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## Review – Incontinence

# Contemporary Management of Postprostatectomy Incontinence

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### Abstract

**Context:** In recent years, despite improvement in the surgical technique, the prevalence of postprostatectomy incontinence has increased due to a rise in the number of radical prostatectomies performed annually.

**Objective:** The aim of this review is to evaluate contemporary noninvasive and invasive treatment options for postprostatectomy incontinence.

**Evidence acquisition:** In August 2010, a review of the literature was performed using the Medline database.

**Evidence synthesis:** All articles concerning noninvasive and invasive treatment for postprostatectomy incontinence were included.

**Conclusions:** No randomised controlled trials exist to compare currently used noninvasive and invasive treatments for postprostatectomy incontinence. Pelvic floor muscle training is recommended for the initial treatment of stress urinary incontinence (SUI). Additionally, antimuscarinic therapy should be applied for urgency or urge incontinence. For decades, the artificial urinary sphincter was the reference standard for persistent SUI. Nowadays, male slings are an alternative for men with mild to moderate postprostatectomy SUI.

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## 1. Introduction

The reported prevalence of urinary incontinence in all men is as high as 39% and increases with age [1]. The most prevalent cause of stress urinary incontinence (SUI) in adult

men is the radical prostatectomy (RP), a standard treatment for localised prostate cancer (PCa) [2]. Postoperative incontinence is one of the most feared complications of RP with a major impact on quality of life. Due to the increasing number of RPs performed for PCa, a substantial

and increasing number of patients suffer from postoperative stress urinary incontinence (SUI). Despite improved surgical techniques, the reported SUI rates are between 5% and 48.0% [1]. In addition, especially during the first year after RP, overactive bladder (OAB) symptoms due to detrusor overactivity (up to 77% of patients) and de novo impaired bladder compliance (up to 50% of patients) may occur [3]. However, in most cases OAB symptoms are self-limiting after a year [3–5]. This large variation in the rates of reported incontinence after RP may be attributed, to a certain extent, on the influence of the interviewing physician as well as the lack of a standardised definition of both “postprostatectomy incontinence” and “postprostatectomy continence” [1,6]. Postprostatectomy continence rates seem to depend on several factors including the methodology of definition (eg, definition of continence: no leakage at all, no pads but loss of a few drops of urine, one safety pad per day; use of questionnaires), patient factors (eg, age, body mass index, urethral length, possibly prostate volume, preoperative continence status, preoperative sphincter insufficiency, preoperative detrusor dysfunction), and surgical technique (eg, the experience of the surgeon, the surgical approach, and the technique of resection) [7]. In general, men <50 yr of age show a significantly better continence rate than men >70 yr after RP [8]. The treatment of postprostatectomy incontinence consists of three different approaches: conservative management, pharmacotherapy, and surgical treatment.

Overall, postprostatectomy incontinence has a major impact on quality of life affecting the patient’s physical activity and social well-being and subsequently imposing a major burden for patients that needs to be addressed [9]. This paper reviews all of the currently available evidence in the field of management of postprostatectomy incontinence and makes recommendations for the evaluation, diagnosis, and treatment of this problem.

## 2. Evidence acquisition

In August 2010, we conducted a review of the literature using the Medline database. All articles concerning noninvasive and invasive treatment for postprostatectomy incontinence were included. Meeting reports were not included. In addition, other significant studies cited in the reference list of the selected articles and other significant studies published after the systematic review were evaluated. Multiple free-text searches were performed including the following terms: *postprostatectomy incontinence, male stress urinary incontinence, male urinary incontinence diagnosis, male urinary incontinence therapy, treatment male incontinence, management male incontinence, management postprostatectomy incontinence, treatment postprostatectomy incontinence, artificial urinary sphincter, male sling, ProAct balloon, Argus sling, Remeex sling, AdVance sling, InVance sling, bulking, pelvic floor training, duloxetine, and antimuscarinics.*

In total, >3000 articles were retrieved and evaluated for available evidence concerning postprostatectomy incontinence treatment options.

## 3. Evidence synthesis

### 3.1. Diagnosis

Evidence for an appropriate, meaningful, and validated tool for the measurement of postprostatectomy incontinence is lacking. According to the European Association of Urology (EAU), the diagnosis of male urinary incontinence requires a two-step assessment (Fig. 1) [1]. The first step of the evaluation should include a medical history, an objective assessment of symptoms, and a physical examination including urine analysis and ultrasound for residual urine (postvoid residual). In addition, the influence of the diagnosis on quality of life and the individual’s desire for treatment should be evaluated. Several questionnaires exist for these evaluations including the International Consultation on Incontinence Questionnaire—Short Form [10], the UCLA/RAND-Prostate Cancer Index urinary function score [11], the Patient’s Global Impression of Improvement [12], and the Incontinence Impact Questionnaire—Short Form [13]. However, often these questionnaires are not specific for postprostatectomy incontinence. The grade of SUI can be objectively determined with a standardised pad weight test as recommended by the International Continence Society (ICS) [14]. The 24-h pad test seems to be the most accurate test [15]; however, the standardised 1-h pad test is most widely used due to feasibility reasons, with the grading of the SUI as follows: grade 1, urine loss in 1-h pad test <10 g; grade 2, urine loss in 1-h pad test 11–50 g; grade 3, urine loss in 1-h pad test 51–100 g; grade 4, urine loss in 1-h pad test >100 g [14]. After the initial diagnostic workup, first-line treatment should be initiated, and if this fails after a period of 8–12 wk, a specialised clinical assessment is indicated [1].

