatre, the various leads being excellent aerials. Operating rooms have wiring systems producing electrical fields capable of generating interference on CCTV systems, as may electrical equipment in an adjoining room. A surgeon hoping to use CCTV must try out the system in his own operating room. If the interference cannot be eliminated easily, do not buy that system. If interference appears when it was not there before, check that all electrical connections are clean and firm, that no lead is frayed or its insulating cover damaged, and that the various pieces of equipment are properly earthed. This check should be applied to all the electrical equipment in the operating room, and especially to the diathermy. If interference persists after an extensive check of all leads, etc., get the diathermy checked electrically as it may be that a minor circuit malfunction has developed.

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Chapter 4
Indications and preparations for transurethral resection of the prostate

Indications for TURP and diagnostic tests prior to TURP

The indications for TURP are bothersome lower urinary tract symptoms which fail to respond to changes in lifestyle or medical therapy; recurrent acute urinary retention; renal impairment due to bladder outlet obstruction (so-called high pressure *chronic* urinary retention); recurrent haematuria due to benign prostatic enlargement and bladder stones due to prostatic obstruction.

These indications are all relative. Indeed, one could say that there are no *absolute* indications for TURP. A man with renal impairment due to bladder outlet obstruction can always be managed with a long-term catheter rather than TURP. Some patients, particularly the very elderly and infirm, will find this an acceptable alternative to surgery. For those practising in the UK, one should remember that the British Association of Urological Surgeons (BAUS) Procedure Specific Consent Forms[1] state that alternative management options should be discussed with the patient (see Chapter 13, Medico-legal aspects of transurethral resection), one of which is a long-term catheter. While the surgeon may feel that a TURP is in the patient's best interest, clearly the decision to proceed with surgery rests with the patient. Having said this, most men with urinary retention will not wish to remain with a long-term catheter and will opt for TURP.

TURP for bothersome lower urinary tract symptoms

Changing terminology: 'LUTS' versus 'prostatism'

The 1990s saw a change in the terminology used to describe the symptom complex that we had traditionally associated with obstruction due to benign prostatic hyperplasia (BPH). We came to appreciate that the 'classic' prostatic symptoms of hesitancy, poor flow, frequency urgency, nocturia and terminal dribbling bore little relationship to prostate size, flow rate, residual urine volume or indeed urodynamic evidence of bladder outlet obstruction[2]. Other studies showed that age-matched men and women had similar levels of urinary symptoms when assessed using the American Urological Association[3] symptom score[4]. Thus, the expression 'lower urinary tract symptoms' (LUTS) came into common use to describe the symptoms hitherto known as prostatism. This is a purely descriptive term which avoids any implication about the possible underlying cause of these symptoms[5].

More recently, one hears the expression ‘LUTS/BPH’ being used to describe the symptoms of BPH while others still use the term prostatism. In many ways it does not really matter whether one uses ‘prostatism’ or ‘LUTS’ to describe these symptoms or ‘BPH’, ‘BPO’ (benign prostatic obstruction), ‘BPE’ (benign prostatic enlargement), or ‘BOO’ (bladder outlet obstruction) to describe the possible underlying cause. What is important is to remember the non-prostatic causes of hesitancy, poor flow, feeling of incomplete emptying, frequency, urgency and nocturia and therefore to avoid operating on the prostate when the problem lies elsewhere. Knowing this, one can give the patient a realistic idea of how likely it is that his symptoms will respond to treatments ‘aimed’ at the prostate. He needs to know that prostate operations such as TURP will not always result in resolution of his symptoms. Thus, the new terminology is useful, but only because it reminds the urologist to consider these alternative causes of symptoms, which may have absolutely nothing to do with prostatic obstruction.

Clinical practice guidelines for BPH and LUTS—a word of warning

A number of clinical practice guidelines have been developed to streamline the approach to diagnosis and treatment in men presenting with symptoms suggestive of BPH[6]. While every available guideline for assessing BPH patients agrees that a history and examination should be taken, and that the severity of urinary symptoms should be formally assessed using a symptom score, there is considerable variation between guidelines in terms of the other diagnostic tests that they recommend. This is unfortunate, because clinical practice guidelines were developed to standardize the approach to diagnosis (and treatment) of the man presenting with urinary symptoms thought to be due to BPH. Some recommend that flow rate and residual urine volume should be measured, some state that these tests are optional, while others specifically state that these tests are not recommended. How can such wide variation between guidelines be possible? Surely the ‘disease’ we are dealing with is the same wherever the patient comes from? The reasons for these varations are complex, but at least part of the answer lies in the way in which guidelines have been designed, i.e. on their ‘quality’.

Guideline quality can actually be measured against a set standard, using criteria based on the system used to create the guidelines[7]. Some guidelines make no mention of the search strategy used for obtaining the evidence on which their recommendations are made, while others do not identify the methods used to assess the strength of the evidence they quote. High quality clinical practice guidelines rank this evidence according to whether it is derived from randomized controlied trials or based on descriptive evidence such as case-series or case reports (evidence from randomized controlled trials being regarded as ‘stronger’). Low quality guidelines do not do this. Interestingly, higher quality BPH guidelines are *less* likely to recommend lots of diagnostic tests[7]. They seem to keep the diagnostic approach to the man presenting with urinary symptoms fairly simple, measuring symptom scores, analysing the urine, obtaining a voiding diary and doing little else. This should not be taken to mean that a careful history to exclude other non-BPH causes of urinary symptoms is not important (in fact, these additional features of the history and examination, as outlined below, are terribly important). But what it does mean is that there must be good evidence that measuring flow rates or doing pressure-flow studies, for example, really do help in deciding what to do and in predicting the outcome from treatment.

Because there is such variability between the various guidelines, it is not possible to recommend one over the other, and of course what guidelines you use will to a considerable degree depend on what part of the world you practise in[8–15]. However, maintaining a healthy scepticism in such things is no bad thing for the practising urologist.

A history, basic examination and some simple investigations can help to determine whether the cause of the patient's symptoms lies in the prostate, in the urethra or bladder or elsewhere.

History and examination

Baseline symptoms can be 'measured' using a symptoms index and the most widely used is the International Prostate Symptom Score (IPSS), which is a modified version of the AUA symptom index (Fig. 4.1).

A history of macroscopic haematuria or the finding of dipstick or microscopic haematuria is clearly an indication for flexible cystoscopy and upper tract imaging to exclude the presence of, for example, a bladder or renal cancer. Similarly, marked frequency and urgency, particularly when also combined with bladder pain, can occasionally be due to carcinoma in situ

Figure 4.1 *The International Prostate Symptom Score (IPSS).*

	Not at all	Less than 1 time in 5	Less than half the time	About half the time	More than half the time	Almost always	Score
Incomplete emptying. Over the last month, how often have you had a sensation of not emptying your bladder completely after you finish urinating?	0	1	2	3	4	5	
Frequency. Over the last month, how often have you had to urinate again in less than 2 hours after you finished urinating?	0	1	2	3	4	5	

Intermittency. Over the past month, how often have you found you stopped and started again several times when you urinated?	0	1	2	3	4	5	
Urgency. Over the past month, how often have you found it difficult to postpone urination?	0	1	2	3	4	5	
Weak stream. Over the past month, how often have you had a weak urinary stream?	0	1	2	3	4	5	
Straining. Over the past month, how often have you had to push or strain to begin urination?	0	1	2	3	4	5	
Nocturia. Over the past month, how many times did you most typically get up to urinate from the time you went to bed at night until the time you got up in the morning? Total IPSS score	0	1	2	3	4	5	
Quality of life due to symptoms	Delighted	Pleased	Mostly statisfied	Mixed—about equally satisfied and dissatisfied	Mostly dissatisfied	Unhappy	Terrible
If you were to spend the rest of your life with your urinary condition	0	1	2	3	4	5	

just the way it is now, how would you feel about that?

of the bladder and one should have a low threshold for obtaining urine for cytology and for performing flexible cystoscopy in such cases.

Recent onset of bedwetting in an elderly man is an important symptom, because it usually allows one to make a diagnosis of high pressure chronic retention. In such cases there is gross distension of the abdomen with high bladder pressures leading to back pressure on the kidneys and impaired renal function[16]. Visual inspection of the patient's abdomen may show marked distension due to a grossly enlarged bladder. The diagnosis of chronic retention can be confirmed by palpation of the enlarged, tense bladder, which is dull to percussion.

Rarely, lower urinary tract symptoms can be due to neurological disease causing spinal cord or cauda equina compression or to pelvic or sacral tumours. There will usually be associated symptoms such as back pain, sciatica, ejaculatory disturbances, and sensory disturbances in the legs, feet and perineum. In these rare cases, loss of pericoccygeal or perineal sensation (sacral nerve roots 2–4) indicates an interruption to the sensory innervation of the bladder and an MRI scan will confirm the clinical suspicion that there is a neurological problem.

Digital rectal examination (DRE)

A discussion of the merits (or otherwise) of prostate cancer screening in men presenting with urinary symptoms is beyond the scope of this book, but it is important to know that the UK National Institute for Clinical Excellence (NICE) Guidelines[17] and the European Association of Urology (EAU) Guidelines[18] on diagnosis of BPH recommend that a digital rectal examination should be done to detect nodules which may indicate an underlying prostate cancer. Most current 'BPH' guidelines recommend a discussion with the patient about the pros and cons of PSA (prostate-specific antigen) testing.

Assessment of prostate size

Apart from being recommended to determine whether the patient has prostate cancer or not, a digital rectal examination (DRE) is also used to give an indication of prostate size. While the size of the prostate does not correlate with severity of symptoms and prostatic enlargement is not in itself an indication for treatment, it is useful to have an idea of prostate size before embarking upon surgical treatment. DRE gives a *rough* estimate of prostate size and if one suspects that the prostate is markedly enlarged, a transrectal ultrasound can be performed to provide a more accurate assessment of its volume. A large prostate could be an indication for an open prostatectomy. It is better for the surgeon to know in advance that an open prostatectomy may be necessary. An accurate assessment of prostate size prior to operation can avoid unexpected conversion from TURP to open protatectomy. In the National Prostatectomy Audit[19] there was a need to convert from TURP to open prostatectomy in 10 of 4226 TURPs (0.2%).

The larger the prostate, the more challenging TURP is likely to be and the more inclined the surgeon is to recommend open prostatectomy. Precisely what constitutes 'large' is a matter of opinion. Some surgeons are happy to resect 75 g of prostate, while others will struggle to remove this volume of tissue transurethrally. Many surgeons, however, will give serious consideration to open prostatectomy for glands estimated to be greater than 75g in size. Apart from detecting prostate cancer, this is the principal reason for palpating the prostate by rectal examination when you are thinking about performing a TURP. Prostate size can also have a bearing on drug treatment of prostate symptoms. Treatment with prostate-shrinking 5-alpha reductase inhibitors tends to be confined to the larger prostate.

There may be other factors present which incline one towards open prostatectomy and these can usually be established from the history and examination. Some patients have orthopaedic problems which prevent abduction or flexion of their hip joints, such that the surgeon simply cannot get between their legs to perform a TURP. The presence of bladder stones which are too large for endoscopic cystolitholapaxy, combined with marked enlargement of the prostate is an indication for open prostatectomy. Rarely the patient may have such a long urethra that even a long resectoscope may not allow transurethal access to the entire length of the prostate, and in this situation one has no choice but to remove the prostate by an open technique. This finding usually only becomes apparent at the time of surgery (although a particularly large prostate on DRE may alert you to this possibility), so it is as well to mention the occasional need to resort to open prostatectomy to all patients prior to TURP. However, it is uncommon nowadays not to know in advance that you are likely to have to perform an open prostatectomy.

Tests

Urine culture

The urine should be cultured to determine whether there is infection. This may be the cause of the patient's symptoms, although if this is so, it will usually be obvious from the presence of suprapubic discomfort and pain or 'scalding' in the urethra on voiding. In patients with a positive urine culture, a short course of antibiotics for a few days before TURP will reduce the likelihood of postoperative septicaemia.

Frequency-volume chart

Patients with nocturia should be asked to estimate the volume of urine they void at night. Elderly men and women lose the diurnal rhythm of urine production, whereby daytime urine output is greater than that at night. Production of large night-time volumes of urine—nocturnal polyuria—can be confirmed by getting the patient to complete a frequency-volume chart or voiding diary, where urine volume is recorded along with the time of each void (Fig. 4.2). It is not surprising that nocturnal polyuria, a fluid balance disorder rather than a prostate problem, does not improve following TURP. Failure to appreciate that nocturia could be due to nocturnal polyuria might account, at least historically, for nocturia being one of the least likely symptoms to improve following TURP. Many men treated with TURP for nocturia probably had nocturnal polyuria.

Serum creatinine

Serum creatinine should be measured to detect renal failure secondary to high pressure urinary retention[18,20,21]. An elevated creatinine may obviously also be due to primary renal disease, which by impairing renal

Figure 4.2 *Frequency volume chart.*

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7am 100 ml	7.30am 250 ml	8am 200 ml	7.30am 250 ml	7am 250 ml	7am 100 ml	7.30am 250 ml
10 am 300 ml	9am 200 ml	9.45am 200 ml	10 am 300 ml	10.15am 175 ml	9am 200 ml	10 am 300 ml
1pm 250 ml	1 1 am 200 ml	11am 250 ml	1pm 250 ml	12.00 150ml	1pm 250 ml	1pm 250 ml
4pm 200 ml	1.30pm 150 ml	1.30pm 150 ml	4.15pm 150 ml	2pm 150 ml	8.30pm 300 ml	2pm 150 ml
8.30pm 300 ml	4.30pm 150 ml	5pm 350 ml	6.30pm 200 ml	5pm 250 ml	10pm 250 ml	6.30pm 200 ml
11pm 200 ml	7pm 150 ml	8pm 200 ml	10pm 200 ml	7.30pm 150 ml	2am 250 ml	7.30pm 150 ml
1am 150 ml	10pm 250 ml	11.30pm 200 ml	2am 250 ml	11pm 200 ml	4am 200 ml	11pm 250 ml
4am 200 ml	2am 250 ml	2.30am 150 ml	4.30am 150 ml	3am 200 ml		2.30am 150 ml
	4.30am 150 ml 6am 200 ml	5am 200 ml				5am 250 ml

concentrating ability can lead to high day and night-time voided volumes and hence daytime frequency and nocturia. One should consider other causes for polyuria, such as poorly controlled diabetes, the resulting glycosuria causing an osmotic induced diuresis, with consequent frequency and nocturia. A simple urine dipstick test for glucose can make the diagnosis.

Post-void residual urine volume

Post-void residual urine (PVR) volume measurement—the volume remaining in the bladder at the end of micturition—is recommended by the 4th International Consultation on BPH[21], but is regarded as an optional test by the AUA[20] (Fig. 4.3).

Residual urine volume measurement is useful (along with measurement of serum creatinine) as a safety measure. It gives an indication about the likelihood of the patient experiencing back pressure on his kidneys and thus it tells the urologist whether it is safe to offer watchful waiting rather than TURP. The Veterans Administration Cooperative Study on Transurethral Resection of the Prostate has shown that in men with moderate urinary symptoms it is safe *not* to operate where the post-void residual volume is <350 ml[22]. In this study over 500 men with residual urine volume <350 ml were randomized to watchful waiting or TURP. Most patients in the watchful waiting arm did not progress to requiring a TURP nor did they show a rise in creatinine or in residual urine volume. At 3 years of follow-up in the watchful waiting group, average residual urine volume had actually decreased by 40 ml from baseline.

Bates *et al* have recently shown that when one observes men with large residual urine volumes over several years (rather than proceeding with

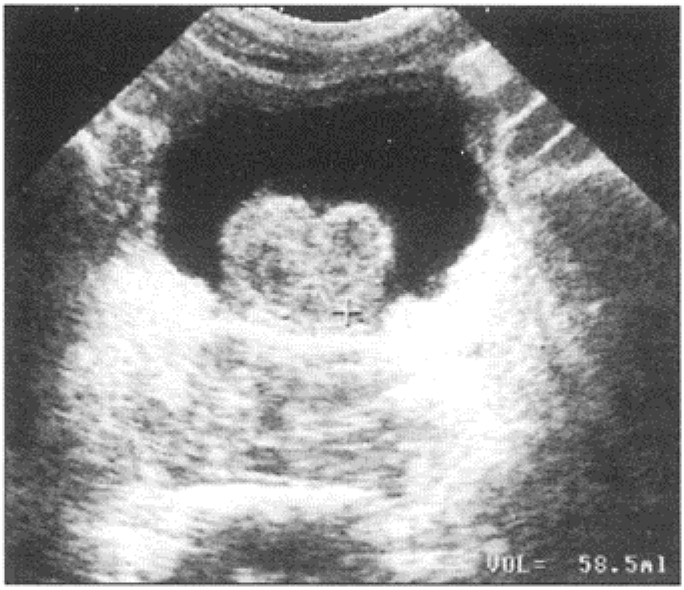


Figure 4.3 *Abdominal ultrasound scan showing a small volume of residual urine in the bladder (approximately 58 ml) and a large middle lobe impression.*

TURP) complications such as renal failure, acute retention and urinary tract infection are uncommon[23]. In this study, 93 men with residual urine volumes averaging 363 ml and ranging from 250 to 700 ml were observed for an average of 5 years. Over this time period residual urine volume remained stable in 50%, fell in 30% and increased in 20%. A third of men went on to have a TURP for serum creatinine elevation, acute retention, increasing residual urine volume or for worsening symptoms. Thus, one can 'get away' without the need for TURP in men with relatively high residual urine volumes, but as the study authors recommended, outpatient surveillance in this group of patients is a sensible idea.

One of the problems of using residual urine as an indication for TURP is its day to day variability. In a substantial proportion of patients there is considerable variation in residual volumes measured either on the same or on different days[24,25]. In two-thirds of men Birch *et al*[24] found wide variations in residual volumes on at least two measurements on the same day. Bruskewitz *et al* repeated residual volume measurements between two and five times on the same day by in and out catheterization and found wide variation within individual patients between repeat measurements[25]. Dunsmuir *et al*[26] measured residual volume in 42 men with 'BPH symptoms' on *different* days over a 3-month period and found that in two-thirds the volume varied between 150 and 670 ml! This represented an average variation within a single individual of 42% between repeated measures. Thus, a patient may have a high residual urine volume on one day and a low one on another. Which volume measurement does one then believe?

The second problem with residual urine volume measurement is that it cannot predict symptomatic outcome from TURP[27,28]. For these reasons, residual urine volume measurement is regarded as an optional test in the AUA guidelines.

It has been suggested—indeed it seems intuitive—that an elevated residual urine volume predisposes to urinary infection. There is surprisingly little evidence that this is the case. In fact, what evidence there is relating residual volume to urine infection suggests that an elevated residual urine may not, at least in the neurologically normal adult, predispose to urine infection. Riehmann *et al*[29] found that the presence of bacteriuria in 30 of 99 institutionalized men was *not* associated with residual urine volume, nor with age, previous diagnosis of 'BPH' or presence of urinary symptoms. Hampson *et al*[30] studied the presence of pyuria and active urinary infection in a large group of adult male and female patients, measuring residual urine volumes by ultrasound or during urodynamic studies. Pyuria and active urinary tract infection (UTI) were present in 18% and 10% of patients with a residual urine volume of <100 ml and in 26% and 18%, respectively, of patients with a residual volume >100 ml. There were no significant differences in the chances of pyuria or UTI between any of these groups and it was concluded that an elevated residual urine volume did not predispose to infection in neurologically normal adults.

Flow rate measurement

Measurement of flow rate (Fig. 4.4) is regarded as an *optional* test by the AUA[20], *recommended* by the 4th International Consultation on BPH[21], and the EAU BPH Guidelines state that it 'is *obligatory* prior to undertaking surgical treatment'[18].

In men with 'prostatic' symptoms, flow rate varies substantially on a given day[31] by an average of 2 ml/s between first and second voids, by 4 ml/s between the first and third void and by as much as 5 ml/s if a fourth flow is done. These changes occur in the absence of any change in voided volumes between repeated flow tests. Rather as with residual urine volume estimation, which flow rate should you base your decision on treatment on?

Uroflowmetry alone cannot distinguish between low flow due to bladder outlet obstruction and that due to a poorly contractile bladder. Some

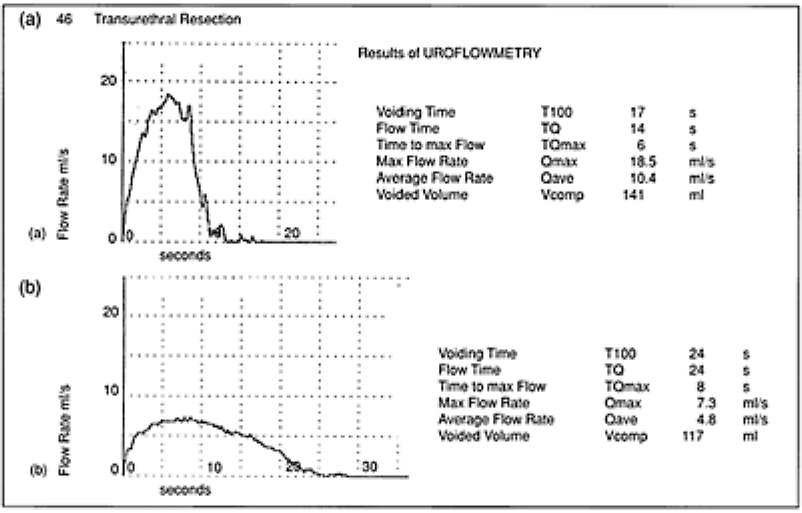


Figure 4.4 *Uroflowmetry.*

(a) A normal flow rate.

(b) In prostatic obstruction.

studies suggest that men with poor outcomes are more likely to have had higher flows pre-operatively compared with those with good outcomes[32–34], whereas other studies report equivalent improvements in symptoms whether or not pre-operative flow rate is high or low[27,35]. In the more recent Veterans Administration trial of TURP versus watchful waiting, Bruskewitz *et al*[28] found that flow rate could not predict the likelihood of a good symptomatic outcome after TURP.

So, whether one measures flow rate or not prior to TURP will probably depend very much on whether one is working in North America (in which case you may well not) or Europe (in which case guidelines recommend that you should).

Pressure-flow studies

Pressure-flow studies are probably better at predicting symptomatic outcome after TURP than are residual urine volume and flow rate. However, most patients without obstruction have a good outcome and the time and cost of performing pressure-flow studies routinely is perceived by most urologists as not worth the effort. A Gallup Organization poll of urologists carried out in the USA in 1995 perhaps provides the most telling statement about what practising urologists regard as important pre-operative ‘urodynamic’ measurements[36]. Of this random sample of 514 urologists, 53% routinely measured urine flow rates when evaluating men with symptoms of BPH, 71 % routinely estimated residual urine volume and only 11% routinely used pressure-flow studies. This must tell us something about the perception urologists have of the ability of these tests to help them in day to day decision making in men presenting with urinary symptoms thought to be due to BPH.

Renal ultrasonography

Koch has shown that renal ultrasound is only useful if serum creatinine is elevated above the normal range. The percentage of patients having upper tract dilatation on ultrasound according to their serum creatinine level was: creatinine <115 µmol/l, 0.8%; creatinine 115–130 µmol/l, 9%; and creatinine >130 µmol/l, 33%[37]. As a consequence Koch and colleagues recommended upper tract imaging only if the creatinine level was >130 µmol/l, if the residual urine volume was >150 ml with a serum creatinine between 115 and 130 µmol/l or in patients presenting with urinary retention.

In terms of diagnostic tests in patients with LUTS who we are considering for TURP we culture the urine and measure serum creatinine. We obtain a frequency volume chart where nocturia is a prominent symptom. We do not routinely measure urine flow rate or post-void residual urine volume, nor do we routinely perform renal ultrasonography in patients with a serum creatinine below 130 µmol/l.

Recurrent acute urinary retention

A focused history and examination combined with selected tests along the lines of those discussed above for a man presenting with symptoms should be carried out in any patient presenting with urinary retention.

Retention may be precipitated by a variety of factors in the absence of a significant degree of prostatic obstruction, and when the precipitating factor has resolved or been removed, the patient may enjoy many years of normal voiding without requiring a TURR The classic example would be postoperative urinary retention. This can be managed by a short period with a catheter and is often followed by successful voiding once the patient is more mobile, postoperative pain has settled down and the effects of anaesthetic and other drugs have washed out of his system.

Remember to exclude the rare but important causes of retention other than simple prostatic obstruction. Be particularly wary of the man with a history of constipation and of back pain which keeps him awake at night, especially if this has become severe in the weeks before the episode of retention. A neurological cause for retention should be excluded in such cases.

Many urologists will try to avoid proceeding straight to TURP after just one episode of retention, instead recommending a trial of catheter removal, with or without an alpha-blocker, in the hope that the patient will void spontaneously and avoid the need for operation. A trial without catheter is clearly not appropriate in cases where there is back pressure on the kidneys, so-called high pressure retention (see below). About a quarter of men with acute retention will void successfully after a trial without catheter[38–40]. Of those who pass urine successfully after an initial episode of retention, about 50% will go back into retention within a week, 60% within a month and 70% after a year. This means that after 1 year, only about 1 in 10 men originally presenting with urinary retention will not have gone back into retention. Recurrent retention is more likely in those with a flow rate <5 ml/s or average voided volumes of <150 ml. An alpha-blocker started 24 hours before a trial of catheter removal increases the chances of voiding successfully (30% taking placebo voiding successfully, and 50% taking an alpha-blocker[41]). However, whether continued use of an alpha-blocker after an episode of acute retention reduces the risk of a further episode of retention[42] is not yet known.

Comparable studies with prostate-shrinking treatments such as finasteride have not been done in patients who have already had an episode of retention. However, patients in retention from malignant prostatic obstruction may void successfully after a few weeks of an indwelling catheter and an LHRH agonist such Zoladex with cyproterone acetate 'cover'[43]. Hampson reported that in men presenting with acute retention with associated prostate cancer diagnosed on needle biopsy (retention volume <800 ml), 30% voided successfully within 1 month of starting treatment, another 30% voided within 2 months of starting treatment and another 20% voided at 3 months. Conversely, only 40% of those with larger retention volumes voided successfully after treatment with hormone therapy. Thus, a substantial proportion of men with malignant retention can avoid the need for TURP by treatment with hormone therapy, and for the elderly, frail man this may be an appealing option.

It is our pratice to recommend a trial of catheter removal in all men presenting with acute retention, as long as there is no evidence of back pressure on the kidneys. We give patients with retention and malignant prostates the option of treatment with an LHRH agonist followed by catheter removal 2–3 months after commencement of treatment.

High pressure chronic retention

Mitchell[16] defined high pressure chronic retention of urine as maintenance of voiding, with a bladder volume of >800 ml and an intravesical pressure above 30 cm H_2O, often accompanied by hydronephrosis[44]. Over time this leads to renal failure. When the patient is suddenly unable to pass urine, so-called acute-on-chronic high pressure retention of urine has occurred.

A man with high pressure retention who continues to void spontaneously may be unaware that there is anything wrong. He will often have no sensation of incomplete emptying and his bladder seems to be insensitive to the gross distension. Often the first presenting symptom is that of bedwetting. This is such an unpleasant and disruptive symptom that it will cause most people to visit their doctor. In such cases inspection of the abdomen will show gross distension of the bladder, which may be confirmed by palpation and percussion of the tense bladder. On catheterization a large volume of urine is drained from the bladder (often in the order of 1–2 L and sometimes much greater). The serum creatinine will be elevated and an ultrasound will show hydronephrosis with a grossly distended bladder if the scan is done before relief of retention. These patients may develop a profound diuresis following drainage of the bladder and a small percentage show a postural drop in blood pressure. It is wise to admit such patients for a short period of observation, until the diuresis has settled. A few will require intravenous fluid replacement if they experience a symptomatic fall in blood pressure when standing.

The treatment choices for high pressure chronic retention, whether the patient is able to void spontaneously or has gone into retention, are either a TURP or a long-term catheter[45]. A trial without catheter is clearly not appropriate in cases where there is back pressure on the kidneys. Very rarely a patient who wants to avoid a TURP and does not want an indwelling catheter will be able to empty their bladder by intermittent self-catheterization, but such cases are exceptional.

Recurrent haematuria due to benign prostatic enlargement

An enlarged, vascular prostate may cause recurrent episodes of frank haematuria, sometimes resulting in clot retention or anaemia. Clearly other causes of haematuria such as bladder or renal cancer should be excluded. In terms of treatment there is some evidence that finasteride may be helpful. Kearney and colleagues[46] reported that 41 of 53 (77%) patients given finasteride for recurrent haematuria due to BPH experienced no further bleeding and similar results have been reported by others[47,48]. However, the effectiveness of finasteride compared with placebo has not been tested. We try to avoid TURP in patients whose main symptom is haematuria due to BPH, preferring instead to treat such cases with a 5-alpha reductase inhibitor.

Bladder stone

The presence of a bladder stone (Fig. 4.5) is a classic indication for TURP. In an autopsy study of over 1600 men and women, Grosse found that bladder stones were eight times more frequent in men with histological evidence of BPH (3.4% vs 0.4%). This implies that bladder stones are caused by bladder outlet obstruction due to BPH[49].

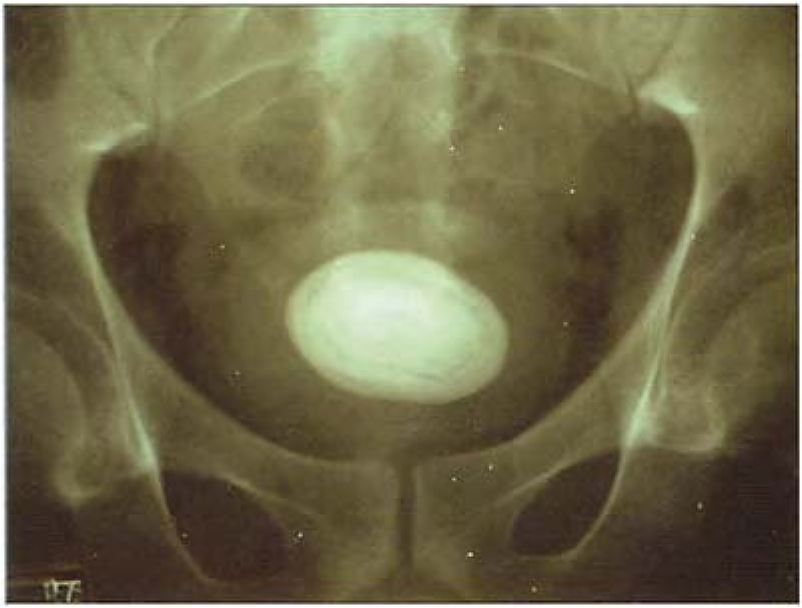


Figure 4.5 *A bladder stone.*

Preparation for TURP in the weeks before surgery

Stopping antiplatelet drugs and non-steroidal anti-inflammatory drugs (NSAIDs)

It is our current practice to stop antiplatelet drugs, including NSAIDs, 10 days prior to surgery.

The risk of postoperative bleeding in patients taking these drugs should be balanced against the risks of stopping antiplatelet therapy. There are no hard and fast rules. In a recent editorial review in the *British Journal of Urology* Mak and Amoroso stated that 'consideration should be given to withholding these agents before elective surgery', but no specific advice was given beyond this[50].

In a series of 125 TURPs, Thurston and Briant[51] reported that 50% of patients on aspirin (seven of 14) required more than 2 units of blood post-TURP compared with 30% in those not on aspirin. While this is not a great difference, those on aspirin who did require blood received on average 10 units each, suggesting that the postoperative bleeding in those on aspirin could be very heavy indeed. This was not a prospective study randomizing one group to aspirin and the other to placebo, so other differences between the aspirin and non-aspirin groups (such as greater age in the aspirin group) could explain the higher transfusion rate in the former. Wierod *et al*[52] found that patients undergoing TURP while on aspirin or NSAIDs received significantly more units of blood transfused than those not on these drugs: 11% of those on aspirin or NSAIDs required 2 or more units of blood compared with 5% of those not on these drugs.

The majority of studies support stopping these agents several days before elective surgery (10 days before for aspirin and 7 days before for the newer agents such as clopidrogel).

Anaesthetists are concerned about the possibility of causing epidural haematomas in patients undergoing regional anaesthesia such as epidurals while on antiplatelet drugs and NSAIDs. The combination of an antiplatelet agent with an NSAID seems to be worse than either agent alone[53]. This is another reason for stopping these drugs prior to TURP.

Haemoglobin, creatinine, typing and saving serum

It goes without saying that the haemoglobin level should be checked before any operation where there is the potential for blood loss. Serum creatinine should also be checked to determine whether there is impairment of renal function. Serum should be grouped and saved, as blood transfusion is required in a significant percentage of men. In the National Prostatectomy Audit approximately 8% of patients undergoing TURP for retention and 3 % of those undergoing TURP for symptoms required >2 units of blood.

Immediate pre-op preparation for TURP

Antibiotics

It is our current practice to give antibiotic prophylaxis for all patients undergoing TURP. Our choice of antibiotic is based on urine culture results done some weeks before surgery (a mid-stream specimen in those not in retention and a catheter specimen in those who presented with urinary retention). If an organism is grown which is sensitive to a specific antibiotic, we start treatment with this antibiotic 48 hours before operation and continue these for a total of 10 days (which for the majority of patients with an organism cultured before surgery means a short course of antibiotics continued after discharge). If the urine is sterile, we still give antibiotic prophylaxis in the form of oral nitrofurantoin 1 hour before the patient is called to the operating theatre, with a dose of intravenous gentamicin (1.5 mg/kg of weight) at induction of anaesthesia. When the catheter is removed a few days after surgery, again we administer a prophylactic dose of 100 mg of oral nitrofurantoin, again 1 hour before the catheter is removed. This policy is based on advice from our microbiology department, which routinely audits the organisms grown on urine culture, and appropriate antibiotic sensitivities.

Giving every patient antibiotics raises the chance of breeding multiresistant organisms and also runs the risk of antibiotic-associated complications such as allergic reactions and anaphylaxis. However, in practice if the prophylactic antibiotics are restricted to either a single dose or a 24-hour course, antibiotic resistance will either not occur or will be of no consequence. The risk of antibiotic resistance and of allergic reactions must be balanced by the risk of postoperative urinary tract infection and septicaemia.

Positive blood cultures and the risk of septicaemia seem to be reduced by routine prophylaxis[54]. A large and well designed randomized placebocontrolled study of over 750 men showed that in men with *sterile* urine prior to TURP, septicaemia occurred in 1.5% of patients receiving no antibiotic prophylaxis, but did not occur in those receiving a single dose or a short course of intravenous ceftazidime[55]. It could be argued that routine antibiotic prophylaxis is expensive, but the cost of avoiding the need to treat septicaemia—which often requires a period in the Intensive Care Unit—will more than offset the costs of a policy of routine prophylaxis. This study also showed that the postoperative UTI rate was substantially lower for those who received antibiotic prophylaxis. Again, this is likely to offset the costs of a policy of routine prophylaxis.

The optimum antibiotic prophylaxis prior to TURP has not been established. It is wise to seek the advice of your local microbiology department with regard to the local bacterial flora and patterns of antibiotic resistance, and to base your policy on their advice.

Antibiotics in patients with heart murmurs and artificial heart valves

The *British National Formulary*, a joint publication of the British Medical Association and the Royal Pharmaceutical Society of Great Britain[56] is widely used in the UK as a reference for indications for drug treatments. For patients with heart murmurs and those with prosthetic heart valves it recommends that 1 g of i.v. amoxycillin with 120 mg of gentamicin should be given at induction of anaesthesia, with an additional dose of oral amoxycillin 500 mg 6 hours later (substituting vancomycin 1 g for those who are allergic to penicillin).

Antibiotic prophylaxis for patients with joint replacements

The American Academy of Orthopaedic Surgeons (AAOS) and the American Urological Association (AUA) have issued joint advice on antibiotic prophylaxis in such patients[57]. Their advice is that antibiotic prophylaxis is not indicated for urological patients who have pins, plates or screws, nor for most patients with total joint replacements. They did, however, recommend that antibiotics be given to all patients undergoing urological procedures, including TURP within 2 years of a prosthetic joint replacement, for those who are immunocompromised (e.g. rheumatoid patients, those with systemic lupus erythematosus, drug-induced immunosuppression including steroids), and for those with co-morbidities including a history of previous joint infection, haemophilia, HIV infection, diabetes and malignancy

The antibiotic regime that has been recommended is a single dose of a quinolone, such as 500 mg of ciprofloxacin, 1–2 hours pre-operatively, plus ampicillin 2 g i.v. and gentamicin 1.5 mg/kg 30–60 minutes preoperatively (substituting vancomycin 1 g i.v. for patients who are allergic to penicillin). It is obviously sensible to culture the patient's urine pre-operatively and use alternative drugs if a specific organism is grown.

However, in the UK a Working Party of the British Society for Antimicrobial Chemotherapy[56] has stated that 'patients with prosthetic joint implants (including total hip replacements) do not require antibiotic prophylaxis… The Working Party considers that it is unacceptable to expose patients to the adverse effects of antibiotics when there is no evidence that such prophylaxis is of any benefit'. This advice is based on the rationale that joint infections are caused by skin organisms that get onto the prosthesis at the time of the operation and that the role of bacteraemia as a cause of seeding, outside the immediate postoperative period, has never been established.

Our policy is to use the same antibiotic prophylaxis as for patients without joint prostheses. Clearly those surgeons who work in the USA are likely to follow the advice of the AUA.

Prophylaxis against deep venous thrombosis and pulmonary embolism

As with many surgical procedures, TURP is associated with a risk of venous thromboembolism, in the form of deep venous thrombosis (DVT) or more seriously pulmonary embolus (PE). There is good evidence that patients undergoing TURP are in a hypercoagulable state[58]. In contemporary studies of complications following TURP (those published since 1990), between 0.1 and 0.2% of patients experience a pulmonary embolus[59] (see Chapter 11).

All patients undergoing TURP in our department are fitted with above-knee TED stockings (thromboembolism stockings) and these are worn until discharge. In addition, we routinely use intermittent pneumatic compression boots (Fig. 4.6) during the operation and until the patient starts to mobilize after the operation (usually the morning after surgery). We encourage early postoperative mobilization.

The American College of Chest Physicians (ACCP) Guidelines on prevention of venous thromboembolism are generally regarded to be the standard of care for DVT and pulmonary embolus prevention[60]. They are based on an extensive review of the literature relating to the prevention of venous thromboembolism. The quality of the evidence establishing the optimal DVT prophylaxis for urologic surgery is not as good as that for orthopaedic surgery and for this reason the ACCP guidelines state that for urological patients 'the optimal approach to thromboprophylaxis is not known'. This uncertainty presumably accounts for the variable approach to DVT and pulmonary embolus prophylaxis shown in a recent survey of British urologists; 80% of urologists responded to the survey. Three-quarters routinely used prophylaxis in men undergoing TURP and a quarter did not[61]. Of those who employed prophylaxis, 80% used mechanical methods, and 20% used heparin, either alone or with anti-thromboembolic stockings.

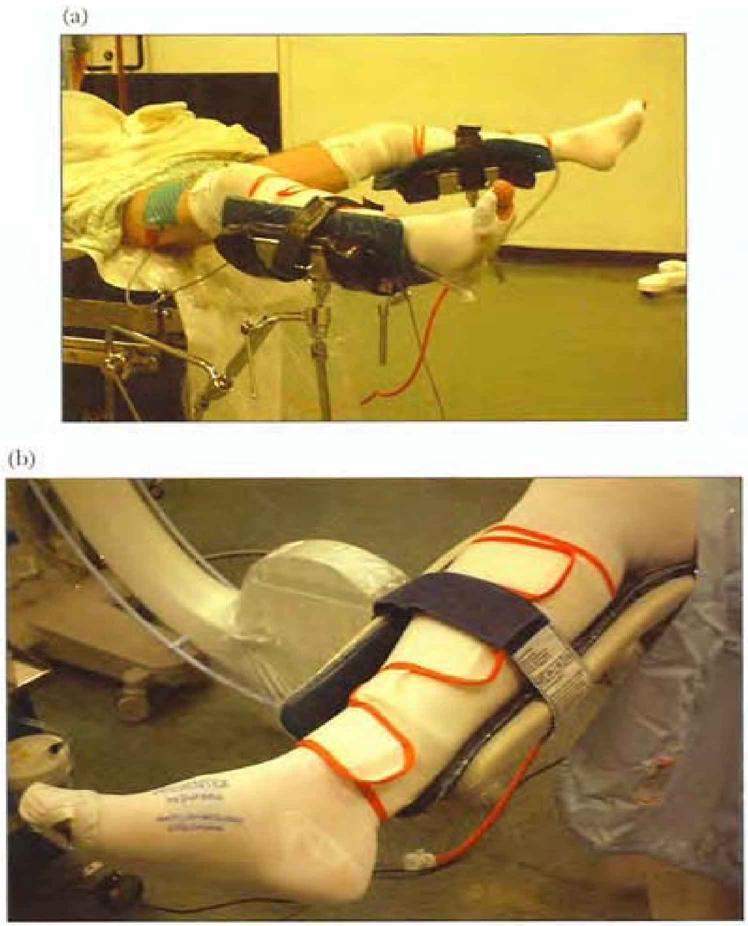


Figure 4.6 *Above-knee TED stockings (thromboembolism stockings) (a) and*

intermittent pneumatic compression boots (b) used to reduce the risk of deep venous thrombosis.

The options for prophylaxis include early postoperative mobilization, TED stockings, subcutaneous heparin (low dose unfractionated heparin or one of the newer low molecular weight heparins) or intermittent pneumatic compression boots. TED stockings provide graduated, static compression of the calves, thereby reducing venous stasis, and are known to reduce the risk of thrombosis and embolism after surgery[62]. Heparin, a sulphated glycosaminoglycan, is a naturally occurring anticoagulant in human tissue, which inhibits thrombin (factor Xa) and other intrinsic pathway coagulation factors. In unfractionated preparations the heparin molecules are polymerized with molecular weights ranging from 5000 to 30 000 daltons. Low molecular weight heparin is depolymerized so the molecular weight is in the order of 4000–5000 daltons. Intermittent pneumatic compression boots which are placed around the calves are intermittently inflated and deflated, thereby increasing the flow of blood in the veins of the calf. This has been shown to reduce the risk of thrombosis after urological surgery[63].

The American Guidelines on DVT and pulmonary embolus prevention and also the British Thromboembolic Risk Factors (THRIFT) Consensus Group[64] categorize the risk of development of venous thromboembolism from low to moderate to high risk. Low risk patients are defined by both groups as those aged under the age of 40 who are undergoing minor surgery, defined as surgery lasting <30 minutes, and with no additional risk factors. No specific measures to prevent DVT are required in such patients other than early mobilization. Clearly, patients undergoing TURP are not low risk, according to this definition. Increasing age and duration of surgery increase the risk of thrombosis and pulmonary embolism. High risk patients include those undergoing non-major surgery (defined by THRIFT as that lasting >30 minutes) who are aged >60. Most patients undergoing TURP are likely to be aged >60 years and will therefore fall into a higher risk group.

The ACCP recommends that such patients should receive either low dose unfractionated heparin 8-hourly or once-daily low molecular weight heparin or should be fitted with intermittent pneumatic compression boots. Combining one or other of these measures with above-knee TED stockings worn throughout the duration of the patient's hospital stay would seem a sensible way of reducing the risk of DVT and pulmonary embolus after TURP. The only contraindications to TED stockings are peripheral vascular disease and peripheral neuropathy. Patients may have additional risk factors such as a history of previous DVT or pulmonary embolism, and in this situation the recommendations are to use a combination of preventative measures, such as heparin together with intermittent pneumatic compression boots.

What is the risk of bleeding when heparin is used as DVT prophylaxis in patients undergoing TURP? The studies that have addressed this question have involved small numbers of patients, are inadequately powered from a statistical perspective and poorly designed, and moreover the results are contradictory. Wilson and colleagues[65] showed no difference in blood loss in 30 patients randomized to receive 5000 units of unfractionated heparin 2 hours before surgery when compared with 30 patients who received no heparin. A third of patients in each group received a blood transfusion. In a double-blind prospective study comparing heparin against normal saline, Bejjani *et al*[66] found no difference in the risk of pulmonary embolus or postoperative blood loss, but the study comprised just 34 patients. Conversely, Sleight[67] reported that low dose subcutaneous heparin significantly increased blood loss during and after TURP. In this non-randomized, non-blinded study comparing blood loss in 50 control patients followed by 48 patients who received heparin, 38 units of blood were required in the heparin group and 7 in the control group, for comparable resected volumes.

It is difficult to draw conclusions from these studies. Some surgeons favour use of subcutaneous heparin and do not perceive an increased risk of peri-operative bleeding with its use. Others do not use it, presumably because of a perceived fear of haemorrhage. Practice in situations where there are no specific guidelines is often based upon personal experiences. The surgeon who has experienced the death of a patient from pulmonary embolus is probably more likely to use heparin, whereas the surgeon who has experienced problems with heavy postoperative bleeding in a patient on heparin will probably use an alternative form of prophylaxis, such as anti-thromboembolic stockings or intermittent pneumatic compression boots. It is our current practice *not* to use heparin as thrombosis prophylaxis.

If you do use subcutaneous heparin as DVT prophylaxis, it is important to be aware of the potential risk of a spinal haematoma that can occur with spinal anaesthesia. Although rare, this complication can be devastating, leading to permanent paralysis. It occurs more frequently with low molecular weight heparin than with low dose unfractionated heparin. For those who use low molecular weight heparin, the American guidelines[60] state that insertion of a spinal needle should be delayed until the anticoagulant effect of low molecular weight heparin is minimal, which is approximately 12 hours after administration of subcutaneous low molecular weight heparin. It should also not be given for 2 hours after the spinal needle has been inserted. These guidelines also apply to low dose unfractionated heparin. Thus, if using heparin there is a 14-hour window (12 hours before and 2 hours after) around insertion of the spinal needle when it should not be given. Clearly communication with your anaesthetist is important to avoid such problems.

How should one manage those patients who are already on warfarin therapy because of a recent DVT, atrial fibrillation or because they have an artificial heart valve? The options are to keep them on warfarin while you do the TURP, or to stop the warfarin with or without anticoagulant cover with heparin.

One study suggests that transurethral resection may safely be performed despite warfarin treatment[68]. Four of the 14 patients in this latter study required transfusion of 2–4 units of blood and fresh frozen plasma was given in three. Only one case of clot retention was reported and no other serious complications occurred. Again, however, the numbers in this study were low and many surgeons will feel uncomfortable performing TURP in a fully anticoagulated patient. The decision has to be based on the individual patient's problems. Certainly withdrawing anticoagulant therapy can be associated with thromboembolic complications that threaten life or limb.

Stopping warfarin clearly exposes the patient to an increased risk of thromboembolism. In addition, there is some evidence that stopping warfarin can cause a rebound increase in clotting factors, leading to a hypercoagulable state[69], so compounding that which already exists in the patient undergoing TURP[58]. It has been estimated that a patient on warfarin for atrial fibrillation has a risk of stroke during the 4–6 days for which their International Normalized Ratio (INR) is subtherapeutic of up to 0.3%[70]. For a patient on warfarin because of venous thromboembolism, the risk of a recurrent DVT while off warfarin is approximately 40% within a month of the first DVT and approximately 10% at 3 months. For such patients it is best to postpone surgery for 3 months. For patients on warfarin because of a prosthetic heart valve, the risk of a stroke when warfarin is stopped is up to about 0.4% per day during which the INR is subtherapeutic[70].

