Urinary incontinence in adults, regardless of its cause, presents a significant quality of life challenge and contributes to a socially uncomfortable situation for the individual. Incontinence affects a range of behaviors, including travel, social functions, entertainment pursuits, sexual activity, sleep, and simple everyday activities around the home. Patients may worry about the odor and embarrassment associated with incontinence, suffer a loss of self-esteem, become socially isolated, and may also become depressed.

Types of incontinence include mild incontinence (the loss of a few drops of urine), stress incontinence (loss of urine with changes in intra-abdominal pressure, such as sneezing), urge incontinence (loss of urine associated with detrusor overactivity), overflow incontinence (a bladder that does not empty completely due to outlet obstruction or neurogenic causes and spills urine when full), and total incontinence (a complete lack of control over urinary function).

Urinary incontinence has a tremendous impact on an individual’s quality of life and self-esteem. A number of patients will fail both conservative medical as well as conservative surgical treatments in their pursuit to regain urinary control. The surgical implantation of an artificial urinary sphincter (AUS) is a definitive surgical option to re-establish continence. However, there are many challenges that may arise as a patient progresses through the rigorous preparation, surgical procedure, and recovery process. Understanding the history, various indications, and risks of AUS surgery will aid in counseling patients considering AUS.

Susanne A. Quallich, APRN,BC, NP-C, CUNP, is a Nurse Practitioner, Division of Andrology and Microsurgery, University of Michigan Medical Center, Ann Arbor, MI.

Dana A. Ohl, MD, is an Associate Professor of Urology and Head, Division of Andrology and Microsurgery, University of Michigan Medical Center, Ann Arbor, MI.

Note: CE Objectives and Evaluation Form appear on page 277.
The first reliable device, the AS 721, was manufactured by American Medical Systems (AMS) and implanted in 1972 (Fishman, Shabsigh, & Scott, 1989; Hajivassilou, 1998; Siegel, 1989). It was made of Dacron-reinforced silicone elastomer and stainless steel. It could be implanted in males or females, either the bladder neck or bulbous urethra. The device functioned by sustaining pressure around the urethra and allowing release of the pressure for voiding or catheterization. Because the AS 721 had a high incidence of mechanical failure (Light & Reynolds, 1992), few of these devices were actually implanted despite the excellent return to continence they facilitated.

Subsequent improvements to the AS 721 (see Table 1) involved the addition of a pressure regulation balloon, a variety of reser-

![Figure 1. The AMS Sphincter 800™ Urinary Control System](Image)

Courtesy of American Medical Systems, Minnetonka, MN.

Table 1.
Descriptions of Previous and Current Artificial Urinary Sphincters Manufactured by American Medical Systems

<table>
<thead>
<tr>
<th>Description *</th>
<th>Continence Mechanism</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 721 (1972)</td>
<td>Fluid in cuff occluded urethra, providing continence; one pump to inflate, one pump to deflate.</td>
<td>System lost pressure over time; high incidence of mechanical failure due to many components.</td>
</tr>
<tr>
<td>AS 742</td>
<td>Delay-fill resistor between cuff and reservoir.</td>
<td>Delay fill mechanism allowed complete emptying of bladder.</td>
</tr>
<tr>
<td>AS 791 AS 792 (1979)</td>
<td>Automatic cuff refill provided pressure to bladder neck or urethra.</td>
<td>All silicone components; lack of deactivation button predisposed to urethral erosion; AS 791 superior for bladder neck; AS 792 superior for bulbous urethra.</td>
</tr>
<tr>
<td>AS 800 (1982)</td>
<td>Fluid in cuff provides pressure to occlude urethra; delay fill mechanism.</td>
<td>Inclusion of deactivation button decreased incidence of erosion; revision (1987) to narrow-backed cuff further decreased incidence of erosion.</td>
</tr>
</tbody>
</table>

* All devices appropriate for use in males or females.
The high incidence of erosion of the cuff into urethra, however, still remained (Smith & Barrett, 2002).

More recent improvements include refinement of the surgical procedure itself. In the 1980s, the surgery was a two-step process: first the components were implanted, and 2 to 3 months later they were connected and activated. Today, the complete device can be implanted in approximately 30 to 60 minutes. The successful development of the AUS is a result, in part, of the involvement of the National Aeronautics and Space Administration with the medical device industry and the incorporation of reliable aerospace components in its development (Hajivassilou, 1998). The most recent improvements to the AUS include a revised cuff design and color-coded tubing which promotes ease of identification intraoperatively.

