

Patients' quality of life after Bipolar Transurethral Enucleation & Laparoscopic Simple Prostatectomy for large Benign Prostatic Hyperplasia

Quality of life after surgical treatment of large BPH

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Background

The purpose of this study was to assess the changes in storage, voiding, and post-micturition LUTS and disease-related QoL in patients with large benign prostatic hyperplasia (BPH) who underwent either bipolar transurethral enucleation (B-TUEP) or laparoscopic simple prostatectomy (LSP).

Methods

This was a prospective study, involving 112 men, aged 58 -78, with BPH > 80m/L, of whom 55 were treated through B-TUEP and 57 through LSP.

Results

Both patient groups experienced a significant reduction in LUTS ($p < 0.001$ for all); however, the LSP patients had a higher reduction in storage, voiding, and post-micturition symptoms ($p < 0.001$ for all comparisons). Overall, LUTS decreased by $76 \pm 5.8\%$ in the LSP group and by $70 \pm 7.8\%$ in the B-TUEP group. The percentage improvement in QoL was $61.66 \pm 15.74\%$ in the LSP group versus $52.69 \pm 17.85\%$ in the B-TUEP group, $p = 0.006$. There was a significant association between reduction in LUTS and improvement in disease-related QoL ($r_s = -0.463$, 95% CI: -0.293 to -0.605). The advantages of B-TUEP were shorter operative duration, hospital stay, and catheter duration ($p < 0.001$).

Conclusions

Our results suggest that both B-TUEP and LSP are effective surgical treatments for patients with BPH > 80m/L, which contribute to significant reductions in LUTS and improved QoL. Yet, the extent of improvement was greater in the LSP group, whereas B-TUEP required less operative time, hospital stay, and catheter duration.

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Benign prostatic hyperplasia (BPH) is a common urinary system disease in older men worldwide.^{1,2} It has been linked to lower urinary tract symptoms (LUTS) which according to the International Continence Society are categorized into: (a) storage symptoms - increased daytime frequency, urgency, nocturia, and urinary incontinence; (b) voiding symptoms - weak flow, urinary intermittency, hesitancy, straining, and terminal dribble; and (c) post-micturition symptoms - incomplete bladder emptying and post-terminal dripping.³ Lower urinary tract symptoms have a negative impact on men's physical, emotional, and social well-being, as well as overall quality of life (QoL).⁴

Treatment options vary according to the size of the prostatic hyperplasia and/or the severity of the symptoms. For patients with moderate-to-severe drug-resistant LUTS and BPH-related complications, surgical therapy is recommended.^{4,5} The European Association of Urology (EAU) guidelines endorse three surgical procedures for large size benign BPH (>80 mL), including an open simple prostatectomy (OSP), holmium laser enucleation (HoLEP), and bipolar-transurethral enucleation (B-TUEP).⁶

Although OSP remains the gold standard for surgical treatment of BPH > 80 mL⁷, the EAU guidelines define it as the most invasive method and recommend B-TUEP and HoLEP when available.⁶ Several randomized controlled trials (RCTs) have found that B-TUEP is as effective as OSP but has a better safety profile.⁸⁻¹¹

Laparoscopic simple prostatectomy (LSP) is a minimally invasive procedure that is listed in the EAU guidelines as a viable alternative to OP, HoLEP, and B-TUEP for surgical treatment of large benign prostatic hyperplasia.⁶

Most of the research on surgical treatments for high-volume enlarged prostate has compared the efficacy of alternative methods to open simple prostatectomy (OSP), with fewer comparisons between alternative methods. The improvement in patients' quality of life (QoL) is usually reported as changes in the international prostate symptom score (IPSS) and the quality of life (QoL) score. However, full-spectrum accounts of the extent of improvement in individual lower urinary tract symptoms (LUTS) and/or subcategories of LUTS are rare.

The primary goal of this study was to assess and compare the changes in storage, voiding, and post-micturition LUTS and disease-related QoL in patients with high-volume enlarged prostate prostatic hyperplasia (> 80m/L) who underwent either bipolar

transurethral enucleation (B-TUEP) or laparoscopic simple (LSP) prostatectomy. We sought to get empirical evidence about the effect of each type of treatment that could be used in the preoperative period for patient advisement and treatment planning. The objectives were as follows:

1. Estimate and compare the reduction in storage, voiding, post-micturition symptoms, and overall LUTS between B-TUEP and LSP.
2. Evaluate and compare the improvement in the patients' disease-related QoL between B-TUEP and LSP.
3. Examine whether a reduction in storage, voiding, post-micturition symptoms, and overall LUTS is associated with an improvement in patients' disease-related QoL.