Urethrocystoscopy and urodynamics may provide additional information to further strengthen the rationale for an informed decision among the different surgical treatment options. Urodynamics should be performed as a multichannel examination as outlined by the ICS for complete evaluation in men where the use of the abdominal leak point pressure, evaluated via rectal catheter, seems to be more accurate in comparison with the Valsalva leak point pressure [16].

### 3.2. Conservative therapy

Conservative noninvasive management of postprostatectomy SUI includes lifestyle interventions, pelvic floor muscle training (PFMT) with or without biofeedback, and bladder training. In some patients with additional OAB symptoms, additional antimuscarinic pharmacotherapy is the recommended first-line treatment for early postprostatectomy incontinence within the first 6–12 mo [1]. In general, the data for the conservative treatment options are much weaker for men with postprostatectomy OAB and SUI than in women, making the evidence for treatment recommendations in this group weak.

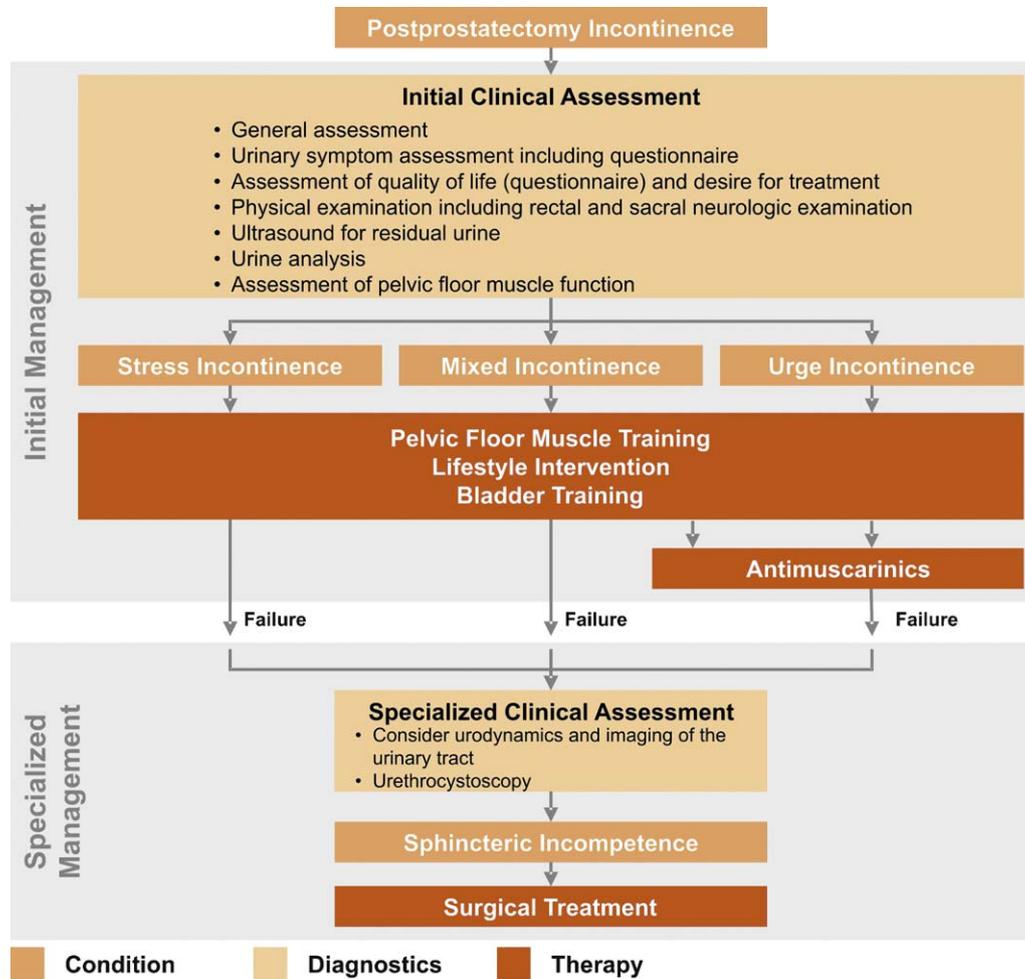


Fig. 1 – Initial and specialised assessment and management of postprostatectomy incontinence based in European Association of Urology 2010 guidelines.

