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Minimizing Sexual Dysfunction in BPH Surgery

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Abstract

Purpose of Review To review the prevalence and risks of sexual dysfunction associated with current treatment options for benign prostatic hyperplasia and to characterize techniques and methods to manage postoperative sexual dysfunction-related side effects.

Recent Findings Current surgical therapies available for the treatment of benign prostatic hyperplasia are associated with a substantial risk of both ejaculatory and erectile function. However, many of the novel minimally invasive treatment alternatives have demonstrated the ability to preserve postoperative sexual function to a better degree, all while providing significant relief of lower urinary tract symptoms in an equally safe and efficacious manner.

Summary Benign prostatic hyperplasia remains a highly prevalent disease among the aging population. While surgical treatments are often necessary to relieve bothersome urinary symptoms, these procedures are associated with an increased risk of sexual dysfunction. As such, there has been an increased interest in the development of minimally invasive therapies, such as the UroLift®, Rezum®, and Aquablation®, with the hopes of achieving similar symptomatic relief while maintaining sexual function. Aside from reporting lower rates of sexual dysfunction, these procedures have also demonstrated comparable safety, durability, and efficacy to current gold standard therapies. Some procedures can even be performed in an outpatient setting, avoiding the need for general anesthesia altogether. Overall, an individualized, shared decision-making approach is necessary to determine the ideal treatment option for each patient.

Keywords Benign prostatic hyperplasia · Lower urinary tract symptoms · Sexual dysfunction · Erectile dysfunction · Ejaculatory dysfunction

Introduction

Benign prostatic hyperplasia (BPH) resulting in lower urinary tract symptoms (LUTS) is a major health burden affecting 50% of men over 60 years and 80% of men over 80 years [1]. With the proliferation of epithelial and smooth muscle cells within the transitional zone of the prostate, urinary flow resistance through the prostatic urethra increases, leading to irritative (nocturia, urgency, frequency) and obstructive (hesitancy, dribbling, weak stream) symptoms. The treatment for LUTS secondary to BPH includes medical therapies, surgical interventions, or observation alone. In men with moderate to severe symptoms, however, medical or surgical management is often recommended as this reduces the risk for disease progression as well as improves the individual's quality of life (QoL). Unfortunately, the surgical treatment of BPH is not without its inherent risks, with one of its major adverse effects being the increased risk of sexual dysfunction.

Interestingly, the direct association between sexual dysfunction and the effects of LUTS secondary to BPH has been well established. A multinational survey conducted by Rosen et al. in 2003 demonstrated that sexual problems such as erectile dysfunction and ejaculatory disorders were strongly related to both patient age and the severity of

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LUTS [2]. This suggests the complex interplay between this disease entity and sexual dysfunction. Conversely, many cavitating procedures aimed at treating BPH to improve LUTS also run the risk of developing sexual dysfunction [3••].

As sexual activity remains an essential component of overall QoL in most men regardless of age, the benefits of more invasive interventions to increase the efficacy of relieving LUTS must be weighed against the cost and risks of developing sexual dysfunction [4]. As such, newer technologies attempting to strike the balance of achieving improved efficacy and decreased sexual dysfunction is constantly underway. The knowledge of current treatment modalities and its accompanying side effect profiles are paramount to the present-day urologist for education and counseling of a patient (Tables 1 and 2).

Herein, we aim to provide a contemporary review on the prevalence and underlying pathophysiology of developing sexual dysfunction with current surgical modalities available for BPH. We further characterize specific techniques to minimize sexual dysfunction in these surgical interventions while also describing the use of novel, minimally invasive treatment alternatives which are safer, cost-effective, and equally efficacious.

What Do We Know About Sexual Dysfunction?

Although BPH remains a highly prevalent disease among the aging population, a majority of men choose to seek medical advice only after experiencing bothersome urinary symptoms [15]. While oral therapy with α-blockers or 5-α reductase inhibitors (5ARIs) are the most common initial treatment for men with LUTS, surgical intervention remains an appropriate alternative in patients with particularly bothersome LUTS or in patients with BPH-related complications, e.g., acute urinary retention. Surgical treatments for LUTS have been shown to provide immediate improvement in alleviating BPH symptoms but have the highest risk of developing sexual dysfunction when compared to other therapeutic options.

