Surgical treatment for urinary incontinence in men: what's worth the effort?

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ABSTRACT

Urinary incontinence following prostatic surgery can be a devastating complication, significantly impacting the health related quality of life of any patient. With the constant increase in the number of radical prostatectomies, there is a corresponding increase in the rate of postsurgical urinary incontinence.
Our paper provides an overview of the diagnostic procedures, including patients' perceptions and expectations. The therapeutic options rely on creating obstruction below the bladder which can be classified into constant and variable obstruction.

We overview the male slings and the artificial urinary sphincter, both with advantages but also significant limits.

Our conclusion is that the artificial sphincter, far from being perfect, provides the best balance between benefits and complications, remaining the gold standard for the treatment of post prostatectomy incontinence.

Keywords: artificial urinary sphincter, intrinsic sphincteric deficiency, prostatectomy, urinary incontinence

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Introduction

Urinary incontinence following prostatic surgery can be a devastating complication, significantly impacting the health related quality of life of any patient. If the incontinence is triggered by this surgery, in the vast majority of cases the underlying mechanism is the failure of the urinary sphincter, known as intrinsic sphincter deficiency (ISD).

The prevalence of post-prostatectomy urinary incontinence (PPI) varies from 2.5%–87%, with 2%–10% reported in more recent series [1,2]. Incontinence can also occur in 1% of patients undergoing surgical treatment for benign prostatic hypertrophy (HBP) [1].

Although the incidence of PPI has decreased with better understanding of neurovascular anatomy and with the increased use of robotic radical prostatectomy and its novel techniques of urethral reconstruction [3], it continues to be one of the most feared complications after prostate surgery.

Patient history and evaluation

The history taking in a patient with PPI should focus on determining the type and severity of incontinence and its impact on his quality of life. Stress urinary incontinence usually has a typical presentation of leakage during periods of mobility or increased abdominal pressure (e.g. getting up from bed, coughing, etc).

The severity of incontinence is usually assessed by the number of pads soaked per day or the use of a penile clamp or similar devices. The stream of urination and the need for straining may indicate the presence of a stricture or bladder neck obstruction. It is also important to evaluate the pre surgery continence status as some problems might be preexistent.

A voiding diary can be helpful to quantify fluid intake and functional bladder capacity. Physical examination is performed with emphasis on the neurological assessment of the S2-S4 spinal segments (including anal sphincter tone, perineal sensation, and bulbocavernosus reflex). Sometimes, abdominal palpation may detect a distended bladder with overflow incontinence. Urodynamic evaluation may differentiate between the various causes of PPI in addition to ruling out poor bladder compliance, high-pressure detrusor overactivity during filling, and bladder obstruction during the flow portion of the study. Bladder capacity is also measured, as most patients with severe incontinence have low functional bladder capacity because of poor storage ability.

Patients with a history of stress incontinence usually have a finding of Intrinsic Sphincter Deficiency (ISD) in cystometrograms. This symptom has a positive predictive value of 95% and a negative predictive value of 100% of poor post surgery continence [4].

A detailed history of all associated comorbidities, particularly stroke, spinal trauma, or other neurological conditions, is important since it might impact the management. The patient's physical dexterity to manage a prosthetic implant also

should be assessed. It also is important to assess the erectile function during this visit, since it may require simultaneous management and may have been affected by the incontinence. Finally, the impact on the patient's quality of life and expectations after therapy are to be evaluated in order to determine the range of therapeutic options to be offered to each particular patient.

Disease Management

Male stress urinary incontinence (SUI) may be addressed by numerous established methods. These vary from relatively noninvasive methods of pelvic floor stimulation or biofeedback to progressively more invasive methods involving the use of various injectable bulking materials, bulbourethral slings, and external compression devices, such as the artificial urinary sphincter. Since the spontaneous improvement of urinary incontinence may take up to 12 months, historically it has been recommended that any corrective surgical intervention be postponed in men with PPI for 12 months after the prostatectomy. Newer evidence suggests that, if the patient is not undergoing any adjuvant therapy after the initial surgery, and since the chance of spontaneous recovery are small, surgical treatment for incontinence should be performed as early as three months, in order to limit the unpleasant symptoms of incontinence without any unnecessary delay [5].

