Review Article on Surgical Management of Stress Urinary Incontinence in Men

A narrative review on surgical treatment options for male stress urinary incontinence

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Contributions: (I) Conception and design: ZJ Prebay, PH Chung; (II) Administrative support: PH Chung; (III) Provision of study materials or patients: None; (IV) Collection and assembly of data: ZJ Prebay, HE Foss, KR Wang; (V) Data analysis and interpretation: All authors; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

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Background and Objective: Stress urinary incontinence (SUI) can occur due to a variety of etiologies. For male patients specifically, SUI is typically thought of as iatrogenic secondary to intrinsic sphincter deficiency occurring after prostate surgery. Given the noted negative impact that SUI can have on a man's quality of life, multiple treatment options have been developed to improve symptoms. However, there is no "One-Size-Fits-All" approach to management of male SUI. In this narrative review, we sought to highlight some of the various procedures and devices available to treat men with bothersome SUI.

Methods: This narrative review gathered primary resources through Medline search, and secondary resources by cross-referencing citations used in articles of interest. We started our investigation by searching for previous systematic reviews on male SUI and treatments for male SUI. Furthermore, we reviewed societal guidelines, such as the American Urological Association and Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction guidelines and the recently published European Urological Association guidelines. Our review focused on English-language full-length manuscripts when available.

Key Content and Findings: We present multiple surgical options for men with SUI. This review focuses on surgical options including 5 fixed male slings, 3 adjustable male slings, 4 artificial urinary sphincters (AUS), and an adjustable balloon device. This review includes treatment options from across the globe, although not all included devices are available in the United States.

Conclusions: A great variety of treatment options exist for men with SUI, although not all Federal Drug Administration (FDA) approved. Shared decision making is paramount to generate the greatest satisfaction for patients.

Keywords: Stress urinary incontinence; artificial urinary sphincter; male sling

Submitted Sep 27, 2022. Accepted for publication Jan 29, 2023. Published online Mar 06, 2023.
doi: 10.21037/tau-22-629
View this article at: https://dx.doi.org/10.21037/tau-22-629

Introduction

Stress urinary incontinence (SUI) can occur due to a variety of etiologies. For male patients specifically, SUI is typically thought of as iatrogenic, secondary to intrinsic sphincter deficiency occurring after prostate surgery (1,2). However, SUI can also have a neurogenic etiology or occur after urethral or pelvic surgery (3). There is a wide variation in reported rates of SUI following radical prostatectomy,

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Table 1 Search methodology

Items	Specification
Date of search	06/01/2022–12/19/2022
Databases and other sources searched	PubMed
Search terms used	"Male Stress Urinary Incontinence", specific device names, "review"
Timeframe	To present
Inclusion and exclusion criteria	Full, English-language manuscripts when available/preferred
Selection process	ZJP, HF, KRW evaluated literature
Any additional considerations, if applicable	Our search primarily identified societal guidelines or devices familiar to our clinical practice as well as previous reviews on the topic and then expanded based on findings within primary sources

with rates of persistent SUI as low as 4% and as high as 40% (4). With that said, not every patient experiences the same degree of SUI or bothersome side effects following a prostate procedure, with symptoms ranging from none or quite mild, to severe (4). SUI has a considerably negative impact on quality of life for patients, even for those only needing 1 pad per day (PPD) after surgery (5). The literature states that 3–6% of men will undergo some form of surgical correction for SUI following prostatectomy (6,7). The rate of SUI following a bladder outlet procedure is lower with 1% to 2% of men experiencing persistent SUI but is distressing for those who are affected (8).

Given the noted negative impact that SUI can have on a man's quality of life, multiple treatment options have been developed to improve symptoms (9). However, there is no "One-Size-Fits-All" approach to management of male SUI. Treatments range from conservative management with lifestyle interventions to surgical procedures. Therefore, it is vital for urologists to know the spectrum of treatment options to properly counsel patients and to minimize treatment regret (10).