### 3.2.1. Physiotherapy

Preoperative or immediate postoperative PFMT is useful (grade of recommendation: B; level of evidence: 2) [1]. Supervised PFMT is the most widely recommended noninvasive conservative treatment [1] and hastens the return of continence after prostate surgery. In general, most recommendations for PFMT are based on wide consensus of incontinence experts and multiple trials due to clinical efficacy and safety. In general, studies on physiotherapy show an earlier return to continence if started early in the postoperative period.

Many urologist advocate PFMT before prostate surgery, especially before RP. A recent published study showed significantly better continence rates 3 mo postoperatively in patients who performed preoperative PFMT (59.3%) in comparison with patients who started postoperatively (37.3%) [17]. Additionally, early postoperative PFMT significantly reduces the continence recovery time after surgery [18]. In a randomised trial of 300 patients, the PFMT group showed a significantly improved continence rate when compared with the control group (19% vs 8% after 1 mo and 94.6% vs 65% after 6 mo) [19]. There is no objective data

indicating the optimal time to initiate physiotherapy after RP. However, based on the authors' experience we recommend initiating physiotherapy immediately after catheter removal. In addition, PFMT is even helpful in men with persisting SUI >1 yr after RP [20].

Data concerning additional biofeedback training are controversial. Recent studies comparing PFMT with biofeedback versus no treatment showed significantly improved results in those undergoing PFMT and physiotherapy (no pads after 3 mo: 65.4–88% vs 28.6–56%; no pads after 6 mo: 80.8–95% vs 54.3–77%) [21,22]. However, other studies showed no difference [20,23,24]. According to the EAU guidelines, additional biofeedback therapy is currently a therapist decision based on economics and preference (grade of recommendation: B; level of evidence: 3) [1].

Several studies have established the benefits of electrical stimulation for postprostatectomy SUI [25–27]. In a recent prospective randomised study, patients with electrical stimulation and biofeedback training were continent after a mean time of 8.0 wk, whereas those who only performed PFMT after verbal instruction needed 13.88 wk to regain continence [27]. However, electrical stimulation provided

no benefit in multiple other studies [20,24,28] and therefore does not appear to be beneficial (grade of recommendation: B; level of evidence: 2) [1].

Lifestyle interventions such as timed voiding, reduction of fluid intake, and reduction of bladder irritants like coffee and hot spices are recommended for postprostatectomy incontinence by the EAU as well as by the ICS. A recent study showed the positive impact of behavioural therapy on incontinence frequency and urine storage symptoms in men with persisting incontinence >1 yr after RP [20]. However, at the moment there are no good objective clinical data for these recommendations (grade of recommendation: no recommendation possible) [1].

Extracorporeal magnetic innervation therapy may have a beneficial effect in the first 1–2 mo of conservative postprostatectomy SUI treatment [29]. However, evidence-based data are missing, and there is no current recommendation in the guidelines for extracorporeal magnetic innervation therapy [1].

### 3.3. Pharmacotherapy

For patients suffering from additional OAB symptoms after prostate surgery, antimuscarinic medications are recommended (grade of recommendation: C; level of evidence: 3) [1]. Currently, no approved pharmacologic therapy for male SUI exists. However, for female SUI, the use of duloxetine, a serotonin and noradrenalin reuptake inhibitor, is an approved therapy in most European countries [30]. In recent years, the efficacy also has been evaluated for use in men. Currently, two randomised controlled trials (RCTs) (one of these studies was only single blinded and combined duloxetine with PFMT) [31,32] and three case series [33–35] exist showing good effectiveness. In the placebo-controlled RCT, a mean reduction of incontinence episodes of 52.2% was achieved after 12 wk of 80 mg duloxetine with significant improvement seen after only 8 wk. The major side effects included fatigue (50% vs 13% in the placebo group), insomnia (25% vs 20%), loss of libido (19% vs 7%), constipation (13% vs 7%), nausea (13% vs 7%), diarrhoea (13% vs 7%), and dry mouth (6% vs 0%) [32]. Often these side effects were mild, and most symptoms resolved after a short period.

In addition, one study showed a significant synergistic effect of adding duloxetine in combination with PFMT [31]. Duloxetine is not approved for the treatment of postprostatectomy incontinence, and warning must be given that this medication can only be prescribed as an off-label therapy.

### 3.4. Surgical treatment

In patients with persistent postprostatectomy SUI, surgical treatment is recommended after conservative noninvasive treatment has failed or is incomplete [1]. There are no guidelines, however, concerning the timing of surgical treatment in the postoperative period. Continence may improve significantly during the first year after surgery [36], and some studies show continued improvement within the first 2 yr [37]. In general, surgical intervention should be

offered if the incontinence status is stable and no further improvement of continence can be achieved with conservative treatment, and up to 10% of patients with postprostatectomy incontinence do ultimately progress to needing surgical treatment [38,39].

