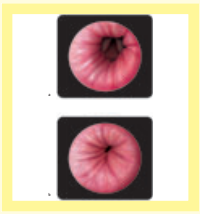
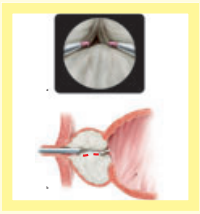
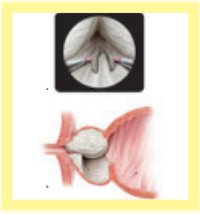
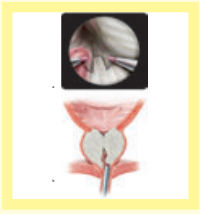
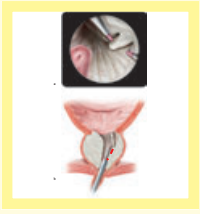
Surgery Illustrated











Surgical Atlas

Transurethral resection of the prostate

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INTRODUCTION

Through improvements in endoscopic instruments and new high-frequency technology, TURP has become an increasingly safe procedure. Modified optical devices and video cameras enable experts and residents to teach and learn this technique like any open procedure. Innovative technological approaches include the 'coagulating intermittent cutting' (Storz Medical AG, Tägerwilen, Switzerland), the 'Instant Response' (Valleylab, Boulder, CO), as well as the 'Dry-Cut technology' (ERBE Elektromedizin GmbH, Tübingen, Germany) that combine cutting and coagulating effects, allowing a blood-sparing cut and significantly lowering blood loss and morbidity. Bipolar resection (Olympus, Tokyo, Japan) represents a further step to reduce the perioperative morbidity of TURP.

Various techniques have been suggested for the systematic removal of the adenomatous tissue, all based on the principle that the resection should be done stepwise. As bleeding is the surgeon's major problem, leading to loss of visual field and disorientation, it is imperative that resection and haemostasis should both be completed in one area of the fossa before the next area is tackled. In the following article, the resection technique used at our institution is described, and was initially developed by Mauermayer [1] and subsequently improved by the authors [2].

INDICATION AND PATIENT SELECTION

The correct indication based on clinical symptoms and reliable objective findings in the evaluation of benign prostatic obstruction is still crucially important for the long-term outcome. The risk of needing surgery for BPH increases with age and with the degree of clinical symptoms at baseline. Evaluating symptom severity with a symptom score is an important part of the initial assessment of the patient. It is helpful in allocating treatment, and both predicting and monitoring the response to therapy. Among all different validated symptom score systems, the use of the IPSS is recommended.

Although symptoms constitute the primary reason for recommending intervention, there are some absolute indications for surgical treatment. Contemporary guidelines on BPH recommend surgery, rather than any of the other available treatment options, in any of the following conditions secondary to BPH [3]: refractory urinary retention; recurrent UTI; recurrent haematuria refractory to medical treatment (finasteride); renal insufficiency; and bladder stones.

ANAESTHETIC CONSIDERATIONS AND PREOPERATIVE MANAGEMENT

TURP can be done under all forms of regional anaesthesia, usually under a general or spinal anaesthetic. Occasionally, high-risk patients require an interdisciplinary preoperative evaluation to determine whether surgery can be safe. In case of acute urinary retention, a

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suprapubic cystostomy should be inserted instead of a urethral catheter, to avoid postoperative urethral strictures. There is no need for a routine preoperative urethrogram unless there is a clear suspicion of urethral stricture.

EQUIPMENT

- Modern high-frequency generator, e.g. Autocon II 400 (Storz).
- 24 F resectoscope (constant-flow resectoscope optional for low pressure irrigation).
- 0° lens (preferred by the authors), 15° and 30° lenses optional.
- Otis urethrotome.
- Sterile, lubricant anaesthetic jelly, conductive for electrical current.
- 20 F three-way catheter with either 50, 80 or 100 mL balloon capacity.

PATIENT POSITIONING AND IRRIGATION

- Lithotomy position.
- Sterile, pyrogen-free, non-haemolytic irrigation solution (e.g. 1.5% glycine), the reservoir 60–70 cm above the level of the symphysis (irrigation pressure 60–70 cmH_2O).
- Suprapubic trocar optional for low-pressure irrigation.

SURGICAL TECHNIQUE

INSERTION OF THE INSTRUMENT

The metal sheath of the resectoscope is generously lubricated with a conductive jelly. An obturator is placed through the sheath to provide a smooth, blunt tip for easy passage through the fossa navicularis and anterior urethra. The instrument should gently enter the urethra under its own weight, to make the introduction as atraumatic as possible. If there is resistance to the passage, any force should be strictly avoided.

If the meatus is narrow, or there is a stricture of the meatus or the anterior urethra, a 'blind' internal urethrotomy up to 30 F with the Otis urethrotome is recommended. Further passage is either blind with the obturator inside the sheath or under direct vision using the 0° endoscope and the video camera. Gentleness and care are essential to avoid urethral strictures. Via the video monitor the bulbar urethra, the external sphincter and the prostatic urethra with the prostatic lobes and the verumontanum are inspected. Then a systematic evaluation of the entire bladder surface using angular optical lenses is mandatory.

BLADDER CALCULI

If there are bladder calculi, lithotripsy is conducted before TURP begins. Larger stones can be fragmented using an ultrasonic lithotripter or Lithoclast (mechanical impactor), and smaller stones or fragments are crushed by a stone punch until small enough to be evacuated. Only after ensuring that the bladder mucosa is free should the jaws of a stone punch be screwed together to crush the stone inside the bladder cavity. Crushing should never be attempted without a clear view, to avoid bladder damage. The fragments are irrigated from the bladder with an 'Ellick' evacuator.

