

URETHROPLASTY

22

FIG. 22-1. In an ideal situation, the surgeon should reconstruct a neourethral lumen of 30 to 40 mm circumference for the meatus and penile shaft, whereas the bulbous and the membranous urethral lumen should have a circumference between 40 and 50 mm. The circumference of the meatus should always be slightly larger than the penile urethra because it will usually contract in the healing stages.

Experienced surgeons realize that in most cases it is not possible to reconstruct a neourethral lumen of the ideal size and that it is necessary to improvise to achieve an end-to-end anastomosis or a pedicled patch graft as the second-best choice.

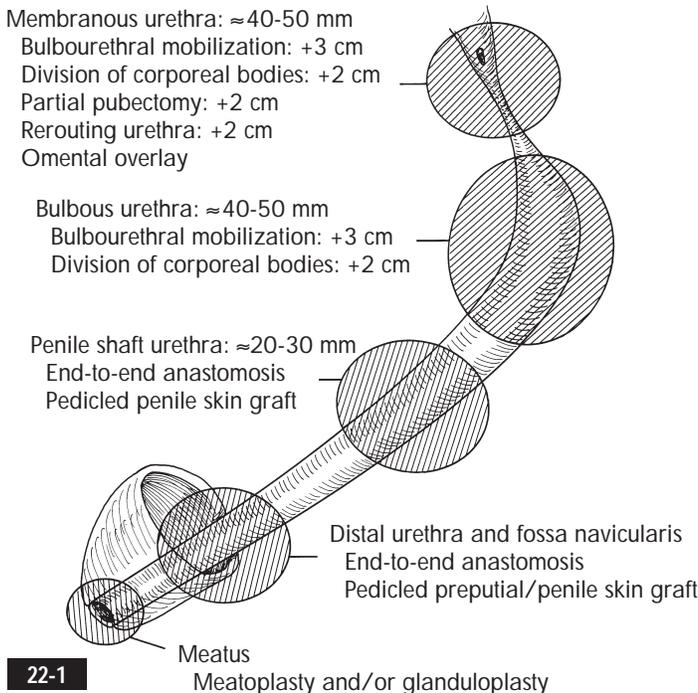
Whether the urethroplasty involves an anterior or posterior stricture, the principles of surgery are common to both.

FIG. 22-2. The entire diseased segment of stricture and the periurethral scar or fibrotic tissues must be excised until healthy tissues are identified on both ends (A).

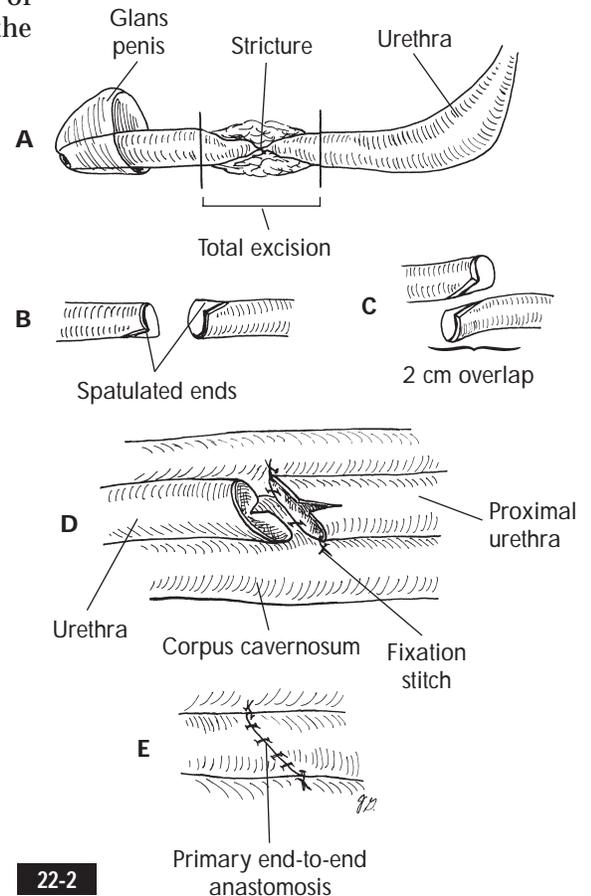
The two ends are spatulated to create the largest lumen possible (B).

If the two spatulated ends can overlap by 2 cm (C), then a primary end-to-end anastomosis is possible. The approximation of urothelium to urothelium is the ideal reconstruction (D and E).

Urethroplasty in Various Locations



22-1



22-2

FIG. 22-3. If an overlap is not possible (A), the next best choice for urethral reconstruction is to incorporate “wet skin” in the repair. “Wet skin,” such as penile and preputial skin, is ideal for grafts because it does not have hair-bearing properties and it will not contract to form scar or loosen to form a diverticulum.^{1,2}

Pedicled skin grafts or skin flaps, with intact vasculature and lymphatics, have the highest chance of survival.

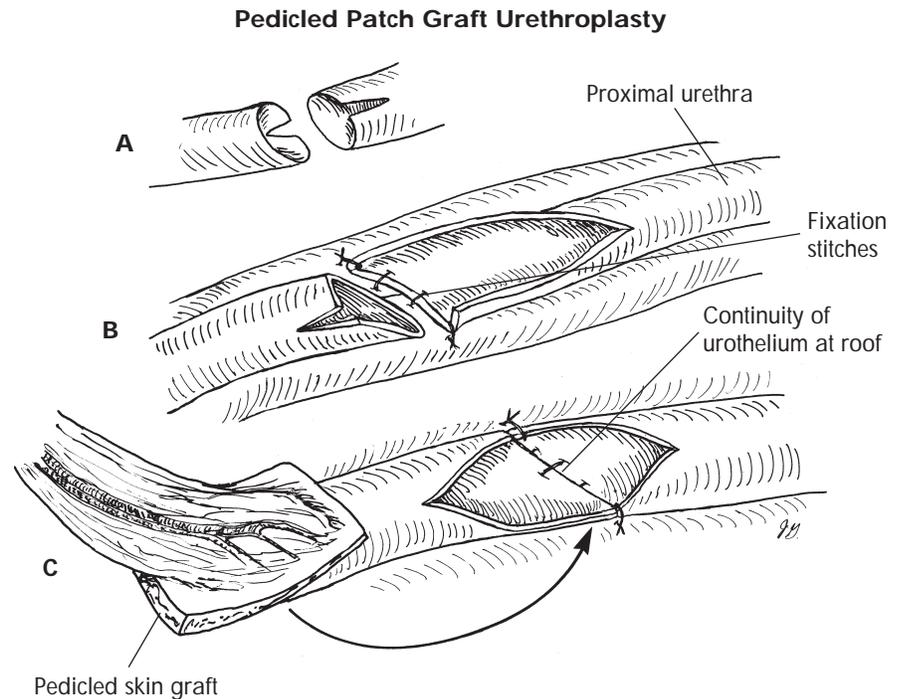
When choosing a pedicled skin graft, the surgeon should use a partial graft rather than a circumferential or tubular graft to complete the urethroplasty. Even with an intact blood supply, circumferential urethral grafts have a greater chance of stricture formation.

