
27 Vaginal Sling Surgery for Stress Urinary Incontinence

*Sandip P. Vasavada, Raymond R. Rackley,
Howard Goldman, and Firouz Daneshgari*

INDICATIONS

Vaginal sling procedures are indicated in the management of stress urinary incontinence secondary to both intrinsic sphincteric deficiency (ISD) and urethral hypermobility resulting in anatomical incontinence. Although we currently do not attempt to distinguish between these two entities, it remains important that a procedure help both types of incontinence. Several long-term reviews have demonstrated that pubovaginal slings are among the most versatile and durable of the surgical approaches for stress incontinence. Still, the goal remains to create a procedure that supports and compresses the urethra during an increase in intra-abdominal pressure while minimizing the attendant morbidities of the approach. Recent efforts have concentrated on using a variety of materials to help create a hammock of support for the damaged sphincteric unit. These include autologous fascia, anterior vaginal wall, dura mater, bovine pericardium, xenograft tissues, a host of synthetic meshes, and allograft tissues. It is beyond the scope of this chapter to discuss all the pros and cons of each approach because many investigators have their individual preferences.

The latest refinements in technique seem to lead towards the division of the bladder neck and mid-urethral zones in regard to placement of the sling. Our increased understanding and comfort level with synthetics have allowed us to use a synthetic sling under minimal, if any, tension at primarily the mid-urethral location. Its exact mechanism of action is unclear, but European data at 7 yr appears to be quite good, with minimal morbidity. We describe the pubovaginal sling (bladder neck), the mid-urethral synthetic sling, our innovative minimally invasive sling, and new techniques utilizing a transobturator approach.

DIAGNOSIS

Most patients complain of leakage of urine with stress maneuvers, but those with poor sphincter function secondary to ISD may have gravitational leakage of urine with minimal if any stress. An important phenomenon to consider is that of precipitated micturition. This represents a condition whereby the patient senses urine in the proximal urethra most likely secondary to stress incontinence or lack of proper coaptation of the sphincter. This reflex translates to the sense of urge and frequency to void. Consequently, these patients may necessitate correction of the stress component to help the urge-related symptoms.

The diagnostic evaluation includes a history and physical exam and in certain circumstances may include cystoscopy and radiographic imaging. All cases of stress incontinence do not require urodynamic evaluation, yet in cases of mixed incontinence urodynamics may be quite valuable. Cystourethroscopy may demonstrate rigidity and scarring of the bladder neck and proximal urethra in cases of ISD, while in anatomical incontinence, the urethra will open and funnel with straining maneuvers. Similar findings may be evident with radiographic studies, including voiding cystourethrograms, videourodynamics, or even magnetic resonance imaging. Measurements of valsalva leak point pressure (VLPP) may be less than 60 cmH₂O in cases of ISD, whereas higher values are typical of anatomical stress incontinence.

The decision to perform a bladder neck sling vs a mid-urethral tension-free sling is based on the history (prior operations), the degree of urethral mobility, and in some cases urodynamic findings. In cases with primarily ISD where the urethra is relatively fixed (minimal mobility) or a very low VLPP is noted, we have found less than satisfactory results with mid-urethral

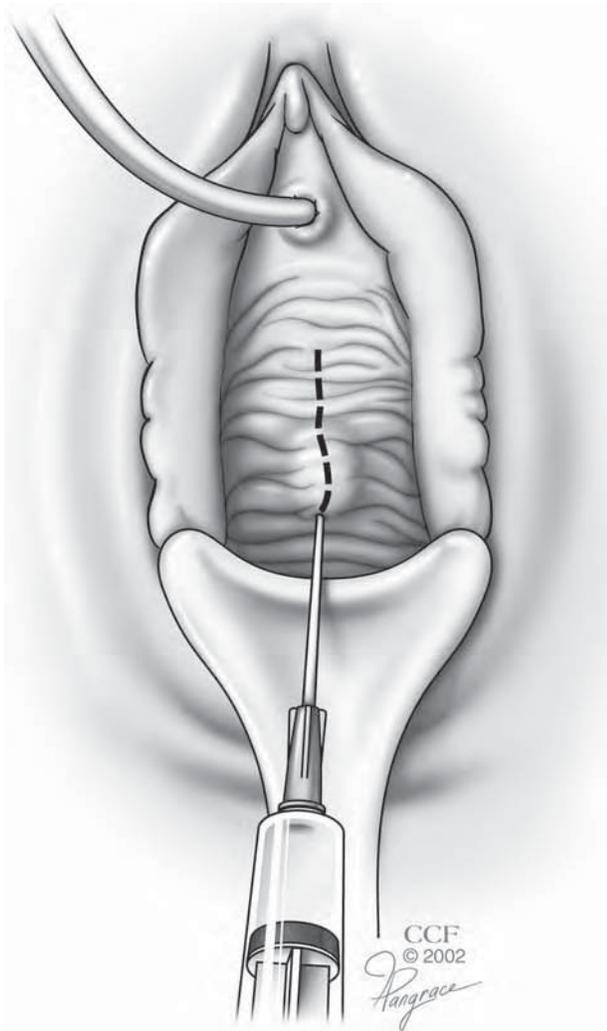


Fig. 27.1

slings and, accordingly, will recommend a formal pubovaginal (bladder neck) sling. This point is certainly debatable, and some proponents advocate mid-urethral slings for all patients. The majority of slings we currently perform are mid-urethral synthetic slings.

However, cases of severe, recurrent incontinence tend to require a more classic approach, and we will, therefore, place a bladder neck sling in those instances.

BLADDER NECK SLING

The patient is prepped and draped in the usual sterile fashion in the dorsal lithotomy position (Fig. 27.1). After a Foley catheter and/or suprapubic catheter is inserted, an Allis clamp applies upward traction to the anterior vaginal wall. Two oblique incisions or a midline incision is made in the anterior vaginal wall after it is infiltrated with normal saline or vasoactive substances.

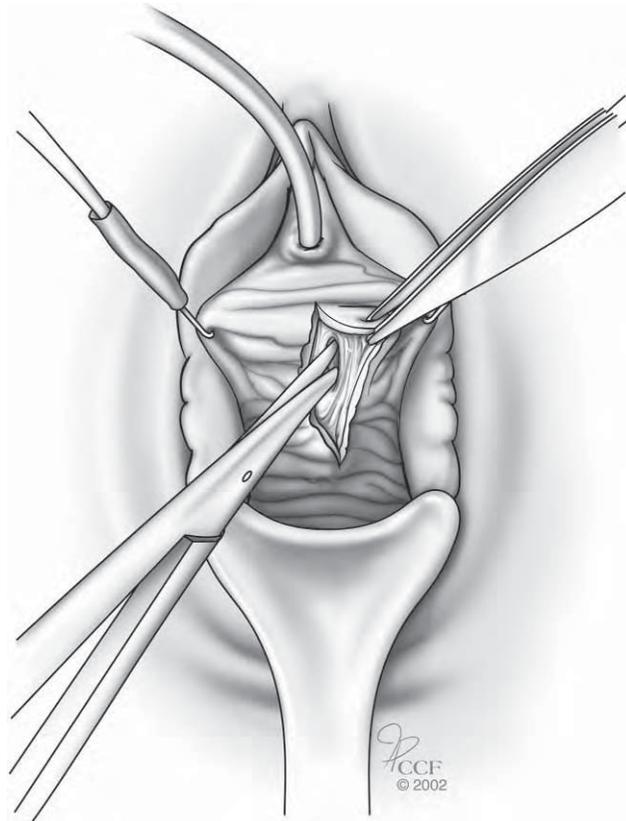


Fig. 27.2

The dissection is carried out laterally over the periurethral fascia toward the ipsilateral shoulder (Fig 27.2). A curved Mayo scissors is used to enter the retropubic space at the level of the bladder neck. It is important to enter the space at the bladder neck level rather than near the bladder base to avoid perforation into the bladder. The urethropelvic ligament is detached from the arcus tendineus. The adhesions are freed either bluntly or sharply.

