URETHRAL CATHETERIZATION

Indications

- Urethral catheterization is performed for diagnosis and treatment of urologic disease.
- Many types of catheters are available for urethral catheterization, and the choice of a specific type of catheter depends on the reason for catheterization.

Diagnostic indications

1. For collection of urine in females for culture to avoid contamination by skin flora. This practice is usually not necessary in males because clean-catch specimens can be obtained without contamination by skin flora.
2. Measurement of the postvoid residual urine (if ultrasound not available)
3. Instillation of contrast agents into the bladder and urethra for cystourethrography
4. For achieving urodynamic studies to assess bladder and urethral function.
5. Collecting the urine for measuring the urine output as in patient in shock state or patient with renal impairment (this indication is both diagnostic and therapeutic)
6. Differentiating urine retention from anuria in postoperative patient passing no urine

Therapeutic indications

1. Administration of intravesical therapy such as with bacillus Calmette-Guérin (BCG) or mitomycin-C for bladder cancer.
2. Relief of infravesical obstruction (one of the most common therapeutic indications for urethral catheterization). Infravesical obstruction can occur as a result of prostatic enlargement, blood clots within the bladder, postsurgical strictures, and urethral inflammatory processes.
3. To drain the bladder after surgical procedures involving the lower urinary tract
4. To accurately monitor urinary output in both medical and surgical fields
5. Managing neurogenic bladder dysfunction when the bladder functions as a storage organ but no longer empties normally. In this case clean intermittent catheterization performed by the patient or an assistant.
6. In patient with urinary incontinence (although it is preferable to manage these patients with clean intermittent catheterization or a condom device for urine collection, if possible, because of the risk of infection with long-term indwelling urethral catheters).
7. Used as stents after surgery to allow healing of an anastomosis or incision involving the bladder neck or urethra.

Types of Catheters (Figure 1)

Catheter size is usually referred to using the French (Fr) scale (circumference is in millimeters), in which 1 Fr = 0.33 mm in diameter.

- For conversion from one scale to the other, it is easier to remember that each millimeter in diameter is approximately 3 Fr; thus, a No. 18 Fr catheter is about 6 mm in diameter.
- Catheter sizes refer to the outside circumference of the catheter, not the luminal diameter.
- Thus, a No. 20 Fr catheter may have a different luminal size for urinary drainage, depending on the type of material used for construction and the number of lumens within the catheter.
- **Straight rubber or latex catheters (see Fig. 1- A to C)**, often referred to as Robinson catheters, are most commonly used for one-time catheterizations (straight catheterization). These catheters are also available with multiple eyes, making them ideal for irrigating the bladder free of clots.
- Although these catheters can be left in place for bladder drainage by taping them to the penis, they are not as well tolerated as other catheter materials (e.g., silicone) because they have a tendency to become encrusted with urinary precipitates.
- Shorter, straight catheters are available for female patients