While the International Index of Erectile Function (IIEF) and Male Sexual Health Questionnaire (MSHQ) scores are objective methods to compare and assess sexual outcomes, clinicians need to take into consideration that most of these BPH patients often already suffer from some degree of preoperative sexual dysfunction, which includes both erectile dysfunction (ED) and ejaculatory dysfunction (EjD). EjD further encompasses multiple ejaculatory and orgasmic symptoms, most commonly in the form of retrograde ejaculation (REj), but also includes

Table 1 Risk of sexual dysfunction after various BPH treatments

Procedure	Risk of postoperative sexual dysfunction	
Transurethral resection of prostate (TURP)	REj	38.2–89.0%
	PE	0–2.0%
	DV	18.3–54.0%
	ED	13.0–14.0%
Holmium laser enucleation of the prostate (HoLEP)	REj	50.0–76.6%
	PE	3.3%
	DV	16.7%
	ED	5.2–7.9%
Photoselective vaporization of the prostate (PVP)	REj	21.4–49.9%
	PE	5.4%
	ED	0–20.9%
Transurethral needle ablation (TUNA)	REj	0–5.6%
	DV	13.0%
	ED	5.8%
Transurethral microwave therapy (TUMT)	REj	9.2–24.0%
	ED	0–18.2%
Prostatic urethral lift (UroLift®)	N/A	N/A
Convective water vapor energy ablation (Rezum®)	DV	2.9%
	AE	2.9%
Aquablation®	REj	10.0%
Prostatic artery embolization (PAE)	REj	24.1%

REj retrograde ejaculation, *PE* painful ejaculation, *DV* decreased volume of ejaculate, *ED* erectile dysfunction, *AE* anejaculation

Table 2 Current BPH treatment options and their related postoperative sexual dysfunction

Procedure	Procedure description	Effect on sexual function	FDA approval; insurance coverage
Transurethral resection of prostate (TURP)	Monopolar or bipolar electrocautery is used to resect prostatic adenoma with a resectoscope.	High rates of ejaculatory dysfunction. Modified technique that spares the paracollicular and supracollicular tissue had 91% of patients maintain anterograde ejaculation on 5-year follow-up [5].	Yes; considered the gold standard for most insurance policies.
Holmium laser enucleation of the prostate (HoLEP)	Uses a laser to enucleate the prostate, which is then morcellated prior to removal.	High rates of ejaculatory dysfunction. Modified technique that spares the paracollicular and supracollicular tissue shown to not affect ejaculatory outcomes [6].	Yes; covered by Medicare, but other insurance providers require prior authorization. Medicare requires patients to have: - BPH for a duration of > 3 months - AUA symptom score > 9 - Urodynamics or post-void residual volume showing bladder outlet obstruction
Photoselective vaporization of the prostate (PVP)	Utilization of laser energy to vaporize prostate tissue.	High rates of ejaculatory dysfunction. Modified technique preserving bladder neck muscle fibers, precollicular tissue and paracollicular prostate tissue had 13% of 160 with anejaculation and 31% with decreased ejaculation [7].	
Simple prostatectomy	Removal of the prostate via open, laparoscopic or robotic approach.	Robotic outcomes with urethral sparing approach reported 1 out of 14 patients developing retrograde ejaculation [8].	N/A
Prostatic urethral lift (UroLift®)	Attachment of nitinol and stainless steel intra-prostatic implants to the lateral lobes of the prostate to reduce bladder outlet obstruction.	Unaffected sexual function after 5 years of follow-up in 206 patients [9••].	Yes; covered by Medicare, other insurance providers require prior authorization to determine that procedure is indicated (prostate volume < 80 cc, no obstructive median lobe).
Convective water vapor energy ablation (Rezum®)	Technique that uses convective radiofrequency water vapor thermal energy to disrupt prostate cell membranes and ablate prostatic tissue.	Minimally affected sexual function with 3 years of follow-up in 197 patients [10].	Yes; covered by Medicare, but other insurance providers require prior authorization.
Aquablation®	Removal of prostate tissue with high-velocity waterjets under the guidance of transrectal ultrasonography.	In a landmark study, rate of anejaculation was 9% with Aquablation® vs 45% in TURP [11].	Yes; most insurance companies see this treatment as experimental and recommend seeking prior authorization.
Prostatic artery embolization (PAE)	Injection of polyvinyl alcohol (PVA) particles to occlude the prostatic arteries and decrease the volume of the prostate with time.	In study of 630 patients, average IIEF score change was + 1.17 points +/− 5.74. Score was decreased in 36.5% of patients (average reduction 3.84 points +/− 3.18) [12].	Yes; requires pre-authorization. Coverage depends on patient's symptoms and type of insurance.
PRX302 intra-prostatic injection	Pore-forming protein activated by prostate-specific antigen (PSA) that is injected into the prostate to cause cell death in the prostate tissue.	No sexual adverse effects after 12-month follow-up in 92 patients [13].	No; This device is currently undergoing clinical trials to assess safety and efficacy.
Temporary implantable nitinol device (TIND)	Device that creates incisions in the prostate to reshape the urethra and bladder neck and reduce bladder outlet obstruction.	No ejaculatory dysfunction after 3-year follow-up in 19 patients [14].	No; This device is currently undergoing clinical trials to assess safety and efficacy.