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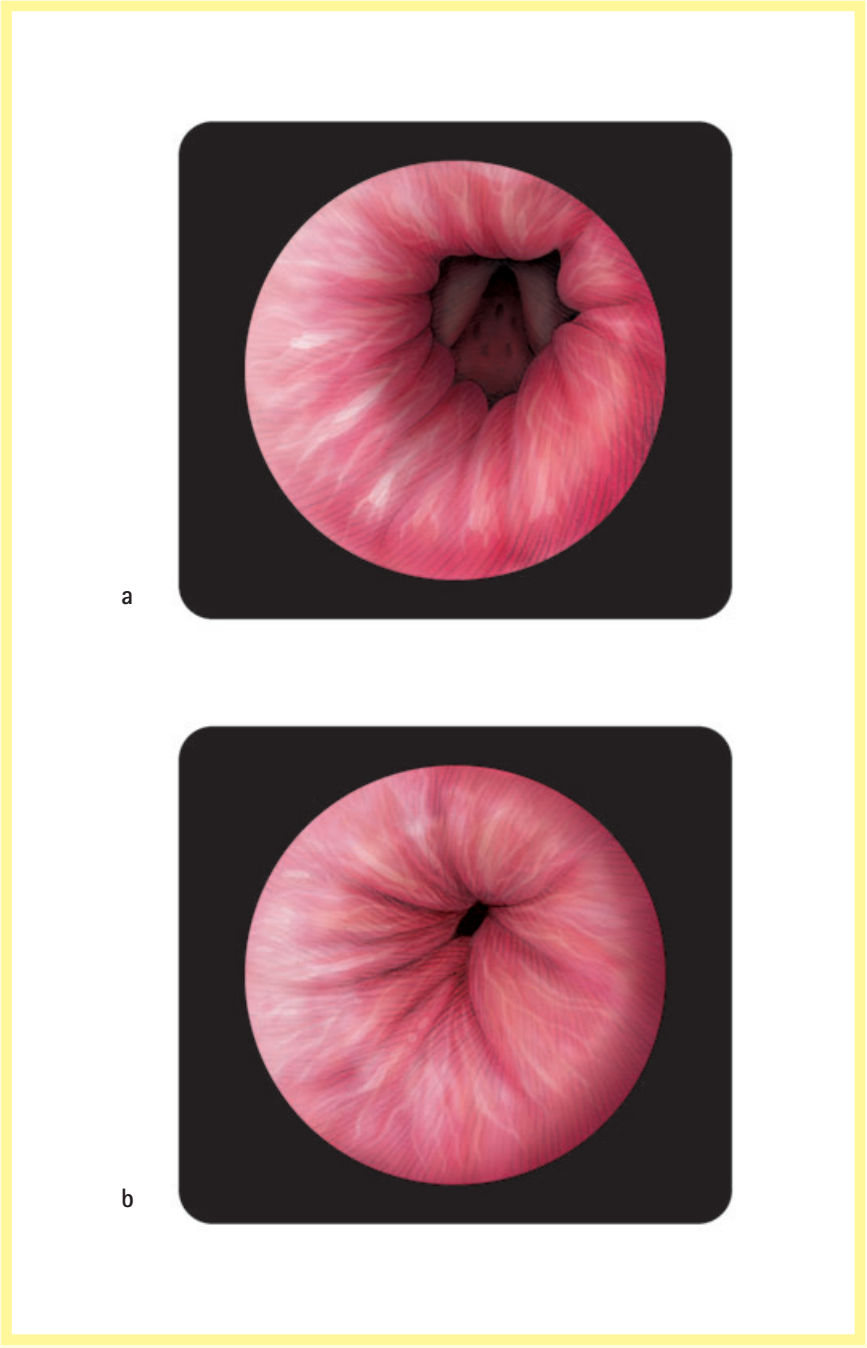
Figure 1

The external sphincter is easily identifiable at the level of the membranous urethra by the 'hydraulic sphincter test'. With an empty bladder, the tube between the irrigation reservoir and the resectoscope is repeatedly squeezed together and reopened. These rapid changes in the hydrostatic pressure lead to a contraction of the external sphincter. Contracting circular mucosal folds radiating from a narrow lumen are apparent. The external sphincter should be repeatedly identified during resection, especially when resecting the apical adenoma, to avoid damage to this area.



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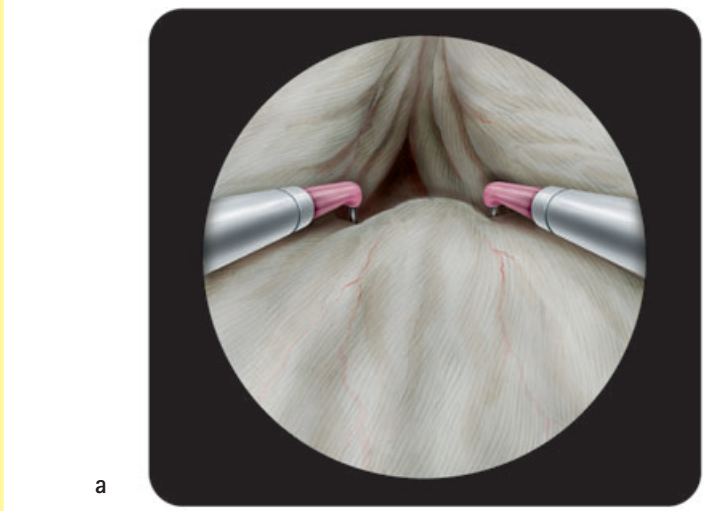

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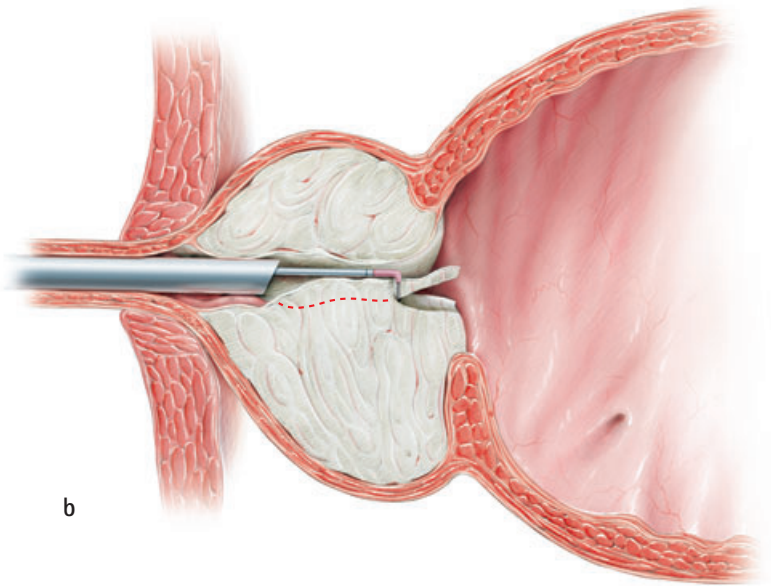

b

Figure 2

Resection usually begins at the proximal portion of the middle lobe at the 6 o'clock position. The resectoscope is placed just proximal to the verumontanum and the resection carried out always controlling the endpoint of each cut. It is necessary to be aware of the position of the verumontanum to see that the lower part of the cut is not extending below this level, otherwise damage to the sphincter mechanism may occur.