The Artificial Urinary Sphincter

The only artificial urinary sphincter currently available, the AS 800, is manufactured by AMS, and has existed in its present form since 1982. The AS 800 is made of silicone elastomer and has a range of cuff sizes as well as an elastic pressure-controlling balloon reservoir that is preset to a variety of pressures (51-60, 61-70, 71-80, 81-90 cm H2O). The pump contains both a deactivation button and a unidirectional valve (see Figure 2). This deactivation button allows for postoperative healing without pressure on the urethra by preventing the flow of fluid from the device reservoir to the cuff surrounding the urethra. It also allows for safe catheterization, cystoscopy, and other genitourinary instrumentation. Its addition to the device design eliminated the need for a second surgery to activate the device intraoperatively.

After the device has been activated, squeezing the pump moves the fluid into the reservoir, allowing urination. The cuff gradually refills after 3 to 5 minutes, restoring continence (see Figures 3a & 3b).

The design of the AUS is limited only because it cannot adjust to changes in intra-abdominal pressure. This can be apparent in male patients who have the device implanted at the bulbous urethra, and may have some degree of stress incontinence despite the presence of the device.

Indications for the AUS

There are a variety of well-established reasons for patients to be offered an AUS. These include post-prostatectomy urinary leakage, congenital disorders of the bladder, unsuccessful reconstructive surgery to the urethra, and genuine stress incontinence in select women patients.

Patients who have undergone a radical retropubic prosta-
The AUS is implanted more frequently in males than in females, largely due to the numerous indications for prostate surgeries.

Any patient considering surgery for an AUS should be evaluated for his or her level of manual dexterity. Without the ability to operate the pump mechanism, the patient will be at risk for urinary retention (Elliott & Barrett, 1998a). Patients with poor cognitive function or a lack of motivation will also be poor candidates (Smith & Barrett, 2002; Petrou, Elliott, & Barrett, 2000). Patients who have a bladder capacity less than 200 cc, a post-void residual greater than 100 cc, or who have been incontinent less than 6 months are typically excluded from considering an AUS.

Contraindications to an AUS

Any patient considering surgery for an AUS should be evaluated for his or her level of manual dexterity. Without the ability to operate the pump mechanism, the patient will be at risk for urinary retention (Elliott & Barrett, 1998a). Patients with poor cognitive function or a lack of motivation will also be poor candidates (Smith & Barrett, 2002; Petrou, Elliott, & Barrett, 2000). Patients who have a bladder capacity less than 200 cc, a post-void residual greater than 100 cc, or who have been incontinent less than 6 months are typically excluded from considering an AUS.

Individuals with a large post-void residual are typically best treated with intermittent self-catheterization (ISC), which alone may resolve the problem. Patients with a small bladder capacity and those with urge incontinence are not candidates for AUS, since high bladder pressures may develop after urethral occlusion, placing the upper urinary tracts at risk. Intermittent catheterization, if required after AUS implantation, has not been shown to increase the incidence of infection or cuff erosion (Barrett & Furlow, 1984).

Because the need for repeated surgical instrumentation of the urethra places the patient at risk for erosion of the cuff, the presence of active stone disease or a history of recurrent bladder tumors or other progressive urologic disease excludes patients from consideration for an AUS.
Patients with recurrent urethral stricture disease, or who are at risk for recurrent strictures, should also be excluded until their disease is definitively treated (Carson, 1989; Petrou et al., 2000) or controlled prior to AUS implantation.

Females with hypermobility-related stress incontinence (examples include women post-childbirth, older women, or those who have had previous pelvic surgery) are not candidates for an AUS, as they do not have bladder neck hypermobility. They should instead be considered for bladder neck suspension procedures to increase outlet resistance and restore the bladder neck to its proper anatomic position, as the problem in these cases is related to the inadequate pelvic support rather than an intrinsic sphincter deficiency.

Active urinary, genital, perineal, or lower abdominal infections should be eradicated prior to surgery, as this can increase the risk of postoperative infection of the AUS (Petrou et al., 2000). Distant infections, such as diabetic foot disease and periodontal disease, must not be overlooked as hematogenous seeding from these distant sources may occur.

Prior pelvic radiation is a relative contraindication to this surgery (Venn, Greenwall, & Mundy, 2000), particularly in female patients who have undergone radiation treatments for cervical cancers. Patients with prostate cancer who have been treated with external beam radiation are AUS candidates because the bulbous urethra is not within the irradiated area. The presence of an urethra that is free from radiation urethritis, inflammation, or adhesions can be confirmed preoperatively with office cystoscopy.

