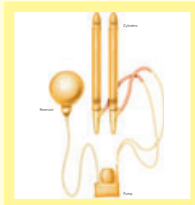


Surgery Illustrated



Surgical Atlas

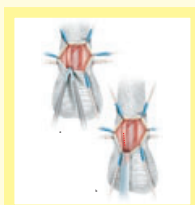
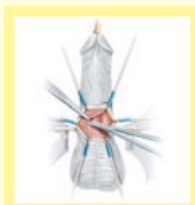
Insertion of an inflatable penile prosthesis

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ILLUSTRATIONS by STEPHAN SPITZER, www.spitzer-illustration.com



INTRODUCTION

Penile prostheses were first developed 30 years ago [1]; despite ongoing advances in the pharmacotherapy for erectile dysfunction (ED), prosthetic surgery continues to occupy an important therapeutic role and $\approx 1\%$ of all patients with ED eventually have a penile prosthesis inserted. This equates to $\approx 25\,000$ penile prostheses implanted annually worldwide. In Europe the ratio of semi-rigid to inflatable penile prostheses (IPPs) is 2 : 3, as a result of fiscal restraints by different healthcare systems because patients prefer the cosmetic qualities of IPPs. American Medical Systems (AMS, Minnetonka, NI, USA) and Mentor Medical Ltd. (Santa Barbara, CA, USA) manufacture both types of devices.

PLANNING AND PREPARATION

INDICATIONS

- Failure of conservative treatment of ED, including Peyronie's disease where ED and erectile deformity coexist.
- Penile fibrosis from any cause.
- Early implantation in acute ischaemic priapism refractory to normal conservative measures.

- Phalloplasty patients, after penile cancer surgery or transgender surgery.

PATIENT SELECTION

Patients must have realistic expectations resulting from appropriate preoperative counselling. Patient information leaflets, personal handling of prosthetic samples and the option of meeting previously treated patients are useful adjuncts. Ideally the partners of patients should also be involved in the counselling process, as should a dedicated urology nurse specialist. Patients must be aware of the serious adverse surgical outcomes of prosthetic surgery. These include a device infection rate of $\approx 2\%$ in patients with no previous surgery and who are not diabetic [2], and mechanical failure of the device, which occurs with an annual cumulative frequency of 2–3% [3]. Patients must also appreciate that once a device is implanted any degree of previous natural erection will be lost. Preoperative sepsis, e.g. perineal septic skin lesion or a UTI, is a contraindication to implantation.

SPECIAL EQUIPMENT

- Scott retractor, transverse penile strap and hook retractors.
- Baby Deaver retractors.

- Brook's cavernosal dilators.
- Rosello cavernotomes for cases of corporal fibrosis.
- Furlow inserter with Keith needles.
- Dissection with DeBakey forceps and Metzenbaum scissors.
- Corporotomies closed with 2/0 polyglactin.

