

PROBLEMS AND VARIATIONS IN THE PLACEMENT OF THE THREE-COMPONENT INFLATABLE PENILE PROSTHESIS

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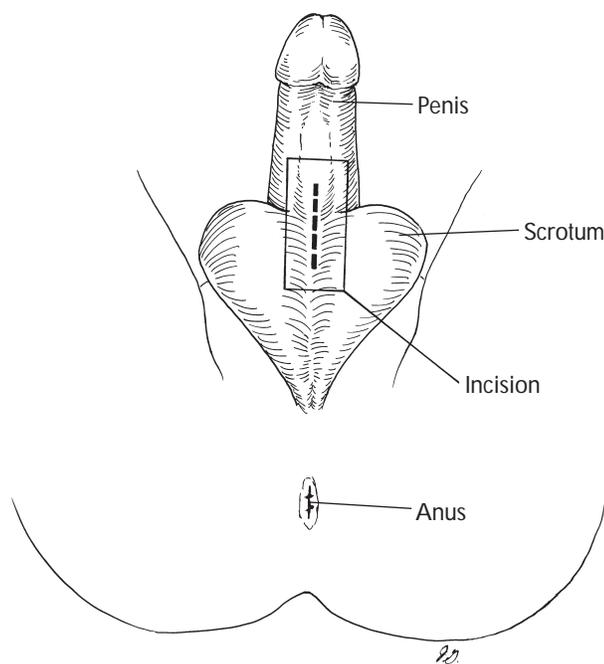
Troubleshooting for the Malfunctioning Prosthesis

Although there are ongoing changes in the design of penile prostheses, we believe there remain basic surgical considerations that are universal and applicable to all penile prosthesis surgery. We have chosen to discuss the more complex three-component prosthesis to illustrate all possible problems.

IDENTIFICATION OF PROXIMAL URETHRA AND CORPORA CAVERNOSA

FIG. 24-1. After the bladder is emptied by catheterization, an incision at the penile scrotal junction is made over the median raphe extending 4 to 5 cm.

A 22 Fr Van Buren sound is passed into the urethra to facilitate identification of the urethra and the corpora on both sides of the urethra. The surgeon should dissect down to the corpus spongiosum surrounding the urethra and then laterally on either side of the corpus spongiosum to



24-1

identify the corpora cavernosa. This dissection defines a clear border between the urethra and corpora cavernosa, thus preventing injury to the urethra during the operation.

An artificial erection can be induced by injecting saline solution with prostaglandin E₁ (20 µg) into a corpus cavernosum for full vasodilation while a tourniquet is applied around the base of the penis. This maneuver will allow the surgeon to estimate erect penis size, diameter, curvatures, and fibrotic plaques and will thus facilitate subsequent corporeal dissection and dilatation.

CORPOREAL INCISION AND DILATATION

FIGS. 24-2, 24-3, AND 24-4. A vertical corporeal incision of 4 cm is made between two traction sutures (0 Prolene) at the 6-o'clock position. The incision should be as proximal as possible and parallel to the urethra.

FIG. 24-5. If the incision is too distal, the surgeon will have difficulty inserting the proximal prosthesis, especially with rear-tip extenders, and the tubing may be pressed against the cylinder wall. Even with the protective sheath over the tubing, the constant pres-

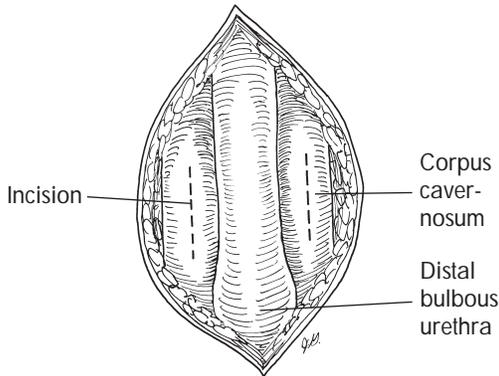
sure over time may cause the cylinder walls to erode.

If the incision is too proximal, the surgeon will have difficulty with distal cylinder insertion and with closure of the corporotomy.

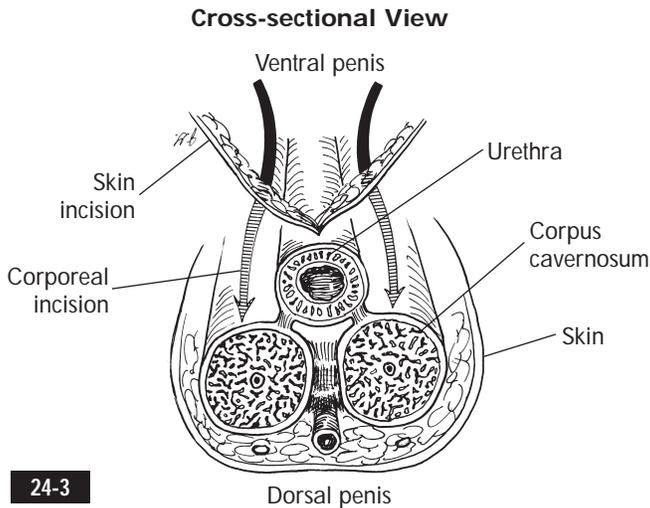
FIG. 24-6. The surgeon first establishes a dissection plane between the most lateral corporeal tunica and sinus bodies using long scissors in a forward-and-backward spreading motion. This dissection technique not only avoids the urethra and the median septum but also preserves as much as possible the sinus endothelium and the cavernosal artery. Preservation of the vascular architecture, even when diseased, enhances the quality of later erections.

FIG. 24-7. After the initial scissors dissection, the space between the corporeal tunica and sinuses is dilated with Hegar size 7 to 13 dilators in preparation for cylinder placement. We prefer to dilate the corpus cavernosum to the size of a size 13 dilator because it makes the cylinder placement easier.

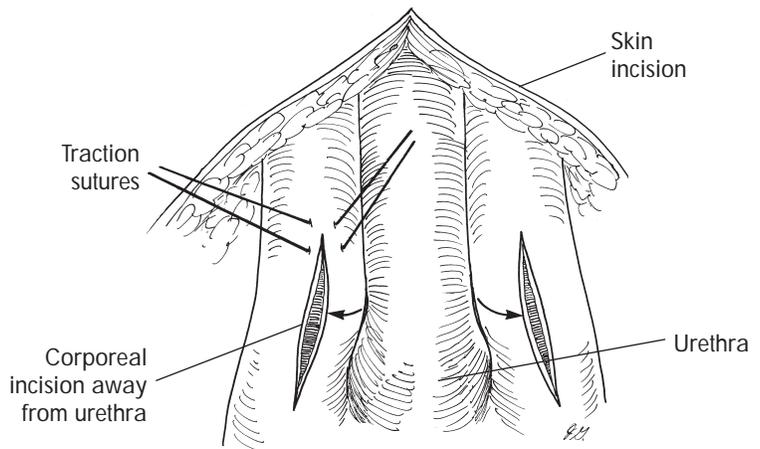
FIGS. 24-8 AND 24-9. The dilatation should extend to the most distal end and reach the most proximal end at the crus. When distal dilatation is incomplete, the surgeon may find a glandular droop "SST syndrome" after placement of the cylinders.