In this narrative review, we sought to highlight some of the various procedures and devices available to treat men with bothersome SUI. Previous reviews have tended to focus on certain subsets of treatments for male SUI, such as just reviewing male slings (MS), but we will discuss multiple surgical treatment options. By broadly highlighting the entire spectrum of surgical treatment options, we hope to guide providers counseling patients on which treatment may be the best for them and to educate providers on additional devices that are not available in their country. We present this article in accordance with the Narrative Review reporting checklist (available at https://tau.amegroups.com/article/view/10.21037/tau-22-629/rc).

Methods

This narrative review gathered primary resources through Medline search and secondary resources by cross-referencing citations referenced in articles of interest. Our methodology is summarized in *Table 1*. We started our investigation by searching for previous systematic reviews on male SUI and treatments for male SUI. Then, we reviewed societal guidelines, such as the American Urological Association and Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction guidelines and the recently published European Urological Association guidelines on male urinary incontinence (2,3). In this manner, we were able to obtain a broad sample of the previous scientific literature from which we were able to synthesize into the review as presented. Of note, as a narrative review synthesizing the results of various primary studies, the definitions and outcomes of interest may vary between each article. This is a consistent issue within the SUI literature as studies lack standardization in both grading of SUI and in terms of outcome measurement. When applicable, we specify how each study defined success or continence to provide context for the reported results. Further, this review is intended to provide an overview for readers and is not designed to guide or recommend

treatment for individual patients as this decision is best left to shared decision making between patient and provider.

Discussion

Bulking agents

We will begin our discussion with a less invasive procedure, urethral bulking. Urethral bulking agents may be considered for men unfit to undergo or wishing to avoid more invasive surgery. There are currently multiple urethral bulking agents available for use. With this procedure, the agent is administered directly into the periurethral tissue under cystoscopic guidance to coapt the mucosa and provide more resistance against urine flow. In the first decade of the new millennia, bulking agents were performed in around one-quarter to one-third of men with SUI (11). However, following this initial enthusiasm, there has been limited data supporting the efficacy of these treatments (12) and a need for contemporary literature describing their current applications and efficacies. A recent systematic review by Toia *et al.* noted a wide variability in reported outcomes with moderate to severe risk of bias (12). The review concluded that there is some evidence for short term improvement in men (up to 83% completely dry in one study) but that the data is scarce with a relatively high risk of bias and that durability of success remains a challenge.

For more definitive treatment, we transition our discussion to the various MS and artificial urinary sphincter (AUS) devices. Traditionally, an AUS has been considered the "gold standard" for SUI and is a valid treatment for all degrees of symptoms. MS have typically been reserved for men with mild or moderate incontinence (13). Both AUS and MS are safe, with AUS having a slightly higher rate of postoperative complications (5.1% *vs.* 2.8%) in an analysis of ACS-NSQIP (American College of Surgeons National Surgical Quality Improvement Program) data (14), which evaluated 608 patients undergoing AUS and 597 patients receiving a MS. However, an AUS requires a minimum level of dexterity to operate the sphincter mechanism, and this important fact may limit its accessibility to some patients.

Fixed MS

MS work by compressing and repositioning the bulbar urethra (13). When on appropriate tension, the sling will relocate the urethral bulb proximally into the pelvis and will also provide support to the dorsal distal portion of the membranous urethra (15). They may be inserted through a transobturator or retropubic approach and come in adjustable or fixed models. For fixed models, Rehder and Gozzi first reported a transobturator tape used in cadavers and later in a pilot of 20 men in 2007 (16). This was followed by a series of 67 patients (17) and shortly thereafter developed into the AdVance Male Sling (Boston Scientific, Marlborough, MA USA) (18). The second-generation AdVance XP entered the market in 2010 (19) with design modifications including a new anchoring mechanism to prevent migration, a liner, and longer mesh arms for easier use in obese patients (13). The interested reader can find links to the companies' websites in Appendix 1 for photos of the devices. Overall cure rate (0 pad use) has been reported at 80% with a median follow-up of 26 months (19). In comparative work, there are largely no significant differences between the original and XP models, both in terms of outcomes and complications except for higher rates of urinary retention in the XP (20). Adverse events related to these slings include elevated post-void residual, increased bleeding, and decreased satisfaction with a need for subsequent incontinence procedures (21).

