Management of urinary incontinence following treatment of prostate disease

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Introduction: *Men who undergo treatment for prostate disease are at increased risk of urinary incontinence (UI). UI has a known negative impact on patient quality of life. Once a thorough evaluation has been performed, there are effective modalities for treatment that can be tailored to the patient.*

Materials and methods: *This review article provides the most recent evidence-based work up and management for men with incontinence after prostate treatment (IPT). Etiology, prophylactic measures, work up, surgical treatments, and patient considerations will be covered. The more recent adjustable balloon device is included in this publication as well as more traditional treatments like the artificial urinary sphincter (AUS) and male urethral sling.*

Results: *IPT can result from treatment of either benign or malignant prostate disease whether surgery or radiotherapy are utilized. Stress urinary incontinence (SUI), urge urinary incontinence (UUI), or mixed urinary incontinence (MUI) are all possibilities. SUI after radical prostatectomy (RP) is the most common form of IPT. Patient education and implementation of pelvic therapy as well as modern surgical techniques have greatly improved continence results. AUS remains the gold standard of SUI treatment with the broadest category of patient eligibility. Patients experiencing UUI should be treated according to the overactive bladder guidelines.*

Conclusions: *For men with IPT, it is crucial to first take a thorough patient history and delineate the exact nature of UI symptoms which will determine the options for management. Patient factors and preferences must also be taken into consideration when ultimately choosing the appropriate intervention.*

Key Words: prostate, prostatectomy, radiotherapy, male incontinence, artificial urinary sphincter, male urethral sling

Introduction

The treatment of prostate disease for both benign and malignant etiology has been associated with an increased risk of urinary incontinence (UI) in men.[1] UI can develop following surgery or radiation therapy (RT) for prostate cancer or after prostate reducing surgeries for benign prostatic hyperplasia (BPH). Types of incontinence include stress urinary incontinence (SUI), urge urinary incontinence (UUI), and mixed urinary incontinence. Any incontinence caused by treatment of prostate disease is referred to as incontinence after prostate treatment (IPT).[2]

The most common type of IPT is SUI after radical prostatectomy (RP). It is estimated that nearly 200,000 new cases of prostate cancer will occur in 2020.[3] Furthermore, an estimated one third or more of men diagnosed with prostate cancer undergo RP annually.[4] Compared with active surveillance, patients who undergo RP are more likely to experience UI.[5] Long term SUI rates following robotic-assisted laparoscopic

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prostatectomy (RALP) are estimated to be between 8%-16%.[6,7] It has been shown that patients with UI are at higher risk for mental health issues and experience poorer quality of life.[8] Given the prevalence of prostate disease, risk for IPT, and its associated emotional and financial burdens, it is imperative understand the evaluation and management of these patients.

Etiology

Prostate cancer treatment

SUI following RP is the most common form of IPT, although UUI can also occur. The historical incidence of SUI after RP has been estimated between 2%-87%.[9] However, progressive improvement in post-RP SUI over time has been shown. Lepor et al found the rate of men using 1 pad or fewer at 3, 6, 12, and 24 months after RP to be 71%, 87%, 92%, and 98.5% respectively.[10] Any UI following RP significantly decreases patient quality of life.[11] Four percent of men with post-RP SUI have bothersome enough symptoms to seek surgical intervention.[12] The pathophysiology of UI following RP is thought to be related to rhabdosphincter incompetence, change in urethral length, and change in detrusor compliance and overactivity.[13]

Incompetence of the rhabdosphincter (also known as the external urethral sphincter) combined with compromise of the internal urethral sphincter during RP can lead to intrinsic sphincter deficiency (ISD). ISD can be as high as 88% at 1 year post RP.[14] ISD is the sole cause of incontinence in 37%-59% of these patients.[15] Given the recovery of continence in many patients over time, it is thought that injury to the nerves and supporting tissue (rather than to the rhabdosphincter itself) is the underlying etiology. Preserved membranous urethral length above 12 mm is associated with increased continence.[16] Alternatively, UUI following RP is linked to detrusor overactivity (DO). DO is observed in up to 34% of men following RP.[14] However, this was the sole cause of UI in only a small percentage of patients. Ultimately, it is important to evaluate patients with IPT following RP for both SUI and UUI in order to determine the most appropriate treatment.