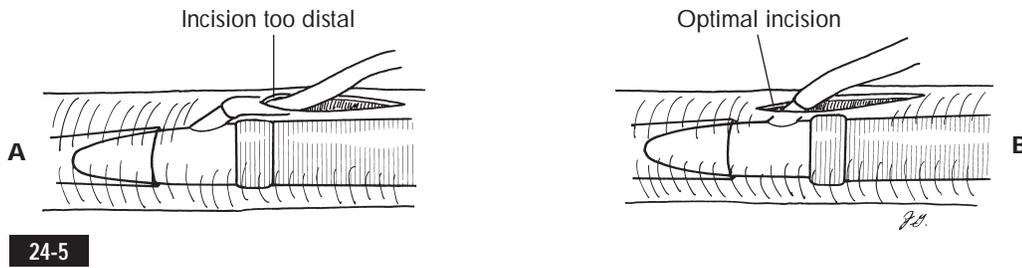
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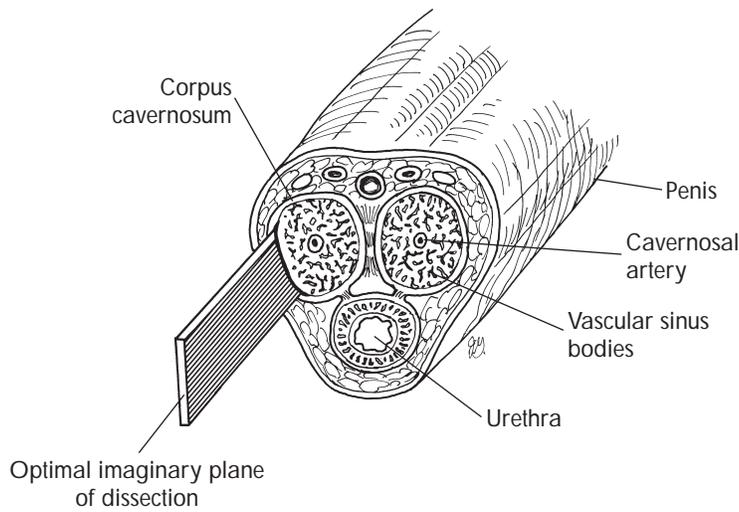


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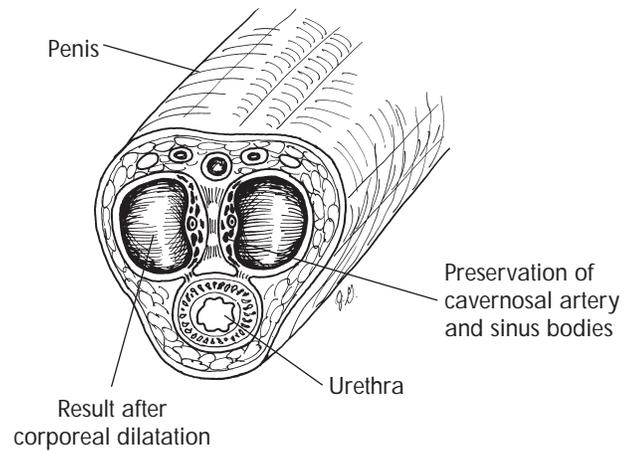


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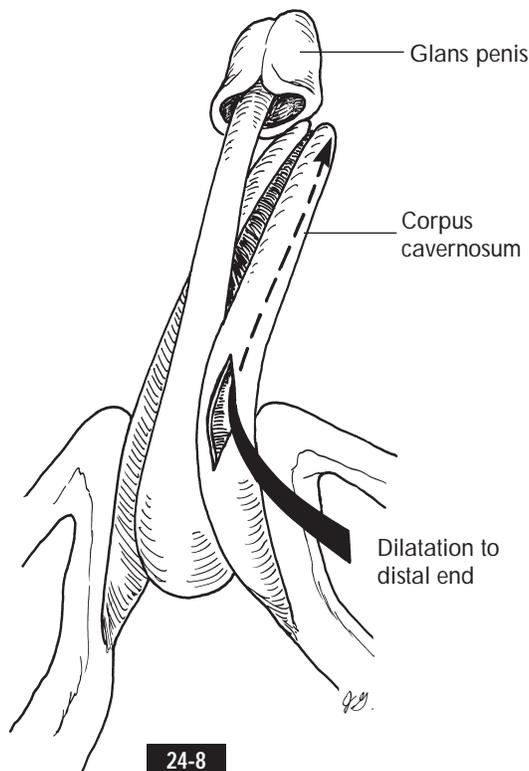
Cross-sectional View



24-6

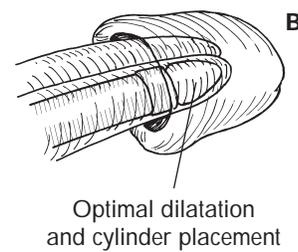
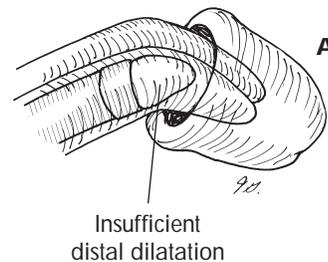


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SST Glandular Droop Syndrome



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CYLINDER SELECTION AND INSERTION

We use the American Medical Systems (AMS, Minneapolis, Minn.) inflatable penile prosthesis, which is representative of the generic type of three-component prosthesis.

FIG. 24-10. After the measurements of both cylinder lengths are made, the surgeon has the choice of using three different cylinder sizes (12, 15, or 18 cm) with three different-sized rear-tip extenders (RTE) and two different-sized reservoirs. The shortest rear-tip extenders are placed against the cylinder *first*. For example:

1. 15 cm cylinder + 1 cm RTE + 2 cm RTE = 18 cm (65 ml reservoir)
2. 18 cm cylinder + additional RTE if needed = >18 cm (100 ml reservoir)

The 12 and 15 cm cylinders always require the 65 ml reservoir, whereas the 18 cm cylinder requires the 100 ml reservoir.