A segment of autologous, xenograft or allograft fascia is isolated and placed on the back table for suture placement (Fig. 27.3). Typically, a 2 × 6 to 2 × 12 cm sling is used. Two separate O-polypropylene sutures are placed in the corners of the sling for transfer into the suprapubic incision.

Two small incisions for use of a stamey device or a single stab incision is made just above the pubic symphysis to allow placement of the Raz-Peyrera ligature carrier and allow it to be delivered under complete fingertip guidance into the vaginal incision (Fig. 27.4). The ends of the polypropylene sutures are passed into the ligature carrier and brought back up to the abdominal incision. Cystoscopy is performed to exclude the possibility of

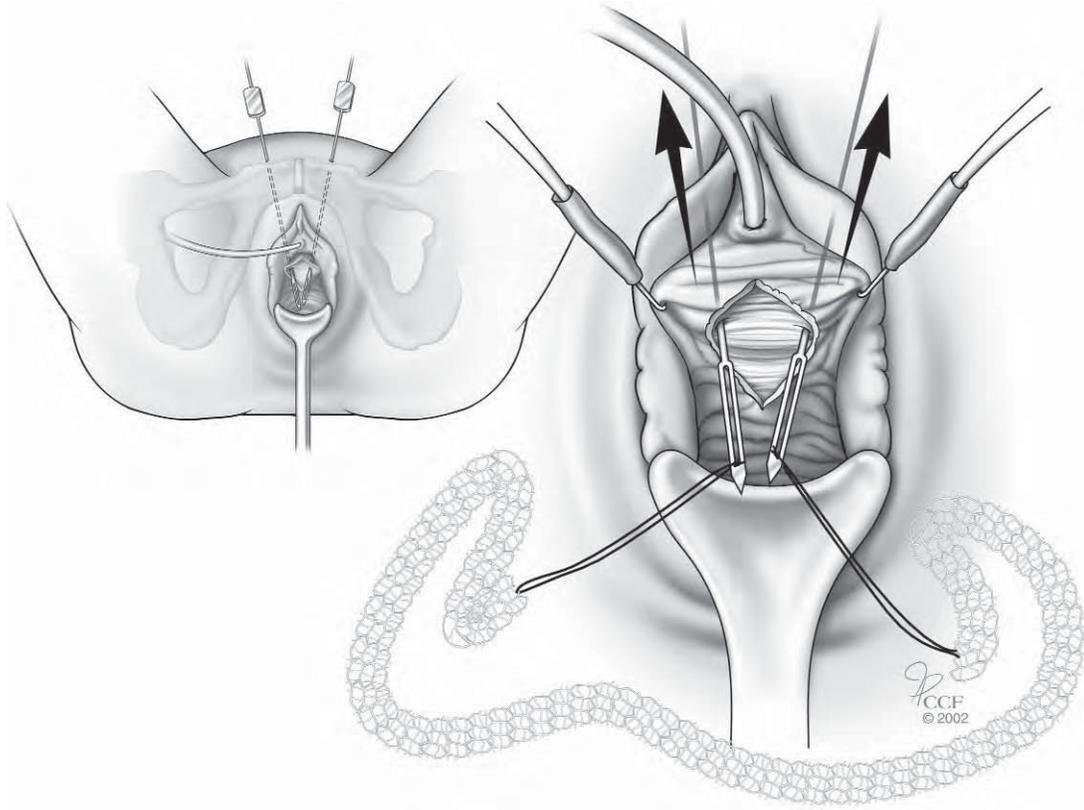


Fig. 27.3 and 4

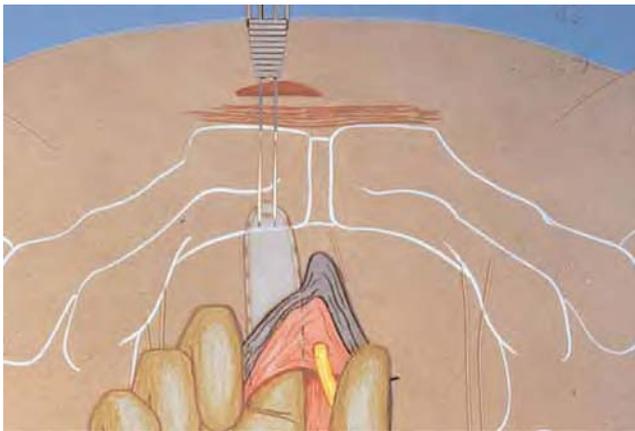


Fig. 27.5

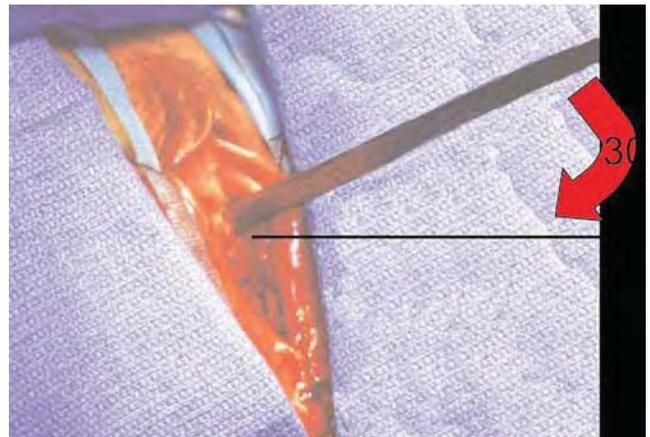


Fig. 27.6

intravesical suture transfer or bladder perforation and to confirm proper position to the suprapubic tube if placed.

The suspension sutures are brought into the suprapubic incision prior to tying (Fig. 27.5).

Proper tying of the sutures to avoid oversuspension of the bladder neck is performed with use of a cystoscope sheath (Fig. 27.6). It is placed in the urethra and bladder neck and not allowed to have greater than a 30° deflection

from the horizontal after the sutures are tied. This is similar to the normal urethrovesical angle as seen in voiding cystourethrography. Alternatively, an open Kelly clamp may be placed under the sling itself while the sutures are tied in order to prevent excess tension. The vaginal incisions and suprapubic incision are closed with absorbable sutures. A vaginal pack is placed for hemostasis.