For those who are not happy to perform TURP on a fully warfarinized patient, the ACCP Consensus Conference on Antithrombotic Therapy gives advice on management of oral anticoagulation around the time of surgical procedures[71,72]. For patients with a low risk of thromboembolism (e.g. DVT >3 months ago or atrial fibrillation with no prior history of stroke), warfarin should be stopped approximately 4 days before surgery, to allow the INR to return to a near-normal level, and prophylaxis such as subcutaneous unfractionated heparin (e.g. 5000 u every 8–12 hours) or low molecular weight heparin should be administered only at the time of surgery (the last dose of heparin being given 12 hours before surgery). It takes approximately 4 days for the INR to return to ≤1.5 in most patients, at which level surgery is safe[73]. For patients with an intermediate risk of thromboembolism (e.g. DVT between 1–3 months ago, those with artificial aortic valves) warfarin should be stopped approximately 4 days before surgery, to allow the INR to return to a near-normal level, and low dose subcutaneous unfractionated heparin (5000 u every 8–12 hours) or low molecular weight heparin should be started 2 days before surgery. For patients with a high risk of thromboembolism (e.g. DVT within the last month; those with mechanical mitral heart valves or old model—ball and cage—valves; atrial fibrillation with a history of stroke), stop warfarin approximately 4 days before surgery, allow the INR to return to a near-normal level and start unfractionated heparin as an intravenous infusion in hospital as the INR falls. The APTT (activated partial thromboplastin time) should be kept at approximately 2.5. The intravenous heparin is stopped about 3–4 hours before surgery so that the anticoagulant effect has worn off at the time of surgery and it is restarted as soon as possible after surgery, the precise timing depending on the colour of the urine in the irrigant fluid.

Shaving

There is no need to shave the skin before transurethral prostatectomy.

Anaesthesia

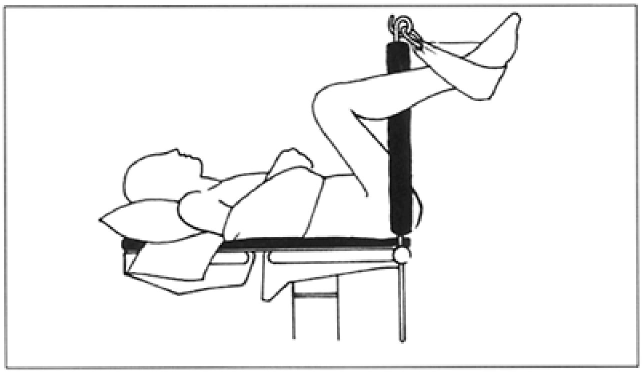
Many techniques of anaesthesia are suitable for transurethral surgery. No particular technique is uniquely suited to endoscopic work. Deliberate hypotension is preferred by some surgeons but in our experience it is not the level of the blood pressure which is critical so much as the absence of venous congestion.

Spinal anaesthesia is used by many anaesthetists as a routine. There are certain advantages to the patient being awake during the procedure. Although TUR syndrome is uncommon, one of the earliest indications that this is occurring can come from the awake patient reporting visual disturbance such as flashing lights. This early warning can allow the surgeon to end the procedure rapidly.

Position on the table

Special tables adapted for endoscopic surgery have the advantage that they can be raised or lowered by the surgeon. In many institutions, however, one must make do with the ordinary operating table, using

Figure 4.7 *Adjustable Lloyd-Davies supports.*



The wrong position for endoscopic surgery.

appropriate supports for the legs. Many different types of support are available (Fig. 4.7), and the important thing is that the legs are kept in the correct position with the thighs making an angle of no more than 45° with the plane of the table (Fig. 4.8). To have the legs in this almost flat position puts less strain on the heart[74]. The so-called lithotomy position, as used in operations on the anus, produces an awkward angulation of the prostate as well as sometimes causing backache afterwards.

Before applying the surgical drapes, the surgeon should take a few seconds to check that the patient is not in contact with any metal such as the drip stand or metal on the operating table, that pressure points are protected, and that the patient has above-knee TED stockings on (and

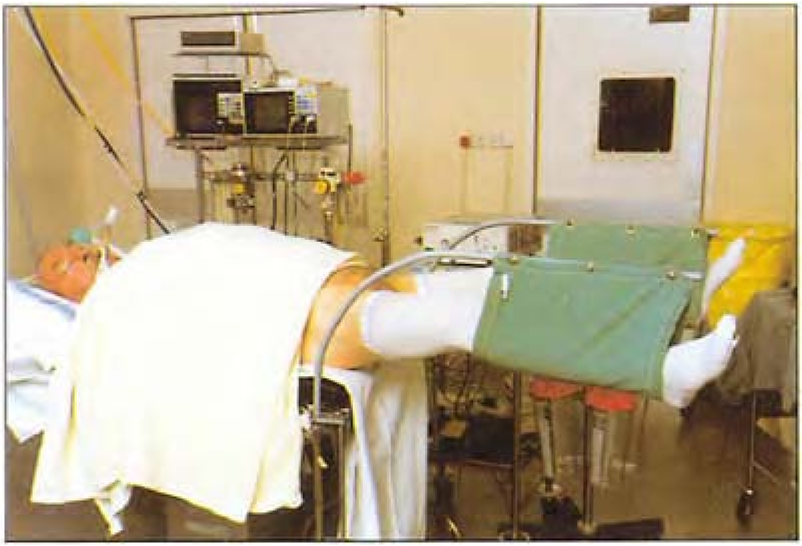


Figure 4.8 *Mitchell slings, which allow the legs to be almost horizontal.*

Flowtron intermittent pneumatic compression boots if these are to be used). Ensure that the patient is positioned at the end of the table so that the resectoscope can be moved freely. If the patient is positioned too far from the end of the table it will be difficult to swing the resectoscope downwards when access to the prostate in the 10 to 2 o'clock position is required (Fig. 4.9).

Diathermy pad

The earth pad is placed on the thigh, if necessary shaving a very hairy thigh. The appropriate safety devices should be checked to ensure that adequate contact has been made.

Skin cleansing

The skin of the genitalia and scrotum should be cleaned with a nonalcoholic antiseptic agent: iodine is avoided in view of the risk of causing a severe allergic reaction on the skin of the scrotum. The cleansing solution is applied with swabs held in forceps in the usual way. It is necessary to retract the prepuce and clean behind it.

Drapes

The legs are enclosed in roomy leggings or special disposable TUR drapes which are provided with a finger-cot to allow rectal examination during the procedure (Fig. 4.10). The camera is covered in a camera sleeve (Fig. 4.11) or a camera which can be sterilized between cases is used.

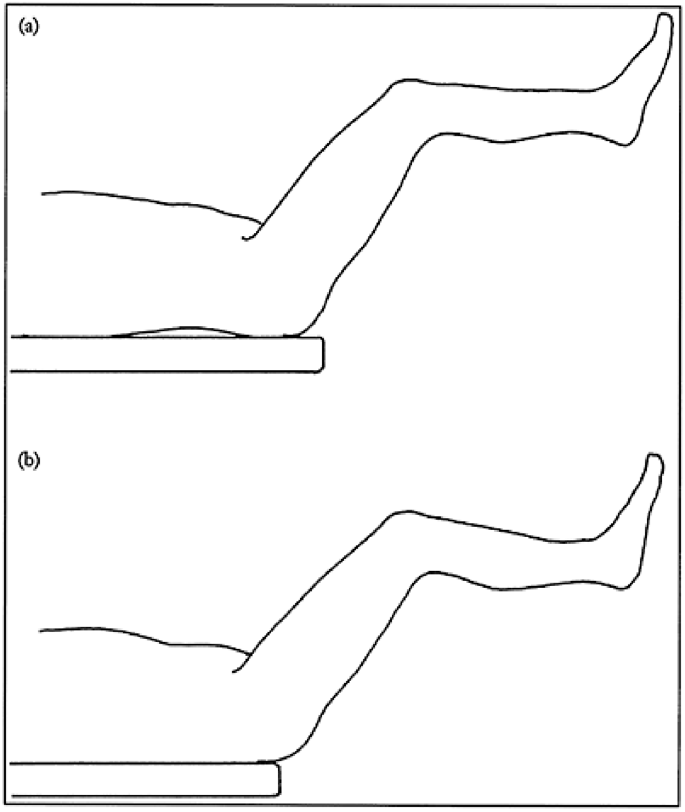


Figure 4.9 *(a) Positioning the patient too far up the table can make it difficult to swing the resectoscope*

downwards when access to the 10 to 2 o'clock position is required. (b) The correct position of the patient relative to the end of the operating table.

Preparation of the urethra

The urethra must be properly lubricated before introducing any instrument, and here the surgeon should follow the example of the engineer who always fills a cylinder with oil before inserting a piston into it. We use water-soluble gel containing dilute chlorhexidine: thereafter all the instruments are well 'buttered' with gel before being inserted. This is repeated whenever one feels the instrument dragging on the urethra.

Figure 4.10 *All-in-one drape for transurethral resection.*

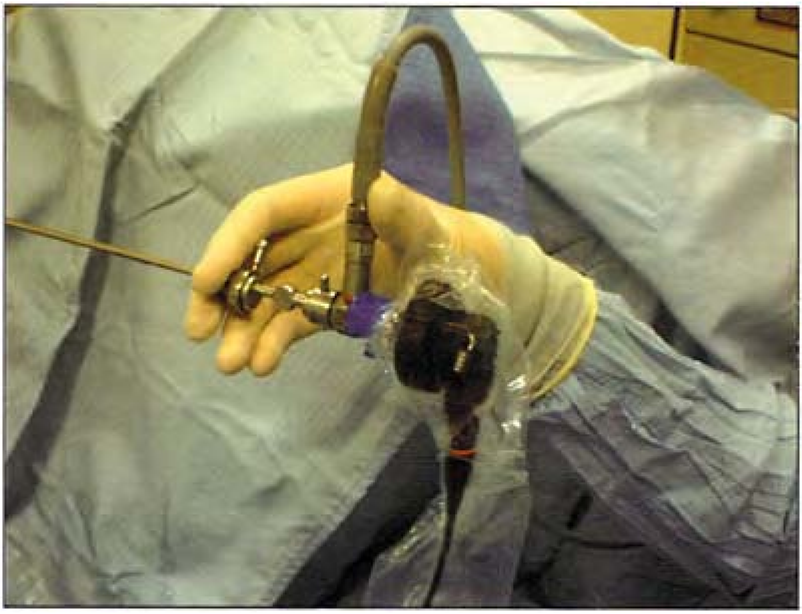


Figure 4.11 *The camera is covered in a camera sleeve.*

Urethroscopy

After lubricating the urethra it is examined from end to end using the 0° or 30° telescope advanced under direct vision. This reveals a surprising number of soft annular strictures in the normal bulbar urethra. Once within the prostatic urethra care is taken to estimate the size of the gland and the distance from verumontanum to sphincter and to bladder neck. The sphincter is identified carefully.

Cystoscopy

The interior of the bladder is inspected with a 30° or 70° telescope. Special search is made for small tumours, especially those that may lie hidden behind the bump of the middle lobe, calculi that might need to be crushed and evacuated, and diverticula which must all be carefully examined to rule out stone or cancer.

Urethrotomy

Once the decision has been taken to go ahead with transurethral resection the 24Ch sheath is introduced. If the urethra is at all tight, avoid the temptation to force the resectoscope sheath into a urethra that is too small to accept it. It takes just a few minutes to pass an Otis or similar urethrotome, and incise the urethra at 12 o'clock along its last 4 or 5 cm (Fig. 4.12). The urethrotome is passed with its blades closed, right into the bladder. Withdraw it past the external sphincter, open the blades to 30Ch in the mid-bulb, advance the knife and withdraw the instrument. If the urethra is examined after 6 weeks or so all that is left of the incision is a fine white line (Fig. 4.13).

Bailey and Shearer[75] performed a prospective study on 210 consecutive patients undergoing TURP, randomizing them either to full-length pre-

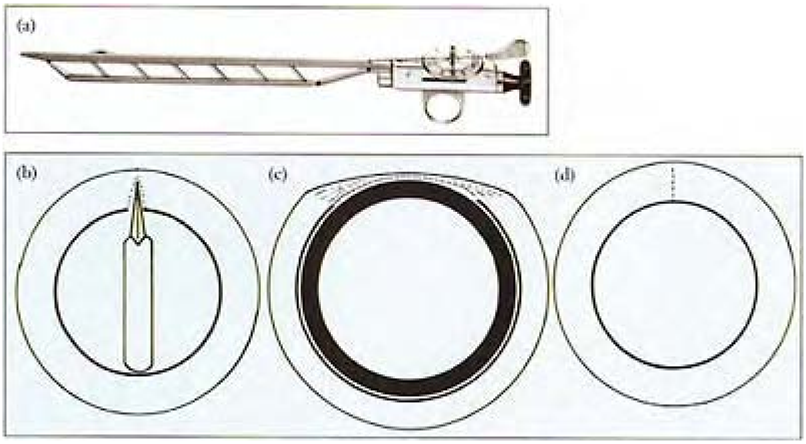


Figure 4.12 *(a) Otis urethrotome. Courtesy of KeyMed.*

(b) Clean incision of urethra.

(c) Large calibre sheath goes in easily.

(d) Heals without narrowing.

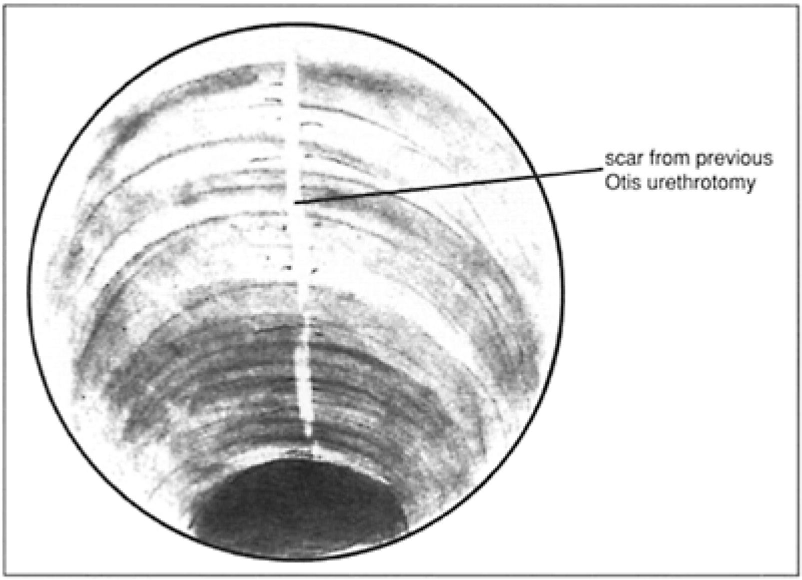


Figure 4.13 *After a few weeks the site of urethrotomy is seen as a thin white scar, without any stricture.*

TURP internal urethrotomy (with the urethrotome set to 30Ch) or to pre-operative urethral dilatation (to 30Ch), according to the day of the week on which surgery was performed. Strictures were diagnosed on the basis of symptoms suggestive of a stricture (it was not deemed ethical to perform routine postoperative urethroscopy). Two patients in the urethrotomy group (2%) and 9 in the dilatation group (10%) developed strictures. Those in the dilatation group were at the external meatus, in the navicular fossa, at the peno-scrotal junction or in the membranous urethra.

And finally…

Once the resectoscope is in position within the prostatic urethra, make yourself comfortable. Position the irrigation tubing, the light lead and the camera so that they will not become tangled in a great knot as you swing the instrument clockwise and anticlockwise through 360°. Some surgeons like to lock the camera in position, while others prefer to let it hang loosely in the 6 o'clock position. It does not matter, as long as you know where you are in relation to the verumontanum. Position the foot pedals in the most comfortable position. Some surgeons like both the diathermy and cutting current pedals on one foot, others prefer one on the left and the other on the right foot. Position the height of the patient and of your stool so that your hand and arm are comfortable. Use a stool with wheels so that you can adjust your position relative to the patient with ease. Check that you can move the resectoscope freely from side to side and up and down, without hitting the patient's legs or the operating table. If you are not happy with the position you or the patient are in, change it until you are happy. Now you can begin.

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Chapter 5
The basic skills of transurethral resection

Just as in general surgery it is necessary to learn to make a clean incision with the knife, to tie a secure knot, to handle tissue with delicacy and to secure haemostasis with the minimum of trauma and tissue necrosis, so in transurethral surgery there are certain basic steps which the beginner has to master. Many of them can be learned on models and appreciated by watching a more experienced surgeon at work. Others can only be learned solo.

Cutting a chip

Cutting chips from prostate or bladder tumours can and must be practised before the beginner tries to resect in a live patient. A number of surgical 'workshops' provide such experience, and use models which have been developed to feel as close to the 'real thing' as is possible. The loop of the resectoscope cuts like a knife through butter without any effort: but it requires a little time to do its work. The cutting is carried out by a halo of sparks between the diathermy electrode and the tissues (see page 21). The cutting takes place without contact, but it takes a little time for the sparks to do their work. No force is ever required. The rate at which you work is limited by the rate of disruption of the tissues.

The shape of the chip is like a canoe (Fig. 5.1). It is as wide and deep as the loop, and its length is determined by the travel of the loop plus

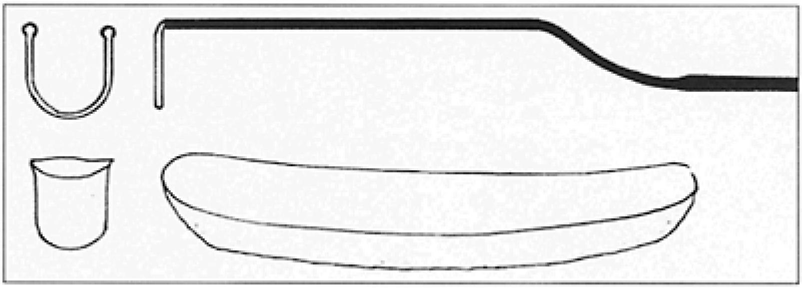


Figure 5.1 *The TUR chip is shaped like a canoe; it should be as deep and broad as the loop, and as long as the travel of the loop in and out of the*

sheath plus the distance you move the sheath.

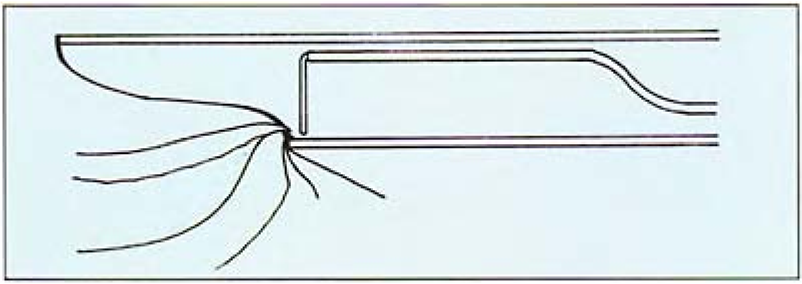


Figure 5.2 *The usual method of cutting the chip off against the edge of the sheath.*

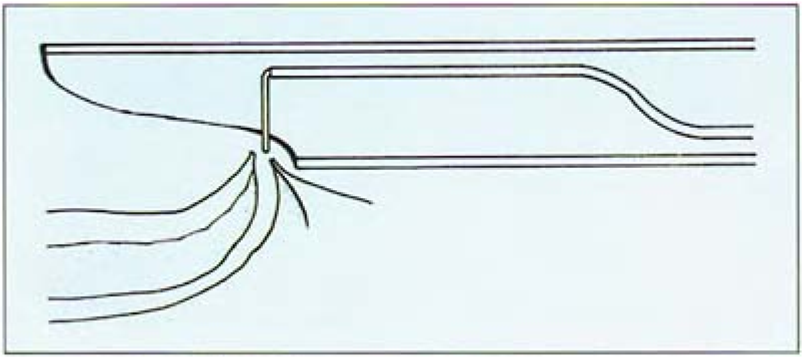


Figure 5.3 *Cutting the chip off before the loop enters the sheath prevents any possible damage to the telescope.*

the extra length gained by moving the sheath in and out. There are two methods of cutting off the chip. The usual method is to sever the chip against the edge of the resectoscope sheath and for this reason many of the old masters such as Barnes insisted on a loop which entered 1 or 2 mm inside the sheath[1] (Fig. 5.2). The second technique, advocated by Nesbit, was to bring the loop out completely before entering the sheath[2] (Figs 5.3 and 5.4).

If the loop goes too far inside the sheath sparks may damage the lens of the telescope and cause expensive damage, and for this reason some instrument makers design the loop so that it will not go inside the sheath. In practice, most urologists use the Barnes method, and will bend the loop: this is perfectly safe so long as there is still a gap between loop and lens (Fig. 5.5).

In time the edge of the sheath always gets more or less burnt away and when this is corrected by bending the loop the result can be disastrous,

Figure 5.4 *Cutting a chip: (a) the loop is sunk into its full depth, (b) drawn towards you and (c) cut off before the loop enters the sheath.*

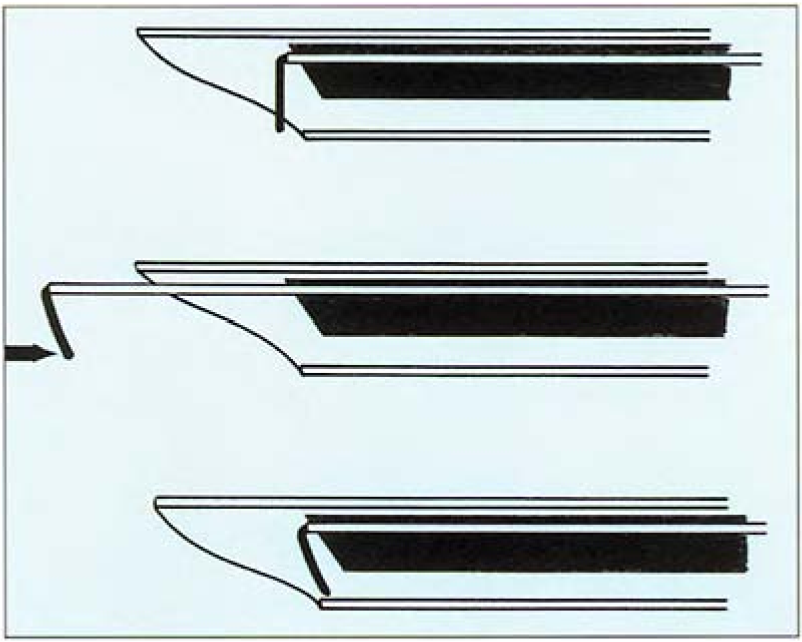


Figure 5.5 *It is safe to bend the loop to allow it to enter the tip of the sheath so long as there is a gap between loop and telescope.*

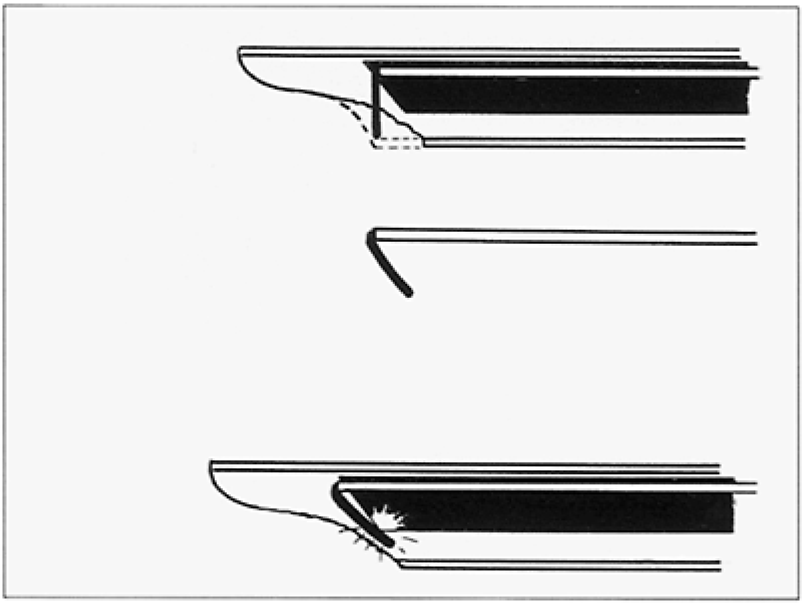


Figure 5.6 *If the end of the sheath has been burnt away, and you continue to bend the loop, you risk damage to the telescope from the diathermy spark.*

with a spark arcing across the lens, thereby fracturing it (Fig. 5.6). The first rule, then, when starting to put the resectoscope together at the beginning of the operation, is to check the end of the sheath and the position of the loop. Send for an undamaged sheath even if this causes delay in the operation. A spare resectoscope sheath is a great deal cheaper than a new telescope.

Rhythm

It is important to develop a smooth rhythm when performing transurethral surgery (Fig. 5.7). Begin by lifting up the handpiece to let the loop sink in as you start the stroke, and end by depressing it to lift out the loop. In a bladder tumour the action is similar although one must take care not to sink the loop too deeply into the wall of the bladder.

When resecting the bulk of the lateral lobes of the prostate, once the landmarks have been established, time is saved by making sure that every stroke removes the maximum amount of tissue, i.e. the depth of the chip should be at least that of the loop and its length as long as that of the lateral lobe even if this means moving the sheath outwards, always making sure that you know the exact situation of the verumontanum.

If the electrode does not spark cleanly it will not cut, but will coagulate or char the tissue (Fig. 5.8). This is most likely to occur if you press the loop into the prostate instead of letting the sparks do the work. A crust of carbonized tissue may cover the loop. Clean it and start again.

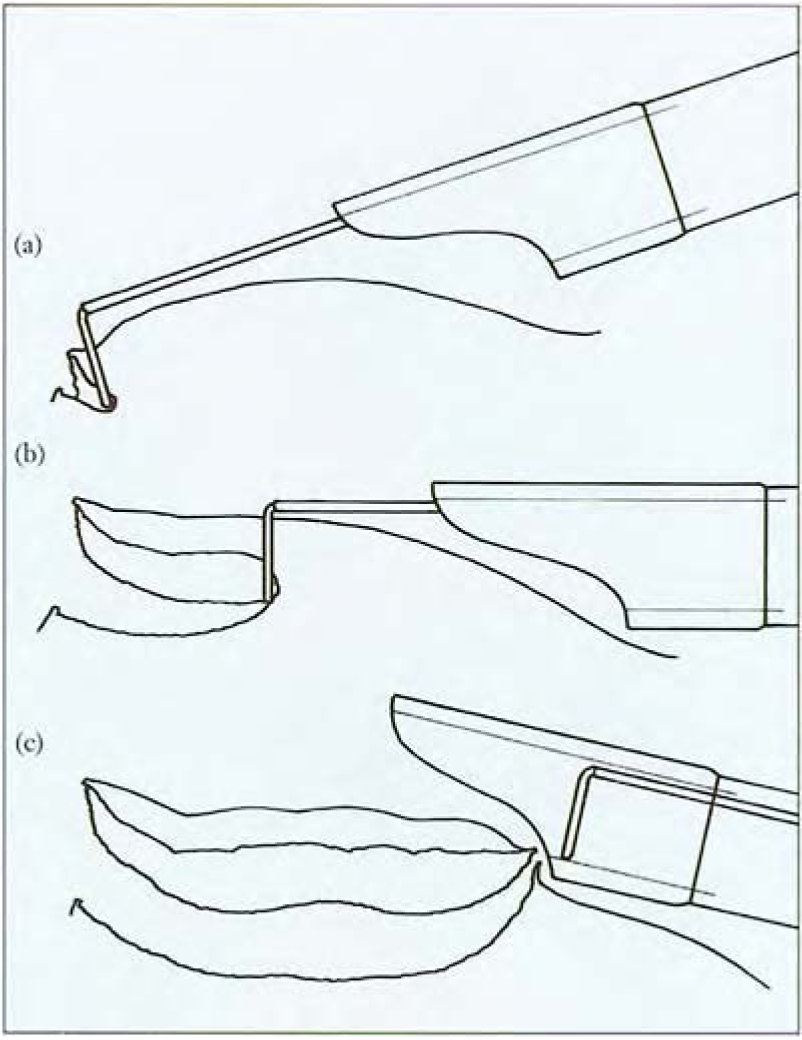


Figure 5.7 *Cutting a chip: (a) lift the resectoscope to allow the loop to sink in, (b) keep it level as you cut the chip and (c) depress the sheath to cut off the chip.*

If the loop does not cut at all, do not respond by asking for the current to be increased. Instead, carry out the following checks:

1. Make sure that the loop is sitting firmly in its holder. A 'click' can be felt and heard as the loop fits into the holder.
2. Check that the loop is not broken.
3. Check that the diathermy plate is securely attached to the thigh.
4. Check that the diathermy lead is attached to the machine.
5. Check that the wire within the diathermy lead has not worked loose at either end.
6. Check the irrigating fluid: a common mistake is for the theatre team to hang a bag of saline instead of glycine.

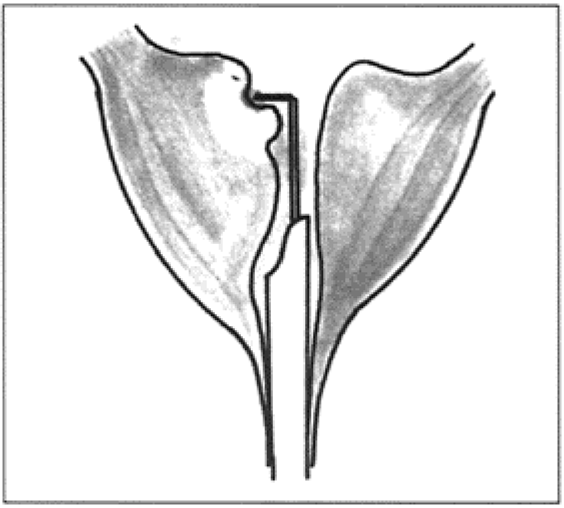


Figure 5.8 *If the loop does not strike sparks it will cause deep local coagulation.*

If all these items have been checked and the loop still does not cut, you must change the diathermy machine. You cannot resect with a loop which merely chars: it drags in the tissues, makes it difficult to cut cleanly, and worse, risks producing a deep burn in the underlying tissues which may damage the sphincter.

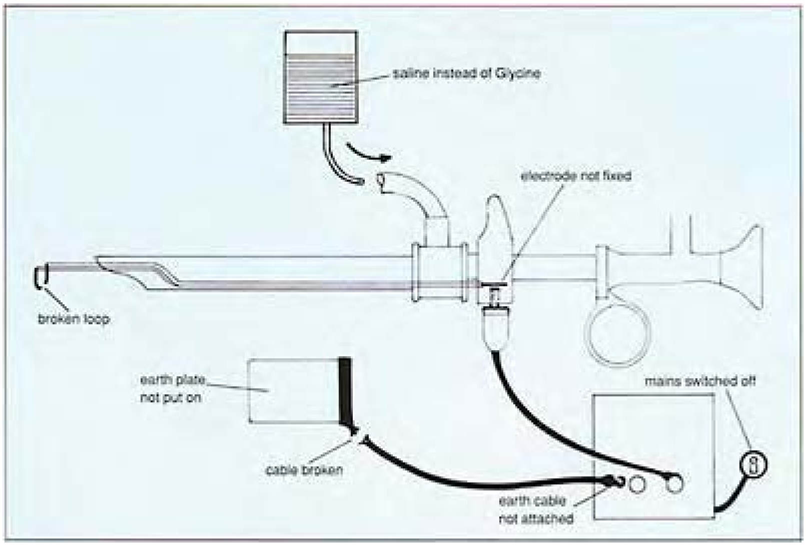


Figure 5.9 *If the loop does not cut, check these causes of failure before asking for the current to be increased.*

Haemostasis

Most of the light oozing which occurs during a resection comes from small veins which are cut as you resect the adenoma. This type of bleeding is minimized by using a continuous flow Iglesias irrigating system, but it should be stopped as you go along in order to keep a clear view. Any arterial bleeder should be controlled as soon as you see it by touching it with the loop and applying the coagulating current for a moment (Fig. 5.10). There is the typical noise of the coagulating circuit but there should be no charring or burning, only cessation of bleeding and a little whitening of the tissue.

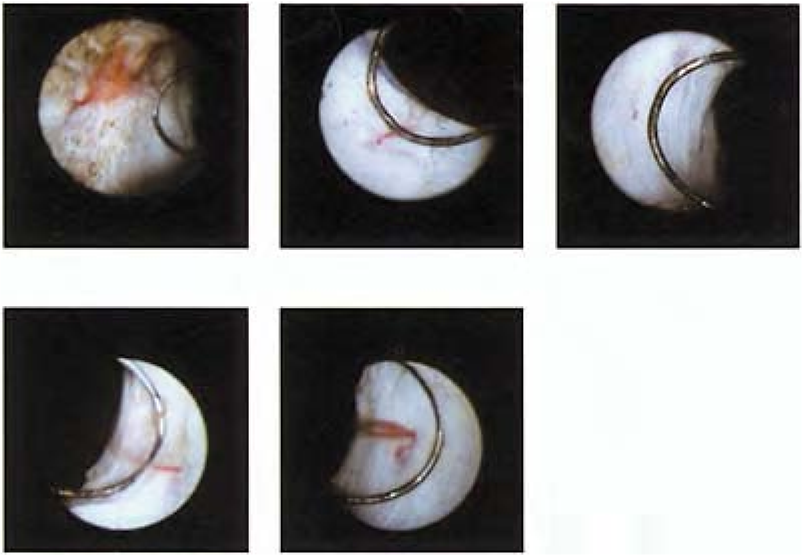


Figure 5.10 *Typical endoscopic appearances of sealing a small artery.*

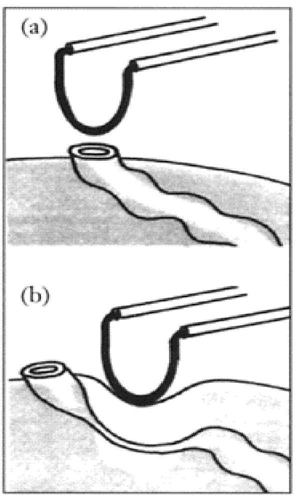


Figure 5.11 *(a) A larger vessel may not be controlled by coagulating its mouth; the trick is (b) to squeeze the walls together by applying the loop*

just to one side to seal them with the coagulating current.

When an artery is larger or thickened by atheroma it may be more difficult to close it off merely by touching its mouth. A useful trick is to compress the tissue to one side or other of the orifice of the artery (Fig. 5.11) so as to squeeze its walls together and allow the coagulating current to seal them.

Occasionally you will be misled by ‘bounce’ bleeding, when a fierce jet of blood rebounds off the opposite wall of the prostatic fossa: the appearance is easily recognized once it has been seen before (Fig. 5.12). The wily operator soon learns to turn his attention to the contralateral wall of the prostatic fossa to seek the true source of bleeding.

Another common source of confusion is the artery which is shooting out straight at the telescope. All you can see is a uniform red haze. The trick is to advance the resectoscope beyond the bleeder, angulate it to compress the vessel, and then slowly withdraw the sheath until the opening of the artery is betrayed by the emergence of a puff of blood (Fig. 5.13).

Coagulating just upstream of the artery will seal it off (Fig. 5.14). When you encounter large veins, multiple vessels set close together, or several atheromatous arteries which do not seal with the loop, change the loop for the roly-ball electrode (Fig. 5.15) and apply this sparingly

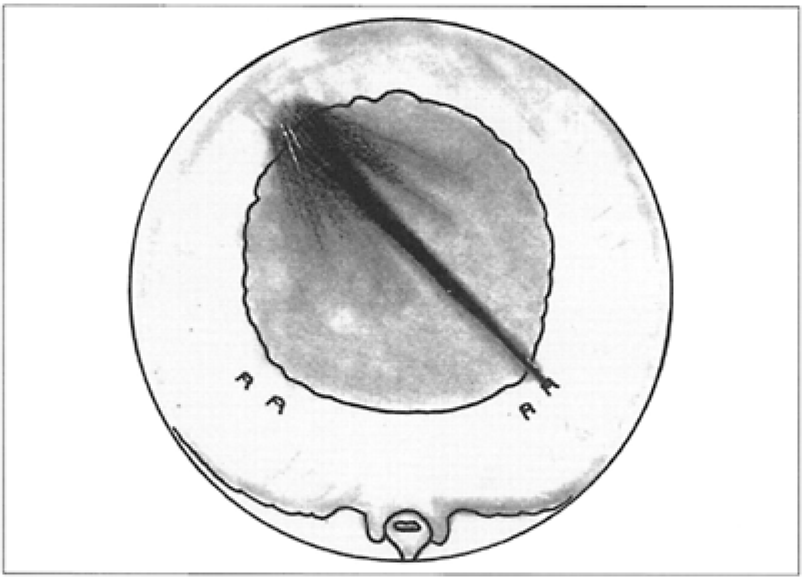


Figure 5.12 *Bounce bleeding.*

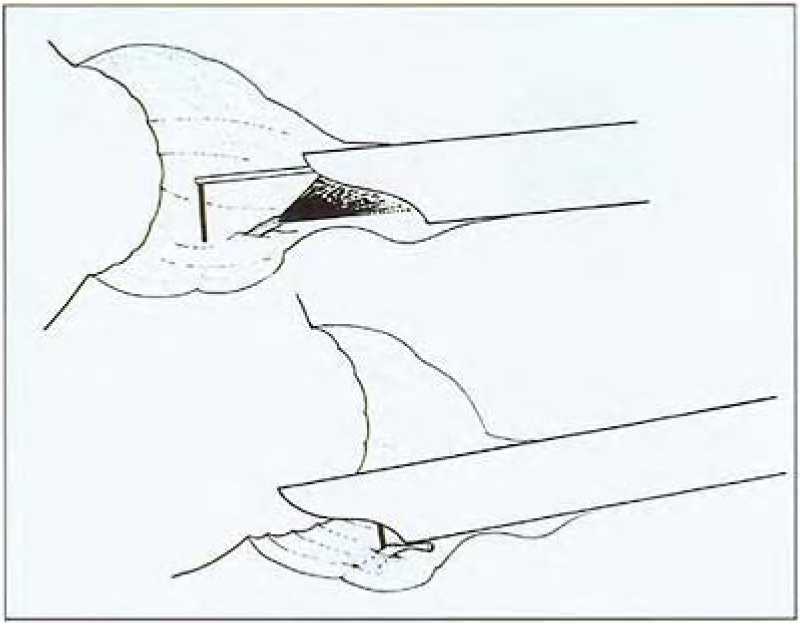


Figure 5.13 *When an artery points straight at you all you can see is a red blur. The trick is to advance the sheath, tilt it to squeeze the vessel, and coagulate just upstream.*

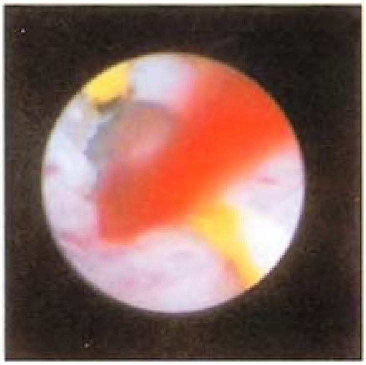


Figure 5.14 *An artery bleeding straight at you. The loop will coagulate it just upstream.*

Figure 5.15 *Coagulation with the loop.*

to the source of the haemorrhage. Take care not to overdo the coagulation with the roly-ball: it produces heat at a depth which is proportional to the square of its diameter and invites late secondary haemorrhage.

Prophylactic coagulation

Sometimes it is obvious from the moment you pass the cystoscope that the resection is likely to be bloody. You can save yourself trouble by making a prophylactic attempt to control the main arteries before you

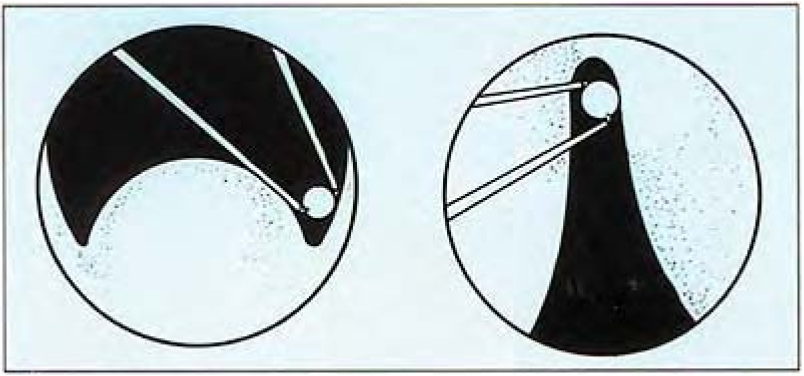


Figure 5.16 *Prophylactic coagulation of the main prostatic arteries at 2, 5, 7 and 10 o'clock.*

start to resect. Using the roly-ball coagulate the prostate at 2, 5, 7 and 10 o'clock (Fig. 5.16) where the main arteries enter the gland. This simple measure minimizes subsequent bleeding, and may be repeated later on during the resection should bleeding recur.

Veins

Veins are more difficult to detect than arteries, especially if the pressure of the irrigating fluid is equal to, or greater than, the pressure in the veins of the pelvis. For this reason you may see no venous bleeding at all during the resection, but as soon as the handpiece is removed there is a copious flow of blood.

Having sealed off all the arteries, the trick in finding the little veins is to slow down the inflow of irrigating fluid by adjusting the tap on the resectoscope until you can hardly see the tissue: little clouds of blood betray the position of the veins, which should be coagulated. It is worth taking time to go over the entire inner surface of the capsule at the end of the operation to seal them all. Time spent on this manoeuvre is time well spent.

Even so, there are some patients in whom, despite prolonged and patient haemostasis, there is still a copious ooze of venous blood. Here tamponade is effective. A catheter is passed on a curved introducer to make sure it does not catch under the bladder neck. Sterile water (40 ml) is injected into the balloon while it is well inside the bladder, and then the catheter is firmly drawn down so that the balloon compresses the

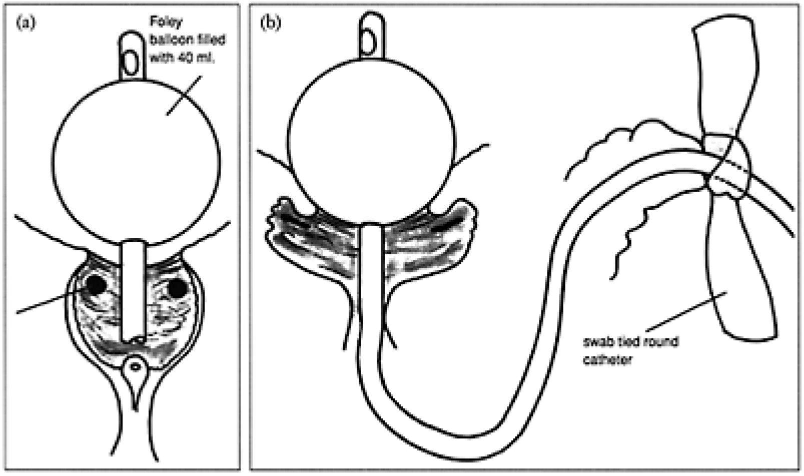


Figure 5.17 *The Foley balloon is filled with 40 ml of sterile water (a) and pulled down to compress the veins at the bladder neck (b): traction is maintained by a gauze swab tied round the catheter and pulled back onto the glans penis.*

neck of the bladder where most of the offending veins are situated (Fig. 5.17). Pull the catheter down, and maintain traction for 8–10 minutes, passing the time by discussing politics or football with your anaesthetist. Before doing so, ask the nurse not to clear the equipment away, but to keep it sterile in case you need to re-insert the resectoscope to achieve better haemostasis. It is far easier and faster to sort the bleeding out now while the patient is on the operating table, anaesthetized, and the equipment is still available, than to bring him back from recovery and start all over again.

Often the bleeding will have been controlled by this period of traction. If not, never hesitate to reinsert the resectoscope to double-check that you have not missed a bleeding vessel. Briskly bleeding arteries just inside the bladder neck at roughly the 12 o'clock position can easily be missed, so look here in particular.

Once you are happy that there are no more bleeding vessels to control, reinsert the catheter and maintain traction by means of the Salvaris swab: two gauze swabs are tied moderately tightly around the catheter and pushed up against the glans penis. These swabs should be removed after 20–30 minutes lest a pressure sore be formed on the glans.

Evacuation of the chips

Whenever one breaks the rhythm of resection to remove chips, time is wasted so keep the number of evacuations to the minimum, i.e. when the chips begin to fall back into the empty prostatic fossa and get in the way of the loop.

Of all instruments for removing clot and chips from the bladder, the evacuator designed by Milo Ellik[3] is the most simple and effective (Fig. 5.18a). Make sure that two of them are always filled and ready. Make sure also that you have mastered the knack of filling them and getting rid of all the air. The purpose of the bulb is to allow the irrigating fluid to go in and out of the bladder, to swirl it around and allow the chips and clot to float out of the bladder and fall down into the chamber. It must be used gently: if used roughly it is possible to rupture the bladder (particularly in old ladies with thin bladders who have undergone bladder tumour resection). The irrigation inflow valve can be left open as a sort of 'safety valve' to take some of the pressure off the bladder each time the Ellik is squeezed. Some surgeons prefer a wide nozzle hand syringe (called by some a Toomey syringe) to the Ellik: readers should try for themselves. Disposable, one-use only sterile Elliks are used in many hospitals nowadays, partly because of concerns about adequacy of sterilization of the components of the old multi-use Elliks (Fig. 5.18b). The receptacle for the prostate chips or bladder tumour can

(a)

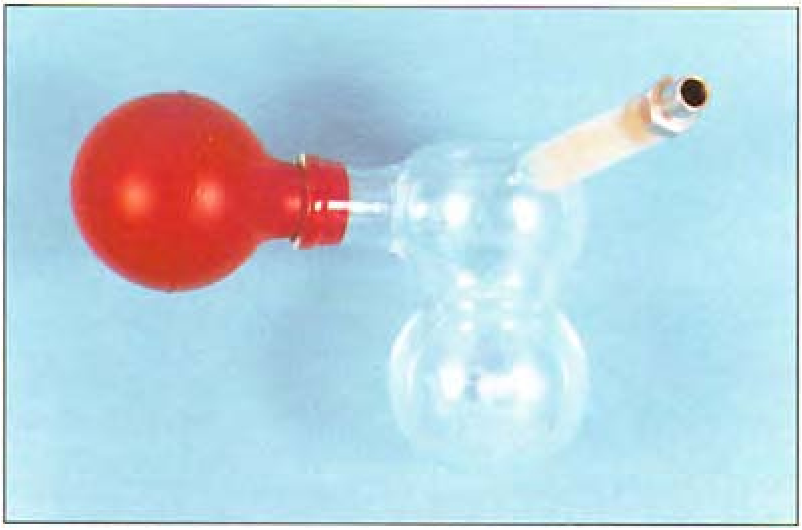


Figure 5.18 *(a) Ellik's evacuator.*

(b)

(c)

(b) Disposable, one-use only sterile Ellik evacuator. (c) The chips of resected tissue can be sent for pathological examination in the container of the Ellik.

be filled with formalin after the operation is over and sent directly to the pathologist as the specimen pot. The disposable Elliks have the added advantage of a flap valve which stops evacuated tissue from flying back into the bladder, and they do not break when you drop them on the floor.

Keeping a clear view

Nothing is more important in resecting prostate or bladder tumour than being able to see what you are doing. There are many causes for a dim or obscured view, and some of them are worth mentioning for the beginner.