Grise and colleagues in France developed a sling similar to the AdVance which is now known as the I-Stop TOMS (originally CL Medical, now DiLo Medical, Lyon, France) (22), with placement of the sling located at the bulbar urethra. It is a 4-arm sling made of monofilament polypropylene. After first performing cadaver studies, they initially tested their device on 50 men with post-prostatectomy incontinence. There were concerns over the durability of success in this device, with lower long term objective cure rates (heterogenous between studies, 40% and 15% at 1- and 5-year follow-up), as summarized by a recent meta-analysis, when compared to other devices (23,24). This device was approved by the Federal Drug Administration (FDA) in 2006. In the available literature, minor adverse events, such as urinary retention or infection, are uncommon, and no serious adverse events were reported (24-26).

From Denmark comes the Virtue quadratic sling (Coloplast, Humlebaek, Denmark) (27), which has been available in the United States since 2008. This "hybrid device" works by achieving both urethral elevation and prepubic compression using a 4-armed polypropylene

mesh (28). The Virtue sling attempted to combine the mechanisms of previous bone-anchored and retroluminal slings into a single more effective implant. Crucial to the success of this surgery is the use of retrograde leak point pressure to determine the tension at which to fix the sling. Saline is administered at 60 cm above the pubic symphysis through a catheter in the fossa navicularis and once flow stops, the tension for the sling is correct. If patients have residual bothersome incontinence after the surgery is performed, a second surgery again using leak point pressure can help guide suture placement to increase tension on the sling. Recent data up to 3 years postoperatively notes the Virtue sling shows promising efficacy, reporting that over 70% of patients continued to show objective improvement based on 24-hour pad weight (>50% reduction) and with a 67% subjective satisfaction rate (29). In this same study, many patients had postoperative pain or *de novo* overactive bladder symptoms; the rate of second procedures was low at 5.1%, and no patients suffered a more serious complication.

Adjustable MS

As innovation continued, adjustable MS were developed in contrast to the traditional fixed models. There is not yet strong evidence to suggest having an adjustable sling provides additional benefit (3), and no adjustable sling has yet been approved for use in men within the United States, although there is a theoretical advantage. Our narration will discuss the ATOMS, Argus, and the Remeex devices. These models likewise provide pressure on the bulbar and membranous urethra and contain adjustable mechanisms to personalize the pressure applied for individual patients and supplement a compressive component to the relocating effect of the sling (30). Consistent with issues throughout SUI research, variable definitions of SUI and cure exist which plagues comparisons between fixed and adjustable slings. The DOMINO (Debates On Male Incontinence) project evaluated the differences between fixed and adjustable slings in a large cohort study. They identified no differences in functional outcomes or quality of life but noted that patients with more risk factors and a higher degree of SUI were more likely to be offered an adjustable sling (30). This analysis included the AdVance and AdVance XP fixed slings as well as the Argus classic, Argus-T, and ATOMS adjustable slings.

The ATOMS (A.M.I, Feldkirch, Austria) sling is well studied with two systematic reviews commenting on outcomes (31,32). This device is composed of a silicone cushion which is anchored to a two-armed mesh attached to both sides of the pubis. The cushion can be filled or emptied via injecting sterile saline into a port, which allows for adjustable compression of the bulbar urethra. The first iteration was introduced in 2008, and the second and third versions were released in 2013 and 2014 respectively. The newer models altered the location and coating of the port and were aimed at reducing the risk of postoperative infections and facilitating easier postoperative device adjustment, specifically involving a pre-attached silicone-covered scrotal port in the 2014 generation. The ATOMS sling resulted in slightly less than a 70% dryness rate, and nearly 90% of patients experienced improvement after adjustment was completed. In a large study of over 200 patients, the device was shown to be most effective in men with mild symptoms resulting in a dryness rate (0–1 safety pads daily) of 96.2% and an overall success rate (completely dry or improved) of 84% at mean 17 months follow-up (33). Between the two systematic reviews, major complications were reported in 3% and 4.2% of patients, and the total complication rate was reported at 16.4% and 17% of patients (31,32). The ATOMS sling is not FDA approved.

