

# Predictive Factors for a Successful Day Case Benign Prostatic Hyperplasia Surgery: A Review

Henry Kimbi Yisa, Yunfen Liao, Guoxi Zhang

First Affiliated Hospital of Gannan Medical University, Ganzhou, China

Email: yisahenry@yahoo.com, yisahenry@gmail.com, lyf130@126.com, gyfyurology@126.com, 1016629228@qq.com

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## Abstract

**Introduction:** Lower urinary tract symptoms (LUTS) secondary to benign prostatic hyperplasia (BPH) is one among the foremost common diseases affecting the aging man with, almost 80% of the lads greater than 70 affected. BPH is caused by unregulated proliferation within the prostate, which may cause physical obstruction of the prostatic urethra and result in anatomic bladder outlet obstruction (BOO). Transurethral resection of the prostate (TURP) has been the historical gold standard up till now to which all endoscopic procedures for benign prostatic hyperplasia (BPH) are compared with a mean hospital stay of three days. This surgery although efficacious has been related with increased morbidity and increased day case failure rates as compared to newer techniques. These shortcomings have prompted the utilization of newer methods like Transurethral enucleation and resection of the prostate (TUERP), Holmium laser enucleation of the prostate (HoLEP) and Thulium laser enucleation of the prostate (ThuLEP). This review will discuss the enucleation techniques, advantages and therefore the predictive factors for a successful day case prostate surgery. **Materials and Methods:** During this review, we discuss the newer techniques utilized in day case BPH surgery as well as the predictive factors for a successful BPH surgery, both enucleation, benefits and morcellation are covered also. **Results:** TUERP, ThuLEP and HoLEP have literature supporting the advantages of these techniques, which demonstrates its ability in day case BPH surgeries in specially selected cases with favorable factors and a 61% overall success rate. **Conclusion:** TUERP, ThuLEP and HoLEP Have proven to show favorable outcomes in day case BPH surgery with urologist's experience, prostate size, duration of operation, age, use of anticoagulants, morning theatre list and ASA score being the key factors for a successful day case surgery.

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## Keywords

Benign Prostatic Hyperplasia (BPH), Transurethral Resection of the Prostate (TURP), Transurethral Enucleation and Resection of the Prostate (TUERP), Holmium Laser Enucleation (HoLEP), Thulium Laser Enucleation (THuLEP), Lower Urinary Tract Symptoms (LUTS), Catheterisation Time (CT), Operation Time (OT), Bladder Outlet Obstruction (BOO), American Society of Anesthesiologists (ASA)

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## 1. Introduction

Lower urinary tract symptoms (LUTS) secondary to benign prostatic hyperplasia (BPH) is one among the foremost common diseases affecting the aging man with, almost 80% of the lads greater than 70 affect [1]. BPH is caused by unregulated proliferation within the prostate, which may cause physical obstruction of the prostatic urethra and end in anatomic bladder outlet obstruction (BOO) [2]. Transurethral resection of the prostate (TURP) has been the historical gold standard up till now to which all endoscopic procedures for BPH are compared with a mean hospital stay of three days) [3] [4]. This surgery although efficacious has been related with increased morbidity and increased day case failure rates as compared to newer techniques [5]. This morbidity is related to many complications like prolonged postoperative catheterization, high retreatment rates and prolonged hospital stay which translates to increased cost of BPH management. These shortcomings have prompted the utilization of newer methods like Transurethral enucleation and resection of the prostate (TUERP), Holmium laser enucleation of the prostate (HoLEP) and Thulium laser enucleation of the prostate (ThuLEP) [6]. These newer techniques are associated with an improved success in day case surgery mainly thanks to less perioperative bleeding, it takes advantage of the distinct anatomical planes to enucleate the whole transition zone with improved outcomes like shorter hospital stay, enucleation of BPH regardless of size and shorter catheterization times [7]. This review will discuss the enucleation techniques, benefits and the predictive factors for a successful day case prostate surgery.

## 2. New Techniques

Classical TUERP was first described in 2006 performed using the plasma kinetic bipolar system with normal saline irrigation, under spinal or general anesthesia [8]. All surgeries were performed or closely supervised by an equivalent surgeon. Preprogrammed power settings for cutting (180 W) and coagulation (80 W) were used. Preliminary cystoscopy was done employing a 20-F-sized sheath, to assess both prostate size and shape, and visualize landmarks (including the 2 ureteric orifices and therefore the verumontanum). A 26-F-sized resectoscope was then introduced, and the TUERP procedure was performed as described

within the following paragraph.

