Management of prostatosymphyseal fistula following photoselective vaporization of the prostate: Case series and systematic review of the literature

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Abstract

Background: This study is aimed to describe our institutional experience and review the literature to date on prostatosymphyseal fistula (PSF), or puboprostatic fistula, following bladder outlet procedures such as transurethral resection of the prostate (TURP) or laser photoselective vaporization of the prostate (PVP).

Materials and methods: We retrospectively queried our institutional experience for management of PSF following PVP performed for symptomatic benign prostatic hyperplasia. We also performed a systematic literature review for PSF following PVP or TURP. Finally, we describe our surgical approach to the management of this challenging condition.

Results: We identified 7 cases of PSF following PVP from our institution, as well as an additional 7 cases following PVP and 9 cases following TURP from literature review. The diagnosis of PSF was made between 0.5 and 24 months following PVP, and the most specific symptoms were pubic pain and difficulty ambulating. Most patients requiring several evaluations before the diagnosis was made using appropriate imaging studies. Seventy percent of patients required surgical intervention including fistula repair or prostatectomy. Our surgical approach has evolved, and we now routinely perform robotic fistula repair with Y-V plasty and interposition flap with excellent results.

Conclusions: Puboprostatic fistula is a rare and poorly described complication of PVP or TURP. To the best of our knowledge, this case series of PSF following PVP represents the largest series to date and doubles the number of reported cases in the literature. Robotic fistula repair with interposition of either peritoneal or perivesical fat flaps appears to be a viable management strategy.

Keywords: Fistula; Laser; Prostatosymphyseal fistula; Puboprostatic fistula; Reconstructive surgery

1. Introduction

Bladder outlet procedures for the treatment of symptomatic benign prostatic hyperplasia (BPH) have undergone a paradigm shift from the gold standard transurethral resection of the prostate (TURP) to a variety of alternative operative and procedural interventions including photoselective vaporization of the prostate (PVP) using the 532 nm green light laser, which has emerged as a safe alternative to TURP with durable outcomes.[1–3] In a series of 500 patients undergoing PVP with an 80 W laser, there were few long-term complications (eg, incontinence, urethral stricture, and bladder neck contracture) and only 1 instance (0.2%) of prostatic capsular perforation.[1]

Subsequent updates to the platform have increased efficiency of vaporization with higher energy 120 and 180 W lasers. In 305 patients treated with a 120 W laser, there were 9 (2.9%) reported capsular perforations but no reports of subsequent sequelae.[2] Contemporary data with the 180 W laser also suggests durable outcomes with few long-term complications.[3]

Starting in the mid-90s, several case reports began to describe an uncommon complication from TURP first presenting with pelvic pain and difficulty walking.[4,5] Further workup revealed the presence of a prostatosymphyseal fistula (PSF), also known as a puboprostatic fistula, from the prostatic fossa to the pubic symphysis. Typically occurring as a result of a capsular perforation at the anterior prostate, PSF results in the development of osteitis pubis and pubic osteomyelitis with or without anterior thigh urinoma, lower urinary tract symptoms, and/or infection. To date 9 cases of PSF following TURP have been reported in the literature[4–12] with management strategies ranging from conservative management via antibiotics and bladder drainage to open surgical repair or extirpative surgery.

PSF following PVP was first described in 2008[13] with the first case reported using the 120 W laser platform. Since the initial description of a puboprostatic fistula following PVP, a total of 7 cases in the English literature have been reported to date.[13–17]

In addition to the above reports, we have treated 7 men to date who developed PSF following PVP. The objective of this case series and systematic review is to summarize the limited published literature for patients presenting with PSF following PVP and to describe an additional 7 cases of PSF following PVP to double the...
2. Materials and methods

This report is an observational retrospective case series of all patients referred to our institution for management of PSF after PVP. All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study was conducted with institutional IRB approval (IRB 17-1462) and consent was waived due to the retrospective nature of the study. Patient charts were queried for all relevant clinical history, perioperative details, and outcomes. Imaging studies obtained both at our institution and imported from outside providers were reviewed. The data was aggregated in Microsoft Excel (Microsoft, Redmond, WA) and analyzed in SPSS version 25 (IBM, Armonk, NY). Parametric variables are reported as mean ± standard deviation, and nonparametric values are reported as median [interquartile range].