#### 3.4.1. Artificial urinary sphincter

According to the EAU guidelines, the artificial urinary sphincter (AUS) (AMS 800, American Medical Systems, Minnetonka, MN, USA) is still the treatment of choice for persistent moderate to severe SUI (Fig. 2) [1,40]. The success rates of the AUS are still the highest compared with all other treatment options for male SUI. Even long-term results (Table 1) are very good, with success rates up to 90% (grade of recommendation: B; level of evidence: 2 [1]) [41–45].

The use of the double-cuff system was thought to reduce urethral atrophy and increase continence rates. However, men with double-cuff systems have a higher risk of complications and additional surgeries with no significant advantage in regard to dry rates [46].

In 2003, the trans-scrotal technique with only one incision for the AUS implantation was introduced [47]. However, complete dry rates seem to be higher in the perineal approach, and a recent multicentre study with 158 patients showed a complete dry rate of 44.1% in patients who underwent the perineal placement of the AUS, whereas only 27.4% were dry after an AUS placement by the trans-scrotal approach [48].

AUS implantation after radiotherapy showed lower success rates and higher revision rates in some studies due to a higher incidence of infection and erosion (grade of recommendation: C; level of evidence: 3 [1]) [49–51]. In patients who have undergone radiotherapy, some surgeons prefer a longer postoperative deactivation time and a lower pressure reservoir, but again there are no data to support this recommendation. Age should not be an exclusion criterion for AUS implantations [52].

Despite a good success rate, the AUS is expensive and does carry a risk of complications such as erosion,

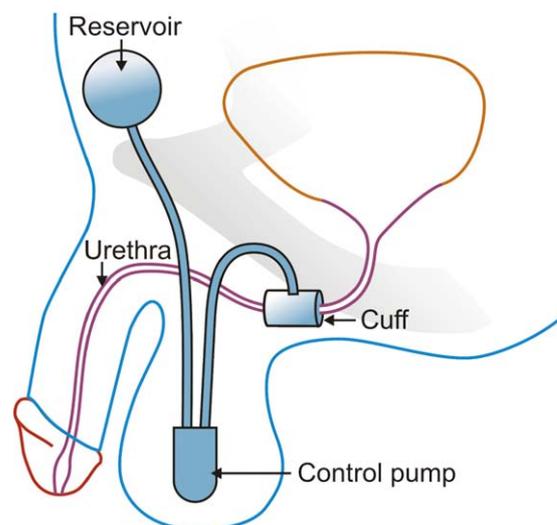


Fig. 2 – Artificial urinary sphincter.

**Table 1 – Results of the artificial urinary sphincter after radical prostatectomy\***

Study	No. of patients	Mean follow-up, yr	Success, % (0–1 pad per day)	Complications, %
Kim et al (2008) [42]	124	6.8	82	Surgical revision: 37.0 • Mechanical failure: 32.4 • Erosion: 8 • Infection: 5.6
Gousse et al (2001) [41]	71	7.7	60	Surgical revision: 29 • Mechanical failure: 25 • Erosion: 4 • Infection: 1.4
Venn et al (2000) [45]	23	Median: 11	92	Infection and erosion: 17

\* With a mean follow-up  $\geq 5$  yr, published in the last 10 yr.

mechanical failure, and infection. In addition, periodic revisions may be necessary. The revision rates due to mechanical failure are reported to be 8–45%; those due to nonmechanical reasons such as erosion, urethral atrophy, and infections range from 7% to 17% [53–55]. In general, with the narrow back cuff, introduced in 1987, the revision rate has decreased and is not associated with worse outcomes than primary implantation [53]. Furthermore, patient satisfaction is associated with level of continence after AUS and not the number of revisions [41]. In addition, patients need dexterity to handle the AUS. All these issues may be the reason for the popularity of treating patients with other devices including the male slings.

### 3.4.2. Slings

The first male slings were described by Berry and Kaufman and later by Schaeffer et al [56–58]. However, these slings fell out of favour because of low success rates and high complication rates.

There have been several new minimally invasive sling systems introduced recently for male SUI. In general, male slings are an alternative for men with SUI, with the best results achieved in patients with mild to moderate SUI and no previous radiotherapy (grade of recommendation: C; level of evidence: 3 [1]). There are no individual recommendations concerning each specific sling system.

**3.4.2.1. Bone-anchored sling systems.** The InVance sling (American Medical Systems), is a nonadjustable sling system consisting of a silicon-coated polyester sling positioned under the bulbar urethra via a perineal incision to achieve compression (Fig. 3). The sling is fixed to both ischiopubic rami by three titanium screws on each side.