Principles of surgical treatment

Most patients with persistent urinary incontinence one year after prostatic surgery will require some form of surgical intervention in order to become dry. Currently used surgical procedures to restore or improve continence are based on devices that often date back to the eighteenth century [6].

The working principle of these devices is to create some resistance (obstruction) below or at the bladder neck. The first category of interventions provides a constant resistance to urine outflow. This type of obstruction ideally prevents urine leakage during periods of physical activity but is low enough not to occlude the normal micturition process completely. Bulking agents are a typical example for this principle, but their proven lack of efficacy over time has led to their very limited usage in present. Most male slings will also be included in this category, although their usage is also limited due to a mix of poor efficacy and relatively high complication rates. Dynamic resistance devices allow the patient to modulate the output resistance manually, lowering it during micturition and raising it during periods when continence is needed. A typical example in this category is the artificial urinary sphincter, which imposed as the gold standard for the treatment of ISD incontinence in males, despite the many limitations it has.

Principles of surgical treatment: The Artificial Urinary Sphincter

The first artificial urinary sphincter and surgery for its placement was described by Foley in 1947. This procedure required the isolation of a segment of the urethra with the surrounding corpora spongiosa from the remaining components of the penile shaft. These were then encircled with an inflatable cuff that was connected to an external pump carried in the patient's pocket. Due to technical limitations in that era, Foley's idea remained theoretical.

The first model of the currently available Artificial Genitourinary Sphincter (AUS) was described by Scott in 1973 . This device, called the AS-721, was developed by American Medical Systems, Minnetonka, Minnesota, USA. It had four components: an inflatable cuff that was placed around the urethra, a reservoir that contained fluid, and two pumps: one placed in each hemiscrotum to activate or deactivate the pump. Activation of one pump pushed fluid out of the reservoir into the cuff to occlude the urethra by external compression. Activating the opposite pump resulted in a flow of fluid in the opposite direction out of the cuff into the reservoir and resulted in subsequent opening of the urethra. This device and its modifications continued to be in use until the development of the currently available AMS 800 sphincter.

The AMS 800 device provides acceptable social continence for approximately 90% of patients. Introduced over 30 years ago, the device has continually evolved to its current and sophisticated form. It is widely used in clinical practice, and over 150 000 devices have been implanted worldwide.

Unlike the original device, the AMS 800 consists of only three components: the urethral cuff, a pressure-regulating balloon (PRB), and the pump control which has both the activating and deactivating mechanisms in one assembly. The pressure on the urethra is controlled by balloons rather than valves, and the cuff is made of a dipcoated silicone rubber. The cuff is usually 2 cm wide after deflation and is available in a variety of lengths ranging from 4 to 11 cm depending on the size of the urethra and the site of placement. The cuff has clear tubing that is connected to similar .clear tubing on the pump which is also is made of a silicone elastomer and is placed in the scrotal soft tissue to allow patient and physician access for activation and deactivation. It consists of a soft lower part and a hard upper part. The hard upper part contains the valves that regulate the direction and flow of fluid while the lower part is mechanically pumped by the patient to drive the fluid. The hard upper part also contains a deactivation button that freezes the function of the pump so that fluid cannot flow in either direction. The pump has two exit tubes, a clear tube that connects to the cuff and a black tube for connection to the PRB.

The PRB usually is implanted in the prevesical space. They are available in a variety of pressure ranges, and the device is chosen depending on the amount of pressure required for the patient's cuff. The balloons are connected to the pump using a black connecting tube. The standard device packaging also includes an accessory kit of materials necessary for an implant. These include a disposable cuff sizer used to estimate the length of the cuff required, special needles for preparing the device components, tubing connection tools, and documentation. Most of the components are disposable and presterilized. However, some components such as the insertion needles or tubing connectors are made of steel and need to be sterilized before each procedure. The implantable components are not sterilizable and must not be reused.

With the evolution of technology, newer products and companies arrived on the market. Rigicon (New York, USA) offers an advanced AUS, with dynamic adjustment of the pressure inside the cuff, in direct relation to the abdominal pressure. This means that the cuff is not compressing the urethra very hard

most of the time, leading to lower chances for erosion. On the other hand, when the patient coughs or exercises, the higher abdominal pressure instantly induces a higher compression in the cuff, ensuring continence. To date there is not enough clinical evidence to support this device, but early data look very promising.