Risks of AUS Surgery

Because the AUS procedure involves implanting a foreign device into the body, the greatest risk of the surgery is infection. Most infections are thought to originate at time of surgery (Carson, 1989), and the incidence of infection requiring removal of the device typically ranges from 1.8% to 10% (Petrou et al., 2000) but is commonly reported as 4.5% (Venn et al., 2000). Patients at higher risk for infection after this type of procedure include patients with spinal cord injury, poorly controlled diabetics, a history of recurrent UTIs, or replacement of a nonfunctional AUS. If an infection occurs, it is usually seen in the first 3 months postoperatively, but can also present later. Pain, swelling, and induration or erythema of the scrotum, labia, or perineum are the common signs of an early postoperative infection. Later signs include fever, abscess and drainage, pump erosion through scrotal skin, and cuff erosion into the urethra.

Treatment of an infected AUS requires removing the entire device with an indwelling catheter for 3 to 6 weeks to allow for urethral healing. Surgeons may consider implanting a second sphincter 3 to 6 months after documented eradication of the infection, although risk of infection increases with the second prosthesis surgery (Smith & Barrett, 2002).

Postoperative hematoma is another risk of AUS surgery. A hematoma can form along the plane of dissection for the pump in the scrotum or labia. Small hematomas will spontaneously resolve, but larger hematomas can displace the pump and may require drainage.

Urinary retention after AUS implantation is usually a result of edema around the cuff site. It should be confirmed that the cuff is in its open position; most patients will be able to void spontaneously after a short course of ISC with a small diameter catheter. In the months following activation of the cuff, retention can be a result of a new or recurrent stricture in the urethra or indicate a change in bladder function as in the patient with a neurogenic bladder.

The AUS is also at risk for mechanical failure, which occurs in approximately 7.6% of cases (Petrou et al., 2000). Mechanical malfunction of the AUS is usually due to a fluid leak, kinked tubing, or a malfunction of the pump. The overall risk of mechanical failure has significantly decreased in the last 15 years since the introduction of the revised device with the narrow-backed cuff (Elliott & Barrett, 1998b).

Erosion of the cuff into the urethra is most commonly reported 3 to 4 months after implantation, and can also be seen after the patient has been catheterized or otherwise instrumented without deactivation of the device. The AUS relies on a balance of pressure to occlude the urethra, but this same pressure can also lead to tissue ischemia and erosion of the urethra. This underscores the importance of careful selection of both cuff size and reservoir pressure. There is a higher risk of erosion when the cuff is placed at the bulbous urethra when compared with placement at the bladder neck (Venn et al., 2000). An eroded cuff may cause pain, local swelling, urinary tract infection, recurrent incontinence, or a bloody urethral discharge.

Because the AUS procedure involves implanting a foreign device into the body, the greatest risk of the surgery is infection.
Erosion can also occur as a direct result of an infection. If no infection is identified, the eroded cuff alone can be removed, the remaining tubing occluded with a stainless steel plug (manufactured by AMS), and a catheter left in the bladder for at least 3 weeks to allow the urethra to heal.

Recurrent or persistent incontinence after AUS implantation has a variety of etiologies. It can be attributed to mechanical failure, such as a loss of fluid in the system. The leaking component can be replaced, if it can be identified; the surgeon may also choose to replace the entire system. If no site for fluid loss can be determined, however, then the entire system must be replaced.

Incontinence can also be the result of tissue atrophy, and commonly presents approximately 4 months after device activation (Light & Reynolds, 1992). Typically the patient gives a history of decreased function and an increased number of pumps to activate the device. In this case, a second surgery can be performed to decrease cuff size, increase reservoir pressure, or place a second cuff distal to the first. Placing a second cuff has the added benefit of avoiding increased pressure on the urethra, but requires more involved urethral dissection. Incontinence that persists after AUS placement may also indicate cuff erosion into the urethra, or in females, a vesicovaginal fistula.

The expected 5-year survival of the device has been described to be between 67% and 90% (Smith & Barrett, 2002; Elliott & Barrett, 1998a). Venn et al. (2000) demonstrated an overall revision rate of 33% for the AUS for reasons of mechanical failure, infection/erosion, and revision of devices that had been implanted many years previously. They reported an estimated AUS survival of 66% at 10 years.

Conclusions

Incontinence presents a significant challenge to everyday activities for many patients. A variety of treatment options exist, but some patients will find conservative measures unsatisfactory as they seek to regain urinary control. The artificial urinary sphincter provides a unique, but invasive, method of restoring control over urinary function.

Candidates for AUS surgery must fit a specific group of criteria to insure that they will benefit from the device. With careful patient selection and evaluation, the AUS can improve a patient’s self-esteem and quality of life by restoring a normal voiding pattern.