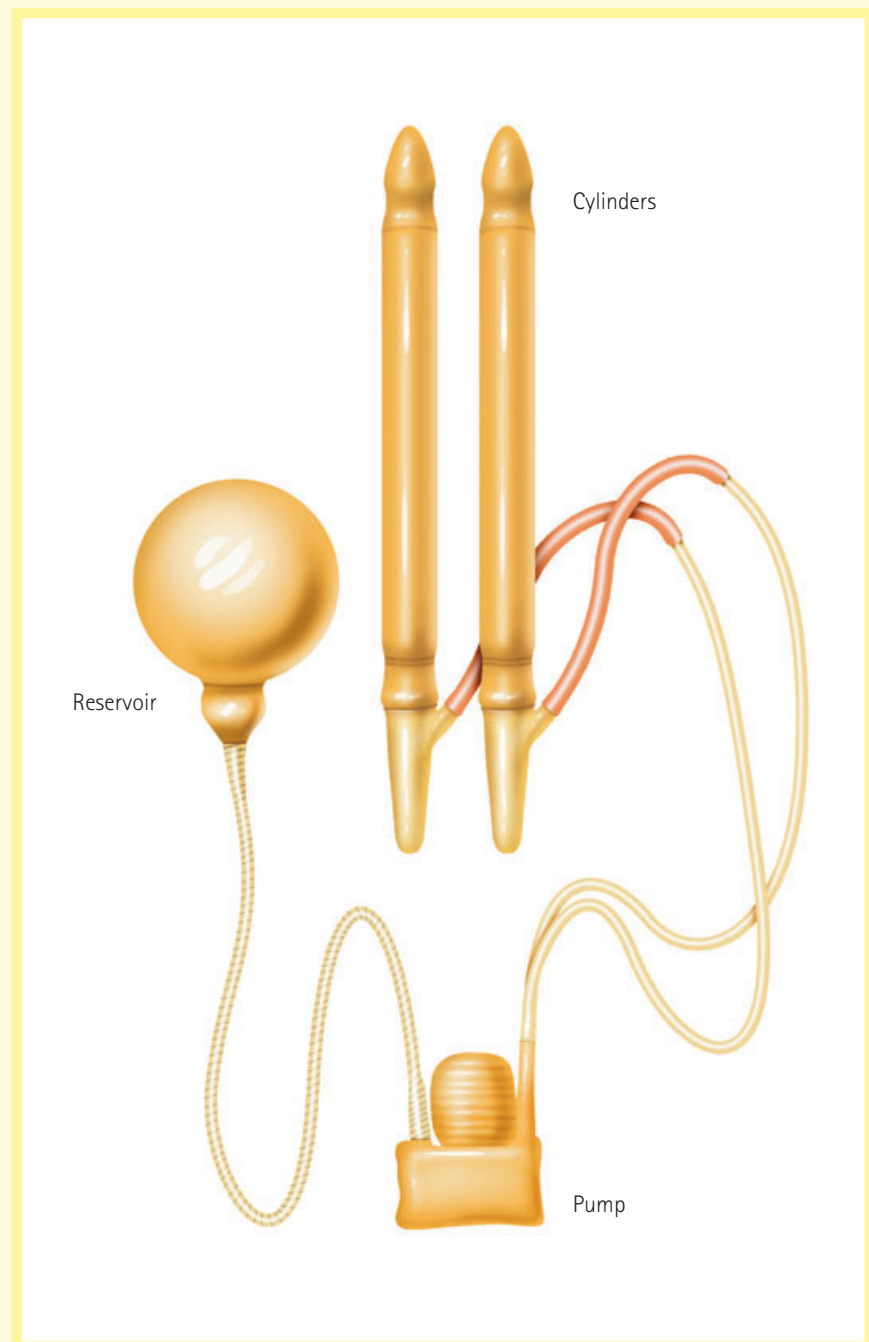
PATIENT PREPARATION

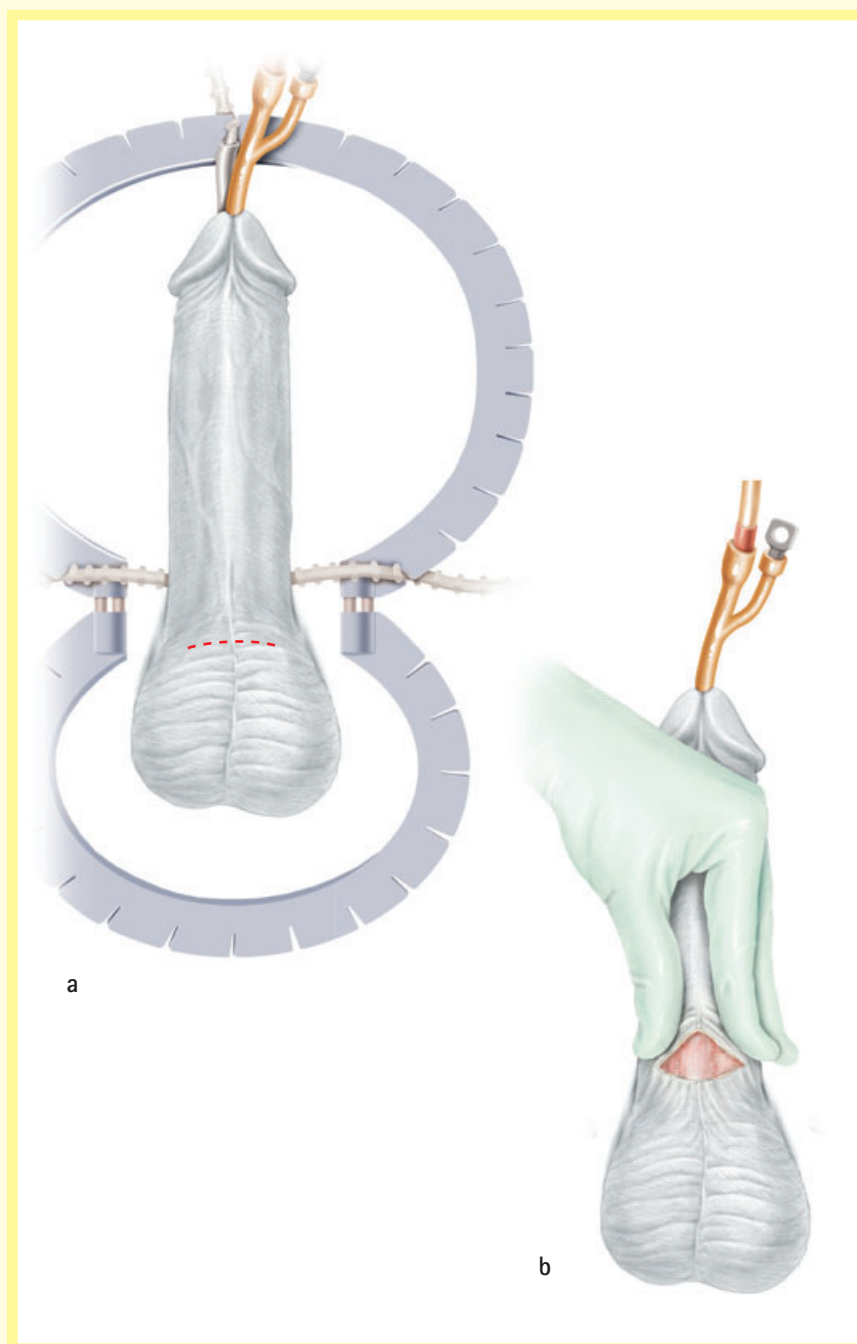
Patients are admitted on the day of surgery and 95% are discharged within 23 h. Patients shower before surgery with an antiseptic scrub, are shaved in theatre and must have a full 10-min pre-surgical betadine scrub of the

genital area. Theatre traffic should be minimal and ideally a laminar flow theatre is used. The patient is placed supine; i.v. antibiotics are administered to cover Gram-positive and -negative organisms. Waterproof gowns and drapes are used and surgeons are double-gloved.

Figure 1

IPPs consist of a fluid reservoir, a scrotal pump and two corporal cylinders which expand in girth to produce the erection (AMS Ultrex cylinders also expand in length). Both companies produce IPPs with reduced diameter cylinders for use in cases of corporal fibrosis.