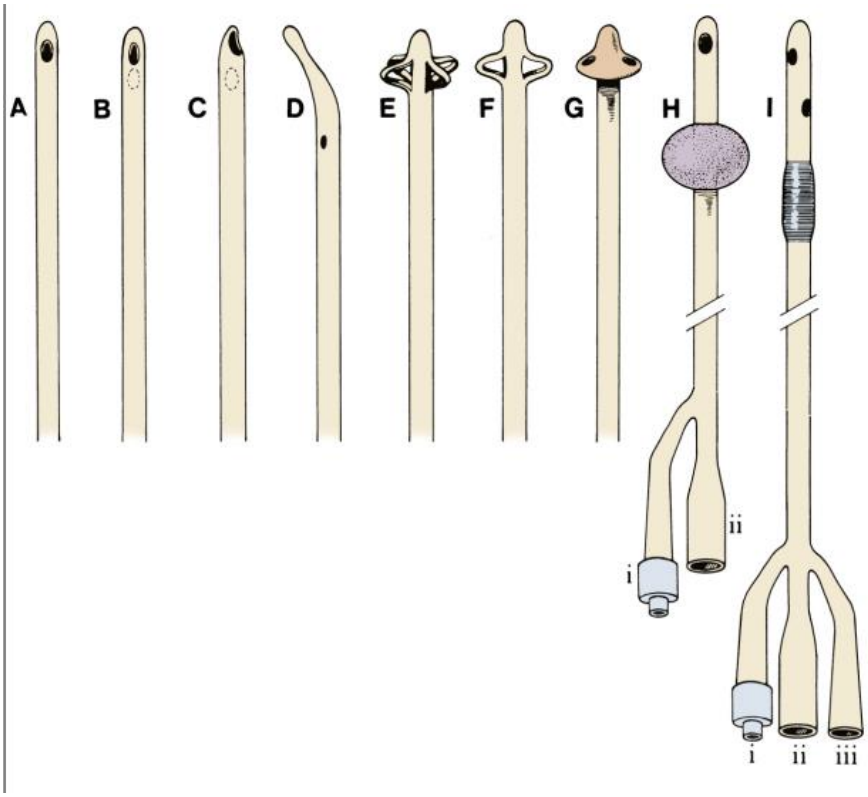

Figure 1 Types of large-diameter catheters.

A. Conical tip urethral catheter, one eye.

B. Robinson urethral catheter.

C. Whistle-tip urethral catheter.

D. Coudé hollow olive-tip catheter.

E. Malecot self-retaining, four-wing urethral catheter.

F. Malecot self-retaining, two-wing catheter.

G. Pezzer self-retaining drain, open-end head, used for cystotomy drainage.

H. Foley-type balloon catheter, one limb of distal end for balloon inflation (i), one for drainage (ii).

I. Foley-type, three-way balloon catheter, one limb of distal end for balloon inflation (i), one for drainage (ii), and one to infuse irrigating solution to prevent clot retention within the bladder (iii).

Catheters with a curved tip

- **Catheters with a curved tip (e.g., coudé catheters)** are specifically designed to help bypass areas of the male urethra that are difficult to negotiate with a straight catheter.
- The normal S-shaped male bulbar urethra and the prostatic urethra associated with an enlarged prostate can be difficult to bypass with a straight catheter because of the urethral angle associated with the former and bladder neck elevation associated with the latter.
- In addition, coudé catheters can be used to irrigate out bladder clots by cutting additional holes in the end of the catheter if a straight catheter cannot be passed into the bladder.

Self-retaining catheter

- **Self-retaining catheter, such as the Pezzer and Malecot catheters**, are shaped in such a way that after placement at open surgery the catheter configuration maintains the catheter within a hollow viscus. For insertion, the wings of the catheter (i.e., retention mechanism) are flattened by stretching the catheter with a wire placed inside the catheter or stretching the catheter from outside with a clamp.
- The advantages of these catheters include the excellent urinary drainage afforded by the single lumen (no balloon mechanism) and the tip design, which make them ideal for use as cystostomy or nephrostomy tubes.

Foley-type catheters

- **Foley-type catheters** are most often used for long-term urethral catheterization. As such, they have a balloon mechanism at the distal end that, when inflated, keeps the catheter from sliding past the bladder neck.
- Two-way and three-way Foley catheters are available in multiple sizes.
- Two-way catheters have a small lumen for inflating the balloon mechanism and a larger lumen for urinary drainage.
- Three-way catheters have a small lumen for inflating the balloon mechanism, a lumen for instilling irrigant, and a larger lumen for bladder drainage.
- Two-way catheters are used when an indwelling catheter for urinary drainage is indicated.
- Three-way catheters are used when bladder irrigation and drainage are necessary, as, for example, in a patient with bladder hemorrhage at risk for forming clots within the bladder that may lead to obstruction of the bladder outlet.

Note

1. Catheters without a lumen for balloon inflation (e.g., Malecot) have a larger luminal size for bladder drainage than do Foley catheters of the same outer circumference.
2. Likewise, for a given outer circumference, two-way catheters (with a balloon port) have a larger luminal size for urinary drainage than three-way catheters (with a balloon port and fluid instillation port).