Despite advances in targeting, both the bladder and rectum can still fall within the treatment field during RT for prostate cancer. The negative sequelae from radiation damage to these organs results in chronic tissue inflammation, abnormal cell proliferation, and vascular insults.[17] Importantly for the patient and urologist who will see them, these effects can lead to DO.[18] Hoffman et al found that men who received RT for prostate cancer had a DO rate of 70% compared to 38% in those who did not.[19] This study also showed smaller bladder capacity in post-RT patients compared to those who did not receive RT (253 mL versus 307 mL, respectively). Patients who present with UI following RT should have bladder function assessed for DO and reduced capacity.

BPH treatment

While not as significant as RP, prostate reducing surgeries in the setting of BPH can also cause IPT. Studies have demonstrated that patients can experience SUI following transurethral resection of prostate (TURP) or holmium laser enucleation of prostate (HoLEP). However, most cases are transient in nature with rates of IPT dropping to 1% or less at the one year interval.[20,21] Although surgery for BPH can reverse some of the pathological changes of the bladder, some patients experience irreversible changes to their bladder from longstanding BPH that persist following surgery.[22] Long-standing BPH left untreated can lead to persistent DO following surgery.[23]

Prophylactic measures against IPT

The value of pelvic floor muscle therapy (PFMT) for IPT after RP has been demonstrated. A systematic review by Strączyńska et al demonstrated not only PFMT's effectiveness in continence outcomes but also improving patient's quality of life.[24] This can possibly be attributed to patients actively participating in their own care. The current AUA/SUFU guidelines state that PFMT can be offered prior to RP and should be offered postoperatively.[2] One of the difficulties regarding PFMT is determining the optimal regimen and educating patients on proper technique. Fernandez et al performed a meta-analysis of eight randomized trials showing three sets of 10 contractions daily led to improved continence versus no intervention.[25] A trial by Milios et al demonstrated a faster return to continence for patients who were randomized to a more intensive PFMT regimen starting 5 weeks before surgery as compared to those who had a standard treatment regimen in the same period.[26]

Improved surgical techniques and advances in technology have also improved continence results following RP. Postoperative continence has been associated with bladder neck preservation, neurovascular sparing, non-thermal ligation of the dorsal venous complex, preserving urethral length and the supporting anatomy of the rhabdosphincter, and anatomic reconstruction.[27] A randomized control trial by Asimakopoulos et al showed faster return to continence for patients undergoing Retzius-sparing RALP compared to the anterior approach.[28]

Work up

Work-up of IPT must include a thorough history and physical examination along with appropriate diagnostic tests to elucidate the type as well as degree of UI.[2] Validated questionnaires to determine the type of UI include The International Consultation on Incontinence Questionnaire - Urinary Incontinence Short Form (ICIQ-UI SF) and the Michigan Incontinence Symptom Index (M-ISI).[29,30] Asking a patient to keep a diary is useful to understand their daily habits (such as fluid and caffeine intake) and can provide real-time recording of their triggers and symptoms. Severity of symptoms is frequently assessed by asking patients how many pads per day they use, frequency of changing their pads, and how wet the pads are when they change them. Daily pad weight, however, provides the most objective measure of degree of incontinence.[31] The Male Stress Incontinence Grading Scale (MSGIS) as well ICIQ-UI SF have been shown to correlate with heavier pads in patients with SUI.[32]

Physical exam should include maneuvers to confirm the presence of SUI such as having the patient cough or increase abdominal pressure via Valsalva maneuver. Urinalysis is a helpful adjunct to look for urinary tract infection, hematuria, or glucosuria which can cause similar symptoms to or exacerbate underlying IPT. Post void residual (PVR) can show if the patient is emptying well and rule out overflow incontinence. Cystourethroscopy should be performed prior to surgical intervention to assess the urethra and bladder for pathology such as urethral stricture or vesicourethral anastomotic stenosis as these can impact surgical intervention.[33] Ruling out bladder cancer is also important prior to surgical intervention. Bladder tumors, especially urothelial carcinoma in situ, can be associated with irritative voiding symptoms and the presence of cancer may influence the surgical options considered. For patients with a more complex presentation, invasive urodynamics is a useful tool.