The distal margin of the prostate lobes is marked with a cutting loop. Starting with the median lobe, the mark between the 5 o'clock and 7 o'clock positions is deepened right down to the surgical capsule. Next, the incision just proximal to the verumontanum is deepened in order that the plane between the adenoma and false capsule (*i.e.* the compressed normal prostatic tissue) might be identified with a thick resectoscope loop. The tip of the resectoscope is then inserted to further develop this plane. The adenoma is gradually dissected far away from the capsule within the avascular plane, toward the bladder neck, until the circular fibers of the bladder neck were seen. The perforating vessels are diathermied at the source and cut. Bleeding points noted during this mechanical dissection is definitely controlled with coagulation. The median lobe, which remains attached to the bladder neck, is then resected. The plane between the lateral lobe and false capsule is developed during a similar manner and resected. No morcellator is employed, the chips are then evacuated employing a bladder evacuator. On completion, a three-way Foley catheter is inserted and continuous bladder irrigation initiated. Bladder irrigation is kept overnight or until the effluent is obviously clear. Once the irrigation is stopped, the catheter is removed after two days, or when the urine is not bloody or had only a light pink coloration.

There are two main sorts of laser enucleation, HoLEP and ThuLEP with same principle and similar steps for both procedures, this text will describe ThuLEP method which is a current laser technique [9]. 26 French (Fr) continuous flow resectoscope with a laser bridge adapter and an endoscopic camera are used. The laser fiber is passed through a 6Fr open-ended ureteral catheter, a 100-Watt Thulium laser with an end-firing 550-micron laser fiber are used with settings at, 30 watts for coagulation and 87.5 watts for cutting. After enucleation is completed, a morcellator is used to clear the bladder of any prostatic tissue.

The ThuLEP procedure can be divided into five distinct steps which should be followed meticulously for complete and safe removal of the entire prostate adenoma and for adequate haemostasis. Preparation of the patient the patient is placed in the lithotomy position with the legs moved laterally. After sterile preparation and draping, the urethra is irrigated with sterile gel. The 26 F continuous flow resectoscope is inserted into the bladder under vision so as to avoid urethral or prostatic trauma. The camera should be fixed in a loose position. Finally, the 550 micron laser fibre is inserted through the working channel of the resectoscope. It might be helpful to guide the loose part of the laser fibre through a mosquito clamp, thereby fixing the fibre to the draping and keeping it out of the working area of the surgeon. The outflow channel should always be open during the enucleation procedure for prevention of bladder overdistension. Cystoscopy is performed to exclude concomitant bladder pathologies and visualize the ureteral orifices. The resectoscope is then pulled back into the prostatic urethra, the bladder neck and the extent of lobar protrusion is assessed. Finally, the positions of the verumontanum and the borders of the external urethral sphincter are determined.

The first step in the three-lobe technique is circumferential incision of the verumontanum in which an inverted U-incision close to the verumontanum is carried out using the 70 - 90 W power setting of the laser. The incision of prostatic tissue reaches until the distal third of the verumontanum. After incision of the mucosa, the incision is deepened till the surgical capsule of the prostate is reached.

The second step is the removal of the prostatic median lobe in which the prostatic median lobe is removed separately before enucleation of the lateral lobes. Bilateral bladder neck incisions close to the lateral margins of the prostatic median lobe are made approximately at the 5 and 7 o'clock positions. This incision is extended until the hemi-circumferential incision at the verumontanum and then deepened till the surgical capsule becomes visible which can clearly be identified as a white layer with superficial vessels. At this level, blunt retrograde enucleation of the prostatic median lobe is started while the laser energy is switched to 30 W. The resectoscope is moved under the edge of the median lobe and bluntly shifted towards the 12 o'clock direction, thereby mechanically disrupting the plane between surgical capsule and prostatic adenoma. During blunt disconnection, visual control of the surgical capsule and laser coagulation of perforating vessels at 30 W is necessary. Shifting and disconnection of the adenoma from the surgical capsule and coagulation of crossing vessels is continued until the bladder neck is reached. After complete disconnection of the median lobe from the surgical capsule, the liberated lobe is pushed into the bladder.

The third step is the apical incision of the lateral lobes in which the distal margin of the adenoma at the 12 o'clock position is marked and incised by the Thulium laser using 30 W. From the incision next to the verumontanum, two superficial incisions towards the 4 and 8 o'clock positions are carried out using the Thulium laser at 30 W. Superficial incisions with low laser energy prevents mucosal bleeding and ensures good visualization for the next steps.