1. Bubbles on the lens may be caused by hydrolysis of the water by the electric sparks and cannot be avoided, but a more tiresome (and avoidable) source of bubbles can be traced to faulty connections of the tube and bag of irrigating fluid. The continuous flow resectoscopes minimize both types of bubble, but do not entirely avoid them (Fig. 5.19). When bubbles form, stop the flow of irrigant for a second

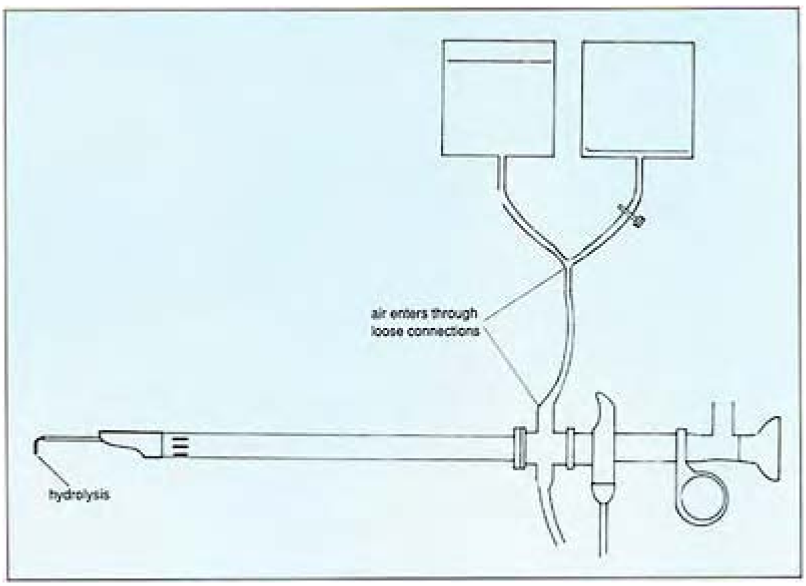


Figure 5.19 *Causes of bubbles in the field of vision.*

and allow water to run out. If the bubbles persist, tap the telescope smartly in and out a few times.

2. A particularly irritating habit of the novice is to finger the eyepiece with a glove moistened with saline or lubricating gel. Others, given their first chance to look down the telescope, huff and puff on the eyepiece. These lenses are made of soft optical glass and should only be cleaned with soft lint rather than cotton gauze which might

scratch them. The best prevention is vigilance on the part of the surgeon and the application of the general rule that the eyepiece is regarded as surgically 'dirty'. Water may also not have been wiped off the lens of the telescope or the camera before the camera is attached to the telescope. Check that they are both dry before connecting them.

3. In conventional irrigating systems the most common cause for want of clear vision is obstruction of the water inflow (Fig. 5.19), usually because an inattentive nurse has let the bag run out. This happens on a boringly regular basis, so keep an eye on the bag from time to time and warn the nurse that you need more fluid well in advance. Sometimes the inflow becomes kinked or twisted. In continuous flow systems there may be imbalance between the negative pressure in the suction and the rate of inflow of the irrigating fluid. For this reason inflow and outflow taps must be under the control of the surgeon.
4. Whatever system of irrigation is used the inflow will stop when the bladder is so full that it can take no more. Since this means that the pressure inside the bladder has risen, this is a state of affairs that should never be allowed to occur. This situation can occur with continuous irrigation, although it is much less likely to do so. If it does, the balance between inflow and outflow is wrong and must be adjusted. Most surgeons develop a sixth sense when the bladder is nearly full and when it is time to empty it out, and most resectoscopes begin to leak before this critical moment has been reached.
5. From time to time a chip of prostate or bladder tumour will be stuck to the lens or jammed between loop and sheath. In either case it is necessary to remove the handpiece. The lens should be cleaned using the jet of irrigating fluid or a piece of sterile lint. Blood that has been allowed to coagulate on the lens is a different matter. Use a broken wooden orange stick such as used for microbiological cultures: the wood does not scratch the optical glass.
6. If the telescope has gone misty, there is nothing you can do about it. Send for a spare and get on with the operation. The telescope will probably have to be returned to the manufacturer to get rid of water vapour.

References

1. Barnes RW. *Endoscopic Prostatic Surgery.* London: Kimpton, 1943.
2. Nesbit RM. *Transurethral Prostatectomy.* Springfield: Thomas, 1943.
3. Ellik M. A modification of the evacuator. *J Urol* 1937; 38:327.

Chapter 6
Transurethral resection technique for benign prostatic enlargement

Although several different techniques of transurethral resection have been described, their aim is essentially the same, to remove all the ade-nomatous tissue from the inner zone, leaving the compressed outer zone intact: the so-called 'surgical capsule'. The tissue which is removed during transurethral resection is therefore in theory identical with the tissue removed by an enucleative open operation[1,2] (Fig. 6.1). The various techniques of transurethral resection differ only in the order in which the bulk of tissue is removed. Two plans are described here: neither is in the least bit original and no particular preference is claimed for either.

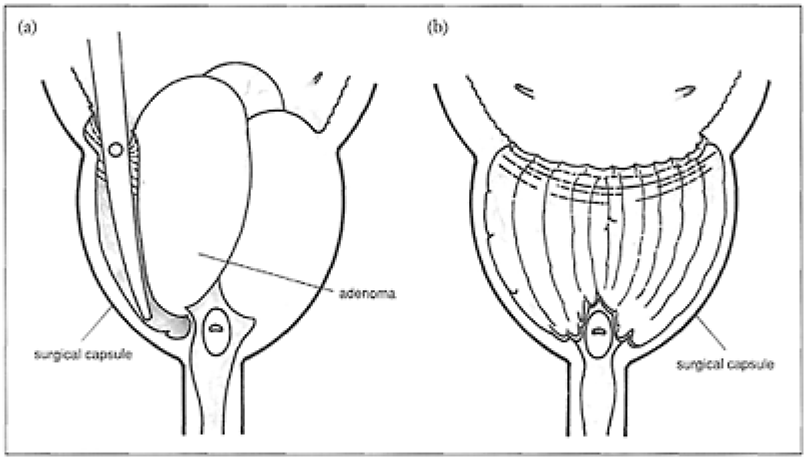


Figure 6.1 *The tissue removed during an enucleative open prostatectomy (a) is the same as that removed by TUR (b). In both, the inner zone adenoma is removed from the 'surgical capsule' of compressed outer zone.*

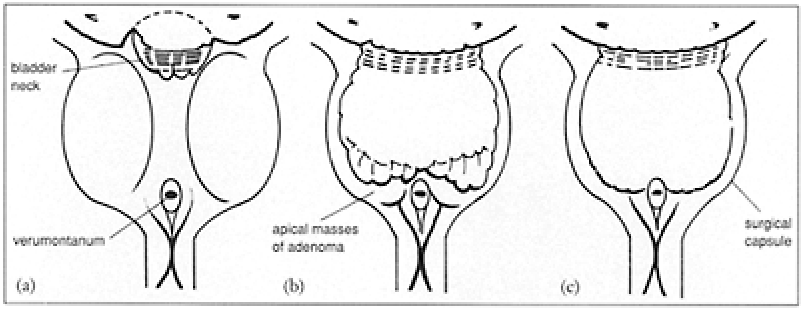


Figure 6.2 *The three stages of transurethral prostatectomy: (a) the landmarks are located, (b) most of the adenoma is removed, (c) the apical tissue is trimmed from either side of the verumontanum.*

The important thing is that you should have a plan and stick to it, or else you will certainly get lost. Try each of these methods and choose the one which suits you best.

In both methods there are three stages (Fig. 6.2):

1. Establishing the landmarks.
2. Removing the main bulk of tissue.
3. Tidying up.

In each method the resection begins with a preliminary urethroscopy and cystoscopy, careful lubrication of the urethra, and an internal urethrotomy if there is the slightest tightness of the resectoscope sheath (see page 70).

1. Establishing the landmarks

The landmarks in transurethral resection are the same whether you remove much tissue or only a little: the distal limit to the resection is the verumontanum, which stands like a lighthouse just proximal to that special region of the prostatic urethra which contains the supramembranous intrinsic component of the external sphincter (Fig. 6.3). This is a ring of elastic tissue, striated and unstriated muscle, quite distinct from and above the levator ani[3]. It is the essential part of the continence mechanism and must not be damaged.

Make sure that you have seen the sphincter: bring the resectoscope out beyond it, cut off the water flow and see it contract like the anus in its characteristic way (Fig. 6.4). As you do this you will note an even more important feature: as the sheath of the resectoscope passes out

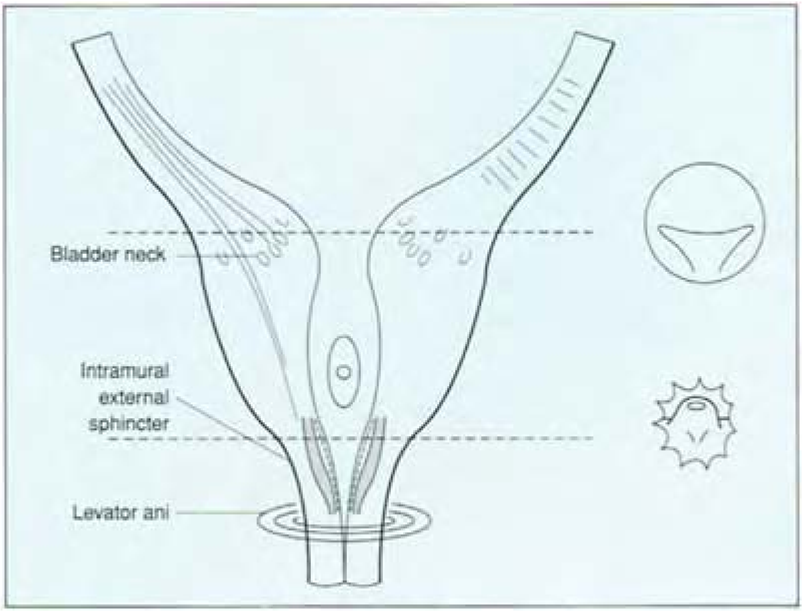


Figure 6.3 *The three components of the sphincter mechanism of the bladder, bladder neck, intramural external sphincter (just distal to the verumontanum) and levator ani.*

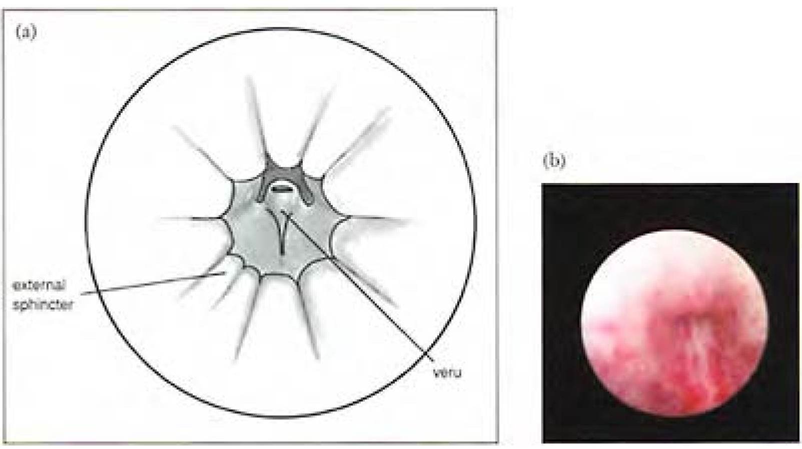


Figure 6.4 *(a) Diagram of the external sphincter, just downstream of the verumontanum and*

(b) endoscopic photograph taken from just downstream of the sphincter.

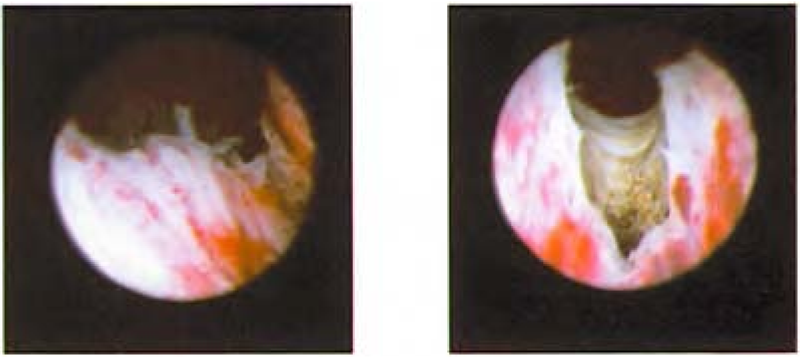


Figure 6.5 *In a patient with a very small middle lobe the first cut reveals the transverse smooth muscle fibres of the bladder neck.*

beyond the sphincter it instantly becomes more loose. Recognizing this sensation is of great importance: it is as important as for the blind man to know what it feels like to step off the pavement onto the road. It is an instant warning that you are too far down the urethra for safety.

The proximal limit to the resection is the ring of muscle at the neck of the bladder. Having identified the verumontanum and the external sphincter, the next step is to find the ring of muscle at the bladder neck in the posterior middle line. The purpose of defining this proximal limit is to prevent you from inadvertently encroaching on the trigone and ureteric orifices. In some patients there is virtually no adenoma in the region of the middle lobe and the first loopful of tissue reveals muscle fibres immediately under the urothelium (Fig. 6.5). In others it is necessary to resect a considerable volume of adenoma before the bladder neck is exposed (Fig. 6.6). Once these fibres have been laid bare, they are left alone for the time being, even though it may be necessary to return to the bladder neck and trim more of it away at the end of the resection.

When the adenoma is very big the anatomy is distorted, and the lumps of adenoma in the apex of each lateral lobe extend well down below the verumontanum, distorting the supramembranous intrinsic component of the external sphincter (Fig. 6.7). When the time comes to resect this apical tissue great care is taken to lift it up with a finger in the rectum so that the loop does not cut the corner and injure the sphincter. It is equally important to refrain from coagulating in this region for fear of injuring the sphincter.

Having found the muscle fibres of the bladder neck, you now complete the removal of the middle lobe from the bladder neck down to just above the verumontanum (Fig. 6.8). You should now be able to see verumontanum and bladder neck in the same field of view and easily reorientate yourself if you get lost (Fig. 6.9).

The value of the verumontanum as a landmark is recognized by all experienced resectionists. In the old days of open prostatectomy it was not

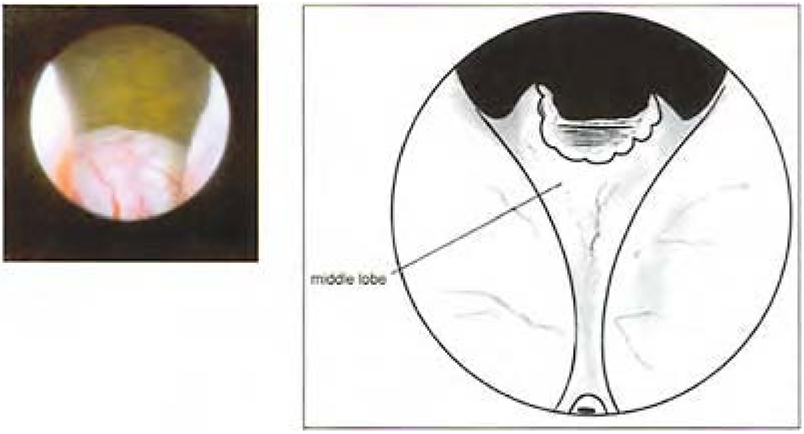


Figure 6.6 *when there is a larger middle lobe more tissue must be removed before the bladder neck is exposed.*

uncommon to see the verumontanum in the specimen, and the patients were not always incontinent because the intrinsic component of the external sphincter remained behind. But the verumontanum lies just upstream of the supramembranous sphincter and wantonly to remove it is not only to vandalize a useful landmark which never causes obstruction to the flow of urine, but also to guarantee the end of any chance of ejaculation.

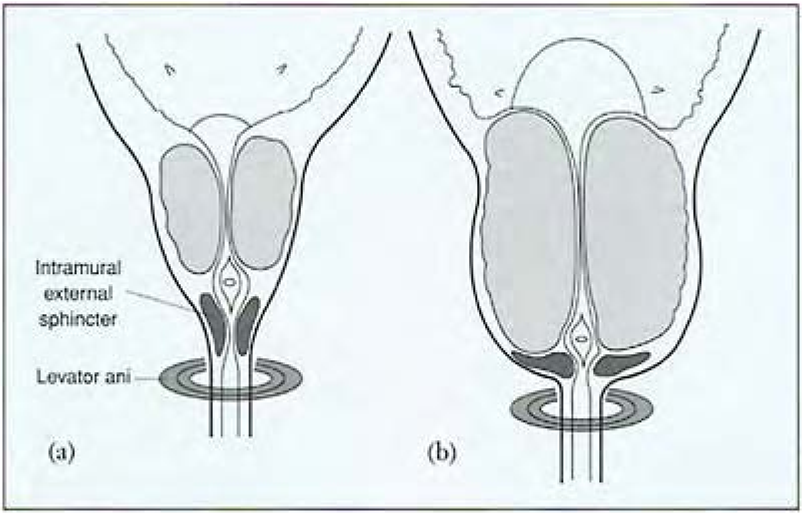


Figure 6.7 *In the small prostate: (a) the verumontanum is well upstream of the sphincter, but in a big bulky prostate (b) the lateral lobe adenomas bulge down past the verumontanum and distort the sphincter.*

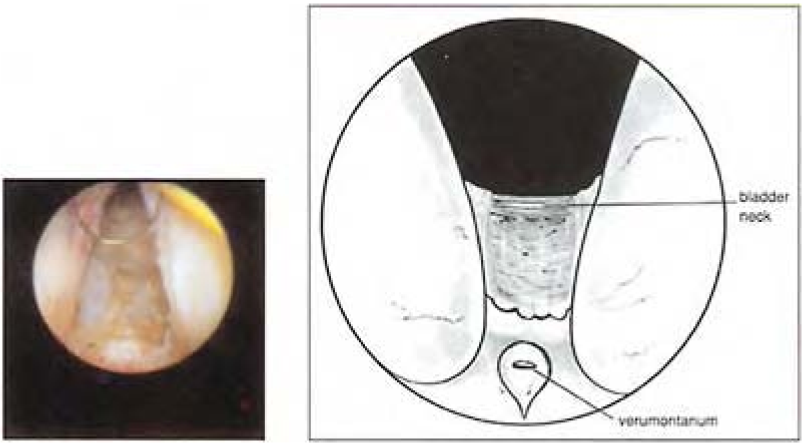


Figure 6.8 *All the middle lobe tissue should be removed from the bladder neck down to just upstream of the verumontanum.*

In the course of defining the bladder neck fibres it is not uncommon to create a small perforation under the edge of the trigone: there is a telltale appearance as if of a spider's web, and sometimes a distinct black hole in the connective tissue under the neck of the bladder (Fig. 6.10). By themselves these are not important, but they do mean you must take care not to pass the beak of the resectoscope under the trigone.

Once the middle lobe has been neatly cleaned out, take time to coagulate Badenoch's large arteries at 5 and 7 o'clock if these have not been completely controlled (Fig. 6.11).

Figure 6.9 *All the middle lobe is resected. You can see clearly from the middle lobe to the bladder neck.*

Figure 6.10 *Correctly resected middle lobe: there is a cobweb appearance under the bladder neck.*

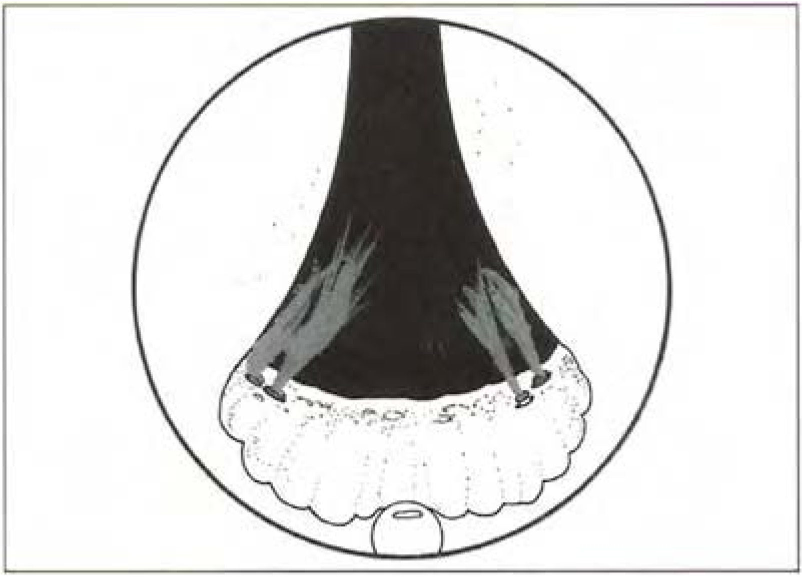


Figure 6.11 *After resecting all the middle lobe, make sure that Badenoch's arteries at 5 and 7 o'clock have been controlled.*

2. Removing the main bulk of tissue

Keeping the landmarks in mind, the next stage of the operation is to remove the main bulk of adenoma.

1. First method

In the first method to be described, you rotate the resectoscope to bring the anterior commissure into view at 12 o'clock (Fig. 6.12). The object is now to liberate one of the lateral lobes from the capsule. Begin by taking one or two careful chips at 1 o'clock until the bladder neck fibres and the capsule are disclosed, remembering that the prostate is very thin anteriorly (Fig. 6.13). Continue to deepen the trench until the lateral

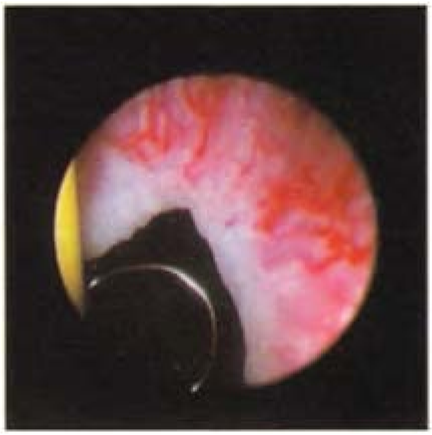


Figure 6.12 *The anterior commissure.*

Figure 6.13 *After the first one or two chips the capsule is exposed at 1 o'clock.*

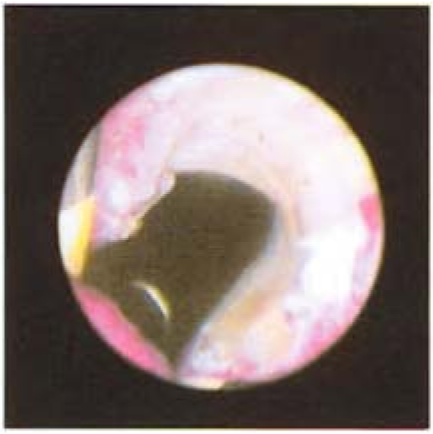


Figure 6.14 *The trench is deepened and the left lateral lobe falls backwards.*

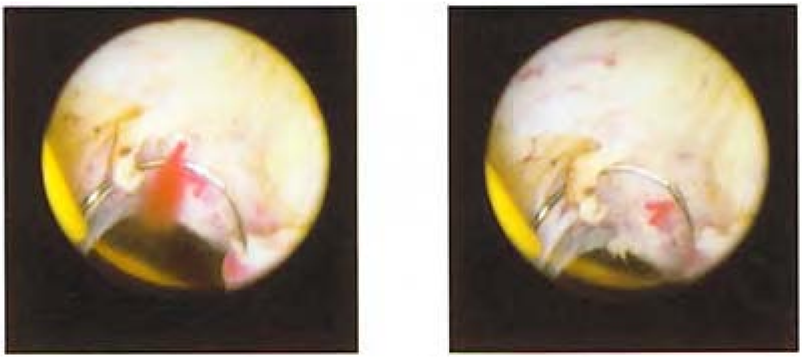


Figure 6.15 *The 2 o'clock arteries of Flocks need to be carefully controlled.*

lobe falls backwards into the defect left by removal of the middle lobe (Fig. 6.14). In doing this you may come across the little arteries of Flocks at 2 o'clock, which should be carefully coagulated[4] (Fig. 6.15).

The next step is to remove the lump of lateral lobe which has fallen inwards and away from the capsule. Removing this part is usually relatively bloodless, because the main arteries have already been controlled at 2 and 5 o'clock. Trim the top of the lateral lobe away in a series of even cuts, keeping the surface flat (Fig. 6.16). Do not make the mistake of hollowing out the lateral lobe or you will find that a thin shell of tissue will flop down and conceal the verumontanum (Figs 6.17 and 6.18).

Make sure that each stroke of the resectoscope loop cuts its chip off completely: do not make the mistake of leaving a chip attached at its distal end like a pine cone (Fig. 6.19).

At this stage you can leave the most distal nubbin of apical tissue just near the verumontanum. Go over the whole of the inner surface of the prostatic 'capsule' from which you have removed the lateral lobe and make sure that all the bleeding has been stopped.

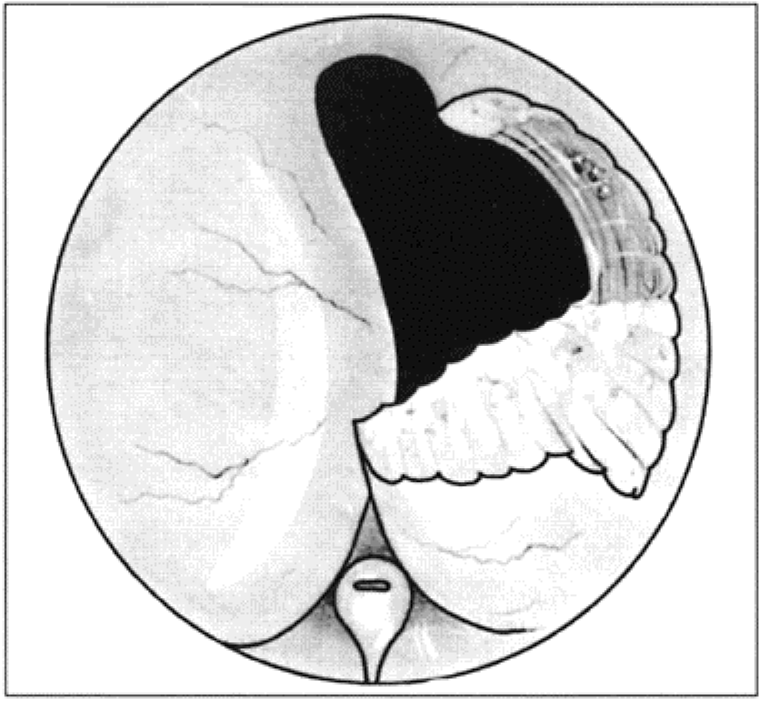


Figure 6.16 *Trim the top of the lateral lobe evenly, keeping its surface flat.*

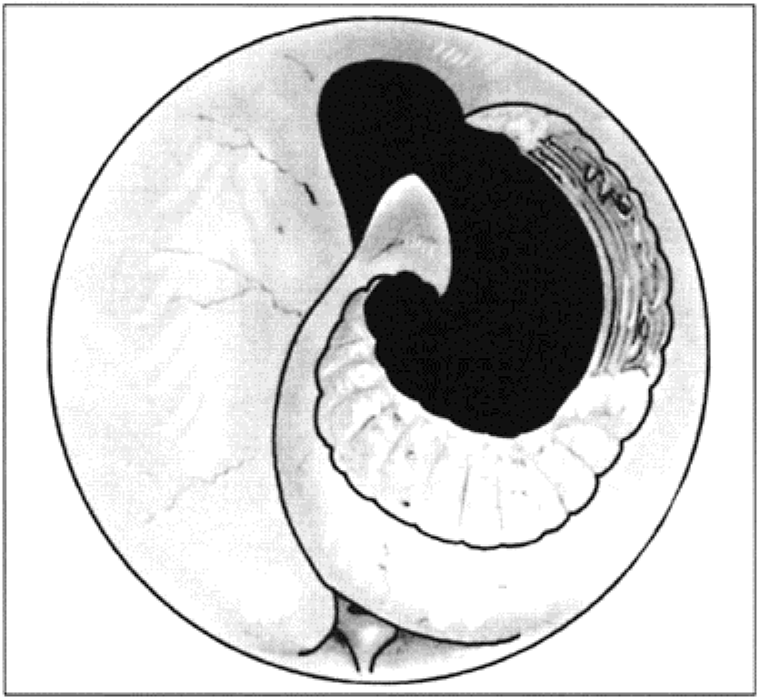


Figure 6.17 *Avoid the mistake of hollowing out the lateral lobe and leaving a thin shell on the medial side.*

Check the position of the verumontanum and bladder neck, and then turn your attention to the other side. You will find that the anterior commissure seems to have moved and your original 2 o'clock trench now seems to be at 12 o'clock. Make a second trench (Fig. 6.20), detach

Figure 6.18 *Left lateral lobe hollowed out: the medial edge needs to be trimmed flat before it flops down and covers up the verumontanum.*

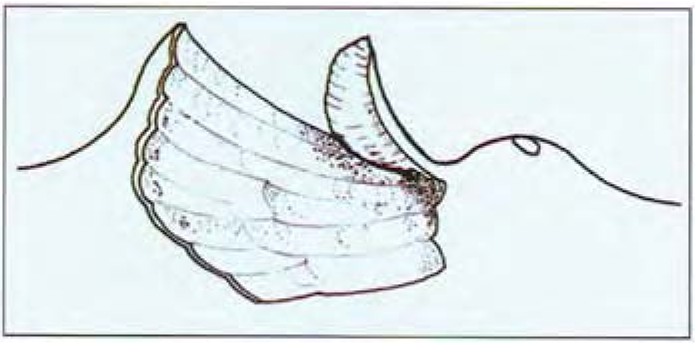


Figure 6.19 *Make sure that every chip is detached. Do not make a pine cone of your resection.*

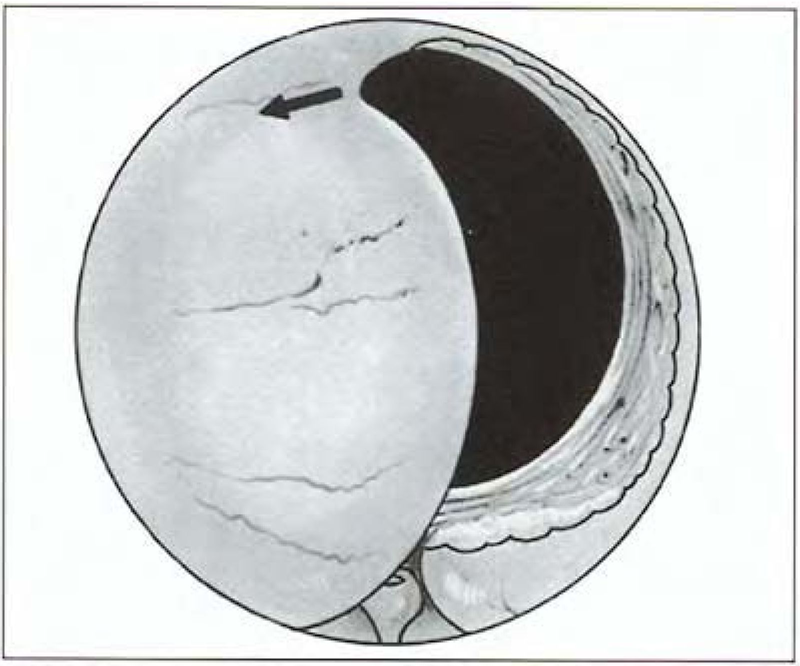


Figure 6.20 *Beginning the second lateral trench. Note that the anterior commissure seems to have moved over to the right.*

Figure 6.21 *Beginning the resection of the right lateral lobe.*

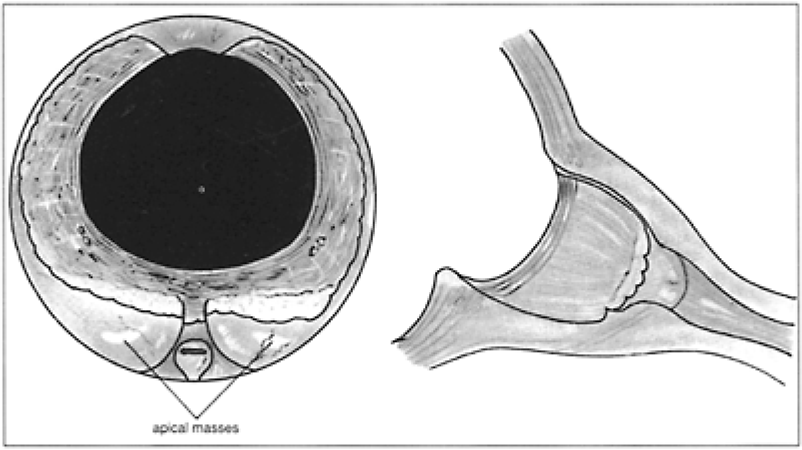


Figure 6.22 *Both lateral lobes are now removed, leaving only a little nubbin of apical tissue on either side of the verumontanum.*

the other lateral lobe, cut it away quickly and cleanly (Fig. 6.21), leaving only the nubbin of apical tissue adjacent to the verumontanum (Fig. 6.22). Go over the exposed 'capsule' and control the bleeding.

2. Second method

Many surgeons find it more comfortable to remove the bulk of the lateral lobes in one circular sequence (Fig. 6.23). After removing the middle lobe (as above) you start by taking one lateral lobe from the bottom upwards, across the commissure between the lateral lobes, and then down the other lateral lobe to the starting point (Figs 6.24 and 6.25). It is important to start each chip at the level of the bladder neck and continue the cut down to the downstream limit of the adenoma, at the level of the verumontanum, in order to maintain a clear plan of progress. Long chips are achieved by moving the sheath in the urethra (Fig. 6.26). As you deepen the cut under the lateral lobe so the length of cut must be shortened to follow the barrel shape of the 'capsule' (Fig. 6.27).

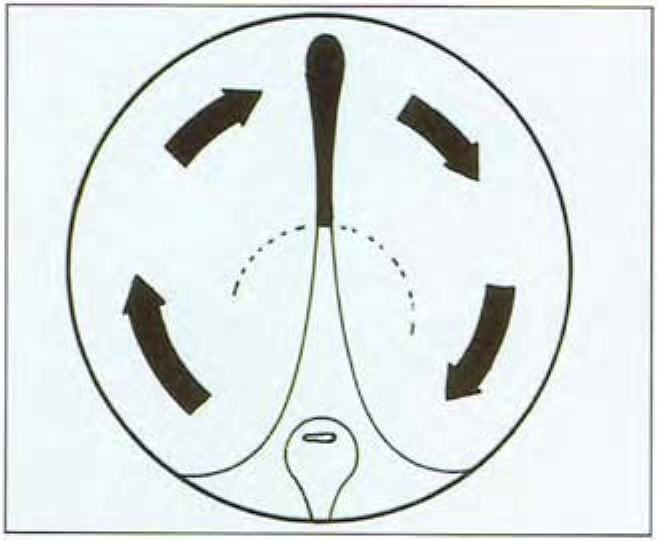


Figure 6.23 *Richard Notley plan of resection: after removing the middle lobe, the operator starts at 7 o'clock and works all round the clock.*

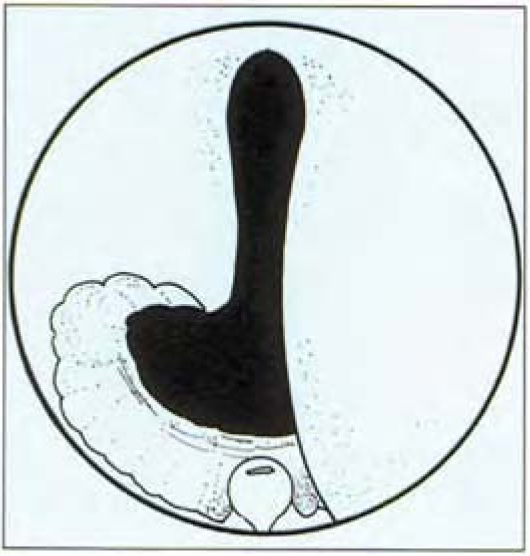


Figure 6.24 *Beginning to resect the right lateral lobe, from 7 to 9 o'clock.*

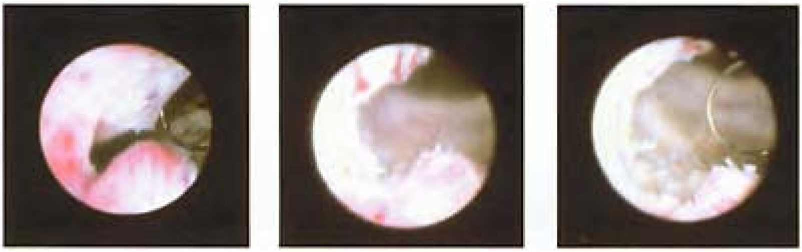


Figure 6.25 *The right lobe is progressively resected from 7 to 9 o'clock.*

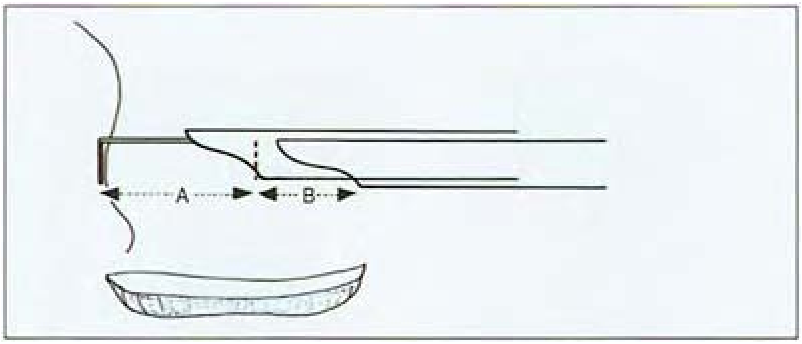


Figure 6.26 *Long chips are made by adding movement of the sheath (b) to the movement of the loop (a).*

Figure 6.27 *Resecting the right lateral lobe.*

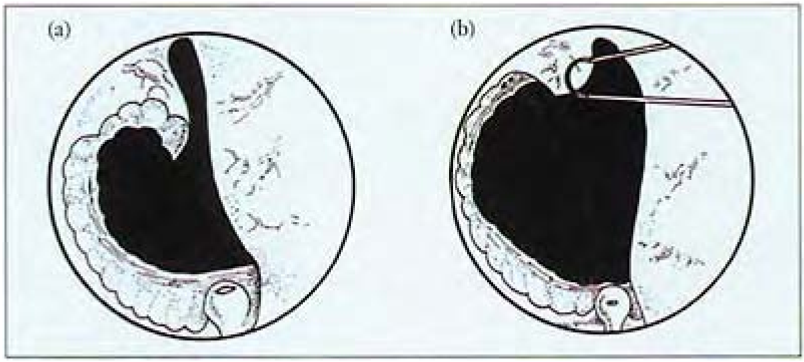


Figure 6.28 *(a) Take care not to hollow out the lateral lobe.*

(b) Near the commissure, where the adenoma is very thin, direct the loop laterally, not upwards.

Figure 6.29 *Flock's 10 o'clock artery will need to be coagulated.*

Figure 6.30 *Continuing the resection across the anterior midline to the left.*

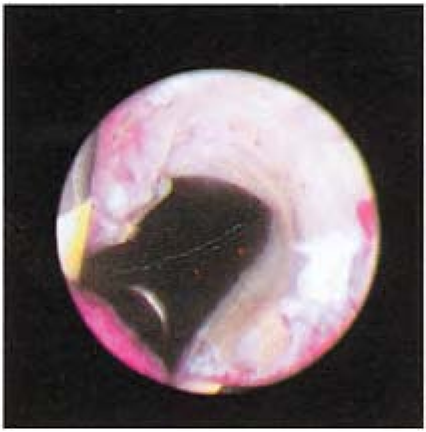


Figure 6.31 *Continuing to resect the left lateral lobe, which has now fallen back.*

As your resection approaches the anterior commissure a mass of tissue will be seen hanging down. Remember again that the prostate is very thin here: do not hollow it out (Fig. 6.28) but trim it away with the loop pointing laterally rather than upwards. The 10 o'clock arteries of Flocks will be found here and must be carefully coagulated (Fig. 6.29).

The resection can then be carried across the midline at 12 o'clock, bearing in mind that there is not much depth of adenoma in this part of the gland (Fig. 6.30). Continue the clockwise resection until the rest of the lateral lobe is removed (Fig. 6.31), sparing only the tissue adjacent to the verumontanum.

3. Tidying up

In the third stage the apical tissue that has been left behind is removed very carefully. The danger here is that the sphincter may be damaged, and you do not start this part of the resection until you have completely controlled the bleeding and have a really clear view. Repeatedly check the position of the verumontanum and sphincter. Take only very short chips. It often helps to insert one finger in the rectum to lift up the verumontanum and offer the apical tissue to the loop rather than digging with the loop to scoop it out (Fig. 6.32). The finger in the rectum provides a very precise sensation of the amount of tissue remaining and of the nearness of the loop. Bleeding is seldom severe in the region of the apex and one should be very sparing in the use of the coagulating current.

After emptying the bladder, withdraw the sheath beyond the sphincter, and then gradually advance it: this will show where you have left adenoma behind. The usual places are just on either side of the verumontanum, and up at 2 and 10 o'clock. These are all carefully trimmed

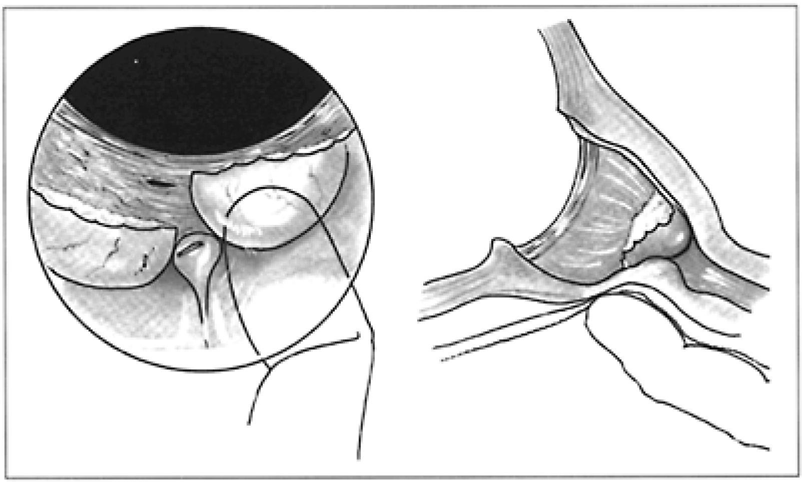


Figure 6.32 *A finger in the rectum lifts the apical tissue up to the resectoscope loop.*

Figure 6.33 *Trim the apical tissue with great care to preserve the verumontanum.*

away (Fig 6.33). In removing the tissue adjacent to the verumontanum err on the side of caution. A gram or two of adenoma in this situation does not cause outflow obstruction, and a damaged sphincter can never be restored.

Resection of the larger prostate >50 g

Thanks to the instruments of today there is virtually no limit to the size of prostate that can be resected transurethrally so long as the surgeon can keep clearly orientated and maintain concentration and patience. It is unwise to attempt to resect a bulky gland when the resectoscope sheath does not slip easily over a huge mound of middle lobe, or when there is so much oedema and bleeding from the margin of the prostate that it is impossible to keep one's bearings. Such cases are uncommon, and it is interesting to see how seldom experienced resectionists need to perform an open prostatectomy. Be guided by your own common sense and judgement. Never be deceived by pride or by a sense of letting down your patient by embarking on a transurethral resection when you are not comfortable and confident: far better to do a clean, safe, open enucleative prostatectomy. On the other hand, if you can see clearly enough to keep your bearings, it is hardly more difficult to remove 100 g than 40 g, since the steps of the operation are the same even though they take a little longer.

Stage 1

With a really bulky prostate there is much to be said for a preliminary coagulation of the main prostatic arteries at 10, 2, 5 and 7 o'clock using the roly-ball before taking out any tissue (Fig. 6.34).

In the first stage the middle lobe is often very bulky and bulges up and over the trigone (Fig. 6.35). It must be resected evenly along its top so

Figure 6.34 *Prophylactic coagulation at 10, 2, 5 and 7 o'clock before starting to resect.*

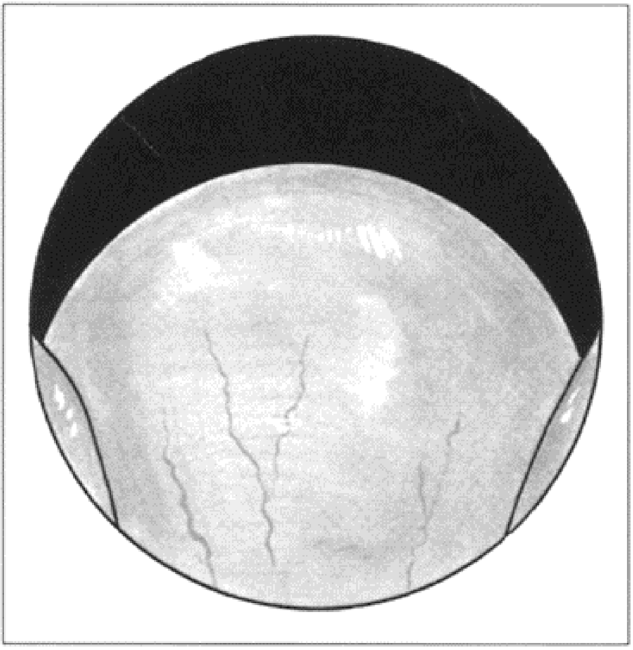


Figure 6.35 *The middle lobe can be very large.*

that the mound is kept level and flat, otherwise it is easy to cleave it into two halves by a single deep channel in the middle which leaves you bewildered and confused by what now seem to be two lateral lobes (Fig. 6.36). In removing the larger middle lobes the large 5 and 7 o'clock arteries will be exposed on either side and thoroughly coagulated (Fig. 6.37). It is wise to remove the whole of the middle lobe right down to within a few millimetres of the verumontanum. There is a tiresome tendency for a clot to sit just proximal to the verumontanum, making it difficult to see clearly. A finger in the rectum makes it easier to check on the position of the verumontanum and complete the resection of the middle lobe (Fig. 6.38).

