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# Procedures in Family Practice

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## Dilation of the Urethra in Males

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Treatment of male urethral strictures can be safely performed in the office. Urinary tract infections should be treated with appropriate antibiotics prior to urethral dilation. Complications from urethral instrumentation, such as bleeding and perforation, can be minimized by careful selection of instruments and gentleness on the part of the physician. If frequent dilations are necessary or the instrumentation is poorly tolerated by the patient, definitive surgical repair of the stricture should be considered.

The problem of male urethral stricture is an age-old malady which has plagued man and has caused him untold amounts of grief. Methods of treatment date back to antiquity and many of these techniques with minor modifications continue to be widely used today. It had been predicted that with the advent of modern antibiotics, the incidence of male urethral stricture would become rare. The late Dr. Frank Hinman in 1935 stated that "frequency of strictures of the urethra was diminishing rapidly."<sup>1</sup> While stricture disease may have lessened somewhat over the years, it still occurs frequently and to the individual afflicted with the disease, it is a most annoying and many times discouraging problem. This paper reviews the current methods used for the office management of the male urethral stricture.

Figures 1 and 2 demonstrate the urethra by means of retrograde urethrography. This study is

obtained by injecting water based radiographic contrast into the urethral meatus. Roentgenographic views are then obtained in the anterior-posterior and the oblique orientation. These are extremely helpful both in confirming the diagnosis and in identifying the size, extent, and specific location of the stricture. Figure 3 shows the urethra after repeated dilations which at some time must have been complicated by perforation and false passage formation as suggested by the multiple outpouches in the bulbous urethra.

### Diagnostic Considerations

Urethral strictures may be caused by a number of entities. One of the most common etiologies is the scarring produced by the acute inflammatory reaction associated with gonococcal urethritis. This may occur despite adequate antibiotic treatment, since by the time the patient notes the first symptoms of gonorrhea, there is usually gross purulent discharge and a full-blown inflammatory involvement of the urethral wall. The most violent reaction occurs due to the infection of the glands of Littre which line the urethra and are most abundant in the area of the bulb and proximal pendulous urethra. The scarring, once initiated, then

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Figure 1. A retrograde urethrogram showing a severe, but well-localized urethral stricture at the junction of the pendulous and bulbous urethra. This occurred approximately eight months following a straddle-type injury to the perineum

progresses and results in stricture formations some months or even years after the initial infection.

Urethral trauma is a frequent cause for stricture formation. A "straddle" type of injury to the perineum may contuse or lacerate the urethra with subsequent fibrosis. If there is any associated extravasation of urine, fibrosis and eventual urethral scarring are enhanced.<sup>2</sup> Likewise, the patients with pelvic fractures may have lacerated or completely avulsed the urethra with subsequent scar formation. Trauma may be iatrogenic or occur during lengthy transurethral surgery. If the urethra is not well protected with lubricants during such surgery, abrasions and denudement of the urethral epithelium may heal with stricture formation. One commonly sees this type of stricture at the meatus or fossa navicularis as well as the junction of the pendulous and bulbous urethra. This latter site is caused by straightening of the normal right angle of the urethra over the rigid resectoscope sheath thereby enhancing the trauma to the mucosa.

While relatively rare, there is unquestionably an occasional urethral stricture which is congenital in origin. Areas of constriction and fibrosis will be detected in very young males with no history of

trauma, infection, or previous instrumentation. Such congenital strictures may occur at any location within the urethra, although the pendulous and bulbous portions of the urethra tend to be more frequently involved.