MATERIALS AND METHODS

This was a single-center prospective study, conducted in the Department of Urology at the University General Hospital "Kaspela" in Plovdiv, Bulgaria. The target population were patients with high-volume enlarged prostate (> 80 mL) and persistent LUT symptoms who had not responded to conservative medical treatment. The pre-operative protocol for patient evaluation and diagnosis included physical examination, digital rectal examination, transrectal ultrasonography (TRUS), uroflowmetry (Qmax), and laboratory measurements of the prostate-specific antigen (PSA) and hemoglobin concentration (HGB).

The research project was approved by the Committee for Scientific Ethics at the University General Hospital "Kaspela" in Plovdiv, Bulgaria (IRB document No. 72, issued on October 15th, 2019). The data was gathered in accordance with the Helsinki Declaration (1964) and its revised version (Edinburgh, 2000). Patients were informed about the procedure's purpose, benefits, and risks and were asked to sign a written informed consent form for their voluntary participation in the study.

To be included in the study, patients had to satisfy the following criteria: (1) BPH > 80 mL; (2) moderate-to-severe lower tract symptoms; (3) written informed consent for participation in the study. The exclusion criteria were: (1) BPH < 80m/L; (2) previous prostatic or urethral surgery; (3) prostate or bladder tumors; (4) severe comorbidities; (5) refusal to provide written consent for inclusion in the study; (6) incomplete data.

In the period between October 2019 and November 2021, 112 patients satisfied the inclusion and exclusion criteria for participation in the study. Of them, 55 were treated with B-TUEP and 57 with LSP. The surgeries were performed by two surgeons with recognized expertise and substantial experience in both B-TUEP and LSP at a university hospital clinic of urology.

Surgical Procedures

The patients were randomly allocated to one of the two surgical treatments.

Bipolar Transurethral Enucleation

B-TUEP was performed using the Karl Storz38T -38T 38TAUTOCON 38TIII bipolar generator, a bipolar working element with a 12° HOPKINS telescope, saline continuous flow irrigation, a 'hybrid' type vapor-resection electrode, and the UNIDRIVE S III morcellator. The procedure followed the standard steps of laser enucleation. During the first endoscopic stage, after an initial cysto-urethroscopic assessment of the prostatic bulk, the median lobe was enucleated using 5 and 7 o'clock incisions starting from the bladder neck and continuing up to the verumontanum. In the next step, a deep incision at 12 o'clock was made, resulting in the complete separation of the two lateral lobes and their enucleation in a descendant direction, beginning from the 1 and 11 o'clock positions. The process continued from the 5 and 7 o'clock incisions in an ascendant sense until the respective lobes were gradually detached from the prostatic capsule and pushed back into the bladder. The remaining adenoma tissue was then ablated by simple plasma vaporization, and the procedure was concluded with the careful coagulation of any hemorrhagic sources. Last, BPH tissue morcellation was performed under clear endoscopic vision and control. The procedure resulted in a large prostatic fossa with no irregularities, debris, or obstruction and was completed with the placement of a Foley catheter.

Laparoscopic simple prostatectomy

LSP was performed through 5 ports using the extraperitoneal and transvesical approaches. A rectal enema was administered one night before surgery as standard pre-operative care to prepare the intestines. In addition, all patients received antibioprohylaxis and anticoagulant therapy to prevent venous thromboembolism. A 20Fr Foley catheter was inserted into the patient's modified Trendelenburg position on the operating table. For the camera port, a 2-cm long transverse incision was

made just under the umbilicus (Hassan port). The preperitoneal space was exposed with a gentle blunt finger dissection and dilated with 700 mL of air using a balloon dissector.

Subsequently, other ports were inserted under direct view. The second and third ports, 12 mm each, were placed on the right and on the left symmetry. On both the right and left sides, fourth and fifth ports of 5 mm each were inserted around 2 fingers long superomedial of the spina iliaca anterior superior. Using a harmonic scalpel (Ethicon, USA), a transverse incision was made at the vesicoprostatic junction of the bladder. After the bladder was opened and the prostate was approached, a mucosal incision was performed between the surgical capsule and the adenoma. Adenoma was enucleated with the assistance of a harmonic scalpel, an aspiration cannula, and a claw grasper. Following a 3-0 V-Lock trigonisation application, a three-way 22F Dufour catheter was inserted and the bladder was closed again with a 3-0 V-lock in one layer suture, in a running continuous fashion. The operation was finalized after the retropubic placement of one redon drain.

Pre-And Post-Operative Data

The preoperative data included patients' age, prostate volume (m/L), maximum urinary flow rate (Qmax), prostate-specific antigen (PSA), residual urine volume (RUV), and haemoglobin concentration (HGB). The post-operative data comprised operation duration, hospital stay, duration of catheter use, Qmax, PSA, RUV, and HGB, and complications according to the Clavian-Dindo classification. The patients also completed the International Prostatic Symptom Score (IPSS) questionnaire before surgery and six months after undergoing either bipolar-transurethral enucleation or laparoscopic simple enucleation. The frequency and severity of each symptom were assessed and compared separately and in categories (storage, voiding, and post-micturition), along with the overall IPSS and QoL scores.