The most common corporeal lengths range from 18 to 20 cm; the 15 cm cylinder is most commonly selected.

The ideal situation is for the inflatable portion of the cylinders to lie within the corpora cavernosa of the penis and the rear-tip extenders to fill the spaces of the two crura.

SPECIFIC DIFFICULTIES IN CYLINDER PLACEMENT

Fibrosis of the corporeal bodies secondary to treatment for priapism from Peyronie's disease, injections, and diabetes can complicate dilatation and cylinder placement.

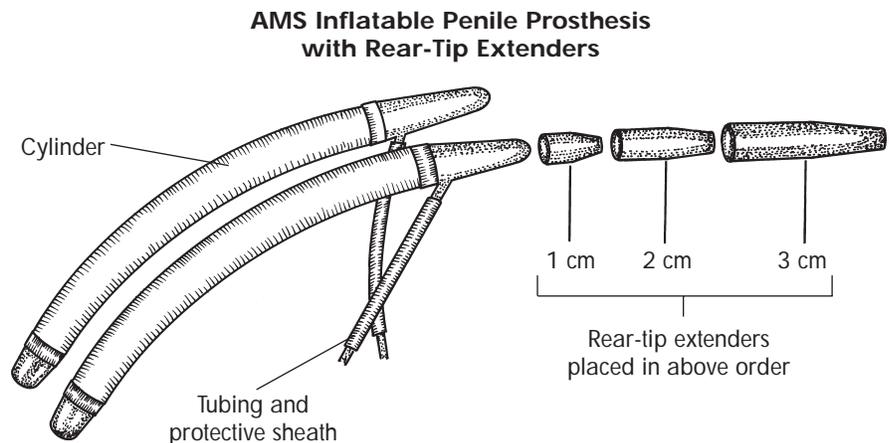
Distal Corpora Cavernosa

FIG. 24-11. Even with complete dilatation of the distal corpora cavernosa and proper placement of the prosthesis, natural anatomic variation may still result in a drooping glans penis.

In this case a horizontal incision around the base of the glans penis is made, exposing the dorsal nerves, glandular tissues, and distal corporeal bodies. The surgeon should place two stitches approximating the glandular tissues to the corpus cavernosum just lateral to the dorsal nerves to correct the drooping glandular configuration.

FIG. 24-12. When dilating the distal corpora cavernosa, the surgeon may encounter a common problem of mild fibrotic webbing in diabetic patients (A). Usually this fibrotic web can be broken up by simply dilating the corporeal tract.

In cases of more severe scarring, such as with Peyronie's disease, an incision or excision with



a replacement graft may be necessary **(B)**. We prefer to use a non-expandable model (CX model; American Medical Systems) for the prosthesis of choice in this situation.

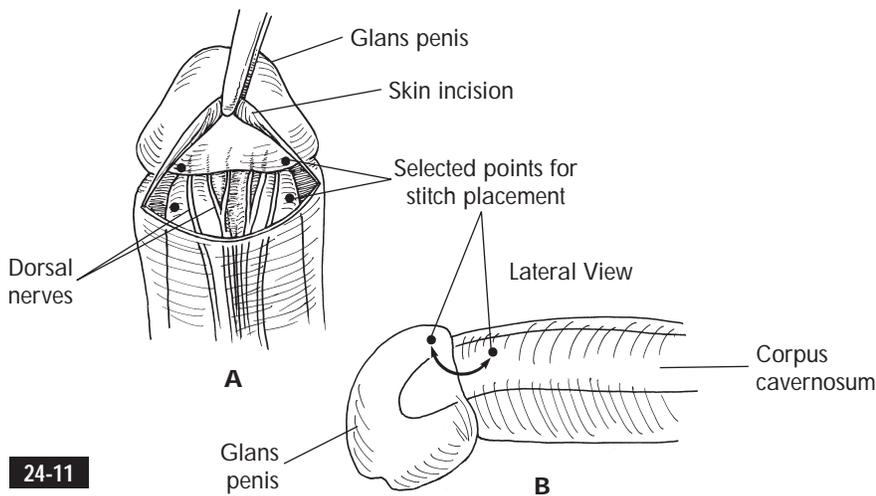
In the dilatation of the fibrotic distal corpus cavernosum, the surgeon may perforate the corporeal tissue and enter the urethra at

the fossa navicularis **(C)**. The surgeon may still place the cylinder in the intact contralateral corpus cavernosum but should postpone further manipulation of the affected side until a later date.

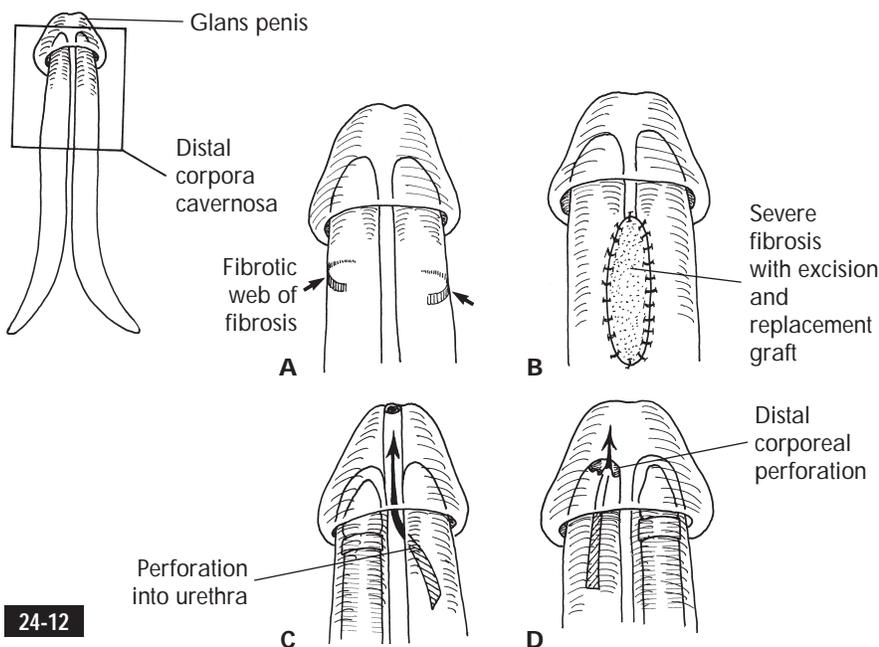
Aggressive dilatation may also lead to perforation of the distal corporeal body at the glans penis **(D)**.