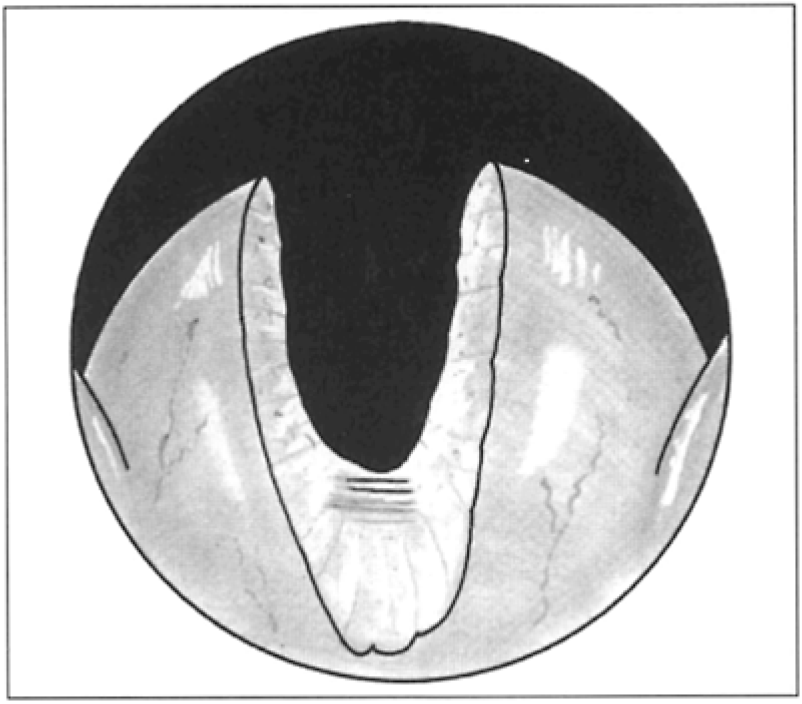


Figure 6.36 *If you do not resect the middle lobe evenly you end up with a deep trench and 'two' middle lobes, which can be very confusing.*

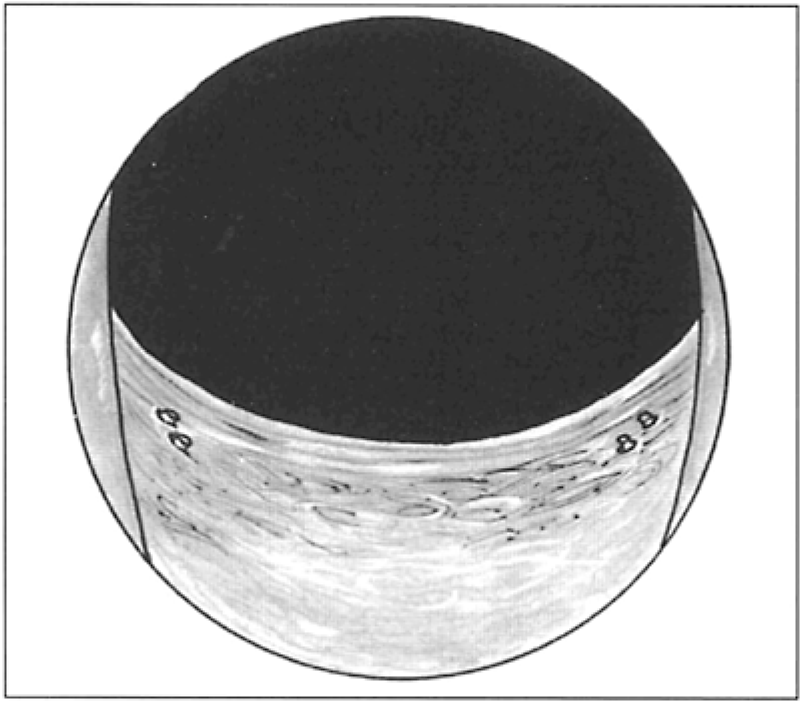


Figure 6.37 *After resecting all the middle lobe, make sure that the 5 and 7 o'clock arteries are completely controlled.*

As always, make sure of the haemostasis before going on to the next stage of the resection.

Stage 2

With large glands it is better to attempt to remove the whole of one lateral lobe than nibble away at both. If you prefer the first method, start

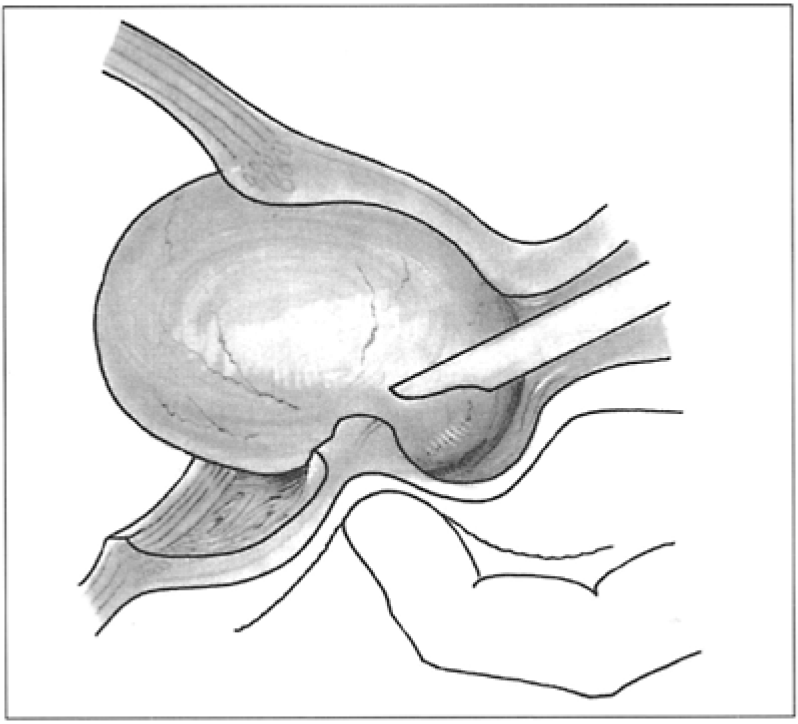


Figure 6.38 *A finger in the rectum makes it easier to check on the position of the verumontanum.*

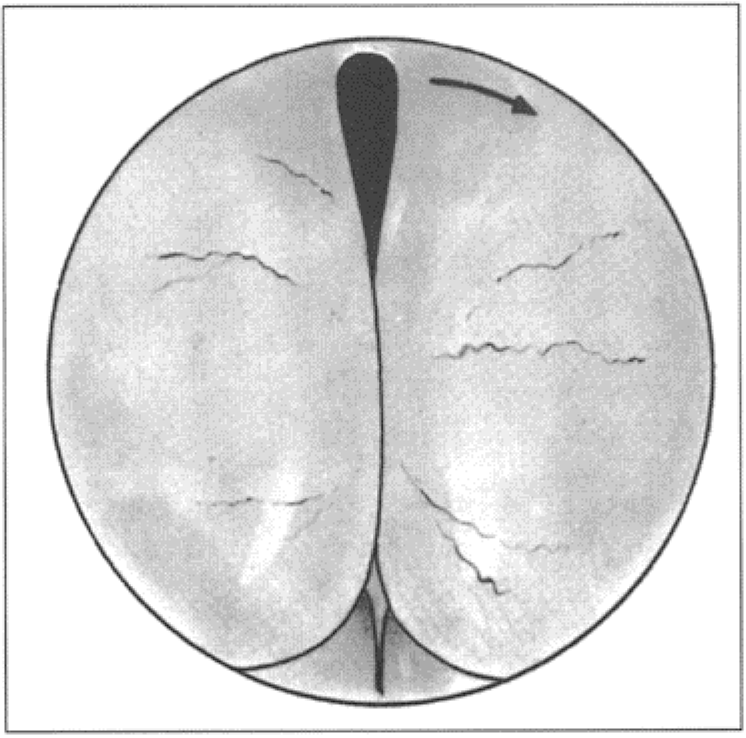


Figure 6.39 *Start the trench near the anterior commissure.*

the trench near the anterior commissure (Fig. 6.39), where the adenoma is always very thin, seal off Flocks' arteries, allow the lateral lobe to fall down, and then cut it away with long even strokes, making sure you do not hollow it out (Fig. 6.40). A finger in the rectum will help to offer the adenoma to the loop rather than you having to dig into the barrel-shaped cavity of the capsule (Fig. 6.41).

If you take big long chips and move the sheath as well as the loop, you are less likely to create cliffs of unresected tissue half way down the prostatic urethra which may cause you to lose your bearings, but of course, you must not let the loop go past the verumontanum at this stage.

Once the first lateral lobe has been removed, saving only the apical tissue (Fig. 6.42), go over the inside of the barrel carefully to stop all the bleeding; if necessary using the roly-ball. If you put off getting haemostasis at this stage you will find that when you return everything is confused by tenacious clot which conceals the origin of the bleeding. If there has been a considerable loss of blood, it is sensible to consider stopping the operation when one lateral lobe has been removed. The patient will often be able to pass urine perfectly well.

If all is well, go ahead and remove the other lateral lobe in the same way (Figs 6.43 and 6.44). It is of no importance which lobe you resect first but it is wise to get into the habit of doing things in the same order, a rule which is especially valuable when you are teaching others.

The third stage in removal of a very large prostate is more difficult because the apical tissue often extends some way distal to the verumontanum (Fig. 6.45) where there is often a definite edge, 'Nesbit's white line', marking the distal limit of the adenoma[5]. The problem is to know

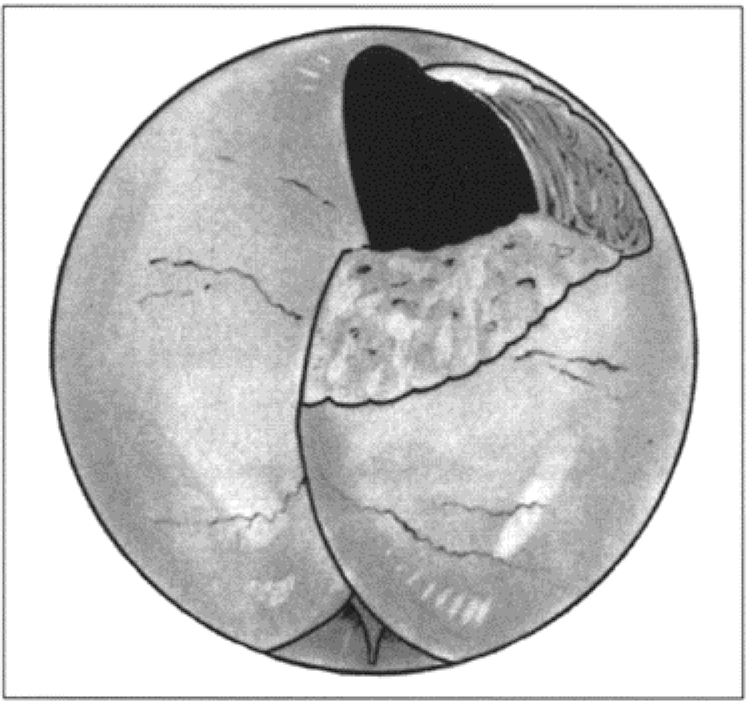


Figure 6.40 *Trim the lateral lobe evenly and avoid hollowing it out.*

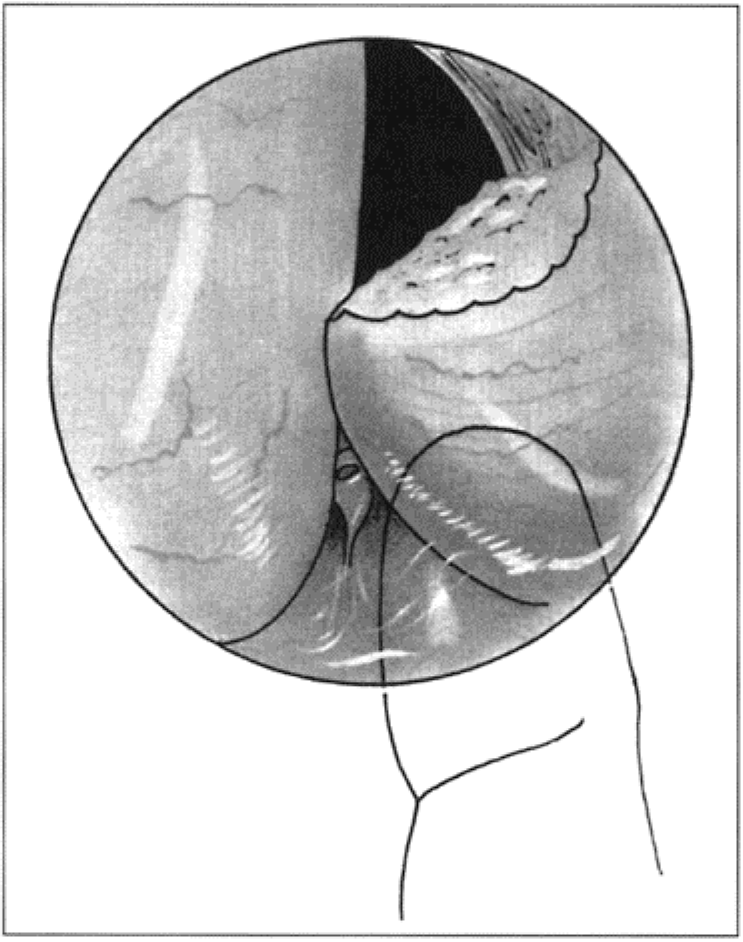


Figure 6.41 *A finger in the rectum helps to push the adenoma medially towards the loop.*

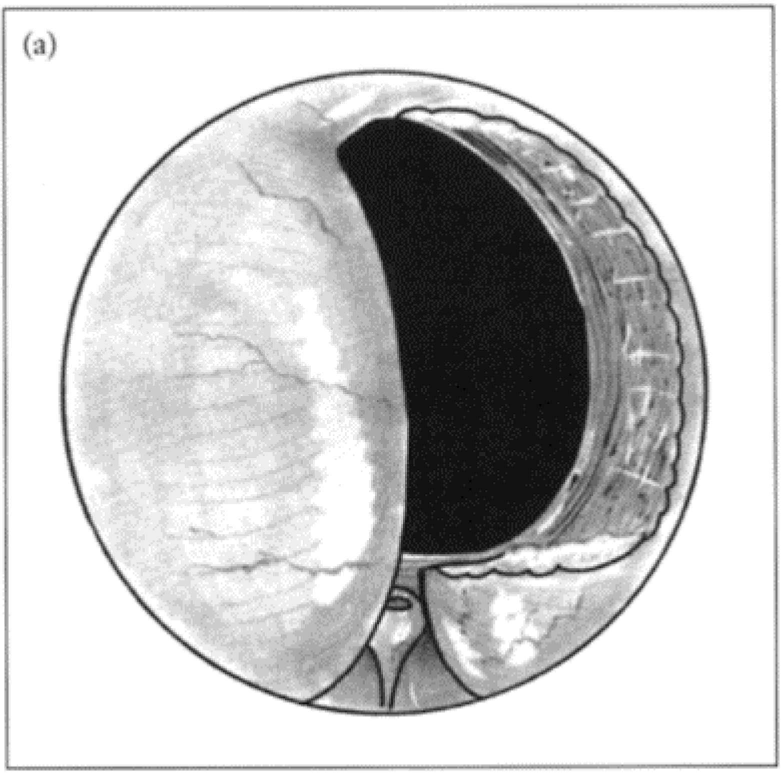


Figure 6.42 *(a) Endoscopic and (b) lateral view after nearly all the left lateral lobe has been removed leaving only a small apical mass level with the verumontanum.*

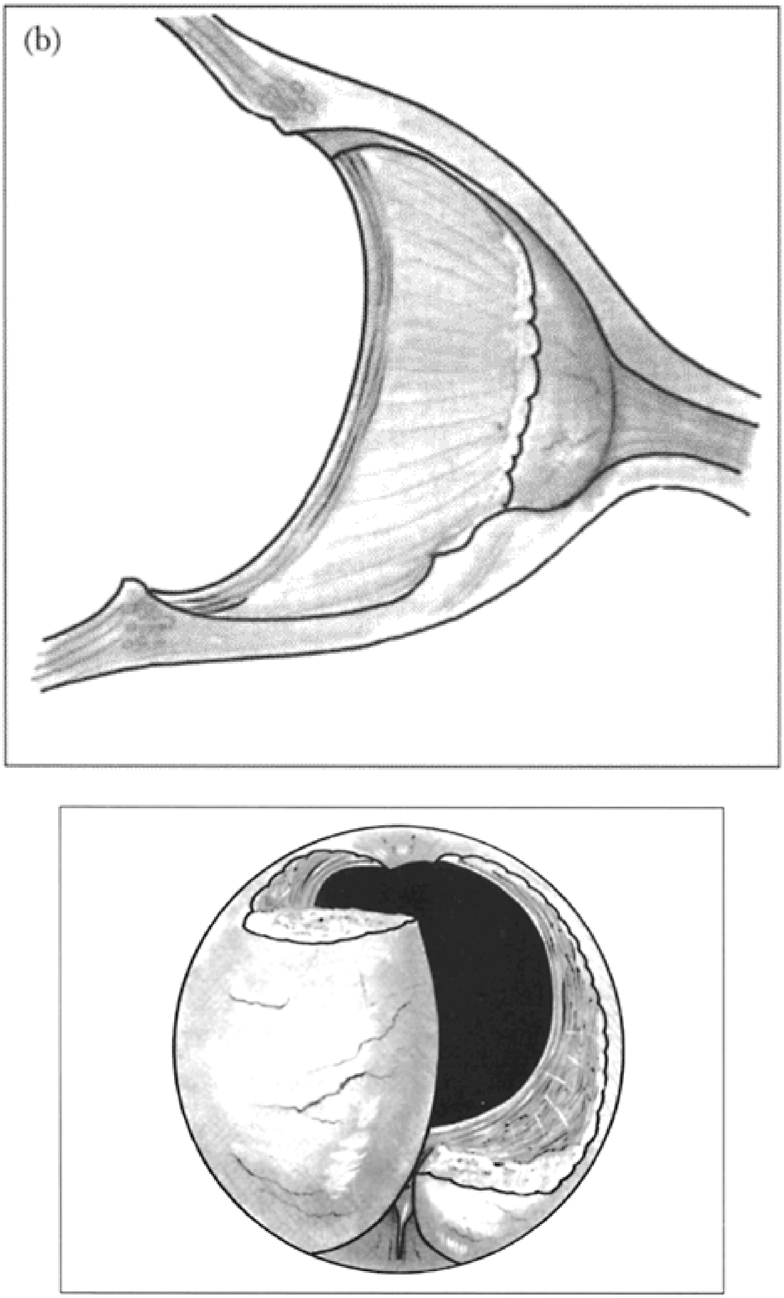


Figure 6.43 *Removal of the right lateral lobe.*

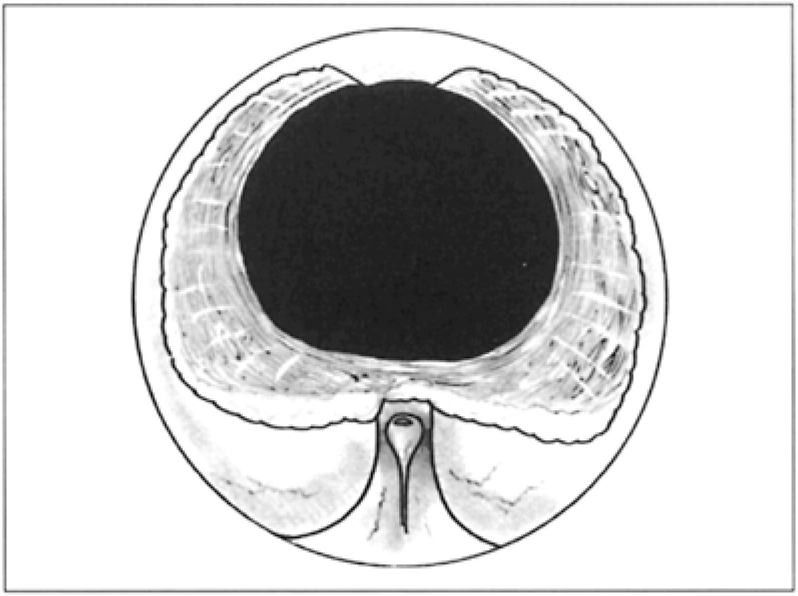
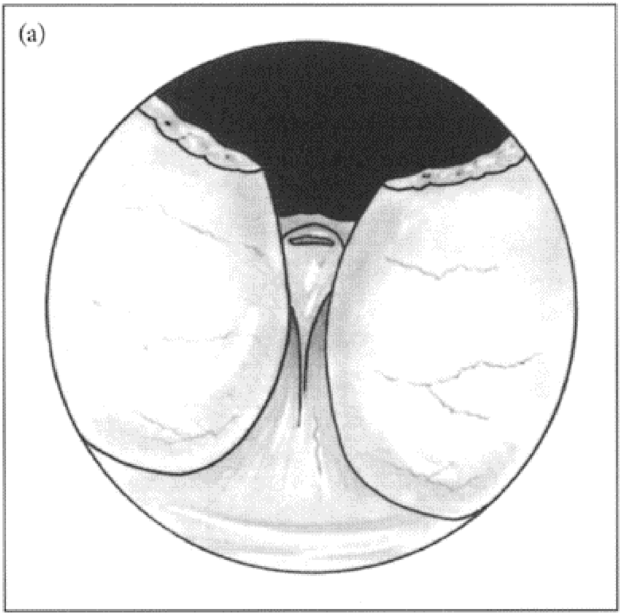


Figure 6.44 *Both lateral lobes removed: apical tissue remains level with verumontanum.*



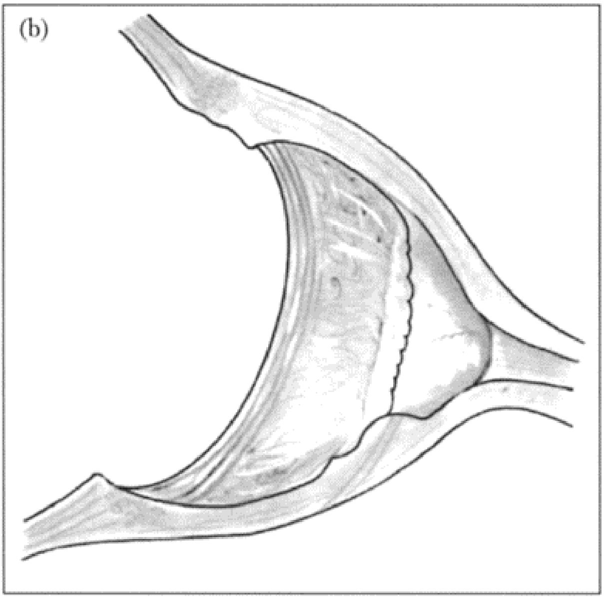


Figure 6.45 *(a) Endoscopic and (b) lateral view of a large prostate showing how the apices of the lateral lobe can extend downstream of the verumontanum.*

how much of this has to be removed if all the obstruction is to be relieved, without risking damage to the sphincter.

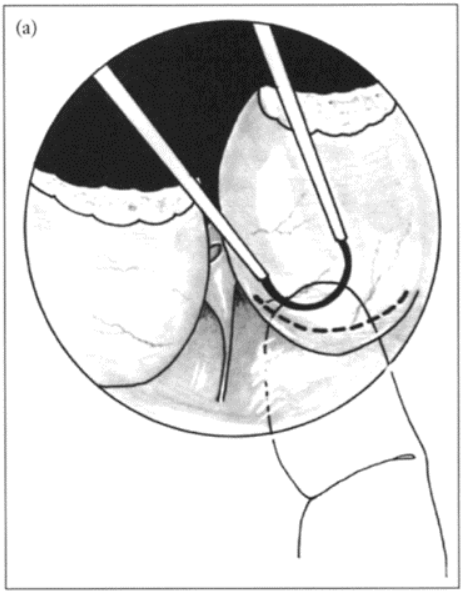
With a finger in the rectum to lift up the apical tissue, and taking very short bites with the loop, the bulk of the adenoma is trimmed away. A back-cut from just above Nesbit's white line helps to define the distal limit of resection (Fig. 6.46).

Once the lateral lobes have been removed and the apices trimmed up, withdraw the resectoscope again distal to the sphincter and slowly advance it to identify any remaining tissue at 2 and 10 o'clock (Figs 6.47 and 6.48).

Finally, make a careful bimanual examination after emptying out the bladder. Usually all that is felt is a ridge of tissue on either side of the mid-line, exactly the same as after an enucleative prostatectomy (Fig. 6.49).

Perforations

Page[6] showed that the tissue remaining in the outer zone after removing the adenoma from the 'capsule' was composed of a compressed adenoma, which was in fact thinner than the loop of the resectoscope. There was no such thing as a true anatomical capsule, or at best only a paper-thin layer of connective tissue which was continuous with that



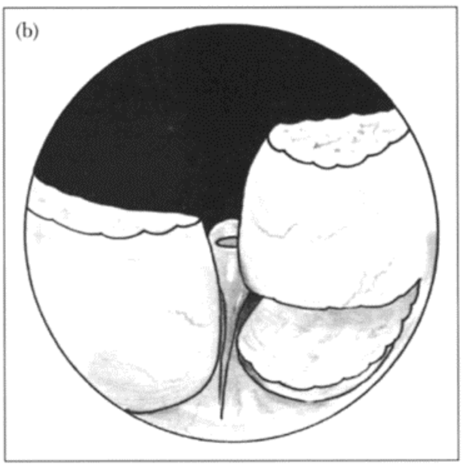


Figure 6.46 *(a) A finger in the rectum lifts up the apex, well clear of the verumontanum.*

(b) Short back-cuts with the loop define the lower edge of the apex.

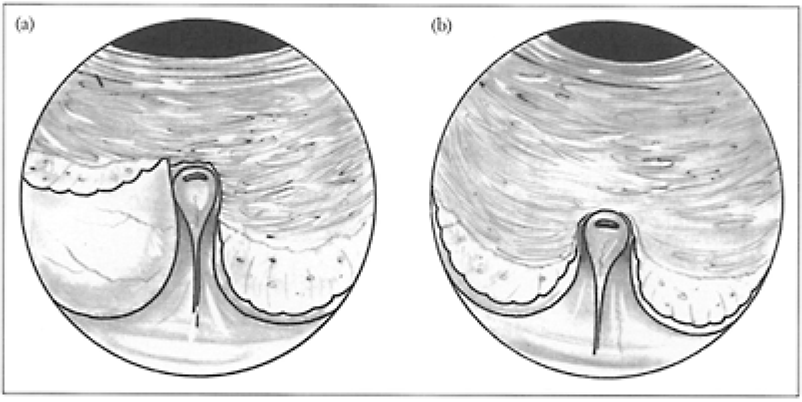


Figure 6.47 *(a) First one and then (b) the other apices are cleared, leaving an intact verumontanum.*

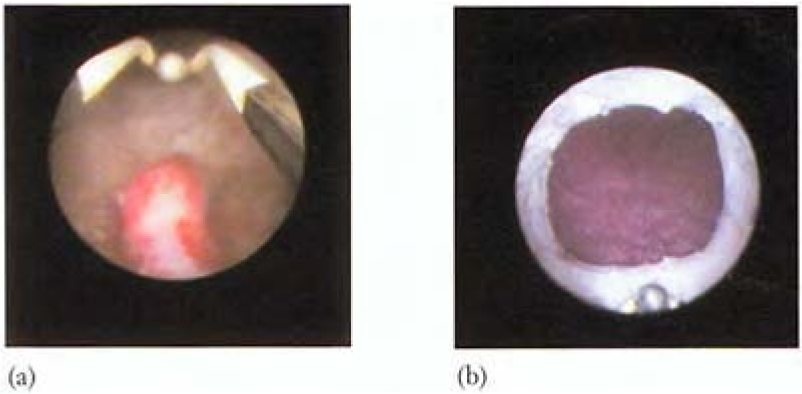


Figure 6.48 *(a) The resection is complete: the verumontanum is intact, and (b) the cavity of the prostate has been clearly hollowed out.*

which surrounded the vessels in the periprostatic fat. What we recognize as 'capsule' is in fact nearly a perforation. It is small wonder then that at the end of a resection it is usual to see little patches of fat (Fig. 6.50), and sometimes the dark hole which is actually the lumen of a vein (Fig. 6.51). These little perforations are not dangerous and there is no need to drain the retropubic space even though there is always some extravasation of the irrigating fluid into it.

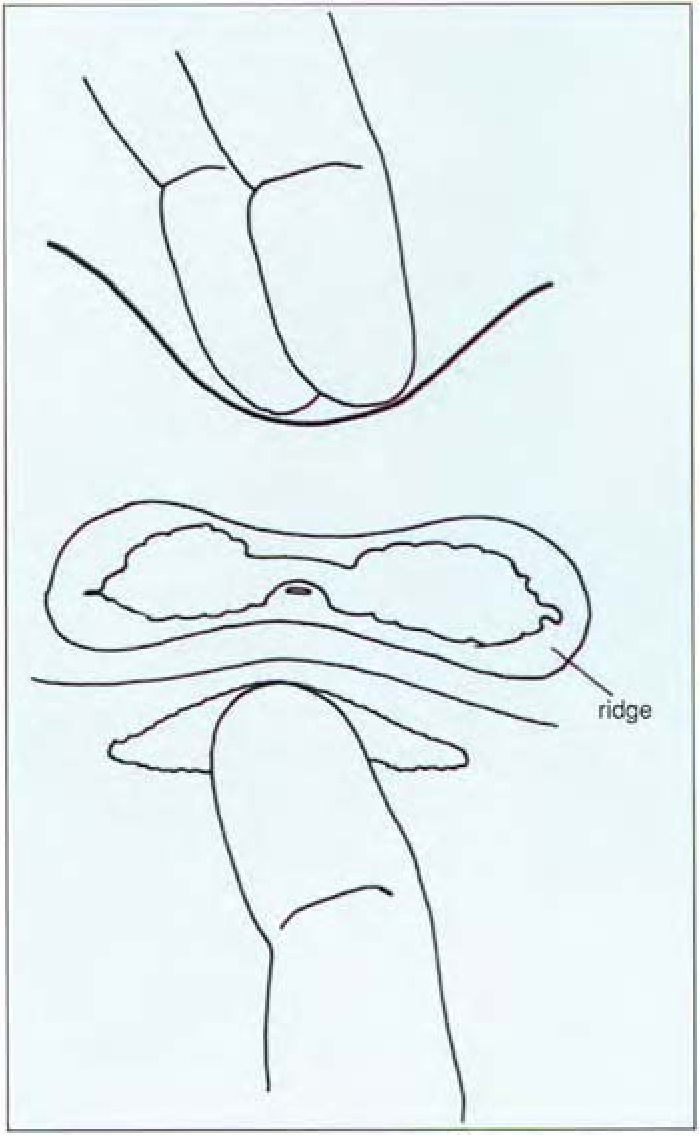


Figure 6.49 *Bimanual palpation will reveal any lumps of prostate that have been left behind.*

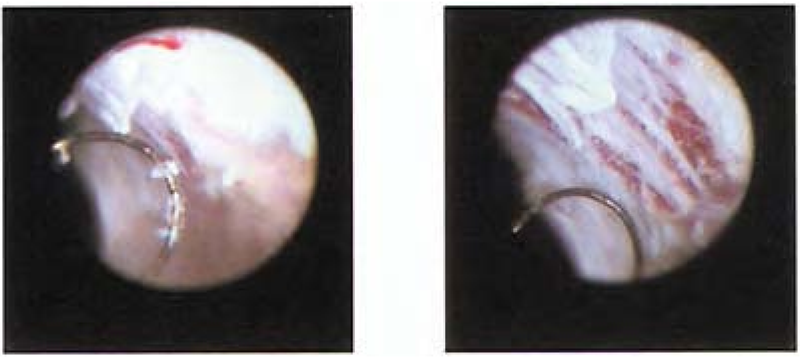


Figure 6.50 *Capsule exposed, and a perforation showing fat globules.*

Figure 6.51 *Deep perforation, probably the lumen of a vein.*

The same deep cut which has revealed fat may have damaged a large vein, which is not controlled by coagulation. In such an event the resection should be completed as quickly as possible and the bleeding controlled with tamponade (see page 85).

Perforations under the trigone

During the first stage of transurethral resection, as the bladder neck is being exposed under the middle lobe, it is very common to see small perforations which give the tell-tale appearance of a spider's web. By themselves these are not important, but there is a risk that the beak of the resectoscope may be driven inadvertently under the trigone, between the bladder muscle and the fascia of Denonvilliers. If this happens it produces a startling sight down the resectoscope (Fig. 6.52) but

Figure 6.52 *Perforation under the bladder neck.*

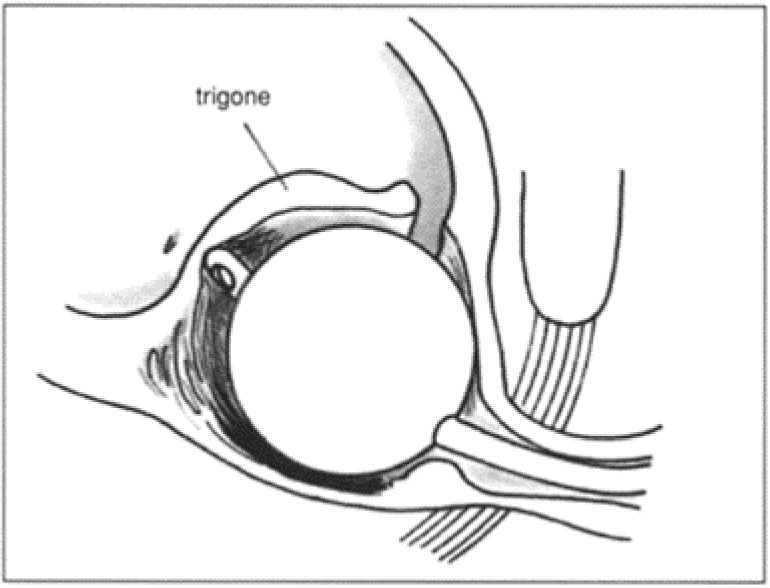


Figure 6.53 *Inadvertent misplacement of the Foley catheter stripping up the trigone.*

is not particularly dangerous: the danger is if the catheter is placed in this space and the balloon is inflated there (Fig. 6.53)—hence the precaution of passing the catheter on an introducer.

Catheters and drainage

Whatever the size of the gland the operation is concluded by putting in a suitable catheter and arranging through and through irrigation (Fig. 6.54). It is not necessary to use a catheter larger than 22Ch, but some surgeons prefer one made of PVC to latex. The irrigation is continued until the existing bag of glycine is finished, and then continued with saline. If the bleeding is more than a very faint pink the balloon should be filled with 40 ml and traction maintained (see page 85).

At this stage do not be in a hurry: have no hesitation in withdrawing the catheter and reinserting the resectoscope if haemostasis is not perfect. A few minutes of extra care at this stage may save hours of misery later on. If the patient has an endotracheal tube, wait for this to be removed, and wait for postoperative coughing and straining to have stopped before allowing the patient to go to the recovery room.

In the recovery room the team should all know how important it is to keep the irrigation flowing and how necessary it is to summon the surgical team if the catheter is blocked. It is easy to irrigate or change the catheter in the recovery room and, when in doubt, the patient can be returned to the theatre for a second look.

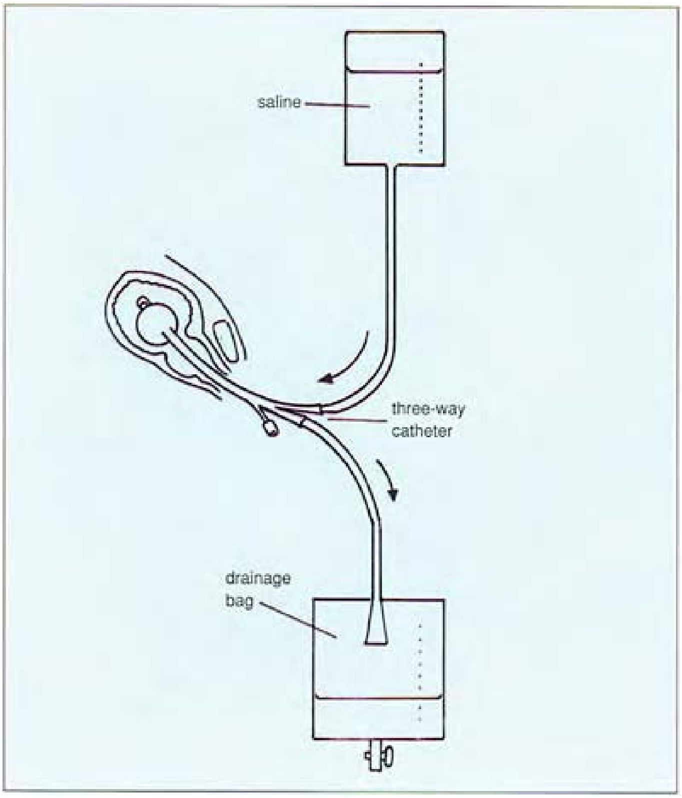


Figure 6.54 *Routine three-way irrigation system.*

The mildly hypotensive patient should be allowed to recover his normal blood pressure naturally, not by aggressive fluid replacement. Particular care must be taken with the bradycardiac hypotensive patient, a common enough situation after halothane anaesthesia. It may be better to correct the bradycardia with atropine rather than attempt to restore the blood pressure by fluids. A confused patient complaining of pain should be allowed to recover his senses, when rational discussion of the discomfort can often allay his unhappiness without the automatic recourse to morphine which may prolong the period of postoperative recovery. The patient should only be allowed to return to the ward when the irrigation is running freely, is no darker than *vin rosé* and the patient is fully conscious.

Bladder neck dyssynergia

Younger patients may have outflow obstruction that seems to be caused by a failure of the α-adrenergic smooth muscle of the bladder neck to relax in synchrony with the contraction of the detrusor[7]. The pre-dominant symptom is frequency, and urodynamics will show an abnormally high detrusor pressure and a poor flow-rate. A therapeutic trial of α-blockers such as prazosin is given, and if the patient is relieved of symptoms, but dislikes the side effects of the drug, the option can be put to him of incision of the bladder neck. It is important that he fully understands the risk of retrograde ejaculation and the possibility of being rendered infertile.

After the usual urethroscopy and cystoscopy, an incision is made with a Collings' knife through the ring of bladder neck muscle. Classically the incisions were made at 5 and 7 o'clock but the proximity of the neurovascular bundles to the penis suggests that incisions at 2, 10 or 6 o'clock may be preferable[8] (Fig. 6.55).

The small fibrous prostate

A different type of narrowing of the bladder neck is seen in patients with severe outflow obstruction but hardly any prostate to feel on rectal examination. They do not respond to α-blockers, and on resection the tissue is white and gristly and usually shows fibrous tissue on histological examination. Occasionally a more active granulation tissue is found in the specimen, in which case the patient should be carefully followed because recurrent stenosis of the bladder neck is then very likely. Mere incision does not result in an open bladder neck and it is better to perform a circumferential resection, leaving only a strip of mucosa in the region of the anterior commissure (Fig. 6.56).

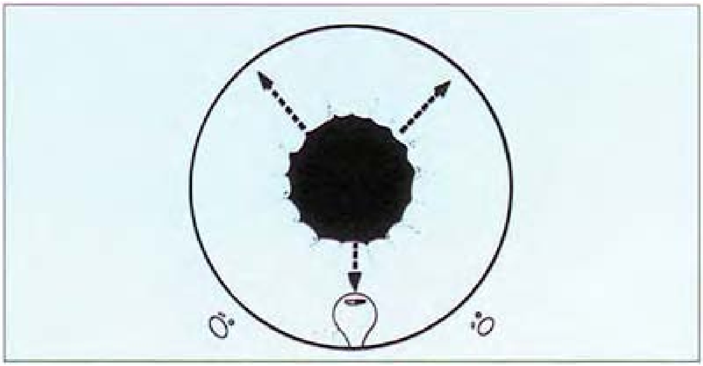


Figure 6.55 *Bladder neck incisions which avoid the neurovascular bundles to the penis.*

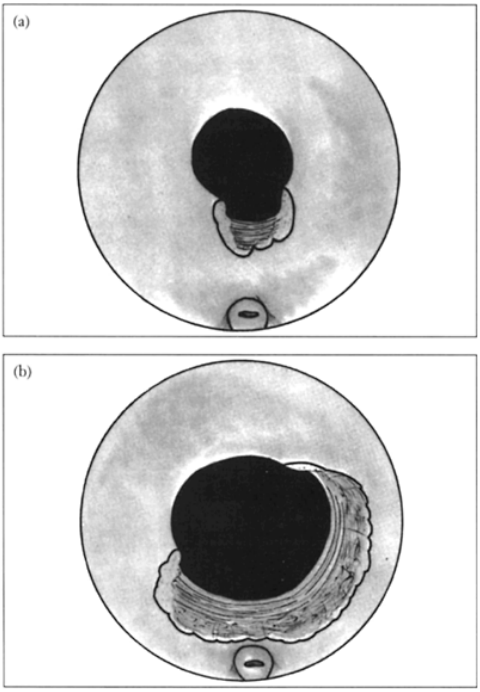


Figure 6.56 *Transurethral resection of a small fibrous prostate.*

(a) First cuts.

(b) Left half resected.

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Chapter 7
Transurethral resection of bladder tumours

The reasons for transurethral resection of a bladder tumour (TURBT) are to:

1. Provide accurate information with regard to bladder tumour grade and local stage.
2. Treat superficial bladder tumours, TURBT being the mainstay of treatment for the majority of such tumours (supplemented by intravesical chemotherapy and immunotherapy).
3. Palliate symptoms, such as bleeding, in invasive cancers where cystectomy or radiotherapy are not appropriate.
4. Debulk large tumours prior to radiotherapy.

In a small percentage of patients, transurethral resection of muscle invasive bladder tumours can be curative, as suggested by the absence of any residual tumour in the bladders of a number of patients who undergo cystectomy for muscle invasive disease diagnosed on an initial TURBT[1]. However, most patients with a diagnosis of a muscle invasive tumour will usually proceed to cystectomy (or radiotherapy), and thus it is only with the benefit of hindsight that it becomes apparent that the TURBT cured the cancer.

Preparations for TURBT

These are much the same as for TURR TURBT is usually a shorter procedure than TURP and above-knee TED stockings (thromboembolism stockings) may be all that is necessary for DVT prophylaxis (provided that it is anticipated that the procedure will not last too long). However, if there are additional risk factors for venous thromboembolism then additional prophylaxis such as intermittent pneumatic calf compression may be necessary.

There have been no placebo-controlled randomized studies of antibiotic propylaxis for TURBT. We routinely culture the urine before-hand and use a similar antibiotic regime to that used for TURP.

Again, as for TURP some surgeons will prefer to stop drugs that might predispose to bleeding, such as aspirin and non-steroidal antiinflammatory agents. Heavy bleeding after TURBT is uncommon, but checking the patient’s blood group and saving some serum prior to TURBT is a sensible precaution.

If you anticipate that the resection is likely to be short, then consider using water rather than glycine. In theory this may cause lysis of freely floating tumour cells, so helping to prevent implantation of tumour cells in raw areas of resected bladder. For longer resections, glycine should be used to reduce the risk of intravascular haemolysis and possible TUR syndrome.

Formal resection versus fulguration of bladder tumours

Before deciding whether to resect a bladder tumour or to ‘coagulate’ it with a Bugbee electrode or the roly-ball, one should have a clear idea of the objectives of removal of the bladder tumour. If the tumour is to be removed for accurate staging and grading to decide the need for adju-vant treatment such as cystectomy or radiotherapy then a formal resection is required. Similarly, some tumours may be too large for roly-ball coagulation and therefore formal resection will be the only way in which the tumour can be removed to stop it from bleeding. If however, further aggressive surgical treatment is not contemplated, for example because the patient is very elderly and frail or has significant medical problems, and if it can be destroyed easily with the roly-ball or Bugbee electrode, then one will be more inclined to ‘coagulate’ the tumour using one or other of these electrodes. There is little point in resecting a tumour aggressively, thereby exposing the patient to the risk of uncontrollable bleeding or bladder perforation, if accurate staging information is not required and if the tumour can be confidently removed by coagulation alone. The bladders of little old ladies can be particularly thin and not infrequently discretion (in the form of roly-ball diathermy coagulation) is the better part of valour. Rather than coagulating the tumour it is easier to use the roly-ball with the cutting current, as the tissue so treated is vaporized rather than coagulated. Coagulated tissue tends to stick to the electrode, which has to be cleaned frequently as a consequence.

Small tumours

When the tumour is very small it can be pinched off together with its base and a layer of bladder muscle with the sharp ‘cold’ cup forceps. The base is then touched with the diathermy to stop any bleeding. An

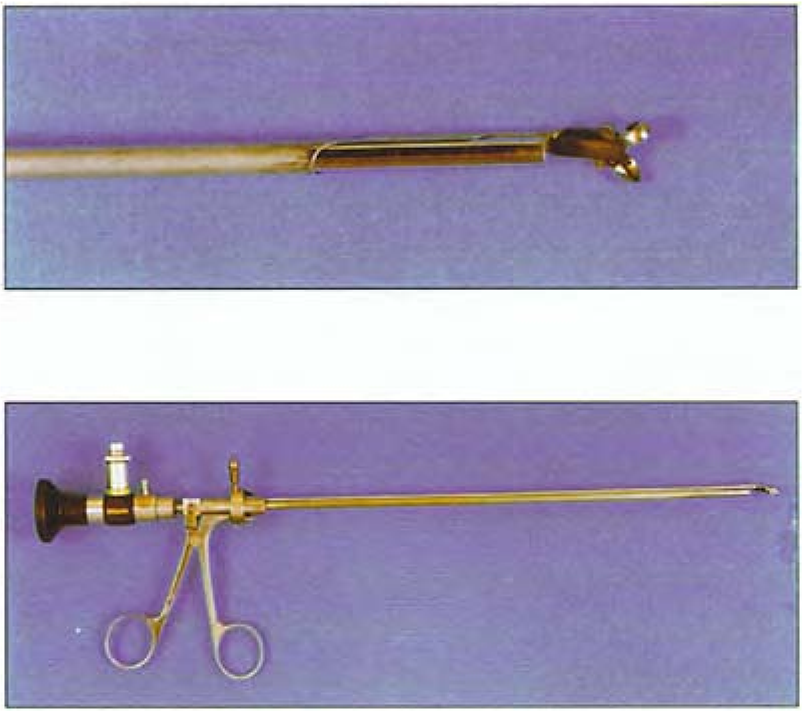

Figure 7.1 *Insulated biopsy forceps.*

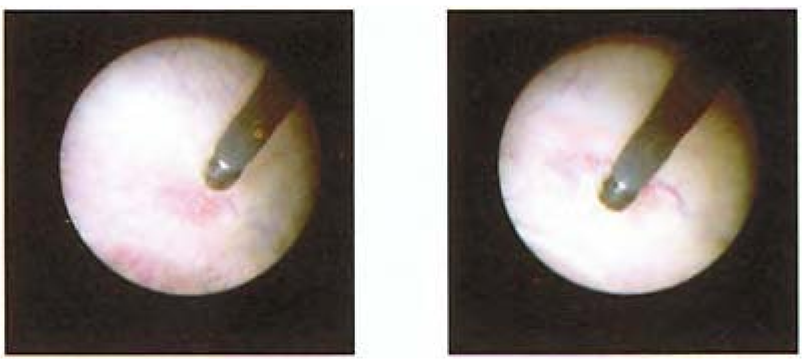

Figure 7.2 *Very small tumours are easily coagulated with the Bugbee electrode.*

insulated biopsy forceps is available which can do both things without changing instruments (Fig. 7.1). When there are multiple superficial tumours a few of them are removed in this way and the remainder are coagulated with the roly-ball or Bugbee electrode (Fig. 7.2).

Biopsy

After removing the obvious tumour, many surgeons routinely take small mucosal biopsies from apparently normal bladder (Fig. 7.3). The cup forceps are thrust at once into formalin to give histology free from the artefact caused by picking the biopsy off a gauze swab with a needle.

Mossy patches

Flat pink patches without obvious exfoliative tumour should be biopsied and then coagulated with the roly-ball electrode. When there is an extensive area of this superficial tumour the process can be speeded up by using the cutting current.