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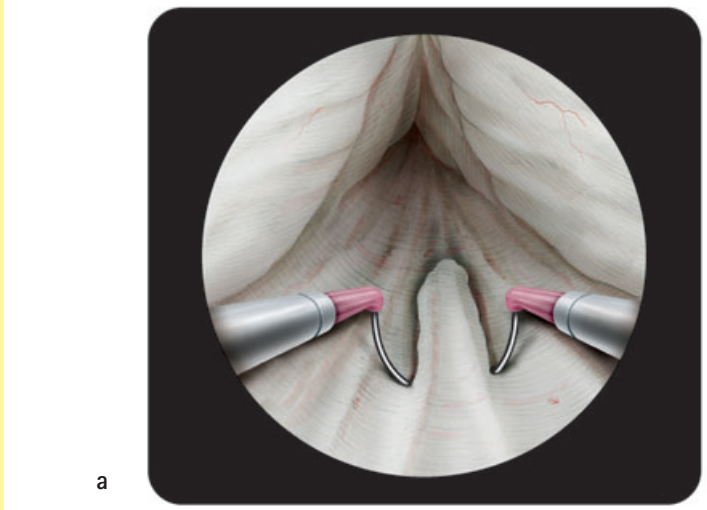
Figure 3

Resection should be carried out with long cuts towards the verumontanum. A large overhanging middle lobe should be resected with special care. It is important to make short cuts in the region of the bladder neck, as the surgeon might not be aware that he or she is cutting down the trigone towards the ureteric orifices. Subsequent cuts are made down to the peripheral tissue, which is recognized as a rather fibrous structure compared with the granular appearance of the prostatic adenoma.



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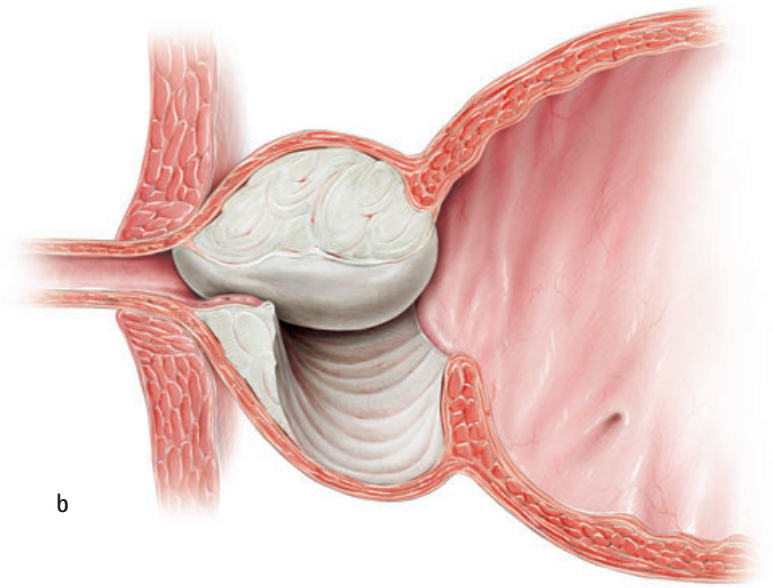

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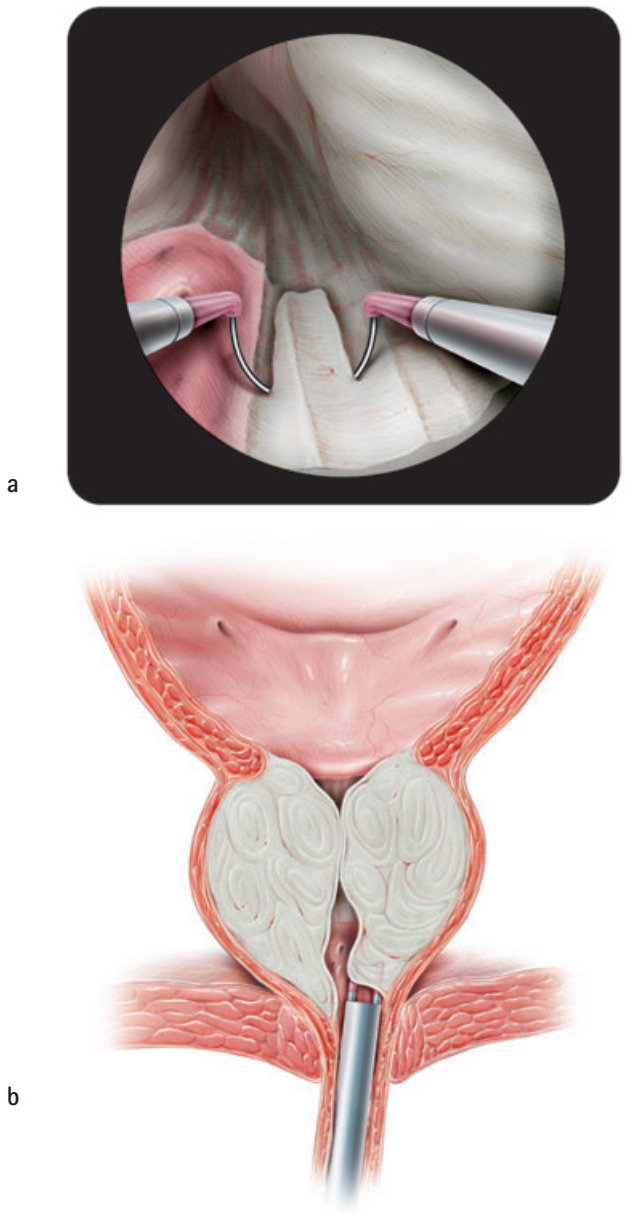

Figure 4

After resecting the middle lobe from the 7 to 5 o'clock positions, the resection is carried to both sides of the verumontanum with particular care. When this stage is completed, the surgeon should pull the resectoscope into the urethra, just distal to the verumontanum, and note that there is no falling and obstructing tissue. During this stage, the surgeon must always be aware of the position of the external sphincter to avoid any sphincter lesion.