Results

It is difficult to quantify the overall success rate because of the subjective influence of the patient's attitude and behavior. While a strict definition would mean total absence of any leakage at any time and under any condition, individual perception varies, and some patients may be content with the occasional leak of a few drops while others may be happy wearing one pad a day. Since the aim of therapy is improvement in patient quality of life, various researchers have used different definitions of success. A complete evaluation would combine both these parameters: an objective evaluation of the amount of leakage/number of pads changed and an assessment of the quality of life.

Litwiller et al. [7] evaluated the results of AUS implantation in 65 patients, of which 51 suffered a radical prostatectomy, 13 had a TURP, and one had an open prostatectomy. All patients had severe postoperative incontinence. They defined continence strictly as no leakage and found an initial continence rate of 44%. This degraded to 20% over 28 months. However, the majority of patients (90%) reported satisfaction with the surgery, since it helped improve their continence from the initial status.

Gousse et al. [8] reviewed their data on 71 men who had undergone an artificial sphincter implantation following radical prostatectomy. At a mean follow-up of 7.7 years, 27% patients used no pads, 32% used one, and 15% used up to three pads per day. Fifty-eight percent of the patients were very satisfied, while another 19% were satisfied with the outcome of their surgery. One of the largest experiences in the use of the AUS for PPI has been reported by Elliot and Barrett [9] from the Mayo Clinic. In a mixed population of patients, they noted a continence rate of 88% at a mean of 6.5 years following surgery. Long-term results of AUS implant for PPI are not widely available. Fulford et al. [10] reported a 10-year follow-up with implants including a majority for neurogenic bladder dysfunction. The continence rate was over 60%.

As for complications, infection rate may be as high as 14.5% in some series [11], but the average rates are around 4–5% [12]. Infected or eroded devices need removal and the placement of a urethral catheter to allow healing of the urethra. The urethra usually heals well with rare stricture formation.

Atrophy of the urethra may occur either due to constant pressure or as a consequence of infection. It may occur in up to 9% of cases [9] and it will manifest as progressive loss of continence, erosion, or the need for increased pumping to void and deflate the cuff.

Gousse et al. [8] reported a revision rate of 7 of 42 in the patients with a narrow cuff compared with 18 of 23 with the older design. Elliott and Barrett [9] described a lower failure and revision rate with the narrow cuff design compared with the original

sphincter design. Downsizing the cuff also may be an option for the management of urethral atrophy. Saffarian et al. [13] reviewed 17 patients with urethral erosion following a standard AUS placement. All patients underwent cuff downsizing to a 4-cm cuff within the capsule of the original cuff, and the patient satisfaction rate improved from 15 to 80%. However, if the urethral atrophy cannot be managed by a simple downsizing, a tandem-cuff placement may be used. Dimarco and Elliott [14] found the tandem cuff to be effective with 89% of the 19 patients requiring less than three pads per day with and 88% satisfaction rate.

Another option for the management of erosion is the transcorporal cuff placement. In this case, it is necessary for a more distal placement of the cuff, either the primary cuff or a second tandem cuff. Guralnick et al. [15] describe a procedure whereby the urethra is dissected dorsally through the two corpora cavernosum, maintaining a layer of the tunica albuginea on the urethra. This adds bulk to the urethra and minimizes the risk of dorsal perforation. In their series of 31 patients at a mean of 17 months follow-up, 26 patients had mild or no stress incontinence. None of the cuffs developed erosion or infection. However, there is a risk of inducing erectile dysfunction in a preoperatively potent patient.

Mechanical problems are not to be ignored, since they require surgical revision or even explantation of the device. Even if the device is covered by warranty from the manufacturer, the patient has to undergo another surgical procedure, with similar or higher risks as the initial one.

Principles of surgical treatment: Male slings

Before the AUS was introduced, a variety of external urethral compression procedures attempted to control urinary incontinence. One of the first prosthetic devices was described by Berry [16] in 1961. It was an acrylic device placed beneath the bulbocavernosus muscle, designed to kink and compress the bulbous urethra at a point just distal to the urogenital diaphragm. The procedure was then modified to include the use of stainless steel sutures, passed through drill holes in the ischial and pubic rami [13]. However, high rates of perineal pain and fistula formation in the presence of only modest success led to the abandonment of the Berry prosthesis [17].