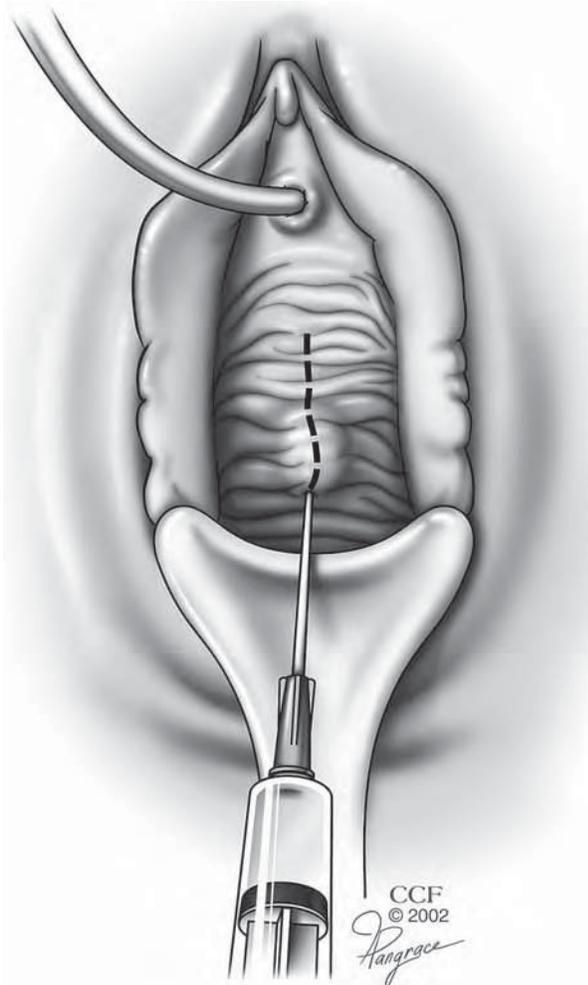


Fig. 27.7

MID-URETHRAL SLING (PERCUTANEOUS VAGINAL TAPE [PVT])

Obtain vaginal exposure via the dorsal lithotomy position (Fig. 27.7). Use a marking pen to draw the abdominal percutaneous puncture and mid-urethral vaginal wall incision sites. Place an 18 French urethral catheter into the bladder, and then place the catheter guide into the catheter and lift the catheter guide handle to bring the anterior vaginal wall closer to the surgical field for making the mid-urethral vaginal incision.

Vaginal Incision

Use a scalpel to make a midline anterior vaginal wall incision at the level of the mid-urethra (Figs. 27.8 and 27.9). Develop a pocket at the level of the mid-urethra between the vaginal wall and underlying urethral and paraurethral tissue by dissecting the vaginal wall tissue off laterally with the

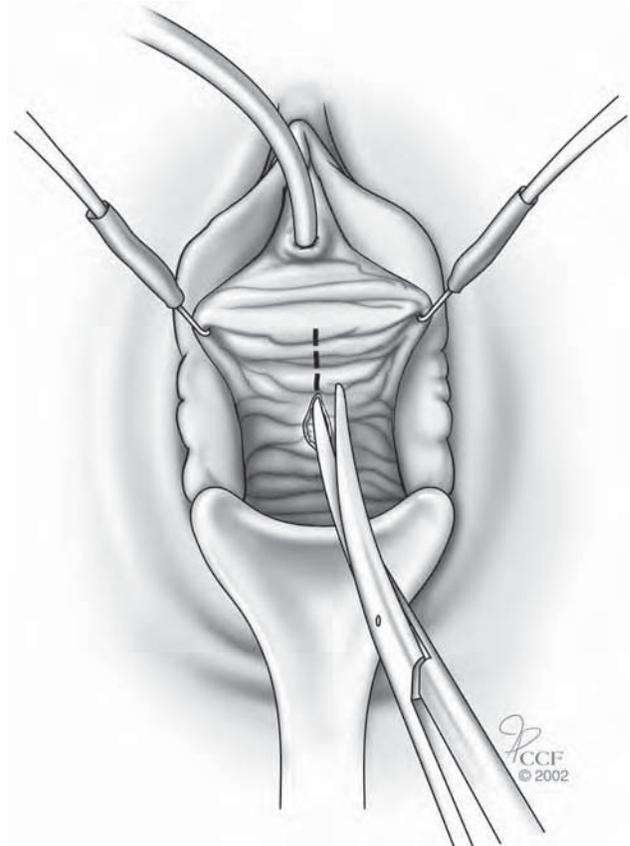


Fig. 27.8

curved Mayo scissors from the 1.5- to 2.0-cm midline incision to the lateral anterior vaginal sulcus.

When the pocket is completed laterally to the junction of the inferior aspect of the pubic ramus and the urethropelvic complex, one can proceed with passage of the needle carrier in either an antegrade or a retrograde fashion. This may be facilitated by use of a catheter guide through the urethral Foley catheter and displacement of the bladder neck away from the side of the carrier passage to decrease the likelihood of bladder perforation. Stabilize the urethral catheter by moving the catheter with guide to the side of interest (right side to start) to open up the mid-paraurethral space for passing through the percutaneous ligature carrier or vaginal trocar in the retropubic space (Fig. 27.10).

Whether passing the percutaneous ligature carrier antegrade or the vaginal trocars retrograde through the retropubic space, several issues are worth discussing. The bladder should be emptied of all fluid. The handle of the catheter with guide should be aligned on the same side of retropubic interest in order to move the bladder and urethra away from where the ligature carrier or trocar will pass. The patient's position on the operating table should result in placement of the symphysis pubis in a near-vertical

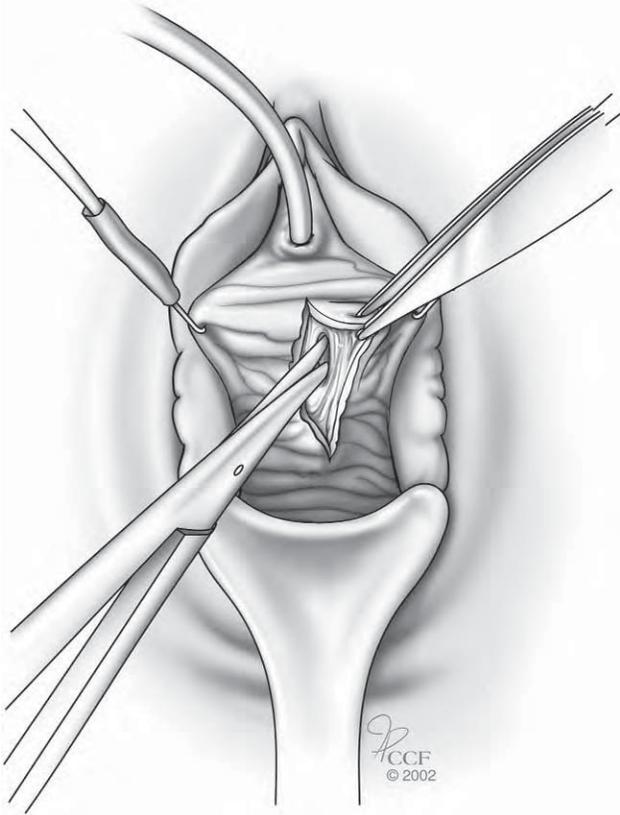


Fig. 27.9

plane; this usually means keeping the patient's torso and head in a level horizontal position or slightly up in a reverse Trendelenburg position.