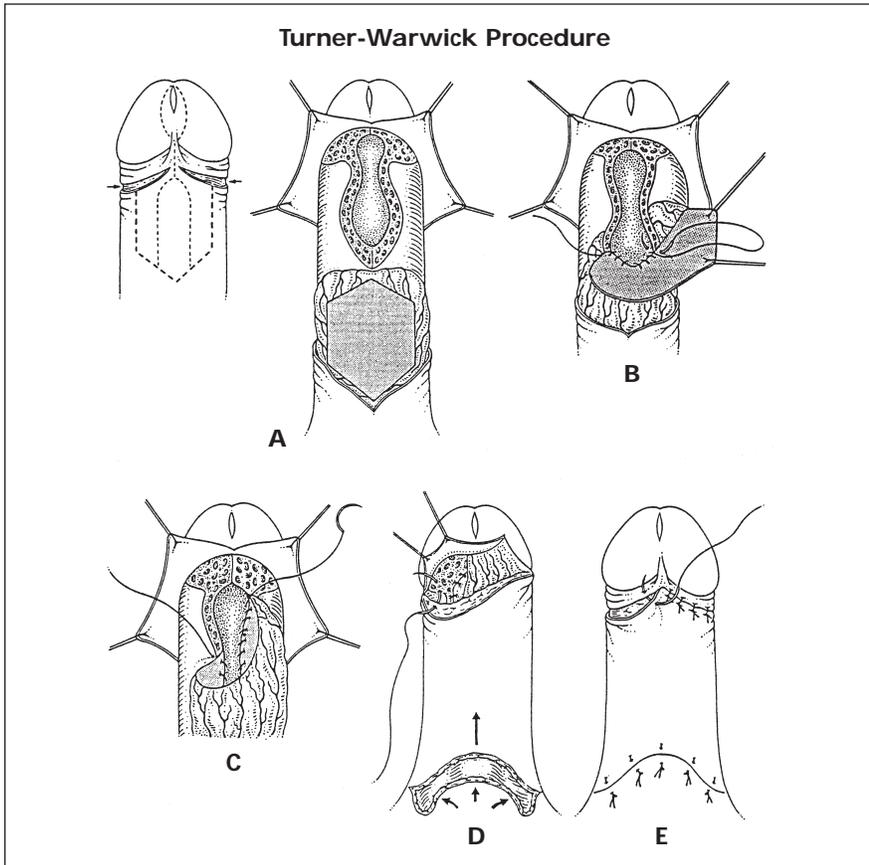
Whether an end-to-end anastomosis or a pedicled patch graft urethroplasty (B and C) is performed, *fixation* of the proximal end and *flattening* of the urethral lumen are critical maneuvers for the success of the operation.^{1,2} Fixation of the proximal urethra en-

sures that there is no tension at the anastomosis. Flattening the lumen prevents postoperative urethral contractions and cross adhesions leading to strictures. For pedicled patch graft urethroplasty, fixation and flattening of the “roof” or anterior urethra with urothelial continuity of the two free ends are critical for a successful result.

For anterior urethroplasty, the surgeon excises the stricture, spatulates the ends, and then fixes and flattens the proximal and/or distal ends to the adjacent corporeal cavernosal bodies before the anastomosis. For a patch graft, the anterior surfaces of the urethral ends are fixed and flattened to the corporeal bodies before graft placement.

FIG. 22-4. The Turner-Warwick bilaterally pedicled island penile skin procedure and the Orandi procedure are excellent choices for a pedicled patch graft.¹⁻³ The pedicled patch in the Turner-Warwick procedure receives its blood supply from both sides and thus has excellent vascularity.





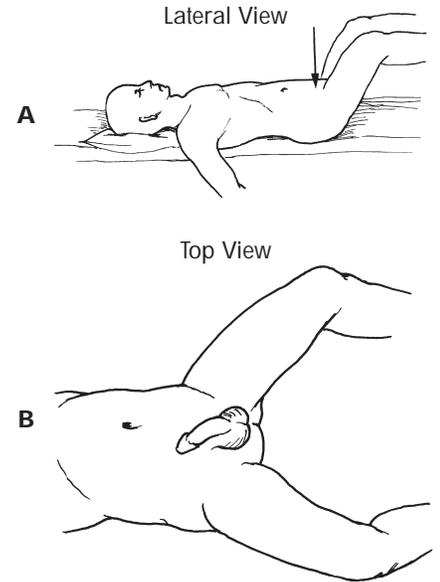
© 1981 Institute of Urology. In Webster G et al: *Reconstructive urology*, London, 1993, Blackwell.

22-4

PATIENT POSITIONING FOR POSTERIOR URETHROPLASTY

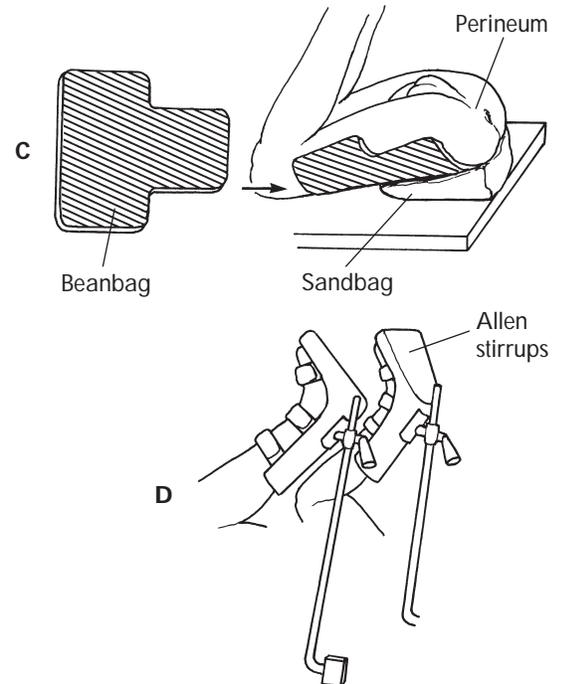
FIG. 22-5. For this procedure we prefer a simple moderate lithotomy position, which allows easy access to both the perineum and the lower abdomen (A and B). Some surgeons prefer to have the patient in an exaggerated lithotomy position as for radical perineal prostatectomy, whereby the perineum is actually parallel to the floor of the operating room (C) (see p. 189). Allen stirrups (D), sandbags or a beanbag, and shoulder supports are all useful to maintain this position throughout the operation.^{2,4}

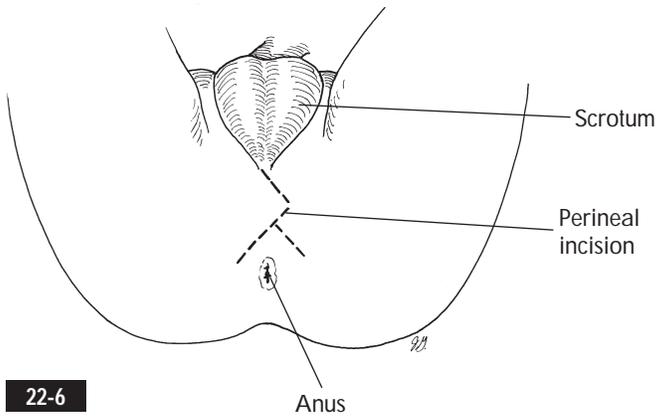
Lithotomy Position for Combined Perineal and Abdominal Approach



