Original Article

Transurethral enucleation with bipolar energy for surgical management of benign prostatic hyperplasia: Our initial experience

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ABSTRACT

Introduction: Transurethral resection of the prostate has been considered as the gold standard for benign prostatic hyperplasia (BPH). LASER enucleation procedures have emerged as a size-independent gold standard. The flip side of LASER procedures is the initial cost of investment and a long learning curve. Transurethral enucleation with bipolar (TUEB) has emerged as an alternative prostatic enucleation procedure. We present our initial experience in TUEB.

Materials and Methods: Fifty patients with BPH and indications for surgery underwent TUEB from December 2014 to October 2015. Patients with prostate size >40 g were selected. All surgeries were done by a single urologist. Various parameters such as preoperative and postoperative International Prostate Symptom Score (IPSS) scores, Qmax (peak flow) scores, duration of surgery, duration of enucleation, drop in hemoglobin, postoperative pain scores, weight of morcellated tissue, and the incidence of stress urinary incontinence were measured.

Results: The mean age was 58 years and mean prostatic size was 84 g. Sixteen patients had refractory urinary retention. The mean IPSS score in remaining patients was 24.5. The mean preoperative maximal flow rate (Qmax) on uroflowmetry was 9.3 mL/s. The mean overall duration of surgery was 83 min. The mean drop in hemoglobin was 0.9 g/dl. The mean postoperative pain scores at 12 and 24 h after surgery were 2.1 and 1.3. The mean weight of morcellated tissue was 48 g. Twenty-six patients had *de novo* transient stress urinary incontinence after surgery. The mean IPSS score after TUEB was 8.3 showing significant improvement in all aspects of IPSS. The mean post-TUEB Qmax on uroflowmetry was 25 mL/s.

Conclusions: TUEB is an effective surgical management of BPH. TUEB allows enucleation of large adenomas in a single sitting, mimicking conventional open enucleation of the prostate while having all the advantages of a minimally invasive surgery.

INTRODUCTION

Surgical management of benign prostatic hyperplasia (BPH) has grown from the earlier days of open suprapubic and perineal prostatectomies to the development of transurethral resection of the prostate (TURP) and to the current explosion of different LASER procedures. TURP has been considered as the gold standard among all these surgical options, against which other modalities have been compared. However, recent studies on LASER enucleation procedures for BPH have shown them to be a size-independent gold standard for surgical management of BPH.[1-3]

LASER enucleation procedures mimic open prostatic enucleation and purportedly allow for a more complete removal of the adenoma. They have advantages over the open procedure in being a minimally invasive procedure with minimal blood loss and in having an expeditious recovery allowing patients to be sent home early.[4] LASER enucleation/vaporization procedures can also be carried

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out in patients whose anticoagulation medications cannot be safely withdrawn even for a short duration.[5] However, LASER procedures have higher initial cost of investment, it is a relatively expensive technology and has a long learning curve.[6]

Transurethral enucleation with bipolar energy (TUEB) has emerged as an alternative prostatic enucleation procedure for BPH using the standard bipolar electrosurgical unit and the bipolar resection sheath with a modified TUEB electrode [Figure 1]. This allows for a reduced initial cost of investment and limits costs to the procurement of a morcellation system and the TUEB electrode. The need for a morcellator can be cut down if the enucleated lobes are kept attached to the bladder neck and resected into small chips and evacuated.[7] The standard TURP resection procedure is widely practiced and graduating to TUEB is easier than learning holmium laser enucleation of the prostate. It would also be easier to convert a TUEB procedure to TURP if nonprogress or complications are encountered during the initial learning curve. We present here our initial experience in adopting TUEB.