Correction for Natural Glans Penis Droop

Top View



24-11



24-12

FIG. 24-13. The primary closure of a perforation is neither effective nor satisfactory. A Dacron “windsock” graft anchored to the corpus cavernosum walls is the only acceptable alternative for primary repair after a distal perforation.¹ The windsock graft should be stitched to the corporeal walls such that the prosthetic cylinder tip matches the contralateral tip.

Another alternative is to postpone any further manipulation for 3 to 6 months and then redilate the corporeal body.

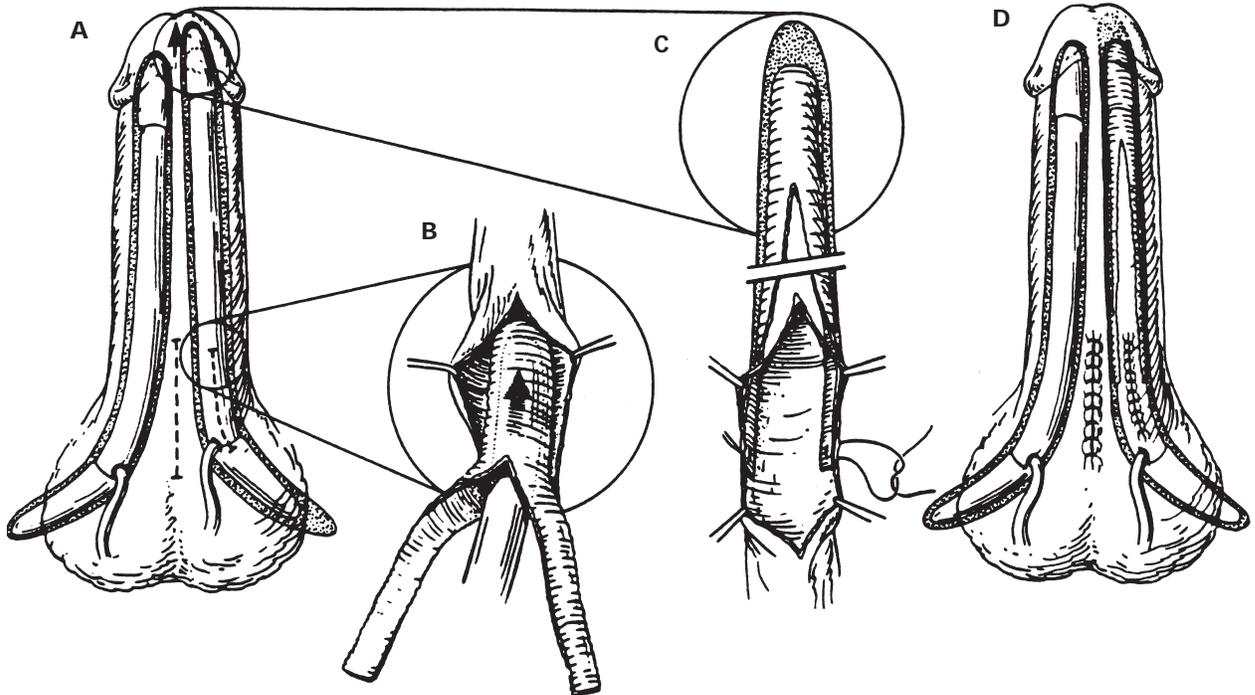
Proximal Corpora Cavernosa and the Crura

For fibrosis of the proximal corpora cavernosa and atrophy of the crura, corrective surgical maneuvers are easier.

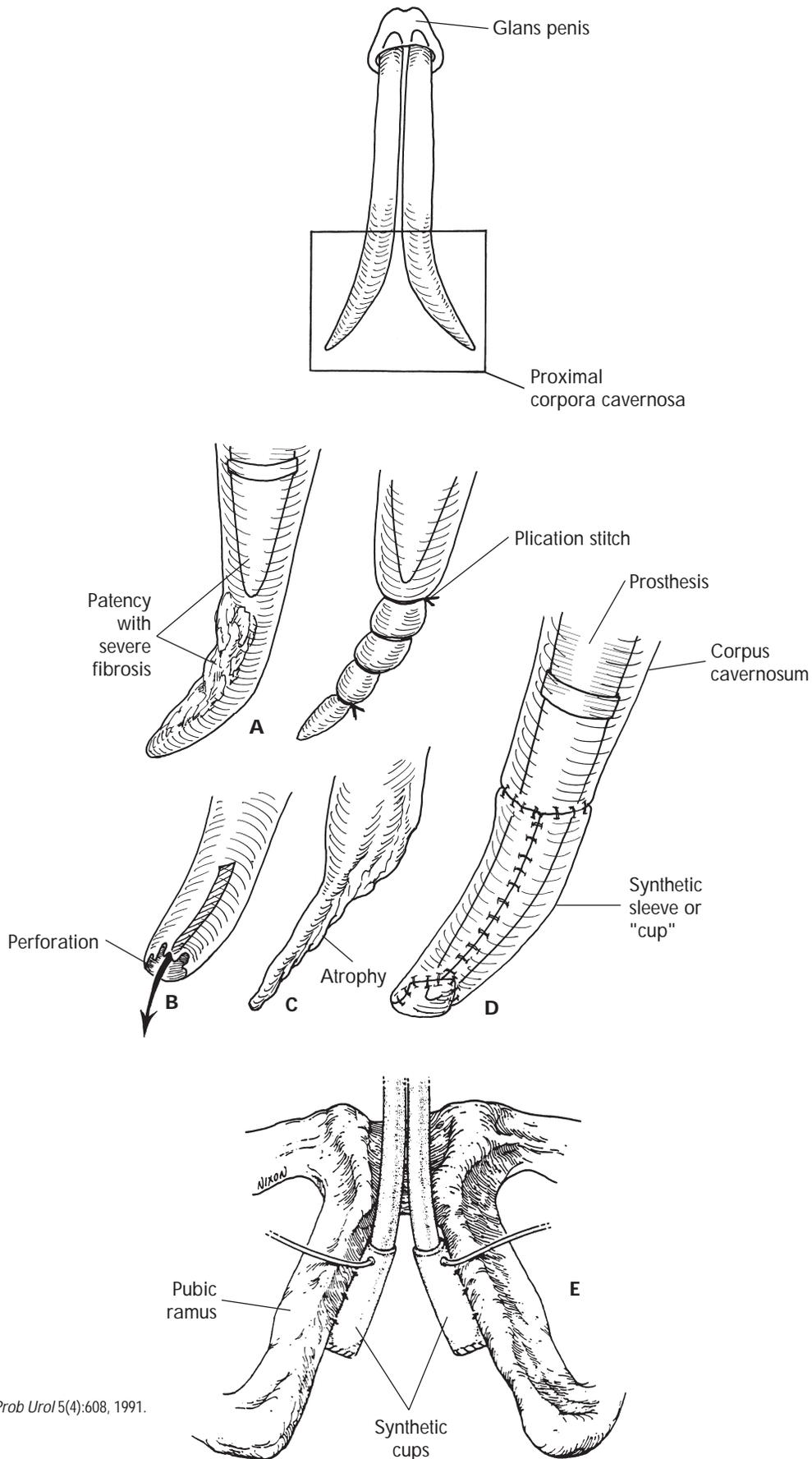
FIG. 24-14. If there is a fibrotic narrowing of the crus such that the rear-tip extenders cannot be placed within, the easiest solution is to place a running plication stitch proximally to obliterate the narrowed space (A). This stitch ensures that proximal migration of the cylinder will not occur.²

