Management of complications after surgical outlet reduction for benign prostatic obstruction

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Introduction: *Lower urinary tract symptoms are a common complaint. Surgery to debulk hyperplastic prostate tissue is indicated for men with symptoms refractory to medical therapy, or for those who cannot tolerate first-line medications. In recent decades, new endoscopic techniques have been developed to reduce the morbidity of transurethral resection of the prostate (TURP). Nonetheless, complications are still frequently encountered in the immediate, early, and remote postoperative setting.*

Materials and methods: *In this review, we perform an in-depth examination of contemporary treatment strategies for long term complications of surgical outlet reduction procedures. Complications encountered in the remote postoperative setting such as erectile dysfunction (ED), urethral stricture, refractory incontinence, and bladder neck contracture were identified in the literature.*

Results: ***T****reatment strategies for ED after TURP do not differ from algorithms applied for ED due to other causes. Management of urethral stricture following TURP depends on the size and location of narrowing and can range from simple dilation to complex excision with grafting techniques or perineal urethrostomy. Refractory urinary incontinence requires a full diagnostic evaluation, and artificial urinary sphincter placement is efficacious for cases that do not respond to first-line medical therapy. Finally, numerous therapies for bladder neck contracture exist and vary in their invasiveness.*

Conclusion: *Endoscopic reduction of the prostate for the male with benign prostatic obstruction via most contemporary modalities is a safe and effective means to decrease outlet resistance to urinary flow. However, late complications from these procedures still exist. Management of remote morbidity following TURP can be diagnostically and therapeutically complex, necessitating prompt referral to a genitourinary reconstruction specialist.*

Key Words: BPH, TURP complications, bladder neck contracture, urethral stricture, postoperative incontinence

Introduction

Although the etiology of lower urinary tract symptoms (LUTS) is now considered multifactorial, many patients will be found to have a significant contributing element of benign prostatic obstruction (BPO) secondary to prostate enlargement warranting treatment.[1] Men who are unwilling or unable to participate in medical therapy directed at the bladder outlet, or those whose disease is refractory to first and second-line medications, are deemed potential surgical candidates. Two gold-standard approaches for surgical removal of prostatic tissue that have been offered to men in the past are open prostatectomy and transurethral resection of the prostate (TURP).[1] Recently, numerous alternatives to standard monopolar TURP (m-TURP) have been developed and implemented with excellent efficacy including bipolar (b-TURP), laser, and ablative technologies.[2-6] Due to the endoscopic arsenal available to urologists, fewer practitioners currently employ monopolar or traditional open techniques.[6]

The surgical complications from any one of these modalities are highly varied and can occur either intraoperatively or in the immediate/remote postoperative period.[7] We present a brief review of the management of the most common remote complications following BPO surgery, such as erectile dysfunction (ED), urethral stricture, refractory incontinence, and bladder neck contracture.

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Remote postoperative complications of TURP

ED and retrograde ejaculation

Most patients report stable sexual function after TURP. In a historic VA study comparing transurethral resection versus watchful waiting, the rates of ED at 3 years following randomization were 19% and 21%, respectively.[8] More contemporary studies have confirmed that up to 14% of men undergoing TURP will report some level of ED. Risk factors include presence of diabetes mellitus,[9] pre-existing cardiovascular disease[10] and resections close to the prostatic capsule and neurovascular bundle.[7] Treatments for ED following TURP do not differ from protocols for ED from other causes.

Retrograde ejaculation is much more common, however, occurring in 50%-75% of all cases.[7] Prevention by avoiding prostatic tissue immediately surrounding or including the verumontanum is paramount, especially in younger men. Medical therapies for retrograde ejaculation are aimed at restoring sympathetic tone to the bladder neck, either by direct stimulation of alpha-receptors or via net effect by cholinergic antagonism. Combination medical therapy has also been employed. Success rates are highly varied (13%-100%) in dated studies of small cohorts.[11]