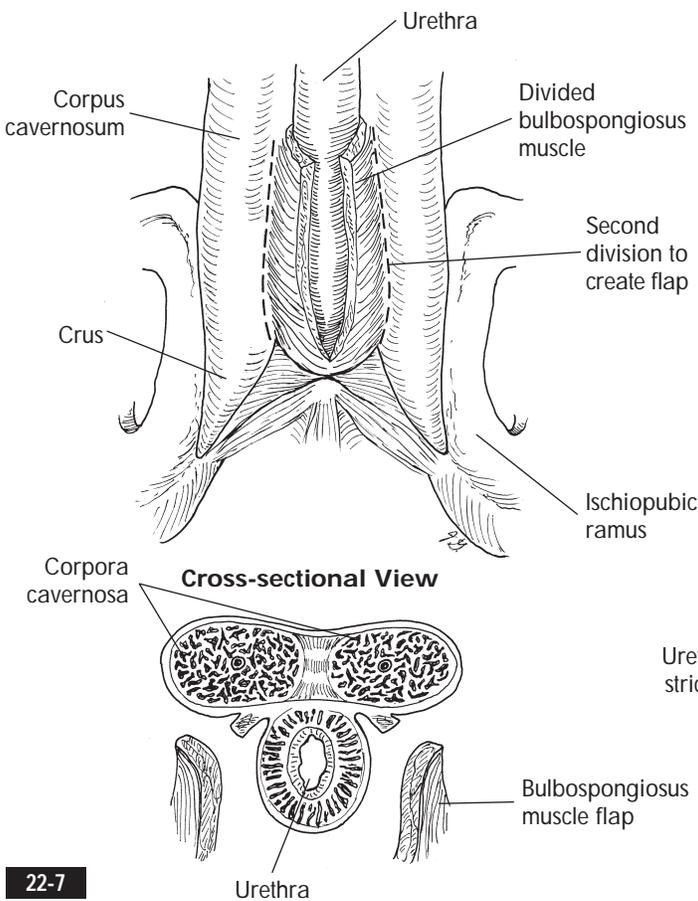
Exaggerated Lithotomy Position

22-5

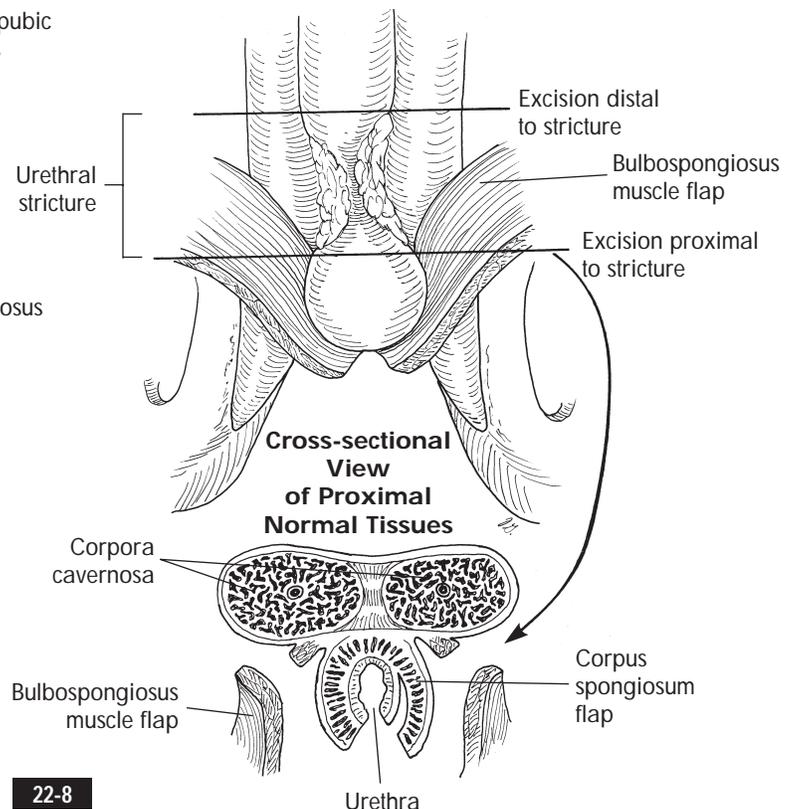




22-6



22-7



22-8

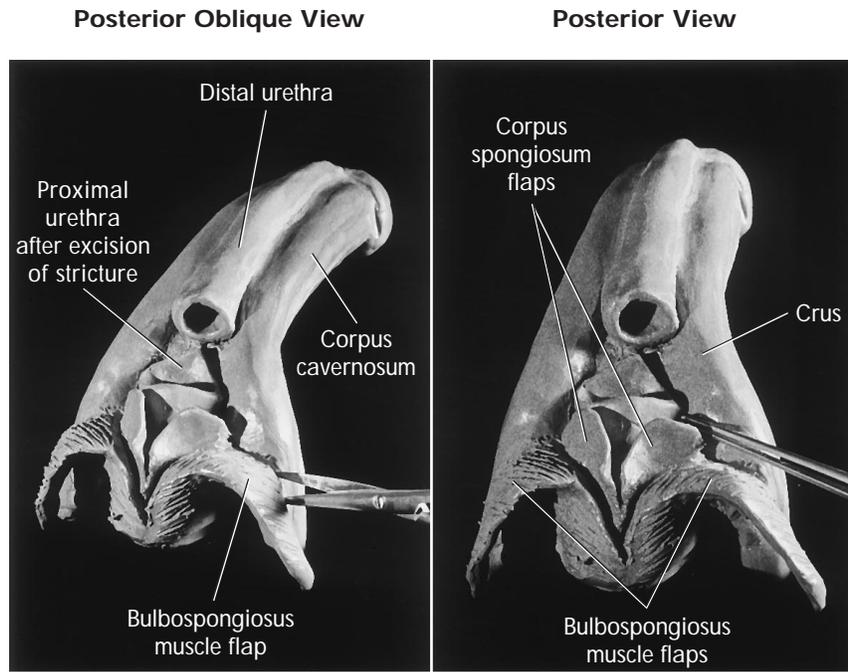
DISSECTION OF THE BULBOUS URETHRA

FIG. 22-6. After the skin incision, with the aid of a Van Buren sound (22 to 24 Fr) placed to the point of the stricture, the surgeon dissects through the perineal fat and identifies the bulbospongiosus muscle surrounding the posterior urethra.

FIG. 22-7. This muscle is divided at the midline as well as at the lateral borders so that it can be peeled off as two flaps for later use.

FIG. 22-8. After the diseased stricture segment has been excised, the surgeon can dissect the thick corpus spongiosum, leaving only a 3 mm thick residual tissue layer surrounding the proximal healthy urethra and thus creating two flaps of corpus spongiosum for later use.

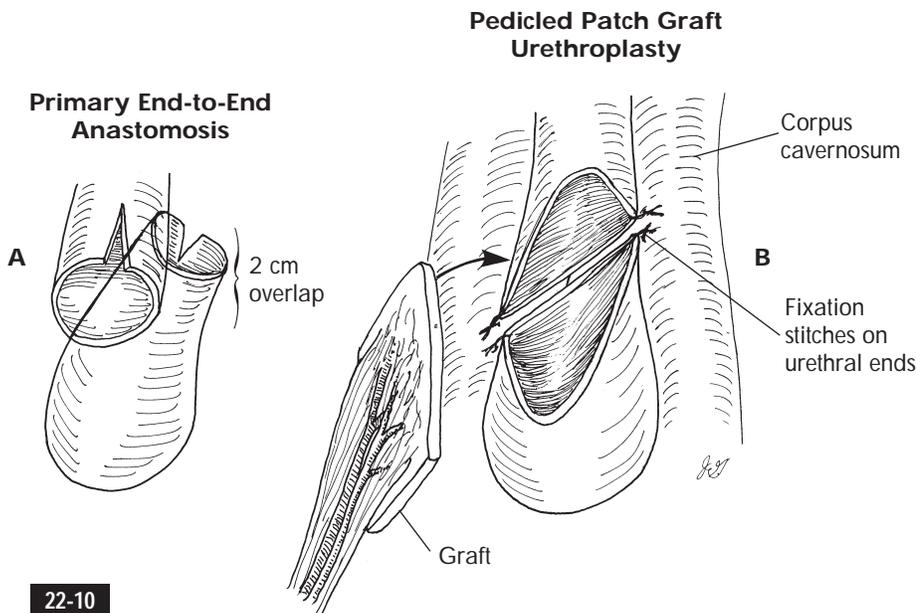
FIG. 22-9. These two layers are reapproximated after urethral reconstruction to add support, prevent diverticulum formation, and fill in dead spaces, which can accumulate extracellular fluid.