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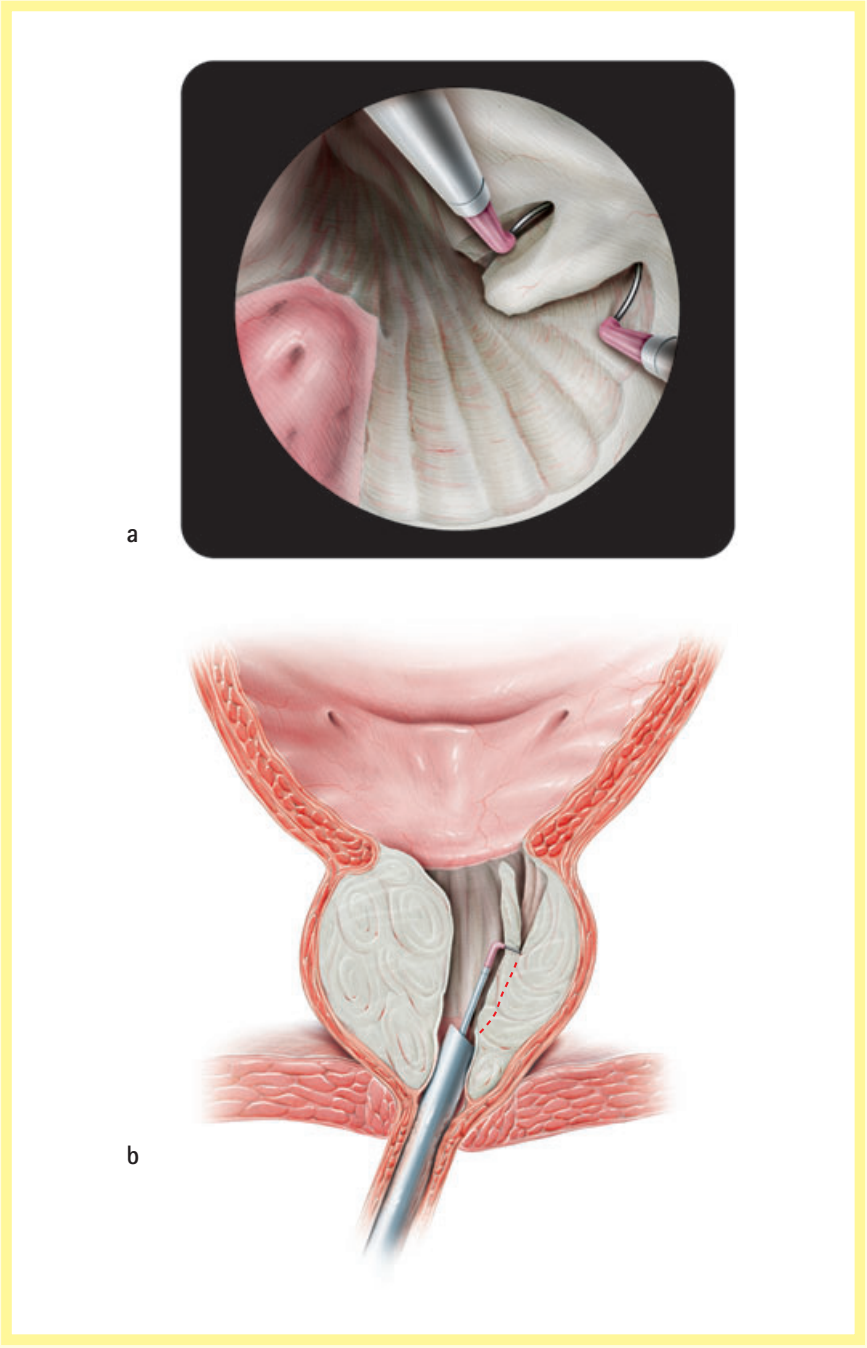
Figure 5

Resection in smaller adenomas is now carried directly to the side lobe. It depends on the preference of the surgeon whether to begin on the left and then resect the other side, or vice versa.