Perforation of the proximal crus from aggressive dilatation (B) or atrophy of the crus (C) requires additional maneuvers. A Dacron windsock graft or a Dacron or Gore-Tex sleeve (2 mm thickness) with a closed blunt end can be anchored to the corpus cavernosum more distally (D) and even anchored to the periosteum of the pubic ramus (E).^{1,3}

Dacron “Windsock” Graft for Repair of Distal Corpus Cavernosum Perforation

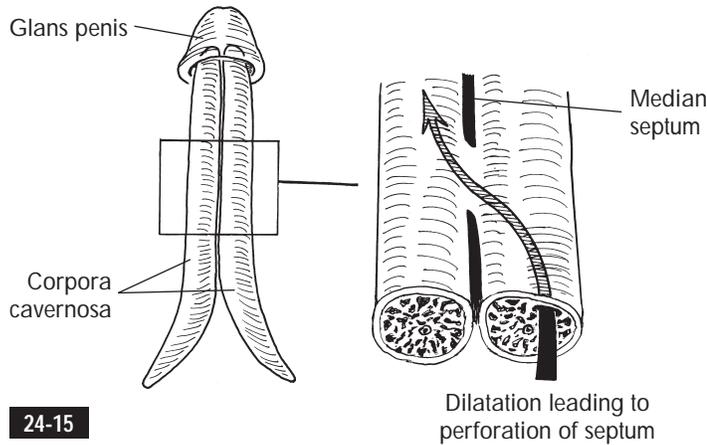


From Fishman IJ: *Contemp Urol* 51, 1991.



E from Mulcahy JJ: *Prob Urol* 5(4):608, 1991.

FIG. 24-15. When there is a disruption of the median septum, the surgeon may have difficulty with dilatation and subsequent cylinder placement in the proper corporeal body. By first establishing the correct space for one side and inserting a Hegar size 8 dilator within, the surgeon can dissect and then dilate the opposite side



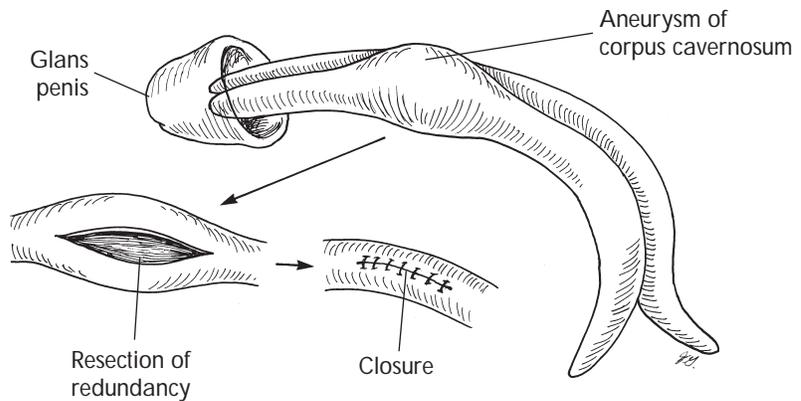
24-15

and establish a proper compartment for cylinder placement. The cylinder should be placed while the Hegar dilator is still within the opposite corporeal body. Once one cylinder is in place, the other cylinder replaces the Hegar dilator.

FIG. 24-16. An aneurysm of the corpus cavernosum may be resected, and nonexpandable cylinders (e.g., CX model; AMS) may be inserted.

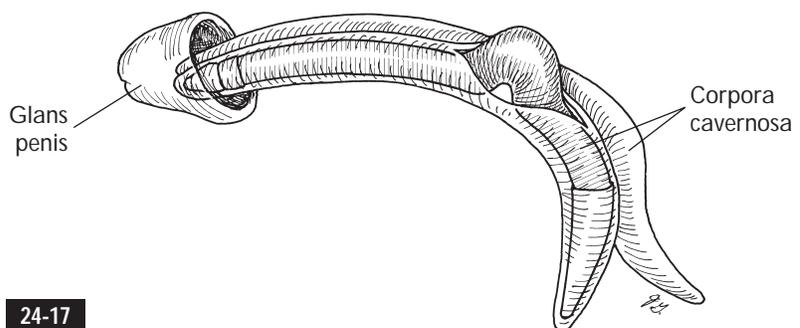
FIG. 24-17. Once the cylinders have been placed, the surgeon should check for any filling difficulties or any "buckling" effect of the cylinders. Buckling suggests that either the cylinder is too long or the diameter of the corpus is too narrow for the selected cylinder.

The 12 cm cylinders have a noninflated diameter of 8.5 mm and the 15 and 18 cm cylinders have a noninflated diameter of 10.5 mm, which can be expanded to 18 mm or greater.