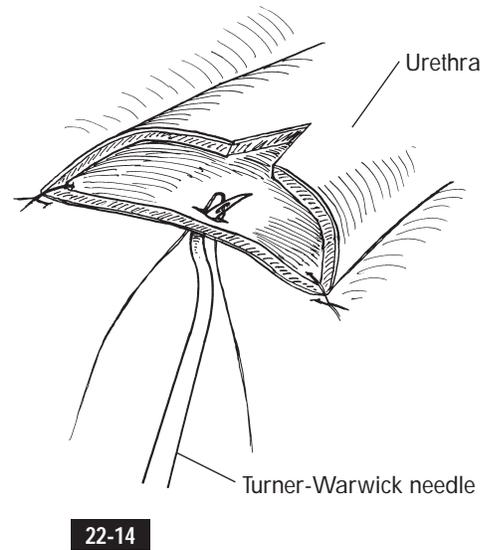
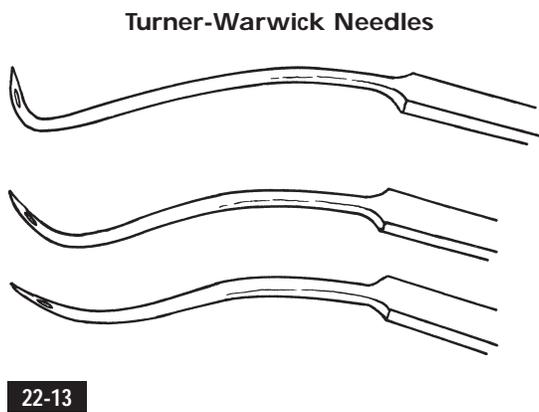
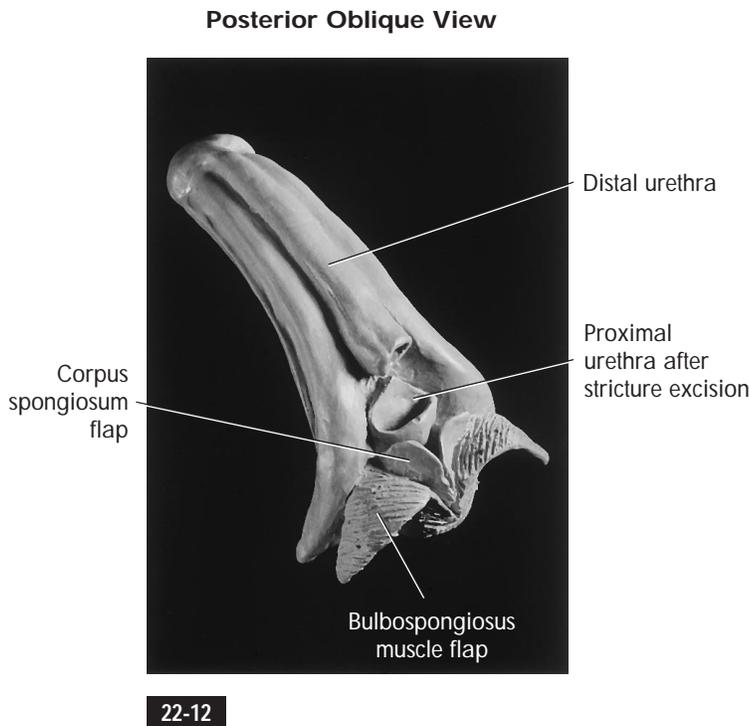
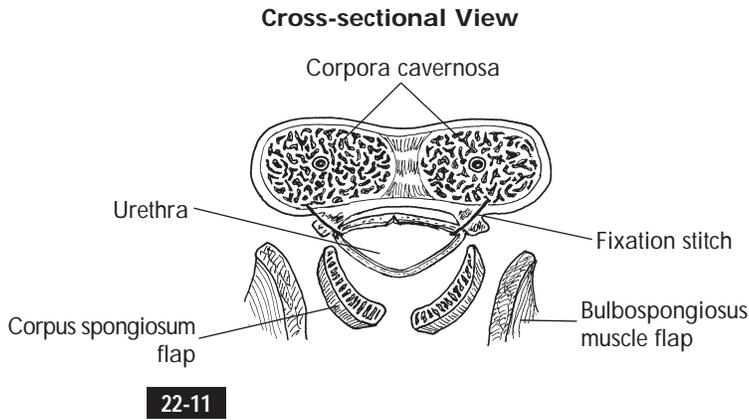
22-9

URETHRAL RECONSTRUCTION

FIG. 22-10. As noted previously, the best reconstructive option is an end-to-end anastomosis if a 2 cm overlap of the two healthy ends is possible (A). A pedicled patch graft would be the second choice (B).



22-10



FIGS. 22-11 AND 22-12. No matter which method of urethroplasty is selected, the most important maneuver is fixation and flattening of the proximal and/or distal urethral ends after urethral spatulation. The fixation stitch (2-0 Vicryl) is secured to the lateral corporeal bodies or the crura, which are more proximally located. With the securing of these fixation stitches, in essence the flattening effect is simultaneously accomplished. The anterior urethra or “roof” of the urethra is flattened against the corporeal bodies above. This will not only avoid placing tension on the urethral anastomosis but also create a wide, flattened urethral lumen that cannot contract.

FIGS. 22-13 AND 22-14. The use of Turner-Warwick needles facilitates stitch placement in a small confined space.

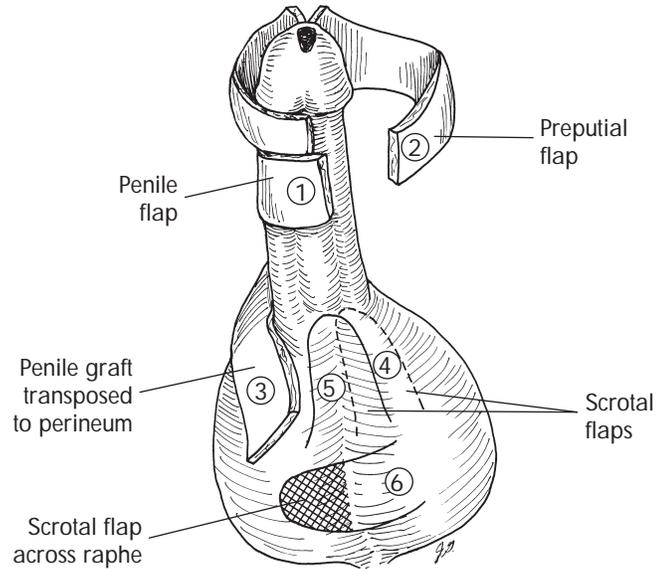
In every case the surgeon must be prepared to use a pedicled graft if a primary end-to-end anastomosis is not possible.

FIGS. 22-15, 22-16, AND 22-17. “Wet” penile (1) or preputial (2) skin can be mobilized down to the perineal region as a pedicled flap (3) with its own blood supply.⁵ Although scrotal skin has rich vascularity, its hair-bearing properties, elasticity (which can lead to potential diverticulum formation), and reactions to direct contact with urine (encrustation) make it less desirable as the first choice for a pedicled graft.

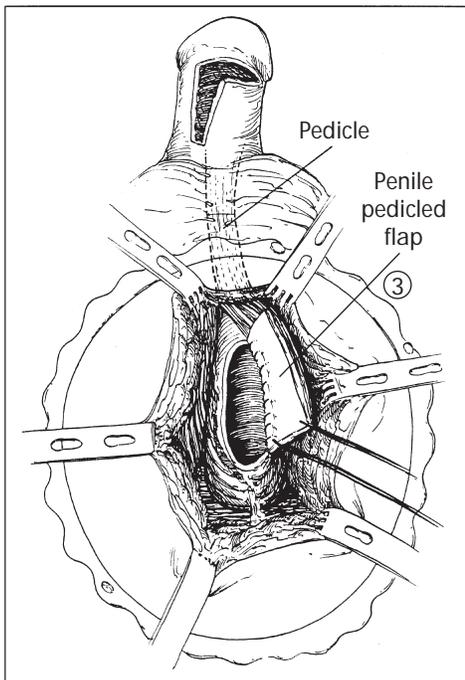
If a scrotal pedicled graft is to be used, a staged approach is required. In the first stage, the hair on the scrotal skin is epilated. In the second stage 4 to 6 months later, the scrotal pedicled graft must be stretched maximally to cover the strictured segment, thus avoiding diverticular formation in the late postoperative period.⁶

If pedicled scrotal grafts or flaps are used for a second layer or as the only alternative for the primary urethroplasty, it is important to create this flap from one side of the scrotum (4). Flaps that cross the median raphe will have poor vasculature at the distal half (5 and 6).