Statistical Analysis

The statistical analyses were performed using the Statistical Package for the Social Sciences IBM SPSS version 27 (SPSS Inc., Chicago, IL, USA). The continuously measured variables were described with the mean values and standard deviations (SDs) if they met the assumption of normality according to the Shapiro-Wilk's test, and with the median values and interquartile ranges (IQR) in the absence of normality. The categorical variables were presented as frequencies and percentages (%). Between-group

Table 1 Preoperative data

Parameters	B-TUEP (n = 55)	LSP (n = 57)	p-value
Age (years)			
Median (IQR)	65 (8)	68 (9.50)	0.271 ^u
Minimum - Maximum	58 - 78	58 - 78	
Prostate volume (mL)			
Median (IQR)	96.12 (8.91)	97.95 (5.77)	0.225 ^u
Minimum-Maximum	85.20 – 115.30	85.12 – 116.55	
PSA (ng/ml)			
Median (IQR)	3.66 (0.99)	3.67 (0.98)	0.349 ^u
Qmax (mL/s)			
Median (IQR)	8 (2)	8 (3)	0.304 ^u
RUV (mL)			
Mean (±SD)	148.34 (±38.97)	143.40 (±34.64)	0.479 ^t
HGB (g/Dl)			
Median (IQR)	139 (15)	133 (14.50)	0.530 ^u

PPSA- prostate-specific antigen; Qmax - maximum urinary flow rate; RUV - residual urine volume; HGB - haemoglobin concentration; U-Mann-Whitney U test; t- independent-samples t-test

comparisons were carried out using the independent-samples t-test for normally distributed variables and the Mann-Whitney U test for non-normally distributed variables. Paired-samples t-tests were used for comparing data within each group. A Spearman rank-order correlation was performed to examine the relationship between changes in patients’ disease-related QoL and LUTS after the treatments. Associations between categorical variables were examined through the chi-square test or the Fisher exact test. All tests were two-tailed and the results were interpreted as significant at Type I error alpha = 0.05 (p < 0.05).

differences in age, prostate volume, PSA level, Qmax, RUV, and HGB (Table 1).

Postoperative data

All surgical procedures were completed successfully, without the need for open surgery. The LSP treatment was associated with significantly longer median operative time (p < 0.001), hospital stay (p < 0.001), and Foley catheter duration (p < 0.001) than the B-TUEP treatment. The two groups did not differ significantly in the median post-operative HGB concentration, mean HGB drop, or the percentage of patients with HGB drop (Table 2).

RESULTS

The statistical comparisons of the preoperative data between the two groups revealed no significant

Complications according to the Clavien-Dindo Classification

The rate of complications according to the Clavien-Dindo classification was low and mostly of Grade I in both treatment groups, with no significant

Table 2 Postoperative data

Parameters	B-TUEP (n = 55)	LSP (n = 57)	p-value
Operative time (min)			
Median (IQR)	77 (11)	106 (11.50)	<0.001 ^u
Minimum - Maximum	65 - 110	97 - 120	
Hospital stay (days)			
Median (IQR)	4 (2)	6 (2)	< 0.001 ^u
Minimum-Maximum	3 – 7	5 – 8	
Catheter duration (days)			
Median (IQR)	7 (2)	8 (5)	<0.001 ^u
Minimum-Maximum	5 - 15	6-15	
HGB (g/Dl)			
Median (IQR)	127 (15)	125 (6)	0.347 ^u
HGB drop			
Mean (±SD)	-9.80 (15.83)	-8.12 (16.35)	0.587 ^t 0.318 ^f
% of patients	61.80%	71.40%	

HGB - haemoglobin concentration; U-Mann-Whitney U test; t- independent-samples t-test; f – Fisher’s exact test

Table 3 Complications of B-TUEP and LSP according to the Clavien-Dindo system

Complications	B-TUEP n = 55	LSP n = 57	p
Grade 1 n (%)	7 (12.70%)	5 (8.75%)	0.554
Hyponatremia	2 (3.63%)	2 (3.50%)	1.000
Acute urinary retention	1 (1.81%)	1 (1.75%)	1.000
Grade 2	1(1.81%)	1 (1.75%)	1.000
Bladder neck stenosis	2 (3.63%)	1 (1.75%)	0.615
Incontinence at 1 st month	2 (3.63%)	1 (1.75%)	0.615
Blood transfusion	1(1.81%)	1 (1.75%)	1.000
Grade 3	2 (3.63%)	0 (0.00%)	0.239
Bleeding requiring surgery	1 (1.81%)	0 (0.00%)	0.491
Urethral stricture	1 (1.81%)	0 (0.00%)	0.491
Grade 4	0 (0.00%)	0 (0.00%)	-
Grade 5	0 (0.00%)	0 (0.00%)	-
Total	10 (18.14%)	6 (10.50%)	0.289

differences (Table 3). Grade II complications occurred in two patients, one from the B-TUEP group and one from the LSP group, both of whom required blood

transfusions. Grade III complications were observed in two patients from the B-TUEP group and in none