premature ejaculation, delayed ejaculation, anejaculation, painful ejaculation, and decreased strength and volume of ejaculate or decreased feelings of pleasure associated with ejaculation [16].

Over the last few decades, novel surgical alternatives to BPH are increasingly emerging, with the goal of achieving similar outcomes to improving LUTS while minimizing sexual side effects. Among these, Aquablation®, prostatic artery embolization (PAE), and in-office procedures such as the UroLift® and Rezum® technology report promising results regarding sexual function preservation.

Why Do Surgeries for BPH Lead to Sexual Dysfunction?

Going through surgery for BPH can negatively impacts sexual desire, arousal, and satisfaction. There are a multitude of reasons why this occurs. Surgery can have a negative psychosocial impact on a patient. A 2017 study by Cornell et al. looked at sexual dysfunction in women after breast cancer surgery which showed a significant decrease in the Female Sexual Function Index (FSFI) score in women who had unilateral mastectomies including those who underwent breast-conserving surgery. This study highlights the impact of psychosocial factors on sexual function after surgeries [17].

In prostate-cavitating surgeries such as the transurethral resection of the prostate, sexual dysfunction can occur when the neurovascular bundles are accidentally dissected or damaged during the procedure. Anterograde ejaculation requires contraction of the external sphincter and bulbar urethra to propel the ejaculate forward and outward into the environment. In 1994, this was proven with a recorded ultrasound video of the proximal urethra during ejaculation, showing the importance of these muscles. When the mechanism to push the ejaculate forward is damaged or disrupted intraoperatively, semen will enter through the bladder neck instead of the urethra and can only be expelled during micturition, hence the term retrograde ejaculation [18].

While ejaculatory disorders are agreed to be a common adverse effect after surgery for BPH, the verdict on erectile function is more controversial. One potential mechanism of postoperative ED is the indirect thermal injury to the erectile nerves. Additionally, some studies also suggest a psychosocial component [19, 20]. Unfortunately, much of this is anecdotal and many modern studies do not show any significant decline in erectile function [21, 22]. Even studies that do show a decrease report lower incidence rates of ED (0–32%) as compared to that of EjD (> 50%) [23]. Some studies further suggest that only men with normal preoperative erectile function will suffer from a significant decrease in IIEF scores after treatment [24]. Overall, despite some evidence demonstrating ED after BPH procedures, EjD is much more common and remain the primary cause of patient dissatisfaction.

In addition, in non-oncology-related surgeries, a study in 2001 showed that anterior urethroplasties and circumcisions both resulted in a 30.9% and 27.3% decrease in erection satisfaction, respectively. The authors suggested that this may be due to the location of the wound, with it being more visible in those after a circumcision, again confirming the role and impact of psychosocial factors on sexual function [25].