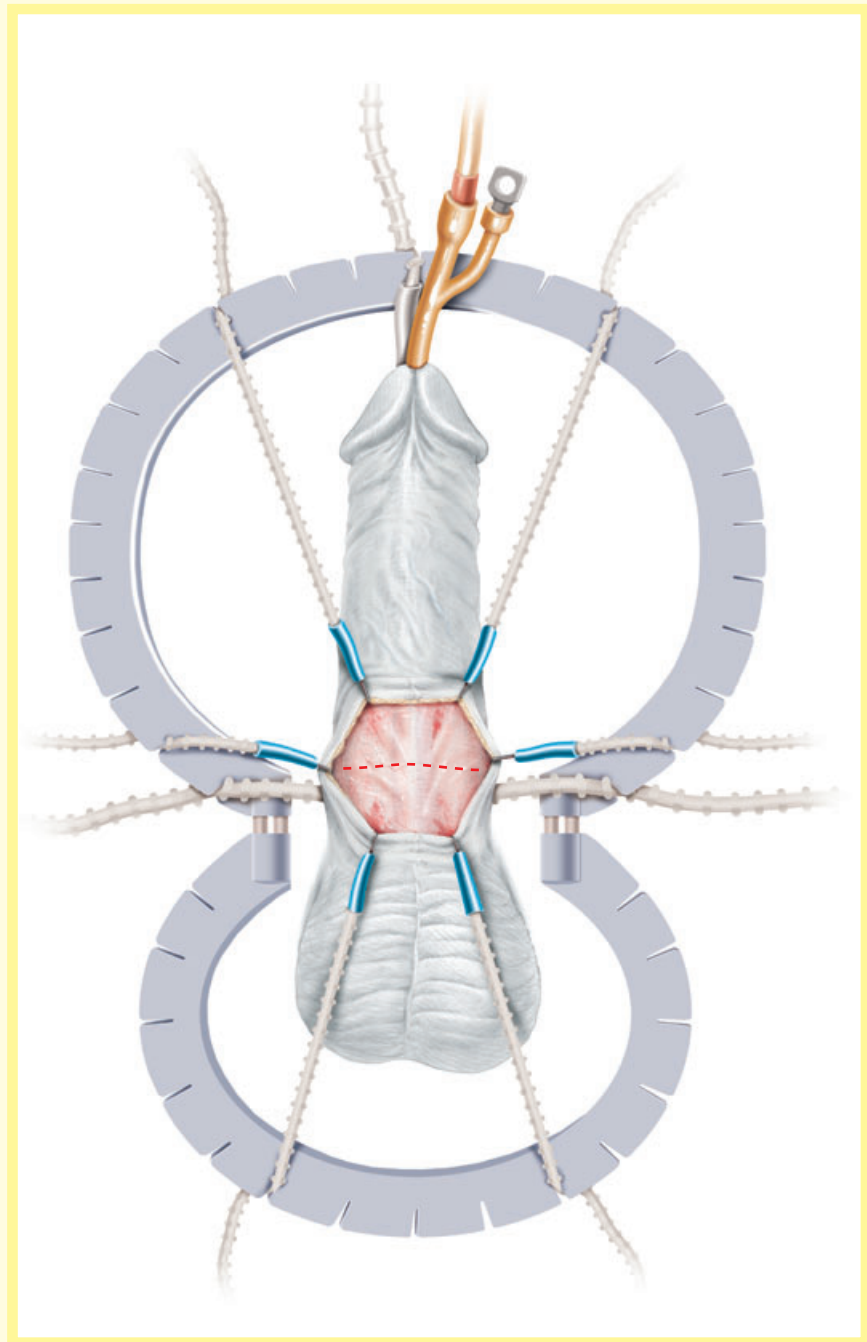


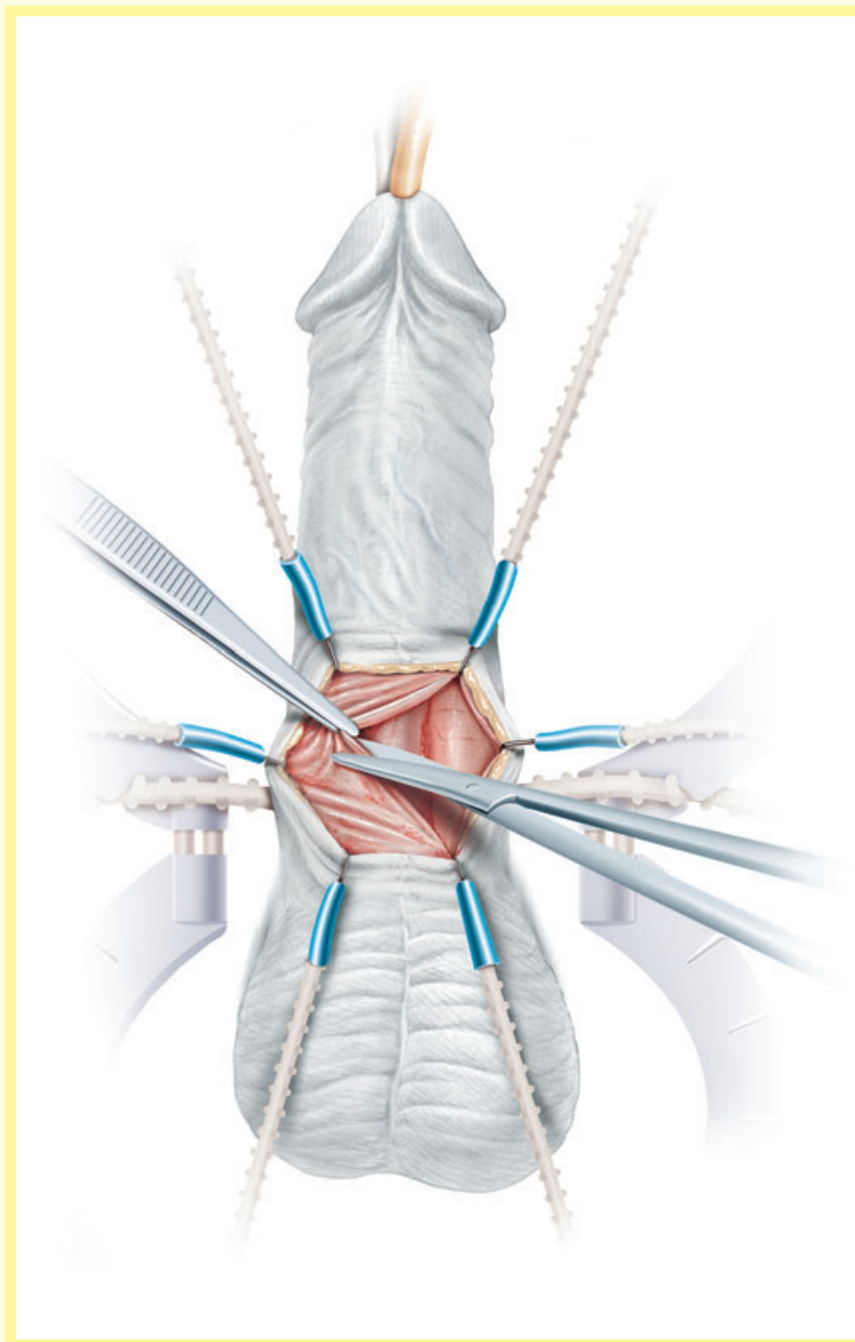
**Figure 2**

The bladder is emptied with a 14 F catheter, which is then spigotted. The Scott retractor with transverse strap is placed under the penis; one sharp hook retractor is placed into the urethral meatus to stretch the penis. A high transverse scrotal skin incision is made which is then moved upwards onto the penis to make the corporotomies. This technique thus avoids a penile scar.

Figure 3

Blunt hooks are then placed hexagonally to expose the penile shaft.