Small 5-mm stab incisions are made through the abdominal skin overlying the top of the symphysis approx 2.5 cm from the midline on either side. This maneuver allows easier manipulation of the ligature carrier for the antegrade approach or vaginal trocars for the retrograde approach by avoiding any resistance at the skin level. It also provides a visual location for avoiding the perforation of the skin and rectus fascia too laterally because that may lead to the reported complication of ilioinguinal nerve or inferior epigastric vascular damage.

For the tension-free vaginal tape (TVT) procedure, place the vaginal trocars in the anterior vaginal wall pocket. After it is "seated" in the pocket (~2–3 cm), turn the trochar tip toward the ipsilateral shoulder and guide it under the pubis with the nondominant hand. By cradling the trochar with the nondominant hand and holding the handle with the dominant hand, the trochar is gently advanced in an upward fashion behind the posterior aspect of the symphysis and out through the abdominal stab wounds. Attention to staying on the

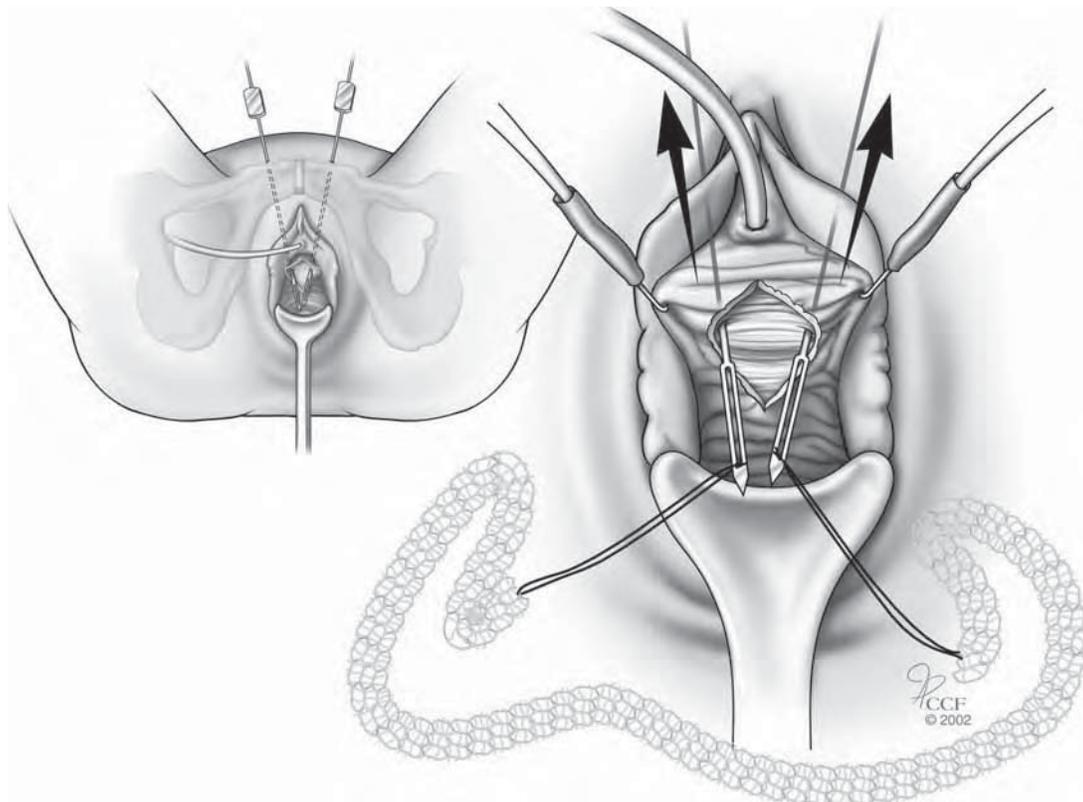


Fig. 27.10

posterior or back side of the symphysis is required to prevent entering the rectus muscle and fascia too far cephalad from its insertion on the symphysis. Removal of the weighted speculum from the vagina and cradling the curve of the trocar in the nondominant hand ensures total control of the device and helps to guide the device in a straight upward direction as pressure is applied with both hands.

When using the percutaneous ligature carrier, we fashion the free sling from a large sheet of polypropylene mesh (PML, Ethicon, Somerville, NJ) to approximately the same size as supplied in the TVT kit (1.2 cm wide \times 30 cm long) (Fig. 27.4A). Using 0-Ethibond suture, we simply weave suspending sutures into each end of the prolene sling for placement into the ligature carrier. For passing the ligature carrier in an antegrade fashion, begin by placement of the carrier through the previously marked skin sites. Be sure to stay in contact with the symphysis as the ligature carrier is passed down in an antegrade fashion to the urethropelvic complex at the location described above for locating the insertion of the vaginal trocars for the TVT procedure. To guide the ligature carrier into the vagina, the periurethral pocket must be developed further toward the arcus tendineus to allow entrance of one's finger to guide the carrier out and into the vagina. The suspending sutures of the tape are then threaded into the carrier and retrieved at the abdominal skin site (Fig. 27.4B).

Cystoscopy is performed to inspect for foreign body material within the urinary tract, and it is best to do this inspection when the ligature carrier for PVT or vaginal trocar for TVT is still within the retropubic space. Inspection must take place with a full bladder and use of the 70° lens. A clue that a perforation of the bladder has taken place is the finding of cystoscopic fluid extravasation around the trochar or the sling material at the level of the abdominal skin. If the ligature carrier or vaginal trocar device has been placed through the bladder, simply extract the device and try again. Most surgeons would leave a urethral catheter for several extra days to ensure bladder healing of the injury in hopes of avoiding any chance that postoperative urinary retention would lead to urinary extravasation. Unlike bladder perforations, trocar injury of the urethra rarely occurs. If urethral perforation does occur, terminate the procedure and return at a later date to repeat the surgery. Leave a Foley catheter in for at least 10 d.

