

ORIGINAL PAPERS

A Long Term Clinical Comparison in Cases of High Volume Benign Prostatic Obstruction – Bipolar Plasma Enucleation Versus Standard Prostatectomy

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Abstract

Objectives: The bipolar plasma enucleation of the prostate (BPEP) and standard open transvesical prostatectomy (OP) were retrospectively compared while applied in cases of high volume benign prostatic hyperplasia (BPH).

Methods: Between January 2013-January 2016, 140 patients underwent BPEP and OP in equal numbers. Cases were selected based on the presence of the International Prostate Symptom Score (IPSS)>19, maximum flow rate (Q_{max}) <10 mL/s and prostate volume >80 mL. Up to 2 year after surgery, patients were periodically followed using the IPSS, Quality of Life score (QoL), Q_{max} , postvoiding residual urinary volume (PVR) and PSA. **Results:** Equivalent surgical speed and ablation capacity were determined for BPEP and OP. The plasma-button enucleation provided the advantages of decreased hemorrhagic risk, as well as faster catheter removal and hospital discharge. No major differences were described in terms of short as well as long term adverse events. The two years' periodical evaluation revealed rather resembling symptomatic profile and voiding features. **Conclusions:** The BPEP technique constitutes a feasible alternative of matching the conventional OP' therapeutic efficiency while reducing morbidity and convalescence. The long-term determinations confirmed similar functional and symptomatic benefits.

Keywords: bipolar plasma enucleation of the prostate, standard open prostatectomy, high volume benign prostatic hyperplasia

Rezumat

Obiective: Enucleerea bipolară cu plasmă și adenomectomia transvezicală au fost comparate retrospectiv în cazurile de hiperplazie benignă de prostată voluminoasă. **Material și metodă:** Între ianuarie 2013-ianuarie 2016, 140 de pacienți au urmat în proporții egale cele 2 tipuri de tratament. Cazurile au fost selectate în funcție de IPSS >19, Q_{max} <10 mL/s și volumul prostatic >80 mL. Până la 2 ani post-intervenție, pacienții au fost urmăriți periodic prin IPSS, QoL, Q_{max} , reziduu vezical postmictțional și PSA. **Rezultate:** Cele două tehnici au evidențiat viteză operatorie și capacitate de ablație echivalente. Enucleerea cu button-ul a demonstrat avantajele scăderii riscului hemoragic, suprimării timpurii a cateterului uretrovezical și perioadei de spitalizare reduse. Nu au fost descrise diferențe majore referitor la reacțiile adverse pe termen scurt și lung. Rezultatele aferente perioadei de urmărire de 2 ani au subliniat similitudini referitoare la profilul simptomatic și funcțional înregistrate în cele două brațe de studiu. **Concluzii:** Enucleerea bipolară cu plasmă este o alternativă fezabilă din punct de vedere al eficienței și siguranței operatorii

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pentru adenomectomia transvezicală prin scăderea morbidității și convalescenței. Determinările pe termen lung au confirmat beneficii funcționale și simptomatice similare.

Cuvinte cheie: enuclearea bipolară cu plasmă a prostatei, adenomectomia transvezicală, hiperplazia benignă de prostată voluminoasă

INTRODUCTION

Despite the constant technological advances achieved during the past decades, large size benign prostatic hyperplasia (BPH) pathology continues to raise questions concerning the most appropriate therapeutic approach. Interestingly enough, the classical open prostatectomy still represents the standard option for this type of cases despite the substantial perioperative morbidity¹.

From the perspective of laser based minimally invasive therapeutic approaches (such as HoLEP – holmium laser enucleation of the prostate and PVP – GreenLight photoselective vaporization of the prostate), two main targets were rather simultaneously achieved. For once, quite resembling functional improvements were obtained while relating to the open surgery series. On the other hand, the perioperative complications became both more scarce as well as brief¹⁻³. However, since conventional OP is still characterized as the most effective and durable procedure for the treatment of BPH-related lower urinary tract symptoms (LUTS)¹, it would be only fair to say that the issue of standardizing surgical therapy for this type of cases is not yet completely solved.