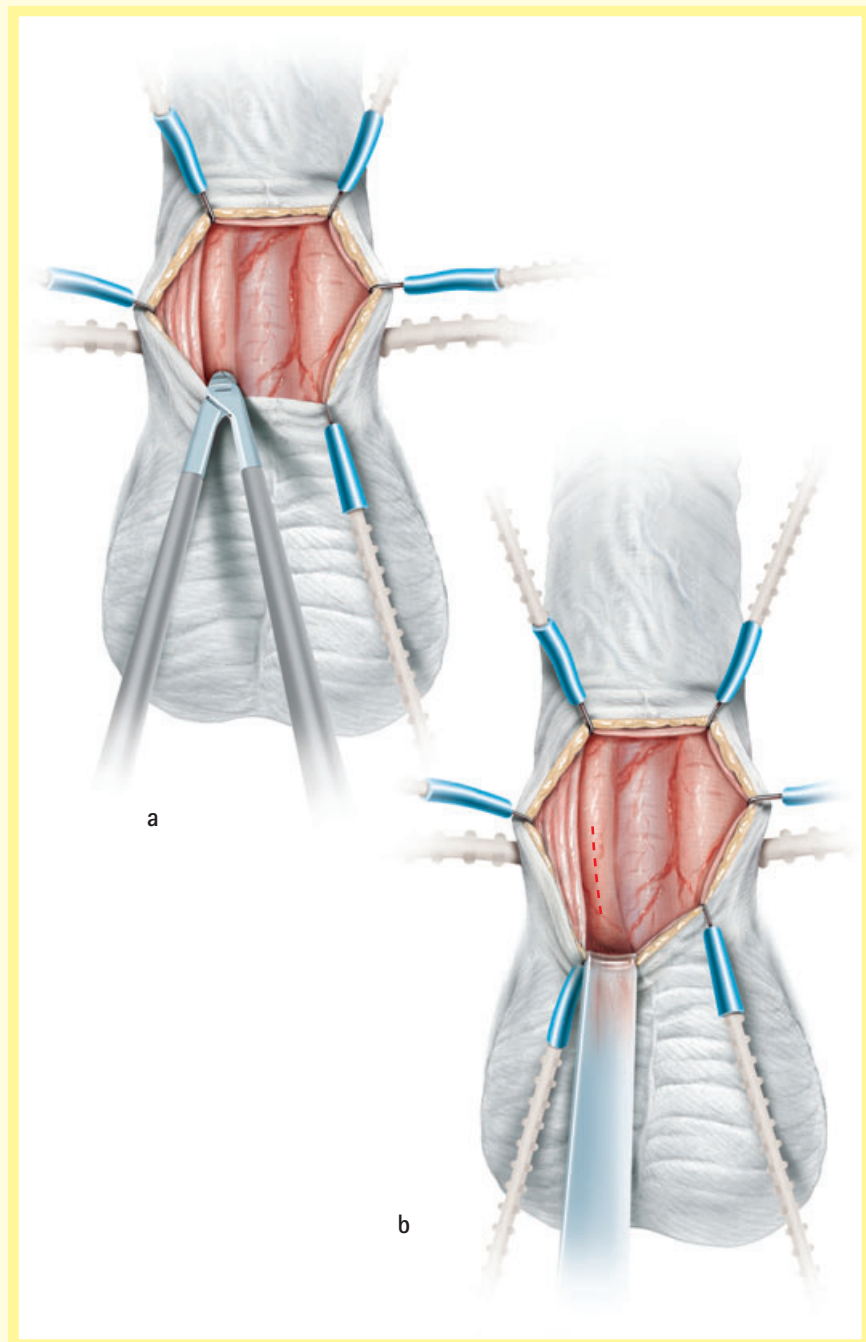


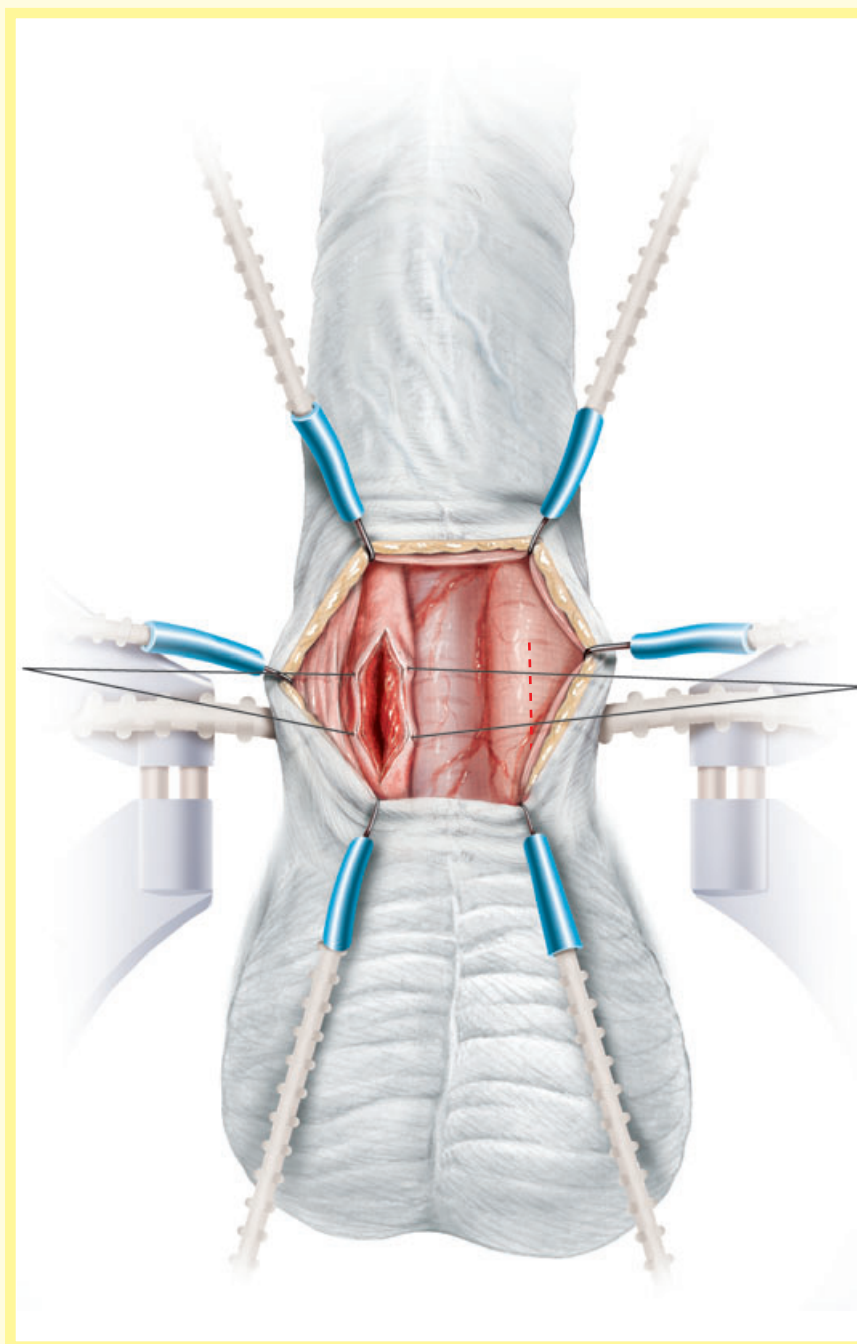
**Figure 4**

First the tunica albuginea of one of the corpora is exposed, then the urethra and then the other corpora. The key to not damaging the urethra is being able to clearly visualize it and to be able to palpate the urethral catheter.

Figure 5

With both corpora exposed, the scissors are passed back to the ischiopubic ramus and a baby Deaver positioned to expose the most proximal corpora.