In 1970, Kaufman [18] described a surgical method for compressing the urethra. In this Kaufman type-I anti-incontinence procedure, the penile crura were crossed over the bulbous urethra to produce urethral compression, but success rates were low (30%). In the Kaufman type-II procedure [19], the crura were approximated in the midline using a polytetrafluoroethylene mesh tape. The synthetic tape was folded in such a manner as to compress the bulb of the urethra. Success rates increased to 50%. The Kaufman type-III procedure used a silicone-gel-filled hemispherical prosthesis, surrounded by external velour of polyurethane and 2 polyurethane straps, leading to success rates approaching 70%. Kishev [20] next described a combined abdominoperineal approach utilizing a pliable prosthetic wad under the bulbar urethra, with tension provided by nylon sutures that are passed through the retropubic space and secured over small Marlex pledgets above the abdominal

fascia. The Kaufman and Kishev prostheses ultimately fell out of favor because of high failure rates, infectious complications, pelvic pain, and the introduction of the AUS.

Jorion et al. [21] described their experience of using the rectus fascia sling in 30 patients where the sling was constructed prophylactically during the radical prostatectomy procedure itself. They reported a 90% continence rate compared with 70% in the group without the sling at 3 months. The results improved to 100 and 93%, respectively, at 12 months. Schaeffer et al. [22] described a procedure using synthetic material in which three bolsters of Cooley soft vascular graft material or polyethylene terephthalate covered by a polytetrafluoroethylene sleeve were used in 64 men with PPI. A Stamey needle was used to guide a nylon thread from each bolster into the suprapubic area from either side of the bladder neck. With a mean follow up of 22.4 months following a single-sling procedure, 64% of patients were either dry or improved. Twenty-three retightening procedures were performed. They found previous irradiation to be the only significant poor risk factor for success.

A new transobturator male sling system (AdVance, American Medical Systems, AMS, Minnetonka, Minnesota, USA) has recently been approved for use in the United States. With this system, a midline perineal incision is made, exposing the bulbospongiosus muscle, which is then split centrally and retracted laterally. The dissection is extended to the perineal body. After exposure of the urethral bulb, blunt-finger dissection is used to identify the space between the corpora cavernosa laterally and the corpus spongiosum medially. A small skin incision is made in the leg fold on the lateral side of the scrotum, 1 cm below and lateral to the insertion of the adductor longus tendon at the medial border of the obturator foramen. The index finger of the surgeon is then placed between the urethral bulb medially and the proximal corpus cavernosum laterally, just inside the bulbospongiosus muscle.

The helical curved introducer needle is placed over the skin incision and mild force is used to perforate the subcutaneous tissue and obturator fascia, maintaining a constant axis of rotation at 45°. The needle is passed towards the tip of the finger and the tape is then positioned through both obturator fossae. With two absorbable sutures the middle part of the polypropylene tape is then fixed distally onto the bulb and proximally onto the perineal body. The tape is then pulled at both ends to its final position, and the ends are cut at skin level. Short-term results of this technique have shown it to be effective in 70% of patients [23].

Recently, various adjustable male slings such as ProACT (Uromedica, Plymouth, MN, USA), Remeex (Neomedic, Barcelona, Spain), and Argus (Promedon SA, Cordoba, Argentina) have been introduced in Europe. These slings can be variably tensioned according to patient needs and the degree of recurrent urinary incontinence.

The ProACT device is constructed from silicone elastomer, similar to the materials used in the AMS 800 AUS. Two ProACT balloons are attached to a reinjectable titanium port with a short length of tubing and are then implanted periurethrally, on either side of the bladder neck, just proximal to the

remnant external sphincter. The ports are sited subcutaneously under the scrotal dartos fascia to allow for future percutaneous adjustments of the balloon volume.

A recent paper comparing the last 50 patients to the first 50 patients using ProACT showed a significant improvement in results [24]. Pad usage was reduced significantly in both groups ($p < .001$). Overall, late-group patients obtained more consistent outcomes than early-group patients (80% vs. 60% dry). I-QOL (incontinence quality of life scale) scores improved in both groups although more significantly in the late group ($p = 0.005$).