BPH Surgeries and Sexual Dysfunction

Transurethral Resection of the Prostate

Although the association of EjD to transurethral resection of the prostate (TURP) has been firmly established, this surgical technique—first described in the early 1900s—remains the gold standard therapy for the surgical management of BPH [26]. In larger prostates over 100 g, open, robotic, or laparoscopic simple prostatectomies may be performed as well. Recent randomized controlled trials have reported a 62–75% incidence rate of EjD, specifically retrograde ejaculation, among patients undergoing TURP [27, 28•, 29]. This is consistent with the 65% reported by the 2018 AUA BPH guideline panel members [26]. Conversely, a 13–14% risk of ED was also associated with TURP with a study by Taher et al. demonstrating a higher risk of postoperative ED with lower preoperative nocturnal penile tumescence parameters [27, 30]. The volume of resected prostate or the use of either monopolar or bipolar TURP was not associated with an increased risk of sexual dysfunction [31–34, 35•]. With regard to other adverse effects, it is important to note that there is an increased risk of urinary incontinence if a TURP is performed in patients who have undergone brachytherapy for prostate cancer [36, 37].

Holmium Laser Enucleation of the Prostate

The Holmium laser, first described by Gilling et al. for the treatment of BPH, emits a 2140-nm wavelength which is selectively absorbed by water which can be used to resect or enucleate prostatic adenomas [38]. While randomized controlled trials have described similar efficacy of Holmium laser enucleation of the prostate (HoLEP) to open prostatectomy in enucleating adenomas over 100 g with its inherent advantages of decreased blood loss and hospital stays, this procedure is not without its risks [39]. A study by Meng et al. demonstrated a 21% risk of painful ejaculation and a 70% rate of REj on 6-month follow-up after HoLEP but no significant differences in erectile function and orgasm rates [40]. Interestingly, there was an increase in early morning erections in 15% of patients who underwent HoLEP. When comparing HoLEP and the gold standard TURP, Briganti et al. found that postoperative erectile function and rates of REj and decreased ejaculate volume did not differ significantly between the two procedures. However, rates of REj, decreased ejaculatory volume, and painful ejaculation were reported to be 76.6%, 18.3%, and 3.3% respectively at 1-year follow-up after HoLEP. Utilizing the International Index of Erectile Function (IIEF) questionnaire, the authors found a slight increase in erectile function score but a significant decrease in orgasmic function domain score postoperatively. The objective decrease in orgasmic function is likely due to the increased prevalence of REj and decreased ejaculatory function. Conversely, the positive correlation between IIEF-erectile function scores to improved IPSS and QoL scores within their study suggests the potential influence of postoperative relief of LUTS and QoL amelioration on increased erection ability [41]. Ultimately, a meta-analysis by Zong et al. found no significant differences in sexual dysfunction when comparing HoLEP to TURP [42]. Due to its excellent hemostatic properties and decreased morbidity in patients with prostates over 100 g, the HoLEP can be considered an effective treatment for BPH after patients are well educated and counseled regarding the potential side effects of the procedure.

Photoselective Vaporization of the Prostate

Utilizing light wavelengths of 532 nm, which is preferentially absorbed by hemoglobin, the GreenLight laser has emerged as an alternative therapy to TURP for the treatment of BPH via rapid vaporization of the transitional zone of the prostate [26, 43•]. Results from the GOLIATH prospective trial comparing GreenLight photoselective vaporization of the prostate (PVP) to TURP showed no significant difference between rates of REj and IIEF-5 scores between the two procedures at the 1- and 2-year follow-ups, respectively [44, 45]. Incidence of new-onset REj rates were reported at 30–67.1% with an additional 5.4% risk of developing painful ejaculation after PVP [44, 46, 47]. Although single institutional studies have shown no detrimental effects of PVP on erectile function, a recent meta-analysis by Li et al. demonstrated that of the nine BPH procedures analyzed, PVP was the only one to negatively impact short-term postoperative erectile function [46, 48, 49]. It is also important to note that studies utilizing higher laser energy levels have a higher propensity to developing sexual dysfunction [19].