Different Sites for Pedicled Skin Graft

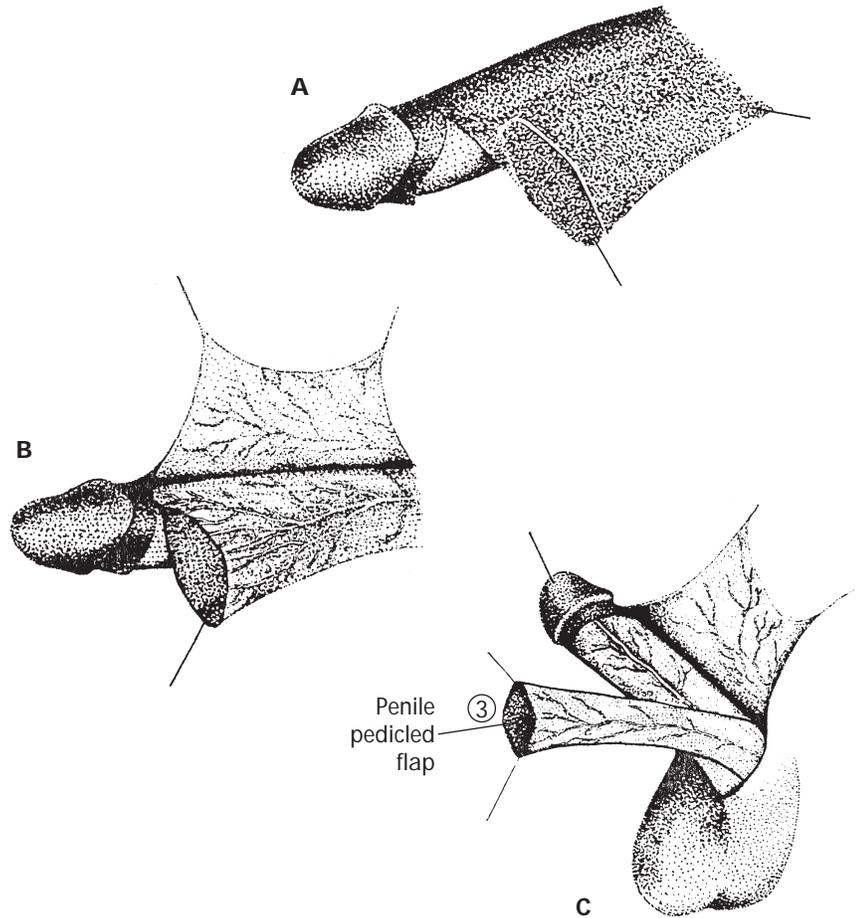


22-15



From Bensimon H: *Urologic surgery*, New York, 1991, McGraw-Hill.

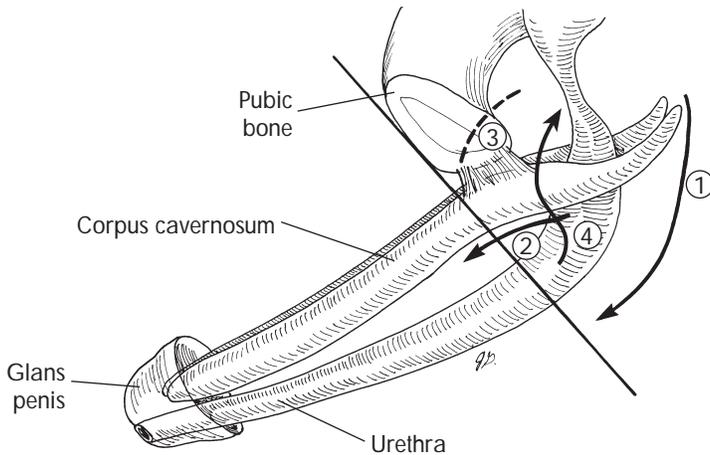
22-16



From Quartey JKM: *J Urol* 129:284, 1983.

22-17

Operative Maneuvers to Approximate Free Urethral Ends



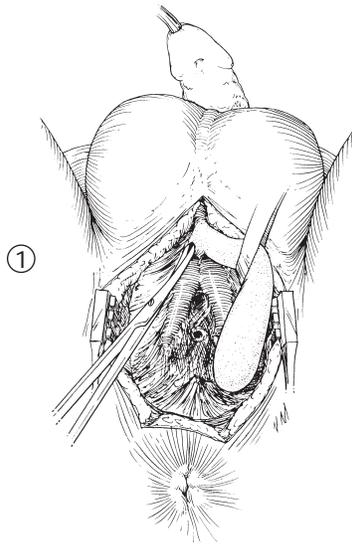
22-18

POSTERIOR URETHRAL MOBILIZATION

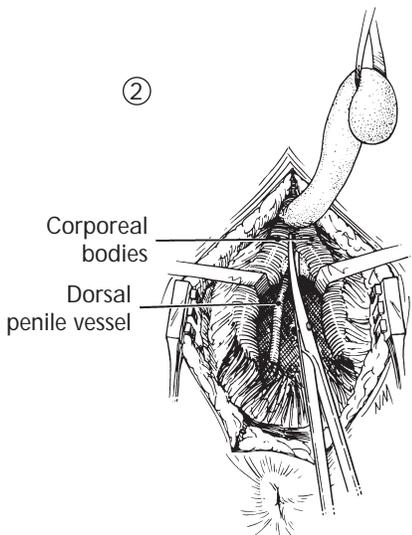
FIGS. 22-18 AND 22-19. After the excision of the stricture, the surgeon has the option to use a number of maneuvers to bring the two healthy urethral ends as close as possible^{7,8}: bulbourethral mobilization (1), division of the triangular fascia and corpora cavernosa (2), partial inferior pubectomy (3), and rerouting the urethra around one corporeal body (4). We prefer to use a combined perineal and abdominal approach to complete the reconstruction. While mobilizing the urethra below, the surgeon can create the cystostomy and pass the Van Buren sounds or guidewires down the bladder neck to define the proximal urethral end for the urethroplasty.

Freeing the bulbous urethra distally to the level of the base of the penis adds an additional 3 cm of length. This maneuver does not devascularize the urethra as long as the dissection remains just proximal to the base of the penis.

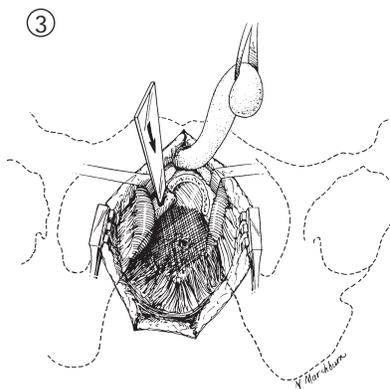
Bulbourethral Mobilization



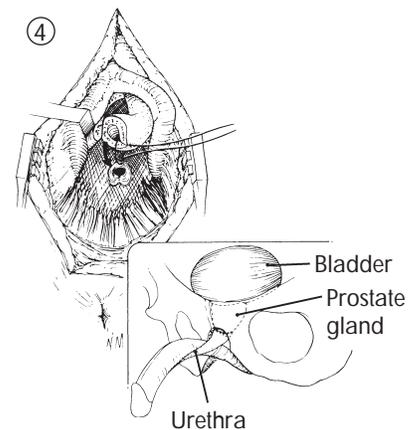
Division of Inferior Fascia and Corpora Cavernosa