Trigo-Rocha [25] reported their results following the use of this device in 23 patients with a mean follow up of 22.4 months. Of these patients, 65% were continent at up to one pad soakage level. Patients not satisfied with the results were 35%, and two opted for an AGUS placement. Four patients required revision surgery. There were no major complications.

The **Argus** sling consists of three components: a silicone foam cushion designed to provide bulbourethral compression, silicone columns attached to both ends of the pad for fixation against the abdominal rectus fascia, and silicone washers. All components are radioopaque to allow sling repositioning after implantation. The device can be regulated by moving the washers up and down to create the desired tension. The Argus device is inserted through both a suprapubic and a perineal incision, in the same fashion as that described by Schaeffer et al. [26]. An European multi-center trial enrolling 48 patients found the device to be very effective. At a mean follow up of 7.5 months, 35 (73%) of the patients were dry, and 5 (10%) were improved, although 8 (17%) were incontinent, including 4 (8%) who needed sling adjustment [26]. There were 3 (6%) urethral perforations during surgery that were resolved by re-passing the needle. The sling was removed from 3 men (6%) due to erosion and from 2 (4%) due to infection. This compares favorably to the complication rate associated with artificial urinary sphincters.

The male **Remeex** system is composed of a monofilament suburethral sling connected to a suprapubic mechanical regulator with two monofilament traction threads. The mechanical regulator, or varitensor, is a subcutaneous permanent implant, placed over the abdominal rectum fascia 2 cm above the pubis, used to wind and tighten the traction threads. The suburethral sling is also placed in a fashion similar to that for the Schaeffer sling. In a recent multi-center European study, 51 patients with mild to severe stress urinary incontinence were treated with the Remeex system. Of these, 44 (86%) patients required a single adjustment of tension between 1 and 4 months after surgery, while 17 (33%) other patients required more than 1 delayed tension adjustment. Overall, 33 (65%) patients were considered cured, another 10 (20%) showed improvement, while 8 (16%) were unchanged. The average follow-up time was 32 months. The mesh was removed in one (2%) case due to urethral erosion, and the varitensor in 2 (4%) cases was removed due to infection. There were 5 (10%) uneventful intraoperative bladder perforations and 3 (6%) mild perineal hematomas reported [27].

Conclusions

All these procedures and devices are relatively new with limited results. Most reported results are of short-term duration and are no better than the AUS. The main reason for their development seems to be the relatively cheaper cost. Efficacy data and direct comparison with AUS are still lacking.

Given the complexity of PPI, it is difficult to produce good quality clinical data, since there is no reasonable randomization procedure and active comparators are not available for most techniques.

Male stress urinary incontinence can be treated with multiple modalities. Current surgical options for post-prostatectomy incontinence include bulking agents such as collagen and devices such as the AUS. Low success rates with bulking agents and high revision rates with the AUS have prompted a resurgence of interest in fixed urethral compression procedures. The modern male sling is an exciting development in fixed urethral compression. However, patients with mild to moderate SUI may benefit greatly from use of this technology. To date, the AUS remains the gold standard therapy for PPI.

References

1. Haab F, Yamaguchi R, Leach GE. Postprostatectomy incontinence. Urol Clin North Am. 1996;23:447-57.

2. Majoros A, Bach D, Keszthelyi A, Hamvas A, Romics I. Urinary incontinence and voiding dysfunction after radical retropubic prostatectomy (prospective urodynamic study). Neurourol Urodyn. 2006;25:2-7.

3. Tewari A, Jhaveri J, Rao S, Yadav R, Bartsch G, Te A, et al. Total reconstruction of the vesico-urethral junction. BJU Int. 2008;101:871-7.

4. Ficazzola MA, Nitti VW. The etiology of post-radical prostatectomy incontinence and correlation of symptoms with urodynamic findings. J Urol 1998; 160:1317.

5.Wilson, S.K., Chung, E., Langford, B., Schlesinger R, Koca O, Simsek A, Persu. C, Pottek T, Mulcahy J. First safety outcomes for rigicon conticlassic® artificial urinary sphincter. Int J Impot Res (2023). https://doi.org/10.1038/s41443-023-00748-8

6. Madjar S, Raz S, Gousse AE. Fixed and dynamic urethral compression for the treatment of post-prostatectomy urinary incontinence: Is history repeating itself? J Urol 2001; 166:411–415.