Other adjustable slings include the Argus and Argus-T (Promedon SA; Cordoba, Argentina) systems and the Remeex (REgulador MEcánico EXterno—External Mechanical Regulator) (Neomedic, Terrassa, Barcelona, Spain) system. These slings are less studied and have a wide variability in reported patient satisfaction postoperatively. The Argus slings, encompassing both the Argus classic and Argus-T (for transobturator approach) models, has a reported continence rate ranging from 62% to 100% depending on the studies' definitions of continence (34). One notable concern with the adjustable slings includes postoperative perineal pain (30). Significant perineal pain can be a multifactorial and challenging outcome for patients following sling placement and can lead to explantation (35). In a DOMINO comparison of fixed and adjustable slings, the adjustable slings had significantly more postoperative pain, and the Argus T model in particular had higher pain (43.8% *vs.* 5.3% Argus classic *vs.* 4.1% ATOMS) in a subanalysis. A recent study from Márquez-Sánchez *et al.* in Spain reported complete dryness (0–1 safety pad) in 72.3%

of patients receiving a Remeex sling (36), which was higher than previously reported results. The Remeex sling has been available in the United States since 2006. Although Promedon has some options available for female SUI in the US, the Argus slings have not been approved in this country.

AUS

The AMS 800 (American Medical System) (Boston Scientific, Marlborough, MA, USA) has long been an implant of choice since its introduction around 50 years ago and is considered the gold standard for treatment of male SUI. Full details of implantation are described elsewhere, but briefly, the AMS 800 is designed to mimic the natural urinary sphincter with a circumferential urethral cuff that can be inflated and deflated by a scrotal pump and includes a fluid reservoir placed inconspicuously in the abdomen. Given its prevalence, robust long-term follow-up and outcomes data exist. Social continence (0–1 PPD) is reported between 55% and 77% (37-39) and maintains a 90% satisfaction rate even at 15 years of follow-up (40). Despite the well-documented success, one downside to the AMS 800 is a relatively high re-intervention rate of around 25% with the rate of revision and the possibility of device failure increasing over time, important considerations to counsel patients on prior to their index operation (41). If an AUS does need revision, two options are available: downsizing the urethral cuff or placing a tandem cuff, both showing similar outcomes and device survival in one study (42). Alternative options include identifying an alternative location for the cuff on the urethra, like a trans corporal placement.

The Zephyr ZSI 375 (Zephyr Surgical Implants, Geneva, Switzerland) was designed as a one-piece AUS for easier insertion. This device does not require an abdominal reservoir, instead utilizing a pressure-regulating tank and pump placed within the scrotum, and the pre-connected design is intended to both save time and decrease mechanical failure due to poor connection (43). Additionally, the device has an adjustable cuff and an adjustable pressure regulator. An early case series did in fact show decreased operative times and no intraoperative complications. However an explantation rate of over 60% was noted with mean device survival of less than one year (43). Since then, the manufacturer has made iterative updates to improve connections and make the device easier to use. A more recent European multicenter study showed considerable success (cured or improved) in 92.7% of the 109 men recruited with severe SUI and a much lower complication rate with 9 (9.7%) patients requiring explant and 3 (3.2%) requiring revision (44).

Another pre-connected device is the Victo AUS from the same company that created the Argus slings (Promedon SA). This sphincter is also designed to be adjustable, similar to their slings, resulting in a 76.4% dry rate and no explantations after one year in two available studies (45,46). However, these devices have not had FDA clearance but are available in many countries in Latin America, Europe, Asia, and Africa.

Balloon device

Lastly, the ProACT (Uromedica Inc., Plymouth, MN, USA) device differs from our previous implants in that it provides a non-circumferential compression on the urethra. This system is placed transperineally under fluoroscopic guidance, endoscopic assistance, or ultrasound and consists of two balloons placed on either side of the bladder neck and adjustment ports within the scrotum (47). The ports can be accessed percutaneously in the outpatient setting to further inflate or deflate the balloons based on the patient's response to treatment. Studies have shown a significantly positive impact on quality of life with a meta-analysis of 1,264 patients and 4,517 patient-years reporting a decrease of 4 to 1.1 PPD (47). In this study, the most common complications were erosions of the bladder or urethra and approximately 1 out of 5 patients needed revision with an average follow-up of 3.6 years. Further, these devices have the known long-term complication of balloon migration occurring in an estimated 6.5% of patients, which can lead to device explant.