The average pedunculated tumour

The majority of superficial tumours are from 1 to 3 cm in diameter on a well-defined stalk. One or two large vessels can be seen entering the stalk from the adjacent mucosa. These may be coagulated with the roly-ball prior to formal resection. These tumours are too large to be removed with the cup biopsy forceps, but a single cut of the diathermy loop can often lift them off the bladder with a generous divot of muscle (Fig. 7.4), and the base is then thoroughly coagulated (Fig. 7.5). If you have not obtained a generous sample of the base of the tumour and the

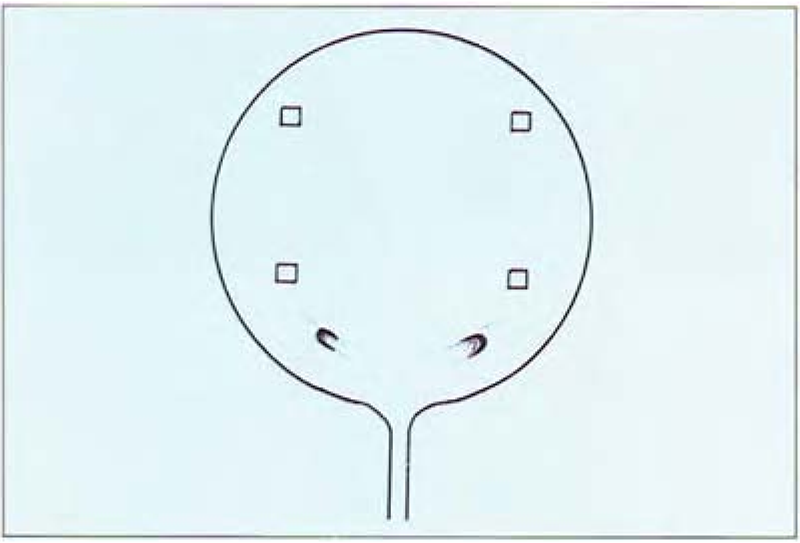

Figure 7.3 *Random biopsies taken from the four quadrants of the bladder.*

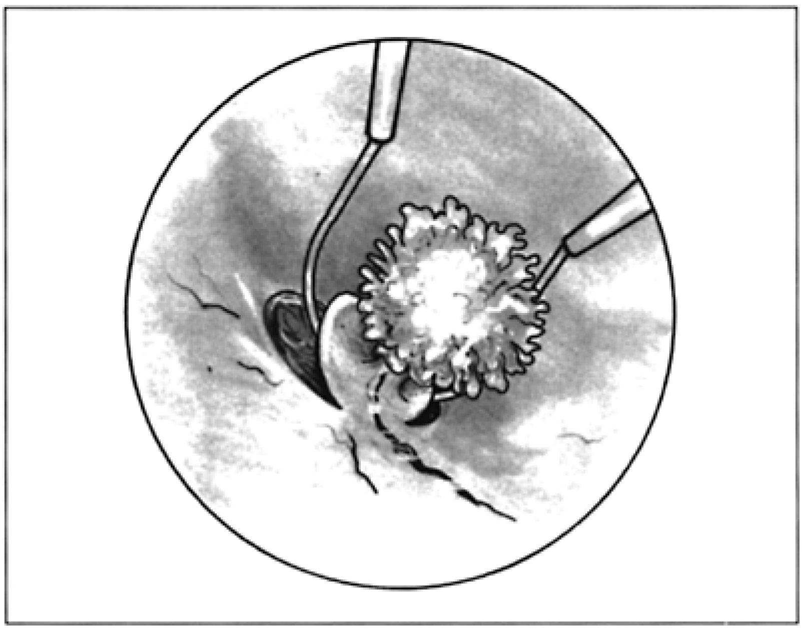

Figure 7.4 *Resection of a small papillary tumour, base and all.*

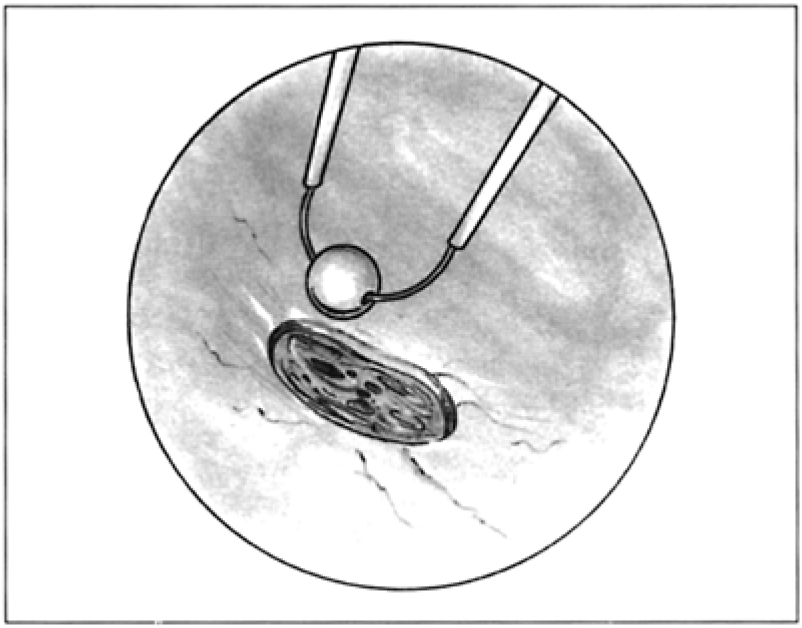

Figure 7.5 *The roly-ball is used to coagulate the base.*

adjacent bladder wall, the cold cup forceps or the loop of the resectoscope can be used to take an additional biopsy from the base of the stalk. This specimen can be sent in a separately labelled pot to indicate that this represents the part of the tumour that was immediately adjacent to the bladder wall. The cold cup forceps may allow better preservation of the tumour architecture, which makes subsequent histological examination of the tumour easier.

Larger papillary tumours 4–6 cm diameter

The first difficulty when resecting the larger papillary tumours with the conventional irrigating system is that the tumour seems to move away from the telescope as the bladder fills up, and you find yourself trying to hit a moving target. As soon as you start to resect the bleeding makes the vision even worse. This difficulty is very largely overcome by using the Iglesias-type continuous flow resectoscope. If the inflow and outflow are correctly adjusted the tumour stays put and can be resected according to a methodical plan.

The second difficulty is that even though the stalk of the tumour may be quite narrow, the bush flops over and hides it, and until the big blood vessels in the stalk have been coagulated, resection of the bush is followed by more or less furious bleeding.

Do not attack the bush of the tumour as if you were trimming a hedge. Direct your attack at the stalk. It will probably be necessary to start by resecting the fronds of the bush which hide the stalk from you (Figs 7.6

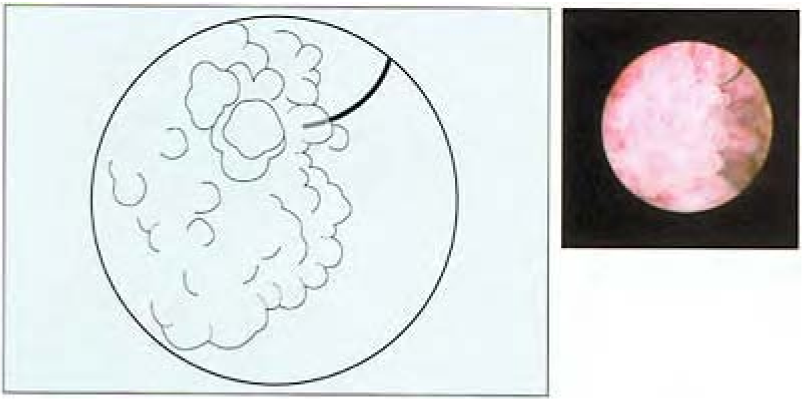

Figure 7.6 *The first aim is to expose the stalk by resecting the overhanging bush.*

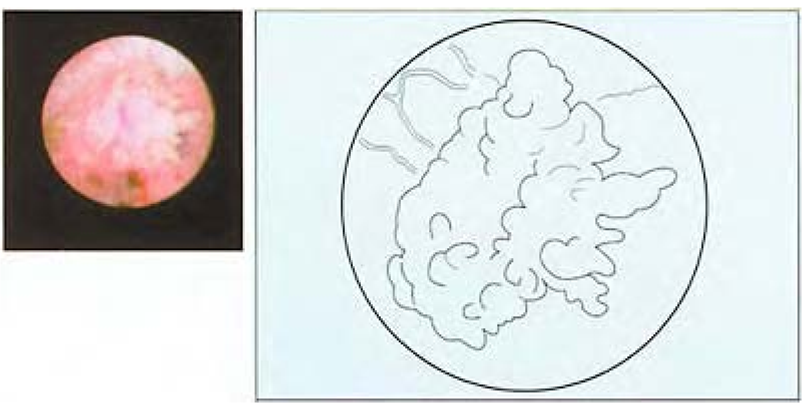

Figure 7.7 *Overlying bush resected to reveal the stalk.*

and 7.7). As soon as you see the edge of the stalk, apply the roly-ball electrode to the stalk to coagulate it, and render the rest of the resection relatively bloodless (Fig. 7.8).

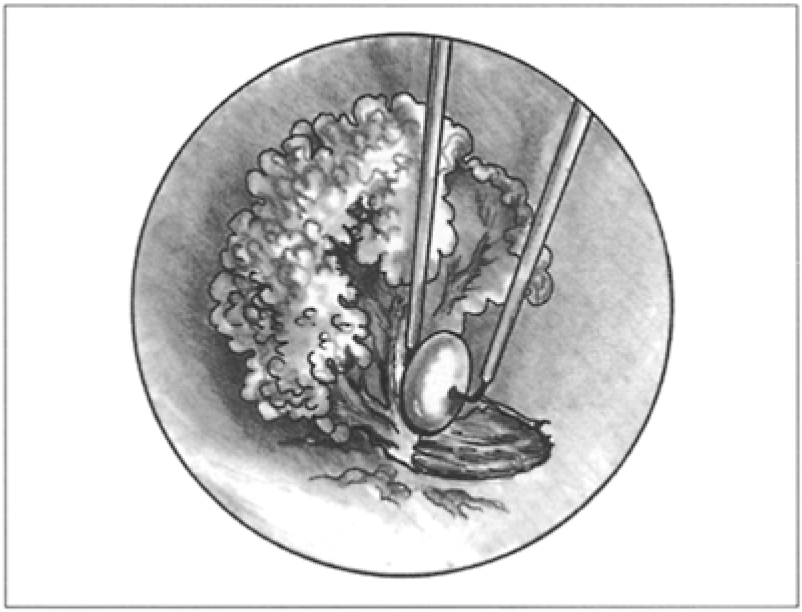

Figure 7.8 *Once the stalk has been found, use the roly-ball to coagulate the main vessels.*

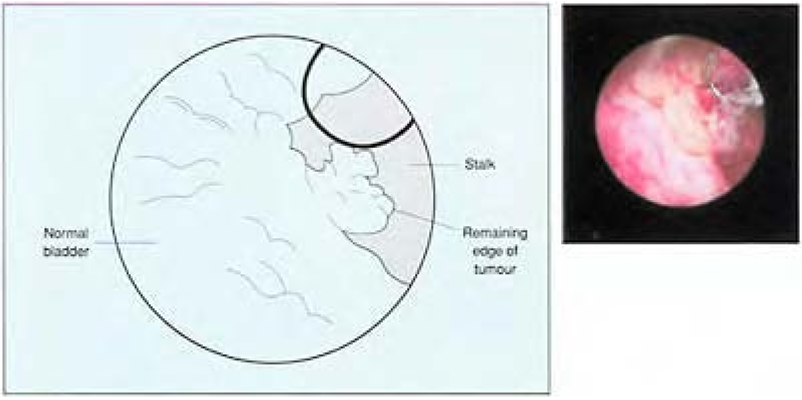

Figure 7.9 *Trimming remaining tumour from the edge of the stalk.*

Then, having found the edge of the stalk, work round it, continuing to resect more and more of the overlying tumour until it has all been removed. Towards the end of the process you will find it easier to work from healthy bladder towards the stalk (Fig. 7.9).

Finally, send pieces from the muscle in the base of the stalk for separate section to help the histopathologist establish how deeply it has invaded (Fig. 7.10). Make

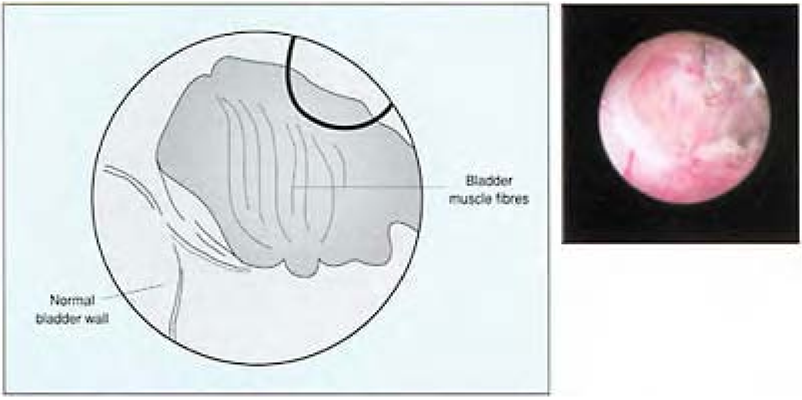

Figure 7.10 *A seperate biospy, taken from the stalk, is sent to detect muscle invasion.*

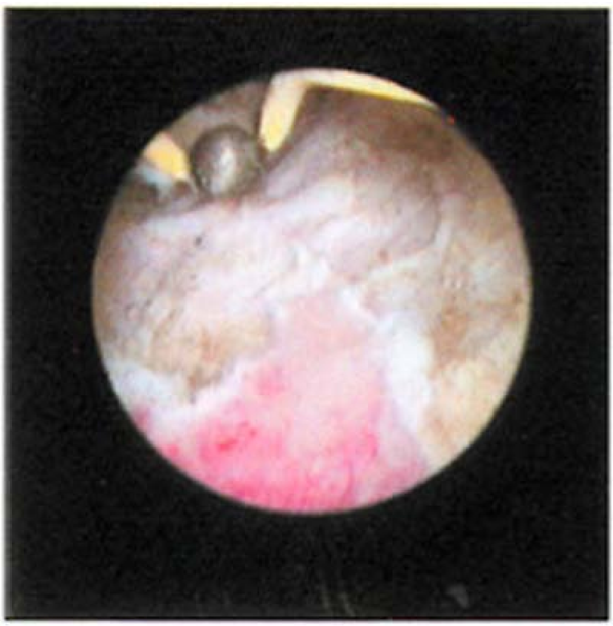

Figure 7.11 *The base is coagulated with the roly-ball to achieve complete haemostasis.*

sure that the tissues from the bush and the stalk are sent in separate specimen pots to the laboratory, labelled ‘bush’ and ‘stalk’ respectively. Finally, go over the base of the stalk thoroughly with the roly-ball electrode to effect haemostasis and coagulate the layer of bladder muscle deep to your resection (Fig. 7.11). Haemostasis must be complete, for unlike the prostate there is no way of effecting tamponade in the bladder.

After resection is complete, empty the bladder and perform a careful bimanual examination: induration in the wall of the bladder remaining after resection suggests invasion of muscle, and puts the tumour stage into T3.

Once haemostasis is complete, set up continuous irrigation as for a routine prostatectomy (see page 153).

Second-look TURBT

In some circumstances a second TURBT is carried out some weeks after the first resection. This is done where the preliminary pathology report suggests a high grade, non-invasive tumour or an intermediate grade tumour that is equivocally into muscle. The rationale for the secondlook TURBT is to establish whether there really is no muscle invasion. In such cases, be particularly careful when taking further biopsies from the original tumour site, as the bladder wall here may be very thin and therefore prone to perforation. A cold cup biopsy may be safer than a formal loop resection where the bladder appears especially thin.

Very large papillary tumours

Very rarely one encounters a group of giant papillomas that daunt even the most experienced resectionist. It is true that with the continuous irrigating cystoscope it is usually possible to resect them in the way described above, but occasionally the bleeding is so furious that it is impossible to see where to start.

There are two options here. Resect as many of the tumours that you can see, as long as you are able to maintain a clear field of view, and then come back on another day to finish the job, rather than risk perforating the bladder. Alternatively, consider using prolonged high pressure cystodistension—Helmstein’s technique. This is very rarely used nowadays, and the majority of younger urologists will probably never have seen, let alone used it. Nonetheless we have retained a description of the technique for the rare cases where it may still be required[2,3]. The technique requires a very long period of continuous epidural anaesthesia because it relies on compression of the tumour by the balloon to produce ischaemic necrosis.

Under continuous epidural anaesthesia, which will produce a measure of hypotension, a large balloon is placed in the bladder tied to a catheter. Specially made and tested balloons are available for the purpose, but in the beginning Helmstein and others used ordinary toy balloons. The pressure inside the balloon is monitored continuously, as it is distended with glycine and the pressure is kept up for 6 hours (Fig. 7.12).

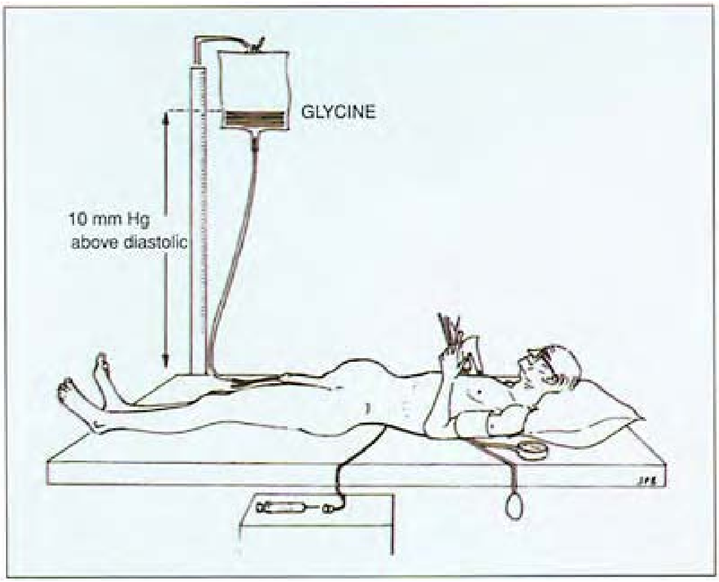

Figure 7.12 *Helmstein's distension method.*

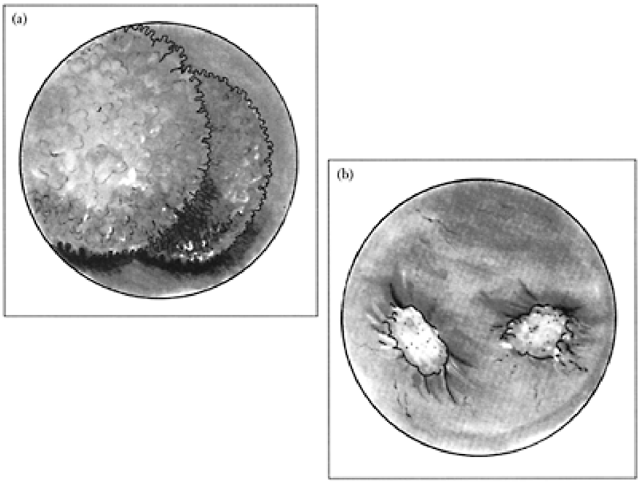

Figure 7.13 *Three weeks after the Helmestein treatment, the bulky tumours (a) have sloughed away leaving only stumps (b) which are then resected.*

After the balloon is let down the ischaemic tissue of the tumour sloughs and an irrigating catheter may be necessary for the next few days until all the necrotic debris has come away. The bladder is re-examined after 3 weeks, by which time only the stumps of the previous tumours will be found. These are resected for staging in the usual way (Fig. 7.13).

Invasive solid tumours

When there is histological evidence of invasion of muscle the distinction between pT2 and pT3 is made according to the finding of induration on bimanual palpation after resection of the tumour is complete. Thus, after resection of a T2 tumour no mass or induration will remain, but after resection of a T3 cancer a mass or induration will still be palpable.

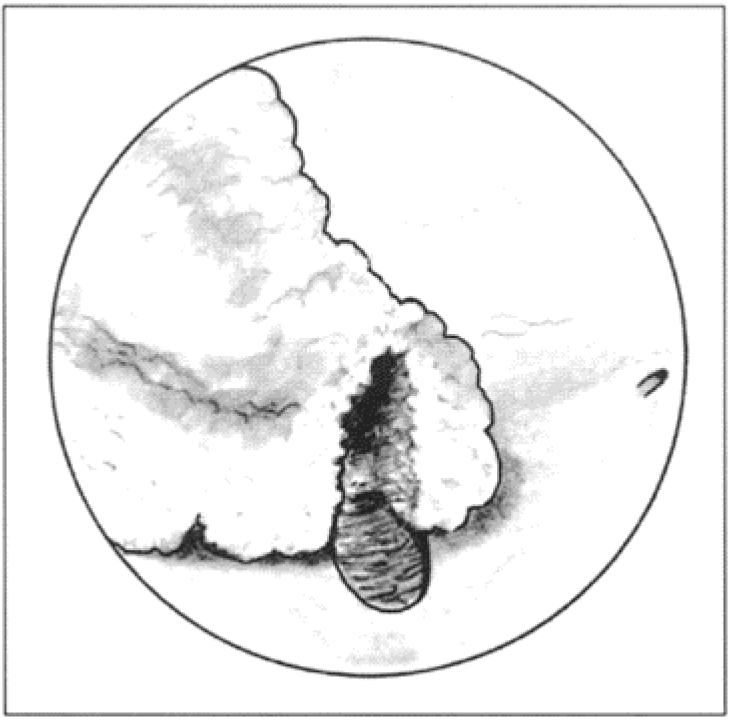

Figure 7.14 *Large solid tumour: a deep biopsy which must include muscle, is taken from its edge for staging purposes.*

The purpose of TURBT for solid tumours, where the patient is a candidate for aggressive adjuvant treatment such as radiotherapy or cystectomy, is to provide accurate grading and local staging information. It is not necessary to resect all the exophytic tumour, particularly if cystectomy is planned, as the purpose of the cystectomy (obviously) is to remove all residual cancer. For patients where radiotherapy is contemplated many surgeons feel that TURBT controls bleeding and provides symptomatic relief from frequency and strangury, and many radiotherapists prefer that the bulk of the intravesical tumour should be removed, leaving less to be destroyed by irradiation. To get evidence of tumour grade and stage, a good deep biopsy that reaches well into bladder muscle is required (Fig. 7.14).

Resecting tumours in inaccessible places

Tumours on the anterior wall and in the dome can sometimes be very difficult to reach. In this situation, decompress the bladder somewhat. This, combined with your free hand applying suprapubic pressure may bring the tumour within reach of the loop of the resectoscope. It is sometimes easier to use the roly-ball to treat such tumours, as this can be controlled more safely than the loop of the resectoscope. Sometimes inclining the table so that the patient is in the head-down position may make the resection a little easier, particularly where there is a large ‘overhang’ of lower abdomen. If these tricks fail, then ask for the long resectoscope.

Tumours in diverticula can present a problem. The bladder wall in the depths of a diverticulum is thin, and it is safer to use the cold cup biopsy forceps to remove tumours here, with roly-ball diathermy for coagulation.

Resecting tumours in the region of a ureteric orifice

From time to time a tumour is located right at the ureteric orifice and the surgeon’s concern may be that resection or diathermy in this location could damage the ureter with subsequent scar formation and stricturing. None of the authors have ever seen this complication over many years of cumulative experience. The usual outcome is a gaping ureteric orifice (‘golf-hole’ ureteric orifice).

Management of this theoretical problem is based on anecdote. The use of pure cutting current will reduce the likelihood of scarring occurring, but clearly coagulating current may be required to stop bleeding. You can simply resect the tumour, leave the resected ureteric orifice alone and hope for the best. Alternatively, an insulated guidewire can be positioned in the ureter before the resection is done, so that you can subsequently place a JJ stent easily. This can be left in place for a couple of weeks and then removed. A follow-up intravenous urogram (IVU) will establish whether there is any significant hold-up to the flow of contrast through the ureter. However, as already stated, in practise we have not seen this problem and therefore leaving a JJ stent in place is probably unnecessary

Occasionally the tumour completely obscures the ureteric orifice and in this situation one has no choice other than to resect it and then try to find the lumen of the ureter to allow placement of a JJ stent. Sometimes the lumen instantly becomes apparent; at other times it cannot be found. Again, a follow-up IVU will determine whether the ureteric orifice is obstructed, in which case a nephrostomy with antegrade balloon dilatation and stenting can be used to deal with the stricture. Again, it is our cumulative experience that ureteric obstruction is very rare and therefore such precautions are probably unnecessary.

Adjuvant chemotherapy for superficial tumours

Every patient who has been treated for a bladder tumour will be carefully followed up by regular check cystoscopy, nowadays using the flexible cystoscope. There is considerable evidence that prophylactic adjuvant immunotherapy with Bacillus Calmette-Guérin (BCG) or chemotherapy with mitomycin will diminish the number of recurrences, and when multiple tumours are seen, when they recur very frequently and in large numbers or where there is associated carcinoma *in situ*, these agents should be used[4,5].

Perforation

The bladder wall is often perforated during transurethral resection of a tumour and it is not uncommon to see the glistening globules of fat in the site of the stalk (Fig 7.15). As with the prostate, this is very seldom of any consequence provided that all the bleeding has been controlled. Extravasation of irrigating fluid is minimized by using a continuous irrigating resectoscope. The bladder should be drained.

The exception is when there is a tumour on the dome of the bladder and a deep resection of an invasive tumour has resulted in a perforation into the peritoneal cavity. This is very rare. It calls for laparotomy, not only to close the hole in the bladder and control bleeding, but also to make sure that any thermal injury to adjacent bowel is correctly over-sewn or resected (see Chapter 11).

There have been reports of spread of cancer cells into the peritoneal cavity following bladder perforation[6].

Figure 7.15 *Perforation through the wall of the bladder into fat.*

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Chapter 8
Carcinoma and other disorders of the prostate and bladder

Carcinoma of the prostate

Since cancer usually arises in the peripheral zone of the prostate, when a small nodule is felt on rectal examination it is better to get tissue for histology by means of a transrectal biopsy, a procedure which today is most accurately performed under transrectal ultrasound control[1,2]. The later management of the small prostatic nodule is still a matter for debate which is beyond the scope of this monograph, and unfortunately is of little relevance to the large number of men who present at a stage when their cancer is not confined to the prostate, but is causing severe symptoms from outflow obstruction.

For these men transurethral resection of the prostate is but one incident in the management of their cancer, but at least to start with it is the one that is most necessary in order to relieve symptoms. The investigations and preparation are identical to those that apply to benign enlargement, and the urethroscopy and cystoscopy are the same standard preliminary.

One difficulty is often encountered with prostatic cancer, where a carcinoma has made the entire prostate and prostatic urethra rigid, as if made of concrete, and it is difficult to pass the resectoscope. Direct visualization of the urethra with a visual obturator can help negotiate a way through the prostate and into the bladder. If this fails, a helpful trick is to pass a filiform bougie, perhaps with a dog-leg bend at its tip (Fig. 8.1), to negotiate a tortuous pathway into the bladder. Once the filiform bougie is in place, an angled Timberlake obturator is fitted into the resectoscope sheath (Fig. 8.2), and the whole gently passed, following the filiform into the bladder. Once in the bladder, the tissue around the internal meatus is then resected, and at once the resectoscope sheath becomes mobile and the rest of the resection is straightforward.

If the angled Timberlake obturator is not available, the same procedure can be followed by passing the resectoscope sheath over a flexible Phillips follower which screws onto the filiform (Fig. 8.3).

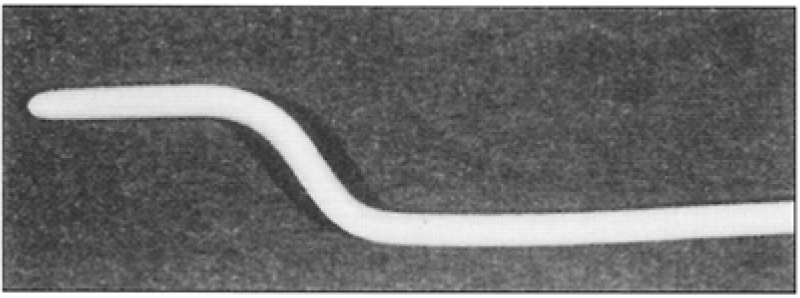

Figure 8.1 *A dog-leg bend on the end of a filiform bougie assists in getting it past a tortuous carcinoma of the prostate.*

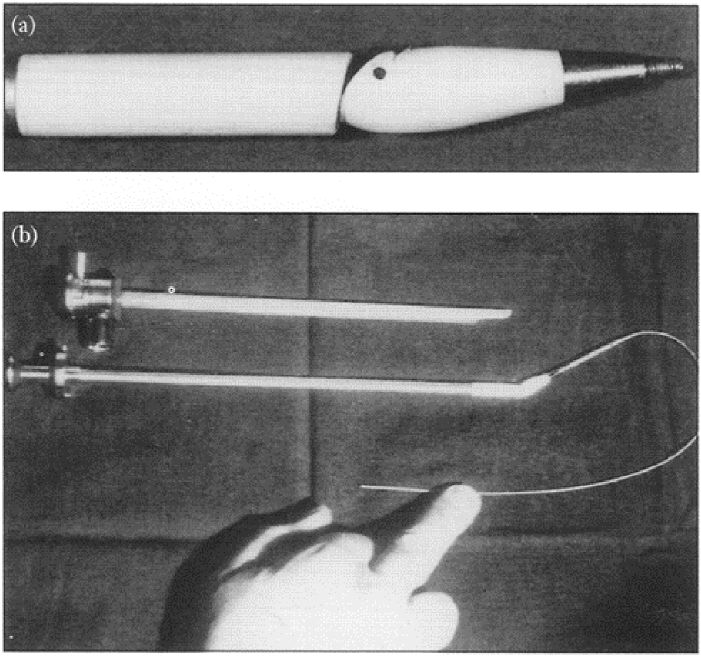

Figure 8.2 *(a) An angled Timberlake obturator can be (b) screwed on to a filiform.*

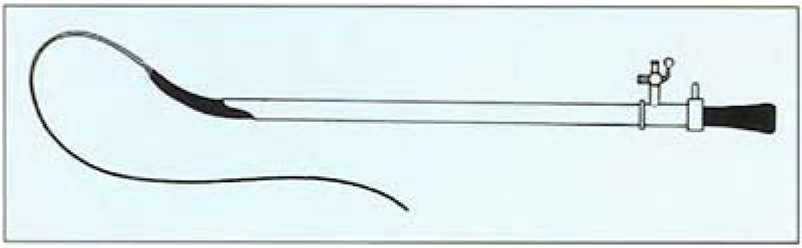

Figure 8.3 *Alternative method of passing a resectoscope sheath through a hard, narrow prostate cancer using a flexible Phillips follower attached to the filiform.*

In many cancers the landmarks may be difficult to find. Often the verumontanum is displaced or distorted by tumour, and sometimes the external sphincter is infiltrated by growth which makes it lumpy and

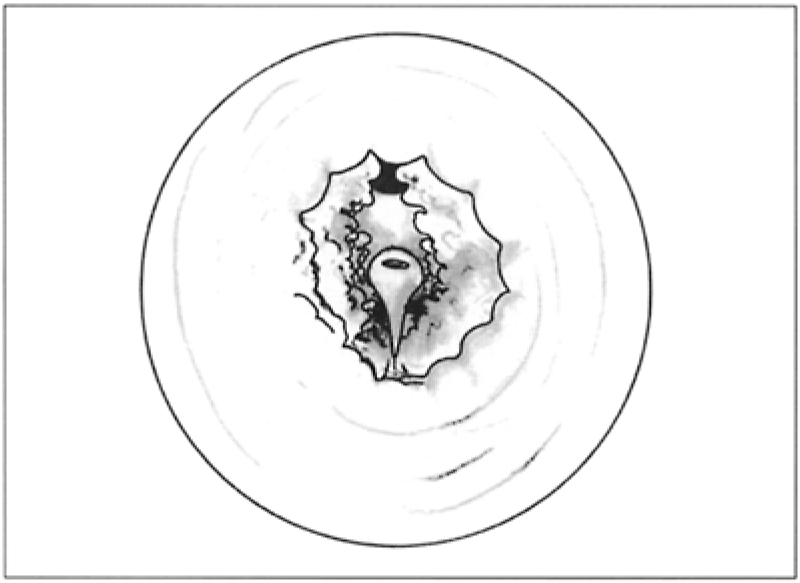

Figure 8.4 *The external sphincter and verumontanum are often distorted by carcinoma of the prostate.*

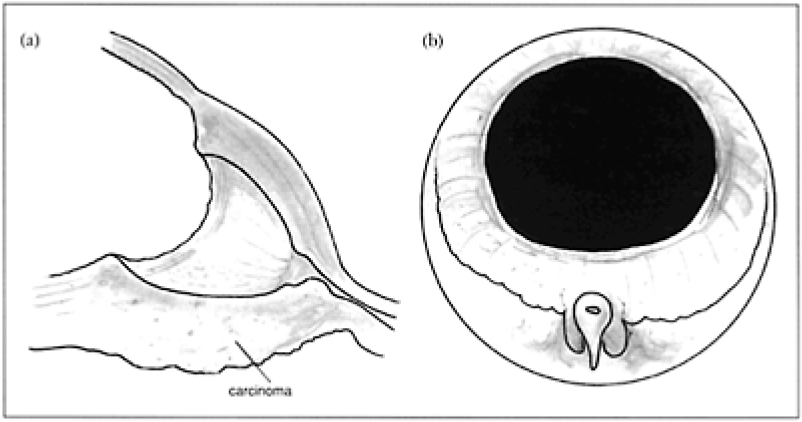

Figure 8.5 *In cancer the intention is only to carve a funnel-shaped cone from the bladder neck to the verumontanum.*

rigid (Fig. 8.4). Since the cancer usually arises in the peripheral and caudal outer zone of the prostate and invades the capsule early on, you must not expect to find the usual difference in appearance between the ‘bread’ of the adenoma and the fibrous lacework of the ‘capsule’. Instead the object of the operation is to carve an adequate funnel through the tumour from verumontanum to bladder neck (Fig. 8.5), through which the patient can pass urine. There is no point in attempting to do more. You should be extra careful when resecting in the region of the verumontanum and sphincter in the hope of preserving continence.

In resecting prostatic cancers it is particularly helpful to work with one finger in the rectum, which will give a three-dimensional concept of the position of the resectoscope and the loop, even when the cancer has made the whole field stiff and unfamiliar.

As a rule, bleeding is less profuse in cancer of the prostate, but one precaution should not be forgotten in men who present with widespread metastases, namely the possible presence of prostatic fibrinolysins which may prevent normal coagulation. Be wary of this, especially in the patient who gives a story of spontaneous bleeding and bruising.

It has been suggested on many occasions that transurethral resection might allow cancer cells to enter the circulation and so encourage dissemination of metastases. The evidence is disturbing, but inconclusive[3,4]. When the requirement is to confirm a diagnosis and establish the grade of the tumour, needle biopsies guided by transrectal ultrasound are more useful.

Calculi in the prostate

Small multiple calculi are so common as to be a normal component of the prostate[5] and they usually lie in the plane between inner and outer zones (Fig. 8.6), so that when they are reached in the course of

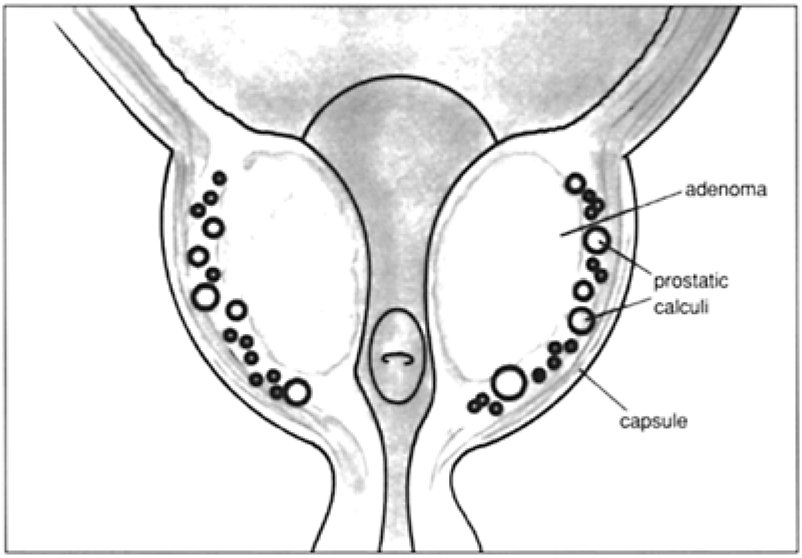

Figure 8.6 *Small calculi are often found in the plane between the inner and outer zones of the prostate.*

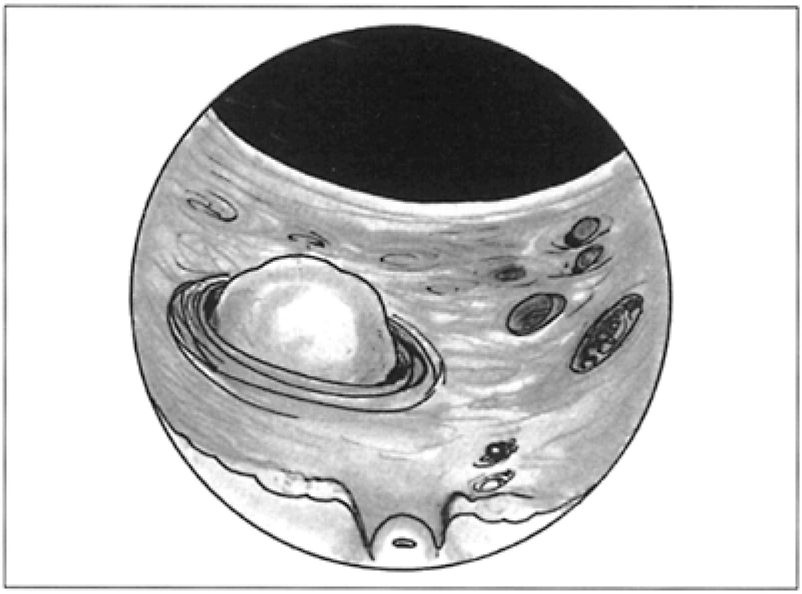

Figure 8.7 *Larger calculi are revealed looking like eggs in a bird's nest, and may break the loop.*

transurethral resection of a benign gland it is a good indication that the 'capsule' has been reached and you have gone far enough. Sometimes the stones are so large that the loop of the resectoscope is broken when trying to dislodge them (Fig. 8.7).

Less common are the very large stones which protrude into the lumen of the prostatic urethra and sometimes extend up into the bladder. They are always half-covered by a layer of prostatic tissue (Fig. 8.8). This has

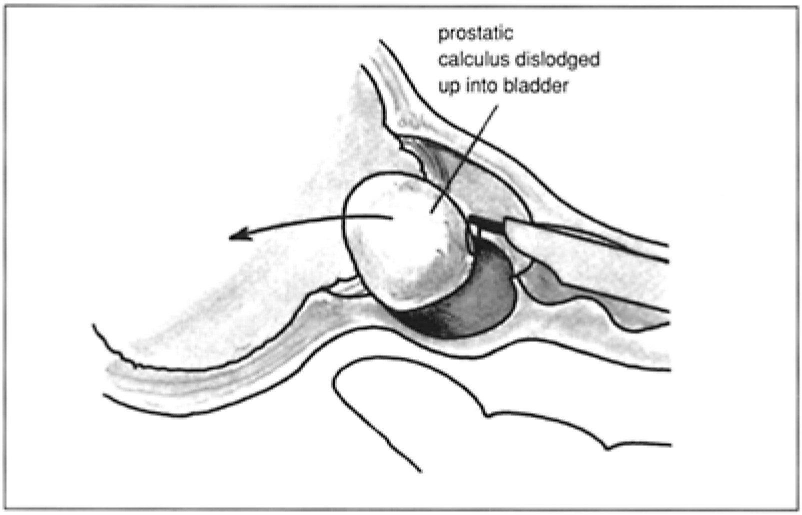

Figure 8.8 *After uncapping the adenoma over a big prostatic stone it is pushed upwards into the bladder where it can be crushed and evacuated.*

to be resected before it is possible to push the stone up into the bladder, where it can be crushed and evacuated in the usual way[6].

Abscess of the prostate

Nowadays it is rare to see an abscess of the prostate, but it should always be suspected when a patient has fever, painful or difficult urination, and a very tender prostate on rectal examination[7]. Usually the prostate is more swollen on one side than the other. Sometimes the abscess bursts as soon as it is touched by the resectoscope; more often it is necessary to sink the loop of the resectoscope into the abscess, when pus pours out and the distended prostate collapses like a pricked balloon (Fig. 8.9).

Chronic prostatitis

This is a diagnosis to be made with the utmost caution, and requires bacteriological confirmation by Stamey's method[8], and perhaps histological confirmation by biopsy under transrectal ultrasound control. Occasionally it is accompanied by outflow obstruction, which in these cases must be proven by urodynamic measurements.

Transurethral resection is likely to leave behind continuing infection in the residual outer zone tissue and relapse of symptoms is very likely to occur.

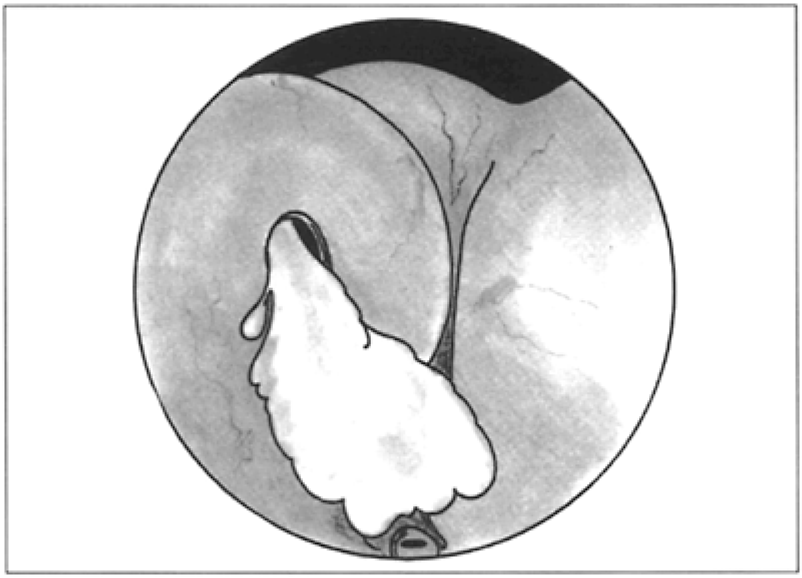

Figure 8.9 *Opening an abscess of the prostate with the loop.*

For the patient who complains of pain in the prostate and has no evidence of microbiological infection or the histological stigmata of inflammation, transurethral resection is contraindicated: it will almost certainly make the patient worse[9].

External sphincterotomy

In males with neuropathic lesions of the bladder an increase in the detrusor pressure may threaten the upper tracts; an incision of the bladder neck is often performed in the hope of allowing the bladder to empty at a lower pressure[10]. In some cases, however, the external sphincter remains closed, and the dangerous increase in detrusor pressure persists. In such patients a deliberate incision of the external sphincter may be necessary so that the bladder will become incontinent, and the patient voids without any increase in pressure into a condom urinal.

The classical site for the incision into the external sphincter was at 5, 6 or 7 o'clock, but to avoid injury to the neurovascular bundles of the penis the sphincterotomy incision should be made at 12 o'clock (Fig. 8.10).

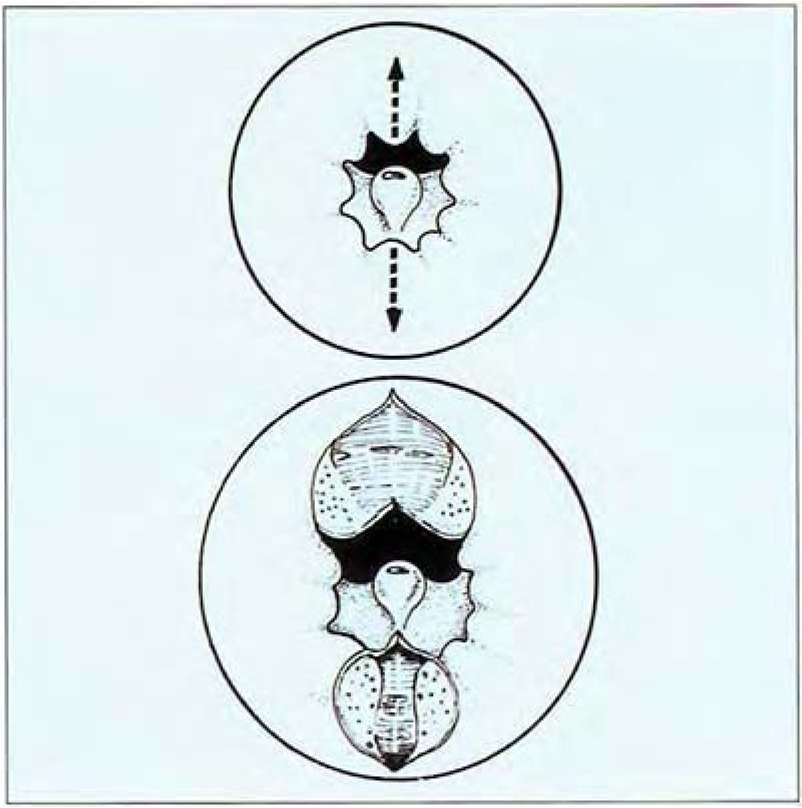

Figure 8.10 *Sphincterotomy. Midline incisions avoid the neurovascular bundles to the penis.*

Bladder calculi

Small stones are often found behind enlarged prostates. There are few calculi which cannot be crushed and evacuated. A number of instruments are now available for crushing bladder calculi including the optical lithotrite (Fig. 8.11), stone-crushing forceps (Fig. 8.12) and Mauermayer's stone punch (Fig. 8.13).

Figure 8.11 *Storz optical lithotrite.*

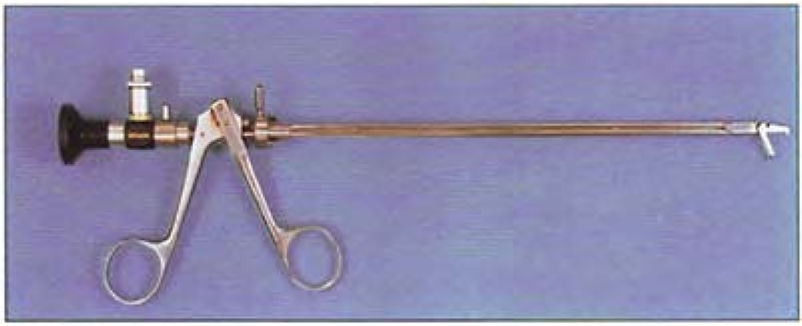

Figure 8.12 *Storz stone-crushing forceps.*

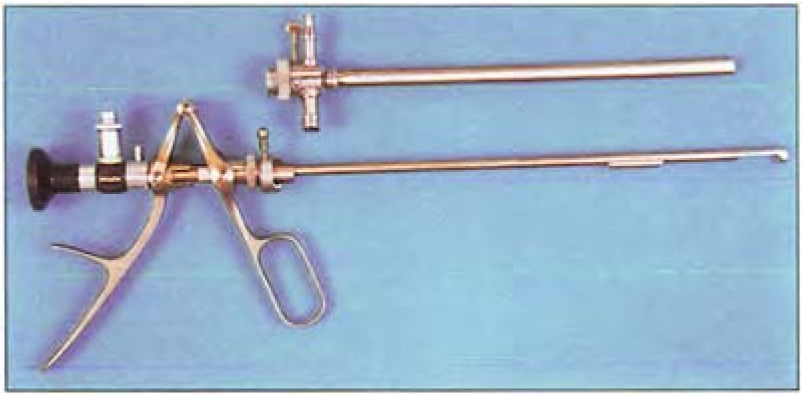

Figure 8.13 *Mauermayer's stone punch.*

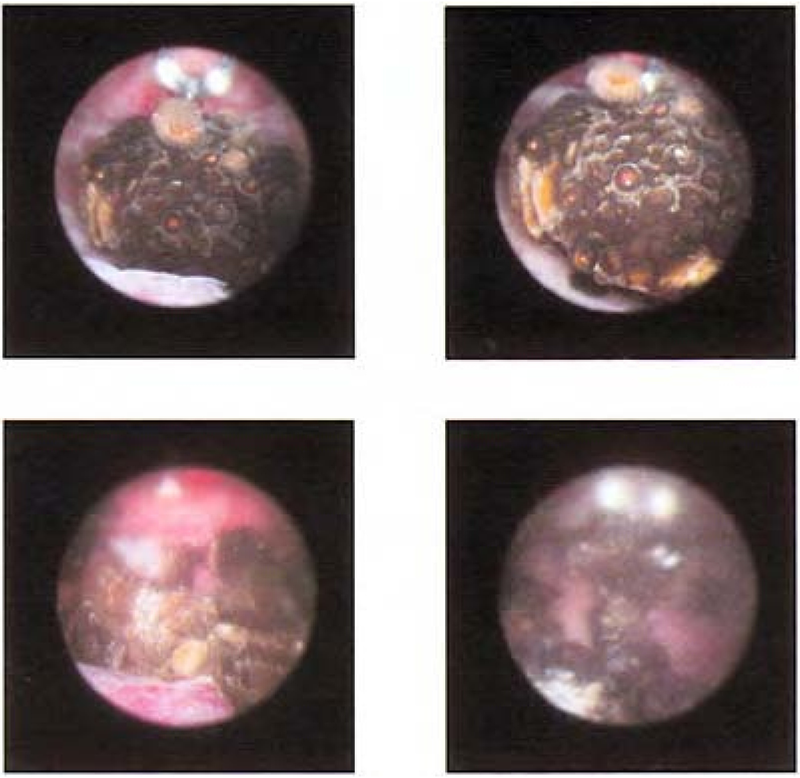

Figure 8.14 *Crushing a small calculus with Mauermayer's stone punch.*

These optical instruments are ideal for small calculi, and allow the stone to be broken up under vision and evacuated with an Ellik evacuator (Fig. 8.14). Larger stones can be fragmented by a combination of electrohydraulic lithotripsy and the Mauermayer stone punch. Very large stones will require open cystolithotomy.