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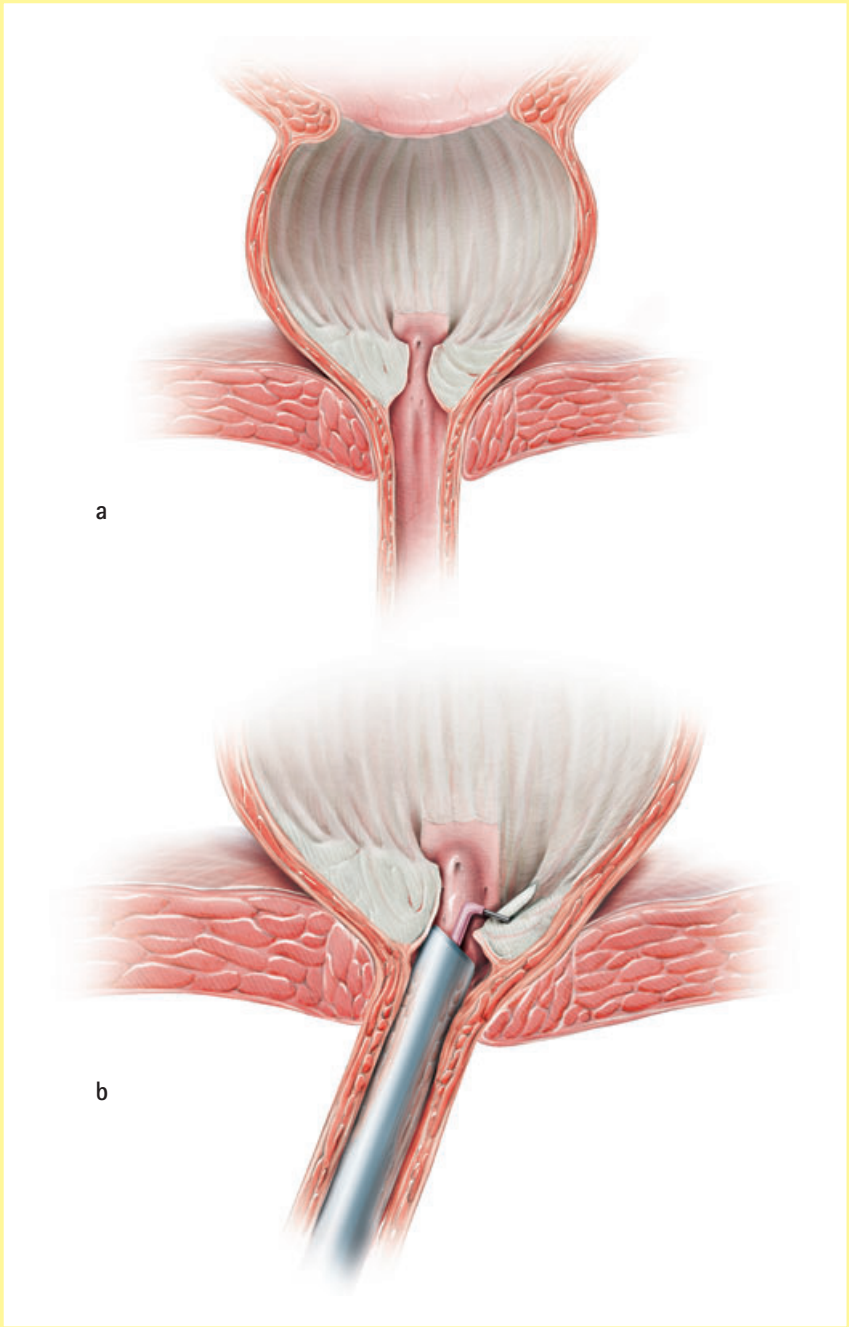

Figure 6

Care must be taken to make subsequent long cuts next to each other to achieve a smooth surface. First the proximal parts of the prostatic adenoma must be completely removed (a), then the remaining apical portion is reseceted with particular care (b).

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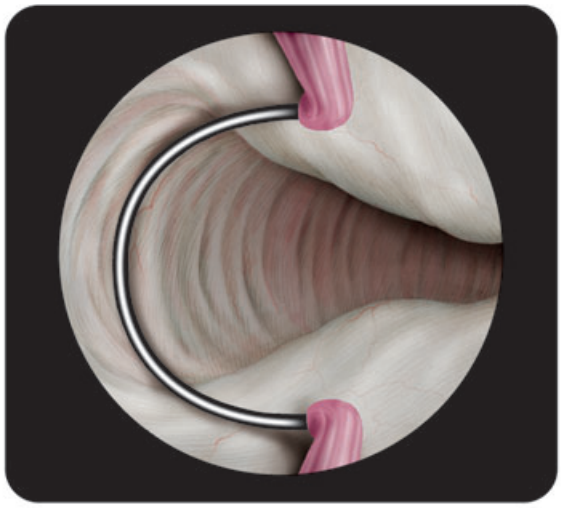
Figure 7

Very large side lobes should be resected using a modified technique. After removing the middle lobe and the area next to the verumontanum, both side lobes are cleaved at the 9 and 3 o'clock positions. The groove should be extended towards the peripheral fibrous prostatic tissue. This speeds the subsequent resection of the lobes and facilitates control of bleeding by coagulating arterial branches entering the prostate in this area. After removing the distal parts between the 9 and 6 o'clock and 3 and 6 o'clock positions, resection is carried on to the ventral parts of the side lobe between the 3 and 12 o'clock and 9 and 12 o'clock positions, respectively, in the same manner.



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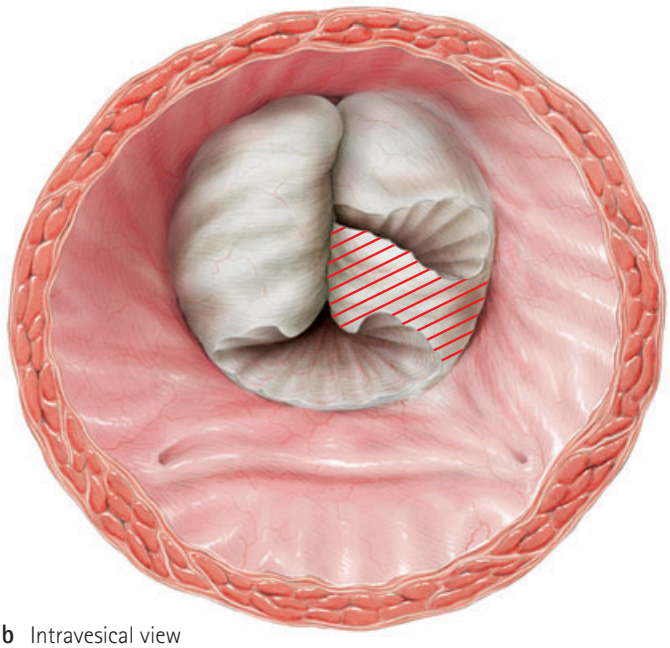