Patient Preparation

As with all procedures, the patient should be informed of the reason for catheterization and what to expect in terms of discomfort. Because catheterization is the instrumentation of a potentially sterile tract, it is essential to prepare and drape the urethra and surrounding area as for a surgical procedure. In the male, retrograde injection of 10 to 15 mL of a water-soluble lubricant-anesthetic (e.g., 2% lidocaine hydrochloride jelly) and placement of a urethral clamp for 5 to 10 minutes to allow the anesthetic to contact the mucosal surfaces are recommended before any urethral instrumentation. In the female, the lubricant-anesthetic can be placed directly on the catheter or a cotton-tipped applicator coated with lubricant-anesthetic can be placed in the urethra before catheterization.

Technique

In the male patient, the penis is placed on stretch perpendicular to the body (pointing slightly toward the umbilicus) without compressing the urethra and then the catheter is placed in the urethral meatus by holding the catheter at the tip. Gentle advancement of the catheter causes the least amount of discomfort, and, with experience, one can feel the natural resistance offered as the catheter traverses the external sphincter. As one approaches the bulbomembranous urethra (i.e., level of external sphincter), asking the patient to take slow, deep breaths will help relax the patient and often allow easier catheter passage. If resistance is met, one should not attempt forceful catheter insertion but should apply continuous, gentle pressure and ascertain at what level the potential obstruction exists.

In the female patient, shorter catheters are available for one-time catheterizations. After spreading the labia, one can usually identify the urethral meatus easily, and the catheter is placed gently into the bladder. **If long-term catheterization is anticipated** (>1 wk), it is advisable to use a Foley catheter made of the most biocompatible material. Catheters made of silicone are, in general, better tolerated over the long-term than those made of materials such as latex and polyurethane. In addition, one should choose the smallest urethral catheter that will accomplish the purpose of catheterization, because urethral secretions drain more easily around smaller catheters. Allowing egress of urethral secretions lessens the chance of a clinically significant urethral inflammatory response. In the adult, catheters of No. 16 to 18 Fr are most often chosen for routine bladder drainage; in the pediatric age group, it is often necessary to use feeding tubes of No. 3 to 5 Fr.

Difficult Catheterizations

Difficulty in catheterizing the male patient can result from a variety of causes:

1. Inability to pass the S-shaped bulbar urethra
2. Resistance to catheter passage at the bulbomembranous urethra
3. Tightening of the external sphincter are common.
4. Urethral strictures,
5. Prostatic enlargement,
6. Postsurgical bladder neck contractures

These problems are usually easily overcome with a coudé catheter to negotiate the bulb or with slow, gentle pressure to bypass the external sphincter.

- If one encounters difficulty passing a catheter, it is wise to have a logical stepwise plan to maximize the chances of success in overcoming the difficulty (look to the figure below).
- Often, the urologic history will give a clue to the most likely problem preventing catheterization.
- For example, the patient with a history of gonococcal urethritis in whom catheterization presents a problem is likely to have a pendulous urethral stricture whereas the patient who has undergone an open prostatectomy may have a bladder neck contracture.
- The history, together with the clinical observations from the initial unsuccessful urethral manipulation, should give the physician a clue to the problem.