However, the classical blind lithotrite (Fig. 8.15), remains the most effective and rapid instrument for all but the smallest stones and it is a

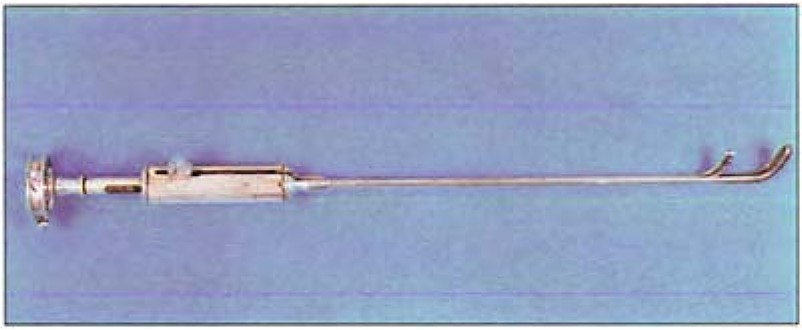

Figure 8.15 *Freyer's classical lithotrite.*

pity that its use is a skill which is dying out, despised by a generation of urologists reared on electrohydraulic or ultrasonic lithotriptors[11].

When there has been a large stone that has been present for a long time it is prudent to take a mucosal biopsy of any suspicious area in view of the occasional complication of squamous cell cancer[12].

When the patient has a bulky middle lobe it can be difficult to see the stone. It is then more convenient to resect most of the middle lobe, then crush and evacuate the stone, and complete the transurethral resection in the usual way.

Diverticula of the bladder

Small saccules are commonly present in association with prostatic obstruction and can be disregarded (Fig. 8.16). Larger diverticula must always be fully examined by passing the cystoscope inside them to rule out cancer or a stone; be particularly suspicious of a diverticulum whose opening is oedematous or inflamed. If you cannot see inside clearly, make sure that the diverticulum is innocent by means of a CT scan. When it harbours a stone or a tumour, or when there is continuing infection, the diverticulum should be removed, but since the prostate is often quite a small one, it is easier to perform the prostatectomy transurethrally and then go on to do the diverticulectomy in the usual way[13].

Figure 8.16 *Multiple small diverticula are often found with a trabeculated bladder.*

Urethral strictures and transnrethral resection

Strictures may be found in patients who need transurethral resection of a bladder tumour. To allow the passage of the resectoscope it is necessary to dilate them or perform an optical urethrotomy. The optical urethrotome (Fig. 8.17) may be passed over a guidewire or a ureteric catheter if the way through the stricture cannot be seen clearly (Fig. 8.18). The incision is made at 12 o’clock right through the fibrous stricture into healthy tissue (Fig. 8.19). Urethrotomy by itself does not

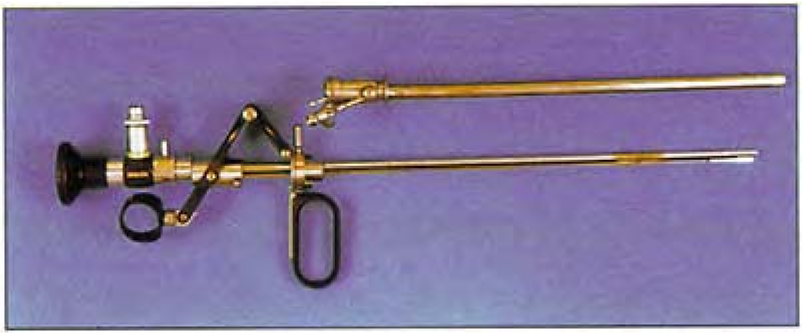

Figure 8.17 *Sachse optical urethrotome (Storz).*

Figure 8.18 *A guidewire or ureteric catheter may be passed through the stricture if the way through is not clear.*

Figure 8.19 *Internal optical urethrotomy using a ureteric catheter as guide.*

produce a long-lasting cure, indeed its results are virtually indistinguishable from traditional dilatation[14], and so every patient must be followed up with intermittent dilatation or self-catheterization. When there is a bladder tumour to be resected prudence suggests that dilatation may be preferable in view of the possible implantation of cancer cells into the raw area in the urethra, although such cases must be exceedingly rare.

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Chapter 9
Routine postoperative care after transurethral resection

In the recovery room

From the operating table the patient goes to the recovery room where, in addition to monitoring the usual vital signs, the airway and the intravenous drip (if there is one), the nursing team pay particular attention to the three-way catheter and its irrigating system (Fig. 9.1).

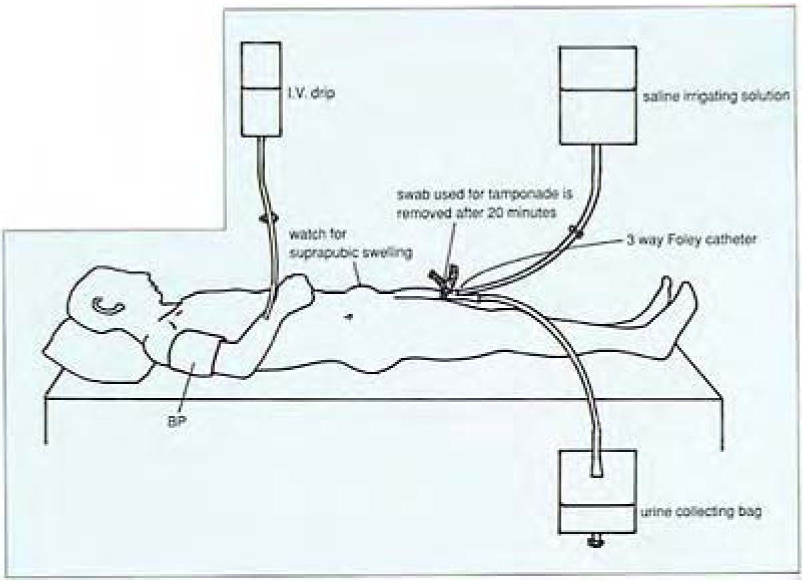

Figure 9.1 *Recovery room: vital signs are monitored; the threeway irrigating system is kept running briskly, and nursing staff keep an eye on the suprapubic region. The penile swab used for tamponade is removed before the patient returns to the ward.*

It is a sensible idea to get to know your recovery room staff. Spend a few moments telling them what operation you have done, and what problems you anticipate. Try to become actively involved in teaching the young recovery nurse about how you like the patient to be managed in the recovery room. Listen to the opinions of the nurses and avoid dismissing their suggestions in what may appear to be an arrogant fashion. It is a good idea to pass through the recovery room from time to time to check that all is well with the patients you have operated on. You might identify problems at an early stage when they are easier to correct and at the very least you will gain a reputation as a surgeon who takes an active interest in the postoperative care of your patients.

A few surgeons prefer to use a two-way catheter, and rely on the patient's own urine to keep the bladder irrigated. If necessary, intravenous fluids and a diuretic are given to encourage an adequate output of urine. The authors mistrust this system, fearing that it courts the risk of dilutional hyponatraemia, particularly in a patient with an inappropriate secretion of antidiuretic hormone, but it has some advocates.

Some surgeons prefer to leave the catheter to drain freely, only irrigating it with a hand syringe if the flow is blocked. The disadvantage of this method is the risk of introducing infection whenever the bladder is irrigated with a syringe[1].

In the usual technique with the three-way catheter the purpose of the irrigation is to dilute the blood so that a clot will not form to block the catheter. The rate of inflow of the saline is adjusted from time to time to keep the outflow a pale pink *vin rosé* colour, and as a rule the rate of inflow can be cut down after about 20 minutes.

Blocked catheter

1. The bag may be too full and its valve squeezed shut (Fig. 9.2). For this reason the drainage bags should be emptied long before they are full. Get into the habit of emptying the bag just before the patient leaves the operating theatre and of reviewing the patient in the recovery room from time to time to check that the catheter bag is not being neglected and allowed to overfill.
2. A small clot may have obstructed the catheter.
3. A chip of prostate may have stuck in the eye of the catheter.

In both these latter cases the first thing is to apply a bladder syringe to the end of the catheter and give it a good suck: this will often start the flow. If not, some of the irrigant should be drawn up in the syringe until it is about half-full, and about 20 ml injected before smartly aspirating again with the object of clearing the eye of the catheter.

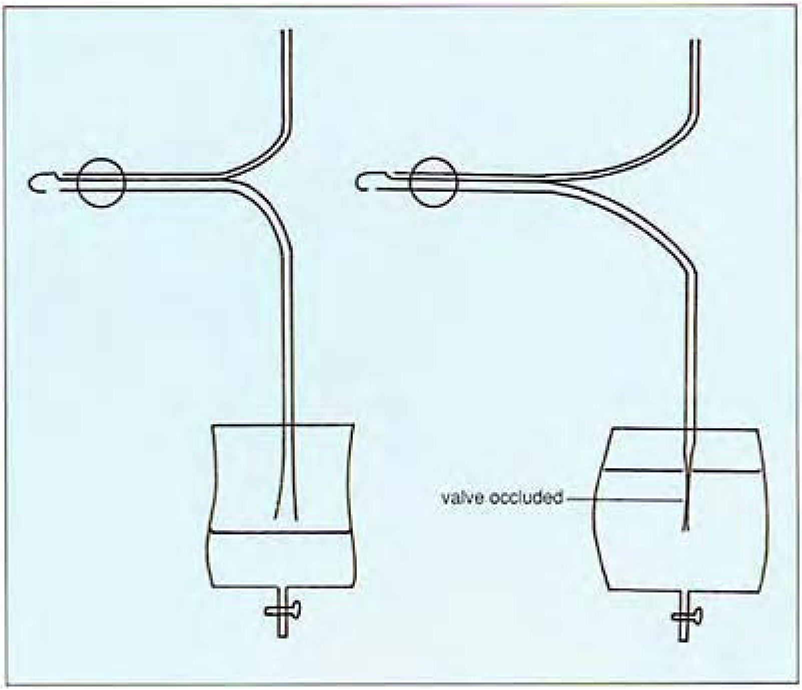

Figure 9.2 *If the valved drainage bag is allowed to get too full, the valve is closed and drainage ceases.*

If neither of these tricks works, the catheter must be changed. It is no good persisting in vain attempts to syringe a catheter which is blocked: it will result in overdistension of the bladder, which adds to the patient's distress and restlessness.

Let down the balloon of the catheter and withdraw it. The offending chip of prostate may declare itself stuck in the eyeholes in the end of the catheter. Place a curved introducer in a new catheter and take care not to catch the bladder neck as you introduce it. More or less clear urine usually runs out at once, and when the bladder is empty irrigation can be started again.

If the bladder has been allowed to become full of clot then the patient should be returned to the theatre without delay. This is one of the chief advantages of having the recovery room close to the operating theatre: a message from the recovery room nurse will bring one of the surgical team within seconds, who can check the situation and make the decision to return the patient or not without delay. Experienced nursing staff usually know when it is time to return the patient and the young surgeon does well to take heed of their advice. It is far better to err on the side of caution than waste valuable time, while the patient may be continuing to bleed, fiddling with a bladder syringe and a hopelessly blocked catheter.

Clot evacuation

Once re-anaesthetized the patient is repositioned, cleaned and draped as for a transurethral resection. The catheter is removed and the resectoscope passed again. Often this will allow a clot or chip to emerge and the problem is solved, but it is always wise to look into the bladder and irrigate out any clots that may be there with the Ellik evacuator (Fig. 9.3). When the bladder has been emptied, check the cavity of the prostate for any source of bleeding. It is rare that you will find any: the bleeding (as with the tonsil bed) has usually stopped when the clot has been evacuated. Rarely you may find a little tag of prostate which seems to be keeping a small vein open: resect it and coagulate the vein.

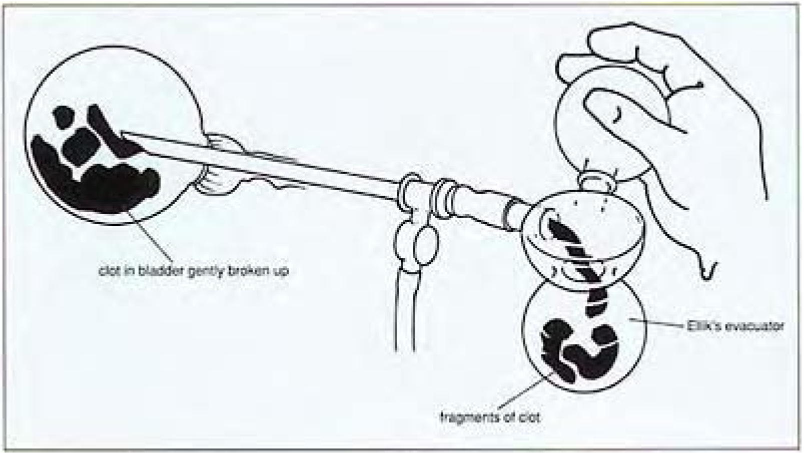

Figure 9.3 *Clot retention. The resectoscope sheath is passed and the Ellik evacuator is used to break up the clot and suck it out.*

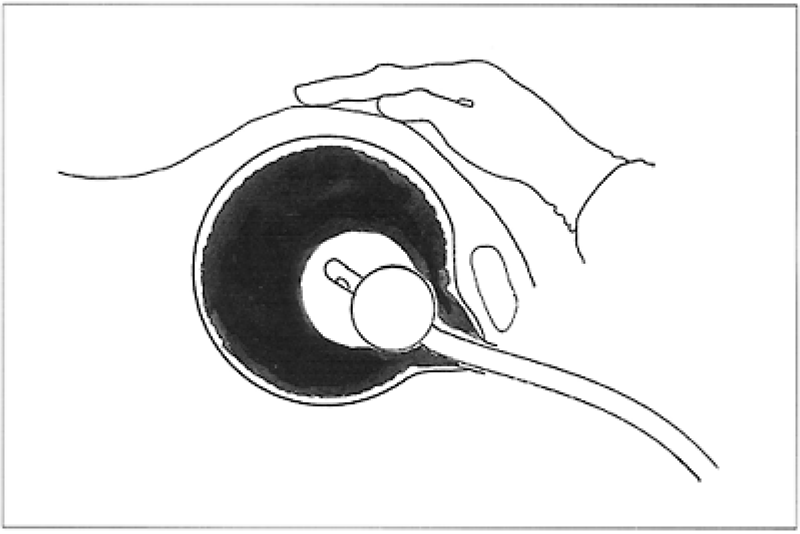

Figure 9.4 *The end of the irrigating catheter has become surrounded by clot, preventing effective irrigation of the bladder.*

Very occasionally there may appear to be normal flow of urine into and out of the bladder, the urine may be only lightly blood-stained, but the patient may complain that their bladder feels full. Examination reveals a tensely distended bladder which is dull to percussion. The distended bladder suggests that the catheter is blocked, but this does not fit with the apparently normal flow of irrigant through the drainage system. What may have happened is that the patient’s bladder has filled up with clot as a consequence of persistent bleeding from the prostate, and the end of the catheter has become surrounded by clot (Fig. 9.4). Irrigant simply passes out from the irrigation channel at the tip of the catheter and then directly back out of the bladder again through the outflow channel of the catheter. Attempts at evacuation of the thick clot through the catheter using a bladder syringe will not work. The only way to deal with this is to take the patient back to theatre, evacuate the clot from the bladder and find and control the source of the persistent bleeding. The clue to diagnosing this uncommon event is simple clinical examination of the patient’s abdomen.

Major reactionary haemorrhage

Mercifully very rare, major reactionary haemorrhage may take place without warning. If there is time, and the general condition of the patient permits, the bladder should be emptied with the Ellik and the source of bleeding coagulated, if possible, or controlled by traction on the Foley catheter. Exceptionally, the bleeding is impossible to control by these means, and it is necessary to open the patient and pack the prostate bed.

The retropubic space is opened through a Pfannenstiel incision. The bladder is retracted as for a Millin's prostatectomy and the capsule is incised transversely[2]. All clot is evacuated and the prostatic bed is firmly packed with gauze. Allow plenty of time for loss of blood to be restored, and then remove the pack, try to identify the source of bleeding, and suture the offending vessel. If the bleeding continues, pack it with two vaginal packs. The second pack should be tied to the first. Close the wound with a large suprapubic tube in the bladder, leaving the end of the second pack protruding through the wound. Book theatre for 24 hours later, so that you can remove the packs under general anaesthetic, with a full prostatectomy set ready and waiting in case you encounter continued bleeding. Withdraw the pack gently. Usually the bleeding will have stopped, but if it has not, you will be in the best position to control it.

Fortunately this emergency is rare, but there are few urologists of experience who have not had to pack the prostate once or twice. The important thing is not to procrastinate when the patient is losing blood rapidly: it is better to have to explain an unexpected Pfannenstiel incision to a living patient than to his widow.

Sedation

Transurethral resection is seldom painful unless the wall of the bladder or the trigone has been resected, or a large middle lobe has had to be removed. Then the patient may have a fierce desire to pass urine and the bladder may be thrown into involuntary detrusor spasms which nothing will control, and urine may escape alongside the catheter.

A sacral or caudal epidural anaesthetic minimizes this kind of postoperative discomfort and will last for several hours. Pethidine or morphine will relieve pain but do not prevent detrusor spasm, and they may lull the recovery staff into a sense of false security so that they may not realize that the pain and leakage are in fact due to a blocked catheter. Because transurethral resection is not usually a painful procedure, it is wise not to prescribe postoperative analgesic drugs as a routine in order to avoid this hazard. If the patient is in pain, find out why, before prescribing analgesia. Most commonly the patient who is apparently in pain will settle down as he regains full consciousness and can understand that there is a catheter in his penis.

Return to the ward

As soon as the patient has recovered consciousness and the irrigating system has settled down to an even flow, then the patient may go back to the ward. During the journey it is important that the irrigation is not inadvertendy shut off, and as soon as the patient arrives on the ward the irrigating system should be checked to make sure that the fluid is running and that the bag has not become overfilled (Fig. 9.5). Thereafter the patient's vital signs are checked at intervals of 15, and later 30, minutes.

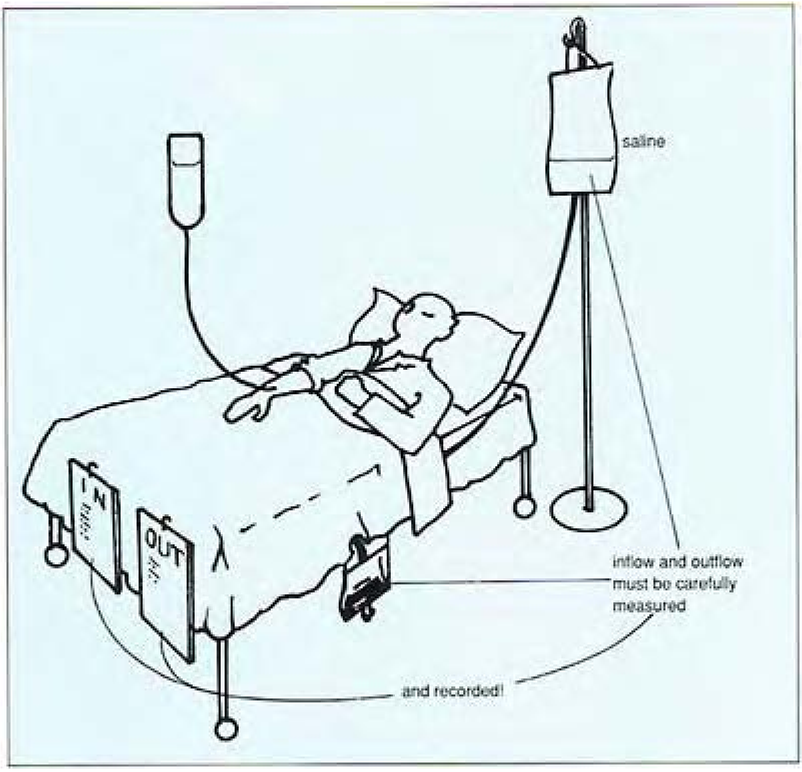

Figure 9.5 *Return to the ward. Inflow and outflow must be measured. Ward staff should check that the penile swab has been removed. As the colour of the outflow becomes less blood-stained the rate of inflow is cut down.*

When the patient comes round he may well be hungry and thirsty and there is no reason why he should not be allowed to drink so long as he is not nauseated. Within 4–6 hours most patients are fully alert, may take a light meal and may start to drink as they please. If blood loss needs to be made up then the intravenous cannula should be retained until all the blood has been given. If the bleeding has stopped and the patient is taking fluids well there is no need to keep the drip up.

Recording the irrigating fluid

The volume of fluid run into the bladder and the urine collected should be continuously recorded and totted up every hour to make sure that there is no large discrepancy that might suggest that the bladder is becoming overdistended, or that there is an excessive loss of fluid into the veins (see page 116).

Ambulation

Early mobilization is a good way of preventing the development of deep venous thrombosis and patients should be encouraged to sit out of bed as soon as possible—the evening of their operation or the following morning—or as soon as the effects of the epidural anaesthetic have worn off. The next day they should be encouraged to walk around the ward carrying their catheter and the drip for the irrigating fluid if this is still needed (Fig. 9.6).

Irrigation

When the effluent is clear, or contains only a little staining of altered brownish blood, the irrigation may be discontinued—usually after about 12 hours.

Removing the catheter

Common sense dictates when the catheter should be removed. Sundays and public holidays are bad days to remove a catheter, and for the same reason it is better to remove the catheter early in the morning than late at night.

When a patient has had chronic retention with a huge floppy bladder year in and year out, it is unlikely that his detrusor will regain the ability to expel the urine for several days. Most patients, however, pass water within a few hours of removing the catheter.

Figure 9.6 *First postoperative day. The patient may walk around, carrying his irrigating drip and urine bag.*

If the catheter is taken out within 6–12 hours of the resection, as one may be tempted to do when the bleeding has been exceptionally well controlled, urine may escape from capsular perforations and give rise to stinging and pain on urination. For this reason it is usual to remove the catheter after about 48 hours. Warn the patient that removing the catheter is a little uncomfortable and ensure that it is taken out slowly and gently. The very apprehensive patient deserves a little sedation beforehand.

Failure to void after removing the catheter

There are three reasons for this:

1. The most common reason is that the patient finds it so uncomfortable to start to void that the process is inhibited. He shuts his external

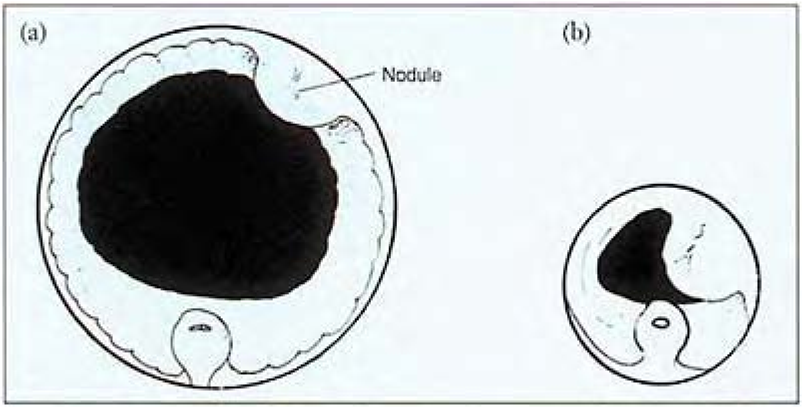

Figure 9.7 *If a small nodule of tissue has been left behind after removing a large prostate, leaving a large cavity, it is very easy to overlook it at the time (a), but it becomes all too obvious when the prostatic cavity has contracted (b).*

sphincter tightly and even when the bladder is painfully distended, cannot void.

2. The patient has detrusor failure from chronic retention.
3. Insufficient tissue may have been removed, usually at 2 or 10 o’clock, for when the prostatic capsule shrinks down a tiny lump becomes relatively large compared with the lumen of the prostatic urethra (Fig. 9.7).

When a patient cannot pass urine within an hour or two of removing the catheter one should not wait for the bladder to become painfully distended, but replace the catheter as soon as the patient has any discomfort, or whenever the bladder can be felt. Be aware of the pitfall of the patient with a big floppy detrusor who may be passing small amounts of urine but is quietly building up a huge residual.

Allow 3 or 4 days of rest, and then remove the catheter a second time and see if the patient can void. The man with the first, most common, type of failure to void will now do so without difficulty.

The patient with significant obstruction due to residual prostatic tissue should be returned to the theatre and the offending tissue resected: it is usually only a few grams.

The patient with detrusor failure poses a more serious problem. There is seldom any pain, but he soon returns to the state of chronic retention with overflow in which he arrived in hospital. In nearly every case the detrusor function returns after about 4 weeks of catheter drainage. He should be allowed to go home with an indwelling catheter on free drainage (Fig. 9.8). On no account should the patient be provided with a spigot or tap, or there will be a serious risk of accumulation of infected urine in the bladder with resulting septicaemia.

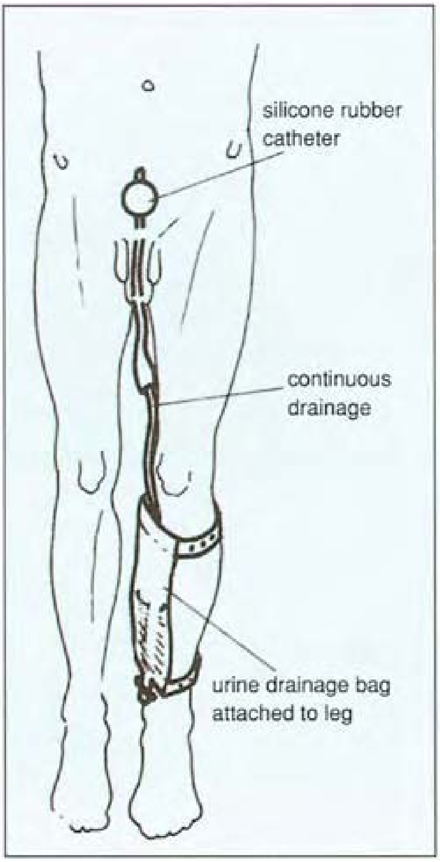

Figure 9.8 *If failure to resume voiding is due to atony of the detrusor, a period of continuous catheter drainage is necessary. The patient may go home wearing a silicone rubber catheter connected to a leg drainage bag. Never permit a spigot to be used.*

After about a month, the patient is re-admitted to hospital overnight for the catheter to be removed, under antibiotic cover. The patient is carefully monitored to make sure that residual urine does not gradually accumulate: the best method is to check this with an ultrasound scan. Cholinergic drugs are often recommended for this type of detrusor failure but they do not work in practice when the problem has been long-standing.

The frequency with which failure to void occurs is discussed further in Chapter 12.

Deliberate sphincterotomy

Some very old demented men with chronic retention have a detrusor which is irrevocably damaged and never recovers the strength to empty the bladder. A permanent indwelling catheter may not be tolerated, and may prevent them from being cared for in sheltered accommodation for the elderly. In such a patient it may be a kindness to perform an external sphincterotomy (see page 147) and fit him with a penile sheath, but such a decision will not be taken lightly and only in consultation with the geriatrician in overall charge of the care of the patient.

Going home

Most men can leave hospital after transurethral resection of the prostate or even a large bladder tumour within 4–5 days of the operation, but it is important to make sure that they understand that the raw area inside them will not be healed up completely for some time. They should rest quietly. Many patients (especially doctors, and practically all surgeons) think they can rush back to work simply because they have felt no pain. Nothing is more likely to give rise to secondary haemorrhage. Tell them they must take it easy. In reply to the inevitable question, ‘What do you mean, Doctor?’, a good guide is anything they would normally do in their carpet slippers (Fig. 9.9). They may potter around the house, go next door for a chat and have friends round to see them, but they must not play golf, walk the dog, dig the garden or mow the lawn. Surgeons must not operate. No one should drive a car.

This carpet-slipper convalescence should go on for 2 weeks after the patient has left hospital. It is designed to prevent the physical effort which might increase the pressure in the pelvic veins and provoke secondary haemorrhage.

Figure 9.9 *'Carpet-slipper' convalescence is enjoined for 2 weeks after leaving hospital.*

After this time the patient should gradually return to normal life, increasing his activities day by day, go for walks, play a few holes of golf and go shopping. The rate of his progress will usually be regulated by the patient's frequency and urgency, which take a little while to subside. Ideally this second period is one of getting back into training for a normal life, and if your patient can afford it, he should go away for a holiday in the sun before returning to work, or the equally strenuous life of modern-day retirement. The holiday should be postponed until 3 or 4 weeks after the operation, this being the risk period for secondary haemorrhage.

It is not uncommon for a patient to experience some haematuria a few weeks after TURP. His urine may have completely cleared of blood for a couple of weeks, and then he may experience a sudden episode of seemingly heavy haematuria, with some residual bleeding for a few days afterwards. This usually resolves spontaneously, and unless accompanied by symptoms of urethral burning or scalding on urination, is not a sign of urinary infection. Passing blood in the urine is always alarming and understandably the patient may think that something is wrong. If you warn the patient before he is discharged that this may happen, then it is far easier to reassure him that all is well, and that the bleeding will in all probability settle down without the need for any active treatment.

Fluid intake

During the period of carpet-slipper convalescence your patient should drink freely—about 3 1 a day—so that the overconcentrated urine does not sting when he voids, and debris is washed away from the healing prostatic fossa. It matters not a jot what he drinks and there is no medical reason why he should not take a little alcohol if he wants to: one never encourages a patient to get drunk, but there is no physiological or pharmacological reason why he should be denied this little solace in time of trouble. After the first 2 weeks he may drink as much or as little fluid as he pleases.

Diet

There are no restrictions on what a man may or may not eat after transurethral surgery. Constipation is to be avoided since the passage of a stiff motion may provoke straining and start secondary haemorrhage. Plenty of bran and vegetables is sufficient for most men, and a bulk laxative for those inclined to be constipated will keep postoperative bowel actions soft and comfortable.

Antibiotics

If prophylactic antibiotics have been given because the patient had been catheterized, or there was known urinary infection, there is no consensus as to how long they should be continued. It is probably wise to keep up the antibiotic cover until the catheter is removed, and for 24 hours thereafter. Where there is a special risk of systemic infection, e.g. in patients with implanted foreign bodies or mitral valve disease, a more prolonged course may be advisable and should be planned with the help of the patient's cardiologist and your microbiologist (see Chapter 4).

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Chapter 10
Complications occurring during transurethral resection

Bleeding

Because bleeding is the chief cause of difficulty and danger in any form of prostatectomy, surgeons have been trying to discover how to limit blood loss for more than a century. In the UK National Prostatectomy Audit[1] bleeding severe enough to require the operation to be stopped occurred in 20 of 4226 TURPs (0.7%) and in 20 (0.4%) packing of the prostate was required to stop the bleeding. In the postoperative period return to the operating theatre to control major bleeding was reported in 0.6% of cases.

The way to obtain haemostasis during the operation has been described (see page 181–3) and is usually sufficient to permit a clean resection for which no blood replacement is needed. Nevertheless from time to time haemorrhage can be copious, unexpected and daunting. However skilled the resector, it is always necessary to be prepared, to know the patient's haemoglobin and to have his blood grouped and serum saved in the laboratory. In very large prostates and very large bladder tumours where considerable blood loss is to be expected it is safer to have 2 units of blood standing by.

Adjuvant methods of limiting blood loss

Claims have been made that cooling the tissues with ice-cold irrigating fluid may reduce blood loss, but were based on resection of very small amounts of tissue. In theory, one would expect the natural clotting mechanisms to work best at normal temperature, and in practice the technique led to a sometimes alarming fall in core temperature[2–6]. Hypotensive anaesthesia was used extensively for retropubic prostatectomy some 30 years ago and is revived from time to time for transurethral surgery, but the benefit in terms of limiting blood loss must be offset by the risk of cerebrovascular accident and coronary thrombosis, both hazards of any surgical procedure in this age group.

Many other agents have been tried with the object of limiting blood loss, including oestrogens, injecting the prostate with vasoconstrictors, carbazochrome salicylate, kutapressin, oestrogens and aprotinin, all without significant benefit[7–11]. Cyclokapron and its precursor ε-amino-caproic acid were in vogue for a time, and then given up when it was found that they caused intraglomerular thrombosis[12,13]. They might have limited postoperative blood loss, but had no effect on bleeding during the operation. Dicynene, said to reduce capillary fragility, had no advantage when bleeding was serious[14].

More important than any of these adjuvant agents is a good technique of haemostasis at the time of operation, and the use of a simple method of measuring blood loss in the operating theatre, e.g. a colorimeter to estimate the haemoglobin in the bucket[15].

Extraperitoneal perforation during TURP

This complication was discussed earlier (see page 116). It occurred in 0.25% of cases in the National Prostatectomy Audit[1]. The capsular perforation in itself is not a problem. The danger is from fluid absorption when a large volume of fluid has been allowed to escape into the circulation (Fig. 10.1a). Occasionally fluid introduced with the Ellik evacuator does not suck back, or a change in the character of the respiration and a coldness and swelling of the suprapubic tissues may suggest that there has been a massive loss of fluid. This is why it is so helpful to get a mental image of the appearance of the patient's lower abdomen before starting a TURP—it allows one to establish whether the distension has occurred since the operation started or whether it simply represents years of over-indulgence at the dinner table!

As in most times in surgery when things go wrong they get worse if you dither and delay. Stop the resection. If there is significant abdominal distension make the decision to proceed with open drainage of the retropubic space. Have things made ready as soon as possible. Make a Pfannenstiel incision. Expose the bladder, open it between stay sutures and evacuate the clot. Complete the prostatectomy (if it is not already complete) by enucleating the remaining adenoma with the finger[16]. Get exact haemostasis by sutures, and if you can see the hole in the capsule, close it with a stitch. Only when all the bleeding is controlled should you close the wound with a suprapubic and urethral catheter and a drain to the retropubic space.

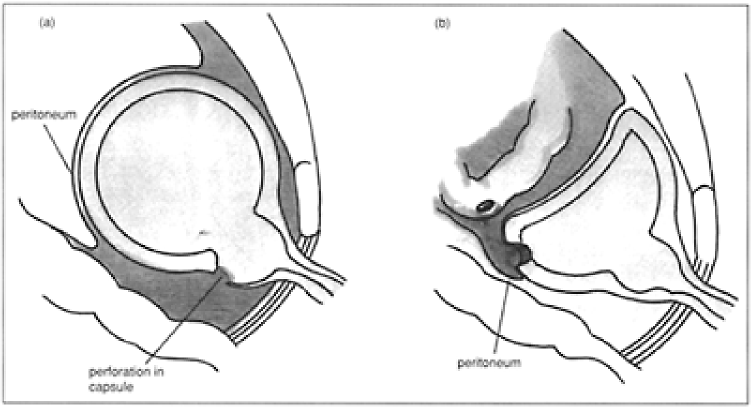

Figure 10.1 *(a) Extraperitoneal perforation; fluid extravasates around the prostate and the base of the bladder.*

(b) Intraperitoneal perforation; the main danger is of inadvertent injury to the bowel.

Extraperitoneal and intraperitoneal perforation during resection of a bladder tumour

Small perforations into the perivesical tissues are not uncommon when resecting small tumours of the bladder and so long as you have secured good haemostasis and all the irrigating fluid is being recovered, no additional steps are required except that perhaps one should leave the catheter in for 4 rather than 2 days.

Trainees are sometimes uncertain whether a perforation is extraperitoneal or intraperitoneal. Establishing this can sometimes be difficult, because both can cause marked distension of the lower abdomen—an intraperitoneal perforation by allowing escape of irrigating solution directly into the abdominal cavity and an extraperitoneal perforation by expanding the retroperitoneal space, with fluid then diffusing directly into the peritoneal cavity. The fact that a suspected intraperitoneal perforation was actually extraperitoneal becomes apparent only at laparotomy when no hole can be found in the bladder!

When there is no abdominal distension, the volume of extravasated fluid is likely to be low and if the perforation is small it is reasonable to manage the case conservatively. Achieve haemostasis, pass a catheter and send the patient to the recovery room. Make frequent visits to see the patient. If the patient remains well, you may continue conservative management. If things are not right—worsening abdominal pain and distension—then proceed to laparotomy. In most cases everything will settle down and the hole in the bladder will heal spontaneously if a catheter is left *in situ* for 10 days or so. The patient can go home in a couple of days and will have been spared the morbidity and longer hospital stay that is required after laparotomy.

However, in cases where there is marked abdominal distension, whether the perforation is extraperitoneal or intraperitoneal is in many senses academic—the important thing is to explore the abdomen, principally to drain the large amount of fluid which can compromise respiration in an elderly patient by splinting the diaphragm, but also to check that loops of bowel adjacent to the site of perforation have not been injured at the same time. Failing to make the diagnosis of an intraperitoneal diagnosis, particularly if bowel has been injured, is a worse situation to be in than performing a laparotomy for a suspected intraperitoneal perforation, but then finding that the perforation was 'only' extraperitoneal.

The diagnosis of an intraperitoneal perforation is obvious if you can actually see loops of bowel (Fig. 10.1b). The tell-tale sign of the Ellik evacuator not sucking back can occur with both intraperitoneal and extraperitoneal perforation and this therefore tells you that something is wrong, rather than what is wrong.

When there is marked abdominal distension, or where it is obvious that the perforation has been made right through into the peritoneum (Fig. 10.1b) or, as is often the case, the perforation is obscured and accompanied by haemorrhage, then it is necessary to explore the abdomen.

The bladder is again approached through a Pfannenstiel incision or lower abdominal incision, opened between stay sutures, the clot is evacuated, the bleeding controlled and the hole sewn up (Fig. 10.2). Then the peritoneum should be opened, which is easily done whether the incision is a Pfannenstiel or lower abdominal one. This allows you to see if there is any blood-stained fluid inside. Adjacent loops of small and large bowel should be pulled out and searched for diathermy damage. A hole in the small bowel is closed in its transverse axis (Fig. 10.3). A hole in the colon should be protected with a temporary loop-colostomy.

Perforation into the rectum

Although this is much dreaded, it is rare. In the National Prostatectomy Audit[1] it was reported in 0.25% of 4226 TURPs. Rectal perforation is so uncommon that management is decided on a case by case basis. Most

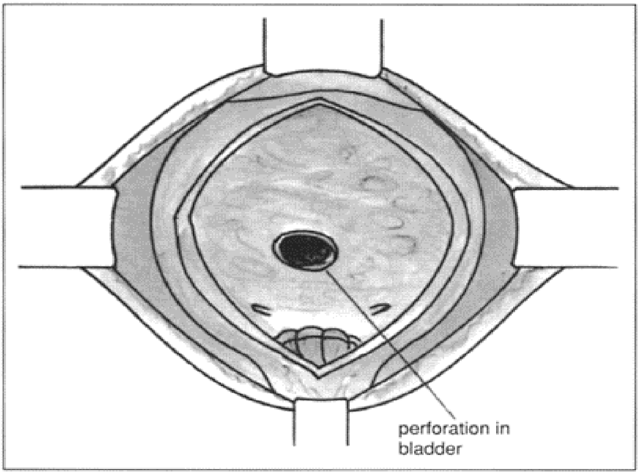

Figure 10.2 *As soon as the bladder is opened the perforation is obvious.*

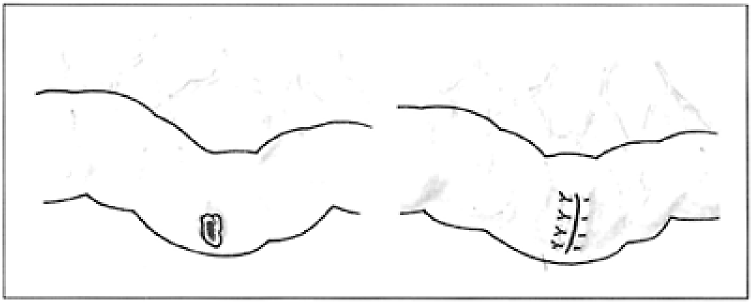

Figure 10.3 *A small burn in the small bowel is oversewn in its transverse axis.*

urologists nowadays will not perform colostomies on a regular basis, and from the perspective of avoiding possible later litigation, it is a sensible idea to involve a colorectal surgeon in subsequent management decisions and indeed with performing the colostomy if this is deemed to be necessary. If the perforation is large, many would recommend a defunctioning colostomy with a catheter left in situ for about 3 weeks. This may be a urethral or suprapubic catheter, but the latter may be more comfortable. If the perforation is small, then an indwelling catheter for a few weeks may be all that is necessary. However, bear in mind that the injury will have been caused by the diathermy, rather than by a sharp knife, and as a consequence the edges of the perforated bowel will have been devitalized and therefore may not heal. If in doubt, err on the side of performing a colostomy.

If a defunctioning colostomy and a suprapubic cystostomy is used, after about 6 weeks most of these fistulae will have healed, and in the rare case that persists the fistula can be closed through a perineal approach or by one of Parks' operations using a sleeve of rectal wall[17,18]

Broken sheath

In days when sheaths were generally made of plastic they sometimes broke across, leaving the tip in the urethra. Even today the tip of a steel sheath may come away. Occasionally one can see the edge of the detached portion with a cystoscope and draw it out with biopsy forceps (Fig. 10.4). An alternative trick is to pass a Foley catheter through the lumen of the detached portion, leave it for 10–14 days, and when the catheter is removed the piece of sheath will usually come away (Fig. 10.5).

Broken loop

A fragment of inert wire broken off in the course of a transurethral resection can do no possible harm unless in the fullness of time it migrates into the bladder and acts as a nucleus for a stone to form. By all means look for it and remove it with a biopsy forceps if you find it, but otherwise, complete the resection with another loop. An X-ray in the

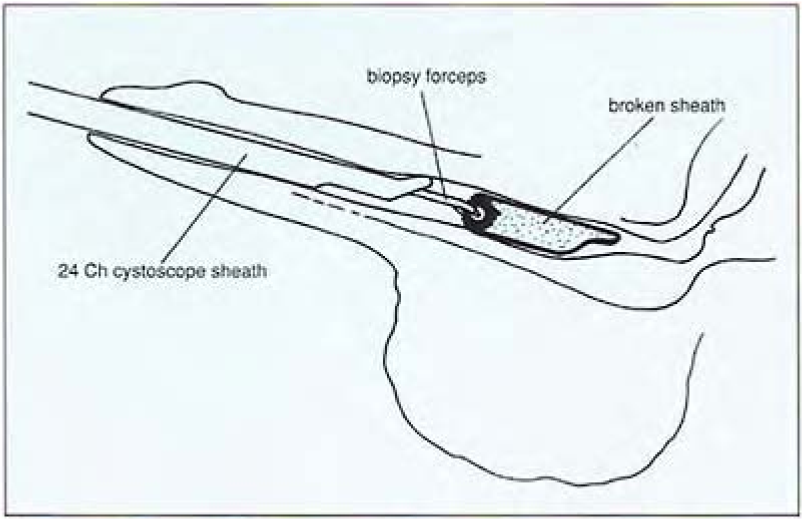

Figure 10.4 *A broken-off tip of a resectoscope may be recovered with a biopsy forceps.*

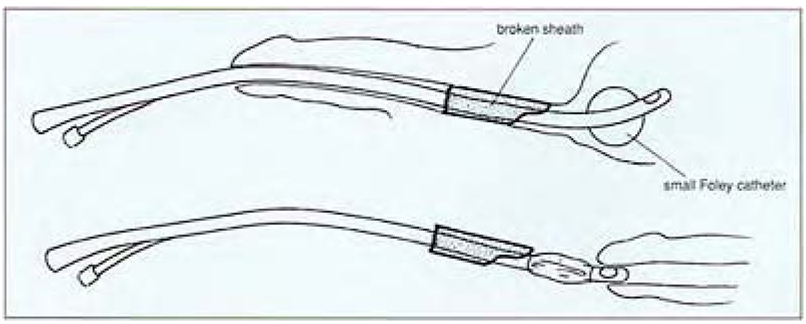

Figure 10.5 *If a small Foley catheter can be passed through the broken fragment of resectoscope sheath, it is left for about 10 days; when it is removed, the sheath comes with it.*

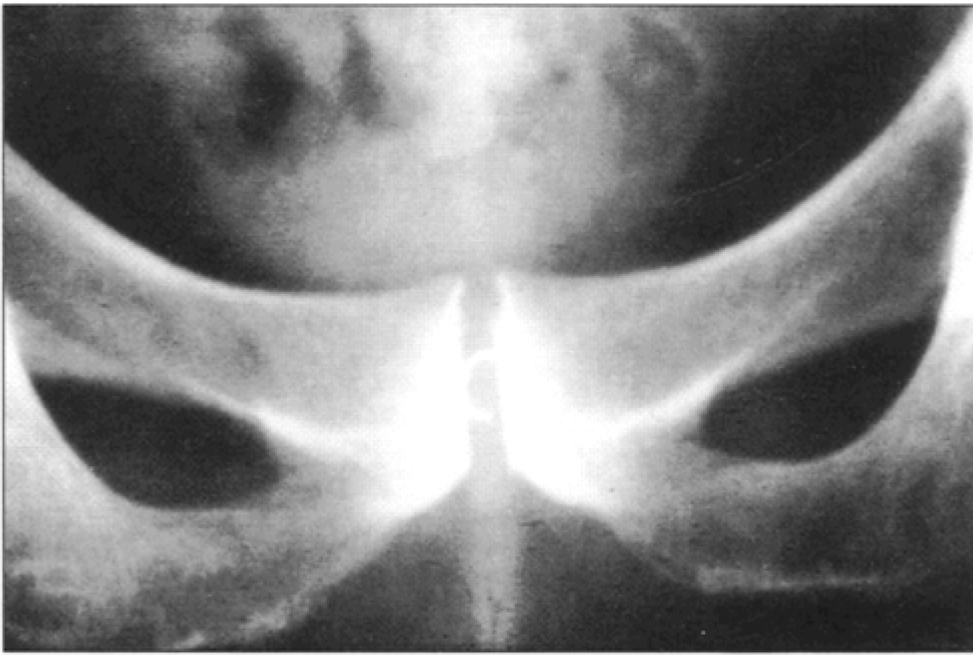

Figure 10.6 *Plain X-ray showing resectoscope loop in the prostate. It caused no trouble and was left alone.*

postoperative period will reveal the loop (Fig. 10.6), but if the patient is comfortable there is no need to hunt for it. What you tell the patient is of course for you to decide in the interests of the peace of mind of your patient rather than what you fear his lawyers might say, but you will probably find that it simplifies things to tell him, explaining that there are many old soldiers who still carry with them bullets and shrapnel fragments from past wars, and many surgeons routinely use metal clips for haemostasis. A man may well feel aggrieved and insulted if he finds out later and you had not told him.