If patients fail conservative therapies, surgery is indicated for those who have bothersome SUI-predominant symptoms. Surgery is contraindicated for patients with risk of renal failure due to bladder dysfunction, anatomy that does not support implantable device, or pathology that requires chronic endoscopic management. Generally, patients with SUI may be offered surgical intervention at 1 year postoperatively for bothersome SUI if they have failed non-surgical therapy. The guidelines, however, allow intervention to be as early as 6 months if the patient shows no improvement of IPT while undergoing non-surgical therapy.[2]

Surgical treatments for IPT

Artificial urinary sphincter

The artificial urinary sphincter (AUS) was first designed in 1976 and has seen several iterations over the years.[34] The AMS 800 (Boston Scientific, Marlborough, MA, USA) is a well-established and studied AUS. It is composed of a fluid-filled cuff that encircles the bulbar urethra, a pump, and a pressure regulating balloon (PRB). To be an appropriate surgical candidate, patients must have adequate cognitive function and manual dexterity to operate the device and stricture/stenotic disease must be ruled out. It is important to note that cognitive dysfunction and poor manual dexterity are predictors of AUS failure.[35]

During the procedure, the patient is placed in the dorsal lithotomy position. The dissection should expose the bulbar urethra where it is circumferentially measured to select the appropriate cuff size. If a patient's bulbar urethral circumference falls between cuff sizes, the larger cuff size should be selected to reduce risk of urethral compromise. The PRB is placed in the retropubic space and filled with enough fluid to achieve a pressure of 61-70 cmH_2O. The pump should be placed in a subdartos pouch within the scrotum. Special consideration must be given to patients with risk factors for or history of urethral atrophy or erosion and previous RT. Cuff size, placement, and pressure can be modified to account for these risk factors.

Patients should be counseled appropriately about AUS outcomes, durability, revision rates, and potential complications. In a study by Linder et al, 1,083 AUS placements were performed between 1983-2011 for men with SUI. With a median follow up of 4.1 years, 59% reported 0-1 pads per day and 94% reported high satisfaction.[36] A systematic review of 12 studies showed a 0-1 pads per day rate of 61%-100% with "complete dryness" varying from 4%-86%.[37] Over time, revision of AUS may become necessary. Device failure rate at 10 years has been shown to be nearly 50%.[38] Bergeson et al evaluated AUS revisions between 2007-2019 and showed PRB failure to account for one third of cases, mechanical cuff failure for 17%, and urethral atrophy for 8%.[39] In a study looking at both primary and revision AUS patients, three out of four patients were still satisfied 10 years following the procedure in both groups.[40]

Urethral bulking agents

Bulking agents are cystoscopically injected submucosally at the bladder neck to help coapt tissue and improve continence. While commonly used for female SUI due to ISD, they are rarely offered in male patients due to poor evidence and low efficacy/cure rates.[41]

Urethral sling

Male slings provide a minimally invasive surgical alternative to AUS for SUI. They increase resistance to urinary flow by elevating the bulbar urethra.[42] They do not require manual manipulation and can be used by patients who lack the dexterity to operate an AUS. They are considered appropriate for patients with mild to moderate SUI.[2] Sling mechanisms vary including transobturator, quadratic, and bone anchored designs.[12]

Patient positioning and dissection for the The AdVance/AdVance XP transobturator sling (Boston Scientific, Marlborough, MA, USA) is similar to AUS. The spongiosum is dissected ventrally to the perineal body. The mesh is attached to a passing device and passed from an outside to inside direction going through the thigh (about one fingerbreadth below adductor longus bilaterally) and obturator foramen (lateral to the pubic ramus) and out the perineal incision medial to the ipsilateral corporal body. The mesh is sutured to the spongiosum at the site of the central tendon. Under cystoscopic vision, tensioning should elevate the perineal body and proximal bulbar urethra about 3 cm-4 cm. A temporary Foley catheter is typically left postoperatively.