We also performed a literature review via PubMed and Cochrane Library for articles published between 1/1/1970 and 4/1/2020 and registered the review with PROSPERO (ID 42020219884). The review was consistent with the Preferred Reporting Items for Systemic Reviews and Meta-Analyses criteria. The initial search was conducted with the following search string: ((“transurethral resection of the prostate” OR “TURP” OR “photoselective vaporization of the prostate” OR “photovaporization” OR “laser prostatectomy” OR “PVP” OR “Greenlight” OR “BPH”) AND (“pubis” OR “pubic” OR “ostetisis pubis” OR “ostemyelitis” OR “urinoma” OR “syphillis”)) AND (“1970/1/1” [Date—Publication]: “2020/4/1” [Date—Publication])). Additional reports were identified via searching the references of relevant manuscripts and recent published abstracts. Exclusion criteria included the following: lack of clinical applicability, manuscripts in languages other than English, retracted articles, and duplicated articles. The data was extracted independently by 2 physicians, with a third physician available to resolve any discordant findings. The data was then compiled into a narrative summary for further discussion. Risk of bias in any prospective trials was assessed using the Cochrane risk-of-bias tool and was not assessed for case reports.

3. Results

3.1. Case series

Between 2012 and 2018, a total of 7 patients were referred to our institution for evaluation and management of PSF following PVP for the treatment of BPH. A summary of their clinical characteristics is presented in Figure 1. Representative magnetic resonance imaging (MRI) images are shown in Figure 2A, and cystoscopic findings are noted in Figure 2B. Of note, none of the

![Figure 1. Summary of case series and literature review. LUTS = lower urinary tract symptoms; UTI = urinary tract infections; CT = computed tomography; MRI = magnetic resonance imaging; VCUG = voiding cystourethrography; RRP = retropubic radical prostatectomy; RALP = robot-assisted laparoscopic prostatectomy; PVP = photovaporization of the prostate; TURP = transurethral resection of the prostate.](image-url)
3.1.1. Patient 1. The first patient treated at our institution was a 56-year-old male who underwent PVP at an outside institution in 2011 complicated by persistent urinary retention. Three months later he underwent TURP of cystoscopically identified necrotic tissue in the prostatic fossa, and his postoperative course was complicated by pubic pain and incontinence. Seven months after the index case, an MRI was performed and showed PSF. He was then referred to us for management and underwent robotic-assisted laparoscopic radical prostatectomy. After seven years of follow-up, the patient remains pain free without recurrence of the fistula. He did undergo artificial urinary sphincter placement due to incontinence from his index PVP/TURP and is currently using one pad per day for security.

3.1.2. Patient 2. The second patient was a 60-year-old male who underwent concomitant PVP and vasectomy in 2013. The patient reported groin pain 1 week following his PVP, which progressed to include difficulty ambulating. He underwent a computed tomography (CT) of the abdomen and pelvis one month following PVP that demonstrated an extraperitoneal fluid collection, and an MRI 2 months postoperatively demonstrated a puboprostatic fistula. He failed conservative and was referred to our institution 7 months following PVP. After cystoscopy confirmed the fistula, he underwent open fistula repair using an anterior bladder advancement flap with omental interposition 10 months after his index PVP. He remained pain free at the time of his last follow-up 6 years later.

3.1.3. Patient 3. The third patient was a 72-year-old morbidly obese male (BMI 42) who underwent a PVP in May 2015 and subsequently developed progressive pelvic pain, hematuria, and urinary urgency and frequency. At 4 months post-PVP he underwent transurethral resection of a suspicious prostatic lesion, and pathology returned as inflammatory tissue. Six months post-PVP the patient underwent a pelvic MRI that demonstrated an anterior outpouching of the urethra extending to the symphysis pubis, consistent with the diagnosis of a fistula. He was referred to us and at 10 months post-PVP and underwent a robotic fistula repair with Y-V plasty and perivesical fat interposition flap. Unfortunately, the patient had persistent postoperative lower urinary tract symptoms, and a cystogram revealed a persistent fistula. At this point the patient elected to undergo definitive treatment via open urinary diversion and has done well since then.

3.1.4. Patient 4. The fourth patient was a 73-year-old male who underwent PVP in November 2016 complicated by abdominal pain and retention requiring Foley catheter reinsertion on postoperative day 1. A cystogram demonstrated urinary extravasation. After catheter removal 1 week later, the patient developed pelvic and bilateral thigh pain with difficulty ambulating. A CT urogram 2 months post-PVP demonstrated a puboprostatic fistula, and he was referred to our institution and underwent robotic fistula repair. One month later the patient’s catheter was removed and a voiding cystourethrogram demonstrated no evidence of extravasation or persistent fistula. After 30 months of follow-up, the patient remains pain free.