The diagnosis of urethral stricture is usually not difficult if a thorough history is obtained. At the present time there are numerous sophisticated measuring devices available which accurately record urine flow rates and the force of the stream. Unless a clinician has particular interest in these studies, these devices are not generally necessary for the routine care of the stricture patient. Most of the diagnostic information can be gained merely by observing the patient urinate with a full bladder. A healthy urethra with a normal detrusor muscle produces a stream which exits the meatus in a smooth, flat, vertical plate. A few centimeters away from the meatus, the stream switches to a horizontal flat plate. Likewise, a few centimeters still further downstream from the meatus, the stream again becomes a vertical plate. This continues from vertical to horizontal plates until normal stream turbulence breaks up the flow. The plate-like configuration of the urine stream just as it exits from the meatus is the result of the contour of the urethra and fossa navicularis as well as the vertical openings of the glandular meatus. When this type of stream is visualized, there is strong assurance that the urethra is normal and voiding pressures are sufficient for satisfactory micturition. If, on the other hand, the patient produces only a thin caliber, but forceful stream, or a spray of urine with multiple diverging tricklets, one can be reasonably sure that urethral problems are present. Often the patient will strain and bear down to initiate the stream and maintain flow. Other factors must be considered at this point especially in the older man where there is a possibility of associated prostatism as a cause of outlet obstruction. Likewise, any neurogenic involvement of the bladder must also be considered. If the observation of the voided urine stream is correlated with a careful history, as well as a thorough digital examination of the prostate per rectum, the diagnosis is generally quite clear.

### Anatomic Considerations

Before any attempt is made to dilate the urethra, it is essential to understand the basic



Figure 2. This retrograde urethrogram shows a very narrow stricture of the midportion of the penile urethra, the result of gonococcal urethritis two years previous. It spans a very long portion of the urethra and the surface is irregular.

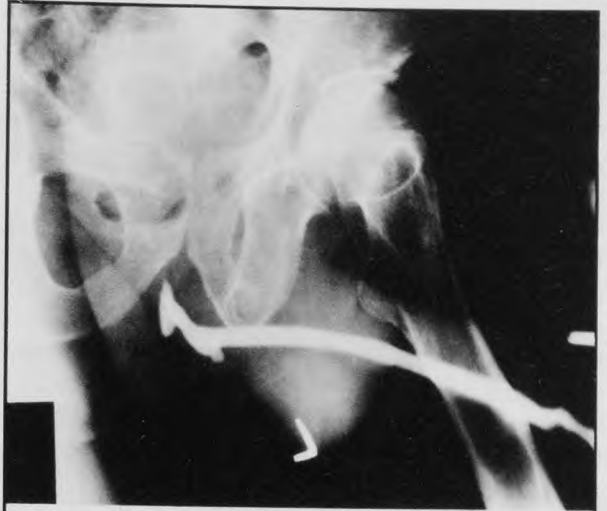


Figure 3. This urethra appears to be patent; however, there is narrowing at the level of the membranous urethra and contrast fails to enter the bladder or prostatic urethra. The external urethral sphincter is located quite near this stricture. A similar appearance can sometimes be seen on the urethrogram by a very active sphincter without the presence of stricture disease. Multiple outpouches are filled with contrast and are the result of trauma during prior instrumentation.

anatomy and structures involved. The normal male urethral lumen as demonstrated over a hundred years ago by Dr. Fessenden N. Otis in New York is not a tube with the uniform caliber and symmetry.<sup>3</sup> Rather it can be divided into four segments with variations in lumen size.

Beginning from the glandular urethral meatus, the healthy penile or pendulous urethra is straight and relatively uniform in caliber except for a short segment just inside the urethral meatus where there is considerable widening. This area is identified as the fossa navicularis. The length of the penile urethra varies a great deal in the adult male depending upon his physical endowment, but in general, measures 10 to 20 cm in length.

Progressing further up toward the bladder, the urethra makes a sweeping right angle curve directed to the bladder base and abdomen. This is the bulbous urethra and generally has a slightly larger lumen which can be easily distended because of the soft surrounding corpus spongiosum erectile tissue and the bulbous cavernosis muscle.

Because of the angulation, this part of the urethra is often traumatized or perforated during vigorous attempts at the passage of a sound or catheter.