Partial Inferior Pubectomy



Rerouting Urethra Around Corporeal Body



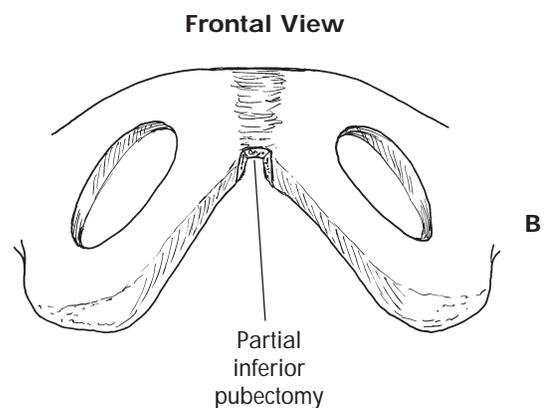
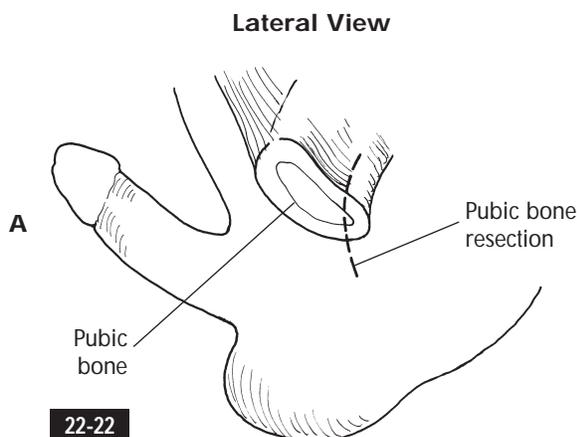
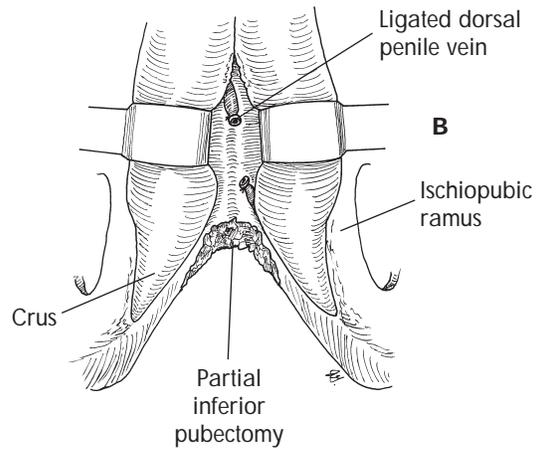
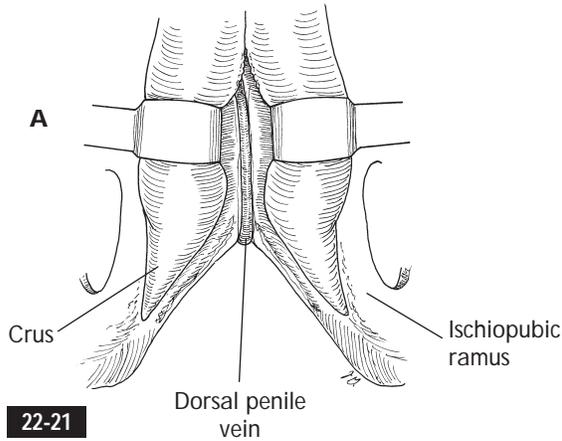
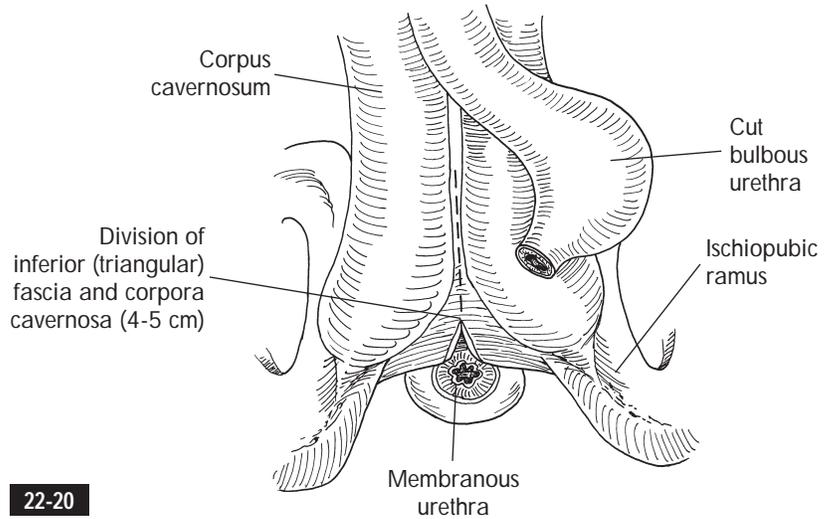
From Webster G, Ramon J: *J Urol* 145:744, 1991.

22-19

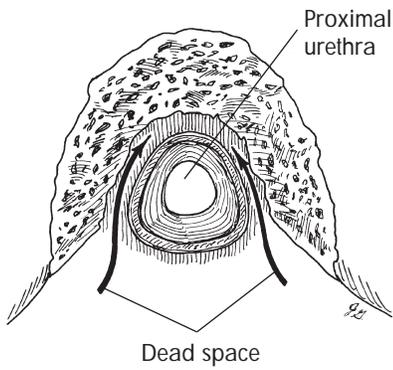
FIG. 22-20. Division of the inferior (triangular) fascia of the urogenital diaphragm and the proximal corpora cavernosa at the midline by 3 to 4 cm shortens the distance between the two urethral ends by another 2 cm. This maneuver does not lead to excessive bleeding or subsequent impotence.

FIGS. 22-21 AND 22-22. After dividing the dorsal penile vein, the surgeon can perform a partial pubectomy of the inferior surface of the pubic bone by using Kerrison or Adson rongeurs to remove a segment of bone, thus creating a horseshoe-shaped defect. This maneuver shortens the distance between the two urethral ends by another 2 cm. The rough inner surface can be further enlarged and smoothed with a dermal abrader.⁹

Corporeal Body Separation and Division of Inferior Fascia



Excessive Pubectomy

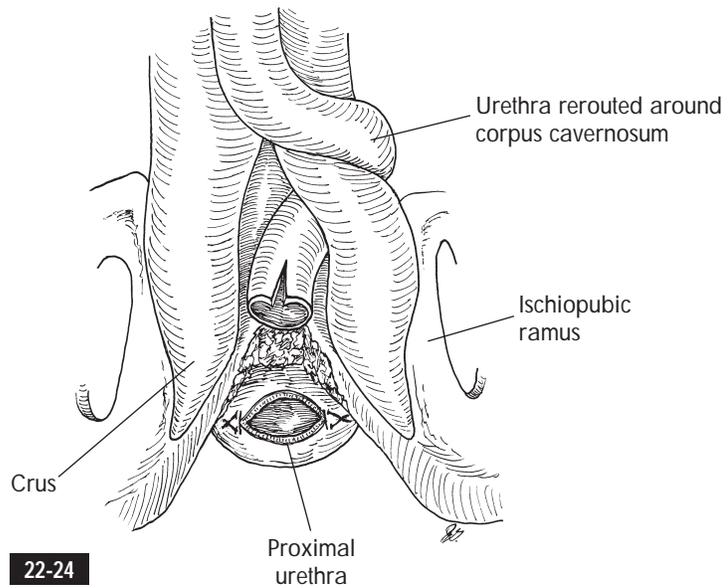


22-23

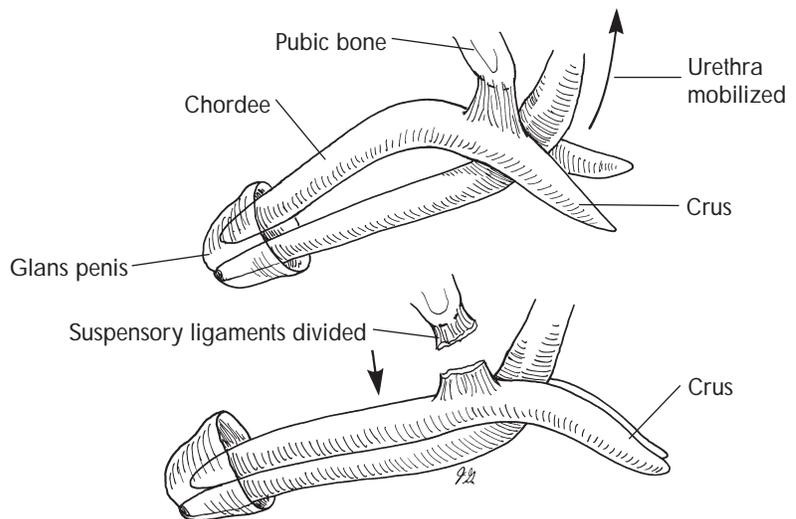
FIG. 22-23. This defect should not be too large because it can act as a compartment of dead space for fluid accumulation. After the urethroplasty, the surgeon should use the two residual corpus spongiosum flaps and the two bulbospongiosus muscle flaps to fill the space around the defect of the pubectomy. If this tissue is insufficient, the surgeon can incorporate omentum into this space.

