Surgical Techniques in Urology

Bipolar Button Transurethral Enucleation of Prostate in Benign Prostate Hypertrophy Treatment: A New Surgical Technique

Roberto Giulianelli, Barbara Gentile, Luca Albanesi, Paola Tariciotti, and Gabriella Mirabile

OBJECTIVE
To evaluate the safety and efficacy of transurethral bipolar enucleation with a button electrode (B-TUEP) for the treatment of bladder outlet obstruction due to benign prostatic hyperplasia.

MATERIALS AND METHODS
Between July 2011 and March 2012, a single surgeon performed 50 B-TUEP. Preoperative and postoperative assessments included prostate-specific antigen, International Prostate Symptoms Score (IPSS), International Index of Erectile Function-5 (IIEF-5), quality of life (QoL) index, uroflowmetry with postvoiding residual (PVR) urinary volume, and prostate volume measured by transrectal ultrasonography. Intraoperatively, we evaluated B-TUEP time (enucleation and resection time). Perioperatively, we evaluated hemoglobin dosage, bladder irrigation time, catheterization time, acute urinary retention events, length of stay, patient readmission, and any endoscopic retreatments.

RESULTS
Three months after surgery, 82% of the patients presented a significant improvement in maximum urine flow (Qmax; \(P < .001\)). At 6 and 12 months, 80% and 83.3% of patients maintained the significant improvement (\(P < .001\)). The secondary end points IPSS, QoL, IIEF-5, and PVR presented a statistically significant improvement compared with baseline values. No significant change in hemoglobin values was observed before and after surgery. Bladder irrigation time was comprised between 24 and 36 hours for about 80% of patients. In one case, second-look hemostatic endoscopy was needed. Length of stay after surgery was <48 hours in 88% of cases. Readmission was required for 6% of patients for hematuria, and 6 months later, 2 other patients developed bladder neck contracture treated with transurethral incision of the prostate.

CONCLUSION
B-TUEP using the Gyrus PK system is a rapid and safety technique with optimal outcomes.

OBJECTIVE
Although monopolar transurethral resection of the prostate (TURP) has long been considered the gold standard for the treatment of symptomatic benign prostatic hyperplasia (BPH) after the failure of medical therapy, new procedures are constantly being developed to reduce patient morbidity and complication rates.

Patients with a large prostate (>40 cc) have a high risk of complication owing to longer operative time, greater bleeding, and increased exposure to hypotonic irrigation solutions that may cause the TURP syndrome.1 One of the most recent and significant improvements in TURP has been the introduction of bipolar technology.

Bipolar TURP redresses a major shortcoming of monopolar TURP (M-TURP) by allowing the procedure to be performed with normal saline irrigation and thus preventing the risk of TURP syndrome.2 Short-term follow-up has shown that the use of bipolar technology for transurethral resection of the prostate in saline (TURis) results in fewer complications and has comparable results to standard monopolar TURP.3

One of the latest devices in bipolar resection technology is the Gyrus PK plasma vaporization generator plus resection button electrode for plasma vaporization. After becoming skilled with bipolar TURP and adenoma prostate vaporization with button electrode, we decided to introduce a new technique, based on the HoLEP procedure. It consists in the enucleation of the prostatic adenoma using a bipolar button electrode instead of the tip of the laser and then proceeding with a classic loop resection of the pedunculated tissue.

OBJECTIVE
The aim of this study was to evaluate the safety and efficacy of bipolar button electrode transurethral resection of the prostate (B-TUEP) for the treatment of bladder outlet obstruction due to benign prostatic hyperplasia.

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enucleation of the prostate (B-TUEP) in saline for the treatment of symptomatic Benign Prostate Hypertrophy (BPH).

The second end point was to determine whether there were any improvements compared with the baseline values of postvoiding residual (PVR) urinary volume, International Prostate Symptoms Score (IPSS), quality of life (Qol), and International Index of Erectile Function-5 (IIEF-5).