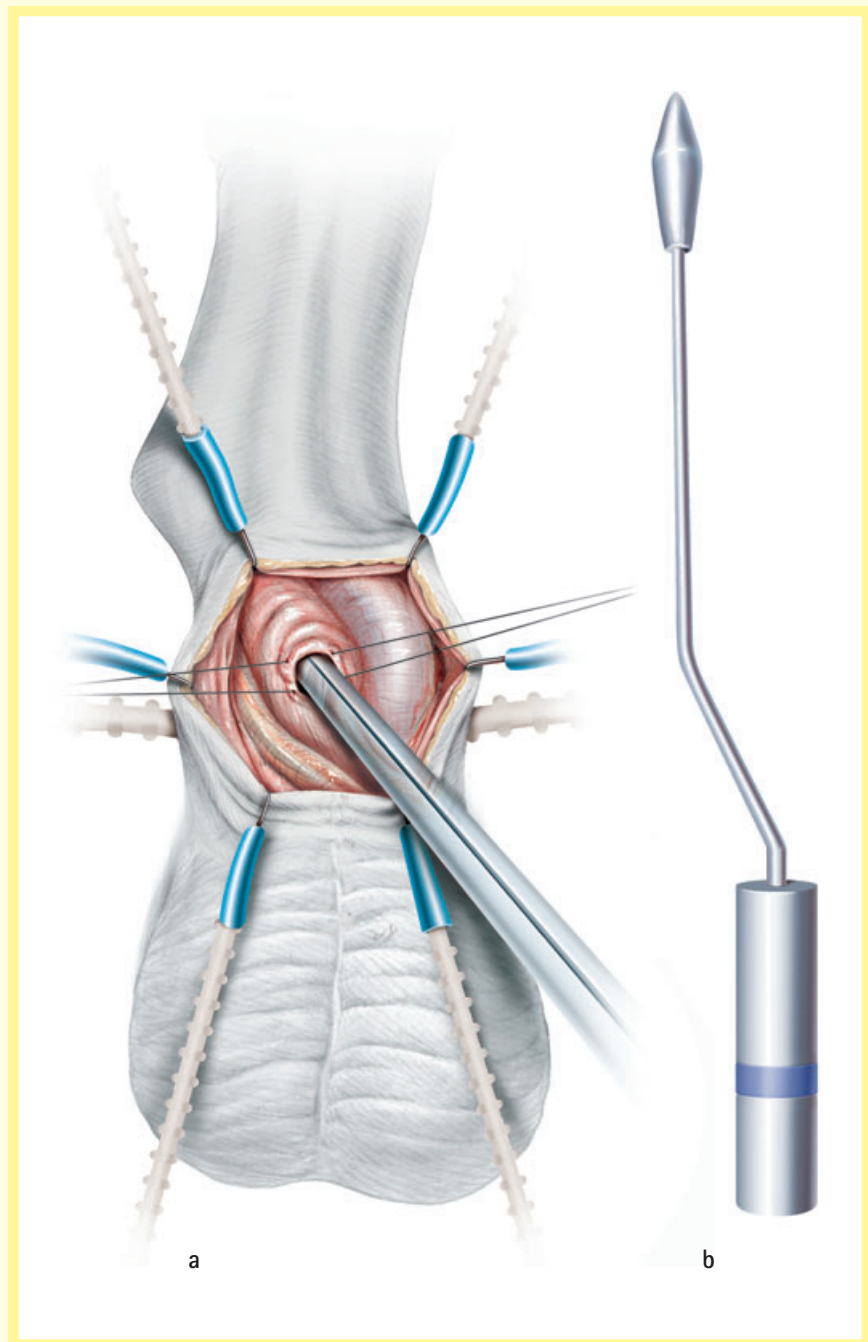


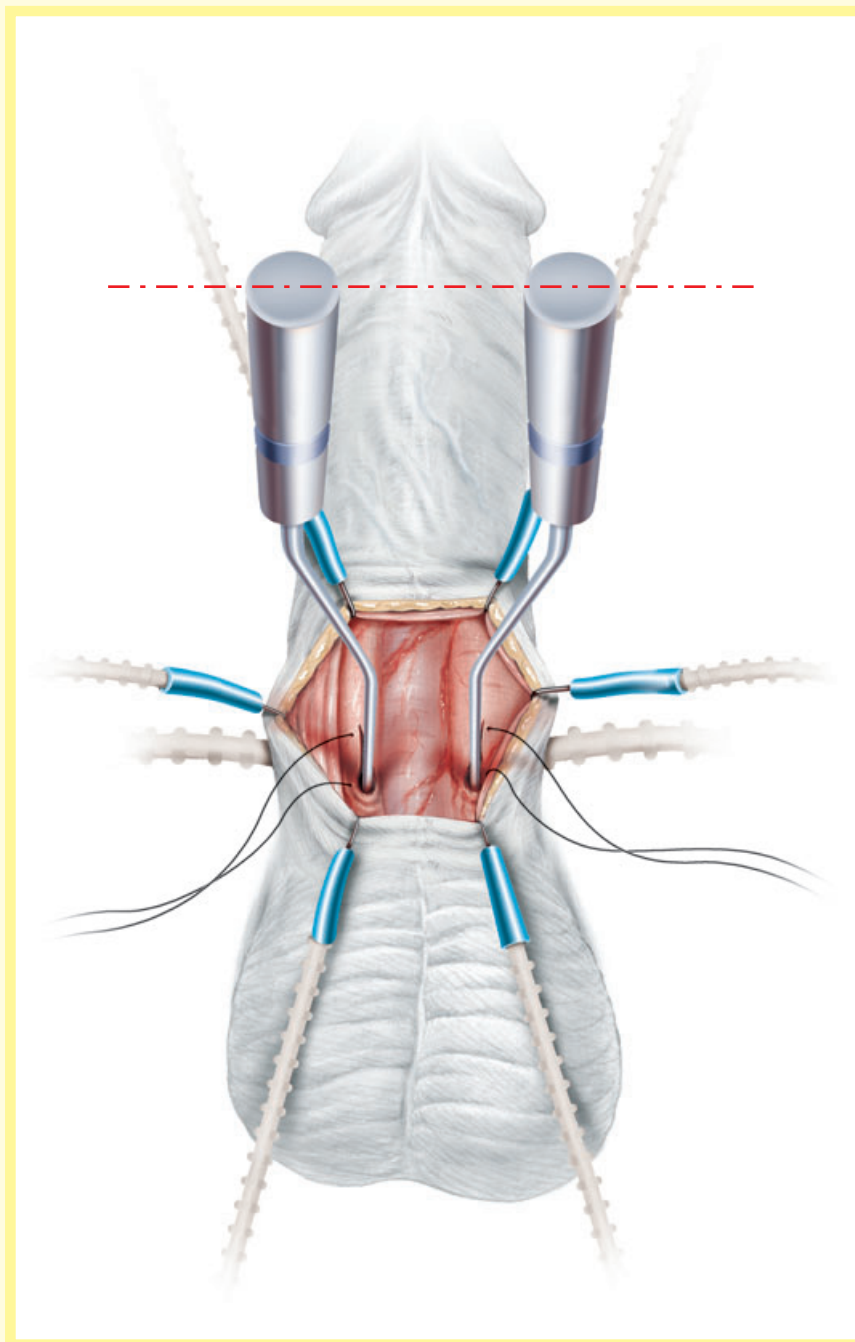
**Figure 6**

A 2-cm proximal longitudinal corporotomy is made between two stay sutures of 2/0 polyglactin.

Figure 7

Corporal dilatation commences with the forward passage of closed scissors directed laterally to avoid urethral injury (Fig. 7a). Subsequently, the corporal space is serially dilated with Brook's dilators from 10 mm up to 14 mm (Fig. 7b).