The fourth step is the removal of the lateral lobes in which the lateral lobes are removed separately, beginning with the left lobe. The apical edges of the lateral lobes are then bluntly exposed by moving the resectoscope under the adenoma and pulling these towards the 2 o'clock position, thereby exposing the apical border of the surgical capsule. After the apical plane is opened, the entire lateral lobe is bluntly and progressively released towards the bladder neck. Because of the blunt dissection of the lateral lobes, the prostate is often ventro-caudally attached. This attachment appears like a broad mucosal band and must be dissected with low laser energy and not bluntly disrupted to prevent tearing at the apex and surrounding sphincter. Again, the surgical capsule can be easily identified by visualizing the small vessels which run in a parallel fashion next to the dissection plane. These vessels remain untouched unless they perforate the capsule and, in such cases, coagulation of capsule perforating vessels is performed with low laser energy in no-touch technique. The released lobe is then dissected from the bladder neck from the 12 to the 4 o'clock position and, afterwards, from the 6 to 4 o'clock position. After complete release from the surgical cap-

sule, the left lateral lobe is pushed into the bladder. The identical procedure is then identically repeated on the right side.

The last and fifth step is morcellation and removal of the prostatic tissue in which the rotating inner sheath and the working element of the laser armamentarium is replaced by a long nephroscope attached to the adapter and the morcellator with 5 mm blades is inserted through the resectoscope into the bladder. Continuous irrigation and a fully distended bladder are needed to avoid unintentional trauma to the bladder wall. Complete fragmentation of the prostatic adenoma in the bladder is carried out using combined morcellation and suction. The procedure is completed by removal of the instruments and insertion of a 22 F urethral catheter.

There have been some recent updates to both the ThuLEP technique and the equipment utilized. Newer techniques include complete en block enucleation and the more commonly used two lobes enucleation technique [10]. The two lobes enucleation technique, the median lobe is undermined at the capsular level and is enucleated with the lateral lobe as one unit. Initial reports on these newer techniques suggest a decrease in both enucleation and total operative time, and easier identification of the surgical capsule [11] [12]. Another big change in operative efficiency has come from the improvements in the type of morcellators available. Versacut, by luminis, was the first morcellator used with ThuLEP. Piranha, by Wolf, is the newer perhaps more advanced morcellator is also available. The versacut has reciprocating blades which are controlled by a foot pedal, while the Piranha has oscillating blades which rotate at a selected rate. The suction mechanism is different for each as well, with the luminis allowing for continuous suction with or without morcellation, while the Wolf only provides microbursts of suction. Studies have compared the two morcellators [13] [14]. Comparisons revealed similar results between the two, though the Piranha had a lower cost of use and higher rates of morcellation with a negligible learning curve. Most ThuLEP surgeons prefer the Piranha to the VersaCut due to an advanced ergonomic design, efficient tissue removal properties and its safety profile. Lastly, recent improvement in laser technology in the form of ThuLEP which is a continuous wave as opposed to HoLEP which is a pulse wave provides a quicker enucleation, effective coagulation and 9 times lesser energy consumption.

The many expected advantages of TUERP, HoLEP and ThuLEP begin with a lower risk of hospital infections and thromboembolism and can lead to a satisfactory feeling linked to an early return home and the rapid resumption of activities as shown on **Table 1**.

**Table 1** summaries the benefits of TUERP, HoLEP and ThuLEP for a day-case Prostate.

### 3. Predictive Factors

Five relevant studies were selected from 2011 till date concerning the factors

**Table 1.** Characteristics of the study population chronologically divided into 3 different groups (group 1 from January 2013 to July 2015, group 2 from August 2015 to June 2017 and group 3 from July 2017 to February 2019).

	Group 1 ( <i>n</i> = 88)	Group 2 ( <i>n</i> = 89)	Group 3 ( <i>n</i> = 89)	<i>p</i> -value
AGE	65.5 (±7.93)	66.8 (±6.86)	68.3 (±7.74)	0.042
ASA	2	2	2	ns
BMI (kg/m <sup>2</sup> )	26.2 (±3.54)	26.6 (±3.78)	26.1 (±4.16)	ns
PSA (ng/ml)	4.79 (±4.24)	6.01 (±6.29)	5.08 (±4.06)	ns
Qmax (ml/s)	8.51 (±4.25)	8.55 (±3.77)	8.99 (±4.27)	ns
PVR 9 (ml)	144 (±142)	120 (±112)	127 (±124)	ns
IPSS	19.1 (±7.04)	17.9 (±6.36)	17.1 (±6.68)	ns
Prostate volume (ml)	75.7 (±34.1)	85.2 (±44.1)	79.5 (±45.1)	ns
Patients with prostate volume > 90 (ml)	31 (37%)	29 (36%)	28 (33%)	ns
Operation time (minutes)	77.0 (±30.8)	60.4 (±24.5)	55.4 (±24.0)	<0.001
Resection tissue weight (g)	44.2 (±33.6)	50.4 (±33.8)	42.4 (±27.9)	ns
Delivered energy (kj)	95.2 (±49.8)	84.0 (±38.7)	77.9 (±45.4)	0.041
Indwelling catheter before surgery	5 (5.7%)	8 (9.9%)	9 (10%)	ns
Antiplatelet therapy	7 (8%)	15 (17%)	17 (19%)	ns
Day-case success	62 (70%)	75 (84%)	77 (87%)	0.014