Table 4 Changes in lower urinary tract symptoms perioperatively

LUTS		Pre- operative	Post-operative	Mean diff. (±SD)	Paired samples p-value!
Storage					
Frequency	B-TUEP	3.75 (±0.86)	1.27 (±0.87)	-2.48(±1.16) -	<0.001
	LSP	3.91 (±0.76)	1.27 (±0.95)	2.64 (±1.40)	<0.001
Urgency	B-TUEP	3.69 (±0.92)	1.32 (±0.96)	-2.37(±1.12) -	<0.001
	LSP	3.89 (±0.72)	1.10 (±0.76)	2.79 (±0.98)*	<0.001
Nocturia	B-TUEP	3.83 (±0.85)	1.14 (±0.73)	-2.69(±1.10) -	<0.001
	LSP	4.03 (±0.73)	1.14 (±0.98)	2.89(±1.12)	<0.001
Voiding					
Weak stream	B-TUEP	3.61 (±0.87)	1.18 (±0.74)	-2.43 (±1.11) -	<0.001
	LSP	4.00 (±0.88)	1.21 (±0.89)	2.79 (±1.35)**	<0.001
Intermittency	B-TUEP	3.45 (±1.08)	1.20 (±0.82)	-2.25 (±1.51) -	<0.001
	LSP	3.72 (±0.78)	0.94 (±0.67)	2.78 (±1.11)**	<0.001
Straining	B-TUEP	3.41 (±0.85)	1.12 (±0.77)	-2.29 (±0.97) -	<0.001
	LSP	3.81 (±0.79)	1.09 (±0.92)	2.72 (±1.16)***	<0.001
Post-micturition					
Incomplete emptying	B-TUEP	3.74 (±0.75)	1.38 (±0.84)	-2.36 (±1.19) -	<0.001
	LSP	4.03 (±0.73)	1.05 (±0.77)	2.98(±1.02)**	<0.001
IPSS (total)	B-TUEP	25.50 (±2.58)	7.45 (±1.85)	-18.05 (±3.03) -	<0.001
	LSP	27.41 (±1.86)	6.61 (±1.64)	20.80 (±2.14)***	<0.001

! – paired-samples t-test shows the p-value for the change in the occurrence of a given symptom between baseline and the 6th month posoperatively in each group (horizontally); * - Significantly larger reduction in a given symptom in comparison to the other group (vertically) at p < 0.05; ** – Significantly larger reduction in a given symptom in comparison to the other group (vertically) at p < 0.01; *** - Significantly larger reduction in a given symptom in comparison to the other group (vertically) at p < 0.001

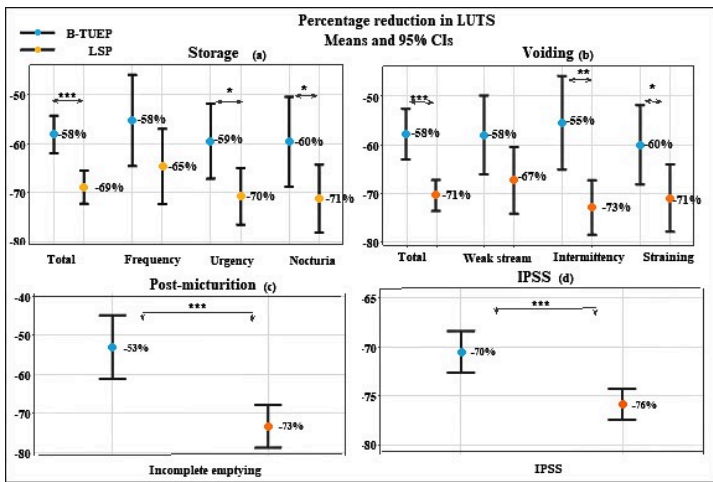


Figure 1 Percentage reduction in lower urinary tract symptoms 6 months after B-TUEP and LSP

from the LSP group. Grades IV and V complications were not registered in either of the two groups.

Change In LUTS Perioperatively

Both groups of patients experienced significant reductions in storage, voiding, and post-micturition symptoms six months after the surgical treatment ($p < 0.001$ for all paired comparisons). However, the patients who underwent LSP had a significantly higher reduction in urgency ($p = 0.037$), weak stream ($p = 0.001$), intermittency ($p = 0.001$), straining ($p = 0.004$), and incomplete emptying ($p = 0.004$).