Positioning the Sling

Having completed the procedure on both sides, the next part of the procedure is to set the mid-urethral sling

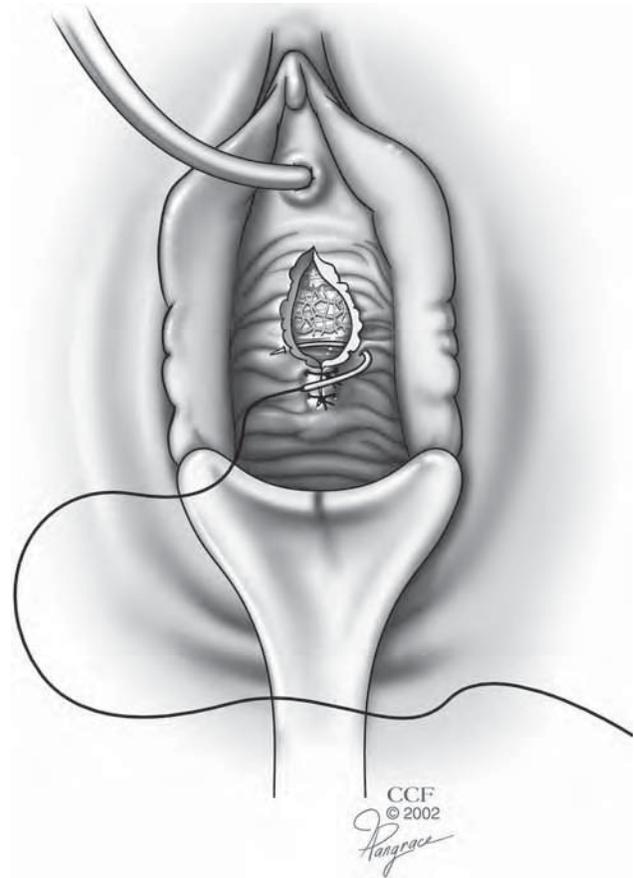


Fig. 27.11

to stabilize, not suspend, the urethra (Figs. 27.11 and 27.12). For a TVT, the trocars are cut from the attached tape covered by a plastic sheath. The plastic sheath theoretically protects the sling material from potential intraoperative contamination and provides for a smooth movement of the sling through the surrounding tissues. The plastic sheath is separated at the midpoint of the sling so that it can be removed once the sling is in the correct position, as described below. Even after removal of the plastic sheath, the TVT tape can be moved, albeit with a fair degree of resistance.

Sling stabilization of the urethra should ensure that at least 30–45° of urethra hypermobility exists as tested by urethral manipulation with the cystoscopic sheath or catheter with guide. We prefer to place the tips of a curved Mayo scissor or a 10 French Heger dilator between the urethra and the sling to ensure ample looseness of the sling. For procedures performed under local anesthesia and sedation or spinal anesthesia, some surgeons prefer to ask the patient to cough or valsalva in order to witness a urinary leak with the sling in place to ensure that the urethra is not obstructed before closing the vaginal incision. This intraoperative cough/stress test for all patients undergoing the

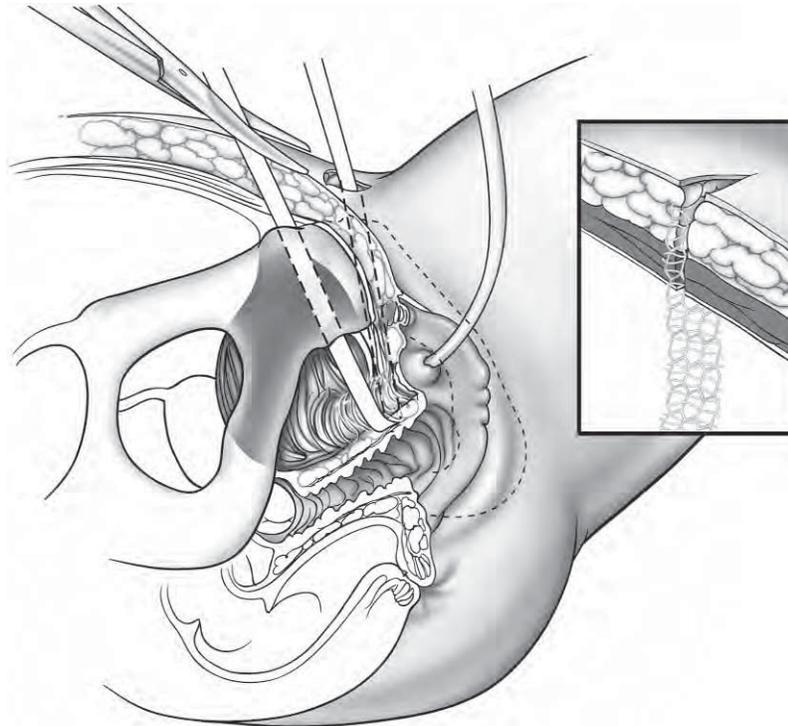


Fig. 27.12

procedure does not make physiological sense because many patients with documented stress urinary incontinence never leak in the supine or lithotomy position.

Once proper positioning of the sling is achieved, the plastic sheath around the TVT tape is removed. Slight countertraction should be applied to the instrument between the mesh and urethra to avoid unwanted tensioning as the sheath is pulled off. The remaining excess sling material at the abdominal skin site for both TVT and PVT is cut below the level of the skin. The vaginal incision site is irrigated with copious amounts of an antibiotic or iodine solution and the incision closed with a running absorbable suture. The skin edges of the abdominal puncture site are approximated with skin adhesive closures. A vaginal pack and urethral catheter are placed for patients remaining in the hospital overnight; otherwise, the bladder is drained, and a urethral catheter and vaginal pack are not usually placed in patients planned for same-day discharge from the recovery room.

TRANSOBTURATOR SLING PLACEMENT

Recently, transobturator passage of synthetic slings using specially designed instruments has been introduced. Theoretically, this may be a safer approach in that it should avoid the possibility of bowel and other

intra-abdominal organ injury. Early outcome data seem to match that reported for the other mid-urethral slings. Two techniques — in-out (passing the device from the vagina out) and out-in (passing the device from the thigh area inward to the vagina) — will be described here. A number of commercial devices are available for the out-in approach. Currently, only one kit is available for the in-out approach (Gynecare, Sommerville, NJ), although several more are in development.

Technique

As with other sling procedures, the patient is placed in the dorsolithotomy position. Access to the obturator foramen is easier with the thighs at a right angle to the pelvis. The area is prepped and draped, taking care to include the inner thighs in the area prepped.

A 1- to 2-cm incision is made in the vaginal wall over the mid-urethra about 1 cm proximal to the meatus (Figs. 27.13 and 27.14). Sites are marked on the inner thighs approx 2 cm lateral to the thigh crease and 2 cm anterior to the level of the urethral meatus. Stab wounds are made at these thigh sites.