The InVance sling system has good data with a follow-up period of 4 yr, the longest follow-up period for all sling systems. The pad-free rates range from 36% to 65% in patients with mild to severe SUI [59–64]. Postoperative perineal pain occurs in up to 76% of the patients but usually resolves after 3 mo. Other reported complications include increased residual urine (up to 12%), the need for explantation due to infection (up to 15%), and bone-anchor dislodgement (up to 5%).

There is a definitively higher failure rate (85%) for these slings in men who have undergone radiation [61,62], but implantation of the AUS after a failed bone-anchored sling therapy still shows good results [65].

**3.4.2.2. Readjustable sling systems.** Two adjustable sling systems are available with published data: the Argus (Promedon, Córdoba, Argentina) and the Remeex (Neomedic, Barcelona, Spain).

The Argus sling is a radiopaque cushioned system with a silicone foam pad for soft compression of the bulbar urethra (Fig. 4). Two silicone columns formed by multiple conical

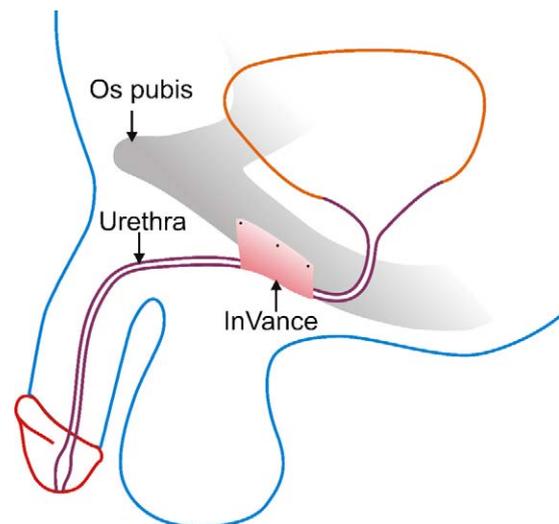


Fig. 3 – InVance sling.

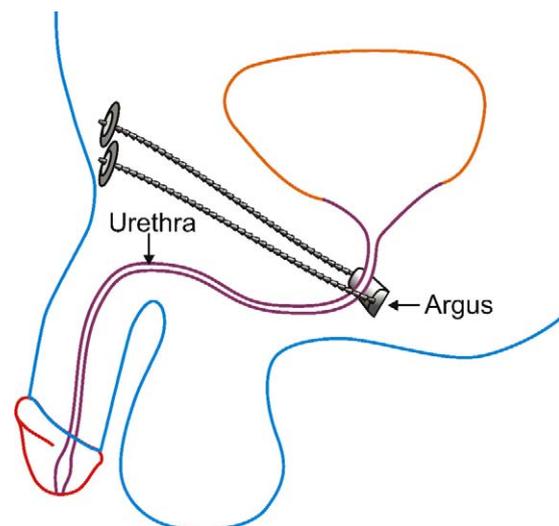


Fig. 4 – Argus sling.

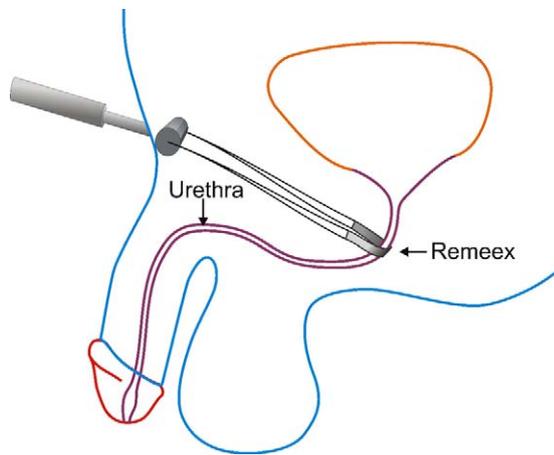


Fig. 5 – Remeex system.

elements are attached to the silicone foam and allow system readjustment while two radiopaque silicone washers allow regulation of the desired tension (recommended maximum intraoperative leak point pressure: 45 cm H<sub>2</sub>O). The Argus sling can be implanted via a retropubic or a transobturator approach. In obese patients the transobturator approach may have some advantage. In patients with mild to moderate SUI, dry rates of up to 65% can be achieved [66,67]. In a recent prospective study of patients with moderate to severe incontinence, a dry rate of 79% was reported and adjustment was required in 38.6% of the cases [68].

Reported complications of the Argus sling include transient perineal pain (15%) and sling explantation (8–12%) due to erosion into the urethra, the bladder, and through the abdominal wall and due to infections. Implantation of the AUS after failed Argus sling showed good results [68].