The postoperative 6-month IPSS decreased significantly in both patient groups - by 18.05 units in the B-TUEP group and by 20.80 units in the LSP group, with a significantly larger reduction in the LSP group, $p < 0.001$ (Table 4).

Percentage Reduction In LUTS

The percentage reduction in lower urinary tract symptoms six months after the surgical treatments is illustrated in Figure 1. In the LSP group, the mean % reduction in storage symptoms was $69 \pm 12\%$ versus $58 \pm 15\%$ in the B-TUEP group ($p < 0.001$). For each symptom in this category, the results were: frequency ($p = 0.121$), urgency ($p = 0.021$), and nocturia ($p = 0.046$) (Panel A).

Post-micturition symptoms (incomplete emptying) were reduced by $73 \pm 20\%$ in the LSP group versus $53 \pm 29\%$ in the B-TUEP group, $p < 0.001$ (Panel C). Overall, IPSS decreased by $76 \pm 5.8\%$ in the LSP group and by $70 \pm 7.8\%$ in the B-TUEP group, $p < 0.001$ (Panel D).

According to the IPSS categorization ranges (1 to 7 – mild; 8 to 19 – moderate; 20 to 35 – severe), 98.20% of the B-TUEP group and 100% of the LSP group had severe symptoms prior to surgery. Six months after surgery, 0.0% of the patients had severe symptoms; 57.70% of the B-TUEP and 34.50% of the LSP

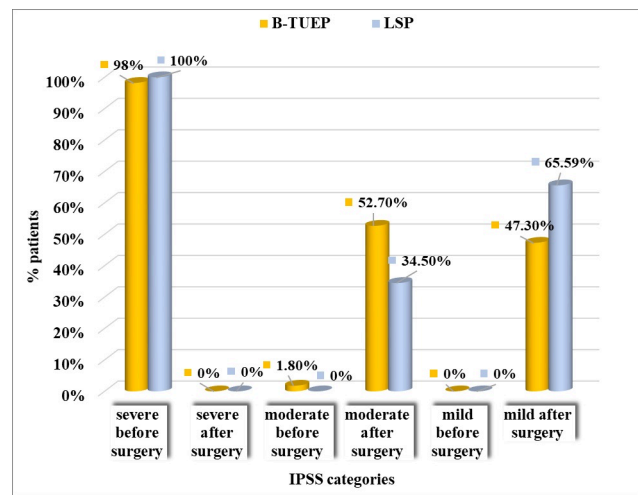


Figure 2 Distribution of the patients across IPSS categories before and 6 months after the surgical treatment

improved to moderate symptoms; 47.30% of the B-TUEP group and 65.59% of the LSP group improved to mild symptoms. The distribution of the patients across IPSS categories did not differ significantly between the groups, $p = 0.056$ (Figure 2).

Change in the Patients' Disease-Related Quality Of Life

The QoL question is categorized into 7 levels with the following descriptions: 0 = delighted, 1 = pleased, 2 = mostly satisfied, 3 = mixed, 4 = mostly dissatisfied, 5 = unhappy, 6 = terrible. Both groups of patients had a mean QoL score close to 5 (unhappy) prior to surgery (B-TUEP 4.69 ± 0.71 ; LSP 4.73 ± 0.69), with no significant difference ($p = 0.731$). Six months after surgery, both groups improved, with mean QoL scores close to 2 (mostly satisfied) – (TUEP 2.16 ± 0.73 ; LSP 1.80 ± 0.73). However, the LSP group showed a significantly greater improvement (-2.96 ± 0.96) than the B-TUEP group (-2.52 ± 1.06), $p = 0.026$ (Figure 3). The mean percentage improvement in the LSP group was $61.66 \pm 15.74\%$ versus $52.69 \pm 17.85\%$ in the B-TUEP group, $p = 0.006$.

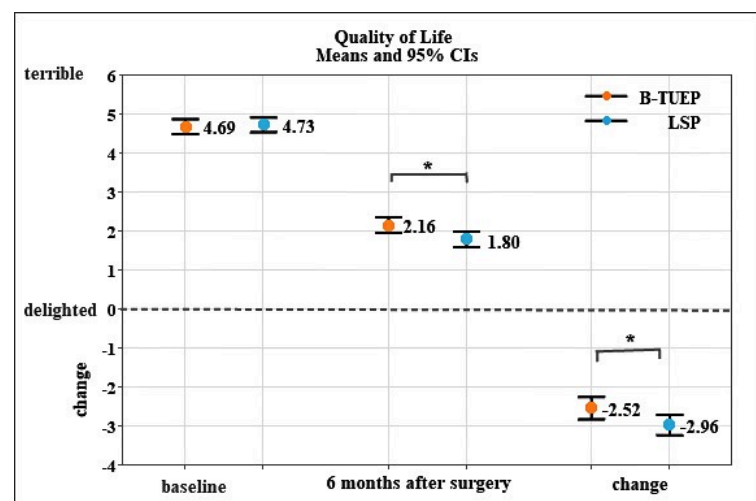


Figure 3 Change in the patients' quality of life 6 months after the surgical treatment