OUT-IN TECHNIQUE

A pocket is developed periurethrally to the level of the internal obturator membrane (Fig. 27.15). The medial rim

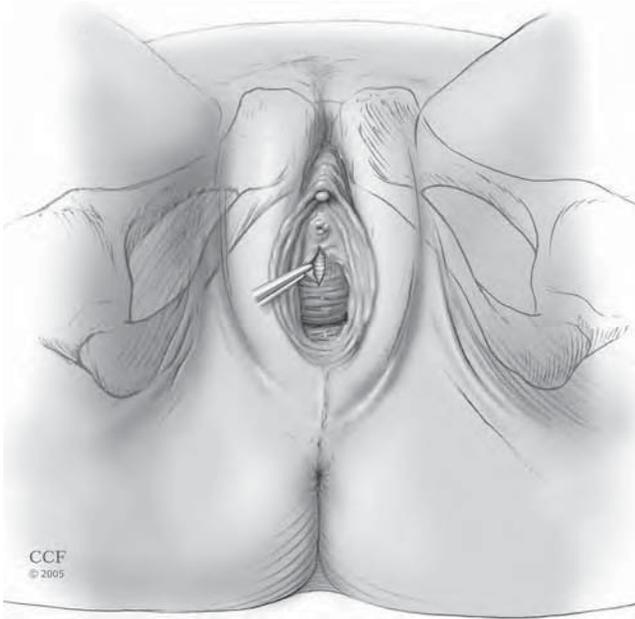


Fig. 27.13

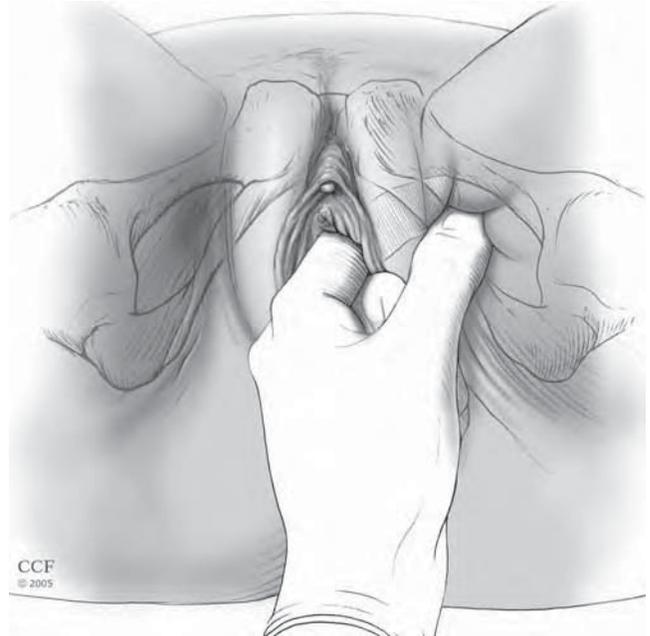


Fig. 27.15

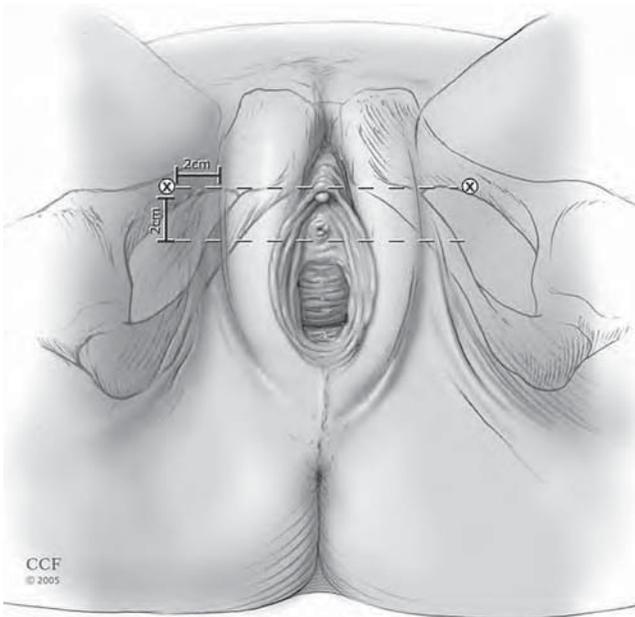


Fig. 27.14

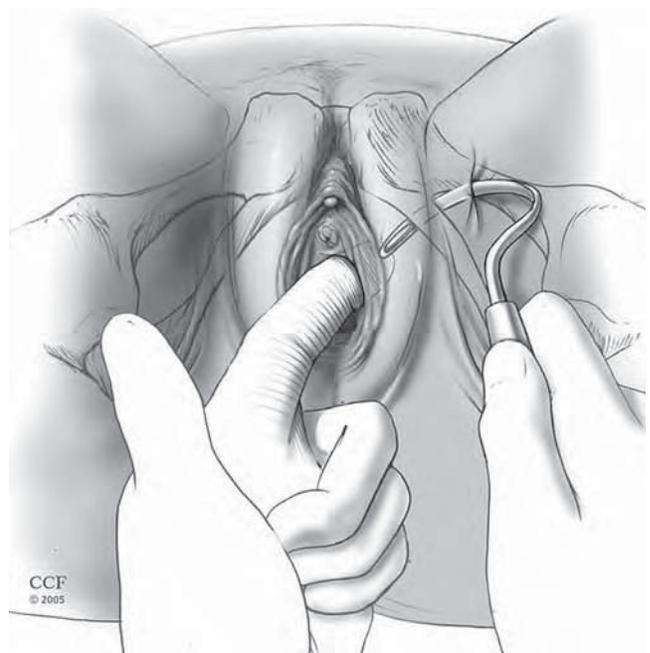


Fig. 27.16

of the obturator foramen is pinched between a vaginal finger and one on the inner thigh near the stab wound at the premarked site.

A curved device is passed from the inner thigh site, through skin, muscle, and fascia onto the vaginal finger and then rotated into the vagina (Fig. 27.16). Cystoscopy should be done at this point to exclude any bladder or urethral perforation.

The sling material is attached to the curved instrument and brought out to the thigh area (Fig. 27.17). This is then repeated on the contralateral side.

IN-OUT TECHNIQUE

Using fine scissors, a tunnel is developed under the vaginal wall to the level of the internal obturator fascia by dissecting at a 45° angle to the vertical plane