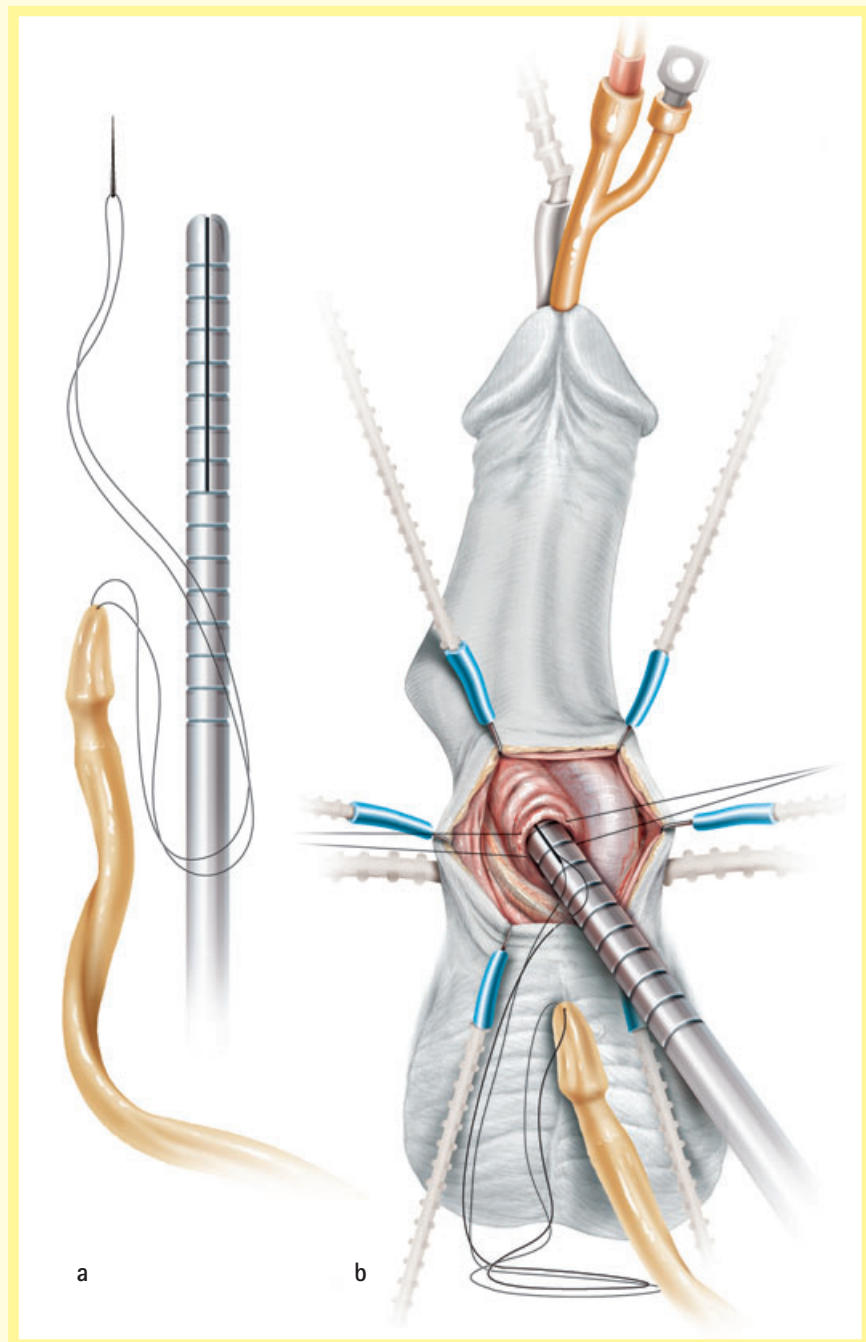


**Figure 8**

Proximally, the Brook's dilator can be felt to 'clunk' on the ischiopubic ramus. Here, two Brook's dilators show that there is an equal depth of proximal dilatation, reassuring the surgeon that proximal perforation is unlikely. After dilating, the corpora are flushed with antibiotic solution. If irrigant is seen to flow from the external urethral meatus then a urethral injury has occurred and the cylinder should not be implanted on the side of the injury.

Figures 9 and 10

The corporal lengths are measured. The length of the IPP cylinder and the size of rear tip extender(s) can then be calculated. Normally there should be no more than a 1-cm difference between the sides. The surgeon then re-gloves and prepares the implant for insertion at a sterile table. The pre-connected corporal cylinders and pump are cycled two or three times with sterile saline to remove all air bubbles from the system. The tubing is then gently double-clamped with 'shod' mosquito clamps. The reservoir is similarly prepared. The Furlow inserter is passed distally and laterally to avoid 'cross over' into the contralateral corpora. The Furlow inserter directs the Keith needle (with the device pulling-suture attached) through the glans penis (Fig. 9b) and allows the attached cylinder to be positioned appropriately.