Relationship between LUTS And Disease-Related QoL after Surgical Treatment With B-TUEP And LSP

We examined the relationship between the percentage reduction in LUTS and the improvement in the patients' disease-related QoL for the entire sample of 112 patients. Three significant negative correlations were observed between the % improvement in QoL and the % reduction in: IPSS ($r_s = -0.463$, 95% CI: -0.293 to -0.605, $p < 0.001$); storage symptoms ($r_s = -0.333$, 95% CI: -0.150 to -0.493, $p < 0.001$); and voiding symptoms ($r_s = -0.300$, 95% CI: -0.115 to -0.465, $p = 0.001$). No significant association was found with post-micturition symptoms/incomplete emptying ($r_s = -0.130$, 95% CI: -0.310 to -0.060, $p = 0.176$) (Figure 4: a, b, and c).

DISCUSSION

The incidence of BPH increases in aging men. By the age of 85, approximately 90% of men in this age group are affected by BPH and develop lower urinary symptoms, which have a negative impact on their physical and mental health^{4,12}. The main purpose of the present study was to provide a comprehensive assessment of the improvement in lower urinary track symptoms and disease-related quality of life in patients with high-volume enlarged prostate (> 80mL) treated with either bipolar transurethral enucleation or laparoscopic simple prostatectomy.

Both B-TUEP and LSP are recommended as minimally invasive alternatives to OSP for patients with high-volume enlarged prostate.⁶ in the EAU guidelines,

with comparable effectiveness, improved safety, and fewer complications than OSP [8, 13, 14]. Our findings revealed that both treatments were effective, with a low rate of Clavien-Dindo complications, mostly of Grade 1.

Except for one patient in the B-TUEP group, all patients had severe LUT symptoms prior to surgery. Six months after surgery, both groups of patients experienced a significant reduction in LUTS, which improved from severe to moderate or mild, with a 76% improvement rate in the LSP group and a 70% improvement rate in the B-TUEP group.

The LSP treatment produced superior results in reducing storage, voiding, and post-micturition symptoms. The improvement in storage symptoms was 11% higher, in voiding it was 13% higher, and in post-micturition it was 20% higher.

Irrespective of the surgical treatment, reduction in IPSS was significantly associated with an improvement in the patients' disease-related QoL. In the existing literature, some studies found that storage symptoms correlated more closely with disease-related QoL than voiding symptoms¹⁵⁻¹⁸, whereas in other studies the reversed result was reported¹⁹. In our study, reductions in both storage and voiding symptoms were moderately associated with an improvement in the patients' disease-related quality of life, with a slightly stronger link between storage symptoms and disease-related QoL.

Prior to surgery, the mean disease-related QoL score in both groups indicated that the patients were "unhappy" with their urinary condition. Six months