The bipolar plasma enucleation of the prostate (BPEP) began to become part of the modern BPH treatment arsenal rather recently⁴, while responding to the need to reproduce the transurethral enucleation therapeutic principle in a more economically convenient and easier-to-learn manner when compared to holmium laser. Under these circumstances, despite the expected initially fragile literature support, further clinical literature is regarded as due to bring enlightenment towards the eventual evidence-based progress. Still, both BPEP as well as its' predecessor, the plasmakinetic enucleation of the prostate (PKEP), were emphasized by several reports as able to reach substantial benefits in high volume glands^{5,6}. Generally speaking, a favorable clinical parallel to standard OP has been constantly outlined for bipolar electrosurgery as a viable tool in achieving a successful transurethral enucleation of the prostatic bulk^{7,8}.

On a related subject, confirming the long term efficiency of a treatment alternative with regard to the follow-up features constitutes a compulsory landmark

on the road towards scientific recognition. Based on these premises, the present trial was aimed to clarify the BPEP prolonged effect on symptom scores and voiding parameters within a retrospective comparison to open surgery.

METHODS

A long term, retrospective study was conducted while targeting to draw an evidence-based parallel between the plasma-button enucleation of the prostate and classical OP applied in large size benign prostatic obstruction cases. The first primary objective was to reliably compare the surgical efficiency and perioperative morbidity related to the two therapeutic approaches. The second main goal of this analysis was to determine the long term viability specific to BPEP and OP from the point of view of the postoperative functional outcomes as well as the durability of the initially obtained clinical progresses. The secondary objective was to gain a clear picture of both the short as well as the long term adverse events negatively marking the two techniques.

During a 12 months' inclusion period (January 2013-January 2014), a total of 70 consecutive large size BPH-related LUTS patients underwent BPEP using the plasma-button electrode as enucleation tool. While looking at a way in which to actually select the most representative cases for the trial, the following parameters were emphasized as relevant and reliable at the same time: prostate volume larger than 80 mL, International Prostate Symptom Score (IPSS) over 19 and maximum flow rate (Q_{max}) below 10 mL/s. Results within the study group were retrospectively matched against a control series represented by a similar number of cases (n=70) in which conventional transvesical prostatectomy was applied.

All the patients taken into consideration during the course of this study had to undergo certain periodical investigations aimed to present their clinical characteristics in a homogenous fashion. As of such, the IPSS, quality of life score (QoL), Q_{max} , postvoiding residual urinary volume (PVR), prostate specific antigen (PSA) and prostate volume (measured by transrectal ultrasound – TRUS) were routinely applied. The main stages of the symptomatic and functional check-ups were established at 1, 3, 6, 12, 18 and 24 months after

the initial intervention using. Obviously, the individuals that did not respect the established verification program and missed one or more controls were consequently excluded from the continuation of the study.

The BPEP procedure was successfully carried out in all cases using basically a HoLEP-like technique that began with the retrograde enucleation of the median lobe by 5 and 7 o'clock incisions (Figure 1). Next, the lateral lobes' were separated by a 12 o'clock incision (Figure 1), then enucleated ascendingly as well as descendingly and pushed back into the bladder (Figure 2). The prostatic tissue was extracted through a morcellation process and an obstruction-free, wide cavity with a neat surface and no residual debris was observed within the prostatic fossa (Figure 3).

RESULTS

Subsequent to the preoperative evaluation, quite similar figures were outlined among patients of the two groups concerning the mean age, prostate size, PSA value, IPSS and QoL scores, Q_{max} and PVR (Table 1).

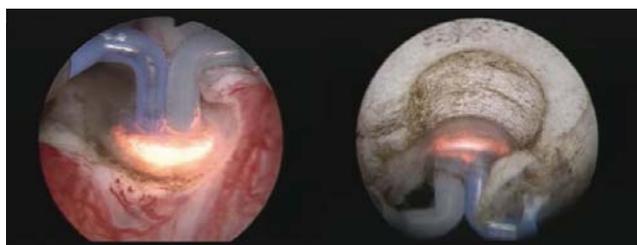


Figure 1. 5 o'clock incision of the median lobe; lateral lobes' separation by 12 o'clock incision.

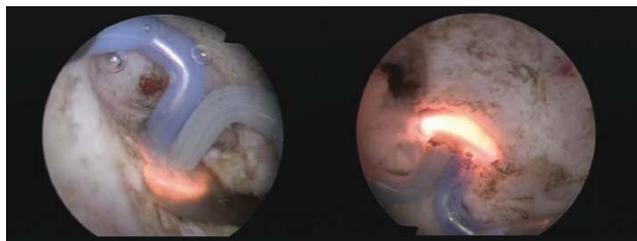


Figure 2. Ascendant and descendant enucleation and push-back of the lateral lobes.