MATERIALS AND METHODS

We prospectively collected data from all the consecutive patients who underwent B-TUEP performed by a single surgeon between July 2011 and March 2012. To be included in this group, patients had to meet all of the following inclusion criteria: symptomatic BPH (IPSS >12), maximum urine flow (Qmax) <15 mL/s, at least 45 years of age, prostate volume >20 g, drug therapy nonresponders (5α-reductase inhibitors and/or α-blockers). Patients with renal impairment, neurogenic bladder, bladder stones, prostate cancer, history of prostatic or urethral surgery, and/or hydronephrosis were excluded.

Urodynamic investigation was not routinely performed in this trial.

Preoperative workup included IPSS, IIEF-5, QoL, uroflowmetry with PVR, transrectal ultrasound (TRUS), and prostate-specific antigen (PSA).

Prostate and adenoma TRUS weight and volume were calculated using the ellipsoid formula.

All the procedures were carried out under regional anesthesia.

Informed consent was obtained from all recruited patients.

OPERATIVE TECHNIQUE

Instruments

We used a traditional bipolar TURP (12° optics and Olympus 26Ch resectoscope), a “button-shaped electrode” to perform the enucleation of the adenoma, and a standard wire loop to perform adenoma enucleated resection. We always used the same current intensity: 160W for cutting and 100W for coagulation.

B-TUEP Technique

B-TUEP can be divided into 2 different steps: the enucleation of the adenoma as described by Gilling et al and the resection of the pedunculated adenoma.

Step 1—Urethral Calibration

The patients, in lithotomy position, underwent urethral dilatation of up to 26-28 Ch with Otis-Mauermayer urethrotome to prevent iatrogenic urethral strictures. Continuous flow was used taking care not to oversretch the bladder during the procedure. The bladder neck and verumontanum were identified and the ureteral orifices visualized.

Regardless of prostatic anatomy, such as the presence of a medium lobe or asymmetric lateral lobes, we started the procedure with an apical incision with button electrode laterally to the verumontanum.

Step 2—Apical and Lateral Dissection

The apical incision at 5 and 7 o’clock was extended with a latero-lateral movement and a distal-proximal pressure of the surgeon on the button (Figs. 2A, 1B). This action of the button created a progressive pedunculation and concurrent tissue vaporization of the adenoma. The lateral lobes were treated one at a time (Figs. A and B).

The possibility to use the button for coagulation made it possible to clearly define the operation field, easily identify the capsule, and progressively enucleate the adenoma from the verumontanum to the bladder neck. This created a pedunculated structure connected to the bladder neck as “a bladder neoplasm,” with a small implant base (Figs. 4B, 5A, 3C).

Step 3—Enucleation of the Median Lobe

Right behind verumontanum, using the previous 5 and 7 o’clock incisions, we proceeded with the enucleation of the median lobe. The surface was created with the same technique (Figs. 1C, 2C, 3C, 4C).

Step 4—Creation of Anterior Groove

Attention was now placed on the 12 o’clock region of the prostatic fossa, where the anterior commissure (midline groove between lateral lobes) is located. The resectoscope was turned 180° to allow the button to be positioned correctly. Starting at the bladder neck and proceeding distally, a groove was cut along the anterior commissure. This groove should span from the level of the bladder neck to the level of the verumontanum. The surgeon should occasionally check the location of the verumontanum by looking toward the floor, to make sure that the groove is not extended too far distally. Once the groove was created, it was further widened and deepened to the level of the surgical capsule along its entire length.

Step 5—Resection of Lateral, Middle, and Anterior Lobe From the Capsule

At this point, it was possible to proceed quickly, safely, and easily with the resection of the pedunculated structures of the adenoma. You should be careful to start the resection from the top of the structure and never from the base; otherwise, the removal of the pedunculated hemilobe, floating freely in the bladder, could become difficult. Fragments were cleared from the bladder and sent to the pathologist for histological investigation (Figs. 6A, 5B, 4C).

Step 6—Inspection of the Prostatic Fossa

The loop was removed and the button electrode was used to achieve optimal coagulation of the small bleeding vessels. (Fig. 1)

At the end of the procedure, a 20-Fr 3-way catheter was placed and continuous bladder irrigation (CBI) was generally used for about 36 hours.

During the procedure, total operative time (OT) and the time of each step for enucleation and resection were recorded. We also recorded the weight of the resected
tissue, catheter time, and length of stay as well as perioperative complications or persistent hematuria.