Mean (± standard deviation);  $\Psi$  Median Bold indicates  $p < 0.05$ . ASA = American Society of Anesthesiologists; BMI = Body Mass Index; PSA = Prostate Specific Antigen;  $Q_{\max}$  = Maximum Urinary Flow Rate; PVR = Postvoid Residual; IPSS = International Prostatic Symptom Score, ns = Not Significant Klein *et al.* 2021.

influencing a day case prostate surgery with details described below, one prospective and four retrospective studies were carried out in France, Italy, United Kingdom and United States of America as shown in **Table 2**. A total of 1760 BPH patients underwent a day case surgery and 1074 patients were successfully discharged on the same day with no readmissions giving a success rate of 61%. The factors that were studied and found significant included the surgeon's experience, age, prostate size, early morning surgery, operation time and ASA score.

A retrospective review of all consecutive day-case holmium laser enucleation of the prostate (HoLEP) performed by a single surgeon between January 2013 and February 2019 using a prospective database revealed that the surgeons experience seems to be crucial to improve perioperative outcomes and prostate volume of less than 90 cc is associated with a higher success rates of day case surgery [15]. Day-case success was defined as discharge within less than 12 hours from admission without any readmission within 48 hours after discharge. A total of 266 patients were retrieved and dispatched as follows: group 1 ( $n = 88$ ) from January 2013 to July 2015, group 2 ( $n = 89$ ) from August 2015 to June 2017, and

**Table 2.** Influential day case prostate surgery factors.

Authors, Publications, Location	Study design	Time of enrollment, year	Patient with BPH, <i>n</i>	Managed as day case surgery, <i>n</i> (%)	Influential day case surgery factors
Klein <i>et al.</i> France	Retrospective cohort	2013-2019	266	214 (80.5%)	The surgeon's experience was associated with day case success while day-case failure was prostate volume greater than 90 cc
Lee <i>et al.</i> United Kingdom	Retrospective cohort	2013-2016	210	74 (35%)	Two factors were significantly associated with successful day case surgery: small volume prostate and morning theatre lists
Italy	Prospective study	2011-2013	53	53 (100%)	A 1-day surgery showed that a short operation time of 71 minutes and a small prostatic adenoma volume of 56 cc was associated very high success rate of a day surgery which was estimated at 14.8 hours
Agarwal <i>et al.</i> USA	Retrospective cohort	2013-2017	30	27 (90)	Positive predictive factors were younger age, low ASA score, shorter enucleation time, shorter resection time and in patients who did not use anticoagulants
Mouton <i>et al.</i> France	Retrospective cohort	2012-2016	1201	706 (58.7%)	Younger age, ASA score, large prostate volume, anticoagulant intake, urologist experience and operation time were key factors for a successful day case surgery
TOTAL			1760	1074 (61%)	

group 3 ( $n = 89$ ) from July 2017 to February 2019. The overall success rate was 80.5% (214/266) over the study period. It significantly improved over time from 70% in group 1 to 84% in group 2 and 87% in group 3 ( $p = 0.014$ ). In the meantime, the operating time and the total energy delivered to the tissue decreased from 77 minutes in the first group to 60.4 minutes in the second group and 55.4 minutes in the third group ( $p < 0.001$ ), and from 95.2 kJ in the first group to 84 kJ in the second group and 77.9 kJ in the third group ( $p = 0.041$ ). On multivariate analysis, the only risk factor significantly associated with day-case failure was prostate volume greater than 90 cc (odds ratio = 2.041,  $p = 0.047$ ).

Patients presenting for HoLEP by a single surgeon from September 2013 to September 2016 were considered for day-case surgery which revealed that two factors were significantly associated with successful day case surgery: small volume prostate and morning theatre lists [15] [16]. In total, 210 patients (mean age  $70.3 \pm 8.5$  years) underwent HoLEP, with 74 (35.3%) discharged as true day-cases and a further 84 (40.0%) discharged within 23 hours. Readmission rate was 5.5%, with all complications Clavien-Dindo grade I or II. Factors associated with successful day-case operation included low-volume prostates ( $\leq 40$  g) (odds ratio, OR, 3.097, 95% confidence interval, CI, 1.619 - 5.924,  $P = 0.0001$ ) and morning surgical lists (OR 6.124, 95% CI 2.526 - 14.845,  $p < 0.001$ ).