Beyond the bulbous urethra, the lumen again narrows as it passes through the plate-like urogenital diaphragm. This portion, referred to as the membranous urethra, is a very short segment measuring less than 2 cm in the adult. It is, however, an extremely important area as it is the location of the external urethral sphincter which encircles the urethral wall. Often a "holdup" or resistance will be felt as the catheter is passed through this area due to contracture or spasm of the external sphincter. With gentle and persistent pressure on the catheter, the sphincter will relax and the catheter will be felt to suddenly pass through this area with ease.

Just beyond the membranous urethra, the lumen again widens in the final portion before entering the bladder. This segment of urethra traverses the prostate gland and, therefore, the term, prostatic urethra. Normally, measuring only

a few centimeters in length, if the prostate is enlarged as occurs with benign prostatic hypertrophy, the prostatic urethra likewise will be increased in length. If the prostate gland is considerably enlarged or there is malignant growth of the prostate, the urethral lumen in this area may be impinged upon or even totally obstructed making the passage of a catheter extremely difficult. Occasionally, a localized overgrowth of prostatic tissue known as a "median bar" of the prostate may be present, and since it is situated posteriorly where the prostatic urethra enters the bladder, the catheter may catch on this lip of tissue and make final passage into the bladder impossible. This problem can be solved by using one of the curve-tip catheters which follow the normal curvature of the urethra and slides over the median bar of the prostate.

Urethral stricture disease is generally due to fibrous replacement of the normal urethral wall and surrounding tissue. Usually, there will be complete encirclement of the urethra and over a period of time as the fibrous tissue bands continue to contract, the lumen is narrowed. This continued scar contracture accounts for the occurrence of obstructive symptoms some weeks or months after an otherwise successful urethral dilation. As dilation does not remove any of the fibrous tissue, it provides only temporary relief and not a complete cure.

### Precautions

The three main complications from dilation of the urethra are bleeding, sepsis, and urethral perforation. The problem of bleeding is generally the result of overly vigorous manipulation with the dilating instrument, such as using force when resistance is encountered or overstretching the stricture with an instrument having too large a caliber. Major problems with urethral bleeding should not occur if attempts at further dilation are halted as soon as any bleeding is noted. Bleeding following dilation may mean that the stricture problem has been exacerbated by further trauma of dilation.

Bacteremia or generalized sepsis during or immediately following dilation is most often encountered if the patient has an already existing urinary tract infection. The association of urinary tract infection with urethral stricture is well recognized. The passage of a sound even atraumatically carries serious risk of forcing bacteria into the vascular

compartment of the corpus spongiosum with dissemination into the general blood stream. A urine culture should be obtained prior to dilation to identify the specific bacteria infecting the urine and determine antibiotic sensitivity. Armed with this information, the patient should be placed on appropriate antibiotics for approximately 24-48 hours prior to dilation. He should continue on antibiotics for an additional 48 hours following the instrumentation. The patient should be cautioned to immediately report any chills or fever experienced during the first 24 hours following dilation. These precautions are particularly important in patients with implanted prosthetic devices or a history of valvular cardiac disease.

The third complication of urethral dilation is perforation of the urethral wall with the dilating instrument. This is usually the result of aggressive instrumentation or poor selection of the dilating instrument. However, even the most cautious and gentle passage of a sound in a very friable, irregular, and tortuous urethral lumen may result in perforation. When this occurs, the complications of bleeding and sepsis are often also encountered. In such circumstances careful observation, continued coverage with specific antibiotics, or a broad spectrum gram-negative antibiotic if a culture report is not available are required. Hospitalization may be necessary. If fever develops or any swelling or discoloration of the genitalia is noted, immediate suprapubic catheter drainage as a temporary urine diversion is necessary.

### Technique

The safest and surest way of identifying and localizing as well as dilating a soft or limited stricture is to gently pass a regular latex catheter. The catheter as well as most urologic instruments are calibrated in sizes by French numbers. The French number is roughly equivalent to the circumference of the instrument in millimeters. Therefore, the number 16 French caliber is approximately 16 mm in circumference while the number 20 French instrument is approximately 20 mm in circumference.