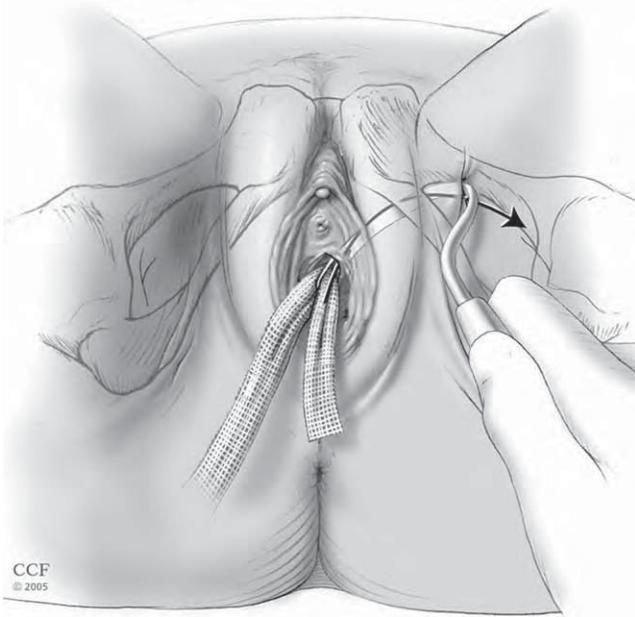


Fig. 27.17

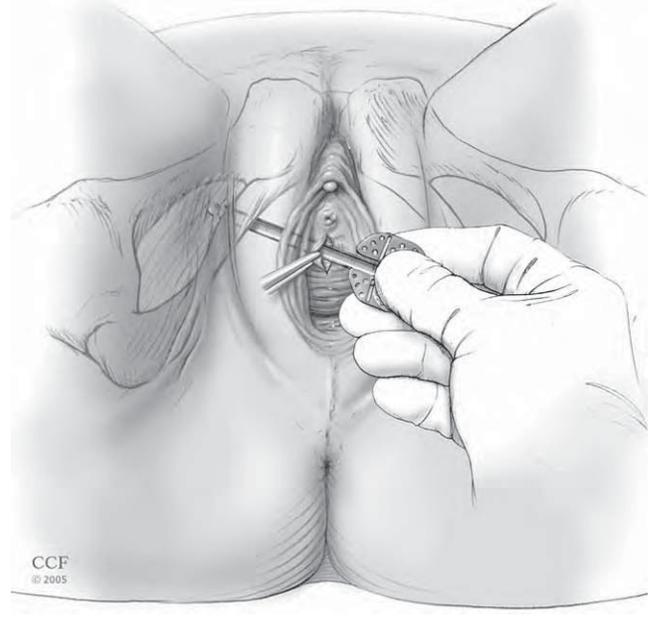


Fig. 27.19

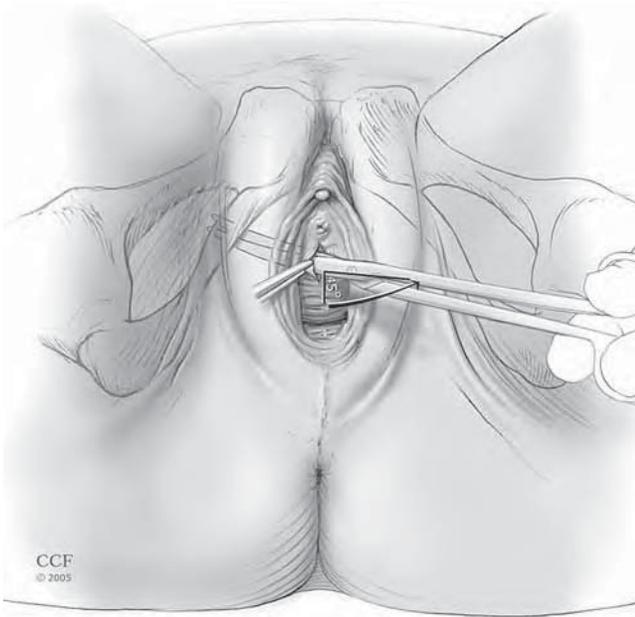


Fig. 27.18

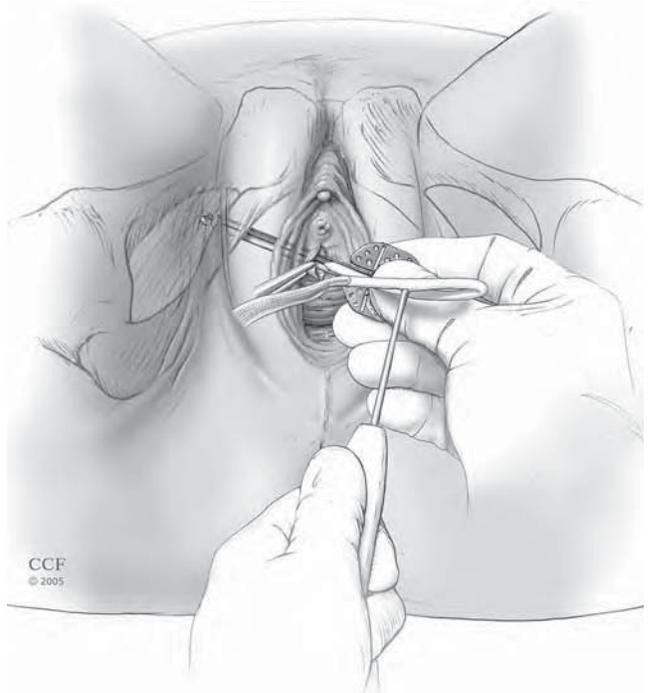


Fig. 27.20

aiming slightly upward (Fig. 27.18). The fascia is then perforated.

A specialized guide is placed in the tunnel and carefully passed through the fascia at the site of perforation (Fig. 27.19).

A specialized spiral instrument with sling attached is passed via the groove of the guide through the foramen and rotated while bringing the handle of the device into a

vertical position and the tip out through the premade inner thigh stab wound (Figs. 27.20–27.22).

The sling is pulled through the thigh incision while the spiral device is backed out (Fig. 27.23). This is all repeated on the contralateral side. Because one is always aiming away from the urethra and bladder, many feel cystoscopy is unnecessary in the in–out approach.