Newer devices

In addition to the devices mentioned above, new devices are being brought to market, such as the Rigicon ContiClassic and ContiReflex systems (Rigicon—Innovative Urological Solutions, Ronkonkoma, NY, USA) which was granted approval in Europe in 2020 and is still in its first trial of patients (48). The company was targeting a US approval in 2022, thus the first availability in the

States may occur shortly.

Historical devices

In contrast, older models have since been taken off the market. A historical mention will be made of the InVance male sling (American Medical Systems, Minnetonka, MN, USA) (49). This sling was anchored to bone, but given associations with bone infection and a high failure rate (50), it is no longer available for use. Similarly, the TiLOOP Male (pfm medical, Cologne, Germany) sling uniquely had a titanium coating designed with the theory that the titanium coating would limit cellular reactions (51-53), like apoptosis and proliferation. This carried the apparent advantage of minimizing inflammation, shrinkage, and sling migration. In a study of 44 patients with midterm follow-up, objective and subjective improvement were nearly consistent at 77% and 75% with a median follow-up of 25 months (54). Although this device is no longer available on the company website, some argue perhaps it was prematurely disregarded (55). Finally, another fixed sling includes the Surgimesh M-Sling (Aspide Medical, La Talaudière, France), with one study from France available in the literature (56). This sling was designed for direct implantation over the urethral bulb and includes two transobturator and two prepubic arms with divergent traction axes to provide adequate tension. In a study of 77 patients, 34.4% reported a cure (0 pad or daily pad weight <2 g) and 71% reported being either "satisfied" or "very satisfied" after 24 months (56). The M-Sling is no longer available on the company website.

The various treatment options above are summarized in *Tables 2-4* separated into fixed slings, adjustable slings, AUS, and ProACT. If all else fails, offering a urinary diversion to patients unable to achieve satisfactory improvements in their quality of life from other treatments is in line with national guidelines (2). However, this decision must not be taken lightly given the well-known morbidity of diversions, especially if a cystectomy is included.

The landscape of treatment options for SUI is constantly changing, with innovative research being published daily. Many opportunities for research to improve our care of patients remains. One of the pitfalls when studying SUI is the lack of standardization across studies. This can make comparisons between devices difficult as definitions of "success" are not uniform. Future directions to standardize how we communicate and evaluate SUI and treatment of SUI will benefit providers and more importantly patients. Other areas of future research include more multi-institutional and registry-based studies. Much literature regarding SUI comes from single institutional studies or studies only including a few institutions. Multi-institutional initiatives such as the DOMINO project are applauded, and even larger registry-based studies would be strongly welcomed as this can capture more real-world outcomes in a way that has been lacking. Additionally, we would like to highlight the continued efforts and innovative work being done by contributors to the International Consultation on Incontinence, with the 7th consultation occurring in November 2021. We look forward to Abrams and colleagues' updated edition of "Incontinence", which will provide a far more comprehensive overview of male SUI than a review article could hope to accomplish. And finally, with all of the available devices on the market, continued efforts to refine patient selection and to individualize treatment will improve patient care.

Conclusions

In conclusion, a great variety of treatment options exist for men with SUI although not all are FDA approved. Shared decision making is paramount in generating the greatest satisfaction for patients (10). An AUS has long been considered the gold standard for SUI, but for men wishing to avoid a surgery or without the dexterity to manipulate a scrotal pump, alternatives exist and can be attempted. We discuss a wide variety of treatments from multiple countries of origin capturing the majority of devices and procedures utilized worldwide. The most recognized surgical treatments for SUI were presented and serve as a framework and quick reference for urologists wishing to better guide patients looking for treatment of their SUI.