7. Litwiller SE, Kim KB, Fone PD, et al. Post-prostatectomy incontinence and the artificial urinary sphincter: a long-term study of patient satisfaction and criteria for success. J Urol. 1996;156:1975-1980

8. Gousse AE, Madjar S, Lambert MM, Fishman IJ. Artificial urinary sphincter for post-radical prostatectomy urinary incontinence: Long-term subjective results. J Urol 2001; 166(5):1755–1.

9. Elliott DS, Barrett DM. Mayo Clinic long-term analysis of the functional durability of the AMS 800 artificial urinary sphincter: A review of 323 cases. J Urol 1998; 159(4):1206–1208.

10. Fulford SC, Sutton C, Bales G, et al. The fate of the "modern" artificial urinary sphincter with a follow-up of more than 10 years. Br J Urol 1997; 79(5):713–716.

11. Scott FB. The artificial urinary sphincter. Experience in adults. Urol Clin North Am 1989; 16:105.

12. Hussain M, Greenwell TJ, Venn SN, Mundy AR. The

current role of the artificial urinary sphincter for the treatment of urinary incontinence. J Urol 2005; 174(2):418–424.

13. Saffarian A, Walsh K, Walsh IK, Stone AR. Urethral atrophy after artificial urinary sphincter placement: Is cuff downsizing effective? J Urol 2003; 169:567–569.

14. DiMarco DS, Elliott DS. Tandem cuff artificial urinary sphincter as a salvage procedure following failed primary sphincter placement for the treatment of post-prostatectomy incontinence. J Urol 2003; 170(4 Pt 1):1252–1254.

15. Guralnick ML, Miller E, Toh KL, Webster GD. Trans-corporal artificial urinary sphincter cuff placement in cases requiring revision for erosion and urethral atrophy. J Urol 2002; 167(5):2075–2078.

16. Berry JL. New procedure for correction of urinary incontinence: a preliminary report. J Urol. 1961:771-5.

17. Engel RM, Wade JC. Experience with the Berry prosthesis. J Urol. 1969;102:78-80.

18. Kaufman JJ. A new operation for male incontinence. Surg Gynecol Obstet. 1970;131:295-9.

19. Kaufman JJ. Surgical treatment of post-prostatectomy incontinence: use of the penile crura to compress the bulbous urethra. J Urol. 1972;107:293-7.

20. Kishev SV. Surgery for male urinary incontinence. In: Glenn JF, ed. Urologic Surgery. 2nd ed. Philadelphia, PA: JB Lippincott; 1975:596-611.

21. Jorion JL. Rectus fascial sling suspension of the vesicourethral anastomosis after radical prostatectomy. J Urol. 1997; 157(3):926–928.

22. Schaeffer AJ, Clemens JQ, Ferrari M, Stamey TA. The male bulbourethral sling procedure for postradical prostatectomy incontinence. J Urol 1998; 159(5):1510–1515.

23. Rehder P, Gozzi C. Transobturator sling suspension for male urinary incontinence including post-radical prostatectomy. Eur Urol. 2007;52:860-6. Epub 2007 Feb 12.

24. Moreno Sierra J, Victor Romano S, Galante Romo I, Barrera Ortega J, Salinas Casado J, Silmi Moyano A. New male sling "Argus" for the treatment of stress urinary incontinence. [In Spanish]Arch Esp Urol. 2006;59:607-13.

25. Trigo-Rocha F, Gomes CM, Pompeo AC, et al. Prospective study evaluating efficacy and safety of adjustable continence therapy (ProACT) for post radical prostatectomy urinary incontinence. Urology 2006; 67(5):965–969.

26. Schaeffer AJ, Clemens JQ, Ferrari M, Stamey TA. The male bulbourethral sling procedure for post-radical prostatectomy incontinence. J Urol . 1998;159:1510–5. Erratum in: J Urol 1998;160:136.

27. Sousa-Escandón A, Cabrera J, Mantovani F, Moretti M, Ioanidis E, Kondelidis N, et al. Adjustable suburethral sling (male remeex system) in the treatment of male stress urinary incontinence: a multicentric European study. Eur Urol. 2007;52:1473-9. Epub 2007 Jun 4.l