MATERIALS AND METHODS

Fifty patients with BPH and indications for surgery underwent TUEB in our institution from December 2014 to October 2015. Prior informed consent was taken from the patients. Various parameters such as preoperative and postoperative International Prostate Symptom Score (IPSS) scores, Qmax (peak flow) scores, duration of surgery, duration of enucleation, drop in hemoglobin, postoperative pain scores, weight of morcellated tissue, and the incidence of stress urinary incontinence were measured. Patients were followed up at 1 week and at 1 month after surgery. TUEB is an enucleating technique and enucleation is traditionally reserved for a larger gland. Smaller glands can be very well managed with TURP, and in our early cases with TUEB, there was a perceived difficulty in reaching a plane between the adenoma and the capsule in a smaller gland. For these reasons, only patients with prostates >40 g were selected for this study.

All of them underwent TUEB with Olympus TUR system and the newly developed TUEB electrode as per a set protocol. Morcellation was carried out using the Unidrive II Karl-Storz and the Piranha (Richard-Wolf) morcellator systems. Catheter removal and discharge was done on the third postoperative day in all patients. All patients were put on a low dose of laxative for 2 weeks to prevent constipation in the postoperative period. They were advised against lifting weights and strenuous activity for 20 days following surgery. A single urologist did all the surgeries.

Operative technique

A preoperative urethrocystoscopy is done for assessing the pattern of prostatic enlargement (bilobar or trilobar) and to rule out the presence of concomitant urethral or bladder pathology. The procedure is started by marking a circular full-thickness mucosal cut all around, between prostatic apex and the external sphincter area [Figure 2a-c]. This is followed by creating a trough on the floor of the prostate from the bladder neck to the mucosal marking on either side of verumontanum, at 5'o clock and 7'o clock (for a trilobar enucleation, if there is a large median lobe) or at 5'o clock/7'o clock alone (for a bilobar enucleation). A 12'o clock trough is then created from the bladder neck to meet the circular apical mucosal incision placed in the beginning.

Bipolar enucleation is started with the TUEB electrode, which comprises of a routine bipolar electrosurgical loop and a mechanical spatula mounted over it. A 12-degree cystoscope is used throughout the procedure. Enucleation is started by entering the plane between the adenoma and

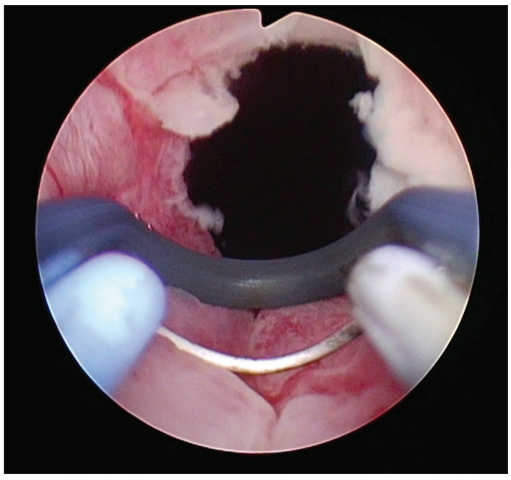

Figure 1: Transurethral enucleation with bipolar loop with a distal spatula and a proximal resection loop

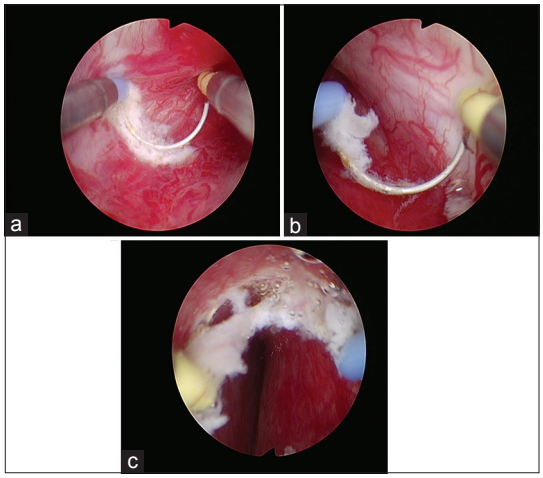

Figure 2: (a) Distal mucosal marking at the apex of the right lobe. (b) Distal mucosal marking at the apex of the left lobe. (c) Distal mucosal marking at 12'o clock