Collado et al found the AdVance and AdVance XP to have a cure rate of 77% (defined as 0 pads used) in a cohort of 94 patients with a median follow up of just over 4 years.[43] Patients in the study had mild to moderate SUI as defined by daily pad weight < 400 g. A clinical trial for the quadratic sling by Comiter et al demonstrated a 79.2% objective success rate at 12 months (considered as > 50% reduction in pad weight).[44] A review by Doudt et al on male urethral slings showed an overall success rate of nearly 80%.[45] Their review highlighted the importance of proper patient selection including mild to moderate incontinence, absence of bladder dysfunction/DO, and absence of prior RT. Potential complications from sling placement include urinary retention, perineal pain, and hematoma with explantation rarely being necessary.[46]

Adjustable balloon device

The ProACT device (Uromedica, Inc., MN, USA) was FDA approved in 2015. It consists of two balloons that are implanted on the lateral aspects of the bladder neck and provide coaptation. The balloons are filled with isotonic contrast solution and can be filled with additional fluid via subcutaneous ports in a subdartos pouch in the scrotum. The device can be adjusted every 6-8 weeks following initial implant to reach optimal symptomatic improvement in SUI. In a study by Noordhooff et al, they showed a success rate (considered zero pads or 1 pad for security) among 143 patients with any degree of incontinence and no prior history of radiation of 47% at 6 months and 51% at 12 months.[47] Seventy-eight percent of patients had significant improvement (considered greater than 50% reduction of pad use) at 1 year. The 2019 AUA/SUFU guidelines state that the adjustable balloon device may be offered to patients with mild SUI after prostate treatment.[2]

Patient factors influencing surgical treatment

In a review by Ajay et al of men who failed sling surgery, outcomes were compared between revision with AUS or a second sling operation.[48] Failure rate for the repeat sling cohort was 55% compared to only 6% for those receiving AUS. Furthermore, a study comparing men who received an AUS following failed sling placement to primary AUS patients showed a similar success rate of 96% (defined as 0-1 pads per day at 3 months) in both groups.[49]

Even though AUS and urethral slings are considered appropriate for patients who fall into the mild to moderate category of SUI, it is important to know their history, physical capabilities, and personal preferences to guide them towards the best option that would provide them a satisfying outcome. Patients with severe incontinence, previous RT, bladder dysfunction/DO, and those requiring revision should be offered AUS. Patients with cognitive dysfunction, poor manual dexterity, or not wanting to interact with a sphincter mechanism can be offered a sling. A balloon device should only be offered to patients with mild SUI.

Post prostatectomy UUI

According to the 2019 AUA/SUFU guidelines, patients who experience UUI or mixed UI should initially be treated following the AUA overactive bladder guidelines.[2] The treatment algorithm includes patient education about normal/abnormal bladder function, modification of voiding habits, PFMT, and lifestyle modifications.[50,51] This can then be followed by pharmacologic treatment with either anticholinergics or beta-3 agonist medication. Third line therapies include tibial nerve stimulation (TNS), sacral neuromodulation, and botulinum toxin. Very rarely patients who are not adequately treated with the aforementioned therapies require urinary diversion or bladder augmentation.

Conclusions

Prostate disease is a core men's health issue. Patients receiving RP or RT for prostate cancer or surgery for BPH have the potential of developing IPT. This

can result in mental/emotional distress and reduced quality of life. While SUI following RP is the biggest contributor to IPT, patients can also experience SUI, UUI or mixed incontinence following any modality of treatment for prostate disease.

For patients experiencing SUI, conservative therapies like PFMT are important in improving continence and patient quality of life and should be offered as standard of care. When surgical intervention is required, there are options available to patients including AUS, urethral sling, and adjustable balloon device. While AUS is considered the most established and versatile treatment, patient factors and preferences must be taken into consideration when determining the correct procedure. □

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