Follow-up at 1 month and then every 3 months for 1 year included IPSS, IIEF-5, QoL, uroflow with PVR, and PSA. At 3 and 12 months, we performed a TRUS.

STATISTICAL ANALYSIS

Statistical analysis was performed using SAS (Statistical Analysis System) 9.3. The Wilcoxon test was used during follow-up for IPSS, QoL, IIEF-5, PVR, Qmax, and PSA. The chi-square test was applied to compare data concerning complications. A P value of <.05 was considered statistically significant.

RESULTS

The median preoperative PSA value was 2.98 ng/mL (0.3-7 ng/mL). The median IPS score was 22.8 (12-30). The median Qmax was 6.29 mL/s (3-14 mL/s). The median prostate weight was 50 g (20-70 g).

Adenoma enucleation time was <35 minutes in 19 (38%) patients, between 35 and 50 minutes in 29 (58%) patients, and >50 minutes in 2 patients. Resection time was <20 minutes in 15 (30%) patients, between 20 and
40 minutes in 33 (66%) patients, and >40 minutes in 2 patients.

We observed no significant intraoperative bleeding or intraoperative complication (such as perforation of the prostatic capsule).

In 2 cases, the pathologist diagnosed an accidental prostatic neoplasm (4%), and after 6 months, because of rising PSA values they underwent radical prostatectomy and left the study.

CBI was <24 hours in 5 (10%) patients, between 24 and 36 hours in 40 (80%) patients, and >36 hours in 5 patients. Catheterization time was <36 hours in 38 (76%) patients, between 36 and 48 hours in 10 (20%) patients, and >48 hours in 2 (4%) patients.

The length of stay was <48 hours in 44 (88%) patients, and between 48 and 72 hours in 6 (12%) patients.

The preoperative hemoglobin value was >13 g/dL in 44 (88%) patients; after surgery, 29 (58%) patients still presented a value >13 g/dL ($\Delta = -30\%$). No patient lost >2 g/dL of hemoglobin, so no blood transfusion was needed.

In 7 hospitalized patients, we observed acute urinary retention with hematuria and clots but only in 1 case (2%), a "second look" endoscopic hemostatic procedure.

Figure 1. (continued).
was performed (grade III, Clavien-Dindo score). In all other cases, we performed nonsurgical maneuvers (eg, balloon inflation or increase of the speed of continuous bladder irrigation (BCI), grade II Clavien-Dindo score).

After catheter removal, 3 (6%) patients showed acute urinary retention before discharge and another 3 required rehospitalization for the same problem with the placement of a new catheter and CBI <24 hours long (grade II, Clavien-Dindo score).

Table 1 summarizes the follow-up data.

At 3 months after the procedure, 82% of patients showed a significant improvement in Qmax >15 mL/s and <25 mL/s (19.3 ± 5.6 mL/s, P <.001), 80% after 6 months (20.3 ± 4.6 mL/s, P <.001), and 83.3% after 12 months (21.2 ±3.6 mL/s P <.001).

All the secondary end points showed a statistically significant improvement compared with the baseline values (P <.01). During the follow-up, the IPSS assessment showed a higher score in 4 patients: in 2 of them because of prostate cancer (PCa) and in the other 2 because of bladder outlet obstruction (BOO). After 12 months, 39 (84.7%) patients had an IPSS 12 score; P <.05. Before surgery, 56% of patients had a QoL >3 and 90% of patients with PVR >50 mL; at 3 months, we
recorded 10% (P < .05) and 6% (P < .05) of patients, respectively. After 12 months, this result was stable with a QoL > 3 in 0% (P < .05) and a PVR > 50 mL in 4.3% (P < .05).

No patient after the procedure experienced incontinence.

In 52% of cases (26 patients), we observed irritating urinary symptoms (ie, urgency and nocturia) that after 3 months affected only 32% (16 patients) and after 6 months 12% (6 patients).

Within 6 months, 2 patients presented a reduction in Qmax, a worsening of symptoms, and increased PVR (Qmax < 15 mL/s, IPSS > 19, QoL > 3, and PVR > 50 mL). They underwent flexible cystoscopy, which identified an obstructing bladder neck contracture (BOO). In these patients, we performed bladder neck incision (transurethral incision of the prostate), according to Orandi flap (grade III, Clavien-Dindo score).