b Intravesical view

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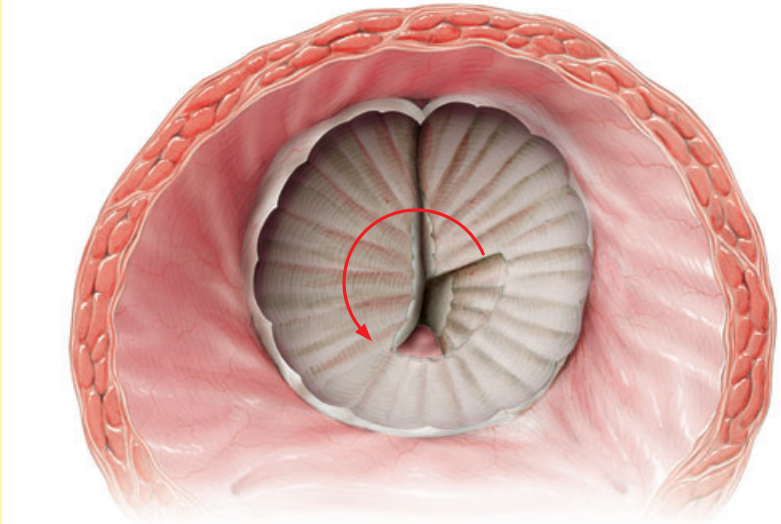
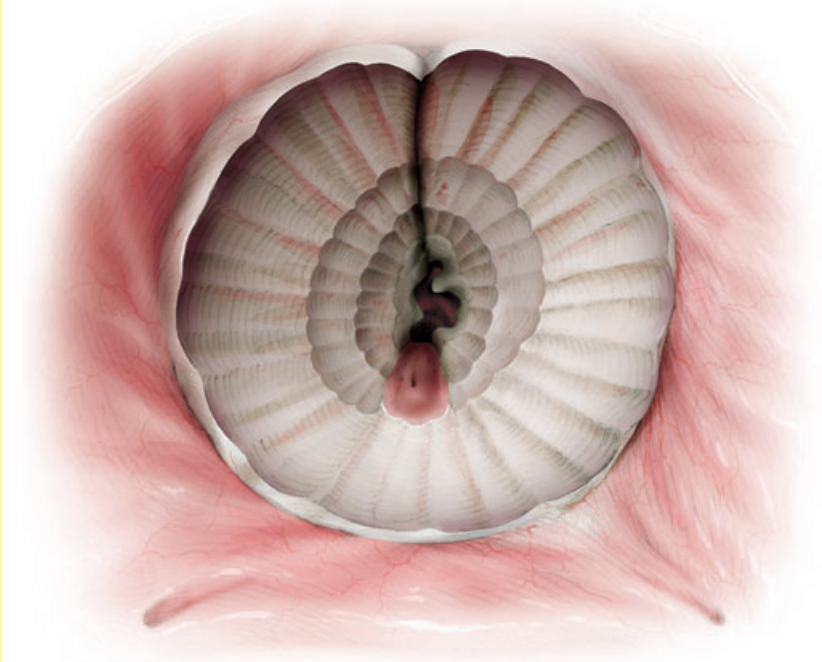


a Intravesical view



b Intravesical view

Figure 8

The apex is resected with controlled short cuts next to each other. Beginning next to the verumontanum, the whole apex is resected clockwise. The sheath of the resectoscope should be fixed very carefully and one short cut follows the other. Complete control of the full excursion of the loop is mandatory to restrict each cut to the remaining apical tissue.

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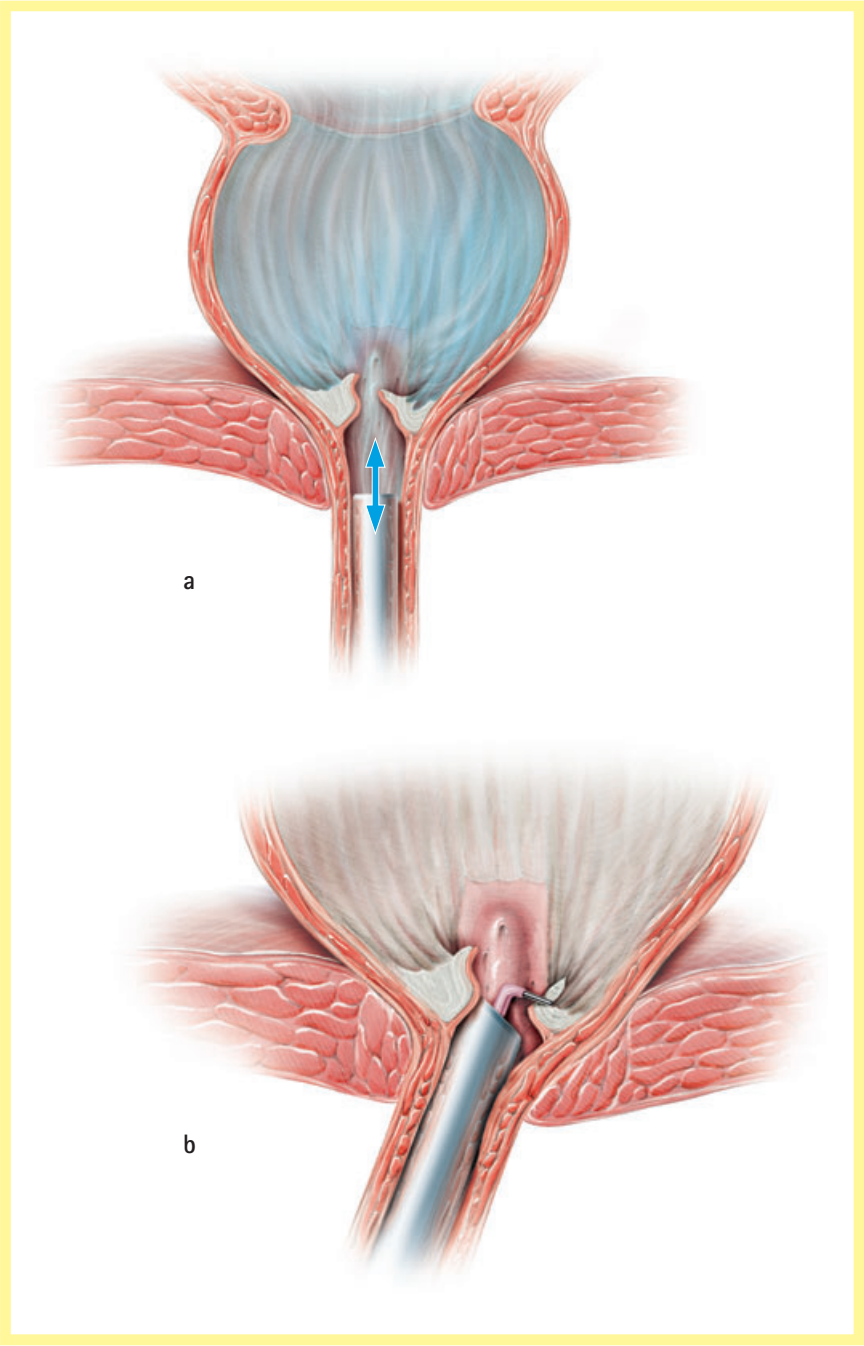
Figure 9