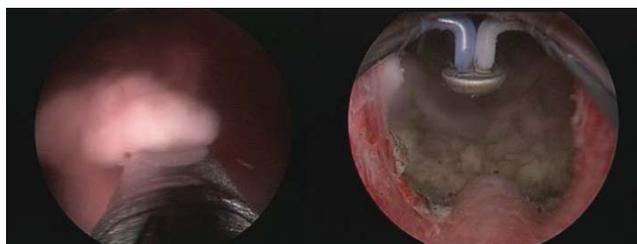


Figure 3. Prostatic tissue morcellation; obstruction-free prostatic fossa.

Table 1. Preoperative parameters

Preoperative parameters	BPEP	OP
Patient age (years)	71.6	68.9
Prostate volume (mL)	127.4	125.3
PSA (ng/mL)	8.23	7.92
IPSS	24.2	23.7
QoL	4.0	4.2
Q_{max} (mL/s)	7.1	6.8
PVR (mL)	168.5	154.7

The surgical speed characterizing the two kinds of technique appeared to be rather equivalent, since no major differences were found from the perspectives of the mean operating time (95.8 versus 86.2 minutes) and transurethrally removed adenoma tissue weight (101.6 versus 110.3 grams) (Table 2).

By comparison to open surgery, a substantially lower bleeding risk characterized the plasma enucleation approach, as proved by the reduced mean hemoglobin level drop (1.4 versus 2.9 g/dL). This perspective was further confirmed by the clearly decreased bladder irrigation period (1.5 versus 3.4 days) and blood transfusion rate (1.4% versus 7.1%) established in the BPEP study arm when compared to the open prostatectomy control series. The clinical advantages of the BPEP alternative turned out to be quite important when drawing a parallel to the classical transvesical procedure, as it enabled patients to be relieved from urethral catheterization faster and to leave the hospital sooner. More precisely, there were underlined a decreased catheterization period (2.4 versus 6.3 days) and fewer hospitalization days (3.1 versus 7.2 days) as characterizing the plasma-button enucleation series (Table 2).

Along the immediate postoperative period, there seemed to be somewhat more frequent secondary coagulation requirements in the OP study group (2.9% versus 5.7%), thus adding to the superior haemostatic properties' profile of the bipolar electro-surgical approach. On the other hand, the same as previously reported among the literature data, this kind of endoscopic technique displayed a tendency towards a higher rate of irritative

Table 2. Perioperative features

Perioperative features	BPEP (n = 70)	OP (n = 70)
Operation time (minutes)	95.8	86.2
Resected tissue weight (grams)	101.6	110.3
Hemoglobin level drop (g/dL)	1.4	2.9
Blood transfusion rate (%)	1.4%	7.1%
Irrigation period (days)	1.5	3.4
Catheterization period (days)	2.4	6.3
Hospital stay (days)	3.1	7.2

symptoms while drawing a parallel to transvesical prostatectomy (12.9% versus 7.1%). From another point of view, also of substantial clinical relevance, the BPEP procedure was seemingly able to match the traditional adenomectomy with regard to the capacity of relieving the prostatic urethra obstruction. This positive feature materialized into quite equivalent rates of re-catheterization imposed by acute urinary tract retention (4.3% versus 4.3%). Also, the safety of plasma-button enucleation in terms of infectious hazards turned out to be no different from OP, as shown by the similar frequency of urinary tract infections (8.6% versus 11.4%) (Table 3).

During the course of this long term clinical analysis, certain patients were, for various reasons, unable to comply with the follow-up requirements included in the originally accepted study protocol (8 plasma enucleation and 9 transvesical prostatectomy cases were lost from the follow-up). Ultimately, at the end of the entire 24 months' evaluation period, the data that constituted the basis for the final results as well as conclusions of the trial relied on figures related to a total of 62 BPEP and respectively 61 OP patients. Moreover, at that given time (2 years), the summarized undesired events showed a rather resembling frequency within the two study arms. More to the point, the rates of bladder neck sclerosis (3.2% versus 4.9%), urethral strictures (6.4% versus 4.8%) and urinary incontinence (1.6% versus 3.3%) displayed no major discrepancies in cases treated by either one of the two procedures (Table 3).