the capsule at 5'o clock by deepening the mucosal cut near the verumontanum on the left side. The adenoma is then gradually lifted off the capsule by applying gentle pressure with the spatula, slowly progressing from the apex toward the bladder neck at the 1'o clock position [Figure 3a]. Once bladder neck is reached at the 1'o clock position, the thin translucent mucosal bridge between the prostate and the bladder will be cut and the bladder entered at that point [Figure 3b]. Further dissection occurs by moving the loop in a rocking and rotating motion, sweeping the adenoma off the capsule from above downward, and cutting the mucosa at the bladder neck from above downward. Any bleeders that are encountered during this are coagulated using loop coagulation. It is possible to do precise and point coagulation of these bleeders arising from the capsule. The field remains bloodless as the adenomatous lobe gets gently enucleated, finally being attached only by a mucosal tag at the bladder neck at 11'o clock. The same would be repeated on the other side for the right lobe [Figure 3c]. The mucosal tag would be cut at 1'o clock and 11'o clock to allow for a continuous movement of sheath in the plane between the adenoma and capsule between 5'o clock and 7'o clock.

If a trilobar enucleation is planned, enucleation of the median lobe is accomplished by deepening of the mucosal troughs at both 5 and 7'o clock positions before enucleating the lateral lobes.

Once the lobes have been enucleated into the bladder, hemostasis within the prostatic fossa is ensured [Figure 3d], and morcellation is carried out with a standard morcellator. In the absence of a morcellator, the lobes would be left attached by their mucosal tags and resected *in situ* using the standard resection loop.

Following completion of the procedure, a 20 Fr Foley's urethral catheter is left in the bladder. Bladder irrigation may be instituted if deemed necessary. It is generally not necessary to use traction on the Foley's bulb in the immediate postoperative period.

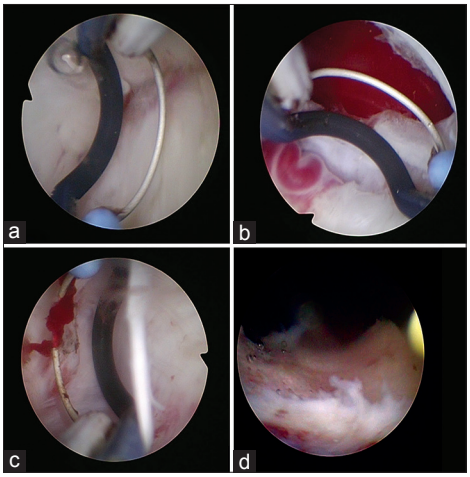

Figure 3: (a) Enucleation of the left lobe of the prostate. (b) Entering the bladder at 1'o clock after enucleation of the left lobe. (c) Enucleation of the right lobe. (d) Prostatic fossa after completion of enucleation

RESULTS

The mean age of these patients was 58 years (52–78) and their mean prostatic size on ultrasound was 84 g (45–185). Of these, 3 were on low-dose aspirin following percutaneous transluminal coronary angioplasty with insertion of drug-eluting stents within the past 1 year, in whom it was not advisable to stop aspirin. Sixteen of these patients had refractory urinary retention and they were on a perurethral Foley's catheter for varying durations of time. The mean IPSS score in the remaining patients was 24.5 (18–32). The mean preoperative maximal flow rate (Qmax) on uroflowmetry was 9.3 mL/s (5–21).

The mean overall duration of the surgery was 83 min (45–148), and the mean duration of enucleation was 56 min (23–75). The mean enucleation time was 82 min (65–140) in the initial 10 cases and was 47 min (23–67) in the next 40 cases. The mean drop in hemoglobin was 0.9 g/dl (0.3 g/dl to 1.8 g/dl). The mean postoperative pain scores at 12 and 24 h after surgery were 2.1 (1–4) and 1.3 (0–3) according to the visual analog score for pain assessment. The mean weight of morcellated tissue was 48 g (30–100). None of the patients had any instance of excessive postoperative bleeding necessitating re-intervention or blood transfusion. Two patients had their catheter removal deferred by 2 days each due to postoperative fever.