After thoroughly resecting the adenoma, the remaining apical tissue becomes quite mobile, similar to folding doors. These remnants can be more easily identified using reduced irrigation. Identifying the remaining mobile apical tissue is easy, moving the instrument slowly back and forth in the apical area, requiring an empty bladder and full irrigating fluid pressure.



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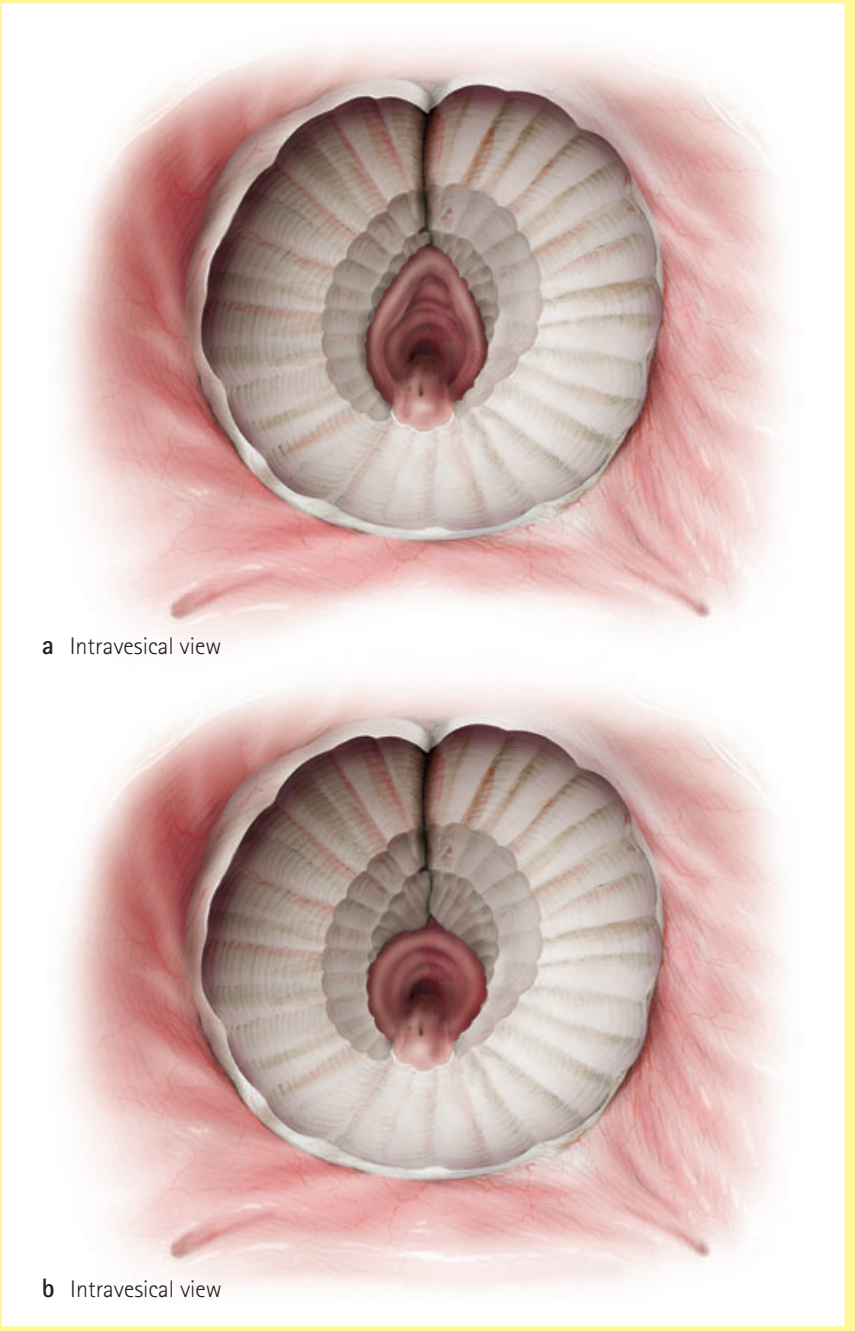

a Intravesical view

b Intravesical view

Figure 10

The remaining tissue is resected by controlled short cuts to create a round or oval apical outlet (a–b). Particular care must be taken at the apex, and the verumontanum is an important landmark. Resection should not be stopped in all adenomas next to the verumontanum; in large glands resection can be extended to a more distal endpoint. The hydraulic sphincter test should be repeated occasionally to clearly identify the external sphincter during this stage of resection.

INCISION OF THE INTERNAL SPHINCTER

Especially after resecting small adenomas and in patients with a deep vesical recess, bilateral incisions of the internal sphincter area are done at the 5 and 7 o'clock positions, to reduce the incidence of postoperative bladder neck contracture. After incising, the bladder neck usually springs apart. An adequate depth of the incision is indicated by visualization of fibres from the prostatic capsule or even protrusion of periprostatic fat.

HAEMOSTASIS

Haemostasis is achieved by spot-coagulating with the resection loop. Irrigation can be reduced to identify even small vessels. After the resection, all chips must be evacuated from the bladder with a bulb syringe, as they can occlude the catheter after surgery. The resectoscope is then reinserted to control the whole resection area for any residual bleeding. Return irrigation should be clear or light pink at the end of the operation.