Explosions

The mixture of hydrogen and oxygen formed by hydrolysis of water by diathermy sparks, along with air introduced in the irrigating fluid, collects into a bubble at the vault of the bladder. This is sometimes an explosive mixture, so if you are resecting tumour from the vault, push down on the suprapubic region to indent the vault and displace the bubble away from the loop. The authors have never seen this terrible complication but the accounts of it in the literature make grim reading[19].

Obturator jump

If a bladder tumour is situated on the lateral wall of the bladder, resection may be complicated by brisk spasms of the adductors of the ipsilateral leg—the obturator jump. This occurs when low frequency harmonic currents generated by the diathermy stimulate the obturator nerve. Apart from giving you a box on the ears, this surprising event may cause you to perforate the wall of the bladder with the cutting loop. There is no certain way to avoid this phenomenon, but steps can be taken to reduce the likelihood of it taking place.

First, be aware of the possibility whenever you are resecting tumours near the ureteric orifice. It is particularly easy to stimulate the obturator nerve just above and lateral to the ureteric orifice. If you see a tumour in this location, and it is small and the purpose of treating the tumour is for local control only, then use the roly-ball to coagulate the tumour, rather than trying to formally resect it. If the patient is not a candidate for radical treatment of a muscle invasive bladder tumour, there is little point in exposing them to the potential risk of bladder perforation from an aggressive resection causing an obturator kick.

However, if it is important to determine the precise stage of the tumour because you need to decide whether radical treatment such as cystectomy or radiotherapy will be required, then you will have to perform formal resection of the tumour. Even if you do not need precise staging information, the tumour may simply be too large for adequate local control by roly-ball vaporization. In these situations, turn down the current until it is barely cutting. The obturator nerve may no longer be stimulated by the lower current. Get two assistants to stand one on either side of the patient, and to grasp the patient's thighs and lower abdomen firmly, underneath the sterile drapes. This can help to stabilize the pelvis, preventing it from rocking to one side or other if the obturator nerve is stimulated. Next, ask your anaesthetist to intubate the patient and paralyse his muscles. Curare-related agents work by blocking depolarization of the neuromuscular end plates, but this blockade can be overcome by supramaximal nerve stimulation. Paralysis with agents such as suxamethonium, which depolarize the end plates and prevent repolarization, overcomes the problem, but their action is shortlived, and repeated administration may lead to other problems so that anaesthetists are understandably not enthusiastic to use repeated doses. Finally, just as you are about to start resecting, be prepared to quickly withdraw the resectoscope into the prostatic urethra so that if an obturator kick does occur, the end of the resectoscope will not go shooting through the bladder.

The obturator nerve may be anaesthetized locally by injecting local anaesthetic directly into the nerve (Fig. 10.7). Using a long spinal needle aim for the obturator foramen, entering the needle halfway between the mid-inguinal point and the pubic tubercle, aiming downwards and medially, aspirating and injecting alternately until the bony medial edge

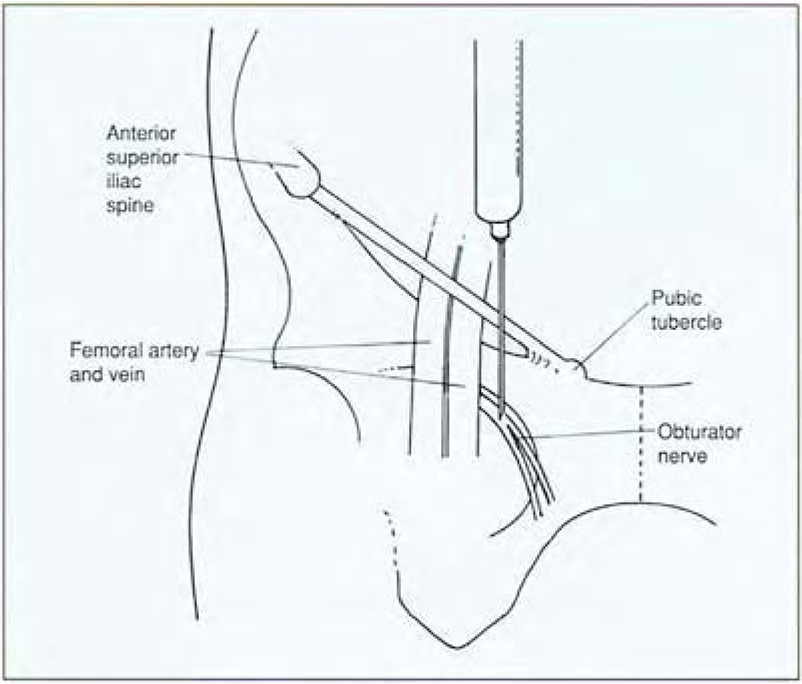

Figure 10.7 *Injection of local anaesthetic into the obturator nerve.*

of the obturator foramen is encountered. If the femoral vein is inadvertently entered, press on the puncture for 5 minutes.

Erection

Penile erection can develop insidiously and the operator must constantly be on the lookout for it, as it is exceedingly dangerous. It is the authors' experience that erection is most common in patients who are too lightly anaesthetized, often by an inexperienced anaesthetist. In the National Prostatectomy Audit[1] an erection caused the operation to be stopped in 0.2% of cases.

The first sign that anything is going wrong may be that the resectoscope seems to be unduly tight in the urethra, or that the view has become obscured by new bleeding. Feel the penis; early engorgement is quite obvious. Stop now, before it is too late.

The erection can be reversed with an injection directly into the corpus cavernosum of 200 micrograms of phenylephrine diluted in normal saline[20]. This can be repeated. If the erection fails to subside immediately then you should seriously consider terminating the operation. It is better to come back another day rather than lose one's way and risk damaging the sphincter.

Failure to recognize that an erection is taking place and failure to reverse it may result in the resectoscope being forced out of the urethra, with the result that the operator may easily mistake the external sphincter for prostate, and resect it. The result is irreversible incontinence (Fig. 10.8).

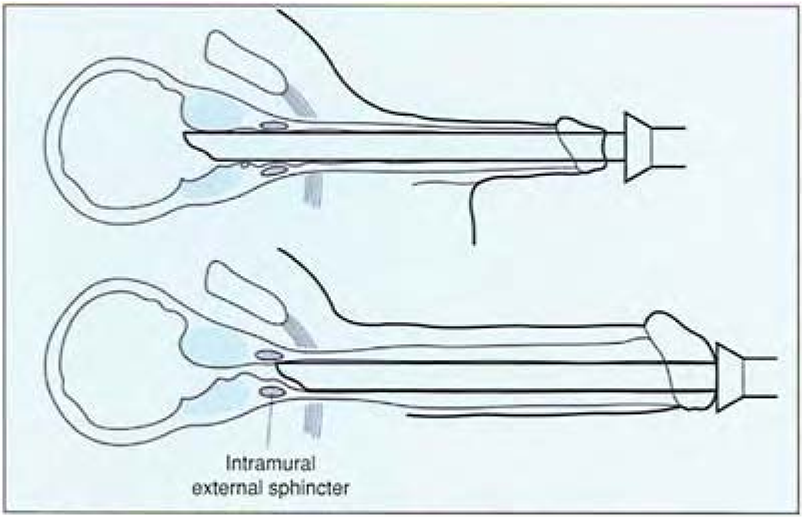

Figure 10.8 *During an erection the short flaccid penis becomes elongated, forcing the resectoscope out. It is easy to mistake external sphincter for prostate, especially when bleeding confuses your view.*

The 1 hour rule and transurethral resection

An interesting myth has been handed down from one generation of resectors to the next, without any basis in measurement or experiment, namely that resection must be completed within 60 minutes or disaster will befall. The myth probably took its origin in the early days of transurethral resection when the surgeon often gave his own spinal anaesthetic, and patients began to recover sensation after about an hour.

Clearly, the longer the operation goes on, the more time there is for blood to be lost and irrigating fluid to enter the veins, and if the resection takes more than 1 hour, it usually means that the gland is very large (when there is more likely to be more of both) or the resector has been unduly slow in removing what gland there is. Time alone is no more relevant to endoscopic than to any other kind of surgery, and if you can make a better job of the operation by taking 61 minutes it is illogical to call a halt at 59.

While the 1 hour rule is certainly great nonsense there is never any excuse for dawdling. This is nothing new in surgery; operating time is not wasted by taking care and trouble over the steps of any operation, but in indecision—fiddling about and wondering what to do next. It is a commonplace in surgery that master craftsmen neither hurry nor watch the clock, but they never waste a movement. So it should be in transurethral resection. Keep your landmarks ever in view; know where you are and what you are cutting. Cut with a confident rhythm and stop the bleeding as you go. Transurethral resection is no work for the picker and scratcher.

The TUR syndrome

Early in the history of transurethral resection it was recognized that if distilled water was allowed to run into the circulation it would lead to haemolysis, haemoglobinuria and possibly even renal failure[21–24] (Fig. 10.9). Accordingly a number of non-ionizing solutions were introduced which would be more or less isotonic and fail to cause haemolysis, e.g. 2.5% glucose, Cytal (a proprietary mixture of sorbitol and mannitol) and 1.5% glycine.

Although these solutions avoided the risk of haemolysis, they did not avoid the dangers that arose from intravenous infusion of a large volume of water into the blood. This dilutes the normal electrolytes, especially sodium, leading to a lowering of the membrane potential on the cell wall (the latter is necessary for nerve conduction and muscle contraction). This is soon followed by an increase in intracellular water, resulting in cell oedema (Fig. 10.10). A normal patient can cope with a surprisingly

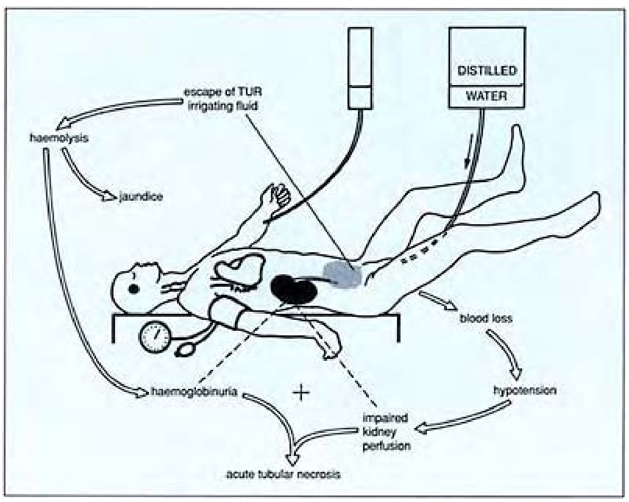

Figure 10.9 *The hazards of using distilled water as the irrigating medium.*

large volume of water added to his bloodstream in this way, responding with a prompt diuresis that gets rid of the surplus water. But not all transurethral resection patients are normal; many are already on the brink of heart failure, and in as many as 25% there is an inappropriate secretion of pituitary antidiuretic hormone[25]. An additional factor, hitherto unnoticed, may be the effect of endotoxins due to bacteraemia during the resection[26].

Diagnosis—symptoms, signs and tests

In the National Prostatectomy Audit[1] the TUR syndrome occurred in 0.5% of cases. It is characterized by a number of symptoms and signs which may be present in variable degree depending on the severity of the condition. These include confusion, nausea, vomiting, hypertension, bradycardia and visual disturbances.

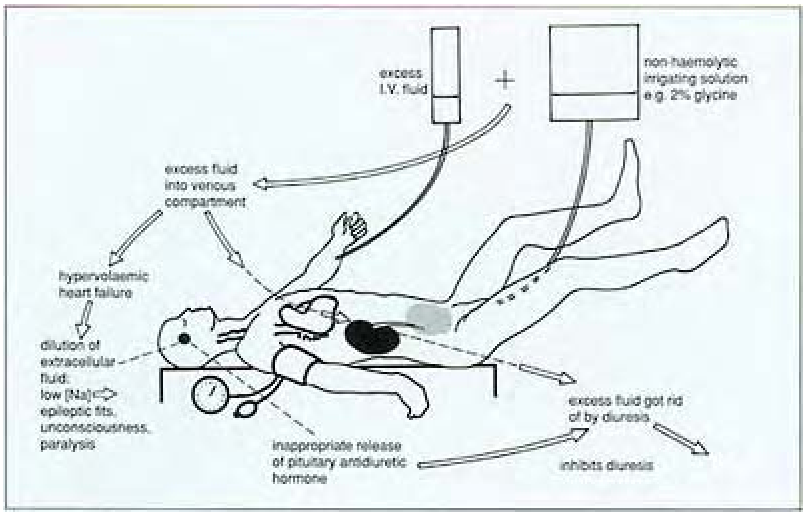

Figure 10.10 *The dilutional syndrome.*

The diagnosis of the TUR syndrome calls for a high degree of awareness on the part of the urological team. It may be ushered in with restlessness and hypertension, and rapidly proceed to what appears to be a grand mal seizure. If the patient is under spinal anaesthesia and is therefore awake during the procedure, they may report visual disturbances such as flashing lights. This can be a very helpful warning that significant amounts of glycine (and therefore fluid) are being absorbed and that corrective measures should be started. One of the authors was once explaining this feature of TUR syndrome to a junior anaesthetic colleague when the patient suddenly complained of flashing lights. The operation was quickly brought to a conclusion and the patient responded rapidly to intravenous frusemide and fluid restriction, without going on to develop the more serious manifestations of advanced TUR syndrome.

Pathophysiology

The TUR syndrome is characterized by biochemical, haemodynamic and neurological disturbances. Dilutional hyponatraemia is the most important—and serious—factor leading to the symptoms and signs. The serum sodium usually has to fall to below 125 mmol/l before the patient becomes unwell. The hypertension is due to fluid overload. Visual disturbances may be due to the fact that glycine is a neurotransmitter in the retina.

Predicting and preventing development of the TUR syndrome and definitive treatment

Prevention is better than cure. Try to avoid the development of the TUR syndrome by limiting resection time, avoiding aggressive resection near the capsule and by reducing the height of the irrigant solution. Madsen and Naber[27] demonstrated that increasing the height of the irrigation fluid from 60 to 70 cm above the patient increased fluid absorption by a factor of two.

If the resection has been long and bloody, assume that the patient is going to develop the TUR syndrome and take corrective measures before the patient starts developing symptoms. Send a sample of blood for sodium measurement, and give 20–40 mg of intravenous frusemide to start off-loading the excess fluid that has been absorbed. If the serum sodium comes back as being normal, you will have done little harm by giving the frusemide, but if it comes back at <125 mmol/l, you will have started treatment already and thereby may have prevented the development of severe TUR syndrome.

It is possible to measure the quantity of fluid escaping into the patient if a special weighing machine is added to the ordinary operating table[28]. Nowadays it is also possible to monitor the concentration of sodium in the blood with a sodium-sensing electrode[29], or more easily, by adding a little alcohol to the irrigating fluid and constantly monitoring the expired air with a breathalyser[30]. This allows one to estimate the volume of excess fluid that has been absorbed.

Many techniques have been used to avoid the TUR syndrome. A suprapubic cannula and the continuous irrigating cystoscope of Iglesias are commonly used[31]. In practice the TUR syndrome is rarely seen in most modern departments, partly because of these precautions, and perhaps because of sparing use of intravenous fluids[32,33] and careful measurement of the volumes of fluid that are irrigated in and out of the bladder.

In a patient who is not too ill, and is having a good diuresis, it is safe to wait and let him get better. Intravenous frusemide can be given to hasten the excretion of the excess water that has been absorbed.

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Chapter 11
Complications after transurethral resection

Three large, contemporary audits provide useful information on outcomes and complications after TURP. These are the UK National Prostatectomy Audit[1–3], Mebust's Cooperative Study from North America[4] and the Northern Region Audit[5].

The National Prostatectomy Audit[1–3] was a prospective audit conducted on operations performed in four health regions of the UK over a 6-month period in 1992. The majority of patients in this study underwent TURP (4624 patients representing 86% of all patients in the study), TURP combined with bladder neck incision (4.6% of patients), or bladder neck incision alone (5.7% of patients). Only 1.6% of patients underwent open prostatectomy. Thus, the National Prostatectomy Audit essentially represents the outcome from TURP. Mebust *et al*[4] retrospectively evaluated outcome following TURP at 13 participating institutions in the USA with a total of 3885 patients. In the Northern Audit[5], data were collected prospectively from 12 sites in one UK health region, on 1400 prostatectomies. TURP was the form of prostatectomy performed in 98% of cases. Complications reported by these studies, with additional information provided by other studies, are documented below.

Death

In 1989 Roos and co-workers[6] reported that the death rate within 90 days of TURP was significantly higher than after open prostatectomy. This sent shockwaves through the urological community. The 90-day mortality after TURP amongst the 37 000 Danish men in this study who formed the most recent group of patients operated on—between 1977 and 1985—was 2.5%. For open prostatectomy in the Danish patients 90-day mortality was 2.7%, but for the other centres mortality after open prostatectomy was lower when compared with TURP. For the entire group of patients in the Roos study, the relative risk of death 90 days after TURP compared with open prostatectomy was 1.45.

Roos and co-authors admitted that it was not possible to 'rule out potential confounding effects of unmeasured characteristics of patients' and it is likely that the higher mortality after TURP was due to a greater degree of co-morbidity in those patients undergoing TURP when compared with those undergoing open prostatectomy. When one thinks about it, a patient with significant co-morbidity is more likely to be offered a TURP rather than an open prostatectomy so that those undergoing TURP may be less fit than those undergoing open prostatectomy. This view is supported by data from Western Australia[7]. In this large population-based cohort study of mortality after TURP and open prostatectomy, after adjusting for co-morbidity the relative mortality of TURP over open prostatectomy was 1.2 (CI 0.99–1.23). In a study of almost 66 000 TURPs performed in Scotland between 1968 and 1989, Hargreave *et al*[8] found that the relative risk of death after TURP compared with open prostatectomy was 1.1. There had been suggestions that the fluid balance changes occurring as a consequence of using irrigation fluid during the process of TURP could in some way lead to an increased 'strain' on the heart of frail patients, but interestingly no difference in the risk of dying from ischaemic heart disease (including myocardial infarction) was found between the TURP and open prostatectomy groups in the Australian study.

In the contemporary series of TURPs, the National Prostatectomy Audit[3] reported a hospital mortality rate (death before discharge) of 0.8% for patients undergoing TURP for urinary retention and 0.2% for those with symptoms alone. Overall mortality in the Northern Region Audit was 0.9% at 30 days[5]. For elective admissions this was 0.5% and 2.4% for emergency admissions. In Mebust's series 0.23% of patients died within 30 days of surgery[4].

Infective complications

Septicaemia

Different incidences of *bacteraemia* are reported after transurethral resection, ranging from as low as 1.6% to 58%, more commonly when the urine is infected before operation[9–11]. Disturbingly, as many as 55% of men were found to have positive blood cultures even though their pre-operative urine had been sterile[12], while if bacterial endotoxins were measured the proportion rose even higher[13]. Fortunately only a small proportion of men in whom bacteria or endotoxins are found go on to develop septicaemic shock, which is relatively rare and always unexpected.

In the National Prostatectomy Audit septicaemia occurred in 1.9% of men undergoing TURP for retention and 1.3% of those with symptoms

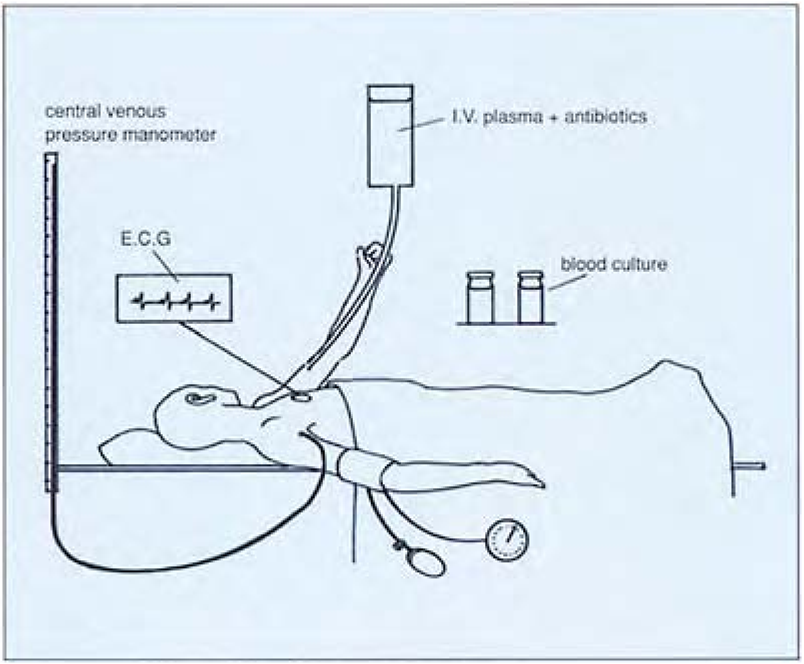

Figure 11.1 *Septicaemic shock: the essentials of management.*

alone. The Northern Region Audit reported a sepsis rate of 8% (varying between 0 and 17% depending on the hospital). Although in Mebust's series of 3885 TURPs the septicaemia rate was not given, of the 9 post-operative deaths, 5 were due to sepsis (presumably with urine as the source) leading to multi-organ failure. In the European Collaborative Study of Antibiotic Prophylaxis for TURP (see Chapter 4), postoperative septicaemia occurred in 1.5% of patients with sterile urine prior to surgery, where no antibiotic prophylaxis had been given at the time of surgery[14].

Septicaemic shock is most likely to occur on the day of operation, or when the catheter is removed. A high fever and rigors, sometimes with flushing of the skin, precedes haemodynamic instability with hypotension. As soon as the diagnosis is suspected (on the basis of a fever), urine and blood should be cultured and empirical intravenous antibiotic treatment started, with generous infusion of intravenous fluids (Fig. 11.1). An early, aggressive approach can prevent the development of hypotension and subsequent multi-organ failure. There should be a low threshold for requesting care in a high dependency unit or intensive care unit. Fortunately death from septicaemic shock after transurethral resection is now rare, although it is still dangerous in men over 80[15,16]. Treating culture-positive urine with several days of antibiotics prior to TURP and antibiotic prophylaxis in all patients (even those with culture-negative urine) probably reduces the rate of septicaemia. Even in patients with sterile urine before TURP, septicaemia can still occur, and a policy of giving prophylactic antibiotics to all patients before TURP may reduce this risk[14].

Urinary infection

The reported incidence of urinary infection after transurethral resection varies from 6 to 100%. In the National Prostatectomy Audit proven UTI occurred either before or after discharge in 13% of patients undergoing prostatectomy for retention and 4.6% of those undergoing prostatectomy for symptoms alone. Comparable figures in Mebust's series were 4.3% and 1.5%.

Much can be done to reduce infection by strict attention to aseptic drill when changing the catheter bag and when irrigating the bladder. If organisms enter the closed system it becomes a culture and they are rapidly carried up into the bladder on the interface of bubbles[17]. Experience and quality control in the management of the catheter is one major reason for bringing urological patients together in one ward area. Even so, the incidence of urinary infection inexorably rises when any catheter has been in the bladder for more than 5 days, by which time a continuous biofilm of bacteria has come to coat the catheter from external meatus to bladder.

Fortunately the clinical effects of this bacterial colonization of the bladder are seldom of any consequence. Upper tract infection, as judged by rigors, a high temperature, or pain in the loin, is rare. Bacteraemia (as pointed out above) is even more rare. As a rule, within a few days of removing the catheter, the infected system has cleansed itself and infection which persists for more than 6 weeks after transurethral resection is so unusual that it makes one suspect persistent residual urine or a diverticulum.

Routine antibiotic prophylaxis in patients with sterile urine prior to TURP has been shown to substantially reduce the chance of postoperative symptomatic UTI[14].

Epididymitis

Once the bane of open prostatectomy, epididymitis is so rarely seen in hospital after TURP that the old practice of routine prophylactic vasectomy has long been given up. In the 1970s prophylactic vasectomy was being performed in up to 95% of prostatectomy patients[18], but by the 1980s this had fallen to 10%[4] and nowadays it is simply no longer part of routine practice.

However, epididymitis is still reported, albeit rarely. In the National Prostatectomy Study it occurred in 5% of men, whether undergoing TURP for retention or symptoms alone[2,3]. When epididymitis does occur it may give rise to systemic illness out of proportion to the local signs, and require intensive antibiotic treatment. If unchecked, epididymitis may proceed to suppuration and even loss of a testicle.

Urethritis

The catheter always provokes some discharge of mucus around the catheter. The normal secretions of the urethra accumulate at the external meatus to form a crust which should be cleansed regularly to remove a potential source of infection. In some patients there is an unusually severe reaction to the catheter, and this may be followed by a stricture, probably from chemical or allergic irritation[19]. In some cases this may represent a latex allergy, and clearly latex-containing catheters should be avoided in individuals with a history of latex allergy.

Osteomyelitis

One very rare infective complication of transurethral resection is vertebral osteomyelitis, which is presumably a late aftermath of bacteraemia, although patients who develop this have seldom had any noteworthy postoperative symptoms (Fig. 11.2). The infection begins in the inter-vertebral disk, and typically the patient complains of backache which comes on several weeks or months after the operation, is difficult to localize and steadily gets worse. There are almost no physical signs, and it is only when the characteristic erosion of the vertebral body is eventually demonstrated by computerized tomography or magnetic resonance imaging that the diagnosis is made. Intensive treatment with antibiotics usually cures the condition quickly. The difficulty is to make the diagnosis.

Figure 11.2 *X-ray showing osteomyelitis of vertebra.*

Deep venous thrombosis and pulmonary embolism

Deep venous thrombosis (DVT) has been reported in between 4 and 10% of patients after TURP[20], although contemporary series suggest that the rate is somewhat lower, only 0.2% of patients in the National Prostatectomy Audit[2] being diagnosed with a DVT after TURP. In this same audit pulmonary embolus was reported in 0.1% of men. From other reports of outcome after TURP, published since 1990, 0.1–0.5% of men develop a pulmonary embolus after TURP[21].

Pulmonary embolism was diagnosed in 11 out of the 166 cases of death within 30 days of TURP analysed by the National Confidential Enquiry into Perioperative Deaths in 1993/1994, although the true proportion might well have been somewhat higher[22].

DVT and pulmonary embolus prophylaxis is discussed in Chapter 4.

Cerebrovascular accident

From time to time an elderly man with a cardiac history or a previous small stroke comes into hospital, undergoes a transurethral resection, does well, and returns rejoicing to his family. A few weeks later he dies with a sudden stroke and the urologist blames himself, feeling that perhaps if no operation had been done the patient might have survived. In the National Prostatectomy Audit[2] stroke occurred in 0.3% of men after TURP. There is an increased risk of postoperative stroke if the patient has had a history of cerebral or myocardial infarction within the last 3 months.

Failure to void after postoperative catheter removal

It is depressing when a patient fails to void following catheter removal a few days after TURP. Inevitably the patient thinks that something has gone wrong and the surgeon, particularly the trainee, is concerned that not enough obstructing tissue has been removed. In fact this is rarely the case; although failure to void is a common occurrence after TURP, a second ‘trial of catheter removal’ a few weeks later is usually successful.

Mebust *et al*[4] reported failure to void in 6.5% of men and in the National Prostatectomy Audit[3] 9% of those with acute retention and 2.3% in those who had a TURP for symptoms alone failed to void on catheter removal after the operation. In the latter study, a permanent catheter was required in 1% and 0.1% of men respectively.

Reynard and Shearer[23] reviewed a series of 381 consecutive TURPs performed by four experienced surgeons over an 18-month period. Failure to void did not occur after TURP done for symptoms alone, but it was suprisingly frequent after TURP done for retention. Most significantly it could be predicted from the retention volume—the volume of urine drained at the initial presentation. Acute retention was defined as painful inability to void with a catheter volume of <800 ml of urine, chronic retention as maintenance of voiding with a residual urine volume of >500 ml (average residual volume in this group was 1400 ml, and ranged from 500 to 3000 ml) and acute-on-chronic retention as painful inability to void with a catheter volume of >800 ml of urine (average retention volume in this group was 1300 ml, and ranged from 900 to 5000 ml). Using these definitions, failure to void after TURP was reported in 10%, 38% and 44%, respectively. Only 1% of patients ultimately failed to void at repeat catheter removal 6 weeks later (thus requiring a long-term catheter), all having presented with chronic retention.

Why should the patient not void after the initial catheter removal, even though an adequate volume of tissue has been removed? This presumably relates to a degree of swelling of the residual prostatic tissue, possibly combined with postoperative urethral pain which inhibits normal voiding and in some cases with the added problem of a poorly contractile bladder[24]. Given a few additional weeks of catheterization after TURP, the oedema has settled down, the resection margin has shrunk a little and the patient has recovered from the effects of surgery. Successful voiding is the norm. There is some evidence that detrusor pressure increases over the course of several months in patients who initially fail to void after TURP, but ultimately regain the ability to void spontaneously[24].

As with so many surgical operations, it is much better to warn the patient in advance that problems can be encountered postoperatively and that failure to void might occur. The patient can be reassured that there is a 99% chance that they will ultimately be free of a catheter.

Secondary haemorrhage

Bleeding in the early postoperative phase has been dealt with on page 81–3. Very commonly there is a small secondary bleed about the 10th postoperative day which the patient should be warned about. In the National Prostatectomy Study it caused difficulty in passing urine in 10% of patients[2].

What is far less common is for haemorrhage to occur months or years later. Often there is some new cause for it, e.g. cancer of the bladder or kidney, and all cases require a complete urological investigation (such as urine culture and cytology, flexible cystoscopy and renal ultrasonography). But in a number of men all that can be found is some regrowth of the prostatic adenoma and, after a biopsy to rule out cancer of the prostate, nothing else needs to be done. However, within this group is a small number who continue to bleed. The options for such patients include a prolonged course of 5-alpha reductase inhibitors (see Chapter 4) or a further TURP.

Urethral stricture

The true incidence of stricture after transurethral surgery is probably rather higher than is admitted in most series, and it depends on how the diagnosis is made. If the patient has no symptoms he is unlikely to have his flow rate measured, let alone his urethra investigated by urethrogram, urethroscopy or urethral ultrasound. The usual problem is a narrowing just inside the external meatus, presenting about 8 weeks after the operation with the symptom of spraying on micturition. It is easily treated by regular dilatation using a short straight sound. The patient can be taught to pass a Lofric® catheter of appropriate calibre on himself. The annual toll of these strictures is diminishing, thanks probably to the increasing use of narrow resectoscope sheaths and the use of prophylactic internal urethrotomy[25].

Other sites for postoperative stricture are at the penoscrotal junction, the bulb and the external sphincter (Fig. 11. 3). Occasionally optical urethrotomy is required, but usually these strictures are easily managed by dilatation supplemented by regular self-catheterization.

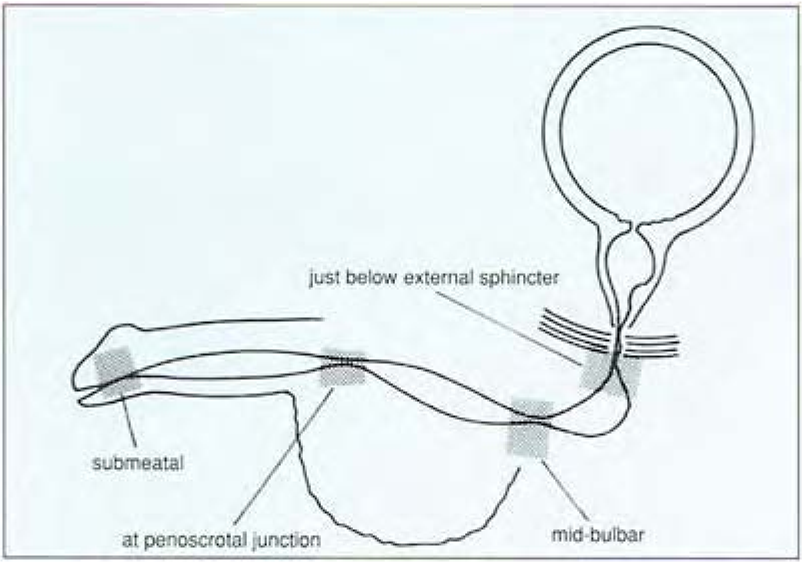

Figure 11.3 *Main sites of post transurethral resection strictures.*

Bladder neck stenosis

Formerly common after open prostatectomy this is rare after transurethral surgery. At an interval of some months after transurethral resection the patient comes back with a return of symptoms and is found to have a tight membrane at the level of the bladder neck (Fig. 11.4). It is easily put right with a urethrotome or a bee-sting electrode (Fig. 11.5), but it does tend to recur, perhaps because (as histology often shows) there is evidence of granuloma in the tissue. Bladder neck stenosis is not prevented by incision of the bladder neck[26].

Vesico-ureteric junction stricture and ureteric reflux

The ureteric orifice, where the ureter drains in the bladder, is close to the bladder neck. Very rarely it is possible for the loop of the resectoscope to cut across the lower end of the ureter at this point during a TURP, particularly if there is a large middle lobe such that the loop of the resectoscope has to be advanced well into the bladder to allow this lobe to be resected. In theory this may lead either to vesicoureteric reflux or to obstruction of the kidney, although none of the authors have ever encountered this complication over many years of practice. Reflux of urine occurs because the flap valve mechanism of the ureteric orifice is disrupted. Obstruction occurs as a consequence of contraction of scar

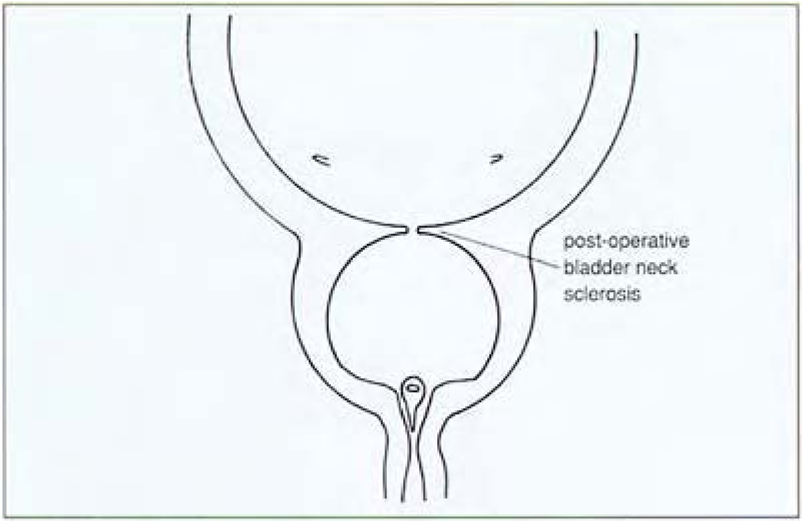

Figure 11.4 *Bladder neck stenosis following prostatectomy.*

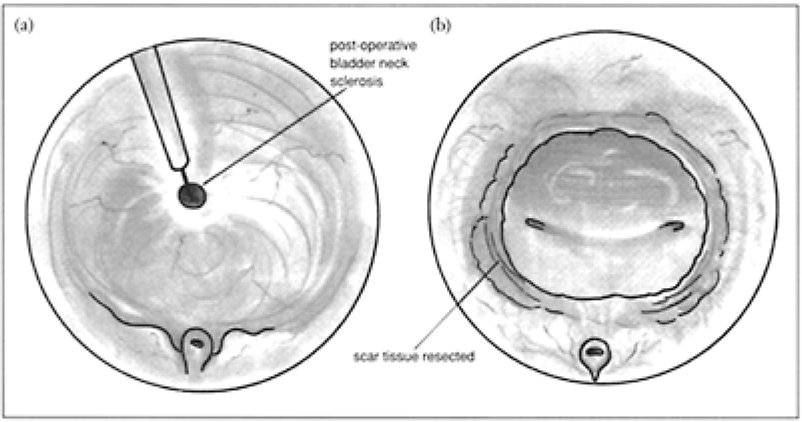

Figure 11.5 *Bladder neck stenosis. (a) The hole in the diaphragm is incised with the bee-sting electrode or Collings knife and then (b) the scar tissue is cut away all round.*

tissue around the healing ureteric orifice and this process constricts the lumen of the ureter. This problem can be avoided by making a mental note at the start of resection of the location of the ureteric orifices. At the end of the resection some surgeons find it comforting to look at the ureteric orifices just to check that they have not been damaged.

Where a bladder tumour overlies the ureteric orifice, it is impossible to remove the tumour without deliberately cutting across the ureteric orifice. Leaving a JJ stent in the ureter for a few weeks after the TURBT may reduce the risk of contraction of the ureteric orifice. If possible, try to place a guidewire (preferably insulated) into the ureter before starting the resection. This can make it easier to pass a JJ stent after the resection, because the lumen of the ureter may be lost once the tumour has been resected. Placing a JJ stent in the ureter before the resection runs the risk of cutting through the stent, and the proximal part of the stent may then be very difficult to retrieve.

If the ureter does become scarred, the stricture can be managed endoscopically (by incision or dilatation) or (rarely) by reimplantation.

The need to repeat transurethral resection

One of the old criticisms of transurethral resection was that it was less thorough than surgical enucleation, and this was certainly true in the days when instrumentation was so poor. Today it is probably less common, but it was disturbing to find that about 12% of transurethral resections were revision procedures[5]. The Roos study[6] found a re-operation rate after TURP of approximately 12% versus 4.5% after open prostatectomy. Of course the prostate will continue to grow and this will account for a proportion of such patients who need to undergo repeat TURP.

Incontinence

Far from causing incontinence, TUR often cures the incontinence that is present in a quarter of patients before operation. Nevertheless, one in 10 men remain incontinent afterwards and the operation seems to cause incontinence in as many as 6%[2]; nothing is a greater disaster for an otherwise fit patient. In a proportion of cases the cause is poor selection of the patient, whose symptoms were really due to detrusor instability from some other cause. In such patients transurethral resection may change a picture of severe frequency into one of disabling incontinence.

The incidence of incontinence after TURP falls with time. This is probably due to spontaneous resolution of bladder overactivity (detrusor instability) in a substantial proportion of patients.

Technical error at the time of operation can also cause incontinence. In such a patient endoscopy will show a tell-tale defect in the external sphincter, usually at 10 or 2 o’clock, and perusal of the notes may yield the story that during the operation the patient developed an erection, the surgeon lost his way, and the sphincter was cut in mistake for adenoma.

The investigation of post TUR incontinence requires urodynamic investigations to determine the state of the detrusor, and endoscopy to reveal the sphincter. The treatment is often unsatisfactory. The choice is between wearing incontinence pads or an incontinence appliance such as a condom sheath, injection of urethral bulking agents such as marcoplastique in the bladder neck and/or membranous urethra or an artificial implanted sphincter. In days gone by a Cunningham clip was sometimes applied to the penis, but ischaemic necrosis could develop at the site where the clip was worn. The artificial urinary sphincter usually provides a satisfactory degree of continence, but this is at the price of a further operation which carries certain risks. The greatest worry is infection of the implanted sphincter, which almost always requires complete removal of the device and weeks of nursing care of the wound, often in hospital. The urethral cuff of the artificial sphincter applies a constant pressure to the urethra and as a consequence the underlying urethra may atrophy so that the cuff no longer fits snugly around it, and the incontinence recurs. A more extreme effect of this pressure on the urethra is that of urethral erosion, which leads to recurrent incontinence and ultimately device infection. Being a mechanical device, sooner or later the artificial sphincter will simply break down and require replacement[27].

Sexual dysfunction after transurethral resection

In all, 40% of men in the National Prostatectomy Audit were unhappy with their postoperative sexual function[28].

There are three separate elements to sexual dissatisfaction after transurethral surgery. The first is retrograde ejaculation, about which urologists have been aware of for many years, and must routinely warn all their patients as it occurs in about two out of three men[28]. It is probably caused by the removal of the bladder neck, which normally closes during ejaculation, and is necessarily removed along with the obstructing adenoma.

The second component is erectile impotence. For many years this was given little thought, but some 70% of men are still sexually active in their 70s, and of these 10–30% will be rendered impotent afterwards[2,29–31]. Erectile function can improve after TURP. Indeed, 20% of men in the UK National Prostatectomy Audit reported an improvement in erectile function after TURP[28].

There is a third component, namely the lack of the sensation of orgasm. This may relate to a deficiency in contraction of muscular tissue in the prostate and seminal vesicles. In the National Prostatectomy Audit 52% of men described absent or altered sensation of orgasm.

Dunsmuir and Emberton[30] found a strong association between the presence of retrograde ejaculation and sensation of impaired orgasm: 60% of men with retrograde ejaculation reported impaired orgasm, compared with only 16% of men who retained antegrade ejaculation after TURP. The occurrence of retrograde ejaculation after TURP implies that a more extensive resection has taken place than in men where no retrograde ejaculation occurs. It is conceivable that a more extensive resection, particularly if capsular perforation occurs, could damage the cavernous nerves and arteries which are located in the periprostatic tissues.

For the surgeon the crucial thing is that these matters are discussed with the patient before the operation, particularly when there is no life-threatening complication such as ureteric obstruction or severe infection, and especially in the younger patient who may not have completed his family. It was disturbing to find in one large audit that a note had been made to the effect that these matters had been discussed with the patient at the time of getting consent in <30% of records[32]. At the very least patients are likely to be upset if they are not warned about the possibility that significant sexual dysfunction can occur following TURP. In a proportion this will lead to anger and the possibility of litigation[28].

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Chapter 12
The role of alternatives to transurethral resection

Guidelines

As discussed in Chapter 4, to decide the most appropriate treatment for patients presenting with lower urinary tract symptoms thought to be due to BPH, the urologist should be aware of so-called clinical practice guidelines (CPGs) which summarize the available options. Guidelines started to appear in the early 1990s as an attempt to standardize treatment. This was a consequence of reports which showed wide variations in TURP rates both within and between countries. The fact that the treatment you received depended not so much on what condition you had, but more on where you lived, suggested that there was no consensus on the indications for TURP. Therefore, in an attemp to define more precisely the indications for treating BPH symptoms, clinical practice guidelines were established.

A number of clinical practice guidelines have been published and they have recently been reviewed[1,2], (see also Chapter 4 page 44). Precisely which guidelines you use will depend to a considerable degree on which country you are working in. In essence there are few differences between them, in terms of their treatment recommendations (although their recommendations for diagnostic tests to complement the diagnosis of 'BPH' vary considerably—see Chapter 4). All recommend documenting the severity of the patient's symptoms using the IPSS, the International Prostate Symptom Score. This provides a baseline against which the effects of treatment can be measured. The IPSS also measures the 'bother' caused by the patient's symptoms—the degree to which the patient's symptoms trouble him. A man may have a high symptom score, but may not be bothered by his symptoms. Clearly, one would tend towards recommending watchful waiting in such an individual, rather than active treatment.

Using guidelines in your practice is not obligatory, but with the ever-present threat of litigation you need to be able to defend a decision not to use them. They thus provide a certain amount of protection from litigation, quite apart from helping day to day management decisions.

Why do men seek treatment for their symptoms?

There are several reasons. Firstly the symptoms may be bothersome. Secondly, there may be the fear that the symptoms are a warning that acute urinary retention will develop. Thirdly, the patient may be concerned that their symptoms indicate that they have prostate cancer. It is important to establish what the patient wants from his consultation with you. Once reassured that the likelihood of urinary retention and prostate cancer is low, he may not want treatment for symptoms which on the surface may appear quite bad and may be quite happy to adopt a policy of watchful waiting.

Watchful waiting

The first option that should be discussed with the patient is watchful waiting. Numerous studies have shown that in a substantial proportion of men symptoms do not progress, even for those with severe symptoms.

In a study now regarded as a classic, Ball *et al*[3] followed 107 men with watchful waiting over a 5-year period. In none was there an absolute indication for surgery. Half of the patients were obstructed on urodynamic testing. A third of the patients got better, just under half stayed the same, a quarter got worse (of whom eight underwent TURP) and only 2% went into retention. This study had been preceded by another which suggested that urinary symptoms improved in approximately 30% of men in the placebo arm of a BPH drug study[4].

Data from the placebo arm of the PLESS study (Proscar long-term efficacy and safety study) in which 1500 men with moderate to severe symptoms were randomized to placebo, showed that the average symptom score had fallen by 1 point at 4 years of follow-up[5]. Clearly symptoms got worse in some men, but better in others. The Wasson study of watchful waiting versus TURP has shown that for the man with moderate symptoms who chooses watchful waiting, the risk of progression to retention, worsening symptoms or need for TURP is relatively low[6]. Of those men on watchful waiting 40% noticed an improvement in their symptoms, 30% got worse and TURP was required in about a quarter. In the five centres study[7], 500 men referred by their family doctors for consideration for TURP were managed non-operatively after viewing an educational programme. Over the following 4-year period a proportion of the men chose drug treatment or surgery. For men with mild, moderate or severe symptoms, 10%, 24% and 39%, respectively, had undergone surgery at the end of 4 years. For the same symptom categories, 63%, 45 % and 33% were still not receiving any treatment at the end of 4 years. Almost a quarter of men who initially presented with severe symptoms noted an improvement in their symptoms, to mild or moderate.

On the basis of these studies we can say that symptoms, even if severe, do not necessarily get worse even over fairly long periods of time. This forms the foundation of watchful waiting as an option for many patients, even if the symptoms at baseline are severe.

Drug treatment

Where a patient has bothersome symptoms and wants active treatment, a 5-alpha reductase inhibitor or an alpha-blocker will usually be the first line of treatment.

Alpha-blockers

The alpha-blockers act on the so-called 'dynamic' component of prostatic obstruction, which is thought to be mediated by alpha-adrenergic-dependent smooth muscle contraction in the stroma of the prostate.

Relative to the improvement in symptoms after TURP, that seen with the alpha-blockers is modest. The average improvement in symptom score after TURP is about 85%[8]. While clearly some of this may represent a placebo response, this improvement is considerably better than that seen with the alpha-blockers which result in a 10–30% improvement in symptom score relative to placebo[9]. In real terms, the average improvement in symptom score is about 4–5 points over and above an improvement with placebo of 2–3 points. This improvement in symptom score must be considered in the context of the smallest perceptible change in symptom score that a man can detect, which is 3 points. It is therefore difficult to describe the symptomatic effect of alpha-blockers as anything other than modest.

Furthermore, not all patients respond to an alpha-blocker. If one defines 'response' as a >25% improvement in symptoms relative to placebo (a fairly modest definition of improvement), most studies describe response rates of 30–40%[10]. The mean probability for improvement in symptom score after TURP is in the order of 80%, i.e. 8 out of 10 men will notice an improvement in their symptoms after TURP[8,11].