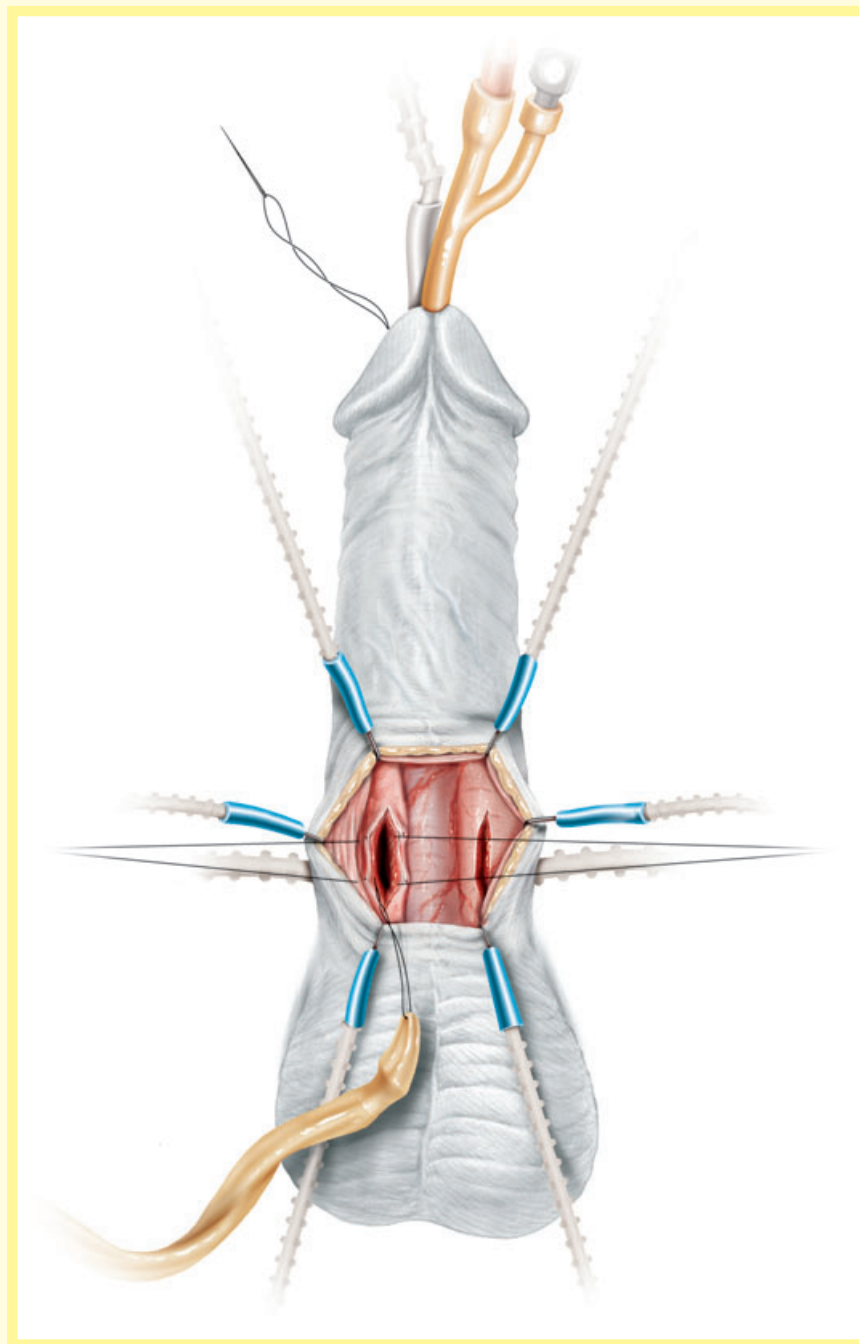
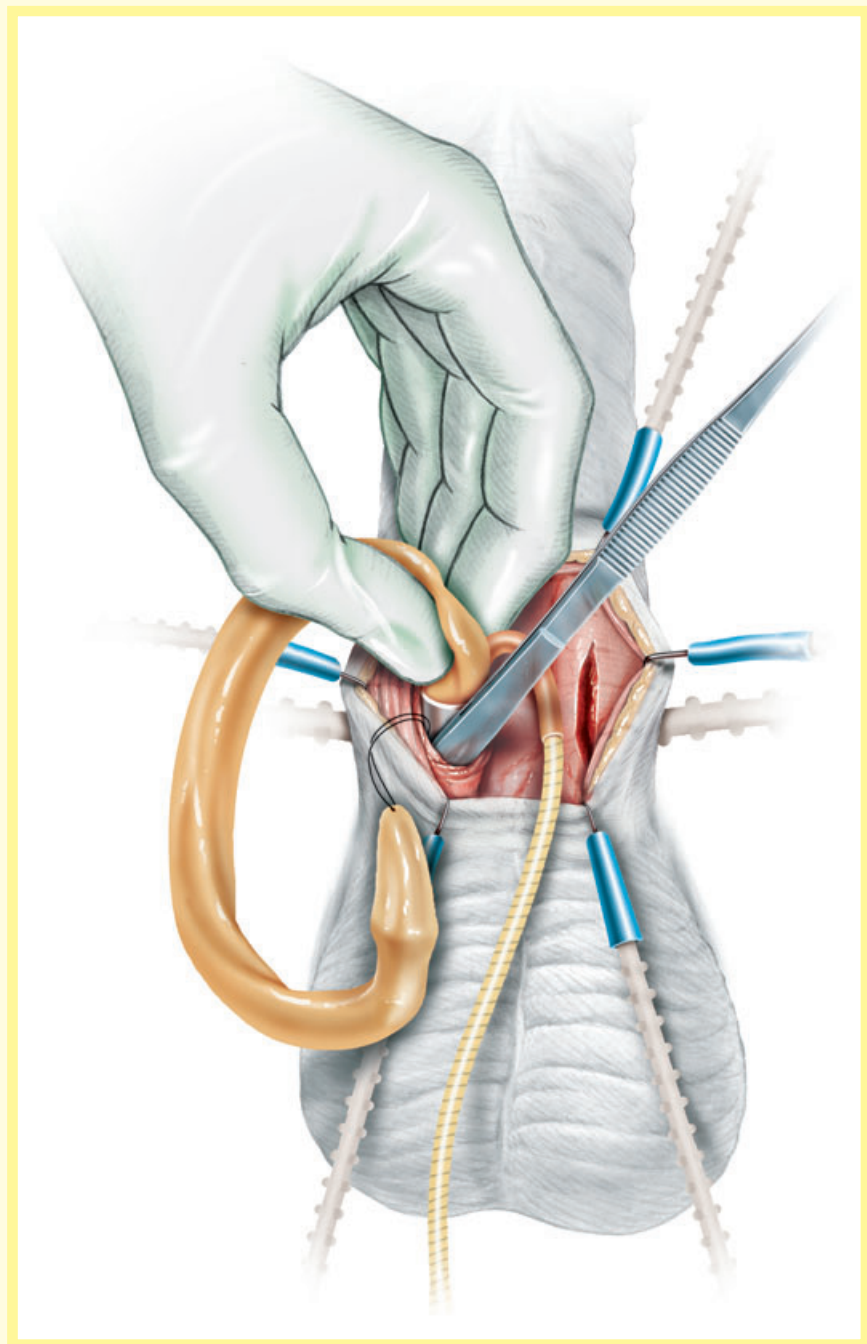
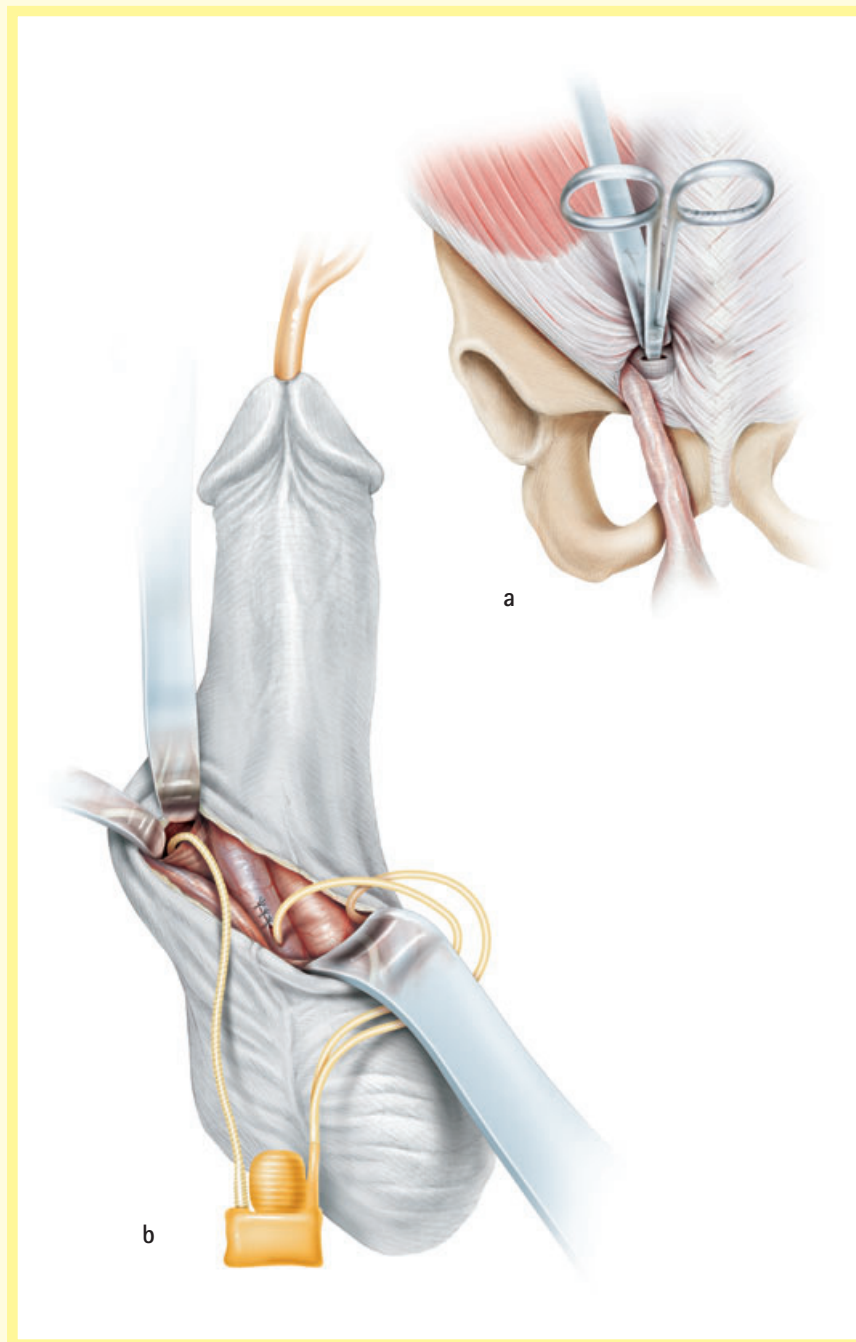


Figure 11

The proximal part of the corporal cylinder/rear tip extender is inserted by placing DeBakey forceps as a 'shoehorn' and then pushing the cylinder into the space created. Next the distal tip of the IPP is inserted into the corporotomy and the suture from the Keith needle pulled, to position the cylinder within the full length of the dilated corpora. The corporotomies are closed using the 2/0 polyglactin stays tied as a horizontal mattress suture.