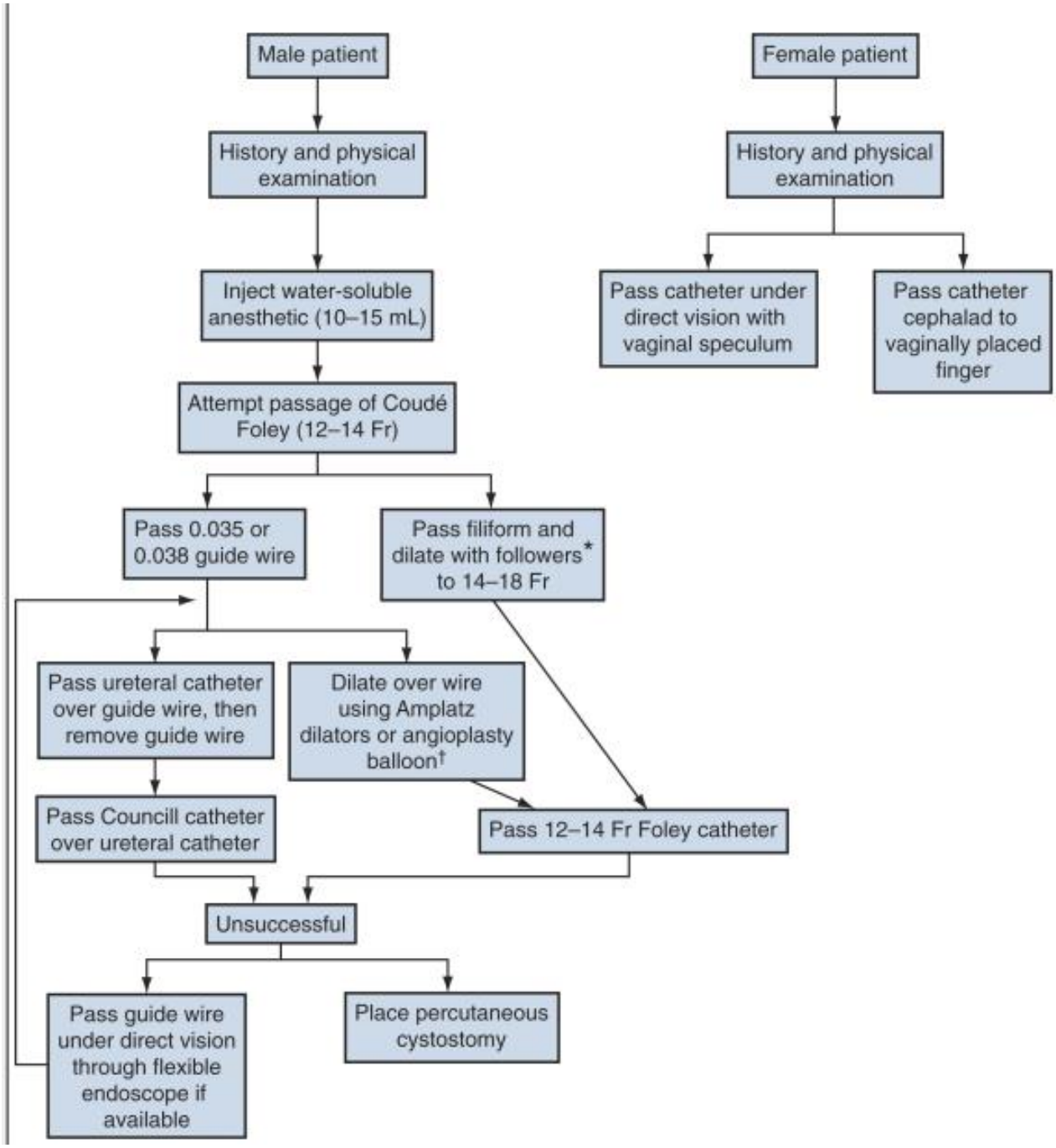

Figure 2 Suggested algorithm for approaching the difficult-to-catheterize patient. *Arrows* indicate the next reasonable step; *horizontal lines* indicate that either option is reasonable.

- If difficulty in initial catheterization is encountered, it is advisable to inject in a retrograde manner 10 to 15 mL of a water-soluble lubricant-anesthetic into the urethra.
- If the catheter is believed to have passed the bulbomembranous urethra and the problem is thought to be a bladder neck contracture, it is helpful to use a latex coudé catheter starting at No. 12 Fr, which will often bypass the obstruction.
- The coudé tip may allow negotiation of the lip, which is sometimes present at the 6 o'clock bladder neck position in men with bladder neck contractures. The curved tip of the catheter must be maintained in the same position during catheter passage, with the 12 o'clock position (curved tip pointing up) marked at the connector end of the catheter.
- If coudé catheterization is not successful, it is sometimes possible to pass a guide wire with a floppy tip into the bladder. Next, an open-ended ureteral catheter is passed over the guide wire, and then a urethral catheter with an end hole (Councill catheter) can be passed over the guide wire and ureteral catheter (Fig. 3) (a No. 6 Fr ureteral catheter will pass over a 0.038-inch guide wire; a No. 5 Fr will pass over a 0.035-inch guide wire).
- Any catheter can be used as a Councill catheter if a hole punch is available so that an opening can be made in the catheter tip for insertion of the guide wire (see Fig. 3).
- A filiform catheter (Fig. 4) may negotiate the bladder neck if guide wire placement is unsuccessful. The filiform catheter can then be followed gently with a small follower screwed to the filiform. If more than gentle pressure is necessary when attempting to pass any instrument into the bladder, the procedure should be aborted before urethral trauma occurs.

