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The natural history of benign prostatic hyperplasia-related voiding symptoms following penile prosthesis implantation

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Abstract

Background: There is a rising prevalence of benign prostatic hyperplasia (BPH)-related urinary symptoms along with erectile dysfunction in the aging male population. Therefore, assessment of lower urinary tract symptoms (LUTS) is advised before penile prosthesis surgery with some men requiring preoperative transurethral surgical management to reduce the risk of post-procedure complications. However, less is known about the natural history of men with uncomplicated LUTS who do not require surgical management for BPH before penile prosthesis.

Objective: We sought to assess the natural history of BPH-related uncomplicated LUTS in men following penile prosthesis surgery.

Design: Single institution retrospective review.

Methods: Following institutional review board approval, we performed a retrospective review of all adult males with a preoperative diagnosis of LUTS undergoing penile prosthesis surgery at our institution from January 2017 to November 2022. The primary outcome was progression to transurethral surgery.

Results: From 2017 to 2022, 211 patients with preexisting LUTS underwent penile prosthesis surgery and met all criteria for inclusion including no history of transurethral surgery. The median (interquartile range, IQR) AUA symptom score (AUA-SS) was 12 (12). Post-void residual was below 200 cc in 96.2% of patients preoperatively and 99.1% of patients after surgery. At a median (IQR) follow-up duration of 9 (23) months after surgery, 5.7% (12/211) of patients had progressed to bladder outlet surgery and 35.5% of patients endorsed LUTS bother with a median (IQR) AUA-SS of 14.5 (11.8).

Conclusion: The majority of patients with uncomplicated LUTS did not require bladder outlet surgery following penile prosthesis implantation and could be managed with conservative or pharmacologic measures alone. Prostate gland size was significantly larger in patients who progressed to bladder outlet surgery. While the results are overall reassuring, further study is needed to identify specific factors associated with pursuing bladder outlet surgery in this small subset of patients.

Keywords: frequency, lower urinary tract, obstruction, storage

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Introduction

Penile prosthesis implantation is the gold standard treatment for medication-refractory erectile dysfunction (ED), and while likely under-utilized in the United States, worldwide volume continues to rise by approximately 8% annually.[1,2] As the average age at prosthesis implantation is 59 years, up to 50% of these patients are likely to also suffer from benign prostatic hyperplasia (BPH).[3,4]

Accordingly, assessment of BPH-related lower urinary tract symptoms (LUTS) is an important

consideration prior to penile prosthesis implantation. Undergoing bladder outlet surgery after penile prosthesis is hypothesized to put the prosthetic device at risk of infection or erosion, though no definitive data exist on this topic.[5] While certain symptoms such as recurrent urinary tract infections or bladder stones are clear indications for preoperative BPH management, less is known regarding the progression of symptoms in men with uncomplicated LUTS who undergo penile prosthesis.

We, therefore, sought to assess the natural history of BPH-related uncomplicated LUTS following inflatable penile prosthesis (IPP) implantation.

Methods

Institutional review board (IRB) approval was granted as an exemption along with a waiver of informed consent due to the minimal risk nature of the study. We performed a retrospective review of all adult males undergoing penile prosthesis surgery from January 2017 to November 2022 at our institution with a preoperative diagnosis of LUTS. Our primary outcome was progression to transurethral surgery, and secondary outcomes were incidence of postsurgical acute urinary retention, elevated post-void residual, or persistent stated bother at follow-up.

Patients were identified using Current Procedural Terminology codes 54401, 54405, and 54400 to capture penile prosthesis implantation. International Classification of Diseases codes N40.1 (BPH with LUTS), R35.0 (frequency of urination), R39.15 (urgency of urination), R39.11 (hesitancy of urination), R39.12 (poor flow), R35.1 (nocturia), and R39.14 (feeling of incomplete bladder emptying) were included. Patients with a history of prostate cancer intervention (prostatectomy, prostate radiation), bladder outlet surgery (including transurethral resection, photovaporization, Rezum, and aquablation), urethral stricture (or dilation), and neurogenic bladder were excluded from the analysis.