Urethral stricture

The incidence of urethral stricture, irrespective of location, is probably 2.2%-9.8% following endoscopic BPO treatment. The two locations most commonly affected are the bulbar urethra and fossa novicularis.[7] The proposed mechanism for distal involvement of the urethra is mechanical in nature, due to stretch forces caused by a resectoscope that is likely too large to be accommodated without injury. In the case of bulbar strictures following TURP, nonconductive lubricant can act as a thermal insulator, allowing stray currents of electricity from the resectoscope to heat surrounding urethral tissue, causing damage that ultimately results in inflammation and scar formation.[12] Although there is a paucity of data examining any differences, there does not seem to be a statistical difference between m-TURP and other TURP modalities on long term stricture rates.[6]

Management of urethral stricture at the fossa novicularis or penile urethra is largely dependent on stricture length. For novel strictures or those under 1 cm, dilation or internal urethrotomy are acceptable and may be performed by the general urologist.[13,14] For longer or recurrent strictures, however, more complex meatoplasty or formal urethroplasty may be necessary, either by local flap advancement[15] or penile urethroplasty.[16] Often, patients with recurrent or complex strictures are best treated under the care of a genitourinary reconstructive specialist. Figure 1 represents a severe case of penile urethral stricture disease in a patient merely 6 weeks status-post outlet reduction, Figure 1a, necessitating overlapping dorsal and ventral buccal grafts at the time of penile urethroplasty, Figure 1b.

Urologists trained in reconstructive techniques have a variety of surgical options at their disposal for the management of bulbar urethral strictures. Excision with primary anastomosis (EPA), stricture excision with augmented anastomosis (AAR), flaps, grafts, and bail-out perineal urethrostomy (PU) creation have all been described to treat this problem.[17] In one single-center experience spanning 15 years, EPA was the most commonly utilized technique for patients with such bulbar strictures (52.6%) with a recurrence rate of only 3%-6.9%. The range of recurrence was due to the evolution of EPA utilization for longer strictures over the study period, without statistically significant differences ($p = 0.27$). For patients in this series who were treated with AAR, the adopted use of buccal mucosa was associated with an almost 16% improvement in recurrence over penile skin ($p = 0.002$).[17]

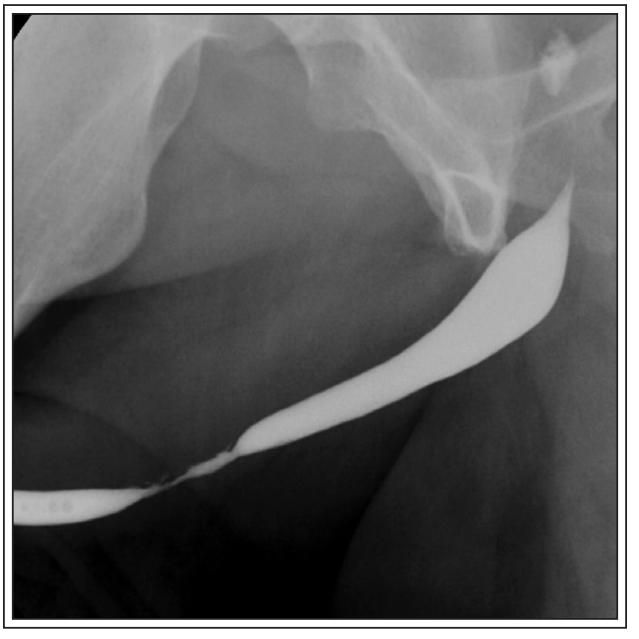

Figure 1a. Retrograde urethrography demonstrating severe penile urethral stricture that presented symptomatically 6 weeks following Greenlight laser TURP.