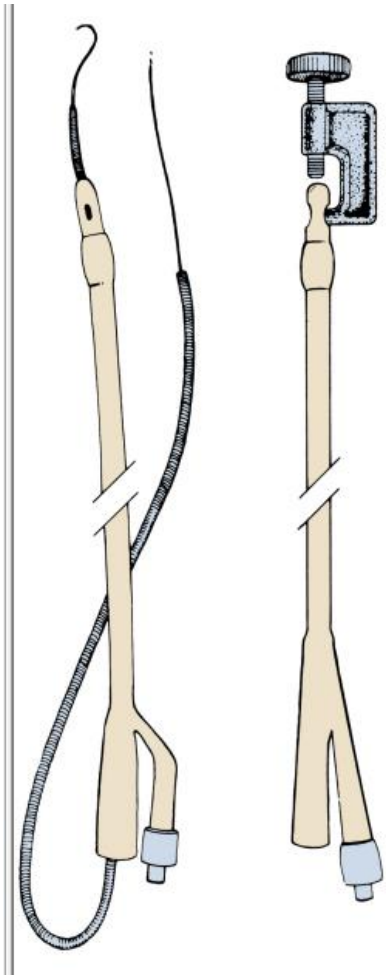

Figure 3 Left, Councill catheter—with end hole—passed over a guide wire and ureteral catheter. **Right,** Creation of an end hole in a Foley-type catheter with a hole punch

