Prostatic Urethral Lift Vs Prostate Arterial Embolization: Novel Nonablative Strategies in the Management of Lower Urinary Tract Symptoms Secondary to Benign Prostate Hyperplasia

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Prostate urethral lift and prostate arterial embolization represent two evolving techniques with contrasting mechanisms of action (mechanical decompression vs angiographic embolization). Both yield relief of lower urinary tract symptoms over a period of several weeks. They display similar safety profiles with self-limiting pelvic discomfort characterizing the commonest minor adverse event. Both procedures have the potential to be carried out under local anesthesia and in the outpatient setting with suitability for patients with cardiovascular comorbidities. Neither has been found to cause degradation of sexual function. Further randomized studies are needed to delineate the formal position of these techniques in the surgical management of benign prostate hyperplasia. UROLOGY 87: 11–17, 2016. © 2015 Elsevier Inc.

The advent of newly available, minimally invasive surgical therapies has confirmed that the therapeutic landscape for lower urinary tract symptoms (LUTS) secondary to benign prostate hyperplasia (BPH) is changing. The prostatic urethral lift (PUL) system known as the UroLift device (NeoTract Inc., Pleasanton, CA) and prostate artery embolization (PAE) represent the latest newcomers to the global stage.[1,2] Whereas TURP continues to represent the gold standard surgical intervention, the paradigm shift toward minimally invasive surgery coupled with advances in uro-technology has prompted the urology community to reevaluate the position of this resective technique. To be formally accepted as part of the urologist's armamentarium, an emerging technique such as PUL or PAE must prove to be a safe, effective, and durable alternative that is able to improve both subjective and objective disease status measures.

To this effect, the technique must withstand rigorous validation through multicenter randomized studies. Although there are an increasing number of data series being reported from studies on PUL and PAE alike, critical appraisal on these two surgical methods is lacking. Therefore, we aim to evaluate these evolving techniques.

MATERIALS AND METHODS

A search strategy was conducted to include EMBASE, PubMed, Web of Science, and Scopus databases. Search terms included "benign prostate hyperplasia," "lower urinary tract symptoms," "urolift," "urethral lift," and "prostate artery embolization." Relevant abstracts and proceedings from conferences were also hand searched. We included studies that had 10 or more patients with a minimum follow-up of 12 months to allow for short and mid-term follow-up of efficacy and safety.

CURRENT TREATMENTS FOR BPH

BPH is a progressive disease and histopathological examination of affected tissue reveals hyperplasia of the epithelial and stromal architecture in the transition zone of the gland.[3] The prevalence of this pathology exceeds 50% in men over 60 years and is exponential thereafter.[4] Alpha 1-adrenoreceptor (AR) antagonist monotherapy has been the traditional first line in the medical management of LUTS secondary to BPH. Although this pharmacological treatment demonstrates significant efficacy over placebo, α-AR antagonists are associated with adverse effects such as postural hypotension and retrograde ejaculation.[5] Furthermore, they do not yield any effect on disease progression nor do they prevent acute urinary retention.[6]

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5α-reductase inhibitors (5α-RIs) such as dutasteride and finasteride, serve to mediate the conversion of testosterone to dihydrotestosterone (DHT) as well as trigger prostatic epithelial cell apoptosis.[7] Unlike alpha-blockers, 5α-RIs can significantly alter BPH progression.[8] Although the effect of 5α-RIs translates into a reduction in prostate size by up to 28%, their onset of action is slow and the side effect profile includes diminished libido, erectile dysfunction, and potential depression.[9] The unwanted sequelae of α-AR and 5α-RIs can therefore lead to poor tolerability and subsequent withdrawal.