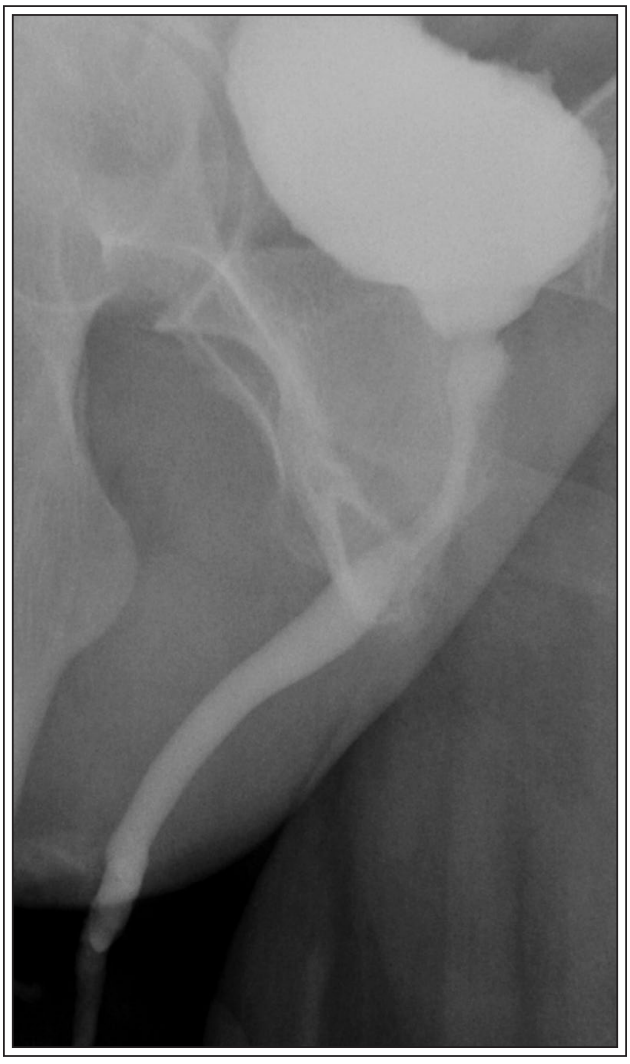

Figure 1b. Voiding cystourethrography demonstrating excellent urethral patency following urethroplasty with overlapping dorsal and ventral buccal mucosal grafting.

Urinary incontinence

Urinary incontinence (UI) after bladder outlet reduction surgery manifests in the early postoperative or late postoperative setting. Rates of early UI are as high as 30%-40% while late incontinence is rare (0.5%).[18] The timing of UI corresponds to the pathogenesis of the presenting symptoms. Early UI is primarily urge related and the etiology involved is that of detrusor instability or healing of the resection bed. In this setting, early UI following outlet reduction is rarely iatrogenic in nature. Conversely, late refractory UI after TURP is associated with permanent injury to the external urinary sphincter, causing primarily stress urinary incontinence (SUI).[7] Bipolar TURP was not statistically different from m-TURP in incontinence rates at 12 months in a meta-analysis.[6] The treatment for early urge incontinence is conservative, and short courses of anti-inflammatory agents in conjunction with time-limited doses of anticholinergic medications are first-line.[18]

When a patient presents with non-neurogenic refractory incontinence remotely from TURP, a full diagnostic evaluation should be undertaken. Urodynamic studies, cystoscopy, and retrograde urethrography all may assist the urologist in determining which of the likely factors involved is the source of the patient's incontinence: sphincter trauma (30%), detrusor irritability (20%), mixed urinary incontinence (30%), incomplete resection (5%) and bladder neck contracture or urethral stricture (10%) [18]. Therapy can then be directed accordingly.

In the event that the UI is due to incompetence of the external urethral sphincter, conservative management beginning with pelvic floor exercises and pharmacotherapy utilizing alpha-blockers or serotonin/norepinephrine reuptake inhibitors have been efficacious.[19] In the event that no lasting improvement is achieved, an artificial urinary sphincter (AUS) implantation is indicated.

A recent review of outcomes data regarding AUS implantation demonstrated durable results despite heterogeneous reporting patterns. Continence after surgery can be expected in two-thirds to 100% of cases. Infection, device failure, and erosion rates are all less than 10% in pooled analysis but are serious issues for patients with AUS devices.[20] Leon and colleagues shared their experience with AUS and offered long term functional outcomes. With a median follow up of 15 years, nearly 45% of patients had their primary AUS still in place and 77% were continent at the time of their last visit. The authors demonstrated AUS implantation to be a durable treatment option in the long term as explantation-free survival was 87% at 10 years and 80% at 20 years.[21] These excellent results, however, are only observed in large volume AUS implant centers with highly experienced surgeons. In fact, the primary factor in decreasing re-operative rates for AUS by 50% in one report was a surgeon that had amassed at least 200 cases.[22]