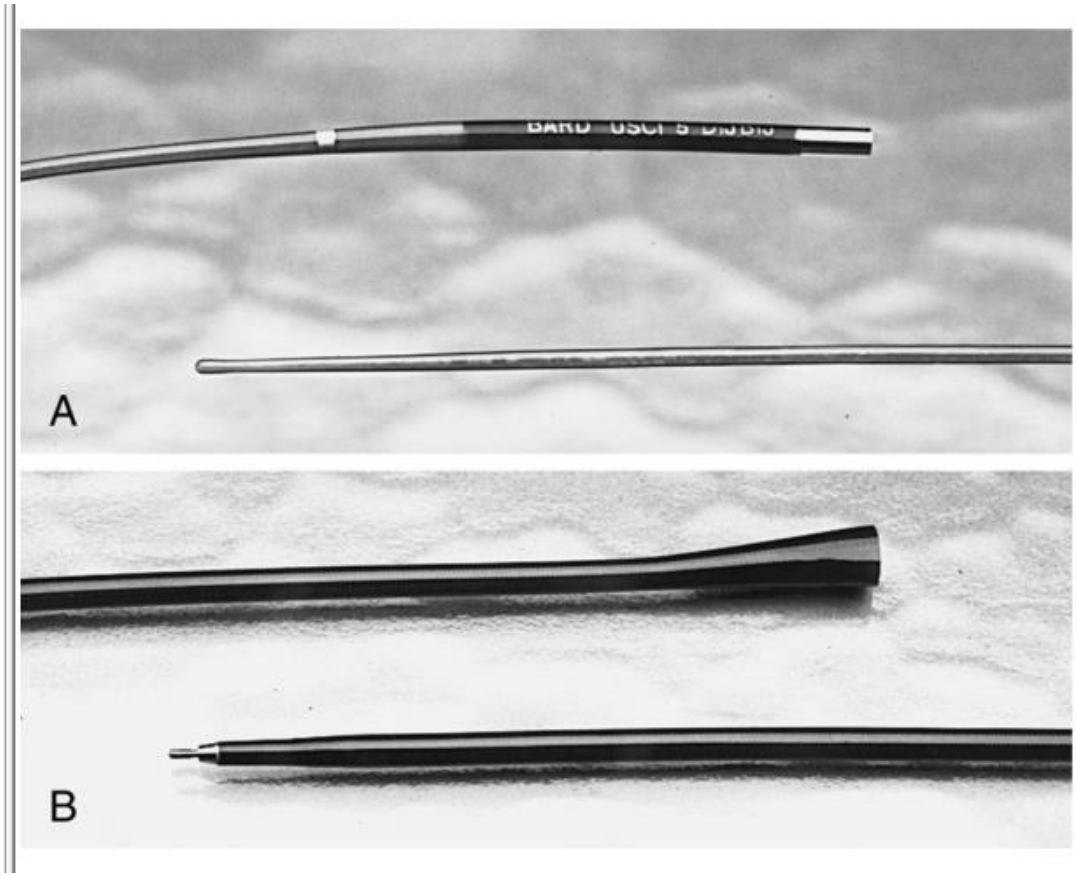

Figure 4 **A,** Filiform with grooved metal end to accept follower. **B,** Follower with metal tip designed to screw onto filiform

If available, a flexible cystoscope can be passed to the level of obstruction and a guide wire placed in the bladder under direct vision. The guide wire can be used to introduce a ureteral catheter, as described previously, or to guide passage of Amplatz semirigid dilators for dilatation of a urethral stricture

When it is not possible to gently bypass a bladder neck contracture using the approaches previously described, placement of a cystostomy tube is preferable, because continued attempts at catheterization will cause urethral trauma. At a later time, investigation (radiographic and/or endoscopic) can be performed to define the nature of the obstruction.

Percutaneous cystostomy (Fig. 5).

Percutaneous puncture of the bladder is accomplished with the obturator and catheter assembled; withdrawal of the obturator leaves the catheter indwelling within the bladder.