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Buckling of Prosthesis

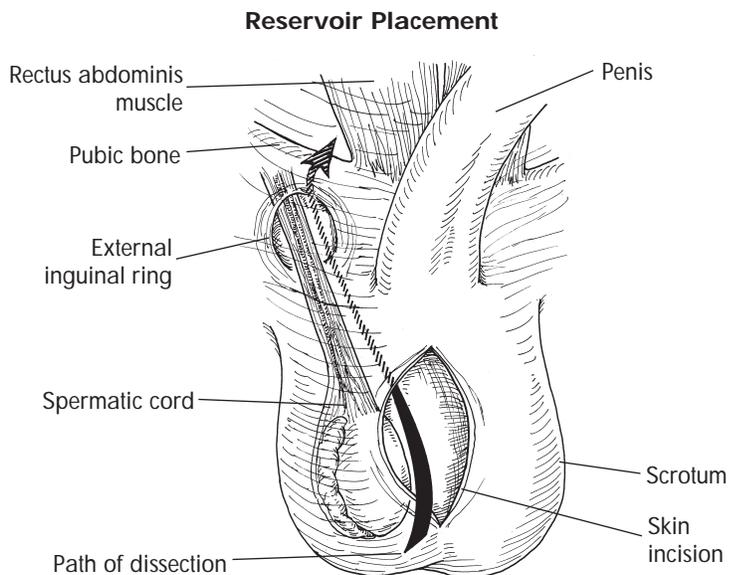


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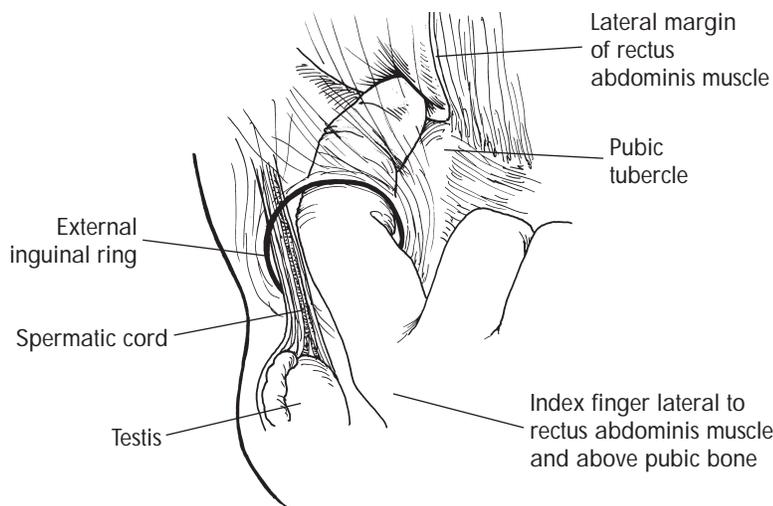
RESERVOIR PLACEMENT
Inguinal Approach

FIGS. 24-18 AND 24-19. If the patient is right-handed, the surgeon should approach the retropubic space through the right inguinal ring, applying traction on the right scrotum, testis, and spermatic cord laterally with the left hand. The surgeon inserts the right index finger adjacent to the spermatic cord through the external inguinal ring and to just lateral to the junction of the rectus abdominis muscle and the pubic bone.

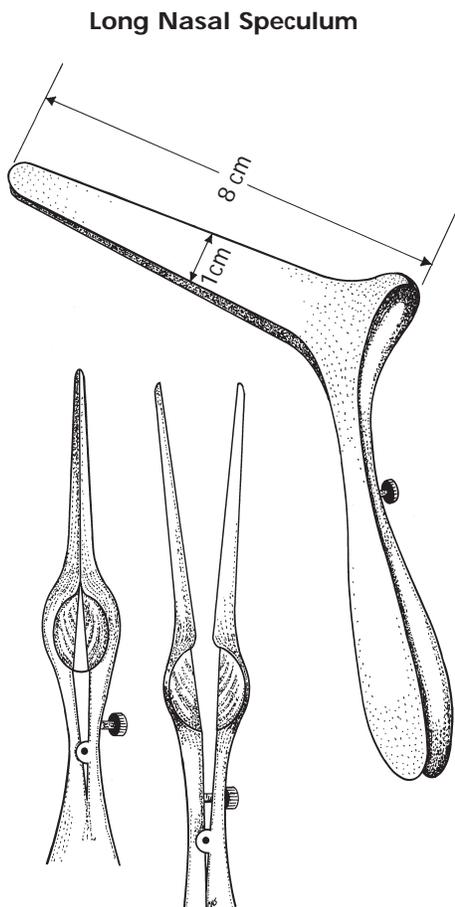
FIGS. 24-20 AND 24-21. Once the surgeon has palpated the space, an 8 cm-long nasal speculum (Killian), with the handles facing up, is passed adjacent to the surgeon's index finger by the assistant.



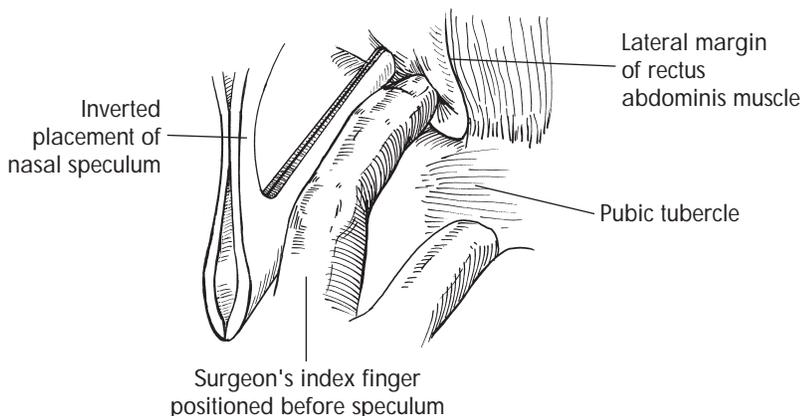
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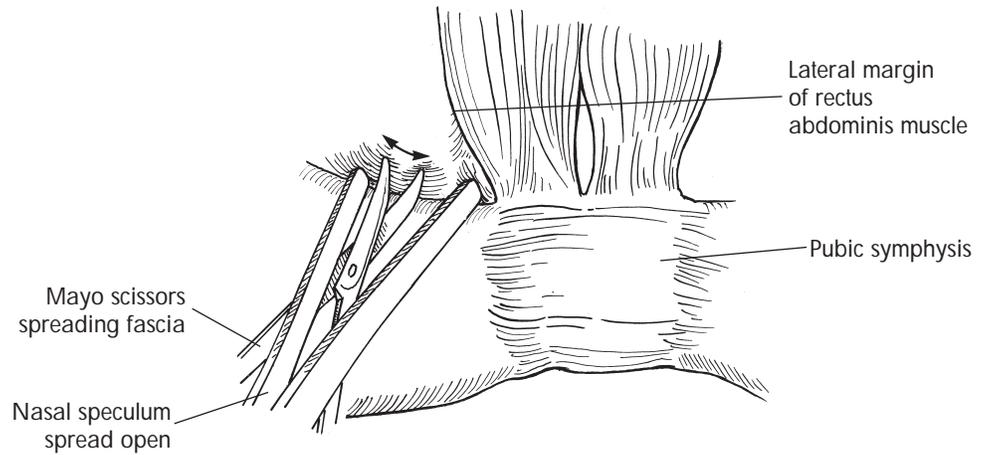
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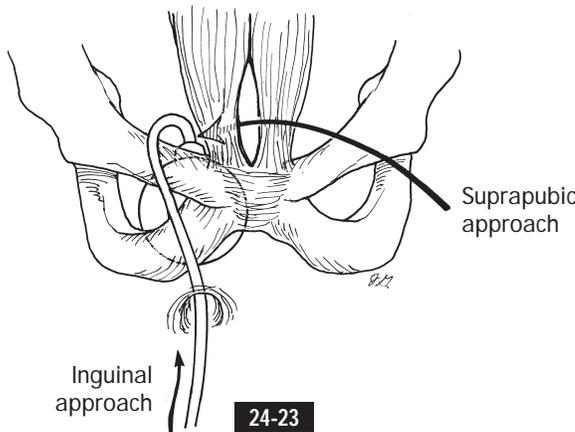