The Remeex system is a readjustable sling positioned under the bulbar urethra (Fig. 5). A mesh is connected via two monofilament traction threads to a suprapubic mechanical regulator. The mechanical regulator is permanently implanted subcutaneously over the abdominal rectum fascia 2 cm above the pubis. Adjustment is conducted via an external manipulator. Reported dry rates in patients with mild to moderate SUI are comparable with the Argus sling (Table 2) [68–71]. However, most of the

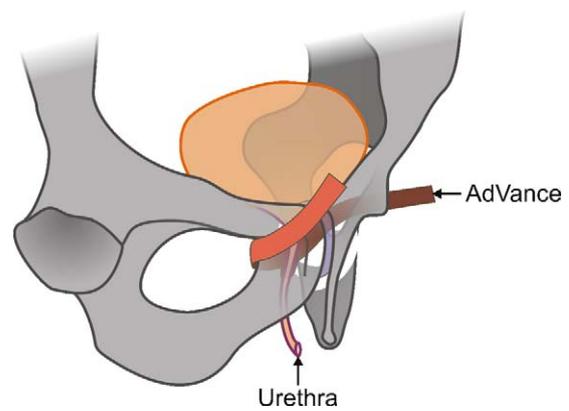


Fig. 6 – AdVance sling.

patients need at least one readjustment to achieve these rates. Reported complications of this device include intraoperative bladder injuries (up to 11%) and removal of the device (up to 12%) due to infections or urethral erosion. In addition, the reported rate of postoperatively perineal discomfort and pain is high. No data exist concerning further treatment after failed Remeex sling implantation.

**3.4.2.3. Retrourethral transobturator sling.** According to the inventors, the AdVance sling (American Medical Systems) works by relocating the lax and descended supporting structures of the posterior urethra and sphincter region after prostate surgery into the former preprostatectomy position (Fig. 6) [72]. Hence required preconditions for success include good mobility of the sphincter region and a good residual function of the sphincter with a coaptive zone of >1 cm [73].

In a follow-up period of at least 1 yr, dry rates of up to 70% can be achieved (Table 3) [73–79]. In patients with additional radiotherapy, the AdVance sling showed reduced treatment success with dry rates between 25% and 53% [76,78,80]. The major complication includes transient acute postoperative urinary retention (up to 21%) requiring temporary recatheterisation, local wound infection, urinary infection with fever, and persistent moderate perineal pain. In addition, explantation rate is very low [81].

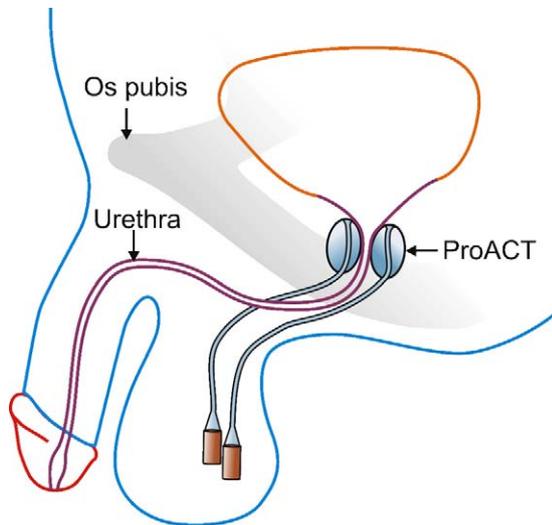
In patients after failed first AdVance sling implantation despite good sphincter function, the implantation of a second AdVance sling showed good results in a follow-up

Table 2 – Results of the Remeex and Argus sling with a mean follow-up  $\geq 12$  mo

Study	Type of sling	No. of patients	Mean follow-up, mo	Cure, %	Improvement, %	Readjustments, %
Romano et al (2009) [67]	Argus	48	45	66 (no pads)	12.8	Dry patients: 10.4
Hübner et al (2011) [68]	Argus	101	50.4	79.2	5.0	38.6
Sousa-Escandon et al (2004) [71]	Remeex	6	18	83	0	Not specified
Campos-Fernandes et al (2006) [69]	Remeex	18	26.3	55.5	11.1	1×: 44
Sousa-Escandon et al (2007) [70]	Remeex	51	32	64.7 (no or one small pad per day)	19.6	1×: 100 >1×: 33.3

**Table 3 – Results of the AdVance sling with a mean follow-up  $\geq 12$  mo**

Study	No. of patients	Follow-up, mo	Cure, %	Improvement, %
Cornu et al (2009) [76]	102	Mean: 13	62.7 (no pad)	17.6
Bauer et al (2009) [75]	70	12	51.4 (no pad or one dry security pad)	25.7
Rehder et al (2009) [73]	20	24.3	65 (no pads)	20
Rehder et al (2010) [74]	118	12	73.7 (no pads)	16.9
Bauer et al (2010) [81]	126	27.2	51.6 (no pad or one dry security pad)	23.8
Cornel et al (2010) [77]	35	12	9 (no pad use and $< 2$ g urine loss/24 h)	45.5
Cornu et al (2010) [32]	136	21	62 (no pads)	16

**Fig. 7 – ProACT system.**

period of 16.6 mo (no pad use: 34.5%, 10 of 29 patients; one dry “security” pad: 37.9%, 11 of 29 patients) [82].