References


Artificial Urinary Sphincter, Part II: Patient Teaching And Perioperative Care

Susanne A. Quallich
Dana A. Ohl

A variety of patients are common candidates for placement of an artificial urinary sphincter (AUS). As discussed in Part I, these include patients with postprostatectomy urinary leakage, congenital disorders of the bladder, unsuccessful reconstructive surgery to the urethra, and genuine stress incontinence in select female patients.

As the population continues to age, the number of patients presenting with questions about the AUS is likely to rise. An understanding of the preoperative process for the AUS as well as the surgical procedure itself will aid in discussions with these patients. Awareness of the postoperative care will also help prepare patients for a positive outcome and realistic expectations for the function of the device.

Preoperative Evaluation and Preoperative Patient Counseling

Because AUS surgery is an elective surgical procedure, the preoperative evaluation should confirm that the client is medically optimized. Cardiovascular disease, peripheral vascular occlusive disease, and diabetes can increase a patient’s risk for surgery and can affect postoperative healing. Routine preoperative evaluation for patients undergoing AUS includes baseline chemistries, complete blood count, coagulation studies, electrocardiogram, and a chest film in patients over age 50. Glycosolated hemoglobin and albumin may be added at the provider’s discretion, but a clean urinalysis and culture within 2 weeks of the anticipated surgery date is mandatory (Carson, 1989).

Appropriate patient education must also occur prior to surgery, to ensure that the patient understands what his/her role will be in postoperative care as well as to ensure that the patient’s expectations are realistic. Several points must be emphasized to the patient preoperatively: the importance of completely emptying the cuff prior to urinating; the possibility that the patient may continue to experience some degree of stress incontinence despite the presence of the AUS; and the possible need to replace the device or add an additional cuff after the initial implantation. Patients should also be counseled that their incontinence will usually continue after surgery, because the cuff is not activated until they are cleared at subsequent postoperative visits. Only an occasional patient will become continent after surgery but prior to activation of the device.

In addition to the general medical evaluation, AUS candidates should undergo a specialized urologic workup that can involve a variety of components that often includes urodynamic evaluation, cystoscopy, and radiologic studies. Despite the fact that the underlying cause of incontinence may seem obvious, (for example, a radical prostatectomy) a patient must be evaluated for any conditions that could lead to an unsuccessful outcome.

A urodynamic evaluation evaluates the patient for poor detrusor compliance, involuntary detrusor contractions, and
of healthy tissue at the planned urethral tissue viability, as a lack of invasiveness and a poor response or situe. This poten- bleed provides an unprotected surgical urethral reconstruc- tion, the uninfected device may remain in place if it is clear that it is not involved in the infec- tious process (Petrou et al., 2000).

Patients should also be pro- vided with written instructions specific to the artificial urinary sphincter procedure (see Table 1). This will not only provide a written reminder to the patient regarding the instructions for his/her surgery, but also serve to detail the role of the patient in the immediate preoperative process.

Immediate Preoperative Patient Preparation

Patients scheduled to receive an AUS should have a docu- mented clean urinalysis within the 2 weeks prior to the surgery date (Carson, 1989). If a docu- mented urinalysis is not available, one may be ordered as part of the routine preoperative orders for this procedure. The patient should be made aware that the surgeon may choose to cancel the surgery if the urinalysis is suspicious for an infection.

Table 1.
Preoperative Instructions Before Artificial Urinary Sphincter Surgery

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Stop taking aspirin, ibuprofen, Motrin®, Advil®, Naprosyn®, and naproxen 7 days before your surgery date. These drugs can thin your blood.</td>
<td></td>
</tr>
<tr>
<td>• Stop taking all herbal supplements 2 weeks before surgery.</td>
<td></td>
</tr>
<tr>
<td>• If you take the blood thinners, such as Coumadin® (warfarin sodium), you will be given special instructions about when to stop this medication.</td>
<td></td>
</tr>
<tr>
<td>• You will be given separate instructions about which medications you may take the morning of surgery.</td>
<td></td>
</tr>
<tr>
<td>• Do not shave your groin or perineal area for the 2 weeks before your surgery date. This prevents any nicks to your skin that can provide an entrance for bacteria.</td>
<td></td>
</tr>
<tr>
<td>• You will be given four Hibiclens® sponges, which have special antibi- otic soap. Use two to bathe or shower the night before surgery: use one to clean your entire body, and one to clean your groin. The morning of surgery, bathe or shower again, using one sponge to clean your entire body, and one to clean your groin.</td>
<td></td>
</tr>
<tr>
<td>• Males and females: You will instructed to use one Fleet enema the night before surgery.</td>
<td></td>
</tr>
<tr>
<td>• Females: You will be instructed to use a vaginal douche while you are waiting to go into the operating room. This will be provided to you.</td>
<td></td>
</tr>
</tbody>
</table>

Endoscopic evaluation is required preoperatively to look for possible anatomic abnormalities, such as stricture, bladder neck contracture, false passage, or diverticulum (Elliott & Barrett, 1998). Any patient who requires surgical correction for any of these conditions must wait a minimum of 3 additional months before re-evaluation and consider- ation for an AUS. Endoscopic evaluation also helps to establish urethral tissue viability, as a lack of healthy tissue at the planned site of cuff placement contributes to erosion and/or loss of cuff compression after implantation (Fishman, Shabsigh, & Scott, 1989).