For over 30 years, transurethral resection of the prostate (TURP) has remained the mainstay surgical intervention for BPH with moderate to severe symptoms and has remained refractory to medical therapy. However, the number of this endoscopic procedure performed each year has steadily declined.[10] Although major morbidity associated with TURP is less than 1% and mortality is virtually 0%, retrograde ejaculation continues to be recorded in up to 75% of cases.[11] The case for TURP is weakened further by the requirement for a general anesthesia and inpatient stay. The median hospital stay after TURP in the UK is 48 hours.[12] The era of transurethral laser prostatectomies has carved a new chapter in the evolution of BPH practice patterns. The recently published 12-month results of the European GOLIATH study have upheld the noninferiority of GreenLight vaporisation vs TURP in regard to various efficacy outcomes including International Prostate Symptom Score (IPSS) and maximum urinary flow rate (Qmax).[13] Equally, holmium laser enucleation of the prostate (HoLEP) has received increasing attention for its potential role as a "size independent" procedure.[14] However, the rate of retrograde ejaculation has been reported at 22% and 78% after these two laser procedures, respectively.[15] Management of LUTS secondary to BPH is multidimensional and the rationale for the patient's treatment pathway is stratified according to a number of patient characteristics including personal expectations, medical comorbidities, pre-existing sexual function, and prostate burden. Surgeon experience as well as the accessibility and diffusion of the technique will also shape the treatment a patient is able to receive. HoLEP, for example, is associated with a steep learning curve and is unlikely to be offered to patients attending smaller centers. A void in the therapeutic armamentarium for this condition has therefore developed. The search continues for a surgical treatment that has an attainable learning curve and efficacy outcomes rivaling TURP and can also preserve sexual function.

UROLIFT

Technique

This endoscopic and nonablative procedure serves to establish an uninterrupted channel in the prostatic fossa extending from the bladder neck down to the verumontanum.[16] It achieves this via mechanical compression with adjustable, trans-prostatic implants. The 3 core components of these biocompatible implants are a capsular nitinol tab, stainless steel urethral end piece, and an adjustable polymeric monofilament.[17]

The procedure can be performed under local anesthesia and sedation. Following cystoscopy, the bladder is emptied. The trans-prostatic implants are typically deployed at the 2 and 10 o'clock positions in the anterolateral direction under cystoscopic guidance. This is done using a 19-gauge needle, which houses the components of the implant and is passed through the prostate lobe. Full retraction of the needle causes the prostate capsule to be engaged by the tab and the monofilament to be placed under tension, which secures the device. Once the urethral end piece is attached to the monofilament, the latter is then cut. Owing to the tissue-sparing nature of the procedure, which allows for preservation of bladder neck integrity (implants should therefore be deployed at least 1.5 cm distal to this site and angulated carefully), antegrade ejaculation is protected.[18] The result is retraction of the encroaching lateral lobes and therefore expansion of the urethral lumen without compromising to vital anatomical structures such as the primary neurovascular bundles and the dorsal venous complex. Avoiding the use of a thermal energy source is thought to keep the risk of erectile dysfunction to a minimum. The number of implants installed per case is adenoma dependent and ranges between 2 and 10 according to Garcia et al.[18] Larger prostates require more implants. Computed tomography can confirm positioning of these invaginated devices at follow-up.

Evolution of the Technique

An Australian group led by Henry Woo, at the University of Sydney, has largely pioneered this novel device.[17-19] They carried out their debut PUL procedure in 2005 and in 2011 published results from a prospective, cohort study of 19 men.[17] Their results showed the mean IPSS to be reduced by 37% at 2 weeks. The following year, the same author group released findings from a single arm registry of 64 men.[20] At the 24-month end point, the IPSS and Qmax had improved by 42% and 30%, respectively. No adverse event related to retrograde ejaculation or erectile dysfunction was reported, which led the authors to conclude that this noncavitating approach allows for preservation of sexual function. The next year, Roehrborn et al reported from the first randomized blinded trial of PUL across 19 international centers.[21] Two hundred and six men were randomly assigned to either a PUL or a sham procedure (involving rigid cystoscopy with simulated sounds of implants being deployed). The mean American Urological Association Symptom Index value was reduced from 22.1 at baseline to 11.1 after 12 months ($P < .001$) in the PUL group. No de novo cases of ejaculatory or erectile dysfunction were reported. The author group later published the 24-month results, which found that PUL reduced the American Urological Association Symptom Index 88% more than did the sham therapy (−11.1 vs −5.9, $P = .003$).[22]

In 2013, PUL gained US Food and Drug Administration approval. In 2014, Cantwell et al published results from a crossover study involving patients enrolled in the sham