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Dissection for Reservoir Placement



24-23

FIG. 24-22. After the speculum is spread by the assistant, the surgeon passes long Mayo scissors between the spread speculum wings and spreads these dense fascial layers to enter the retropubic space. The bladder should be drained before this maneuver.

Once the dense tissues are open, the surgeon reinserts the right-hand fingers and slides them into the retropubic space for reservoir placement.

After bluntly dissecting a space adjacent to the bladder with the fingers, the surgeon places the

reservoir in the space (65 ml for 12 and 15 cm cylinders or 100 ml for 18 cm cylinders). If there is spontaneous efflux of saline solution into the syringe after initial inflation of the reservoir, then the space is too small and requires further blunt dissection.

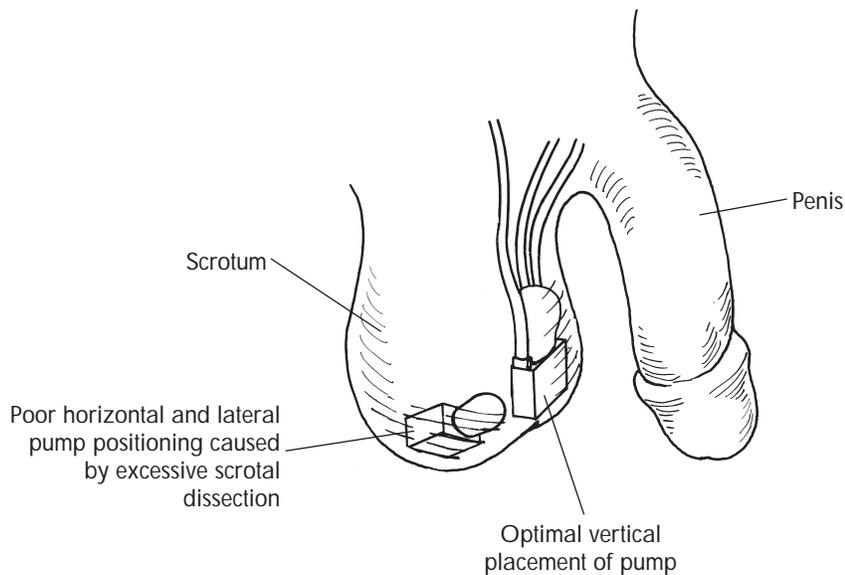
Suprapubic Approach

FIG. 24-23. In patients who have had previous inguinal hernia surgery or who have a weakness of this area due to previous surgery, a suprapubic approach for reservoir placement, with the tubing coming over the pubis into the scrotum, is the safest method.

Previous radical retropubic prostatectomy or open prostatectomy with severe fibrosis may require that the reservoir be placed in the peritoneal cavity.

PUMP PLACEMENT

FIG. 24-24. The pump is placed in the scrotum with the reservoir tubing in a lateral position and the two cylinder tubings in a medial position. When the patient is standing, the pump should be in a vertical position. Excessive scrotal dissection sometimes leads to a horizontal and posterior placement of the pump. This horizontal pump placement makes it difficult for the patient to deflate the prosthesis.



24-24

If the tubes are not already connected, the “quick-connect” system is used for the three components.

ANTIBIOTIC ADMINISTRATION AND DRAIN PLACEMENT

Bacterial infection is the worst complication with any kind of prosthetic surgery whether a penile prosthesis or an artificial knee. Aside from strict sterile technique and preferably an early morning case-scheduling, the surgeon should be generous with the use of antibiotic solutions for irrigation during the operation. A typical irrigating solution is 50,000 U bacitracin and 1 g neomycin or kanamycin in 1 L solution.

Preoperative and postoperative antibiotic administration is important for the assurance of a successful outcome. Antibiotic administration should be continued until after the drain and Foley catheter are removed.

A Jackson-Pratt or Blake suction drain can be left adjacent to

the tubings for 24 hours postoperatively if the dissection has been extensive. A Foley catheter (16 Fr) is left in place for 24 to 48 hours postoperatively.

TROUBLESHOOTING AND REVISION OF THE MALFUNCTIONAL PROSTHESIS

Incision

A superficial penile-scrotal incision is made over the tubing of the prosthesis.

By using electrocautery to divide the scar tissues over the prosthesis, the surgeon will not injure the prosthetic material even when dividing tissues directly over the prosthesis.

A Van Buren sound (22 Fr) placed in the urethra gives the surgeon a palpable landmark to avoid while searching for the prosthetic tubing, thus preventing injury to the urethra.

The two tubings medial to the urethra are from the cylinders, and the single lateral tubing is from the reservoir.

Sequential Testing

FIG. 24-25. The surgeon first identifies the cylinder tubings because they are the most common site of leakage. When the scar tissue over the tubing is divided, a sudden release of prosthesis fluid should make the surgeon suspect a regional leak. The leaking can occur on either side of the tubing connection (1) or where there is excessive tubing redundancy.

If no leakage is identified, the surgeon should trace both tubings to the cylinders. By making a small corporotomy, the surgeon can examine another site of potential leakage. The sleeve around the tube protects it; however, if the placement of the tubing is in contact with the cylinders within the corporeal body, there is a potential for damage to the cylinder as well as to the tubing (2). Although cylinders now have extra reinforcement, the long-term compression of the tubing against the cylinder may lead to erosion and laceration of the cylinder.

If the corporotomy does not reveal an obvious leak, the next step is to divide the reservoir tubing (3) and place a 60 ml syringe filled with saline solution to the pump end of the tubing.

By inflating the cylinders using the scrotal pump, the surgeon should be able to identify any malfunctions of either the cylinders or the pump. When the cylinders are deflated, the syringe should receive an equal volume of saline solution as used in the inflation.