From September 2011 to September 2013, a prospective study on 53 patients who underwent surgery with ThuLEP in a 1-day surgery showed that a short operation time of 71 minutes and a small prostatic adenoma volume of 56 cc was associated very high success rate of a day surgery which was estimated at 14.8 hours [17]. No complications or readmissions were recorded.

The exponential development of the day-case procedures seems to be linked with the advent of laser technology. 92% of day case surgeries in France in 2016 were Laser surgeries and only about 8% were non laser [18]. This tendency is expected to increase in the coming years according to the spreading of laser surgery. In a similar retrospective study of 473 adult males who underwent HoLEP from July 2018 to December 2019 at a tertiary referral center and high-volume HoLEP hospital, same day discharge was possible in 87.4% of the patients and positive predictive factors were younger age, low ASA score, shorter enucleation time, shorter resection time and in patients who did not use anticoagulants [19]. Patients with longer morcellation times and with post-procedure hematuria with clots were more likely to have an unplanned admission and were the main reason for a failed successful day case surgery.

It was demonstrated in a single-center HoLEP procedures performed between January 1, 2012 and December 31, 2016 that; age, ASA score, large prostate volume, anticoagulant intake, urologist experience and operation time were key factors for a successful day case surgery [19] [20]. Age, at procedure ( $P = 0.019$ ), an ASA score  $> 2$  ( $P = 0.0019$ ), a high prostatic volume ( $P = 0.011$ ), an anticoagulant intake ( $P \leq 0.0001$ ), a poor-urologist experience ( $P = 0.048$ ) and a long operative time ( $P = 0.0144$ ) were at risks of complications.

#### 4. Discussion

The successful transfer of a standard inpatient operation to a day-case procedure demands that the treatment is equally effective, are often safely delivered which the patients are carefully selected to realize favorable outcome. TURP is the gold standard for the surgical relief of BPH. More advanced procedures designed to facilitate shorter hospitalization and particularly a successful day case surgery, e.g., TUERP, HoLEP and ThuLEP, have all shown to be superior to TURP with a future re-operation free rate of 95% at 10 years [21]. A successful outcome to the relief of prostatic obstruction requires adequate tissue removal as demonstrated in these newer techniques. The utilization of higher laser energy settings is related to a far better coagulation leading to the increase success rate of day case prostate surgery as confirmed from some studies [22] [23] [24] [25] [26]. For the urologists, these are exciting technological advances; except for the patients, these might merely be strings of medical jargon, as they are more concerned about whether the improvements in the urinary tract symptoms are going to be significant and sustainable after surgery, whether the clinical safety is assured, whether they require prolonged hospitalization and whether their hospital bills are often reduced from a successful day case surgery. Day case BPH surgery



leading to early discharge is an effort to translate the technological advances of enucleation into actual clinical outcomes that patients can appreciate. Overall, from **Tables 1-3** and **Figure 1**, the surgeons experience and a little prostate size is found to be the foremost important factor for a successful day case BPH surgery meanwhile, hematuria with clot is the most vital factor for failure.

**Table 3.** Advantages of TUERP, HoLEP and ThuLEP for a day-case prostate surgery.

Arthur(s)	Title	Year	Publication	Laser System	Advantage
Scoffon <i>et al.</i>	The en-bloc no-touch holmium laser enucleation of the prostate (HoLEP) technique. World J Urol.	2016	World J Urol. 34(8): 1175-1181.	Lumenis Pulse 100H and 120H	The en-bloc no-touch technique has the potential to ease some difficult intraoperative steps and to improve the learning curve of HoLEP.
Liu <i>et al.</i>	Transurethral enucleation and resection of prostate in patients with benign prostatic hyperplasia by plasma kinetics.	2010	J Urol. 184(6): 2440-2445.	Lumenis Pulse 120H	HoLEP treatment of benign prostatic hyperplasia could achieve the advantages of open surgery the same effect. It had fewer damage, faster recovery, fewer complications, and is a good treatment option.
Klein <i>et al.</i>	Evolution of Day-case HoLEP Success Rate Over Time.	2020	J Endourol. 81(3): 62-73.	Lumenis Pulse 100H	HoLEP is a reliable and safe procedure with a high success rate improving over time.
Pirola <i>et al.</i>	Holmium laser versus thulium laser enucleation of the prostate: a matched-pair analysis from two centers. Therapeutic advances in urology.	2018	Urology. 10(8): 223-233.	Lumenis Pulse 120H	Both HoLEP (100 W) and ThuLEP (110 W) relieve lower urinary tract symptoms in a comparable way with high efficacy and safety, with negligible clinical differences.
Lwin <i>et al.</i>	Holmium Laser Enucleation of the Prostate is Safe and Feasible as a Same Day Surgery.	2020	Urology. 138: 119-124.	Lumenis Pulse 120H	Same-day outpatient surgery for HoLEP is both safe and feasible and should be considered regardless of prostate size, comorbidities, age, or anticoagulation status.
Muhsin <i>et al.</i>	Feasibility of Holmium Laser Enucleation of the Prostate as a 1-day Surgery.	2019	World J Urol. 38(4): 1017-1025.	Lumenis Pulse 120H	HoLEP has proven successful as a same-day procedure with good safety profile in selected patients.
Lee <i>et al.</i>	Day-case Holmium Laser Enucleation of the Prostate: Feasibility, Safety and Predictive Factors.	2018	Ann R Coll Surg Engl. 100(6): 475-479.	N/A	Same-day HoLEP is both feasible and safe, with low readmission rates.
Minagawa <i>et al.</i>	En-Bloc Technique with Anteroposterior Dissection Holmium Laser Enucleation of the Prostate Allows a Short Operative Time and Acceptable Outcomes. Urology.	2015	Urology. 86(3): 628-633.	Lumenis Pulse 120H	A short operating time and may address concerns regarding the complexity of the enucleation procedure.