Demographic data including age, comorbidities, testosterone level, prostate-specific antigen (PSA), AUA symptom score (AUA-SS), post-void residual (PVR), and type of LUTS were extracted from the medical record, aggregated, and tabulated. An AUA-SS of 8–19 was used to designate moderate LUTS. Clinical parameters included the type of symptom management prescribed prior to inflatable penile prosthesis surgery (behavioral, pharmacologic), the incidence of postoperative urinary retention, and reported bother from LUTS following surgery, and also aggregated and tabulated. Operative data included prosthetic device type, size, and reservoir location. Categorical data were presented as counts and percentages while continuous data were presented as median with interquartile range (IQR). Progression to bladder outlet surgery was compared based on gland size, reservoir location, and device manufacturer using the Mann–Whitney *U* test for nonparametric data. The threshold for statistical significance was set *a priori* at $p \leqslant 0.05$. Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 28.0 (IBM Corp., Armonk, NY, USA).

Table 1. Urinary parameters before and after penile prosthesis surgery for erectile dysfunction.

Parameter	Pre-surgery, median (IQR)	Post-surgery, median (IQR)
AUA symptom score	12 (12)	14.5 (11.8)
Quality of life score	3 (2)	3 (1)
Post-void residual, ml	30 (81)	36.5 (78)

IQR, interquartile range.

Results

From 2017 to 2022, 211 patients with preexisting LUTS underwent penile prosthesis surgery and met all criteria for inclusion. The median (IQR) patient age was 69 (10) years with a gland size of 38 (17) g. The median (IQR) PSA was 1.03 (1.9) and the serum total testosterone level was 389 (251) ng/dL. In total, 44.5% had a diagnosis of diabetes mellitus type 2. The diagnosis of BPH-related LUTS was made a median (IQR) of 67 (249) days prior to prosthesis implantation with a median AUA-SS of 12 (12) and quality-of-life (QoL) score of 3 (Table 1). In terms of symptom type, 29.9% had storage symptoms (frequency, urgency, and nocturia), 28.9% had voiding symptoms (hesitancy, weak stream, intermittency), and 20.9% had mixed symptoms. Post-void residual was below 200 cc in 96.2% of patients.

Preoperatively, all patients had been evaluated, diagnosed, and counseled on their LUTS. In total, 45% of patients had been counseled to

avoid dietary bladder irritants, 11.8% were prescribed an anticholinergic medication, 2.5% were prescribed a b3 agonist, 36.7% were prescribed an alpha blocker, and 9.3% were prescribed a 5-alpha reductase inhibitor.

A review of intraoperative device characteristics demonstrated that 57.8% of devices implanted were AMS700 CX (Boston Scientific, Marlborough, MA, USA), 22.7% were AMS700 LGX (Boston Scientific, Marlborough, MA, USA), and 17.1% were Coloplast Titan (Coloplast Corporation, Humlebaek, Denmark). The majority of reservoirs were placed in a retropubic location (75.4%) and 46.5% of them were 100 ml or larger. There were no intra-operative complications noted. A total of 4.3% had an episode of acute urinary retention following surgery. Of those who remained catheter-free after surgery, 99.1% of patients had PVRs measured under 200 cc at the time of their voiding trial.

The median (IQR) duration of the most recent follow-up was 9 (23) months. In total, 35.5% of patients endorsed LUTS bother at this follow-up visit with a median (IQR) AUA-SS score of 14.5 (11.8), QoL 3 (2) (Table 1). At this visit, 5.7% (12/211) had progressed to bladder outlet surgery. The median gland size for this group of patients was 65.5 g *versus* those who did not undergo bladder outlet surgery (35 g, $p = 0.0004$). Progression to bladder outlet surgery was not significantly different based on reservoir location ($p = 0.9$) or device manufacturer ($p = 0.7$). Of the patients who required bladder outlet surgery, 50% (6/12) underwent transurethral resection of the prostate, 33% (4/12) underwent UroLift, and 16.7% (2/12) underwent Rezum transurethral water vapor therapy.

Discussion

Given the coexistence of BPH-related LUTS and ED in the aging male population, it is prudent to assess urinary symptoms in patients prior to penile prosthesis surgery. In the case of the Coloplast Titan device, incomplete bladder emptying is a contraindication to proceeding with prosthesis implantation. While there is insufficient published data to conclude that transurethral instrumentation increases the risk of damage to penile prosthesis, some implanters theorize that these cases go undetected because of low infection rates overall.[5] However, many patients endorse a mild to moderate degree of uncomplicated LUTS that do not require surgical intervention prior to prosthesis.