Patients may also require evaluation of any existing upper-tract abnormalities. Patients with a personal history of stone disease or previous reconstruction of the upper genitourinary tracts are at risk for additional invasive procedures, and should be coun- seled extensively as to the potential risk this may pose to the AUS.

Patients with both inconti- nence and a poor response or poor tolerance to primary and secondary pharmacologic man- agement for erectile dysfunction may consider the simultaneous implantation of a penile prosthesis and an AUS. The benefits of a combined procedure include a single episode of general anes- thesia, shorter inpatient hospital stay, and an overall decrease in postoperative pain. This potential scenario is commonly seen with patients undergoing radical prostatectomy who have under- gone a non-nerve sparing procedure. It is advised that during the operative procedure the AUS be implanted first so that in the event of a surgical urethral injury, the entire procedure can be aborted (Smith & Barrett, 2002; Petrou, Elliott, & Barrett, 2000; Roberts & Barrett, 2000), and that the reservoirs are placed on opposite sides. Simultaneous implantation does not increase the patient’s risk for mechanical problems with either device. If one implant develops an infec- tion, the uninfected device may remain in place if it is clear that it is not involved in the infec- tious process (Petrou et al., 2000).

Women of childbearing age who are considering AUS implantation must also be informed that vaginal delivery may put pressure on the urethral cuff and possibly stretch the device’s tubing. Petro et al. (2000) suggested that the AUS should be deactivated during the last trimester as there is an increased risk of the device erod- ing through the urethra due to the increasing pelvic pressure from the developing infant.

Patients should also be pro- vided with written instructions specific to the artificial urinary sphincter procedure (see Table 1). This will not only provide a written reminder to the patient regarding the instructions for his/her surgery, but also serves to detail the role of the patient in the immediate preoperative process.

Immediate Preoperative Patient Preparation

Patients scheduled to receive an AUS should have a docu- mented clean urinalysis within the 2 weeks prior to the surgery date (Carson, 1989). If a docu- mented urinalysis is not available, one may be ordered as part of the routine preoperative orders for this procedure. The patient should be made aware that the surgeon may choose to cancel the surgery if the urinalysis is suspicious for an infection.
The patient must be instructed to shower the night before and the morning of surgery with chlorhexidine soap that is provided. Both males and females will also have a limited bowel prep (one Fleet® enema) the night before surgery, and females will be instructed to perform a vaginal douche the morning of surgery.

Antibiotics, such as vancomycin and gentamicin, are given in the holding area in the hour before surgery to provide broad-spectrum coverage against common skin flora and gram-negative bacteria, most commonly Staphylococcus epidermidis and Escherichia coli. The specific antibiotics will be surgeon and/or facility dependent. The patient’s genital and perineal area should be carefully inspected in the holding area to confirm that there are no lesions present that could be a source for infection.

Surgical Procedure

The surgical field is shaved in the operating room itself, to prevent bacterial contamination by exposure to skin pathogens. For females, the labia, perineal area, and lower abdomen are shaved; for males, the scrotum, perineum, and lower abdomen are shaved. After a 10-minute betadine scrub of the surgical field, the patient is draped with paper drapes (paper drapes are used because wet cloth is permeable to bacteria). The surgical team scrubs for 10 minutes and dons paper gowns. It is also recommended that the scrub technician or nurse remain in the operating room for the duration of the case. Traffic in the surgical suite itself should be limited to prevent contamination. The AUS is assembled on a separate Mayo stand and soaked in a solution consisting of two antibiotics, such as 50,000 U of bacitracin and 160 mg of gentamicin in 1,000 mL of normal saline. This mixture will be surgeon and/or facility dependent. These stringent recommendations for operating room procedure were inspired by Carson’s work in 1989 that evaluated causes for infection in genitourinary prostheses.