Transurethral Microwave Therapy/Transurethral Needle Ablation

Given its markedly lower side effect profile, its ability to be performed as an outpatient procedure and its efficacy in providing reasonable symptom reduction, the use of minimally invasive procedures such as transurethral microwave therapy (TUMT) and transurethral needle ablation (TUNA) are gaining in popularity for the treatment of BPH [50, 51]. The incidence of ED after TUMT and TUNA is minimal and the risk of REj after these procedures remain low as compared to TURP. A systematic review by Frieben et al. found that TUNA was associated with only a 5.6% and 5.8% risk of EjD and ED, respectively. Conversely, TUMT had a lower post-procedure sexual dysfunction rate when compared to TURP with an 8.7% risk of developing ED and 17.8% risk of developing EjD. This was decreased to 11%, upon 24-month follow-up [35•]. Despite considerable improvements in their LUTS, patients who undergo TUMT/TUNA do not match TURP for objective improvement of IPSS and Qmax [52–54]. Thus, these treatment modalities may be considered as an alternative option in younger patients who wish to preserve sexual function [55•].

Newer Therapies for BPH

Prostatic Urethral Lift

The prostatic urethral lift (PUL), performed with the UroLift® system (NeoTract, Pleasanton, CA, USA), is a considerably novel yet minimally invasive technique that utilizes permanent nitinol and stainless steel implants placed under cystoscopic guidance to retract the obstructing lateral lobes of the prostate. It has demonstrated considerable safety and efficacy in the improvement of LUTS in patients with small- to medium-sized prostates (< 80 g) but is not ideal in patients with obstructing median lobes. Moreover, PUL is known to preserve sexual function with no evidence to date reporting any incidence of ED or EjD [56–59]. The largest prospectively collected PUL data from the LIFT study by Roehrborn et al. demonstrated no significant changes in MSHQ and IIEF scores when compared to baseline during annual follow-ups. Symptomatic relief from LUTS was achieved within 2 weeks of PUL while erectile and ejaculatory functions were preserved up to 5 years after PUL. It also had minimal adverse urinary symptoms and most were seen in the first 3 months postoperatively , e.g., dysuria (9%) and urge incontinence (3%). The rate of dysuria decreased to 1% after 3 months, while the rate of urge incontinence dropped to 1% after 2 years [9••, 60–62]. Another study by McVary et al. reported an improvement in ejaculatory function with a 4% improved ability to ejaculate, 23% improved ejaculation intensity and 22% increase in ejaculate volume while the BPH6 study demonstrated the superiority of PUL to TURP with regard to quality of recovery and preservation of ejaculatory function as measured by the SHIM score [63, 64]. Thus, the current literature unanimously supports the claim that this tissue-sparing approach has modest and rapid relief of LUTS while simultaneously preserving sexual function and should be considered in patients with prostate sizes smaller than 80 g.

Convective Water Vapor Energy Ablation (Rezum®)

The recently introduced Rezum® system (NxThera, Inc., Maple Grove, MN) utilizes a platform technology that convectively delivers stored thermal energy created with radiofrequency current in the form of water vapor to targeted prostatic tissue, producing instantaneous cell death [65]. This procedure is similar in concept to TUNA, but rather than using conductive energy, the Rezum® has better efficacy with regard to delivering thermal energy to heat and ablation of targeted prostatic tissue via convection. Rezum® has been shown to produce significant, rapid, and durable responses to LUTS while preserving sexual function in patients. Patients may be catheterized based on physician preference or if they develop urinary retention. A 2015 study by Dixon et al. showed that 36 out of 65 patients required catheterization prior to discharge with a mean duration of 5.6 days and an additional 11 required catheterizations after discharge, mainly due to urinary retention [66].

The largest and longest prospective cohort conducted by Roehrborn and McVary et al. reports a total of 136 patients with follow-up outcomes of up to 4 years [67••]. The authors report a < 3% risk of anejaculation after the procedure but this completely resolved by 3 months. There was also a 2.9% incidence of decreased ejaculatory volume, but this decreased to 1.5% by 3 months [68, 69]. Sexual function evaluated with IIEF and MSHQ-EjD-Function remained durable over the course of 2 years while MSHQ-EjD-Bother score remained significantly improved over 3 years [10]. Other prospective studies by Darson and Dixon report similar findings with no significant changes in IIEF and MSHQ-EjD scores after intervention with no de novo cases of ED reported post-procedure [65, 70]. Other retrospective and crossover studies also report a 3–6% risk of developing decreased ejaculatory volume or REj [71, 72]. Nevertheless, the true incidence of sexual dysfunction needs to be studied further, but it does seem to be rarely reported at this stage. Overall, the Rezum® system provides durable and rapid improvement of LUTS and its impact on sexual function seems to be minimal and temporary. Future studies comparing this technology to the current gold standards should be conducted to further assess the efficacy of Rezum® in treating men with BPH secondary to LUTS.