A substantial proportion of men will also stop taking their medication as time goes by, either because of side effects or because of a perceived lack of effectiveness. The side effects of alpha-blockers include asthenia (weakness-5%), dizziness (6%), headache (2%), postural hypotension (1%) and retrograde ejaculation (8%)[10]. Overall approximately 15–30% of men report some constellation of side effects.

5-Alpha reductase inhibitors

Generally speaking, 5-alpha reductase inhibitors are used for the larger prostate. They inhibit the conversion of testosterone to dihydrotestosterone, the more active androgen in the prostate. This causes shrinkage of the prostatic epithelium and therefore a reduction in prostate volume. This takes some months to occur, so urinary symptoms will not improve initially.

A number of large studies have reported on the effectiveness of these drugs. These include the SCARP (Scandinavian BPH Study Group)[12], PROSPECT[13] (Proscar safety plus efficacy Canadian 2-year study) and PROWESS studies[14] and more recently the PLESS study[5] (Proscar long-term efficacy and safety study). All these studies show symptom improvement over placebo in the order of 2–3 points on the IPSS and improvements in flow rate in the order of 1–2 ml/s. The PLESS data also show a small reduction in the risk of urinary retention (see below).

The side effects of the 5-alpha reductase inhibitors are generally speaking fairly mild and principally centre around sexual problems such as loss of libido in 5%, impotence in 5% and reduced volume of ejaculate in a few percent. This low side effect profile is reflected in the relatively low drop-out rate in the PLESS study, two-thirds of men assigned to finasteride remaining on the drug at 4 years of follow-up and 50% of those on finasteride in the SCARP study remaining on the drug at 6 years.

Anticholinergics

For a man with frequency, urgency and urge incontinence—symptoms suggestive of an overactive bladder—one can consider an anticholiner-gic such as oxybutynin or tolterodine. There is concern that these drugs could precipitate urinary retention in men with bladder outlet obstruction, but in fact the risk of this occurring is probably very low[15].

Combination therapy

An alternative to a single drug is to use a combination of an alpha-blocker and a 5-alpha reductase inhibitor. In the MTOPS (Medical Therapy of Prostatic Symptoms) study[16] this combination prevented progression of BPH, progression being defined as a worsening of symptom score by 4 or more, or the development of complications such as UTI or acute urinary retention.

In the Veterans Affairs combination therapy study[17] 1200 men were randomized to placebo, finasteride, terozosin or a combination of terazosin and finasteride. At 1 year of follow-up, finasteride had reduced the symptom score by an average of 3 points relative to placebo, whereas terazosin alone or in combination with finasteride had reduced the symptom score by an average of 6 points.

The PREDICT (Prospective European Doxazosin and Combination Therapy) study[18] randomized over 1000 men to placebo, finasteride, doxazosin or a combination of finasteride and doxazosin. The differences in symptom score (International Prostate Symptom Score) at baseline and at 1 year of follow-up were −5.7 and −6.6 for placebo and finasteride, and −8.3 and −8.5 for doxazosin and combination therapy. In another study over 1000 men were randomized to alfuzosin, finasteride or a combination. At 6 months the improvement in the IPSS was not significantly different in the alfuzosin versus the combination group[19].

Thus, most studies except for the MTOPS suggest that combination therapy is no more useful than an alpha-blocker alone. Enthusiasm for dual therapy has been dampened somewhat by the Prostate Cancer Prevention Trial[20]. In this study of over 18 000 men who were randomized to receive finasteride or placebo over a 7-year period, those in the finasteride group had a lower prevalence of prostate cancer detected on prostate biopsy. However, higher grade tumours, which are biologically more aggressive than low grade cancers were more common in the finasteride group. The jury is out on whether finasteride causes higher grade cancers or not.

Phytotherapy

An alternative drug treatment for BPH symptoms, and one which is widely used in Europe and increasingly in North America, is phytotherapy: 50% of all medications consumed for BPH symptoms are phytotherapeutic ones[21]. These attractively named agents include the African plum *(Pygeum africanum),* purple cone flower *(Echinacea* *purpurea),* South African star grass *(Hipoxis rooperi)* and saw palmetto berry *(Seronoa repens, Permixon).*

Saw palmetto contains an anti-inflammatory, antiproliferative, oestrogenic drug with 5-alpha reductase inhibitory activity, derived from the American dwarf palm. It has been compared with finasteride in a large double-blind, randomized trial, and equivalent (40%) reductions in symptom score were found with both agents over a 6-month period[22]. A meta-analysis of 18 randomized controlled trials of almost 3000 men suggests that *Seronoa repens* produces similar improvements in symptoms and flow rates to those produced by finasteride[23].

South African star grass *(Hipoxis rooperi),* which is marketed as Harzol, contains beta-sitosterol, which may induce apoptosis in prostate stromal cells, by causing elevated levels of TGF-β_1 (transforming growth factor). In a 6-month randomized, double-blind, placebo-controlled study involving 200 men, the IPSS improved by 2 points with placebo and by 7 points with beta-sitosterol[24].

For other agents, such as *Urtica dioica* (stinging nettle) and the African plum the studies that set out to establish their effectiveness involved small numbers of patients, placebo groups were seldom included and follow-up was short. Many lack sufficient statistical power to prove conclusively that the various agents work[25].

Practice in 'real life'

So, in practice, what does the average urologist do for a man with symptoms of BPH? In a recent survey of American urologists who were specifically questioned about their management of BPH symptoms[26], for mild symptoms (AUA score 0–7) 77% recommended watchful waiting, 21% alpha-blockers and 1% finasteride.

For the moderately symptomatic man (AUA score 8–19) alpha-blockers were recommended by 88%, finasteride by 1% and TURP by 1% of urologists for prostate estimated to be <40 ml in volume. For the moderately symptomatic man with a prostate larger than 40 ml, alpha-blockers were recommended by 69%, finasteride by 10% and TURP by 9% of urologists.

For the severely symptomatic patient, alpha-blockers were recommended 58% of the time for smaller prostates and 45% of the time for larger prostates. TURP was recommended for 31% of severely symptomatic patients with prostates <40 ml in volume and for 38% with prostates >40 ml. Thus, watchful waiting is being used by a large proportion of urologists, particularly for patients with mild symptoms, and many are using drug treatments even for the severely symptomatic man. It seems sensible to at least give the patient the option of avoiding surgery. It is always a relief that this was done when a complication develops after surgery.

'Am I likely to develop retention of urine?'

Many patients are understandably concerned that their urinary symptoms may be a harbinger for the development of acute urinary retention. This may influence their decision to seek help for symptoms which they may perceive as indicating a risk of subsequent retention and it may affect the type of treatment they choose.

In a community-based study from North America, Jacobsen *et al*[27] prospectively followed a cohort of over 2000 men for a period of 4 years to identify risk factors for acute urinary retention. Pre-study symptom scores and flow rates were obtained for the whole group, and in a subsample transrectal ultrasonography was used to determine prostate volume. The presence of lower urinary tract symptoms, a low maximum flow rate, and enlarged prostate and old age were asociated with an increased risk of urinary retention. In those aged 40–49 years with mild symptoms (AUA symptom score ≤7), approximately 3 men in every 1000 experienced an episode of retention each year, compared with 9 men in every 1000 in those aged 70–79 years. For those with moderate or severe symptoms, 3 of every 1000 men aged 40–49 years went into retention every year, and for those aged 70–79 years, 34 of every 1000 men experienced urinary retention each year. These data are reassuring, as they suggest that even for the elderly man with moderate to severe symptoms, the chance of an episode of urinary retention is only 3 in 100 per year.

Adjusting for age and flow rate, those with an AUA symptom score of ≥8 had a 2.3-fold increased risk of going into urinary retention when compared with those with an AUA score of ≤7. Those men with a peak flow rate of <12 ml/s had a 4-fold increased risk of urinary retention when compared with those with a flow rate of >12 ml/s. Prostate volume >30 ml was associated with a 3-fold increased risk of urinary retention compared with those with prostate volumes <30 ml.

The PLESS data[5] have been widely publicized as showing a substantial reduction in the risk of urinary retention. In this 4-year follow-up study, 42 of 1471 men on finasteride went into urinary retention (3%), while 99 of 1404 on placebo experienced an episode of retention (7%). This represents an impressive 43 % *relative* reduction in risk in those taking finasteride. However, the *absolute* risk reduction over a 4-year period is a less impressive 4%. And of course, it is the absolute reduction in risk that patients are interested in. So, finasteride does reduce the risk of retention, but it is reducing the risk of an event which is actually quite rare, as suggested by the fact that 93% of men on placebo in this study did not experience retention over a 4-year period. Put another way, to prevent 1 episode of retention, 25 men would have to continue treatment with finasteride for 4 years.

Surgical alternatives to TURP

TURP or other surgical alternatives are used where complications of BPH have developed (such as urinary retention), where medical treatment has not worked or where the effects of such treatment have worn off. The search for alternative surgical treatments essentially started with the Roos paper, which reported a seemingly higher mortality and re-operation rate after TURP when compared with open prostatectomy[28]. The search was on for less invasive treatments, with lower morbidity and mortality, but with similar efficacy.

There are two broad categories of alternative surgical techniques—the minimally invasive and the invasive. All are essentially heat treatments, delivered at variable temperature and power and producing variable degrees of coagulative necrosis of the prostate or vaporization of prostatic tissue. The emphasis, particularly for the more invasive options such as TUVP (transurethral electrovaporization) and laser prostatectomy, has been directed towards trying to reduce blood loss while maintaining effective relief of symptoms.

Minimally invasive surgical alternatives to TURP

These include transurethral radio-frequency needle ablation of the prostate (TUNA), transurethral microwave thermotherapy (TUMT) and high intensity focused ultrasound (HIFU).

Transurethral radio-frequency needle ablation of the prostate—TUNA

Low level radio-frequency is transmitted to the prostate via a transurethral needle delivery system, the needles which transmit the energy being deployed in the prostatic urethra once the instrument has been advanced into the prostatic urethra. The procedure is done under local anaesthetic, with or without intravenous sedation. The resultant heat causes localized necrosis of the prostate.

In a randomized trial comparing TUNA with TURP, Bruskewitz *et al*[29] reported a low complication rate after TUNA with a substantial reduction in symptom score (13 points) at 1 year of follow-up compared with a similar reduction in symptom score after TURP (15 points). Flow rate after TURP had increased by 12 ml/s at 1 year, compared with a 6 ml/s increase after TUNA. Roehrborn *et al*[30] reported similar results. It seems that, on average, the improvement in flow rate at 12 months post-treatment is in the order of 6 ml/s and the improvement in symptom score averages about 13 points[31]. Side effects include bleeding in about one-third of patients, urinary tract infection in 10% and urethral stricture in about 2%. No adverse effects on sexual function have been reported.

TUNA has recently been endorsed as a minimally invasive treatment option for symptoms associated with prostatic enlargement by the UK National Institute for Clinical Excellence (NICE)[32], alhough concerns were expressed relating to the long-term effectiveness of the treatment, a concern similarly expressed in EAU Guidelines[33]. Only time will tell whether TUNA falls out of favour as a treatment which simply delays the need for TURP, but Gee's survey of practice among North American urologists suggests that very few are offering this treatment—only 3 % of urologists were performing TUNA in 1997[26].

Transurethral microwave thermotherapy—TUMT

Microwave energy can be delivered to the prostate via an intraurethral catheter, with a cooling system to prevent damage to the adjacent urethra. The microwave energy produces heating of the prostate, leading to coagulative necrosis. Subsequent shrinkage of the prostate relieves obstruction. There is also evidence that TUMT causes thermal damage to adrenergic neurons and this heat-induced blockade of the adrenergic pathway may account for at least some of the reported symptomatic improvement[34].

Many published reports of outcomes after TUMT are open studies, where all patients have received treatment and where there is no control group. In trials comparing TUMT with sham 'treatments' (where the intraurethral microwave catheter is inserted, but the machine is not turned on), improvements in symptom scores in the order of 10 points on the IPSS have been reported, in as many as three-quarters of men[35–40]. Symptomatic improvement appears to be greater when using microwave systems that deliver higher energy to the prostate. One study, however, found an equivalent improvement in symptom score in treated patients and in those undergoing sham treatment with the machine turned off[41]. This suggests that the improvements in symptoms score, at least in this study, represented a placebo effect. In those studies where symptoms improve, the maximal improvement is usually apparent within 3–6 months of treatment and the improvement seems to be durable, at least over a 3-year period[42].

D'Ancona *et al*[43] compared TUMT with TURP in 52 patients. Symptoms improved in 56% after TUMT compared with 74% after TURP. TURP relieved obstruction in 90% of the TURP patients and 70% of the TUMT patients. Sexual side effects after TUMT, such as impotence and retrograde ejaculation, were less frequent than after TURP. The period of catheterization after TUMT is longer than with TURP (in this study averaging 4 days after TURP and 12 days after TUMT) and urinary infection and irritative urinary symptoms are more common after TUMT.

TUMT is really an intermediate treatment between drugs and more invasive methods. It has the obvious advantage that it can be performed under local anaesthetic, although where higher energy systems are used intravenous sedation may be required. It may have less of an effect on sexual function than TURP, but post-treatment catheterization is longer, on average, than that after TURP. It is a less effective treatment for improving bladder outflow obstruction than TURP. On the basis of these effects, EAU Guidelines[33] state that TUMT 'should be reserved for patients who prefer to avoid surgery or who no longer respond favourably to medication'.

High intensity focused ultrasound—HIFU

A focused ultrasound beam can be used to induce a rise in temperature in the prostate, or indeed in any other tissue to which it is applied. For HIFU treatment of the prostate a transrectal probe is used. A general anaesthetic or heavy intravenous sedation is required during the treatment. Preliminary data suggested a reduction in symptom score in the order of 12 points[44,45]. There are no data comparing HIFU against other surgical treatments for BPH and it should therefore, as EAU Guidelines state, be regarded as an investigational therapy.

Invasive surgical alternatives to TURP

These include laser prostatectomy and TUVP.

TUVP

TUVP uses a combination of vaporization and dessication of prostatic tissue. A number of electrode configurations have been designed to maximize the efficiency of vaporization. TUVP has been compared against TURP in a number of well designed, randomized, single-blinded studies.

Over the short term (up to about 1 year of follow-up) TUVP seems to be as effective as TURP for symptom control and relief of bladder outlet obstruction[46]. In this same study operating time and in-patient hospital stay were equivalent, although more patients required blood transfusion after TURP compared with TUVP (9 versus 2). Over a 5-year period symptomatic relief after TUVP is maintained and reoperation rates are equivalent to TURP[47].

Thus, TUVP seems to be very nearly equivalent to TURP in terms of symptom relief, relief of obstruction, complications and re-operation rate. It has the potential disadvantage over TURP of not allowing histological examination of tissue which is removed, so prostate cancers cannot be detected. Recently, NICE in the UK has endorsed its use as a surgical treatment option for prostatic symptoms[48].

Laser prostatectomy

Several different techniques of 'laser prostatectomy' evolved during the 1990s using laser energy to coagulate, vaporize or resect the prostate. The precise effect—coagulation or vaporization—depends on the laser type, the time for which it is applied and the total laser energy that is delivered to the prostate. A single laser system may produce a combination of coagulation and vaporization, with one effect predominating. A number of different laser delivery systems have been used for laser treatment of the prostate.

Transurethral ultrasound-guided laser-induced prostatectomy—TULIP

TULIP was performed using a probe consisting of a Nd:YAG laser adjacent to an ultrasound transducer, with a balloon designed to keep the laser at a defined distance from the prostate. This probe was swept backwards and forwards from the bladder neck to the verumontanum under ultrasound guidance. No comparative studies of TULIP versus TURP have been reported, although data from the TULIP National Human Cooperative Study Group[49] suggested improvement in symptom scores in the order of 70% at 6 months of follow-up. However, less modest improvements with longer follow-up suggest that the effects are not durable[50]. TULIP is no longer used and this may partly be because urologists were not comfortable with a technique that did not allow direct visualization of the tissue being treated.

Other laser delivery systems were developed using either an end-firing laser fibre applied directly onto the surface of the prostate ('contact' laser), a side-firing delivery system (so-called visual laser ablation of the prostate, VLAP) or a laser fibre introduced directly into the prostate, the so-called interstitial laser system. All these systems allowed direct visualization of the prostatic urethra during treatment.

Visual laser ablation of the prostate—VLAP

The side-firing system used either a mirror to reflect or a prism to refract the laser energy at various angles (usually 90°) from a laser fibre located in the prostatic urethra onto the surface of the prostate. Some vaporization of the surface of the prostate occured, but the principal tissue effect was one of coagulation. The coagulated tissue underwent necrosis and then sloughs over the course of several weeks.

Two well designed studies, both with a 12-month follow-up, have compared outcomes in patients randomized to VLAP or TURP. Cowles *et al*[51] reported a reduction in the AUA symptom score of 13 after TURP and 9 after VLAP, with an increase in flow rate of 7 ml/s after TURP and 5 ml/s after VLAP. Anson *et al*[52] found very similar improvements in AUA symptom score, of 13 and 10 after TURP and VLAP respectively, and improvements in flow rate of 12 ml/s and 6 ml/s, respectively. Longer-term results are difficult to assess. In those studies that have reported on long-term outcome, many patients have been lost to follow-up[53]. Of those patients who were available for follow-up (only a third of the total originally treated), 16% of the TURP patients and 38% of the VLAP patients had required further surgical treatment.

The results have to be weighed against the advantages of VLAP. No blood transfusions were required after VLAP; indeed, it can be performed safely on patients on full anticoagulation. Nor did TUR syndrome occur, as normal saline is used as the irrigant during the procedure. Retrograde ejaculation occurred in approximately 30% of men. Postoperative urinary retention developed in 30%.

Contact laser prostatectomy

Contact laser prostatectomy produces a greater degree of vaporization than VLAP, allowing the immediate removal of tissue. This has the potential advantage of reducing the likelihood of postoperative retention, which is a problem with VLAP. A variety of specialized laser fibre tips were developed, made of sapphire, configured into a variety of shapes. Like VLAP, contact laser prostatectomy uses normal saline as the irrigation solution, so that TUR syndrome does not occur.

Contact laser prostatectomy was compared with TURP in the Oxford Laser Prostate Trial. Patients were randomized to TURP or laser prostatectomy. At 3 months of follow-up the improvement in AUA symptom score was 12 in the TURP group and 7 in the laser group[54]. By 1 and 3 years of follow-up, the improvement in symptom score was 12 following TURP and 11 after laser prostatectomy. Re-operation (principally TURP) was required in 9% of the TURP group and 18% of the laser group at 3 years of follow-up[55].

The mean duration of catheterization was 1 day after laser prostatectomy and 2 days after TURP, but the re-catheterization rate was higher in the laser group, 28% of laser patients failing to void after the postoperative catheter was removed compared with 12% in the TURP group. Thus, the hoped-for reduction in postoperative retention was not realized.

Interstitial laser prostatectomy—ILP

ILP is performed by transurethral placement of a laser fibre directly into the prostate. This produces a zone of coagulative necrosis some distance from the prostatic urethra, thereby avoiding damage to the prostatic urethra and eliminating postoperative voiding problems such as urinary retention. Open studies where all subjects were treated by ILP have shown improvements in symptom scores of between 30 and 90%. In a randomized study comparing ILP with TURP, AUA symptom score improved by 18 points after TURP and by 12 points after ILP, at 3 months of follow-up[56]. Postoperative urinary retention does not appear to have been a problem following ILP, but whether these shortterm improvements in symptoms have been sustained is not known.

Holmium laser prostatectomy

The wavelength of the holmium: YAG laser is such that the energy of this form of laser is strongly absorbed by water within prostatic tissue. At the energy levels delivered it produces vaporization at the tip of the laser fibre. Its depth of penetration is <0.5 mm and thus it can be used to produce precise incisions in tissue. It has the added advantage of all laser techniques that it can be used with normal saline, and so TUR syndrome does not occur during holmium laser prostatectomy. When the beam is 'de-focused', it provides excellent haemostasis.

The holmium laser can be used for contact vaporization (holmiumonly laser ablation of the prostate, HoLAP), for resection (holmium laser resection of the prostate, HoLRP[57]) or for enucleation of the prostate (holmium laser enucleation of the prostate, HoLEP). These different techniques developed in progression. Initially the holmium laser was used for contact vaporization, but this was time-consuming and only suitable for small prostates. With increasing experience advocates of the technique appreciated that the holmium laser could incise tissue and in this way chips of prostate could be formally resected, which could then be evacuated from the bladder in the usual way. In a large, randomized study comparing HoLRP with TURP, symptomatic and urodynamic outcomes at 2 years were similar, with a lower transfusion rate and shorter hospital stay after HoLRP[58].

Holmium laser resection led to the development of holmium laser enucleation (HoLEP) of the prostate. In this technique the lobes of the prostate are dissected off the capsule of the prostate and then pushed back into the bladder. A transurethral tissue morcellator is introduced into the bladder and used to slice the freed lobes into pieces that can then be removed. As with HoLRP, HoLEP has been compared with TURP in well designed, randomized studies. Improvement in symptom scores and flow rates are equivalent, and although the operation time with HoLEP is longer, catheter times and in-hospital stays are less with HoLEP[59–62].

So why does not everyone use HoLEP rather than TURP? This is partly because the laser units are costly, but these capital costs can be offset to a degree by using the laser for other procedures such as treatment of ureteric and renal calculi. One should, however, bear in mind that the more costly a piece of equipment, the more costly the repairs. Many hospitals will only be able to afford one laser unit and thus when the laser breaks down, as will occasionally happen, you will have to wait for the laser to be repaired and this may take some time.

Evidence suggests that approximately 20–30 procedures need to be done under supervision before results similar to those of a more experienced surgeon are achieved[63]. For the surgeon who has completed his training, or for those in training jobs that do not offer experience in HoLEP or HoLRP, it is clearly difficult to gain the necessary experience to be able to operate safely on one's own. There are only a limited number of centres, principally in New Zealand and North America, where these techniques of prostatectomy are practised regularly, and so opportunities for training are limited.

Summary

A substantial proportion of men who opt for no active treatment of their symptoms—watchful waiting—will experience no worsening of their symptoms, even over several years. A patient, once reassured that his symptoms may not get worse, that he does not have prostate cancer and that he is unlikely to develop acute urinary retention, may well decide not to have any active treatment. Drug treatments for BPH produce only modest improvements in symptom scores when compared with placebo, and in the case of alpha-blockers a significant proportion of men stop taking their medication over the course of time because of side effects. The efficacy of combination therapy with both an alpha blocker and finasteride appears to be no better than that with alpha-blockers alone. Phytotherapy seems to produce improvements in symptoms equivalent to those with finasteride.

Minimally invasive treatments such as TUNA and TUMT produce symptom improvements that are intermediate between drug treatments and TURP, and at least in the case of TUMT these effects seem to be durable over a 3-year period. The morbidity after both TUNA and TUMT is less than that associated with TURP. The more invasive procedures of TUVP and holmium laser prostatectomy produce results which are equivalent to TURP. Longer-term results are needed to allow the precise role of these alternative surgical techniques in BPH treatment to be defined.

Thus, there is a wide range of potential treatment options for men presenting with BPH symptoms. In general terms, clinical practice guidelines recommend surgical treatment over medical therapy where complications such as renal impairment or recurrent acute retention have developed, or where medical therapy has failed to control severe symptoms. In uncomplicated cases, these guidelines state the importance of patient preference in deciding which treatment to have.

In terms of the precise technique used to treat the prostate in those patients who opt for surgical treatment, unless there are clear benefits of one technique over another, the majority of surgeons will tend to use the technique that they feel provides the best results in their hands.

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Chapter 13
Medico-legal aspects of transurethral resection

It is an unfortunate fact of surgical life that the risk of being involved in litigation has increased enormously during the latter part of the twentieth century and into the twenty-first century, to the extent that today few surgeons get through their professional lifetime without being sued at least once. Transurethral resection seems to cause rather less litigation than many other procedures, but has its own areas of risk, which need to be considered.

Litigation after any operation more often than not arises because something unexpected occurs. The patient believes, or the relatives believe, that something has gone wrong. They then interpret this as having been due to an error by the surgeon, and go on to make the assumption that such an error on his part must have involved negligence. Litigation follows.

Any surgeon may make a mistake from time to time, but only a very few are incompetent. However, every surgeon owes the patient a duty of care. If that duty of care is breached then the Court may adjudge that breach to be negligent. A breach of duty may be founded upon a positive act or acts of 'commission' by the surgeon (i.e. carelessly doing something which he/she ought not to have done), but it may equally be founded on an act or acts of 'omission' (i.e. carelessly failing to do something which he/she ought to have done). Lawyers refer to the surgeon's negligent breach of his duty of care as his 'liability'. Any harm, damage and consequential financial loss suffered by the patient as a result of (or—in legal jargon—'causation by') a negligent breach of care is the basis upon which the Court assesses compensation: such compensation is known as 'damages'. The amount (or 'quantum') of an award of damages will depend upon the extent of the harm, damage and consequential financial loss which is proved in any given case. Sometimes, an award will not involve compensation for financial loss and will be confined to damages for so-called 'pain and suffering' (for example, where a patient is not in employment and/or where the harm suffered by him is relatively minor and has no permanent effects). Where, on the other hand, the harm suffered results in a permanent and serious disability which restricts (or even prevents) the patient from carrying on with his preoperation employment, then obviously the award of damages will be very much larger.

The judgement as to whether an act or omission is negligent is a subtle one. It has to be related to a bedrock of basic standards of knowledge below which one cannot go. It also must be related to standards of experience; so an act or omission which causes a problem may not be found by a Court to be negligent if performed (or not performed) by a junior trainee, but would be so found if done (or not done) by a consultant of many years' standing. The point in time when the supposedly negligent act or omission took place will also be significant—a complication that was acceptable 5 years ago may no longer be so, due to changes in techniques, preventative measures or understanding. The judgement of what is negligent may vary as practices vary, surgery being an imprecise art. It is a defence to a civil action in negligence if it can be shown that, in relation to a particular act or omission, a body of surgeons would have done (or not done) the same even if others disagree. This is the so-called *Bolam* defence. Latterly this defence has been qualified so that an act/omission is defensible only so long as there is a logical basis for the act or omission (the *Bolitho* modification of the *Bolam* defence).

But litigation may start when there has been no negligence. Probably 50% of allegations have no basis in fact, so why should they be made? A few arise from malice, or the perception that there is money to be made, and some arise from the distorted perception by a diseased mind of what has happened. Sometimes there is arrogance on the part of the surgeon, who may feel that the patient has no right or need to be given explanations—in years gone by this was a commonplace attitude, but is happily rare today. There may be a simple lack of courtesy on the part of the surgeon—polite surgeons do not often get sued without reason. However, most unfounded allegations of negligence arise from a simple failure to communicate between patient and surgeon. This can on the one hand arise as a result of a failure by the surgeon to explain clearly and, on the other, by a failure of the patient to understand what is being said. Most commonly the loss of proper communication is a failure by the surgeon to judge his or her patient's ability to understand the situation. It is sometimes hard to realize just how ignorant a person may be about the workings of his or her body, let alone understand how the surgeon intends to modify it. That ignorance has little to do with social or educational status—a High Court judge may have less understanding of anatomy or physiology than a filing clerk. So the surgeon must put as much thought, skill and care into the explanation of the treatment as has been put into the diagnosis and investigation of the condition about to be treated.

Failure of communication is not, of course, restricted to the preoperative period. Good communication is essential after the operation, even if nothing untoward occurs. If complications do occur, if something went wrong during the operation or if something unexpected occurred, good communication becomes even more important, as this is when the idea of litigation may germinate. A clear explanation that is understood by the patient and the relatives, if necessary accompanied by an apology (which is not an admission of liability), will go a very long way towards preventing that germ of suspicion growing into subsequent litigation. It is the regular experience of many lawyers that the first real explanation ever understood by the patient was that given in the litigation expert witness's report.

Clearly it is necessary to ensure that the standard of history taking, physical examination and investigation before an operation are appropriate. Similarly it is essential to ensure that the operation is done carefully and accurately and that aftercare is appropriate. It is absolutely vital to document all this activity accurately and legibly in a set of records written at the time, so that, if necessary, you can prove what you did and why. This takes time, particularly because it must be done for every single case, but it is time well spent. Remember, if you haven't documented what you said, it could be argued that you never said it!

With today's atmosphere of potential litigation it is easy to fall into a defensive attitude and to over-investigate patients. However, the sensible surgeon can avoid litigation, or mitigate litigation, by appropriate care in these areas without going to extremes—there is no need to resort to doing magnetic resonance or CT scanning in men with bladder outflow obstruction, for example. Such elaborate investigations need only be done if circumstances indicate that it is necessary. As noted in Chapter 4, the most rigourously constructed BPH guidelines are actually those that recommend the least number of routine investigations, so more is not necessarily better.

It is necessary to warn patients of certain outcomes of your proposed operation, or the possible complications that may arise. In the past these have been selected on the basis of their frequency of incidence, their severity or their unpleasantness. For example, it is necessary to warn men that they will have troublesome urinary frequency with pain on urination, urgency and possible urge incontinence when the catheter is first removed after TURP. Although these symptoms are not a sign of a significant problem, they are unpleasant and universal, so you must tell your patient that they will occur. Deep vein thrombosis and pulmonary embolism, on the other hand, are rare complications after TUR and in the past did not warrant a warning. Although the possible outcome was grave, the risk was small. However, the medico-legal climate has changed and it is now necessary to warn of this complication because some complications carry such far-reaching consequences that they merit explanation even if the risk is so small. All urological surgeons will be familiar with the necessity to warn of the possible spontaneous late return of fertility after vasectomy—the incidence is tiny, but its effect is not. The possible significance of such a small risk was brought into the medico-legal arena many years ago when a neurosurgeon was sued successfully by a patient who developed a rare but well-documented complication after an operation *(Sidaway)*. This significance has been underlined recently by an Australian High Court decision in 1992 that an ophthalmic surgeon was guilty of negligence for not warning of the tiny risk (1 in 40 000) of losing vision in the normal eye after surgery to the contralateral eye[1] *(Rogers v.Whittaker)*. So the *Bolam* test—the defence that a group of reasonably competent doctors would have done the same—may no longer be the impregnable defence that it has been in the past, as the Courts may move away from it towards a Rogers and Whittaker 'reasonable patient' test in cases involving consent.

The difficulty that the surgeon now has to face will be in deciding what a reasonable patient would wish to know. On whose advice or on what evidence will the Court make a decision about what a reasonable patient would want to know? Using the *Bolam* test, expert witnesses provide evidence to the court and, using this information, the Court makes a decision. If the test becomes the *Rogers v.Whittaker* test, the court will have to make its own assessment of whether a risk was a material one or not. There may be additional problems in adopting the *Rogers v.Whittaker* approach to what a patient thinks is appropriate, as the perception of information provided or not provided may change with events. Once a patient knows more about a risk or complication—usually when they have just experienced it—they are likely to think that information about this risk should have been given prior to the procedure. For the doctor, all of this presents the dilemma of uncertainty and there is a risk that surgeons may respond by overloading patients with information.

Complications may occur after any operation. In a perfect world it should be possible to quantify the risk of any particular complication, but many episodes go unpublished in the literature, so that any survey of operative outcomes is necessarily incomplete and the true incidence of a complication may be significantly greater than is actually recognized. Documented complications in themselves are not reasonable grounds for litigation, unless there is clear evidence that the appropriate skill has not been used, or the necessary precautions were omitted. It is easy to assume that because a particular complication of a certain operation is a recognized complication its occurrence cannot be regarded as arising from negligence. However, if it can be demonstrated that the complication occurred because the surgeon failed to take a specific precaution that had been identified beforehand as appropriate to eliminate or lessen the incidence of that complication the Court may find the surgeon negligent. For example, septicaemia is a recognized complication of TURP and antibiotic prophylaxis can reduce the risk of this occurring. Failure to give antibiotic prophylaxis to an at-risk patient undergoing TURP who subsequently develops septicaemia could be construed as negligence.

Things change. Whether for better or worse may be a matter of opinion, but sometimes a surgeon has failed to notice a change going on in attitudes or practices affecting aspects of his or her work. A complication arising after an operation that hitherto he or she had thought was a recognized and acceptable risk of the particular procedure may have become an unacceptable one. This may arise as a result of any one of a number of reasons, commonly because of a better understanding of the causes of the problem, and therefore its prevention, but also because of progress in specific treatment for the problem or its cause. Constant attention to the current medical literature, continuing medical education (CME) and participation in departmental death and complication meetings with appropriate departmental audit should be a guard against such failures to keep up to date.

So, if the surgeon sets out to investigate a patient using appropriate and established tests, establishes a diagnosis according to orthodox contemporary knowledge, gives appropriate advice, writes that sequence of events clearly in the records and finally makes sure that the patient really understands what is proposed, he or she should be immune from suit. Or that is the theory!

Like any other operation transurethral resection is open to the possibility of litigation. How may this be coped with? There are a number of general principles and a number of specific areas of risk.

It goes without saying that clear communication is essential at all times. Use simple words. Speak in the vernacular rather than using technical terms—talk of peeing, not micturition, balls, not testicles—to ensure understanding. Use simple images. Ensure that the message is being received—is his deaf-aid working? Are your words being understood by a patient whose first language is not the same as your own? Repeat the explanation if in doubt, changing the words and images if necessary. Clear, simple diagrams are useful tools in the promotion of understanding. Perhaps you can keep a diagram of the bladder and prostate before and after transurethral resection on the desk, which you can show to the patient during the consultation. You may draw such diagrams in the patient’s notes. This is not only a good way of explaining the reasons why a procedure is needed and the possible risks, but also serves as a permanent record of the efforts you made to explain the nature of the procedure. When you have finished your explanation of the plan of treatment it is a sensible idea to ask the patient what it is he thinks you are going to do. Do not just ask if has understood what you have said, get him to tell you what he has understood you to have said. If he cannot explain it to you, you have not made it clear to him.

The most senior member of the operating team should provide the explanation, preferably the operating surgeon. The individual providing the explanation should then obtain the patient's signed consent for the operation planned and should countersign the declaration to say that the procedure has been explained. It has become common practice for this to be done at the end of the final pre-operative consultation, rather than leaving it until admission to the ward. In the UK all hospitals have recently adopted a standardized form for this purpose. More recently still the British Association of Urological Surgeons (BAUS) Procedure Specific Consent Forms have been produced in an attempt to standardize the process of consent for urological surgery. The process of obtaining consent has become fairly tedious and time-consuming. Unfortunately it is the only way you can guard yourself against vexatious litigation, so it is actually time well spent. Pre-operative explanation and consent is <u>not</u> for the admitting house surgeon, the ward nursing staff, the anaesthetist or a passing medical student.

Pre-admission clinics are now widespread in the UK, where patients are screened and examined by junior staff at a suitable interval before the admission for the planned operation. While the notes from these clinics need to be recorded with care, these clinics—generally speaking—are not appropriate places for the main explanation of the proposed surgery to be given, or consent obtained, as the doctors seeing the patients are usually junior members of the surgical team. However, if a consultant is able to be present at the pre-admission clinic, then consent may be taken at this time if it was not obtained at the clinic when the decision to operate was made. There is much to be said for obtaining consent some days or weeks before the operation. This provides a cooling off period, allowing the patient time for contemplation, giving him the opportunity to ask questions that did not originally spring to mind and giving him time to change his mind.

Many urological surgeons provide an explanatory pamphlet or leaflet that sets out the information they wish to transmit to the patient about transurethral resection. If you decide to use such an explanatory pamphlet, how do you set about creating it? First of all it needs to be couched in simple language. Then it may be divided conveniently into several sections, arranged in a logical sequence to present the information you wish to impart. A good place to start is with an explanation of what the prostate is and what it does, followed by a very brief explanation of the mechanics of the proposed operation.

Next the document should set out what the patient needs to know and do <u>before coming into hospital</u>, especially if he is to be admitted on the day of the proposed surgery. This section should include such matters as whether or not to take their regular medication (e.g. stopping their regular aspirin a week prior to admission), having a bath or shower before admission, going without food and drink, pre-operative bowel action, etc. It is wise to give some suggestions as to what arrangements need to be made at home, before admission, in preparation for return there after the operation, especially if it is your practice to send the patient home within a day or so of surgery. This is particularly important for an elderly man who lives alone or who has a frail or disabled spouse.

Then the leaflet should describe what the patient may expect <u>on admission to the ward</u>. This should include a brief outline of what the nursing staff will do and that there will be a visit from the surgeon and anaesthetist, who will explain their plans and provide an opportunity for any further questions to be asked by the patient. Most hospitals provide general information to all patients concerning the planned admission, so the TUR pamphlet does not need to go into exhaustive detail if the situation has been described clearly already—find out what your hospital provides so that you do not duplicate information unnecessarily.

The pamphlet should then describe what will happen immediately after the operation, which will depend upon your local practices. This section should contain information about the urethral catheter, what a catheter is and does, why it will not fall out, that it is connected to a urine bag and whether or not it will be connected to a bladder washout. It is wise to provide a warning that the patient's first waking sensation after transurethral resection is usually a fierce desire to urinate but that the catheter is taking care of that problem. Make sure, by a clear explanation, that the presence of blood in the catheter urine is to be expected and is not an indication that all is not well. Mention the use of postoperative painkillers and how to get them if necessary. Explain what happens when the catheter is removed, when it is likely to be removed and what will happen when it has been removed—urinary frequency, dysuria, urgency, temporary leaks, etc.

The final section should include a brief outline about what is likely to happen after going home. This should include the plan for postoperative review in the urology clinic as well as what to do if things do not seem right. Advice about the timing of resumption of physical activities (including sexual intercourse) is essential. Tell your patient when he may reasonably expect to be able to drive his car and when it is sensible to go back to work, bearing in mind the nature of your patient's work—an office worker can probably expect to go back to full work earlier than a labourer. The possibility of unexpected secondary haemorrhage, both minor and major, and what to do about it should be included in this section.

This may sound a daunting catalogue, but it can usually be condensed into a few sides of A5 paper with a little thought. The advantage of such a leaflet is that the patient can take it home and refer to the various points when a doubt arises, or when he cannot remember what you told him. It is also useful reading for the patient's spouse! Its final function is to be available as a rebuttal to the tales of his well-meaning friends who take such innocent pleasure in telling him grisly tales of what happened to their grandfather or uncle when they had a prostate operation, often many years before!

Possible complications may be included in this pamphlet if you wish. There is a risk that providing too much information may simply mean than none of it gets read by the patient. However, if your pamphlet does contain an explanation of possible complications no one can claim subsequently that they were not given the information.

Make sure that the staff of the ward into which your patient is to be admitted all know exactly what operation is proposed, what explanation has been given and what warnings have been provided. Ensure that your particular habits are clearly understood by the nursing staff, perhaps you aim to remove the catheter after transurethral resection after 24 hours regardless of circumstances, whereas your colleague removes it when he is happy that there is no more haematuria. There is nothing worse than a patient receiving contradictory information. Many hospitals use a set of individual ward protocols to ensure that all the necessary points are covered for each operation.

With regard to risks and complications, how much information should you provide? The amount and nature of the information that patients receive can be daunting for the surgeon and frightening for the patient. However, do not forget that it is your duty as a surgeon to give adequate information to the patient concerning the benefits and risks of a procedure, unpleasant though that information may be. No one likes to talk about serious complications, but you should not shy away from discussing these issues with the excuse that you are trying to 'protect' the patient. There are a number of complications associated with TURP that must be discussed with each man advised to undergo transurethral resection. The BAUS Procedure Specific Consent Forms do not require that you mention every single complication that can occur after TURP. While it is quite obviously impossible to mention all possible complications, erring on the side of giving more information rather than less is a safe practice to adopt, bearing mind the case-law mentioned above. Litigation is far more likely to occur if you have *not* warned a patient of a particular complication than if you have warned him that it could occur. Patients often want more information than we think they do and one should be careful to avoid the assumption that they don't want to hear about particular risks. The BAUS Procedure Specific Forms do provide a basis upon which consent can be obtained.

It is perfectly possible to talk gently about any serious risks without frightening the patient, but it will depend on you having already established a friendly relationship and perhaps by emphasizing the likelihood that a serious complication is <u>not</u> going to happen. For instance a risk of a 1 in 200 chance of death can be put the other way round—that 199 out of 200 men leave hospital fit and well, which sounds like better odds!

Occasionally you will meet a patient who specifically expresses a desire <u>not</u> to know about any unpleasant or serious risks. A way around this is to suggest to the patient that he is actually putting you in a difficult position and that it is unacceptable to perform a procedure that does carry significant risks without being able to explain in advance what these risks are. An alternative is to talk to a close relative or friend about the risks, with the patient's consent. In any case, making sure the relatives are au fait with the ins and outs of the proposed operation is a good principle to follow when obtaining consent for any procedure. It is to be borne in mind that, if a very serious complication does occur, it will often be a close relative with whom you will be communicating afterwards.

It is worth bearing in mind that in the light of the Bristol paediatric heart scandal[2] there is a move towards surgeons being required to warn patients of their individual outcomes and complications, rather than relying on national or international figures. Audit of your own outcomes will allow you to modify the discussion with regard to the complications discussed in the next few paragraphs.

There are a number of specific points that must be discussed with each man being advised to undergo transurethral resection. The patient must understand that there are various complications that may occur, the reasons for them if they do occur and their management. He must also know that certain things are an inevitable sequel of the procedure and <u>will</u> happen. The BAUS Procedure Specific Consent Forms recommend that all men should be aware of the alternatives to TURP such as observation, drug treatments, catheters or open prostatectomy. All men need to know that after a TURP there will be blood in the urine after the operation, with a warning that very occasionally this is severe and may need blood transfusion and rarely return to the operating theatre. Absorption of irrigating fluid leading to confusion and heart failure (the TUR syndrome) should be mentioned as a rare possibility. The BAUS Procedure Specific Consent Forms recommend that the patient should be warned that very rarely perforation of the bladder can occur, even during TURP, and that this may require a longer period of catheter drainage than normal, or even a formal open operation for its repair.

What should we tell men about to have a TURP?

- With regard to the postoperative period, it is essential that everyone knows that they will have frequency, burning and urgency of micturition for a while after the catheter has been removed and that this may take a matter of weeks to subside, but is part of the natural healing process. In this context the risk that detrusor instability associated with the existing bladder outflow obstruction may not subside postoperatively must be mentioned, which can lead to a degree of urge incontinence.
- It is sensible to warn that some men cannot urinate when the catheter is removed postoperatively so that it needs to be replaced temporarily. The risk of this occurring after a TURP for symptoms alone is very low, but if the TURP is being done in a man with retention of urine the risk of not being able to void goes up to around 1 in 5–10. The greater the retention volume the higher the risk, so it may be difficult to get men with long-standing chronic retention voiding spontaneously.
- The risk of severe bleeding mentioned above can be set out, making clear that it is very unlikely to happen.
- The inevitability of minor bleeding occurring after the patient has gone home must be mentioned and the warning given that the occasional man will have a brisk and alarmingly red bleed a couple of weeks after the operation. Give the reassurance that it will stop spontaneously and the advice to drink generously to help wash it away. It is not necessary to mention the possibility of clot retention as that is very unusual and a warning may cause unnecessary anxiety.
- The remote possibility of TUR syndrome should be included.
- It is wise to mention the small risk of postoperative bladder infection.
- The patient should be told that a pathologist will examine the tissue that is removed at TURP and that in a proportion of cases a prostate cancer will inadvertently be found and this may require further investigation and treatment.

The longer-term outcomes, complications and risks then need to be dealt with.

- If the operation is being done for symptoms alone, the patient should be made aware that a proportion of men may not experience any improvement in their symptoms. This may occur in the order of 20% of cases. Some symptoms, such as nocturia and urgency are less likely to improve than are hesitancy and poor flow.
- It is essential to warn <u>all</u> men about to have a transurethral resection of the prostate or bladder neck, or a bladder neck incision, that they are more likely than not to have retrograde ejaculation of semen postoperatively and that this will be a permanent situation. This occurs after approximately 20% of bladder neck incisions and at least 75% of TURPs. It is absolutely essential to discuss this with younger men, particularly because of the desire to retain fertility in this age group. Many older men accept retrograde ejaculation as no more than a curious occurrence, but some find it intolerable not to have been warned of the likelihood. This warning must be documented in the clinical record, as should all potential risks and complications.

- It is necessary to warn that there is a risk of erectile dysfunction postoperatively. Make a note that you have told the patient that there is a chance that he may permanently lose the ability to get an erection. This is a rather long-winded way of saying impotence, but not all men understand what impotence is. For a condition where the implications both for the patient and for the doctor can be profound, it is important to make it as clear as possible what you mean. Statistics available are almost certainly incomplete, but it does seem that somewhere around 5–10% of men undergoing transurethral surgery for bladder outflow obstruction will suffer erectile dysfunction postoperatively and that this figure will tend to increase with the passage of years and with the ‘quality’ of erections prior to surgery. Most men who are actually capable of penetrative sexual intercourse before transurethral resection of the prostate or bladder neck, or bladder neck incision, will continue to be able to enjoy worthwhile sexual intercourse afterwards, although usually without ejaculation. Not all men are completely honest about their sexual prowess, or their sexual activity may have ceased to be a matter of great concern, but it is necessary to warn all men that there is a small risk of losing the ability to get a worthwhile erection. Never assume that it is not likely to be a cause for concern because the patient in question is over ninety! This warning should also be documented in the clinical record.
- Mention should be made of the possibility that the sensation of orgasm may be lost or altered after TURP. In the National Prostatectomy Audit this occurred in 52% of men.
- The risk of urinary incontinence needs to be mentioned, if only to emphasize that it is a small risk in the region of 3 % unless there are predisposing pre-operative causes.
- Similarly the small risk of urethral stricture after endoscopic surgery must be mentioned, again if only to underline its low incidence.
- Finally the chance of needing a repeat operation for a late return of symptoms must be quantified—about 10–20% after 10 years.

For TURBT, the BAUS Procedure Specific Consent Forms give useful guidance. You should warn your patient of a number of points.

- The patient should be made aware that radiotherapy or cystectomy may become necessary after the findings of the TURBT are known.
- There will be a need for a catheter after the operation, almost certainly with bladder irrigation.
- There will be urinary burning and frequency when the catheter is removed.
- There is a risk of postoperative bleeding, occasionally requiring clot evacuation, both immediately after the operation and then secondarily after they have gone home.
- The small risk of perforation of the bladder requiring prolonged catheter drainage or even open surgical repair should be explained.
- The patient should be told that additional treatment such as intravesical chemotherapy might be necessary.
- It must be made clear that you cannot guarantee that complete removal of the cancer with cure of the disease can be achieved by this operation alone. Make it clear that recurrence may occur, so that follow-up is necessary.

Litigation based upon these risks can usually be avoided if it is possible to demonstrate clearly that they have been aired with the patient preoperatively. If a pamphlet is used it is necessary to record in the clinical notes that the patient has been given one. Clear contemporaneous notes of the warnings given are the best way of proving that you have discussed the risks pre-operatively. This is time-consuming, but so is trying to defend a case because your documentation does not provide adequate support for what you said or what you think you said to the patient!

Having said all that, there is a risk that you will get involved in litigation when strange and rare complications arise, but these should be entirely defensible. The occurrence of what is a recognized complication of an operation is defensible if a clear warning has been provided (and can be demonstrated to have been provided) and the necessary precautions against its occurrence had been taken. Some complications of certain operations are all too well recognized, but are not defensible against an allegation of negligence if there are reasonable and established methods of avoiding them which the surgeon has not followed.

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