#### 3.4.3. ProACT system

The ProACT system (Uromedica, USA) was introduced in 2001 and consists of a readjustable treatment with two balloons placed bilaterally at the bladder neck (Fig. 7). Continence is achieved due to urethra compression. Titanium ports are placed in the scrotum for volume adjustment. Reported dry rates are up to 67% (Table 4) [83–88], but several readjustments are often necessary to

achieve this rate of continence. Published studies show comparatively high complication rates including device removal (10–30%) due to erosion, deflation, or migration of the balloons and infections. Transrectal ultrasound-guided implantation seems to be safer with reduced complications rates and shows a better positioning of the balloons [89]. Additionally, the published data show that the complication rates decline (eg, revision surgeries due to complications more than halved) and success rates improve (nonresponders: 8% vs 40%) with surgeon’s experience [85]. After radiation therapy, complications increase and success rates decrease. At the moment we can make no evidence-based recommendations concerning the use of the adjustable balloons (grade of recommendation: D; level of evidence: 3) [1].

#### 3.4.4. Bulking agents

Various autologous or artificial substances such as collagen, Teflon, silicone, autologous fat, autologous chondrocytes, dextranomer/hyaluronic acid copolymer, pyrolytic carbon microspheres, and polydimethylsiloxane have been used as bulking agents. The currently most commonly used agents, dextranomer/hyaluronic acid copolymer and polydimethylsiloxane, show a slower migration without compromising other organs [90,91]. Early failure rate is about 50%, and initial success in continence decreases with time. In addition, comparative studies showed a significantly better results for the AUS (socially continent 75% vs 20%) and the InVance sling (failure rate 24% vs 70%) in comparison with bulking agents [92,93]. For satisfactory intermediate results, reinjections are necessary [94–98]. However, these may induce inflammatory reactions resulting in an impairment of urethral elasticity and possibly a “frozen

**Table 4 – Results of the ProACT system with a mean follow-up  $\geq 12$  mo**

Study	No. of patients	Follow-up, mo	Cure, %	Improvement, %	Readjustments
Hübner et al (2005) [88]	117	Mean: 13	67 (no pad or one security pad)	25	Mean: 3 (0–15)
Trigo Rocha et al (2008) [87]	25	Mean: 22.4	65.2 (no or one pad)	12.8	Mean: 4.6 (1–7)
Hübner et al (2007) [85]	50	Mean: 20	60 (no pad or one security pad)	22	Mean: 4
Kocjancic et al (2007) [86]	65	19.5	67	15	Mean: 3 (0–8)
Lebret et al (2008) [84]	62	12	No data (Daily pad usage decreased from 4.6 pads per day to 1.06 pads)	No data	4×: 38.7% 3×: 12.9% 2×: 24.2% 1×: 12.9%
Gilling et al (2008) [83]	34	24	62 (no pads)	19	Mean: 3.3 (0–7)

urethra.” In these cases, further treatments can be negatively affected. However, the results of subsequent AUS implantation seem to be unaffected [99].

The use of Teflon for medical therapies was discontinued due to migration of Teflon to lymph nodes, spleen, lung, and brain after injection in the external sphincter in animal tests [100]. In addition, periurethral injections of collagen can cause anaphylactic reactions, and bulking agents in general can induce a frozen urethra due to postinjection inflammation.

Again, evidence-based data concerning bulking agents for the treatment of male SUI is lacking, and existing cohort studies show early decrease of initial success rates. Therefore, bulking agents should only be used in highly selected patients with mild postprostatectomy SUI (grade of recommendation: C; level of evidence: 3) [1].

#### 3.4.5. Stem cell therapy

Although the initial results of autologous myoblast and fibroblast injections in patients with male SUI were promising [101], doubts about the results of these studies were raised shortly thereafter. At the moment, stem cell therapy for the treatment of postprostatectomy SUI cannot be recommended. Further studies are necessary for proper evaluation.

## 4. Conclusions

RP is the main causative factor for male SUI. However, there has been no standardised definition for postprostatectomy SUI incontinence. The evaluation and diagnosis of this problem should be performed according to the two-stage assessment recommended by the EAU guidelines. Validated questionnaires should be used to assess symptoms and impact of quality of life. Before surgical treatment, we recommend specialised clinical assessment including urethroscopy and urodynamics.