The follow-up data were stable in the next 12 months.

### Table 1. Follow-up data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Baseline</th>
<th>6 mo</th>
<th>12 mo</th>
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</thead>
<tbody>
<tr>
<td>PSA (prostate specific antigen)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPSS</td>
<td></td>
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### COMMENT

The commonly used first-line treatment in men with symptomatic BPH is the association of α-adrenergic blockers with 5α-reductase inhibitors. Nonresponders and patients with drug intolerance may require surgical procedures. It is well known that surgical treatment is more effective in improving lower urinary tract symptoms and urinary flow rate than medical therapy. In the past decade, several surgical instruments have been developed to treat BPH and to reduce intraoperative complications, while maintaining efficacy. Bipolar energy is one of the most significant advances in this field.

Bipolar electrosurgical TURP in saline (TURis) offers lower complication rates and comparable results vs standard TURP. In light of our long experience in the TURis plasma vaporization technique, we intend to evaluate the feasibility of adenoma enucleation using bipolar plasmakinetic technology (Gyrus PK) with button electrode.

This electrode has the same cutting and coagulation features as the traditional bipolar loop, but it has a larger contact surface with the tissue. At our facility, we started performing TURis plasma vaporization in 2010 and we have found it particularly effective in anticoagulated patients. Our procedure reproduces HoLEP adenoma enucleation, adding new aspects to the surgical technique.

In HoLEP, once the laser cuts the urethral mucosa from bladder neck, a cleavage plane is created using the laser fiber and the pressure of the instrument on the prostatic adenoma. In our technique, the cleavage plane is found starting laterally from the verumontanum, just with the cutting power of the button-shaped electrode, without pulling or pressing on the tissue. We easily enucleate and remove the whole adenoma through the accurate and efficient hemostatic power provided by the large surface of the button electrode.

We have adapted the HoLEP technique to the Gyrus PK button electrode, and we have been able to fully enucleate the prostate without using a morcellator. In our personal experience, we have seen that the large convex surface of the button increases the hemostatic effect and makes the procedure easier and faster vs HoLEP. No patient has required transfusion. Our initial outcomes are comparable with the international HoLEP experience (Table 1). HoLEP outcome data, described in literature, have demonstrated that, in the first months after surgery, there is major local irritation that affects the symptom score and the urodynamic state.

After their first 125 HoLEP procedures, Endo et al reported 4.8% of stress incontinence, lasting longer than 6 months. They attribute this to the difficult technique and to the long learning curve. By contrast, in our experience, no patient experienced early or late incontinence, with a percentage of acute urinary retention in 6 patients.

Regarding the secondary end points, after 3 months all patients showed a significant improvement in all values compared with the baseline. All patients were discharged from the hospital without catheter. Of them, 88% required hospital stays < 48 hours whereas 6% were readmitted within 30 days for hematuria; no one required retreatment, and in all cases, hematuria was managed conservatively with CBI. Only 4% of patients required retreatment within 6 months for postoperative BOO. In both cases, the bladder neck contracture was treated with traditional transurethral incision of the prostate.

### CONCLUSION

The results of our preliminary experience, correlated with the low morbidity, the low costs, and short learning curve required by the technique, as well as the safety and ease of use of the instruments, prove that this technique is a valid alternative to TURP, HoLEP, or open prostatectomy.
Table 2. International HoLEP experience

<table>
<thead>
<tr>
<th>No. of Patients</th>
<th>Mean Operative Time</th>
<th>Mean Enucleated Tissue Weight (g)</th>
<th>Mean Hospital Stay (d)</th>
<th>Mean Preoperative Qmax (mL/s)</th>
<th>Mean Postoperative Qmax (mL/s)</th>
<th>Mean Preoperative AUA SS</th>
<th>Mean Postoperative AUA SS</th>
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<td>Gilling et al</td>
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<td>59.2</td>
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<td>1.3</td>
<td>8.9</td>
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<td>—</td>
<td>19.0</td>
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<td>Kuntz et al</td>
<td>60</td>
<td>135.9</td>
<td>83.9</td>
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<td>3.8</td>
<td>27.6</td>
<td>22.1</td>
</tr>
<tr>
<td>Giulianelli et al</td>
<td>50</td>
<td>43.4</td>
<td>32.9</td>
<td>2.1</td>
<td>6.29</td>
<td>21.2</td>
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</table>

* We used IPSS.