While taking into account the symptom scores' profile characterizing the two procedures, virtually no evident variations between BPEP and OP were found with regard to the mean IPSS and QoL values determined at the 1 to 24 months' assessment (7.9-5.2 versus 7.4-4.8; 2.4-1.3 versus 2.1-1.2). In other words, a constant improvement was underlined for these parameters up to one year after surgery (4.7 versus 4.5; 1.2 versus 1.1), followed by rather minor fluctuations in the second year of follow-up (Table 4).

Table 3. Short and medium term complication' rates

Short term complications	BPEP (n = 70)	OP (n = 70)
Secondary coagulation	2.9%	5.7%
Re-catheterization	4.3%	4.3%
Urinary tract infection	8.6%	11.4%
Early irritative symptoms	12.9%	7.1%
Long term complications	BPEP (n = 62)	OP (n = 61)
Bladder neck sclerosis	3.2%	4.9%
Urethral strictures	6.4%	4.8%
Urinary incontinence	1.6%	3.3%

Table 4. Follow-up outcomes

Follow-up results	BPEP	OP
IPSS		
1 month	7.9	7.4
3 months	6.1	5.7
6 months	5.3	5.0
12 months	4.7	4.5
18 months	4.8	4.3
24 months	5.2	4.8
QoL		
1 month	2.4	2.1
3 months	1.9	1.8
6 months	1.5	1.3
12 months	1.2	1.1
18 months	1.4	1.1
24 months	1.3	1.2
Q_{max} (mL/s)		
1 month	22.5	23.1
3 months	23.6	24.0
6 months	24.3	24.8
12 months	24.7	24.9
18 months	25.1	24.6
24 months	24.8	24.7
PVR (mL)		
1 month	54.7	61.2
3 months	48.5	52.8
6 months	31.2	39.4
12 months	37.6	30.5
18 months	29.1	36.0
24 months	35.4	41.9
PSA (ng/mL)		
6 months	0.94	0.85
12 months	0.76	0.63
24 months	0.81	0.69
Prostate volume (mL)		
6 months	31.8	26.5
12 months	23.7	22.8
24 months	26.2	24.9

Basically the same situation was outlined concerning the main voiding parameters, thus suggesting generally equivalent short-to-medium term improvements secondary to plasma-button enucleation and open surgery. More precisely, a favorable postoperative evolution was determined with regard to the mean Q_{max} and PVR features at 6-to-12 months after the initial intervention (24.3-24.7 versus 24.8-24.9 mL/s and 31.2-37.6 versus 39.4-30.5 mL, respectively). Results remained stable and positive at the end of the long term assessment period (24.8 versus 24.7 mL/s; 35.4 versus 41.9 mL) (Table 4).

Last but not least, during practically all the periodical check-ups, bipolar enucleation and standard prostatectomy resided in resembling outcomes from the

point of view of the mean residual prostate volume as well as PSA level. This aspect remained constantly valid during the 12 and 24 months' evaluation (37.6-35.4 versus 30.5-41.9 mL and 0.76-0.81 versus 0.63-0.69 ng/mL, respectively) (Table 4). Based on figures such as those just mentioned, it became possible to actually calculate the relative decrease in prostate volume and PSA when compared to the initial preoperative assessment. Starting at this point, it was established along the way of the present trial that data acquired during the specific follow-up check-ups (one and two years) described a certainly similar outcome for the two features listed above (81.4% versus 81.8% and 79.4% versus 80.1% for prostate volume, respectively; 90.76% versus 92.04% and 90.15% versus 91.28% at 12 and 24 months' for PSA).

DISCUSSIONS

In light of the available literature so far, the three main principles of prostatic tissue ablation during BPH transurethral surgery are represented by vaporization, resection and enucleation⁹. In average size (30-80 mL) benign prostatic obstruction cases, single wire resection seems to remain, according to most authors and at least up to now, the standard manner in which to apply treatment¹. The outcomes of monopolar transurethral resection of the prostate (TURP) distinctively appear to have been overcome by the bipolar cutting current in terms of perioperative morbidity, while the actual removal efficiency remained the same¹⁰. In addition, bipolar electrosurgery has been successfully adapted to providing a satisfactory prostatic bulk vaporization process while substantially improving patient' safety¹¹.