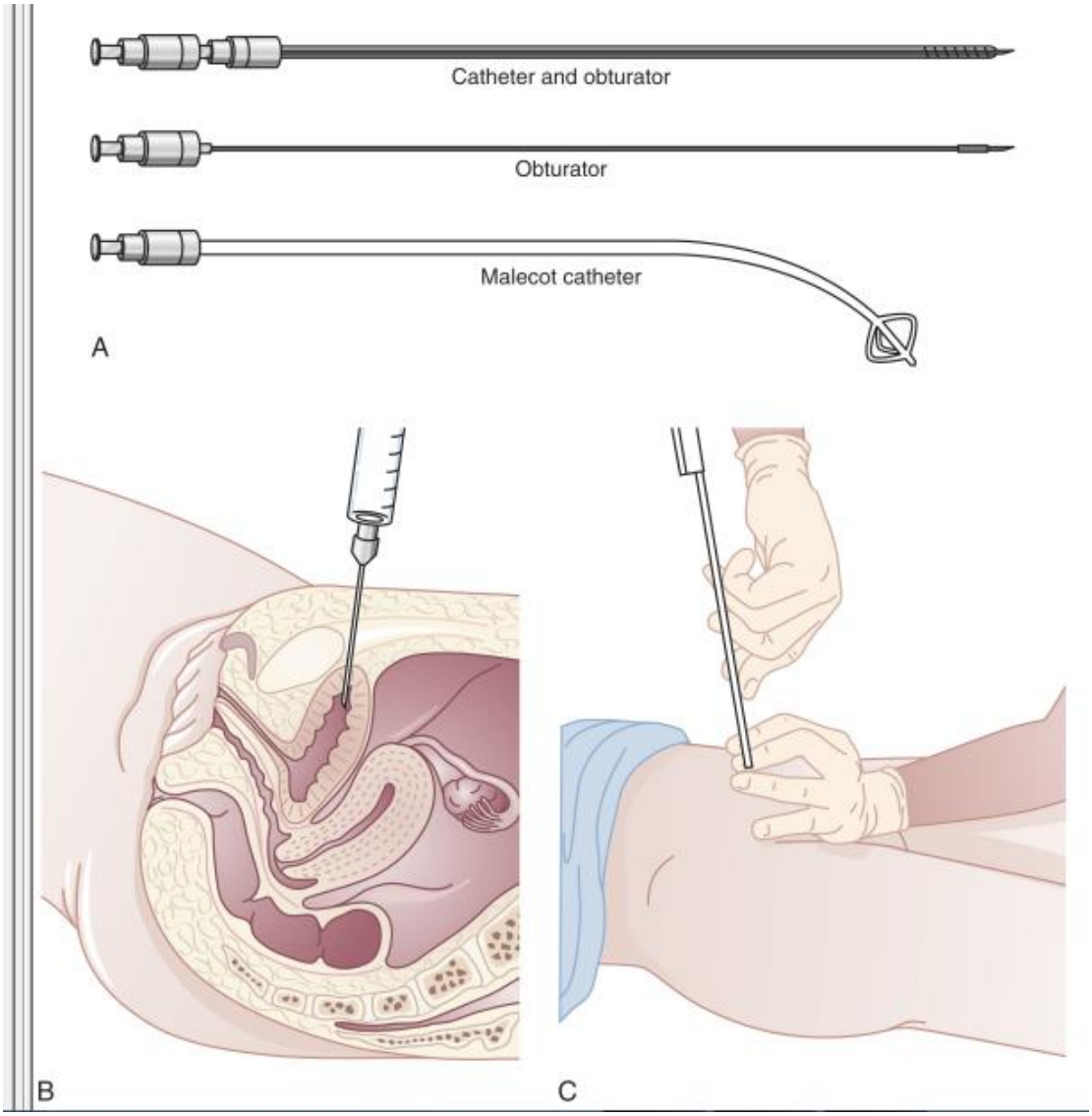

Figure 5 A, Stamey percutaneous cystostomy set with obturator and catheter. **B,** Localization of the bladder with a spinal needle placed percutaneously above the pubic bone. **C,** Placement of a percutaneous cystostomy catheter with obturator (right).

In preparation for percutaneous cystostomy placement, the suprapubic area is prepared and draped, with the patient in the supine position. The percutaneous tract, 3 to 4 cm above the symphysis pubis in the midline, should be anesthetized. Next, a spinal needle with a 10-mL syringe on the end is placed perpendicular to the skin and advanced while withdrawing on the syringe (see Fig. 5B). Correct placement of the needle is documented by withdrawal of urine into the syringe. The cystostomy catheter and obturator assembly is then placed in the same manner as the spinal needle, and the obturator is withdrawn, leaving the cystostomy catheter in place. The catheter is secured to the abdominal wall with suture material. Before considering percutaneous cystostomy placement, if there has been prior abdominal or pelvic surgery, or if the bladder is not full, one should consider using ultrasound for bladder localization, because the bowel may be in close proximity to the percutaneous tract.

Difficulty in catheterization of the female urethra is uncommon and usually results from extreme obesity and inability to locate the urethral meatus. Placement of a vaginal speculum can aid in localization of the urethra. Also, a catheter can be directed cephalad into the urethra by using the vaginally placed finger as a guide (see the algorithm in Figure 2).

هتفت أتُصلحُ للمنونِ حُساما واضيعتاهُ أراملٌ ويتاما

يا دهشةَ الحوراءِ حينَ تطلعت ترنو الفضاءَ فشاهدتهُ رُكاما

فلوت عنانَ الجيدِ واهيةَ القوى ورأت حسيناً يُصلحُ الصمصاما

إرجع أُخيَّ بنا لموطنِ جدنا فأجابَ لو تُركَ الحمامُ لناما

وعلى الحسامِ قد إتكى ما بينهُ يستنصتُ الآحادَ والأحزاما

أيهٍ بني كوفانَ أيُ دمٍ لكم عندي أمِ استحللتُ قبلُ حراما

بالأمسِ مثلَ المزنَ تترى كتبكم لن نرضى غيركَ راعياً وإماما

أسرع فإنَ الأرضَ حاليةُ الربى وإليكَ أعددنا الخميسَ لُهاما

أينَ المواثيقُ التي سلفت لكم أبني النفاقِ نقضتموا الأقساما

أم هل سوايَّ إبنُ لِبنتي نبيكم تاللهِ لن تجدوا سوايَّ عِصاما

فتصاموا عن وعظهِ وإستبدلوا رجعَ الجوابِ أسِنةً وسِهاهما

ومضى يثيرُ الى الوغاء أبنائها من كانَ عندهمُ الكفاحُ غراما

فتواثبوا من دونهِ أُسدُ الشرى يستقطرونَ من السيوفِ حِماما

دكُ الهضابَ على السهولِ وضيقوا سِعت الفضاءِ وحطموا الأقراما

Muqdad fuad