FIG. 22-24. Rerouting the urethra around one corporeal body surprisingly shortens the distance between the two urethral ends by another 2 cm.

FIG. 22-25. If all of these maneuvers for the urethroplasty cause a slight ventral chordee of the penis, the surgeon has the option of dividing the suspensory ligaments at the penile base to correct the problem with minimal retraction of the penis.



22-24



22-25

URINARY DIVERSION AND SUPRAPUBIC CATHETERS

The suprapubic tube should be the main route for urinary diversion.

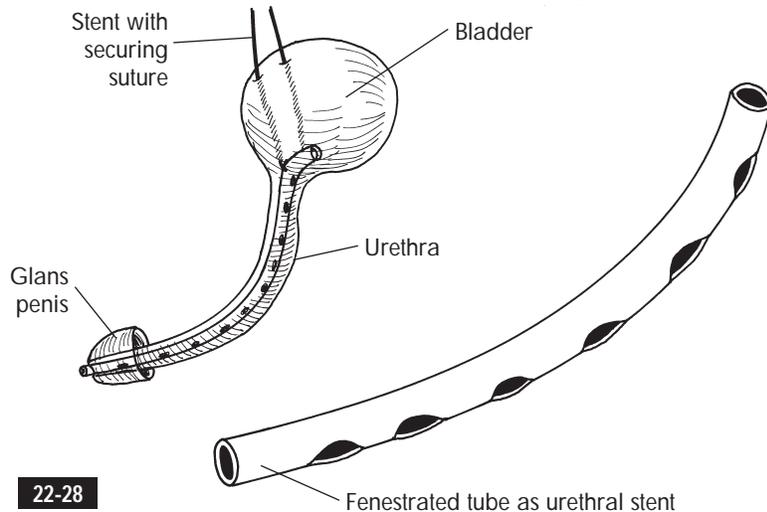
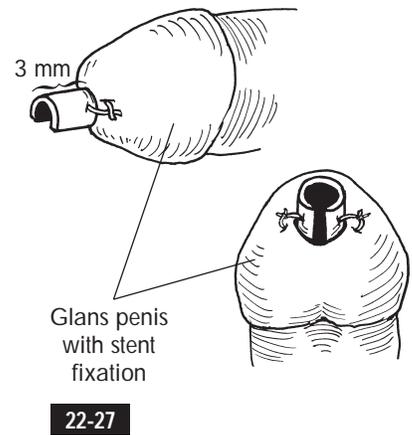
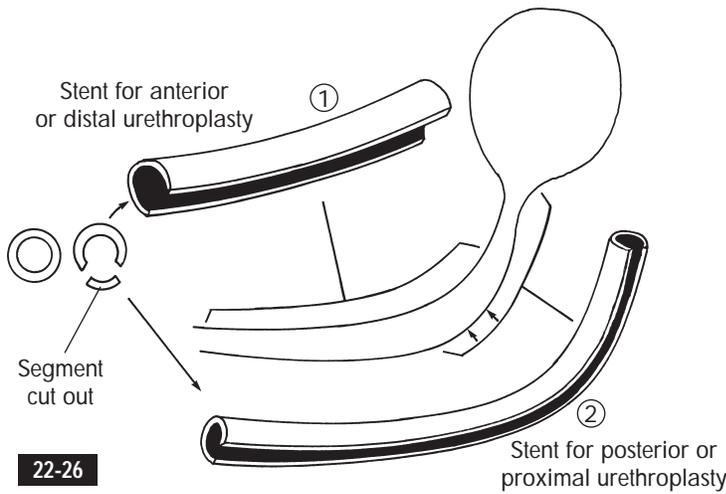
FIG. 22-26. For stenting the urethroplasty, we prefer to use Silastic tubing (16 to 19 Fr) with a cutout trough¹⁰ placed from the meatus past the segment of the urethral repair. For anterior urethroplasty, the stent is placed up to the bulbous urethra and secured at the meatus (1). For poste-

rior urethroplasty, the stent is placed past the bladder neck and secured with a nylon suture to the abdominal wall (2).

FIG. 22-27. The stent is placed so that it extends 3 mm from the tip of the glans meatus and it is sutured in position with fixation stitches.

FIG. 22-28. The use of a fenestrated tube through the urethra and secured to a suture fixed to the abdominal wall is also an excellent method to ensure proper urethral drainage.^{1,2}

Open-Trough Silastic Stent



SPONTANEOUS NOCTURNAL PENILE TUMESCENCE

FIG. 22-29. We regularly induce an artificial erection with an intracorporeal injection of prostaglandin E₁ (20 µg) after the urethroplasty to check for excessive skin tension. If the surgeon believes that the tension could jeopardize the repair, small relaxing incisions 1 to 2 mm in length can be made on the dorsal penile skin to decrease the tension. Multiple, small incisions heal much faster than one large incision.

TWO-STAGE REPAIR WITH THE DROPBACK MANEUVER

If the surgeon plans a two-stage posterior urethroplasty, the scrotal dropback maneuver is useful in the preparation period 6 to 8 months before the second stage.^{1,2}

By mobilizing the scrotum posterior to the marsupialized strictured segment, the surgeon can easily inspect and manipulate the area of future reconstruction.

Even with urethral marsupialization, which not only fixes but also flattens the urethral plate, it is inevitable to have cross synechial adhesions that require dilatation.

Multiple epilations ensure that proper, hairless adjacent skin will be available for the neourethra.

FIG. 22-30. After a perineal incision is made (A), urethrotomy is performed and should include the entire strictured segment.

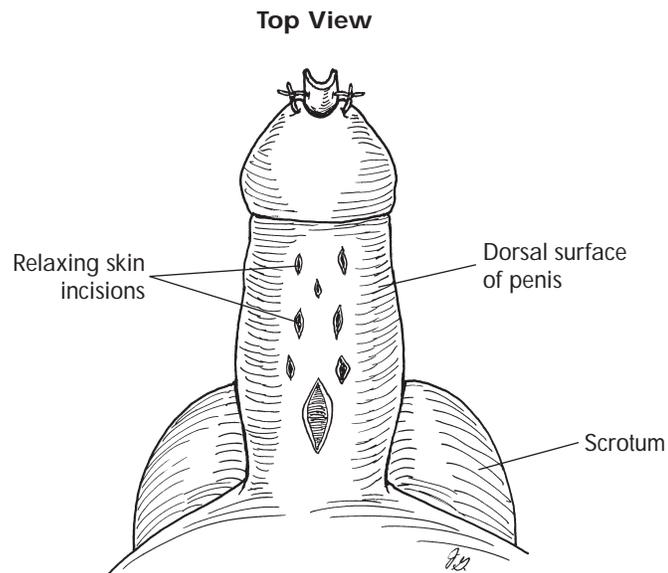
Scar tissues around the urethra are totally excised proximally and distally.

The residual urethral plate should be *fixed and flattened* to the adjacent corporeal bodies.