3.1.5. Patient 5. Patient 5 was a 73-year-old male who underwent PVP in August 2016 and developed suprapubic pain with difficulty ambulating shortly thereafter. He was initially treated with physical therapy for presumed osteoarthritis, but his pain persisted and an MRI pelvis at 9 months post-PVP demonstrated narrow edema of the pubis with suspicion of fistula. A Foley catheter was inserted, and CT cystogram performed 11 months post-PVP confirmed a persistent puboprostatic fistula. He was referred to us 1 year after his PVP and underwent successful robotic repair. His postoperative voiding cystourethrogram demonstrated resolution of the fistula and he was asymptomatic prior to being lost to follow-up at 7 months post-operation.

3.1.6. Patient 6. The sixth patient is a 58-year-old gentleman who underwent PVP complicated by urinary retention. Approximately 1 month later he was readmitted with MRI-proven PSF and was treated with antibiotics and Foley catheterization. He presented to our institution 1 month later with ongoing pain and inability to ambulate. He underwent robotic fistula repair at 3 months post-PVP and did well postoperatively, and his catheter was removed 1 month later after a normal cystogram. He was subsequently lost to follow-up.

3.1.7. Patient 7. The final patient is a 77-year-old gentleman with longstanding BPH who underwent several prior outlet procedures for symptomatic obstruction. The seventh patient is a 77-year-old male who underwent PVP complicated by urinary retention. Approximately 1 month later he was readmitted with MRI-proven PSF and was treated with antibiotics and Foley catheterization. He presented to our institution 1 month later with ongoing pain and inability to ambulate. He underwent robotic fistula repair at 3 months post-PVP and did well postoperatively, and his catheter was removed 1 month later after a normal cystogram. He was subsequently lost to follow-up.

Figure 2. (A) Representative MRI images demonstrating puboprostatic fistula. The upper two images are T2-weighted sagittal images, and the lower two images are T2-weighted axial images. (B) Cystoscopic demonstration of puboprostatic fistula. Left: Flexible cystoscope directly anteriorly in the prostatic urethra demonstrating fistula tract. Right: Cystoscope advanced into tract, demonstrating erosion of the pubic symphysal cartilage. The arrows represent the location of the fistula.
procedures (2 TURPs and 1 transurethral needle ablation) and subsequently underwent PVP in February 2018. He developed postoperative incontinence and pain, anda follow-up CT scan at 3 months showed a PSF. At 7 months post-PVP he underwent robotic fistula repair with Y-V plasty and perivesical fat interposition. A cystogram 1 month later was negative for leak or fistula, and the catheter was removed. Aside from ongoing mixed urinary incontinence, he remains symptom free at 19 months follow-up.

3.2. Systematic review of the literature
An extensive literature search identified a total of 14 case reports describing 9 cases of PSF following TURP [4-12] and 7 cases of PSF following PVP [13-17] (Fig. 3). With the addition of the 7 cases presented in our case series, a total of 23 cases (14 following PVP, 9 following TURP) have been reported in the English literature to date (Fig. 1). Mean age at presentation was 71 years of age and did not differ between patients undergoing TURP or PVP (p = 0.14). Seven of 23 patients (30%) developed postoperative urinary retention requiring Foley catheter reinsertion. The interval between index operation and symptomatic presentation varied widely from 2 weeks to 24 months, with a median of 2 months. Ninety-six percent of patients presented with pubic pain and 74% endorsed difficulty ambulating. Most patients underwent extensive workup including CT, MRI, and cystoscopy. Surprisingly, over 25% of patients demonstrated negative cultures. Thirty percent of patients were successfully managed with conservative approaches (prolonged bladder drainage and/or antibiotics), and 70% required surgical intervention. Among the patients, 30% underwent open fistula repair, 18% underwent open or robotic prostatectomy, and 3/7 of the patients in our series underwent robotic fistula repair. A total of 4 patients in the entire cohort required secondary operations including urinary diversion, repeat fistula repair, artificial urinary sphincter placement, and salvage prostatectomy.

4. Discussion
This case series details our experience managing 7 cases of puboprostatic fistula following PVP. To the best of our knowledge, this series represents the largest such experience to date, and demonstrates an evolution to a minimally invasive management strategy for this uncommon condition.

4.1. Index procedure characteristics
While this case series and systematic review is unable to assess prevalence, our data does suggest that the type of Greenlight laser (80W, 120W, or 180W) did not appear to have a substantial difference in risk of fistula development, presumably due to their equivalent depth of penetration [18]. All cases in this series with a preoperative prostate size demonstrated relatively small glands, and the largest gland in this series was noted to be...
44 g. This may suggest that smaller glands are at higher risk for anterior perforation and PSF. It is interesting that none of the patients who developed a PSF following TURP required additional operative management beyond the index fistula management operation. This may reflect statistical variation within a small sample size, or it may represent a difference in the underlying tissue quality, and further work will be necessary to clarify this.