Male patients are placed in the dorsal lithotomy position if the AUS cuff is to be implanted at the bulbous urethra. The procedure for AUS implantation in the male begins with the placement of a urethral catheter. An incision is made over the bulbous urethra, and the urethra is then dissected away from the tunica albuginea and corporal bodies. This allows cuff placement around the urethra. A transverse incision is then made to the lower abdomen, over the rectus muscle, allowing the creation of a pocket for the reservoir by bluntly dissecting beneath the belly of the rectus muscle. The reservoir is then placed and filled. A pouch is then created in the hemiscrotum, and the pump is usually placed on the side of the patient’s dominant hand. The AUS system is tested and left deactivated with the cuff in the open position. If the cuff is being placed at the bladder neck, the operative procedure in the male will begin with an abdominal incision, and the reservoir is placed in the perivesical space.

The female patient is also placed in the dorsal lithotomy position, and iodoform-impregnated gauze is placed into the vagina followed by the placement of a urethral catheter. The procedure for AUS implantation in the female begins with a lower abdominal midline incision and dissection of the bladder neck. The cuff is then placed around the bladder neck, and the reservoir is placed in the perivesical space. A pocket for the device pump is created in the labia majora on the side of the patient’s dominant hand for the device pump. The device is cycled and left deactivated with the cuff in the open position. Placement of the device is also possible via a transvaginal approach.

Postoperative Management

The inpatient stay after AUS placement is approximately 1 to 2 days. Oral pain medication is prescribed, and ambulation is not restricted. Intravenous antibiotics are continued until discharge; oral antibiotics (typically a cephalosporin) are given for 7 to 10 days postoperatively. Patients are advised to use ice packs on the scrotal/labial and perineal areas for 24 to 48 hours after the surgery as a local comfort measure to prevent swelling and for a degree of pain control, both while they are inpatient and after discharge. Patients and caregiving staff alike must be reminded to avoid any traction on the urethral catheter, as this will lead to increased pressure on the cuff of the sphincter.

On the first postoperative day, the surgical dressings, any drains, and catheter are removed. The patient is asked to void. If he or she is unable to void, he/she will be instructed to use intermittent self-catheterization with a small caliber catheter until he/she is able to void spontaneously.

A stool softener may be recommended, along with a recommendation to increase fluid intake to prevent straining with bowel movements. Patients with AUS implants should be advised to avoid heavy lifting (greater than five pounds) or strenuous
activity for at least 6 weeks, or until their postoperative appointment. This avoids the increased abdominal pressure caused by straining and avoids stress on the incision.

Patients may also be instructed to gently pull down on the pump as it heals to prevent its upward migration in the scrotum or labia. Beginning 5 days after AUS implantation, patients may shower daily or take a bath.

Patients with AUS implants are placed on a driving restriction and should avoid long periods of time sitting in the car, for 6 weeks postoperatively, in part to prevent increased pressure on the perineal area.

Patients must be advised that abstinence from sexual activity is essential until complete healing has occurred, typically a period of 6 weeks. This helps prevent any unnecessary tension on the incision and also helps decrease the risk of opening the suture line(s) and exposing the device to the risk of infection. Patients must also be advised not to activate the device until they are cleared to do so at a postoperative visit. Table 2 is a summary of discharge instructions for patients with AUS implants.

**Followup**

Because the cuff is not activated postoperatively, patients should be counseled that their incontinence will most likely continue after surgery. Some patients actually report immediate correction of their incontinence. This is largely a result of postoperative edema at the site of cuff placement, which narrows the diameter of the urethra.

Any patient who did not experience nighttime incontinence should be advised to leave the AUS cuff deactivated when sleeping. This will have the added benefit of decreasing any potential tissue ischemia that may lead to urethral atrophy.

Regardless of the site of cuff placement, most patients will have the device activated 6 to 8