Bladder neck contracture

Bladder neck contracture (BNC) occurs after TURP due to obliteration of the microvasculature supplying the outlet. This results in tissue ischemia and scar formation.[23] The incidence is between 0.3%-10% and is more common is smaller glands.[7] Diabetes, smoking, and cardiovascular disease are all modifiable risk factors predisposing patients to BNC.[24]

Management of BNC is varied and ranges in its invasiveness. Now a historical consideration, UroLume

stents (American Medical Systems, Minnetonka, MN, USA) were once a mechanical treatment for BNC by tenting open the stricture. While initial reports of the device were promising,[25] issues with obstruction,[26,27] migration,[28,29] encrustation,[30] and epithelialization[31] resulting in high reoperation rates led to its removal from the market.

Urethral dilation followed by intermittent catheterization is a reasonable treatment strategy in highly dexterous, motivated patients. This is best employed in patients with short, soft bladder neck contractures without evidence of complete occlusion of the outlet. Therefore, a detailed assessment of the problem is necessary before recommending this approach. Even in the properly selected candidate, more than 90% of patients will require repeat dilations within the first 2 years.[32] Complications such as urinary retention, hematuria, infection, and simultaneous stricture development from repetitive urethral trauma all account for poor quality of life in patients undergoing intermittent self-dilation with stricture disease.[33]

Today, bladder neck incision has been demonstrated to have the most durable results for BNC. Morey and colleagues recently described a treatment protocol that combines urethral dilation with hot knife bladder neck incision in one procedure with a 72% success rate at median 16 month follow up. Briefly, a 4 cm x 24 cm UroMax Ultra balloon dilator is used to define the bladder neck circumferentially before a Collins knife is used to take the bladder neck down to perivesical fat at 3 o'clock and 9'oclock. Patients are evaluated with uroflowmetry and cystoscopy at 2 months. Success is defined as the ability to pass a 16Fr flexible cystoscopy into the bladder with ease. Another 14% of patients will have treatment-defined success with a single additional balloon dilation.[34,35] For the refractory case, open surgical options are available and should be reserved for the genitourinary reconstruction specialist. Transpubic,[36] perineal,[37] and abdominoperineal[38] approaches have all been described with success in highly experienced hands.

Finally, emerging techniques combining bladder neck ablation with the introduction of cytotoxic agents transurethrally have been explored and are undergoing validation. Eltahawy et al has shown an 83% success rate taking down the bladder neck with a holmium laser and bathing the stricture site in triamcinolone.[39] Mitomycin C (MMC) utilization has gained significant traction more recently and has been instilled after radial cold knife incision of the bladder neck.[40] In a recent multi-institutional report assessing BNC treatment strategy with MMC, a 75% success rate was noted with a one-time treatment.[41] Limitations of this study, however, included varying dosages of MMC employed as well as a non-uniform injection and incision strategy. Additionally, serious adverse events from MMC have been described with treatment, including extravasation,[42,43] anaphylaxis,[44] impaired healing,[45] and bladder neck necrosis eventually requiring cystectomy.[41] As such, the use of MMC for the management of BNC continues to hold limited promise.

Conclusions

Surgical outlet reduction for BPH remains a safe and highly efficacious option for men with LUTS secondary to BPO who are refractory or unable to tolerate medical therapy. Early complications such as bleeding, infection, dilutional hyponatremia, ureteral obstruction, and perforation are avoidable with proper technique and manageable with low immediate re-operation rates.[6] With advanced treatment modalities and improved technology in recent decades, future directions aimed at more precise resection will likely result in lower rates of more serious late complications, such as urethral stricture, refractory incontinence, and bladder neck contracture. As detailed in this review, correction of these late issues is highly complex and often involves a thorough diagnostic evaluation, prosthetic device implantation, and/or formal urethroplasty. Thus, prompt referral to a genitourinary reconstruction specialist is suggested in order to ensure the most optimal outcomes.[46]

Disclosure

Dr. Daniel C. Parker and Dr. Jay Simhan have no disclosures. □

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