Table 2 Comparison of available fixed sling options for male stress urinary incontinence

Treatment	Study	Measure of success	Infection rate	Complications	Country (year) of approval
AdVance XP Fixed Sling (19,57-59)	Chung *et al.* 2016	84% (16/19) achieved social continence (<1 PPD)			FDA approved Nov 27, 2018
	Collado Serra *et al.* 2013			Urinary retention	
				Perineal numbness	
				De novo storage symptoms (urgency)	
				Perineal hematoma	
	Bauer *et al.* 2010		0.4% (1/230) local wound infection	1.3% (3/230) required surgical intervention for complications	
			0.4% (1/230) urinary infection	21% postoperative urinary retention, managed with temporary catheterization	
	Rehder *et al.* 2010	73.7% (87/118) cured (0 or occasional security pad)			
I-Stop TOMS Fixed Sling (25,26)	Galiano *et al.* 2016	82.4% (28/34) were dry or showed improvement (50% reduction in PPD)	2.9% (1/34) wound infection	14.7% (5/34) required re-implantation	
				Retention	
				Ecchymosis	
				Low perineal pain	
	Grise *et al.* 2012	87% improved to 0–1 PPD			
Virtue Quadratic Fixed Sling (60)	McCall *et al.* 2016	32% (10/31) were successes (see failure)	None	68% (21/31) were procedure failures (no change in postoperative pad use, failure to reduce leakage <2 PPD, need for placement of an artificial genitourinary sphincter, and/or sling explant)	FDA approved Aug 17, 2011
				22% (7/31) underwent sling explant, 20% (6/31) had a subsequent AUS placement	
				Chronic pain	
				Failure more likely in patients who received EBRT	
				More subsequent procedures than other slings	

FDA, United States Food and Drug Administration; PPD, pads per day; AUS, artificial urinary sphincter; EBRT, external beam radiation therapy.

Table 3 Comparison of adjustable sling options for male stress urinary incontinence

Treatment	Study	Measure of success	Infection rate	Complications	Country (year) of approval
ATOMS Adjustable Sling (32,33)	Esquinas *et al.* 2019	Mean 67% and 90% improvement between 20 studies		5.75% needed device removal	Europe
				16% complications, 3% major complications	
				Transient postoperative dysesthesia	
	Angulo *et al.* 2018		3/215 patients with mean 24 months follow-up		
Argus Adjustable Sling (61,62)	Hübner *et al.* 2011	79.2% (80/101) dry with 0–1 PPD in moderate to severe SUI		15.8% (16/101) needed removal	
		38.6% (39/101) required adjustment			
	Romano *et al.* 2009	66% (31/48) dry and 12.8% (6/48) 1 PPD	6.3% (3/48) infection	Erosions through urethra, bladder, and abdominal wall	
				Perineal pain	
				Acute urinary retention, spontaneously resolving	
Remeex Adjustable Sling (63)	Sousa-Escandón *et al.* 2007	64.7% (33/51) cured (no or safety pad)	3.9% (2/51) removed due to infection	Intraoperative bladder perforation	Many European countries
				Perineal hematoma	FDA approved Nov 02, 2006
				Transient perineal discomfort and pain	

PPD, pads per day; FDA, United States Food and Drug Administration.

Table 4 Comparison of artificial urinary sphincter and balloon device option(s) for male stress urinary incontinence