From an ultimately different perspective, the endoscopic treatment of large glands (over 80 mL) continues to pose problems for the contemporary minimally invasive urology and has not yet been proven completely able to replace open surgery as standard treatment¹². Overall, the retrograde enucleation of the BPH formation was commonly acknowledged as the most appropriate manner of reproducing the much praised cleavage plane obtained during the transvesical prostatectomy, ultimately leading to a superior adenoma removal¹³. So far, the holmium laser benefitted from the widest support from the published clinical research, thus gaining the status of an advanced endoscopic method challenging the gold-standard status of OP¹⁴. When performing these types of surgery techniques, the associated comorbidities of these patients represent an important aspect to consider, especially in the presence of chronic kidney disease, cardiovascular disor-

ders, diabetes mellitus or the need of dialysis (hemodialysis / peritoneal dialysis), including the related features: hydroelectrolytic imbalance, metabolic acidosis, residual diuresis, vascular calcifications, dialysis vintage etc¹⁵⁻²⁵.

The PlasmaKinetic tissue management (PKTM) system added a new dimension to bipolar endoscopy, as it was demonstrated to constitute a reliable alternative to HoLEP²⁶. The technique was regarded as capable to overcome the HoLEP specific main drawbacks, namely the steep learning curve and high equipment costs²⁷. Otherwise, the initial findings underlined the advantages of PKEP over open prostatectomy in terms of lower hemorrhagic risks and brief convalescence period²⁸.

During the recent years, the successor of this method, the plasma-button approach, consistently found its way into clinical practice as a useful development in the field of bipolar electrosurgery²⁹. Further along this line, the respective endoscopic tool could be tailored to fit the requirements of transurethral enucleation of the prostate and to basically reproduce the HoLEP steps in a dependable fashion³⁰. Although the initial trials in this field presented a rather optimistic perspective for BPEP within a comparison to OP, the actual viability of the technique remained dependent on the long term outcomes due to establish the evidence-based durability of clinical progresses.

The present clinical analysis followed this point of view and was designed to clarify the long term effects of the plasma enucleation within a parallel to open surgery. To begin with, a first worry as to the actual efficiency of the newly accounted for BPEP technique was related to the quantity of ablated adenoma as well as to the average time implied by this process. In both regards, the obtained outcomes provided no disappointment while concomitantly looking at transvesical prostatectomy parameters. More exactly, BPEP turned out to be a satisfactory match for OP concerning both the mean resected tissue weights (101.6 versus 110.3 grams) as well as operating times (95.8 versus 86.2 minutes). This idea was supported by the PKEP available literature data which, despite the quite wide variations, reached towards about the same range of figures as OP concerning both the surgical duration (71-111 versus 55.4-106 minutes^{31,32}) as well as the quantity of removed adenoma (51 -118.2 grams^{6,28}), respectively.

The eventually superior haemostatic properties of the bipolar electric current during the transurethral resection of adenoma bulk causing benign prostatic obstruction has been subject to much debate during the recent years. The idea seems supported by physics

and managed to translate so far into better endoscopic coagulation features while making up a parallel to monopolar TURP. The question remains whether the use of bipolar energy for enucleation purposes actually preserves the intuitively accepted ability to minimize blood loss. Within the present clinical setting, the plasma-button electrode added a reliable confirmation to this picture, as it was marked by clearly diminished bleeding risks by comparison to the conventional open prostatectomy (decreased mean hemoglobin level drop – 1.4 versus 2.9 g/dL and blood transfusion rate – 1.4% versus 7.1%, respectively). The subject in question was also addressed by the previous publications in this field, which similarly underlined the reduced bleeding risk implied by the bipolar enucleation by comparison to open surgery based on virtually the same perioperative parameters (1.0-1.6 versus 2-3.2 g/dL^{32,33} and 0-6%^{34,35} versus 6.8-10%^{32,36}, respectively).

The predecessor of BPEP, namely the plasmakinetic enucleation of the prostate, was, in accordance with the already available literature data, capable of crossing the line towards a reduced period of time between surgery and hospital discharge. When looking into the comparative trials that analyzed a critical parallel to open adenomectomy, it becomes rather obvious that PKEP study groups enjoyed a shorter admittance length (2-5^{33,34} versus 8-11.5^{28,37} days, respectively). Also, in terms of quality of life after surgery, it is no doubt an advantage to relieve the patients from catheterization sooner. In this regard as well, the PKEP technique confirmed the ability to facilitate a quicker healing (2-4^{31,38} versus 6.1-10.4^{28,37} catheter days). The bipolar plasma enucleation procedure offered the satisfaction of following virtually the same pattern towards clinical progress. During the course of the present study, a real reduction in the BPEP specific catheterization period (2.4 versus 6.3 days) and hospital stay (3.1 versus 7.2 days) was established when comparing to OP.