If there is a malfunction detected by performing the above maneuver, the surgeon should divide the tubing to the cylinders (4) and connect two syringes filled with saline solution to each of the two tubes and in-

flate the cylinders. Malfunctions are more commonly found in the cylinders and are rarely found in the pump.

Depending on the findings, either the cylinders or the pump must be replaced (5).

Reservoir

If the pump and cylinders plus tubings are all intact, the surgeon connects an empty large syringe to the reservoir.

The reservoir should return approximately 65 or 100 ml. Depending on the previous operative notes indicating the cylinder size, the surgeon should know whether it is a 65 or 100 ml reservoir.

By instilling either 65 or 100 ml, the surgeon should be able to draw back the exact same amount of fluid.

If the surgeon can instill the saline solution but there is a spontaneous efflux into the syringe, the fibrous capsule needs to be "re-cracked" and established by saline solution reinfusion.

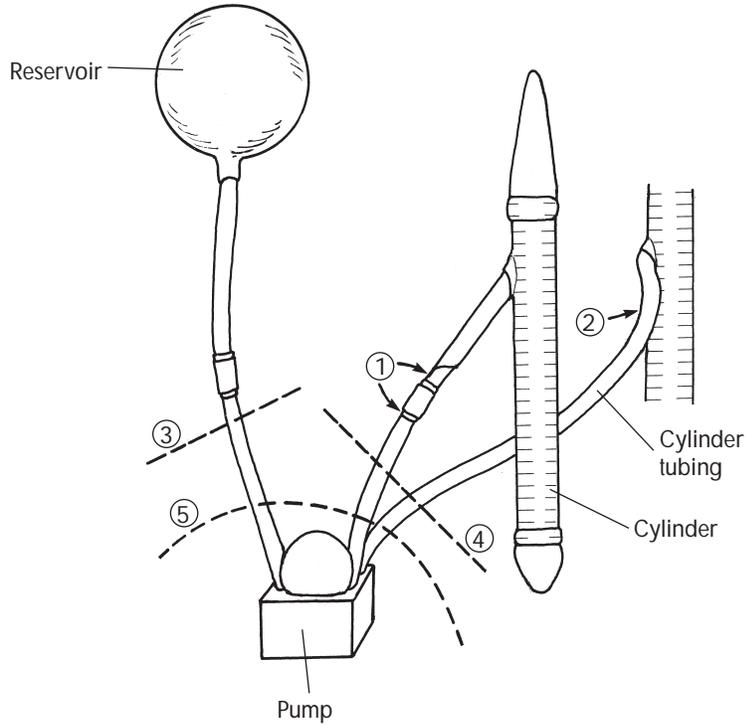
FIG. 24-26. If there is a questionable malfunction, our preference has been to leave the reservoir and place another one from a suprapubic approach.

The removal of a reservoir not only is difficult but also requires excessive tissue dissection and is not worth the time spent. The inert empty reservoir will not cause any problems.

After the reservoir is emptied, the reservoir tubing is cut at the most distal end.

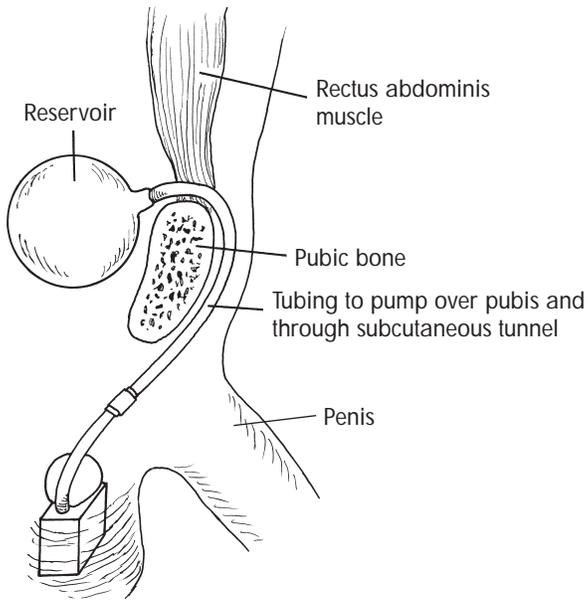
The new reservoir is placed in the perivesical or retropublic space via a separate suprapubic incision, and the tubing is placed over the pubic bone and tunneled through the subcutaneous tissues down into the scrotum.

Troubleshooting for Malfunctional Prosthesis



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Suprapubic Placement of Reservoir (Lateral View)



24-26

KEY POINTS

- Erection is induced to estimate erect penile size and evaluate for possible fibrosis.
- The urethra and corpora cavernosa are identified before the corporeal incisions are made. Traction stitches are placed and a 6-o'clock proximal incision between these stitches is ideal for cylinder placement.
- Lateral dissection between the corporeal tunica and sinuses is performed with Hegar size 7 to 13 dilators; the corporeal sinuses and the cavernosal artery are preserved.
- Cylinder size and corresponding reservoir are selected (12 and 15 cm cylinder, 65 ml reservoir; 18 cm cylinder, 100 ml reservoir). The shortest rear-tip extenders are placed first, next to the proximal cylinder.
- Fibrosis, if present, is corrected.
- An inguinal approach is used for the reservoir placement. In patients who have had previous hernia or organ surgery, a suprapubic approach is appropriate. The reservoir can be placed in the peritoneal cavity if scarring in the retropubic space is severe.
- The pump should be placed in the vertical position.
- The cylinders are inflated to 50%. The drain and Foley catheter are left in place for 24 hours postoperatively.

POTENTIAL PROBLEMS

- *Injury to urethra:* Place cylinder in unaffected side only → postpone cylinder placement in affected side
- *Atrophied crus:* Ligate crus and use cylinder without rear-tip extenders or select a shorter cylinder → alternatively, use a Gore-Tex or Dacron sleeve graft
- *Septal disruption:* Continue dilatation of corpora cavernosa
- *Improper cylinder inflation or buckling:* Check for improper cylinder length or diameter → check for fibrosis with a narrow corporeal diameter
- *Aneurysm of corpus cavernosum:* Correct the aneurysm and select a nonexpandable prosthesis
- *Bladder is punctured while creating reservoir:* Place reservoir in the peritoneal cavity

REFERENCES

- 1 Fishman IJ: Complicated implantation of inflatable penile prosthesis, *Urol Clin North Am* 14(1):217, 1987.
- 2 Palma PCR, Netto NR Jr: Ligation of crura penis for corporeal length adjustment in cases of short rod-like penile prosthesis, *J Urol* 143:764, 1990.
- 3 Mulcahy JJ: The management of complications of penile implants, *Prob Urol* 5(4):608-627, 1991.