---

**Table 2. Postoperative Instructions for Artificial Urinary Sphincter Surgery**

<table>
<thead>
<tr>
<th>Activity: Avoid heavy lifting (greater than 5 pounds) or strenuous activity prior your postoperative appointment. This causes increased abdominal pressure and puts stress on the incision. If you need to brace yourself to pick up an object, it is too heavy.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sexual Activity: It is recommended that sexual activity should be avoided for 6 weeks after surgery. Use of the AUS prior to proper healing of the incision could cause damage to the incision and result in potential infection. Your doctor will discuss resuming sexual activity at a postoperative visit.</td>
</tr>
<tr>
<td>Clothing: Wear loose-fitting undergarments and avoid wearing clothing that is too tight.</td>
</tr>
<tr>
<td>Bathing: You may shower if you wish. Gently wash the incision with soap and water, rinse thoroughly, and pat dry. This will keep your incision clean, dry, and free of bacteria. Beginning 5 days after your surgery, you may also take a bath.</td>
</tr>
<tr>
<td>Incision Care: It is extremely important that you carefully monitor your incision for signs of redness, swelling, or drainage. It is also important to keep the incision clean.</td>
</tr>
<tr>
<td>Driving: Long car trips can put pressure on the perineal area, where the device cuff is located. Avoid long drives, or make frequent stops, such as after every 30-45 minutes in the car.</td>
</tr>
<tr>
<td>Carry your AUS identification card in your wallet at all times.</td>
</tr>
<tr>
<td>SPECIAL CONSIDERATIONS</td>
</tr>
<tr>
<td>Follow any special instructions your doctor has given you.</td>
</tr>
<tr>
<td>Men: If your scrotum is swollen, wear a scrotal support. When resting, elevate your scrotum on a towel roll.</td>
</tr>
<tr>
<td>Avoid constipation to prevent straining. Increase roughage in your diet, drink prune juice or orange juice, or take milk of magnesia or another over-the-counter laxative if necessary. You will be prescribed a stool softener when you are discharged. It is recommended that you drink 6-8 glasses of water a day to enhance the effectiveness of the stool softener.</td>
</tr>
<tr>
<td>Reasons to Call Your Doctor</td>
</tr>
<tr>
<td>Men: Increased scrotal swelling.</td>
</tr>
<tr>
<td>Women: Increased swelling of the labia.</td>
</tr>
<tr>
<td>Drainage from your incision.</td>
</tr>
<tr>
<td>Incision becomes red or swollen.</td>
</tr>
<tr>
<td>Skin around your incision is warmer than elsewhere.</td>
</tr>
<tr>
<td>Difficulty passing your urine or starting a stream.</td>
</tr>
<tr>
<td>Blood in your urine.</td>
</tr>
<tr>
<td>Nausea and vomiting.</td>
</tr>
<tr>
<td>Severe pain that is not relieved by your pain medication.</td>
</tr>
<tr>
<td>Chills or fever of 101 F or more degrees.</td>
</tr>
</tbody>
</table>

You will be scheduled for an appointment to return approximately 6 weeks after your surgery. At this time the doctor will check your AUS, and will discuss activating the device and resuming sexual activity.
weeks postoperatively. In the clinic, they will be shown how to cycle the device and will be instructed that recompression takes from 3 to 5 minutes. Patients should be able to demonstrate that they can open the cuff and void prior to leaving the clinic to avoid the risk of urinary retention. Cuff reactivation takes from 3 to 5 minutes and continence occurs only when the device cuff is inflated. Patients must also be reminded to deflate the cuff prior to self-catheterization, even if using a small-caliber catheter.

Patients with AUS implants have restrictions that will last as long as the device remains in place. Patients who had the cuff placed at the bulbous urethra should be advised not to sit for prolonged periods of time, as well as to avoid chairs with hard seats. This will prevent unnecessary pressure on the perineal area. Patients with AUS implants are permanently restricted from horseback riding and from bicycling of any kind with a traditional saddle seat (Smith & Barrett, 2002), as this will prevent increased pressure in the perineal area and decrease the risk of cuff erosion. Newer bicycle seat designs with open areas in the center to decrease perineal compression may be acceptable.

Patients should carry identification for the AUS, such as a wallet card or MedicAlert bracelet, so that the device can be deactivated prior to catheterization and prevent erosion of the urethra that would necessitate replacing the AUS. Patients with AUS implants should routinely receive antibiotic prophylaxis prior to dental or surgical procedures (Smith & Barrett, 2002).

The AUS has also been studied to verify its safety in magnetic resonance scanners because of its small metallic components. There is no risk to the patient or the device with an MRI scan (Shellock, Morisoli, & Kanal, 1993) and its presence should not cause the images from the scan to be distorted. The device will not cause airport metal detectors to alarm.

**The AUS enjoys a high patient satisfaction rating due to the significant improvement in quality of life afforded by the recovery of continence.**

**Conclusion**

In both male and female patients who have been carefully screened, the artificial urinary sphincter remains an excellent option for treating urinary incontinence. The AUS offers many benefits to patients by restoring a natural voiding pattern, making possible a normal pattern of social behavior without worry about urinary leakage. The AUS enjoys a high patient satisfaction rating due to the significant improvement in quality of life afforded by the recovery of continence. Patient satisfaction ratings have been variously documented, with some reports as high as 84.5%.

Successful treatment of urinary incontinence in any patient provides increased self-esteem and independence, particularly as incontinence can be the consequence of treating a malignancy or as a result of a chronic medical condition. As the population continues to age, less-invasive treatments for urinary incontinence will continue to improve. The artificial urinary sphincter will remain a definitive and unique surgical option to restore continence in a well-chosen percentage of patients.