Another possible risk factor for fistula development is undergoing additional transurethral procedure before or after the index PVP. In our series, 3/7 (43%) of patients had a TURP either before or after the index PVP. The other trend in this series appears to be postoperative urinary retention, which may increase the risk of early infection prior to tissue healing. Even if retention does occur, it seems prudent to forego additional transurethral procedures—particularly at the anterior prostate — until the healing process is complete.

4.2. Diagnostic considerations

The diagnosis of PSF requires a high index of suspicion (Fig. 1). In this series, many patients presented in the early postoperative period with acute symptoms but were not correctly diagnosed for several months. While severe pubic pain is nearly always present, this is likely non-specific. Leg/thigh swelling and difficulty ambulating on the other hand, should prompt further workup as these are likely quite specific. Following initial presentation, a number of imaging studies can be of use. Contrasted CT is often the first imaging study performed and will likely show soft tissue stranding near the pubis. MRI is the imaging study of choice to delineate the presence of a fistulous tract between the urinary tract and the pubic symphysis. A cystoscopy and/or cystogram will also provide useful anatomic information that can assist in surgical planning. The defect is anterior and may be easy to miss on cystoscopy, particularly if the defect is inside the bladder neck area. Retrospection of the scope is recommended in situations where there is a high incidence of suspicion.

4.3. Surgical considerations

Following diagnosis, some men with PSF will respond to antibiotics and bladder drainage and may not need surgical intervention. For the remainder (70%) of men, however, surgical management appears to be necessary. Early case reports described open fistula repair with relatively good outcomes at the expense of perioperative morbidity. Radical prostatectomy is also a viable option as long as patients are counseled appropriately on the risks of urinary leakage and erectile dysfunction. At our institution, we have now shifted to prostate-sparing robotic fistula repair. To accomplish this, we use a port configuration identical to the standard robotic prostatectomy configuration with 3 8-mm robotic ports, 1 12 mm camera port, and 1 12-mm assistant port (Fig. 4A). The bladder is mobilized from the anterior abdominal wall in the standard fashion until the fistula is encountered (Fig. 4B). Similar to the approach used for bladder neck repair described previously, we perform relaxing incisions in a Y configuration and repair the fistula using a Y-V plasty (Fig. 4C). We also routinely use a perivesical fat tissue interposition due to its simplicity and functionality, though omentum is also a viable option in selected cases. Operative outcomes have been favorable, with an average operative time of 136 minutes and estimated blood loss of 40 mL. While the first patient in our series who underwent robotic repair required a secondary operation, the subsequent 4 patients in our series have done well and recovered uneventfully. Ultimately the surgical approach depends upon surgeon comfort level, the specific location of the lesion, and surrounding tissue quality.

This study has several limitations worth mentioning. All 7 patients were referred for fistula management at our institution and had their PVP performed elsewhere, which limits granularity regarding the index operation and potential causal surgical factor identification. Given the retrospective nature of this study, our study also cannot identify the true incidence of PSF following PVP or TURP. This is also an uncommon condition, and as such a robust quantitative analysis of the existing retrospective data is limited in applicability. Finally, the risk of reporting and publication bias is significant in this topic.

5. Conclusions

Photovaporization of the prostate is a common alternative to TURP for management of BPH and has been reported both safe and effective in numerous large series. Prostatosymphysal fistula is a rare complication following either operation and commonly presents with pain and difficulty ambulating. In the absence of urinary symptoms, the orthopedic nature of these presenting complaints may delay fistula diagnosis. When suspected, MRI of the pelvis is able to accurately diagnose the presence of PSF. In the current case series, which is the largest reported to date, fistula management has evolved with growing

Figure 4. Robotic fistula repair. (A) Standard port configuration using the Intuitive DaVinci Si robotic platform. (B) Intraoperative image showing fistula tract containing Foley catheter. (C) Intraoperative image demonstrating bilateral incisions in preparation for Y-V plasty.
experience and robotic fistula repair with Y-V advancement of the anterior bladder neck and interposition of a peritoneal or perivesical fat flap is now the preferred intervention at our institution.

Acknowledgments

None.

Statement of ethics

The study was conducted with institutional IRB approval (IRB 17-1462) and consent was waived due to the retrospective nature of the study. All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of interest statement

The authors report no conflicts of interest.

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Author contributions

All authors contributed equally in this study.

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