From a different point of view, it seems that, while comparatively discussing bipolar enucleation and open surgery, the short term adverse events such as re-catheterization for acute urinary retention (4.3% versus 4.3%) and urinary tract infection (8.6% versus 11.4%) displayed resembling results. This perspective remained valid when referring to PKEP and OP according to the available literature (2.5-5%^{33,39} versus 2.2-7.5%^{32,35} and 5.9-7%^{32,38} versus 6.7-12%^{32,35}, respectively).

Most importantly, the evolution of BPH operated patients does not depend solely on functional outcomes but also on the long term safety profile resulting from scheduled follow-up determinations. In this area of clinical interest, the conventional open prostatec-

tomy generally benefited from distinguishably favorable reports, underlining the quite rare late complications such as urethral strictures, bladder neck sclerosis and urinary incontinence. While bringing the plasma-button enucleation procedure into this picture, the current study enlisted BPEP into the same positive pattern. To be more exact, the frequency of the previously mentioned complications (summarized along a two years' total period) was quite resembling between the two study arms (6.4% versus 4.8%, 3.2% versus 4.9% and 1.6% versus 3.3%, respectively). The very same undesired events were accounted for in a similar fashion by the published data with regard to PKEP and OP (1-5%^{35,38} versus 1.5-3%^{28,32}, 0-17%³², 38 versus 2-5%^{28,32} and 1-4.7%^{32,38} versus 2.2-10%^{32,35}, respectively).

At the end of the day, the true viability of a benign prostatic obstruction' treatment alternative largely depends on the functional outcomes that it constantly provides, both on the short as well as the long term. While facing the widely recognized durability of open surgery concerning the postoperative functional advantages, this particular therapeutic task appears as even more difficult¹.

To start with, symptom scores emphasized a favorably stable evolution during the follow-up, both within the BPEP study arm as well as the OP control series. For example, no important discrepancies were discovered in terms of the mean IPSS and QoL features, while taking into account the short, medium and long term (up to 2 years) follow-up described in the present trial (BPEP versus OP) as well as in the available articles (PKEP versus OP, respectively) (Table 5).

Furthermore, it would be only fair to say, for example, that after 1, 6, 12 and 24 months after the initial intervention, patients tend to feel the same subsequent to transurethral enucleation and simple adenomectomy (Table 5). Ultimately, this aspect may be regarded as reliably confirming the viability of the long term symptomatic benefits related to the newly introduced BPEP procedure "through the looking glass" of the widely acknowledged OP successful standard¹.

Another main point of debate for the field of BPH minimally invasive surgery is constituted by the effect it obtains on the most relevant voiding parameters, when compared of course with the benefits of conventional open prostatectomy. In this matter, BPEP turned out as a sustainable match to OP, as shown by the equivalent outcomes concerning the mean Q_{max} and PVR parameters determined throughout the entire follow-up in general and at 1 and 2 years from the previous surgery in particular. Suggestively enough, the literature reports accounted for in Table 5 generally followed the same

Table 5. Follow-up features according to the literature data

		Present study		PKEP					OP		
		BPEP	OP	Chen et. al ²⁸	Rao et. al ³²	Zhu et. al ³⁴	Liu et. al ⁴⁰	Long et. al ³⁷	Naspro et al ²	Chen et. al ²⁸	Rao et. al ³²
IPSS	1 Month	7.9	7.4	7	8.5	7.5	6	10.5	4.7	7	8.2
	6 Months	5.3	5.0	4	4.3	6.4	5.3	9	-	4	4.1
	12 Months	4.7	4.5	4	3.4	4.2	5.4	8.9	8.4	4	3.5
	24 Months	5.2	4.8	3	-	3.1	5.3	-	8.1	3	-
QoI	1 Month	2.4	2.1	2	2.5	3	1.4	2.5	1.3	3	2.7
	6 Months	1.5	1.3	1	1.8	1	1.1	2.1	-	1	1.9
	12 Months	1.2	1.1	1	1.4	1	1.3	2.2	1.8	1	1.6
	24 Months	1.3	1.2	1	-	1	1.1	-	1.7	1	-
Q _{max}	1 Month	22.5	17.8	21.2	22.4	20.8	19.3	15.4	24.3	20.7	22.9
	6 Months	24.3	16.3	24.3	26.3	23.4	21	17.3	-	24.0	25.4
	12 Months	24.7	20.7	25.2	26.6	25.3	20.3	17.4	24.2	25.5	25.6
	24 Months	24.8	19	27.1	-	27.3	22.6	-	20.1	27.2	-
PVR	1 Month	54.7	61.2	24	8.3	9.5	19	25.9	-	31.5	8.9
	6 Months	31.2	39.4	14	5.4	4	21.7	18.8	-	14.5	5.7
	12 Months	34.6	30.5	12.5	5.1	3	17.8	17.8	-	14	5.5
	24 Months	35.4	41.9	8	-	2	18.5	-	-	8.5	-
PSA	6 Months	0.94	0.85	0.53	0.54	-	-	-	-	0.51	0.58
	12 Months	0.76	0.63	0.58	0.55	-	-	-	-	0.52	0.61
	24 Months	0.81	0.69	0.91	-	-	-	-	-	0.84	-