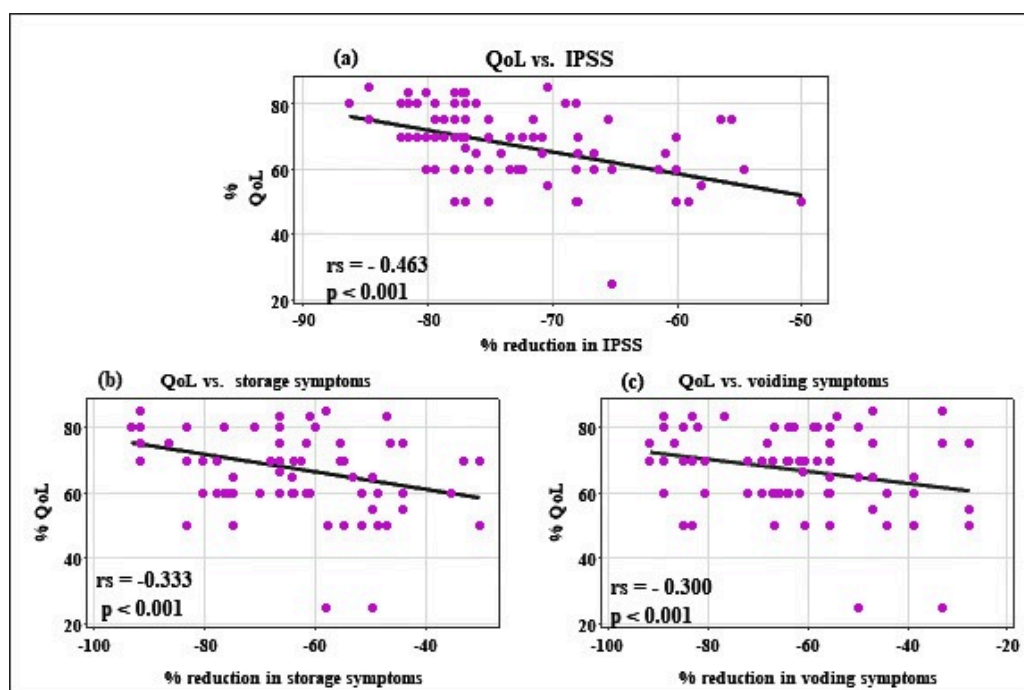


Figure 4 Relationship between changes in LUTS and QoL after surgical treatment with B-TUEP and LSP

SUMMARY BOX

What is already known about this subject

- Benign prostatic hyperplasia (BPH) is a common urinary system disease that negatively impacts the physical and mental well-being of the patients.
- Bipolar transurethral enucleation (B-TUEP) and laparoscopic simple prostatectomy are commonly used as minimally invasive alternatives to open simple prostatectomy (OSP) for the treatment of BHP.
- Previous reports on patients' quality of life after surgical treatment of high-volume enlarged prostate mostly reported the total IPSS (International Prostatic Symptom Score) and QoL scores, but did not track the changes in specific lower urinary tract symptoms (LUTS) and/or sub-categories of symptoms.

What are the new findings?

- The importance of our study is that it provides a detailed evaluation of the extent of improvement in storage, voiding, and post-micturition lower urinary symptoms in patients with BPH > 80m/L after treatment with B-TUEP or LSP.
- Our results showed that the extent of LUTS reduction and improvement in the patients' QoL was significantly greater in the LSP group. On the other hand, the B-TUEP procedure required shorter operative time, hospital stay, and catheter use.
- The findings suggest that LSP would be a better option for patients with high-volume enlarged prostate and severe to very severe LUTS, whereas B-TUEP can be used to treat men with high-volume enlarged prostate and mild to moderate LUTS.
- Our study also adds to the relatively small body of research on the link between lower urinary tract symptoms and the disease-related quality of life of patients with large BPH.

after treatment, the overall perception improved to "mostly satisfied." The improvement in the patients' well-being was higher in the LSP group, 73% of whom were pleased or mostly satisfied with their urinary health versus 60% of the B-TUEP group.

Mariano et al concluded, based on a six-year experience, that using a laparoscopic approach in the

treatment of large benign prostatic hyperplasia was not only effective, but also reduced the hospital stay and recovery time for the patients.²⁰ In our study, LSP was found to be more effective than B-TUEP in reducing LUTS and improving the disease-related quality of life of the patients. However, LSP was associated with significantly longer operative time, hospital stay, and Foley catheter duration than the B-TUEP treatment. The difference with the findings of Mariano et al can be explained by the fact that they compared LSP to the standard OSP procedure, whereas we compared two minimally invasive procedures.

Our study has several limitations. One of them refers to the short-term follow-up time, spanning only the first six months after the surgical treatments. We are aware that the observed trends may not hold for longer postoperative periods. Due to the COVID-19 pandemic, there were several government-imposed lockdowns during which planned surgeries were postponed to later dates. For this reason, we are still in the process of completing the data collection for the 12 and 18-month postoperative periods. Another limitation is that, being a single-center study, we had no access to larger populations of men with BPH > 80m/L, and the relatively small sample sizes might limit the strength of our conclusions. The reported trends need to be validated by longitudinal data and bigger samples.

CONCLUSION

Previous studies have demonstrated the efficacy of minimally invasive surgical treatments for patients with high-volume enlarged prostate. In line with their findings, in our study, both B-TUEP and LSP were shown as effective surgical alternatives to OSP for men with BPH > 80m/L. Irrespective of the treatment, the patients experienced significant reductions in storage, voiding, and post-micturition symptoms, and their disease-related QoL improved significantly. However, the extent of LUTS reduction and improvement in patients' QoL was significantly greater in the LSP group. On the other hand, the B-TUEP procedure required shorter operative time, hospital stay and catheter use. These findings have practical implications for clinical practice, patient counselling, and treatment planning. Based on our results, LSP would be a better option for patients with very severe LUTS, whereas B-TUEP can be used to treat men with large BHP and less severe LUTS.