**References**


Artificial Urinary Sphincter Case Study

Susanne A. Quallich
Dana A. Ohl

M. L. is a 57-year-old gentleman with a history of Gleason 3+4=7 prostate cancer, with a preoperative prostate specific antigen (PSA) of 5.1. He underwent a unilateral nerve-sparing radical prostatectomy approximately 1 year ago. In the immediate period after the surgery, despite the nerve-sparing procedure, he suffered from almost complete incontinence. He had some slow improvement of his urinary symptoms, but currently uses an average of six medium-sized pads in 24 hours to control his leakage. Initially M. L. underwent training in Kegel exercises, which helped to improve his symptoms somewhat. He tried oxybutynin chloride to aid in the management of his urinary leakage, but found that the medication's side effects were bothersome and that the drug was ineffective. He also used a penile clamp, but this was very uncomfortable by the end of the day.

M. L. found his current situation extremely unsatisfactory and that he was both unable and hesitant to pursue his active preoperative lifestyle. He presented to the urology clinic for discussion of an artificial urinary sphincter (AUS).

M. L. has a history of well-controlled hypertension and a vasectomy 20 years ago, in addition to the prostate cancer. He currently takes a baby aspirin and lisinopril 10 mg daily. He has a 15 pack-year history of smoking and consumes three mixed drinks in a week.

Preoperative Assessment

Initial discussion with M. L. included a review of the risks and benefits of the AUS. Discussion of the operative procedure included counseling on the following points: there is a slightly higher risk of infection with AUS surgery when compared with other surgical procedures because a foreign body is being implanted; should the device have to be removed for mechanical failure or infection he would have to wait several months before another could be implanted; and the expected lifespan of the device is approximately 5 years. He was instructed that his incontinence would improve initially due to postoperative swelling of the urethra, even before the device is activated 6 weeks postoperatively.

M. L. decided to proceed with the urologic evaluation for an AUS. His office cystoscopy showed him to be free from any postoperative scarring at the bladder neck, the site of the radical prostatectomy anastomosis. His urodynamic evaluation showed a normal capacity bladder of 450 mL, good compliance, an external sphincter pressure of 35 cm of water, and a stress leak point pressure of 40 cm of water. These findings were consistent with sphincteric incontinence. An intravenous pyelogram to evaluate his upper urinary tracts showed him to be free of hydronephrosis, filling defects, or stones.

M. L.'s preoperative physical showed him to be free of any evidence of open areas or lesions to the penis, scrotum, or inguinal area. He is uncircumcised, with evidence to the glans of the penis of mild irritation due to urine entrapment under the foreskin. The preoperative laboratory values were all within normal limits, with a PSA that was undetectable. His urinalysis was also within normal limits and showed no evidence of infection. Chest x-ray showed no active disease, and his preoperative ECG showed normal sinus rhythm, with some increased R wave progression, consistent with left ventricular hypertrophy. M. L. also demonstrated adequate manual dexterity to operate the pump on the AUS model in the clinic.
M.L. underwent an uneventful placement of an AS 800 artificial urinary sphincter, with reservoir placement through the right external inguinal canal. He was discharged home after 24 hours of intravenous antibiotics, with written postoperative instructions and the manufacturer’s patient education brochure.

Two weeks later at his initial postoperative visit, M.L. had no complaints. He reported that the initial postoperative bruising had resolved, and that he was using fewer pads in 24 hours to protect against urine loss. On physical exam, his sutures were intact, and there was no evidence of infection. He was encouraged to use over-the-counter pain medications as needed, and to contact the urology clinic for any changes in his condition, such as a fever greater than 100 F, drainage from the incision, or an increase in pain. He was also reminded that his degree of incontinence may actually worsen as the postoperative swelling continues to improve.

At his second postoperative visit 6 weeks after his surgery, M.L. had no complaints, with the exception that his preoperative incontinence had returned. His incisions were well-healed, and he had no tenderness to palpation of his scrotum, perineum, or right inguinal region. He was cleared to begin to use his AUS; the initial activation was accomplished without any complaints of pain from the patient. Proper cycling of the device was demonstrated to the patient, and M.L. left the clinic able to correctly cycle the AUS. He was also reminded that he should carry identification that indicates he has an implanted AUS, and to avoid horseback riding and cycling with a traditional saddle seat.

M.L. returned to the urology clinic several months later for routine followup of both his prostate cancer and urinary status. He reported that while it initially took some time to become familiar with the use of the AUS, he is very pleased with the outcome of his surgery. He has returned to his active lifestyle, including 18 holes of golf and his program of lap swimming for exercise.