In the adult male, one would normally make the first passage with either a 14 or 16 French catheter trying to identify the depth where the resistance is first encountered. Generally, it is not necessary or wise to attempt to dilate the male urethra to above

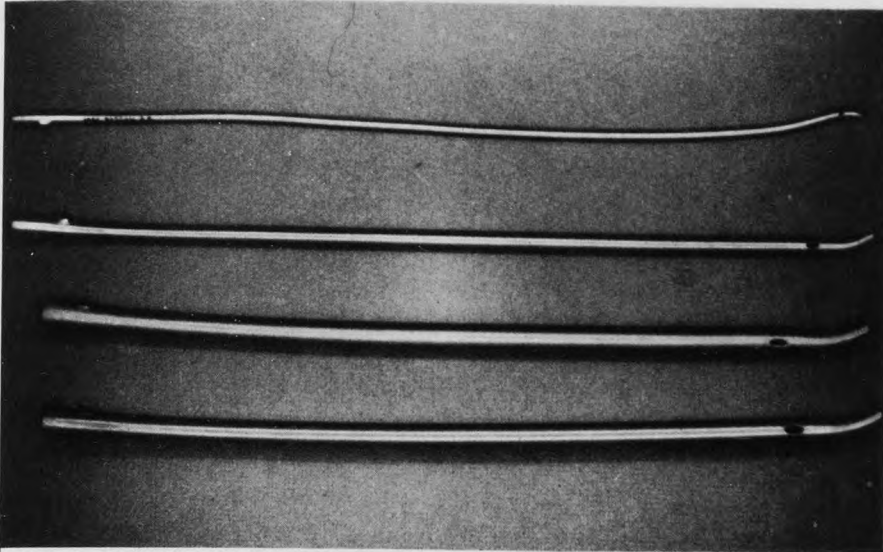


Figure 4. Assorted sizes of rubber catheters of the coudé-tip variety. The small flange on the opposite end of the catheters identifies the direction of the coudé tip

a number 22 or 24 French caliber. Dilation beyond this caliber will further traumatize and overstretch the urethra resulting in worsening of the stricture.

An even more useful tool is the red rubber catheter with the coudé tip (Figure 4). The curvature of the first few centimeters of the catheter allows the physician to direct the tip; and, particularly if there is any prostatic enlargement, the tip of the catheter will slide over the soft median lobe of the prostate and enter the bladder. A small flange on the opposite end of the catheter keeps the physician informed of the direction of the coudé tip after it has been inserted in the urethra.

If the stricture is dense and only a narrow urethral lumen remains, it may be difficult to pass the catheter and keep the instrument from perforating the wall. A helpful and safe set of dilating instruments are the filiforms and followers (Figure 5). As seen in the picture, the filiforms are long, slender filaments made of fibrous material and quite flexible. They are produced either as a straight tip or with a small coil tip which can be negotiated through the urethral stricture lumen. Once the filiform has entered the bladder, the device slides back and forth with ease. If the filiform tends to bounce back when advanced, it would suggest that the filiform has coiled up upon itself in the urethra and should be removed and straightened before

attempting the next passage. When the filiform is securely in the bladder, the larger caliber follower is then screwed into the end of the filiform. The follower is then gently passed in to the bladder knowing with assurance that no perforation will occur since the instrument must follow the correct course through the urethral lumen and advance into the bladder. As the next larger size follower is needed, the first is withdrawn to the point where the filiform can be visualized at the meatus and the original follower detached. The filiform remains in the bladder as the followers are changed and the next larger size is secured into position at the end of the filiform.

For very dense stricture, the age-old Van Buren sound is recognized as the hallmark of the urologist. This curved metal device with the flattened endpiece for grasping the instrument is a very efficient, but also the most hazardous device (Figure 6). The flattened handle is not provided for a more secure hold or in order to allow a greater force to be applied; rather the area allows greater sensitivity to the physician's fingers and permits him to feel where the tip of the sound is located as it probes its way into the bladder. When any resistance is encountered, the tip should be withdrawn a few centimeters and then gently advanced at a slightly different angle in hopes of finding the