Continued

Comat <i>et al.</i>	Day-Case Holmium Laser Enucleation of the Prostate: Prospective Evaluation of 90 Consecutive Case.	2017	JJ Endourol 31(10): 1056-1061.	Lumenis Pulse 100H and 120H	Same-day HoLEP has proven successful regardless of prostate volume, and may be performed by a trained surgeon with an appropriate patient selection.
Rapopo <i>et al.</i>	En bloc holmium laser enucleation of the prostate (HOLEP EN BLOC): Our experience.	2018	Urologiia 65(3): 83-87.		HoLEP is a safe, highly efficacious and a size-independent procedure.
Tayeb <i>et al.</i>	Wolf Piranha Versus Lumenis VersaCut Prostate Morcellation Devices: A Prospective Randomized Trial.	2016	J Urol. 195(2): 413-417.		Piranha is more efficient in tissue removal
Rivera <i>et al.</i>	A Survey of Morcellator Preference and Cost Comparison of the Lumenis VersaCut and Wolf Piranha Morcellators.	2018	Urology. 111: 54-58.		Significant improved efficiency and improved cost savings utilizing the Piranha morcellator even when controlling for disposable costs
Deng <i>et al.</i>	Bipolar plasmakinetic transurethral enucleation and resection versus bipolar plasmakinetic transurethral resection for surgically treating large (≥60 g) prostates: a propensity score-matched analysis with a 3-year follow-up	2021	Urology and nephrology 73(3): 376-383.		For patients with large (≥60 g) prostates, BP-TUERP and BP-TURP are safe options, but the former is a more effective choice in long-term follow-up outcomes. BP-TUERP is related to reduced CT and hemoglobin decrease with more removal of prostatic tissue at the expense of longer OT than BP-TURP.