REFERENCES

1. Launer, BM; McVary, KT; Ricke, WA; Lloyd, GL. The rising worldwide impact of benign prostatic hyperplasia. *British Journal of Urology International* 2021;127,722-728.
2. Zhu, C; Wang, DQ; Zi, H; Huang, Q et al Epidemiological trends of urinary tract infections, urolithiasis and benign prostatic hyperplasia in 203 countries and territories from 1990 to 2019. *Military Medical Research* 2021;8, 64.
3. Abrams, P; Cardozo, L, Fall, M et al Standardisation Sub-committee of the International Continence Society. The standardisation of terminology of lower urinary tract function: report from the Standardisation Sub-committee of the International Continence Society. *Neurourology and Urodynamics* 2002; 21,167-78.
4. Chughtai, B; Forde, JC; Thomas, DD et al Benign prostatic hyperplasia. *Nature Reviews Disease Primers* 2016; 2, 16031.
5. Foster, HE; Barry, MJ; Dahm, P et al Surgical Management of Lower Urinary Tract Symptoms Attributed to Benign Prostatic Hyperplasia: AUA Guideline. *Journal of Urology* 2018; 200,612-619.
6. Oelke, M; Bachmann, A; Descazeaud, A et al European Association of Urology. EAU guidelines on the treatment and follow-up of non-neurogenic male lower urinary tract symptoms including benign prostatic obstruction. *European Urology* 2013; 64,118-40.
7. Millin, T. Retropubic prostatectomy: a new extravesical technique report on 20 cases. 1945. *Journal of Urology* 2002;167(2 Pt 2):976-9; discussion 980.
8. Geavlete, B; Stanescu, F; Iacobaie, C; Geavlete, P. Bipolar plasma enucleation of the prostate vs open prostatectomy in large benign prostatic hyperplasia cases - a medium term, prospective, randomized comparison. *British Journal of Urology International* 2013;111,793-803.
9. Geavlete, B; Bulai, C; Ene, C; Checherita, I; Geavlete, P. Bipolar vaporization, resection, and enucleation versus open prostatectomy: optimal treatment alternatives in large prostate cases? *Journal of Endourology* 2015; 29, 323-31.
10. Ou, R; Deng, X; Yang, W; Wei, X; Chen, H; Xie, K. Transurethral enucleation and resection of the prostate vs transvesical prostatectomy for prostate volumes >80 mL: a prospective randomized study. *British Journal of Urology International* 2013; 112, 239-45.
11. Rao, JM; Yang, JR; Ren, YX; He, J; Ding, P; Yang, JH. Plasmakinetic enucleation of the prostate versus transvesical open prostatectomy for benign prostatic hyperplasia >80 mL: 12-month follow-up results of a randomized clinical trial. *Urology* 2013; 82, 176-81.
12. Egan, KB. The Epidemiology of Benign Prostatic Hyperplasia Associated with Lower Urinary Tract Symptoms: Prevalence and Incident Rates. *Urologic Clinics of North America* 2016; 43,289-97.
13. Li, J; Cao, D; Peng, L; Ren, Z; Gou, H; Li, Y; Wei, Q. Comparison Between Minimally Invasive Simple Prostatectomy and Open Simple Prostatectomy for Large Prostates: A Systematic Review and Meta-Analysis of Comparative Trials. *Journal of Endourology* 2019; 33,767-776.
14. Higazy, A; Tawfeek, AM; Abdalla, HM; Shorbagy, AA; Mousa, W; Radwan, Al. Holmium laser enucleation of the prostate versus bipolar transurethral enucleation of the prostate in management of benign prostatic hyperplasia: A randomized controlled trial. *International Journal of Urology* 2021; 28, 333-338.
15. Marklund-Bau, H; Edéll-Gustafsson, U; Spångberg, A. Bothering urinary symptoms and disease-specific quality of life in patients with benign prostatic obstruction. *Scandinavian Journal of Urology and Nephrology* 2007; 41, 32-41.
16. Engström, G; Henningsohn, L; Walker-Engström, ML; Leppert, J. Impact on quality of life of different lower urinary tract symptoms in men measured by means of the SF 36 questionnaire. *Scandinavian Journal of Urology and Nephrology* 2006; 40, 485-94.

17. Coyne, KS; Wein, AJ; Tubaro, A et al The burden of lower urinary tract symptoms: evaluating the effect of LUTS on health-related quality of life, anxiety and depression: EpiLUTS. *British Journal of Urology International* 2009;103 Suppl 3, 4-11.
18. Sountoulides, P; van Dijk, MM; Wijkstra, H; de la Rosette, JJ; Michel, MC. Role of voiding and storage symptoms for the quality of life before and after treatment in men with voiding dysfunction. *World Journal of Urology* 2010; 28, 3-8.
19. Araki, I; Tsuchida, T; Nomura, T et al Differential impact of lower urinary tract symptoms on generic and disease-specific quality of life in men and women. *Urology International* 2008; 81, 60-5.
20. Mariano, MB; Tefilli, MV; Graziottin, TM; Morales, CM; Goldraich, IH. Laparoscopic prostatectomy for benign prostatic hyperplasia--a six-year experience. *European Urology* 2006; 49, 127-31; discussion 131-2.