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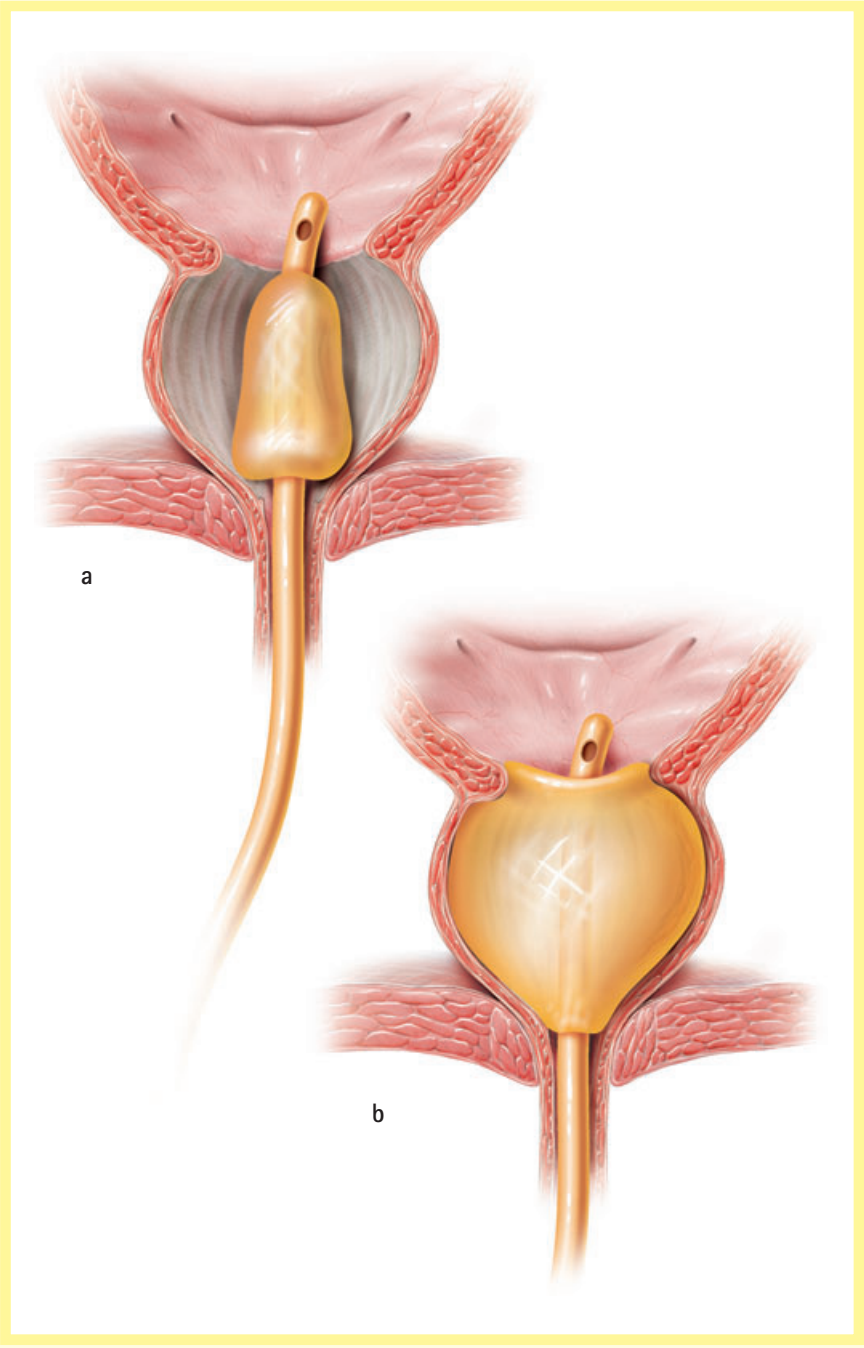
Figure 11

We prefer to place a 20 F three-way catheter for drainage; it should always be inserted with the finger in the rectum, pressing the prostatic tissue up to avoid damage to the bladder neck and trigone. The balloon is inflated to 20 mL (catheter with a maximum balloon volume of 50 mL) or 30 mL (maximum balloon volume of 80 or 100 mL), the catheter is withdrawn in the prostatic fossa (Fig. 11a).

The final balloon inflation filling the prostatic fossa should correspond to the weight of the resected tissue plus 20 mL (Fig. 11b). Catheter fixation in the prostatic fossa is maintained by a mull bandage at the top of the penis. If persistent bleeding occurs that does not clear easily with continuous irrigation after correctly placing the catheter, the resectoscope should be reinserted before leaving the operative suite and the prostatic fossa reviewed for bleeding vessels.



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POSTOPERATIVE CARE

Catheter fixation in the prostatic fossa is stopped after 3 h by removing the mull bandage. Occasionally, if persistent venous bleeding occurs that does not clear easily with continuous irrigation, the catheter can be replaced on gentle traction for a few hours. After final careful irrigation with a bulb syringe, the urethral catheter is removed after 24–48 h of continuous irrigation.

INTRAOPERATIVE COMPLICATIONS

Intraoperative problems include massive haemorrhage and absorption of irrigant (TUR syndrome). Bleeding can always be controlled endoscopically by electrocoagulation, as described. A continuous haemostasis during resection is especially important to prevent absorption of irrigant. Other complications that do not necessarily terminate the operation include perforation of the prostatic capsule and bleeding from larger veins (sinus venosus). Intraoperative blood loss must be estimated carefully by the surgeon and the anaesthesiologist notified of any problems.

Diuretics can be given during surgery to prevent TUR syndrome.

POSTOPERATIVE COMPLICATIONS

Using the TURP as described there should be no stress incontinence. The incidence of urethral stricture is highly variable in peer-reviewed reports, at 0.5–6.3% [4]. Retrograde ejaculation resulting from destruction of the bladder neck is a common finding, occurring in 65–70% of patients after TURP. There is no consensus on the effect of TURP on erectile function. The only randomized controlled trial comparing TURP to 'watchful waiting' reported identical rates of erectile dysfunction in both arms [5].

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