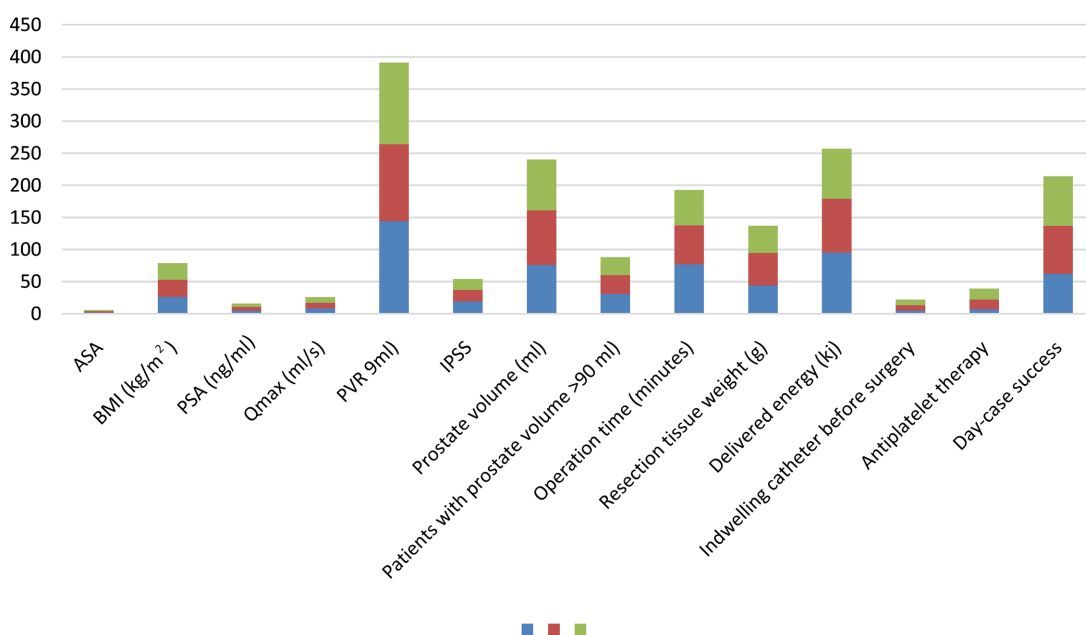


Figure 1. Evolution of day case success over time.

## 5. Conclusion

In conclusion, TUERP and laser enucleation techniques are durable and effective treatment for patients affected by LUTS due to BPH during a day case setting. The AUA guidelines highlight this by recommending laser enucleation as a size independent treatment option for those with moderate to severe symptoms from BPH. The literature shows that TUERP may be a superior solution to TURP for day case prostate surgery, meanwhile ThuLEP is superior to HoLEP in some respect with more favorable outcomes during a successful day case surgery. While there are some limitations to those newer techniques, such as the steep learning curve and high rate of retrograde ejaculation, these procedures have an outsized literature showing its efficacy and favorable outcomes in day case surgery. This research shows that the surgeons experience, the age of the patient, prostate size, operation time, anticoagulant intake, the ASA score and morning theatre list are predictive factors for a successful day case BPH surgery, with an overall success rate of 61%.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

## References

- [1] Das, A.K., Teplitsky, S. and Humphreys, M.R. (2019) Holmium Laser Enucleation of the Prostate (HoLEP): A Review and Update. *The Canadian Journal of Urology*, **26**, 13-19.
- [2] Patel, N.D. and Parsons, J.K. (2014) Epidemiology and Etiology of Benign Prostatic Hyperplasia and Bladder Outlet Obstruction. *Indian Journal of Urology*, **30**, 170-176. <https://doi.org/10.4103/0970-1591.126900>
- [3] McVary, K.T., *et al.* (2011) Update on AUA Guideline on the Management of Benign Prostatic Hyperplasia. *The Journal of Urology*, **185**, 1793-1803. <https://doi.org/10.1016/j.juro.2011.01.074>
- [4] Eaton, A.C. and Francis, R.N. (2002) The Provision of Transurethral Prostatectomy on a Day-Case Basis Using Bipolar Plasma Kinetic Technology. *BJU International*, **89**, 534-537. <https://doi.org/10.1046/j.1464-410X.2002.02673.x>
- [5] Michalak, J., Tzou, D. and Funk, J. (2015) HoLEP: The Gold Standard for the Surgical Management of BPH in the 21(st) Century. *American Journal of Clinical and Experimental Urology*, **3**, 36-42. <https://doi.org/10.5653/cerm.2015.42.1.1>
- [6] Zarrabi, A. and Gross, A.J. (2011) The Evolution of Lasers in Urology. *Therapeutic Advances in Urology*, **3**, 81-89. <https://doi.org/10.1177/1756287211400494>
- [7] Jones, P., *et al.* (2016) Holmium Laser Enucleation versus Simple Prostatectomy for Treating Large Prostates: Results of a Systematic Review and Meta-Analysis. *Arab Journal of Urology*, **14**, 50-58. <https://doi.org/10.1016/j.aju.2015.10.001>
- [8] Liu, C., *et al.* (2010) Transurethral Enucleation and Resection of Prostate in Patients with Benign Prostatic Hyperplasia by Plasma Kinetics. *The Journal of Urology*, **184**, 2440-2445. <https://doi.org/10.1016/j.juro.2010.08.037>
- [9] Pirola, G.M., *et al.* (2018) Holmium Laser versus Thulium Laser Enucleation of the