References


EDITORIAL COMMENT

One of the hallmarks of the increasing mainstream adoption of a surgical technique is the use of “new” alternative approaches to achieve the same end. It was Charles Caleb Colton (1780-1832) who famously said, “Imitation is the sincerest form of flattery” and in the case of enucleation of the prostate, holmium laser enucleation of the prostate (HoLEP) has generated a multitude of “imitators” utilising alternative energy sources. A variety of laser wavelengths and electro-surgery devices have been employed, but the concept and technique remain fundamentally the same.

Bipolar electrosurgical energy was first employed to enucleate using a fine probe with the button electrode appearing more recently. The current study also employs a button electrode, from a different manufacturer, and has been termed “B-TUEP.” Three different acronyms have thus emerged for bipolar enucleation—PKEEP, BPEP, and now B-TUEP—adding to the plethora of acronyms in this space. Other enucleation acronyms already in play include HoLEP, ThuVEP, ThuLEP, DiLEP, and GreenLEP to name a few.

Several statements in the current manuscript make me wonder whether B-TUEP is truly an improvement on the current laser alternatives or not. Firstly, both the use of bladder irrigation and the length of hospital stay were prolonged compared with HoLEP and are more in keeping with those of standard TURP. Secondly, the actual weight of tissue retrieved is not reported, making it difficult to confirm the authors’ assertions regarding equivalence, efficiency, and the learning curve. Some vaporization naturally occurs when using high-powered energy sources, but this diminishes as proficiency increases and will always be <10% of the tissue weight in larger glands. Enucleation efficiency of >1.5 g/minute can generally be achieved combined with tissue retrieval at rates in excess of 10 g/minute often seen with modern morcellators. When the plane of cleavage is attained and a true enucleation is performed, the procedure itself becomes reproducible, quantifiable, and easy to teach! A “mega-resection” removing large fragments rather than anatomical lobes is a different procedure entirely, and the pathologic weight of tissue helps the reader determine the difference. Changes in TRUS prostate volume are insufficient in this regard.

Randomized controlled comparisons of different energy sources for enucleation have begun to appear, but it is clear...
that different devices using the same energy source will also be a
worthy and necessary comparison in the future.

Peter J. Gilling, M.D., F.R.A.C.S., Promed House, Tauranga, New Zealand

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REPLY
The goal of our experience was to assess the feasibility of a new endoscopic surgical technique that would allow obtaining a complete removal of the adenomatous tissue.

The advantage compared with traditional monopolar TURP is the reduced risk of TUR syndrome directly correlated to the volume and time of resection. Compared with HoLEP, the advantage is the shorter learning curve and the less costs and risks associated with morcellation.

In terms of the surgical technique, using the button rather than fiber allows working on a broader cutting surface, which favors better orientation within the prostatic lode, excellent hemostatic control through the large coagulation surface, and rapid and complete cleavage of the adenoma.

Use of the bipolar instrument rather than the pulsedholmium laser fiber which exploits the Moses effect has a more precise and even cutting effect on tissues.

Based on our initial experience, we believe that the procedure can also be offered to patients suffering from massive prostate adenomas as in the case of HoLEP.

As for surgical time—not provided in this paper,1 because it aims at presenting only the surgical technique—enucleation time was <35 minutes in 38% of patients, 35-50 minutes in 58% of patients, and >50 minutes in 4%.

Adding the resection time, total operating time for the entire procedure is <40 minutes in 68% of cases; 40-75 minutes in 28%, and 75-100 minutes in 4%.

The average total weight of the prostate was 51 g (range, 25-78 g) and that of the adenoma 31 g (range, 10-40 g).

This is our preliminary experience, and the time required by the learning curve needs to be considered. In addition, we are working on a randomized study to compare bipolar enucleation technique with conventional loop technique. The data will be available soon.

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