In this study, we examined 211 patients with moderate LUTS and 'mixed' QoL score (median AUA-SS 12, QoL score 3) who underwent penile prosthesis and subsequently completed a median of 9 months follow-up. Our primary outcome was progression to bladder outlet surgery, and we found that just under 6% of patients chose to undergo a bladder outlet procedure after device implantation. Of note, no patient had a preoperative PVR >300 cc or other risk factors that would necessitate bladder outlet surgery before penile prosthesis surgery. Median gland size was significantly larger at 65.5 g in the cohort that underwent bladder outlet surgery *versus* 35 g in those who did not. Retropubic reservoir location did not appear to affect progression to bladder outlet surgery despite the theoretical potential to worsen storage LUTS.

In examining our secondary outcomes, we noted that the incidence of postsurgical acute urinary retention was 4.3%. This number is in keeping with previously published studies estimating that the risk of acute retention after penile prosthesis is about 4%.[6] A cutoff of approximately 200 ml residual has been shown to correlate well with successful voiding trials following bladder outlet surgery, and over 95% of patients in our study met this threshold.[7] Therefore, in patients who were emptying well prior to surgery, implantation of the penile prosthesis reservoir and cylinders did not significantly impact the ability to empty at a short duration of follow-up.

Finally, at a median follow-up duration of 9 months, 35.5% of patients still endorsed LUTS while the majority of patients denied any bothersome urinary symptoms. Of those who endorsed LUTS, these were still moderate with a mixed QoL score as prior. This was noteworthy as every patient in this study had a chief complaint of moderate LUTS diagnosed prior to penile prosthesis surgery and none had undergone surgical management. This indicates that appropriate counseling, identification of behavioral management techniques, and appropriate pharmacological management were sufficient to address two-thirds of patient-voiding complaints. Effective and direct patient counseling is of paramount importance, as many patients derive their medical information

from internet sources of variable accuracy.[8,9] In this study, 49.8% of patients had either pure or mixed voiding symptoms indicating that both types of LUTS can be managed effectively prior to surgery. Accordingly, it is worthwhile to address LUTS prior to prosthetic implantation to maximize patient satisfaction. In practice, this may necessitate an extra visit to assess the patient's response to medical management before deciding to proceed with prosthetic surgery. This is most important for patients with larger prostate glands given their higher likelihood for post-IPP progression to bladder outlet surgery in this study.

While the results of this study are overall reassuring, it is not without limitations. First, a longer duration of follow-up is needed to validate these findings long term. Second, larger numbers would allow for stratification of patient outcomes by type of preoperative behavioral or pharmacologic management. Finally, an in-depth assessment of other factors driving patients toward eventual bladder outlet surgery would be helpful, as most patients could empty to completion and continue to be able to do so after surgery. In particular, cystoscopy and uroflowmetry parameters would be valuable to obtain for future studies of this population.

Conclusion

BPH and ED are comorbid conditions in the aging male population, with some men requiring surgical management of LUTS prior to surgical management of ED. However, many men with uncomplicated LUTS are managed with behavioral or pharmacologic therapy alone. In this study, we found that nonsurgical management of LUTS prior to penile prosthesis resulted in the majority of patients not requiring bladder outlet surgery at a median 9 months of follow-up. The small percentage of patients who did progress to bladder outlet surgery had significantly larger prostate gland size compared to those who remained on conservative management. Further study is needed to increase the duration of follow-up and examine specific factors associated with pursuing bladder outlet surgery in the post-prosthesis population.

Declarations

Ethics approval and consent to participate

Cleveland Clinic IRB-Exempt protocol number 22-1267, waiver of informed consent.

Consent for publication

Not applicable.

Author contributions

Raevti Bole: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Writing – original draft; Writing – review & editing.

Prajit Khooblall: Data curation; Formal analysis; Writing – original draft.

Petar Bajic: Conceptualization; Formal analysis; Investigation; Methodology; Project administration; Supervision; Validation; Writing – review & editing.

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Competing interests

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Availability of data and materials

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