- Prostate: A Matched-Pair Analysis from Two Centers. *Therapeutic Advances in Urology*, **10**, 223-233. <https://doi.org/10.1177/1756287218779784>
- [10] Scoffone, C.M. and Cracco, C.M. (2016) The En-Bloc No-Touch Holmium Laser Enucleation of the Prostate (HoLEP) Technique. *World Journal of Urology*, **34**, 1175-1181. <https://doi.org/10.1007/s00345-015-1741-y>
- [11] Minagawa, S., *et al.* (2015) En-Bloc Technique with Anteroposterior Dissection Holmium Laser Enucleation of the Prostate Allows a Short Operative Time and Acceptable Outcomes. *Urology*, **86**, 628-633. <https://doi.org/10.1016/j.urology.2015.06.009>
- [12] Rapoport, L.M., *et al.* (2018) En Bloc Holmium Laser Enucleation of the Prostate (HOLEP EN BLOC): Our Experience. *Urologia*, No. 3, 83-87. <https://doi.org/10.18565/urology.2018.3.83-87>
- [13] El Tayeb, M.M., *et al.* (2016) Wolf Piranha versus Lumenis VersaCut Prostate Morcellation Devices: A Prospective Randomized Trial. *The Journal of Urology*, **195**, 413-417. <https://doi.org/10.1016/j.juro.2015.08.078>
- [14] Rivera, M.E., *et al.* (2018) A Survey of Morcellator Preference and Cost Comparison of the Lumenis VersaCut and Wolf Piranha Morcellators. *Urology*, **111**, 54-58. <https://doi.org/10.1016/j.urology.2017.09.019>
- [15] Klein, C., *et al.* (2021) Evolution of Day-Case Holmium Laser Enucleation of the Prostate Success Rate over Time. *Journal of Endourology*, **35**, 342-348. <https://doi.org/10.1089/end.2020.0337>
- [16] Lee, S.M., *et al.* (2018) Day-Case Holmium Laser Enucleation of the Prostate: Feasibility, Safety and Predictive Factors. *Annals of the Royal College of Surgeons of England*, **100**, 475-479. <https://doi.org/10.1308/rcsann.2018.0039>
- [17] Carmignani, L., *et al.* (2015) One Day Surgery in the Treatment of Benign Prostatic Enlargement with Thulium Laser: A Single Institution Experience. *Korean Journal of Urology*, **56**, 365-369. <https://doi.org/10.4111/kju.2015.56.5.365>
- [18] Gury, L., Robert, G. and Bensadoun, H. (2018) Where Do We Stand with Benign Prostatic Hyperplasia Day-Case Surgery: A Laser Effect? *Progrès en Urologie*, **28**, 509-514. <https://doi.org/10.1016/j.purol.2018.05.005>
- [19] Agarwal, D.K., *et al.* (2020) Catheter Removal on the Same Day of Holmium Laser Enucleation of the Prostate: Outcomes of a Pilot Study. *Urology*, **146**, 225-229. <https://doi.org/10.1016/j.urology.2020.09.038>
- [20] Mouton, M., *et al.* (2020) Holmium Laser Enucleation of the Prostate: Analysis of Early Complications. Patient Selection for Day-Case Surgery. *Progrès en Urologie*, **30**, 89-96. <https://doi.org/10.1016/j.purol.2019.11.009>
- [21] Elkoushy, M.A., Elshal, A.M. and Elhilali, M.M. (2015) Reoperation after Holmium Laser Enucleation of the Prostate for Management of Benign Prostatic Hyperplasia: Assessment of Risk Factors with Time to Event Analysis. *Journal of Endourology*, **29**, 797-804. <https://doi.org/10.1089/end.2015.0060>
- [22] Becker, B., Gross, A.J. and Netsch, C. (2018) Safety and Efficacy Using a Low-Powered Holmium Laser for Enucleation of the Prostate (HoLEP): 12-Month Results from a Prospective Low-Power HoLEP Series. *World Journal of Urology*, **36**, 441-447. <https://doi.org/10.1007/s00345-017-2159-5>
- [23] Herrmann, T.R., *et al.* (2010) Thulium Laser Enucleation of the Prostate (ThuLEP): Transurethral Anatomical Prostatectomy with Laser Support. Introduction of a Novel Technique for the Treatment of Benign Prostatic Obstruction. *World Journal of Urology*, **28**, 45-51. <https://doi.org/10.1007/s00345-009-0503-0>
- [24] Kyriazis, I., *et al.* (2015) Transurethral Anatomical Enucleation of the Prostate with

- Tm:YAG Support (ThuLEP): Review of the Literature on a Novel Surgical Approach in the Management of Benign Prostatic Enlargement. *World Journal of Urology*, **33**, 525-530. <https://doi.org/10.1007/s00345-015-1529-0>
- [25] Raber, M., *et al.* (2018) Thulium Laser Enucleation of the Prostate (ThuLEP): Results, Complications, and Risk Factors in 139 Consecutive Cases. *Arab Journal of Urology*, **16**, 411-416. <https://doi.org/10.1016/j.aju.2018.05.004>
- [26] Jumper, C., Snyder, P. and Yap, R.L. (2012) Rapid Ambulatory Pathway Laser Prostatectomy Is Safe: Results within the Global Period. *BJU International*, **110**, 1190-1193. <https://doi.org/10.1111/j.1464-410X.2012.10952.x>