Aquablation®

Another novel, minimally invasive technology for the treatment of LUTS in the BPH patient—Aquablation®. With patients under general anesthesia, the AquaBeam system (PROCEPT BioRobotics Inc., Redwood Shores, CA, USA) utilizes robotically assisted, high-velocity waterjets to ablate prostatic tissue with the aid of real-time transrectal ultrasound [73]. Unlike the UroLift® and Rezum®, this procedure cannot be done as an outpatient procedure but can be done in patients with an enlarged median lobe. Being the latest technology in the market for treating BPH, studies measuring the efficacy and outcomes for Aquablation® are beginning to mature. The current literature has demonstrated this procedure to be safe and effective in treating LUTS with significant improvements to IPSS, Qmax, and even sexual function parameters. Currently, the longest prospective trial conducted by Gilling et al. demonstrates promising 1-year results on sexual outcomes for this procedure. Aside from reporting significant improvement in LUTS and comparable rates of post-procedure urinary urgency and frequency to TURP, the authors also showed stable ejaculatory function in all patients after the procedure. IIEF scores were also improved in patients who underwent Aquablation®, although not significantly, except for the intercourse satisfaction subdomain [74, 75•]. Recently in early 2019, the WATER RCT also recently published its 1-year outcomes comparing between Aquablation® and TURP. While rates of anejaculation were significantly lower for Aquablation® compared to TURP (10% vs 36%, $p = 0.0003$), incidence rates for REj were also low for Aquablation® at 6% at 3 months and lower at 0.9% by 6 months. Moreover, IIEF and MSHQ-EjD scores remained stable in the cohort of men who underwent Aquablation®, compared to men who had decreased scores after undergoing TURP. By far, there has yet to be any reported case of ED with Aquablation® therapy [76, 77•].

Prostatic Artery Embolization

PAE is a minimally invasive, radiology-based, endovascular treatment performed for LUTS secondary to BPH. While longer-term studies are still required for this intervention, current evidence demonstrates that this method can be a safe and effective treatment even in patients with prostate sizes > 80 g who are not ideal candidates for surgery. However, it is contraindicated in patients with tortuous iliac or prostatic vasculature and in those with severe atherosclerotic disease. This procedure involves the introduction and aggregation of spherical particles within the arterial lumen, occluding blood supply and resulting in shrinkage of the prostate gland and amelioration of LUTS. This procedure has an immediate effect in decreasing prostate volume with studies reporting a mean difference of about − 17 cm^3 in the first month postoperatively. Studies show this number at 1 year to be from − 15 to −31 cm^3. In terms of PSA changes, a summary of several studies shows a mean difference of − 1.5 to 0.3 ng/mL, 1 month after the procedure and − 2.5 to 0 ng/mL, 1 year post operatively. In terms of functional outcomes, several studies have shown significant and durable improvement in IPSS, QoL, Qmax, and PVR parameters, and the data on sexual function also seems promising [78–81]. Many studies have shown an increase in post-procedure IIEF scores in patients with both smaller and larger prostate sizes, yet, no study has reported any cases of de novo development of ED [82–85]. Furthermore, a meta-analysis by Wang et al. has demonstrated significant improvements in IIEF scores during the 6- and 12-month follow-ups for patients undergoing PAE [86]. The recent prospective, multicentered UK-ROPE study assessing the safety and efficacy of PAE also confirmed that PAE does not negatively affect sexual function and rates of REj were reported at 24.1%, less than half that of the TURP cohort [87].

Others Novel Therapies

Other therapies worth mentioning include the PRX302 intraprostatic injection and the temporary implantable nitinol device (TIND). PRX302 is a pore-forming protein activated by prostate-specific antigen (PSA) that is injected into the prostate to cause cell death in the prostate tissue. This therapy has shown to have no sexual adverse effects after 12-month follow-up in 92 patients [13]. The TIND is a device that acts as a stent and is designed to create incisions in the prostate to reshape the urethra and bladder neck and reduce bladder outlet obstruction. None of the 19 patients studied reported any EjD after a 3-year follow-up period [14, 88].