Treatment	Study	Measure of success	Infection rate	Complications	Country (year) of approval
AMS 800 Artificial Urinary Sphincter (64)	Queissert *et al.* 2020	45.5% *vs.* 24.2% achieved social continence (0–1 PPD) at low-volume *vs.* high-volume centers	8 (1.9%)	Revision rate 38.5% *vs.* 26.7% at low-volume and high-volume centers Erosion Mechanical failure	FDA approved Jun 14, 2001
Zephyr ZSI 375 Artificial Urinary Sphincter (44,65)	Ostrowski *et al.* 2019			8.25% urethral erosion 2.75% mechanical complications requiring re-implantation	Many countries in Europe, Latin America, Near East, Southeast Asia
	Ostrowski *et al.* 2018	58% (29/50) achieved social continence (0–1 PPD) from severe SUI (≥3 PPD)	0% (0/50) at 4 years	24% (12/50) required revision or permanent device removal Failure in 12% (6/50) of patients	
Victo Artificial Urinary Sphincter (45,46)	Giammò *et al.* 2021	1-year dry rate 76.4% Social continence (0–1 PPD) 94%	None reported	17.6% (all Clavien-Dindo I)	Many countries in Europe, Asia, Africa, and Latin America
	Weibl *et al.* 2018	No 1-year explants			
Rigicon ContiClassic Artificial Urinary Sphincter	No studies yet				European approval 2020
ProACT Adjustable Continence Therapy (47,66,67)	Larson *et al.* 2019	4.0 PPD reduced to 1.1 PPD	14% infection	Revisions ranging from 21.7–72.7% mostly due to device leakage Device leakage Intraoperative urethral perforation Urinary retention	In European market since 2002 FDA approved Nov 24, 2015
	Venturino *et al.* 2015	4.5% (1/22) continent immediately Mean 5.9 PPD reduced to 1.7 PPD		73% revision rate 55% explantation rate	
	Rouprêt *et al.* 2011	PPD decreased from 4.2 to 1.5		18% explantation rate Significantly more urethral and bladder erosion than radiotherapy	

PPD, pads per day; FDA, United States Food and Drug Administration; SUI, stress urinary incontinence.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Translational Andrology and Urology* for the series "Surgical Management of Stress Urinary Incontinence in Men". The article has undergone external peer review.

Reporting Checklist: The authors have completed the Narrative Review reporting checklist. Available at https://tau.amegroups.com/article/view/10.21037/tau-22-629/rc

Peer Review File: Available at https://tau.amegroups.com/article/view/10.21037/tau-22-629/prf

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://tau.amegroups.com/article/view/10.21037/tau-22-629/coif). The series "Surgical Management of Stress Urinary Incontinence in Men" was commissioned by the editorial office without any funding or sponsorship. PHC served as the unpaid Guest Editor of the series and serves as an unpaid editorial board member of *Translational Andrology and Urology* from April 2019 to November 2023. PHC received grants, consulting fees and honoraria for lectures from Boston Scientific and Coloplast. The authors have no other conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Cite this article as: Prebay ZJ, Foss HE, Wang KR, Chung PH. A narrative review on surgical treatment options for male stress urinary incontinence. Transl Androl Urol 2023;12(5):874-886. doi: 10.21037/tau-22-629

Supplementary

Appendix 1

Devices are listed in the order of appearance in the manuscript, and photos of the devices can be found on the companies' websites:

AdVance XP Fixed Sling - https://www.bostonscientific.com/en-US/products/slings--suburethral/advance-xp-male-sling-system.html

I-STOP TOMS Fixed Sling - https://www.medicalexpo.com/prod/cl-medical/product-78836-487920.html

Virtue Quadratic Fixed Sling - https://www.coloplast.us/surgical-urology/professional/male-urinary-incontinence/

TiLOOP Fixed Sling - https://www.pfmmedical.com/productcatalogue/mesh_implants_incontinence/tiloopr_tape/index.html

ATOMS Adjustable Sling - https://www.ami.at/en/produkt/a-m-i-atoms-system-2/

ARGUS Adjustable Sling - https://www.medicalexpo.com/prod/promedon/product-89961-718179.html

Remeex Adjustable Sling - http://www.neomedic.com/en-us/professionals/male-solutions/urinary-incontinence/remeex-male/

AMS 800 Artificial Urinary Sphincter - https://www.bostonscientific.com/en-US/products/artificial-urinary-sphincter/ams-800-artificial-urinary-sphincter.html

Zephyr ZSI Artificial Urinary Sphincter - https://www.zsimplants.ch/en/products-en/incontinence/zsi-375-en/zsi-375-information

ProACT Adjustable Continence Therapy - https://www.uromedica-inc.com/proact

Rigicon ContiClassic system Artificial Urinary Sphincter - https://www.rigicon.com/artificial-urinary-sphincter-conticlassic/

https://dx.doi.org/10.21037/tau-22-629