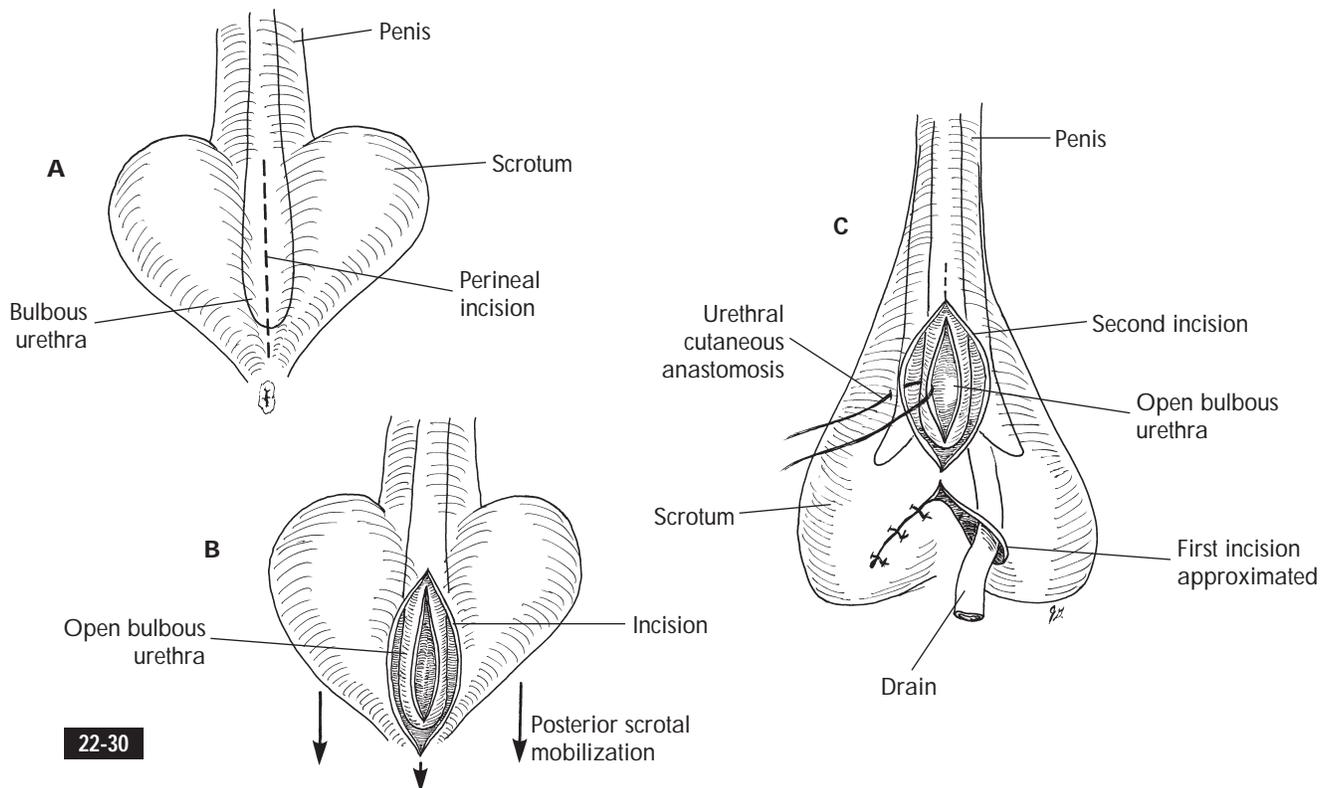
The scrotum is pulled posteriorly behind the strictured site (B), and a second incision is made that is superimposed over the urethrotomy of the strictured segment. By this maneuver, the surgeon has essentially moved the scrotum into a *more posterior or inferior position* in relation to the strictured segment.

After the second incision is made, the urethral plate edges, which have already been fixed to the corporeal bodies, are sewn to the edges of the second incision (C).

The first incision is reapproximated in a horizontal configuration and a drain is left within. In essence, the first incision has been moved posterior to the strictured urethral segment.



Scrotal Dropback Maneuver (Posterior View)



KEY POINTS

- An end-to-end anastomosis is the reconstructive procedure of choice; a pedicled skin graft is the next alternative.
- Complete excision of the stricture is performed.
- A 2 cm overlap of the spatulated urethral ends is optimal.
- The urethral ends are fixed to and flattened against the corpora cavernosa and a tension-free anastomosis is then performed.
- For a pedicled skin graft, the “roof” or anterior urethral ends should be fixed, flattened, and in continuity.
- For the pedicled graft, “wet skin” from the penis should be used and a partial rather than a circumferential repair should be performed.
- If necessary, maneuvers for posterior urethroplasty should be performed to bring the two urethral ends closer: bulbourethral mobilization, division of the inferior (triangular) fascia and the proximal corporeal bodies, partial inferior pubectomy, and urethral rerouting.
- Via a combined perineal and abdominal approach, the cystostomy is created and sounds or guidewires are used to define the proximal and distal urethral ends.
- The residual corpus spongiosum flaps and the bulbospongiosus muscle flaps are reapproximated to provide support for the urethroplasty and to fill the dead spaces.
- If necessary, the suspensory ligaments are divided.
- A suprapubic tube is placed to serve as a urinary stent.
- An artificial erection is induced to check for skin tension. If necessary, small relaxing incisions are made on the dorsal penile skin to decrease tension.

P O T E N T I A L P R O B L E M S

- *End-to-end anastomosis not possible:* Use a pedicled patch graft
- *Penile pedicled skin graft cannot reach posterior urethra:* Use scrotal skin as a second choice → perform a dropback procedure for delayed two-stage urethroplasty using epilated scrotal skin
- *Excessive dead space around posterior urethroplasty:* Fill dead space with omentum
- *Ventral chordee after mobilization maneuvers and urethroplasty:* Divide the suspensory ligaments
- *Excessive skin tension after repair with or without erection:* Make relaxing incisions on the dorsal penile skin

REFERENCES

- 1 Turner-Warwick R: Complications of urethral stricture surgery and some ways of preventing them. In Smith RB, Ehrlich RM, editors: *Complications of urologic surgery*, Philadelphia, 1990, WB Saunders, pp 435-457.
- 2 Turner-Warwick R: Complications of urethral surgery in the male. In Skinner D, Smith RB, editors: *Complications of urologic surgery, prevention and management*, Philadelphia, 1976, WB Saunders.
- 3 Orandi A: One-step urethroplasty: 4-year follow-up, *J Urol* 107:977, 1972.
- 4 Devine CJ, Jordan GH, Schlossberg SM: Surgery of the penis and urethra. In Walsh PC et al, editors: *Campbell's urology*, vol 3, ed 6, Philadelphia, 1992, WB Saunders, pp 2959-3032.
- 5 Quartey JKM: One-stage penile/preputial cutaneous island flap urethroplasty for urethral stricture, *J Urol* 129:284, 1983.
- 6 Blandy JP, Singh M: The technique and results of one-stage island patch urethroplasty, *Br J Urol* 47:83, 1975.
- 7 Webster GD: Perineal repair of membranous urethral stricture, *Urol Clin North Am* 16:303, 1989.
- 8 Webster G, Ramon J: Repair of pelvic fracture posterior urethral defects using an elaborated perineal approach: experience with 74 cases, *J Urol* 145:744, 1991.
- 9 Golimbu M, Al-Askari S, Morales P: Transpubic approach for lower urinary tract surgery: a 15-year experience, *J Urol* 143:72, 1990.
- 10 Mitchell ME, Kulb TB: Hypospadias repair without a bladder drainage catheter, *J Urol* 135:321, 1986.

SUGGESTED READINGS

- Bensimon H: Penis and urethra. In *Urologic surgery*, New York, 1991, McGraw-Hill, pp 351-369.
- Middleton RG, Sutphin MD: Pubectomy in urological surgery, *J Urol* 133:635, 1985.
- Miller EB, Schlossberg SM, Devine CJ: New incision for penile surgery, *J Urol* 150:79, 1993.