*Modified after: Gravas S et al; https://uroweb.org/wp-content/uploads/Non-Neurogenic-Male-LUTS_2705.pdf; accessed May 2016.

therapeutic conduct and sustained the PKEP ability of restoring normal voiding within virtually similar boundaries as transvesical adenomectomy.

Last but not least, the capacity to achieve a satisfactory prostatic bulk removal should definitely be accounted for as a defining parameter while outlining therapeutic success in benign prostatic obstruction^{4,5,7,8}. Naturally, the actual BPH tissue ablation capability can be measured during the medium and long term follow-up based on the mean postoperative PSA levels¹. The presently discussed retrospective study gives evidence towards a reliable similarity in this field of interest, since BPEP and OP cases underlined practically the same variation pattern over the 1 to 24 months' check-ups, thus leaning towards a substantial reduction from the preoperative figures. Otherwise, the plasmakinetic enucleation was also confirmed as an efficient treatment instrument in large BPH formations, able to match the classical adenomectomy in terms of tissue ablation and subsequent PSA value decrease (Table 5).

Finally, despite the previously listed optimistic findings, further clinical comparisons will be required before sustainably settling the place of the plasma-button enucleation within the high volume BPH treatment armamentarium. Such a process will also have to rely

on an evidence-based comparison to HoLEP, a minimally invasive approach that so far reached the closest to challenging the gold-standard status of open prostatectomy. Surely, additional long term data will be necessary before truly matching the past decades of confirmed OP therapeutic efficiency.

CONCLUSIONS

While taking into consideration all the aspects mentioned above, it may be seen as reasonable to consider the bipolar enucleation of the prostate as a dependable way in which to therapeutically approach high volume prostates causing severe LUTS. Technically speaking, the method is actually able to reproduce the surgical steps of HoLEP in an easy-to-learn and cost-effective fashion.

As far as the perioperative features are concerned, BPEP seems to be more than able to match the conventional transvesical prostatectomy in terms of surgical speed and prostatic bulk ablation capacity. At the same time, the method manages to minimize morbidity due to the superior coagulation properties reducing the bleeding risk and improving the overall safety of the technique.

In terms of the quality of life of patients immediately after surgery, positive premises might be underlined in the form of a faster catheter removal and a more rapid hospital discharge. Otherwise, the long term adverse events displayed resembling figures among patients of the two study arms.

In terms of functional outcomes, the much praised durability of open surgery appears to have been matched by the BPEP technique, since no substantial differences were discovered concerning the symptom scores and urodynamic parameters during the long term follow-up. Last but not least, the BPH tissue ablation capacity of the plasma-button based transurethral enucleation technique gained an evidence confirmation “through the looking glass” of open surgery results.

Abbreviations

BPEP	bipolar plasma enucleation of the prostate
OP	open transvesical prostatectomy
BPH	benign prostatic hyperplasia
IPSS	International Prostate Symptom Score
QoL	quality of life score
Q _{max}	maximum flow rate
PVR	post-voiding residual urinary volume
PSA	prostate specific antigen
HoLEP	holmium laser enucleation of the prostate
PVP	GreenLight photoselective vaporization of the prostate
LUTS	lower urinary tract symptoms
PKEP	plasmakinetic enucleation of the prostate
TRUS	transrectal ultrasound
TURP	transurethral resection of the prostate

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