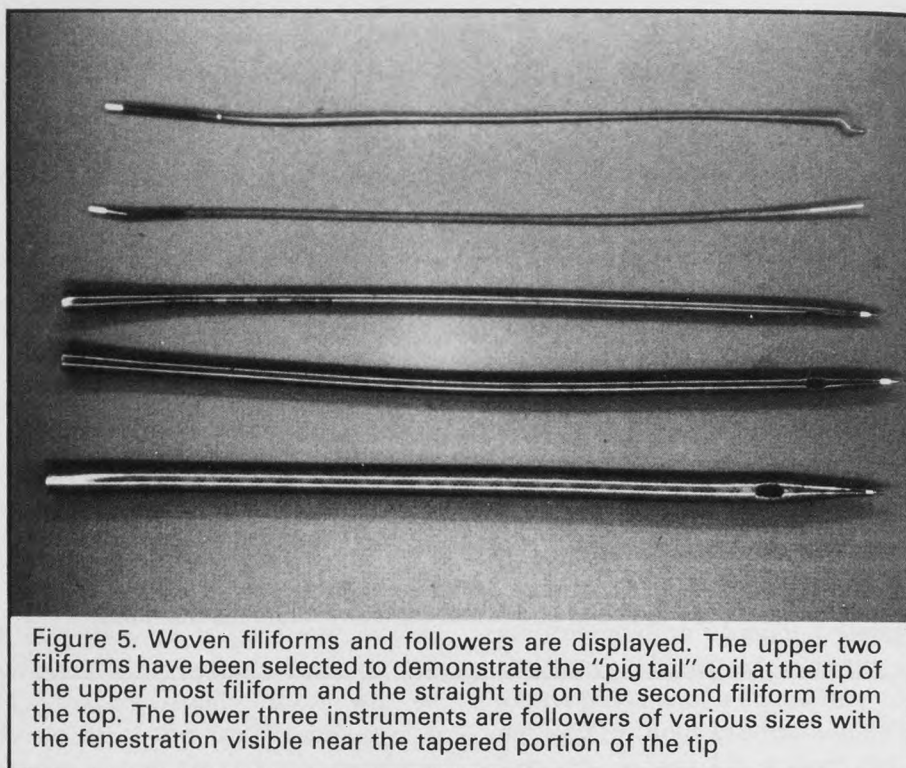


Figure 5. Woven filiforms and followers are displayed. The upper two filiforms have been selected to demonstrate the "pig tail" coil at the tip of the upper most filiform and the straight tip on the second filiform from the top. The lower three instruments are followers of various sizes with the fenestration visible near the tapered portion of the tip

correct lumen. In order to prevent any perforation or false passages, it is essential that no forceful thrusts be made with the Van Buren sound. It is also generally unwise to use sounds smaller than an 18 French caliber since the smaller and also sharper instruments will easily perforate through the soft urethral wall and create a false passage. The keynote to safe use of this instrument, as with all other urethral instrumentation, is gentleness, gentleness, and more gentleness.

If the dense stricture cannot be dilated with a soft catheter and one does not want to risk the use of the Van Buren sound, then an alternative would be to use the LaFort sound. This is a metal curved sound, shaped similar to the Van Buren sound but the tip is fashioned with a small screw which can be fitted to a filiform. This ensures that the sound will follow the correct urethral lumen and yet provides the solid instrument for dilation of very rigid strictures.

During the actual manipulation, it is essential to clean the penis and especially the meatus and glands with either soap and water or a non-irritating type of antiseptic, such as povidone-iodine. The authors prefer to use an abundant amount of water soluble lubricant on the instru-

ment just prior to passage. The use of fat soluble lubricants such as petroleum jelly or mineral oil should be discouraged because of the hazard of fat emboli should some of the material be forced into the blood stream. Some physicians recommend the use of a jelly lubricant which contains topical anesthetic such as lidocaine or dyclonine in order to make the patient more comfortable. This jelly is squirted down the meatus and allowed to anesthetize the urethral mucosa. While it does produce some pain relief, it has a disadvantage in that the patient will not feel or respond to pain if the sound or catheter is misdirected. It therefore seems safer for the less experienced physician to use lubricants lacking the anesthetic and thereby make warning of impending urethral damage possible. It is also generally easier to pass a dilating instrument if the penis is first straightened and placed on a slight amount of tension just as the instrument is passed. This will smooth out any fold or tortuosity which may impede the passage of the sound.