Strategies to Preserve Sexual Function for BPH Surgeries

With the goal of preserving ejaculatory function, there are some modifications to surgeries that have been described in the literature [22]. Saman et al. described a modification to the PVP technique that emphasizes on preserving bladder neck muscle fibers, precollicular tissue, and paracollicular prostate tissue (ejaculatory hood). Only 13% of the 160 patients in their study developed anejaculation, with 56% reporting normal ejaculation and 31% reporting decreased ejaculation [7]. Alloussi et al. used a similar concept to modify the TURP and found that 91% of the patients in their study maintained anterograde ejaculation which was durable up to the 5 years [5]. With the HoLEP, Kim et al. described another technique with the same principle of sparing the paracollicular and supracollicular tissue. However, their study compared outcomes to the conventional HoLEP and did not find any improvement in ejaculatory function. They postulated that the preservation of more apical tissue is necessary to maintain ejaculation [6]. The simple prostatectomy has also been recently modified with a robot-assisted technique. In a small study by Wang et al., only 1 out of 14 patients developed REj after undergoing this procedure [8]. While these new advances make the traditional techniques look more promising for sexual outcomes, more studies are needed to validate these findings.

What Can Be Done for Sexual Dysfunction

The impact of the procedures on sexual function must be discussed thoroughly with the patient to allow them to prepare appropriately for any potential decrease in sexual function, rather than it coming as a surprise. While 90% of practitioners discuss the possibility of EjD for TURPs and PVP, only 60% of health care providers actually discuss ED [89].

A study by Albaugh et al. surveyed 27 prostate cancer patients who underwent surgery or radiation therapy and experienced sexual dysfunction within 5 years after the procedure. Most of them wished they had known more about the negative sexual issues that they would have to face after undergoing the procedure, which would have better prepared them for the likely consequences. Some participants also felt that their providers were overly optimistic with their post-treatment sexual function. While most of the affected patients wanted more resources from their providers to help with their problem, many of them discussed the importance of having a strong social support system which was paramount to their recovery. Although this study only looked at patients with prostate cancer, many of these principles are similar in nature and can be applied interchangeably to patients after BPH surgery [90].

Furthermore, the more recent, minimally invasive therapies should be thoroughly discussed with the patient as an alternative to TURP, PVP, or HoLEP. While TURP has been the gold standard BPH treatment, an increasing number of urologists are opting for other procedures, especially with many of the newer advances having similar surgical outcomes with TURP and significantly fewer sexual adverse effects. Patients should be aware of the availability of such procedures to be able to make an informed decision regarding their desired procedure type. While some procedures may be limited in certain regions or may come with increased costs, a shared decision-making approach should be utilized to seek the ideal procedure type, consistent with the patient's ideas and goals. As a provider, being knowledgeable about the latest BPH therapies and having a list of providers that offer alternative treatments will also be beneficial for the patient.

Additionally, trends show that urologists have been moving away from TURP. A 2019 Australian study analyzing Australian Medicare records showed that TURP made up 96% of surgeries from 1998 to 2008. This dropped to 73% from 2008 to 2014. In 2014 to 2017, 15.5% of procedures were PVP and 7.7% and 5.9% were UroLift® and HoLEP, respectively [91]. A similar decline in the rate of TURP was seen in America with a drop of 47.6% from 2000 to 2008, in favor of PVP, TUNA, and TUMT [92].

Conclusions

There has recently been a multitude of innovative surgical technologies for the treatment of BPH and LUTS. TURP remains the gold standard for the treatment of BPH but is associated with high rates of EjD. Thus, patients should be counseled appropriately regarding the potential reduction in postoperative sexual function. Minimally invasive procedures should also be discussed as an alternative, especially in patients who wish to preserve their sexual function. These novel technologies are a promising option to patients and have demonstrated safe, effective, and durable cure to treating BPH symptoms while minimizing sexual dysfunction. Ultimately, as the robust and dynamic field of BPH treatment continues to grow and advance, an individualized, shared decision-making approach among physicians and their patients should be undertaken to select the optimal treatment option for each patient. Regardless of the outcome of the procedure, providers should always be ready to support and assist patients in their journey to recovery.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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