Guideline recommendations for treatment are given only generally without a clear association to stage and severity of incontinence. Additionally, there are no conclusive data concerning the optimal timing for the initiation of conservative treatment. According to available studies, we recommend early postoperatively initiated PFMT to reduce significantly the continence recovery time after surgery. In addition, preoperative PFMT may be useful in increasing early postoperative continence rates, and PFMT is also of benefit in men with persisting SUI >1 yr after surgery. Besides PFMT, conservative management including lifestyle interventions and bladder training can be appropriate in selected cases. Electrical stimulation in combination with PFMT does not seem to be beneficial, and there is no evidence-based data to recommend electrical stimulation in men. In the short term, the combination of PFMT and medical treatment with duloxetine shows better results compared with any one of the two therapies alone. However, duloxetine is not approved for men, making only off-label use possible. Therefore, it should be prescribed only in selected cases. For patients with additional OAB symptoms, we recommend the additional use of antimuscarinics.

If conservative treatment fails, after a period of at least 6–12 mo, surgical therapy is recommended. For decades, the AUS was the standard surgical treatment for moderate to severe SUI due to high success rates. However, the risk of complications and revisions are significant in the long term. In addition, the need of mechanical handling has to be taken into account. Nowadays, patients' demand for minimally invasive treatment options is high and will drive the choice to use a sling to avoid using a mechanical device such as the well-established AUS. In recent years, numerous minimally invasive treatment options with different success rates have been investigated. Nevertheless, new surgical techniques should match at least the results of the AUS. Male slings showed promising results. Therefore, they are a good alternative surgical treatment option with best results in patients with persistent mild to moderate SUI. In severe SUI, male slings can be used for patients who prefer a minimally invasive treatment, but lower success rates may occur. All currently marketed male slings, except the retrourethral transobturator sling, are implanted in the region of the bulbar (anterior) urethra and induce a compression of the bulbar urethra to achieve continence. In fact, adjustability allows keeping this compression to a minimum, allowing for normal micturition without residual urine. The retrourethral transobturator sling is theorised to exert its function on the membranous (posterior) urethra by relocating it into the “normal” preprostatectomy anatomic position, thus allowing adequate function of the sphincter. The retrourethral transobturator sling has been shown not to be efficacious in patients with direct sphincter defect. Therefore, patients have to be counselled accordingly.

Bulking agents should only be used in highly selected patients due to the low success rate.

Due to early high complication rates of the adjustable balloon system, more data are required for an evidence-based recommendation. However, with ultrasound-guided placement the complication rates seem to decrease. Patients after radiotherapy and urethral alterations such as bladder neck incisions show lower success rates and have to be counselled accordingly.

Currently, stem cell therapy should not be applied.

Table 5 lists all recommendations concerning diagnosis and treatment of postprostatectomy incontinence.

For more evidence-based recommendations for the treatment of postprostatectomy SUI, more prospective RCTs are necessary. Only with RCTs it is possible to compare the efficacy and complications rates of the different treatment options. In addition, the definition of postoperative success needs to be standardised for postprostatectomy incontinence, and the natural healing that occurs in the first year after surgery with its subsequent regaining of continence needs to be considered as well.

For the development of new, more successful, and potentially patient-specific surgical treatment options, it is necessary to improve and deepen the understanding of potentially different pathophysiologic mechanisms of postprostatectomy SUI.

**Table 5 – Recommendations for the diagnosis and treatment of postprostatectomy incontinence**

- Radical prostatectomy is the main causative factor for male stress urinary incontinence (SUI).
- Evaluation and diagnosis should be performed according to the two-stage assessment recommended by the European Association of Urology guidelines.
- Validated questionnaires should be used to assess symptoms and impact on quality of life.
- Before surgical treatment, patients should be evaluated with urethrocytostcopy and urodynamics.
- Preoperative pelvic floor muscle training (PFMT) may be useful in increasing early postoperative continence rates. PFMT is also of benefit in men with persisting SUI >1 yr after surgery.
- If conservative treatment fails after a period of at least 6–12 mo, surgical therapy is recommended.
- Patients demand for minimally invasive treatment options is high and will drive the choice to use a sling to avoid using a mechanical device such as the well-established artificial urinary sphincter.
- Male slings show promising results and seem to be a good alternative surgical treatment option with best results in patients with persistent mild to moderate SUI.
- Bulking agents should only be used in highly selected patients due to the low success rate.
- Due to early high complication rates of the adjustable balloon system, more data are required for an evidence-based recommendation.
- Currently, stem cell therapy should not be applied.
- For more evidence-based recommendations, more prospective randomised controlled trials are necessary.

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**Study concept and design:** Bauer.

**Acquisition of data:** Bauer.

**Analysis and interpretation of data:** Bauer, Stief, Gozzi, Hübner, Nitti, Novara, Sandhu, Peterson.

**Drafting of the manuscript:** Bauer.

**Critical revision of the manuscript for important intellectual content:** Stief, Gozzi, Hübner, Nitti, Novara, Sandhu, Peterson.

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