If the urine stream maintains a satisfactory caliber and the need for urethral dilation is infrequent (such as every two to six months), it is reasonable to continue with periodic office dila-

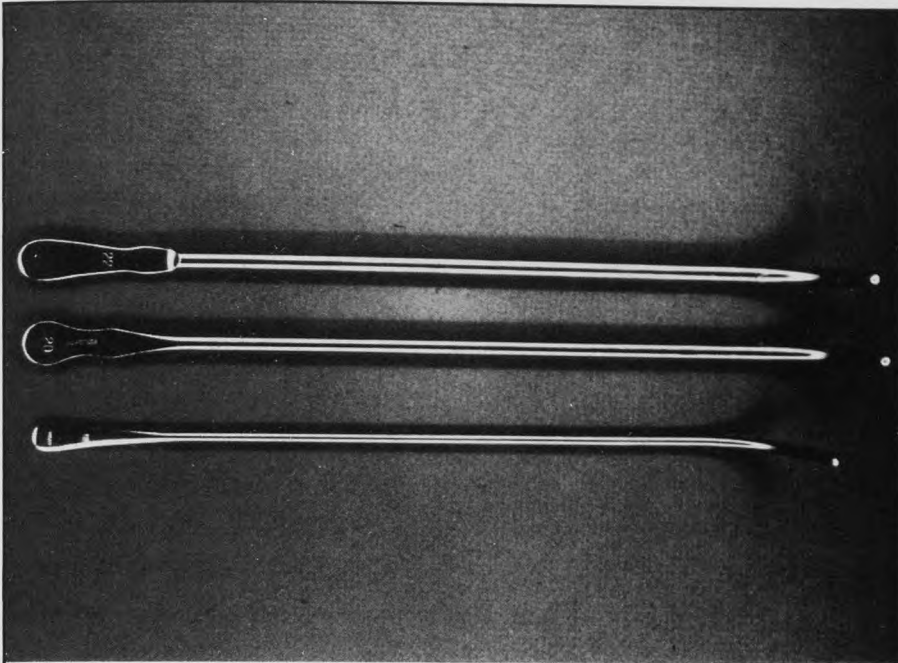


Figure 6. The standard Van Buren urethral sounds of 22F, 20F, and 16 French caliber. The smaller sounds are quite sharp and if misdirected or used too vigorously will traumatize and may perforate the urethra

tions. The decision as to whether more definitive surgery is indicated will depend on the ease of dilation and how well the patient tolerates each instrumentation. If the interval between dilations can be increased to as much as a year between treatments, then certainly it is recommended that periodic dilations be continued.

If, however, each dilation is accomplished only after tedious insertion and manipulation of the instrument, or the patient experiences a great deal of pain, or the need for dilation becomes more frequent, then a more aggressive approach to therapy must be considered.

### Alternative Management

When office dilations are failing to control stricture, a number of alternatives are available and have proven to be quite successful. Despite the recommendations of a number of investigators, in the authors' hands the use of topical agents or the injections of anti-inflammatory drugs, such as steroids, have been most disappointing and, therefore, abandoned. For the patient who fails with office dilations, serious consideration should be given to surgical correction of the stricture. Either

the Otis internal urethrotome or the more successful recent use of the direct vision optical urethrotome allows the strictured area to be incised. The period of hospitalization is relatively short and the procedure is generally well tolerated. Even if the stricture site does not remain permanently patent, it may make office dilations easier and perhaps less frequently needed. The use of open surgical repair to correct the strictures have likewise improved and have been quite successful. Since the development of the single stage patch graft urethroplasty of Devine and Horton,<sup>4</sup> the results have been most encouraging and the patients satisfied with their repairs.

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