A space is made for the pump in the scrotum by elevating the scrotal wall with a Deaver retractor and then placing the index finger in front of the urethra and between and behind the testes.



**Figure 12**

The reservoir is placed by first emptying the bladder and then identifying the walls of the external inguinal ring, and using a Deaver retractor to pull on the upper leaf of the ring. Closed Metzenbaum scissors held vertically adjacent to the pubic bone then puncture the transversalis fascia to allow access into the retropubic space. The Deaver is replaced into this space to permit placement of the reservoir. This technique is **NOT** advisable in patients with a previous cystectomy, and in these cases a separate lower inguinal or suprapubic incision is necessary to safely place the reservoir. The reservoir is then filled and its tubing connected to the pump tubing using a sutureless straight connector applied with a clamping tool.

Figure 13

The IPP pump is placed into the scrotum after first placing a 'Redivac' drain. The wound is then closed in two layers using 2/0 polyglactin to dartos and 3/0 polyglactin to skin. The device is cycled to ensure functionality and good cosmesis. The cylinders are left $\approx 75\%$ inflated to tamponade any corporal bleeding.

The wound is covered with blue gauze, gamgee and three long strips of Mefix tape are then applied with the patient in a frog-leg position, to provide a pressure dressing.



POSTOPERATIVE CARE

Patients receive two further doses of i.v. antibiotics and 7 days of ciprofloxacin 250 mg twice daily. The following morning the pressure dressing is taken down, the catheter removed and the prosthesis fully deflated. If no further blood drains, then the drain is removed. The patient is discharged later the same day, when he is able to void comfortably.

At 2 weeks the patient is reviewed to check for wound healing and auto-inflation, which results from raised intra-abdominal pressure. The latter is not seen with the new Mentor devices, as these include a reservoir lock-out valve to prevent this problem. It is important to keep the cylinders empty and maximize the reservoir size immediately after surgery, otherwise a fibrous capsule will form around the partially filled reservoir and prevent the cylinders emptying fully. At 4 weeks patients are taught to cycle their device and at 6 weeks they can attempt sexual intercourse. Patients should be reviewed at 3, 6 and 12 months.

SURGEON-TO-SURGEON

A perfect operation with a good surgical result (as assessed by the surgeon) does NOT guarantee patient/partner satisfaction. This depends on appropriate preoperative counselling and ideally should include both patient and his partner. Importantly, the patient must be aware that the surgical outcome, however good, does not equal a normal penis, and that there will be a degree of penile shortening together with glans softening. It is vital to mention that any preoperative spontaneous erectile ability will be lost with the implantation of a prosthesis, and that removal of the device for malfunction or infection will result in total ED. The management of device failure is a salvage implant. Lack of patient dexterity or cognitive ability turns a surgical success into a patient's disaster. Needle puncture of an IPP cylinder at surgery is a catastrophe; avoid it by placing tunical sutures before inserting the cylinders. Always test the integrity of the suture-less

connectors before wound closure. Early IPP failure might be due to inadvertent separation of the reservoir/pump quick connect (leading to an 'empty pump').

SUPPORT STRATEGIES FOR PROBLEMS DURING SURGERY

Corporal fibrosis: this occurs after prolonged priapism due to any cause, is a feature of severe Peyronie's disease, and invariably results after explantation of an infected penile prosthesis. Developing the corporal space is extremely challenging and not for the inexperienced operator. Several strategies can be used to create corporal space but there is a real risk of urethral damage and perforation of the corporal bodies, both proximally and distally. Inevitably, even having created a space in these patients, a smaller-cylinder prosthesis needs to be implanted and to reduce the likelihood of subsequent tunical aneurysm formation an AMS 700 CXR IPP should be used.

Previous pelvic surgery: Where it is unsafe to blindly pierce the floor of the inguinal canal (for fear of perforating adherent bowel) the reservoir can be placed ectopically. Instead of piercing the transversalis fascia, a space is created digitally and anterior to this fascia, but posterior to the anterior abdominal wall musculature. Once the reservoir is positioned a purse-string suture is tied at the neck of the reservoir to keep it in place. Alternatively, a separate abdominal incision can be used to place the reservoir.

Crossover: Avoid this by keeping the penis on stretch and aiming laterally during dilatation and passage of the Furlow inserter. If corporal measurements are significantly different (>1 cm) place a Hegar dilator into one corporal space and re-dilate the other side.

Urethral perforation: If this occurs whilst dilating the first side then catheterize the patient, abandon the procedure and re-operate after healing. If this occurs during dilating the second side then place a cylinder

into the contralateral intact side and leave a urethral catheter *in situ* for 7 days.

Crural perforation: This is recognized by a sudden 'give' when dilating proximally, or by finding an inequality of corporal length measurements. It might be confirmed by placing Brook dilators into both corporal spaces simultaneously and observing a stepped appearance. To repair the crural defect the surgeon can elect to make a 'wind-sock' from Gortex and place this over the rear tip extender of the problem cylinder, or to place a nonabsorbable suture through the proximal tunica albuginea into the rear tip extender itself, and re-route the suture back out from the rear tip extender and tunica and tie it. In either case it is advisable not to cycle the device until 6 weeks after surgery.

Prosthetic infection: If an acute infection occurs with obvious pus formation the entire device should be removed immediately. If a chronic non-purulent infection occurs the device should be removed but a new device can be immediately implanted after serial irrigation of antibiotics, hydrogen peroxide, betadine and saline [4].

REFERENCES

- 1 Scott FB, Bradley WE, Timm GW. Management of erectile impotence. Use of implantable inflatable prosthesis. *Urology* 1973; **2**: 80-2
- 2 Wilson SK, Delk JR 2nd. Inflatable penile implant infection. predisposing factors and treatment suggestions. *J Urol* 1995; **153**: 659-61
- 3 Carson CC, Mulcahy JJ, Govier FE. Efficacy, safety and patient satisfaction outcomes of the AMS 700CX inflatable penile prosthesis: results of a long-term multicenter study. *J Urol* 2000; **164**: 376-80
- 4 Mulcahy JJ. Long-term experience with salvage of infected penile implants. *J Urol* 2000; **163**: 481-2

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