Twenty-six patients had *de novo* transient stress urinary incontinence after surgery. They were managed with adult diapers and were started on a program of Kegel's exercises. Twenty-five patients recovered completely within 1 week while one other patient had occasional nocturnal incontinence and no daytime incontinence after 1 month of surgery.

All patients were evaluated with IPSS scores and uroflowmetry at 1 month after surgery. The mean IPSS score after TUEB was 8.3 (6–15; $P < 0.05$) showing a significant improvement in all aspects of IPSS. The mean post-TUEB Qmax on uroflowmetry was 25 mL/s (18–29; $P < 0.05$).

DISCUSSION

Open prostatectomy has been the standard procedure for BPH and has delivered the best results in terms of maximal removal of adenomatous tissue and postoperative improvement in flow rates and lower urinary tract symptoms (LUTS). The introduction of monopolar and bipolar TURP made endoscopic management of BPH feasible, thereby countering the disadvantages of open prostatectomy in terms of blood loss and postoperative recovery.

However, the completeness of adenoma removal with TURP has been questioned and an 8%–40% residual adenoma rate after TURP is reported.[7,8] The degree of adenoma removal is surgeon dependent as conservative surgeons tend to leave more tissue around the prostatic apex.

The advent of LASER enucleation procedures provided an opportunity to replicate the technique of open prostatectomy endoscopically. These procedures ensured a near complete removal of adenoma with the inherent advantages of a minimally invasive approach and are being touted as "the new gold standard" in surgical management of BPH.[2,3]

TUEB is an alternative to LASER enucleation, which aspires to achieve the same deliverables as in an enucleation procedure, namely, complete enucleation, minimal bleeding complications, and an early recovery after surgery. The technique of TUEB was initially popularized as an enucleation procedure performed using the standard resection sheath, as advocated by Liu *et al*. and called transurethral enucleation and resection of the prostate (TUERP) by them.[9] Subsequently, Nakagawa modified the procedure by introducing the "TUEB loop" which had an additional mechanical spatula over the conventional TUR loop to help push the adenoma away from the capsule.[10]

In a recent meta-analysis comparing transurethral enucleation of prostate (TUEP) with transvesical open prostatectomy, the authors have found similar functional outcomes and a favorable perioperative outcome profile concerning hemoglobin level drop, catheter period, irrigation length, need for blood transfusion, and hospital stay. No significant differences were found in other complications such as recatheterization, urinary tract infection, reintervention for clots and bleeding control, incidence of pneumonia and infarction, transient incontinence, bladder neck contracture, urethral stricture, and recurrent adenoma.[11]

Our study had a transient incontinence rate of 52% (26 out of 50), and all but one patient recovered and were continent by 1 week. Liu *et al*. published their outcomes with more than 1000 patients undergoing TUERP. TUERP induced significant, pronounced, immediate, and lasting improvement in the IPSS, quality of life, maximum urinary flow, and postvoid residual urine volume. Postoperative complications included meatal stenosis in 9 cases, transient incontinence in 56, urethral stricture in 12, and bladder neck contracture in 10 patients.[9]

Our short-term results are comparable, and although we have not seen any stricture or bladder neck contracture in our study, these patients will be followed up to assess urethral and bladder neck complications in the long term.

CONCLUSIONS

TUEB is an effective alternative in surgical management of BPH. TUEB allows enucleation of large adenomas in a single sitting, mimicking the conventional open enucleation of the prostate while having all the advantages of a minimally invasive surgery. Although the short-term complication rates are comparable with published complication rates of LASER prostatectomy, there is a need for a long-term follow-up in patients undergoing TUEB and also a need for having comparative studies between TUEB and TURP and LASER prostatectomy.

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