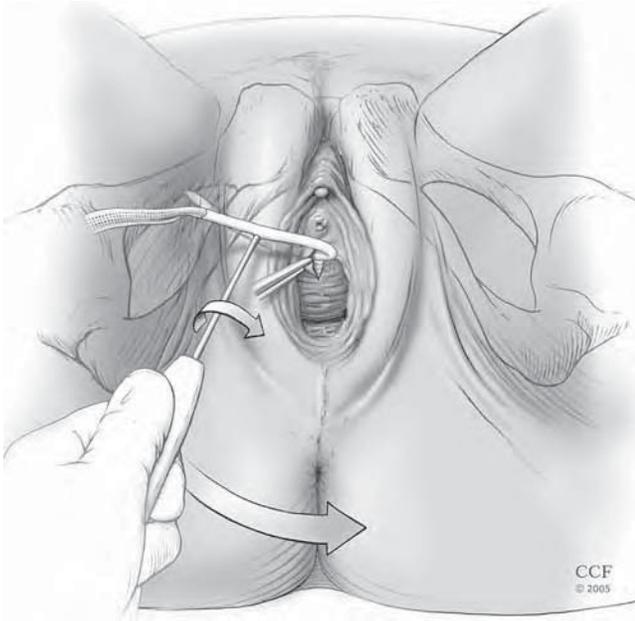


Fig. 27.21

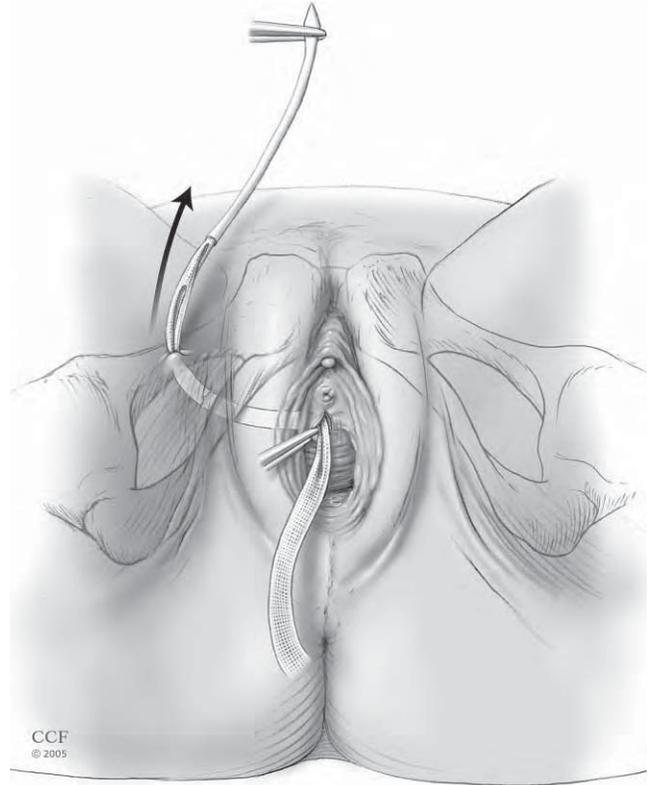


Fig. 27.23

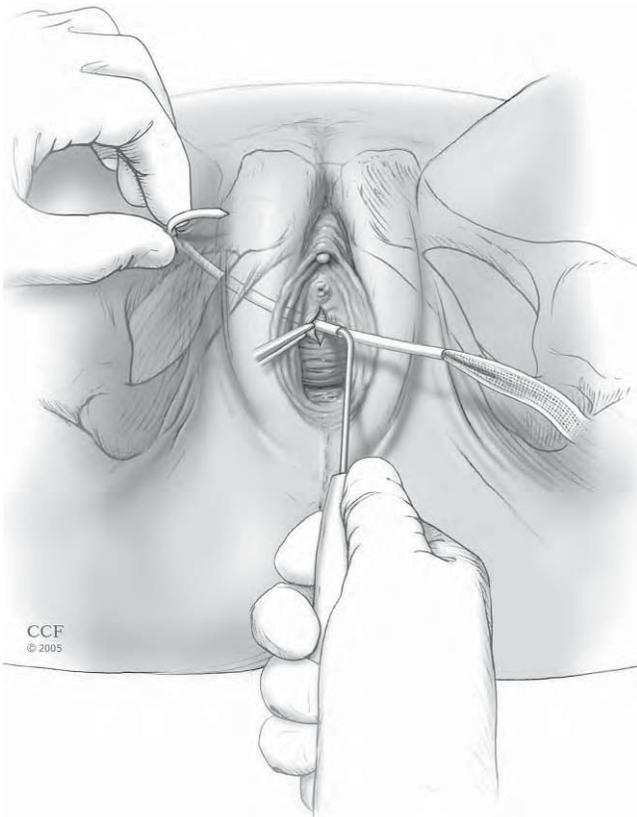


Fig. 27.22

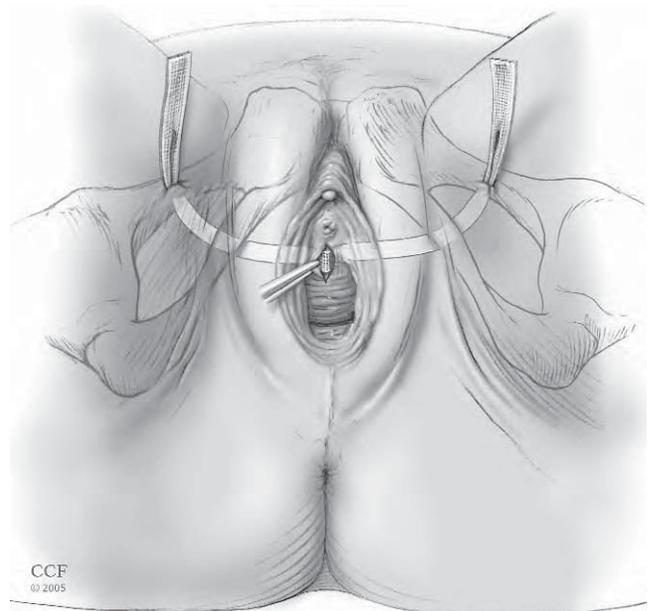


Fig. 27.24

If a plastic sheath is present, it is pulled off, making sure to leave an instrument between the mesh and urethra such that a small air loop is present — the urethra should not be under any tension (Fig. 27.24). All incisions

are irrigated, the vaginal wall incision is closed with absorbable suture, excess mesh in the thigh is excised, and the thigh incisions can be closed with a simple chronic stitch or a skin sealant.

Postoperative Care

Many surgeons who perform the TVT or PVT procedure under local anesthesia with sedation without concomitant prolapse repairs send patients home the same day without a catheter if a voiding trial is successfully completed. If a patient cannot void immediately after the procedure in the recovery room or the bladder was perforated during the procedure, catheter drainage for a brief period of 1–2 d may be required and a voiding trial completed as an outpatient.

POSTOPERATIVE COMPLICATIONS

Bleeding, either intraoperatively or postoperatively, can be dealt with using a few simple maneuvers. Most mild bleeding will stop once the sling material is pulled into place. If there is still mild bleeding at the end of the case, it will often subside simply with bed rest and the prolonged use of a vaginal pack. In cases of more severe bleeding, one may require placement of a Foley catheter with 60–80 mL in the balloon and inflate it posterior to the packing to assist in hemostasis. Persistent bleeding may require surgical exploration, but this is a rare occurrence and has not happened in our experience.

Postoperative pain may occur in the suture sites where the suspension sutures are located either suprapubically in anterior vaginal wall sling cases or in the area of the pubic bone in bone-anchor techniques. The suspending prolene sutures must not be tied over a mobile portion of the rectus muscle so as to prevent the possibility of nerve entrapment.

Urinary retention can be problematic to deal with. Most patients will void shortly after the catheters are removed or, in the case of suprapubic tube use, with low residuals. It is the experience of the authors that the

degree of postoperative bladder dysfunction (urge-type symptoms or period of urinary retention after voiding) is longer with patients undergoing bladder neck slings as they are placed with some degree of tension/support. The majority of patients undergoing mid-urethral tension-free slings void spontaneously in the recovery room and may be discharged home without catheter drainage. Some patients may develop prolonged bouts of retention or carry excessively high residuals. They may complain of irritative and obstructive voiding symptoms, and these should be addressed, as they may or may not be secondary to retention of urine. There exists no clear-cut method of determining outlet obstruction as the cause for these symptoms, but the temporal relation between surgery and the onset of these irritative or obstructive symptoms is a good clue that iatrogenic obstruction has occurred. We have divided the management of obstructive symptoms into the two surgical categories (after bladder neck or mid-urethral sling placements). Because mid-urethral sling placements are typically done with synthetic materials, we prefer to simply incise the sling early in the postoperative period (within several days to weeks) to avoid prolonged voiding problems. Bladder neck sling patients may take a longer time to achieve normal voiding and, accordingly, are given a longer period of time before intervention is contemplated. Voiding cystourethrography and physical exam may confirm a hypersuspended urethra and pressure flow analyses may demonstrate high pressures and low flow rates, but this is variable. Management consists of early institution of intermittent self-catheterization with a prudent trial of waiting. If spontaneous voiding does not resume within 3 mo, one may proceed with transection of the sling, and most will void after this maneuver. Only rarely is formal transvaginal urethrolisis required.