

## Benefits of Same Day Discharge after Transurethral Bipolar Resection or Laser Enucleation for the Treatment of Benign Prostatic Hyperplasia; A Systematic Review

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### Keywords:

Prostatic hyperplasia surgery; bipolar resection; laser enucleation

## 1. Abstract

**1.1. Introduction:** Transurethral endoscopic procedures using bipolar current, or laser energy are nowadays widely accepted and have replaced the traditional old techniques in the treatment of lower urinary tract symptoms due to benign prostatic hyperplasia. TURP has been the gold standard surgical treatment for BPH for a long time. Nonetheless, efforts are still being made to improve the clinical results after TURP. These include technological advances, such as bipolar resection and laser enucleation for secure hemostasis and minimized incidence of TUR syndrome, as well as successful day case prostate surgery for cost savings and shortened hospital stay.

**1.2. Evidence Acquisition:** A systematic review was performed from January 2011 through January 2021. Search engines used included PubMed/ Medline, Scopus and Google scholar data bases. Search query was: "Prostatic Hyperplasia/surgery"[Mesh] AND "same day" OR "bipolar resection" OR "laser enucleation". Study selection followed the PRISMA statement.

**1.3. Evidence Synthesis:** 9 studies from PubMed, 5 studies from Google scholar and 01 study from Scopus data bases were finally relevant for inclusion in this systematic review with a total of 4745 patients. Bipolar TURP and laser enucleation of the prostate has demonstrated good results with high same day discharge rates including the numerous benefits.

**1.4. Conclusion:** In conclusion, same day discharge after transurethral bipolar resection or laser enucleation showed to be safe, effective, with low complication rates, shorter hospital stay, shorter catheterization time, overall cost saving, high patient satisfaction and practicably successful even with large size prostate glands if done according to the specific guidelines.

## 2. Introduction

Benign prostatic Hyperplasia (BPH) usually causes urinary obstruction frequently referred to as Bladder Outlet Obstruction (BOO). The clinical presentation developing from BPH is referred to as Lower Urinary Tract Symptoms (LUTS). LUTS is the most common urological problem among men, affecting about a third of men over age 50 [1, 2]. In addition to LUTS, these patients may develop other complications as well, including retention of urine (acute and chronic), microscopic or macroscopic hematuria, infections in urinary tract, stone formation in bladder, bladder wall weakness and damage, kidney dysfunction, and issues with continence [3]. Research has shown that pharmacological treatment in the form of alpha blockers, 5-Alpha reductase inhibitors (5-ARIs), and other drugs are popularly used for the management of BPH patients [4]. However, there is a significant population of men who end up having surgical interventions like bipolar resection or laser enucleation. Transurethral endoscopic procedures using bipolar current, or laser energy are nowadays widely accepted and have replaced the traditional old techniques in the treatment of lower urinary tract symptoms due to benign prostatic hyperplasia [5, 6]. TURP has been the gold standard surgical treatment for BPH for a long time. Nonetheless, efforts are still being made to improve the clinical results after TURP. These include technological advances, such as bipolar resection and laser enucleation for secure hemostasis [7] and minimized incidence of TUR syndrome, [8] as well as successful day case prostate surgery for cost savings and shortened hospital stay [9, 10]. It is a common practice to discharge patients after 2 to 7 days after BPH surgery, the median length of stay for TURP continues to be two days, despite the introduction of bipolar systems [11, 12,13]. The provision of day-case surgery would allow for greater patient flow by lowering the demand for

hospital beds and improve clinical care through increased efficiency. Centers that offer day case bipolar or laser surgery for the treatment of BPH are gradually increasing in number especially in developed countries. Despite the utilization of these modern techniques the rate of implementation for day case BPH surgeries is still very low as a result of few studies that have assessed the benefits of bipolar resection or laser enucleation as a same-day discharge with scientific rigor despite the fact that this may be the practice of a few experienced centers. This systematic review aims to comprehensively examine and summarize the current evidence supporting the benefits of same day discharge after transurethral bipolar or laser surgery for the treatment of BPH.

### 3. Evidence Acquisition

PubMed/Medline, Scopus and Google scholar databases from January 2011 to January 2021 Were searched with terms “Prostatic Hyperplasia/surgery”[Mesh] AND " same day" OR "bipolar resection" OR "laser enucleation". A total of 1506 articles matched initial search. After removing 29 duplicates, while 1477 were screened, 1459 articles were excluded (irrelevant to the study). Further, after duplicate removal, titles and abstracts were checked

for relevance by two reviewers (HK, LY). Full text analysis of eligible studies was performed by three reviewers (HK, LY, ZG), and any disagreement was handled by consensus, refereed by a fourth reviewer (LL). The selection procedure followed the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) principles and is presented using a PRISMA flow chart (Figure 1) and 15 relevant articles were selected, 01 article could not be retrieved and 02 articles finally excluded because patients for the study were enrolled before 2011. Although recent articles were prioritized, manuscripts with relevant scientific findings were referenced if required. Preoperative, intraoperative and post operative parameters were extracted. Preoperative variable (Age, Number of patients, PSA, IPSS, Qmax, PVR, Prostatic volume). Intraoperative characteristics (resection time, enucleation time, enucleated tissues weight, and morcellation time). Post-operative characteristics (catheterization duration, hospital stay, hematuria, hemoglobin decrease and cost of treatment). Data extracted was tabulated in two tables as seen in Table 1 and 2. It is important to note that 6 prospective studies and 9 retrospective studies consisting of a total of 4745 patients were all enrolled between 2011 to 2021.

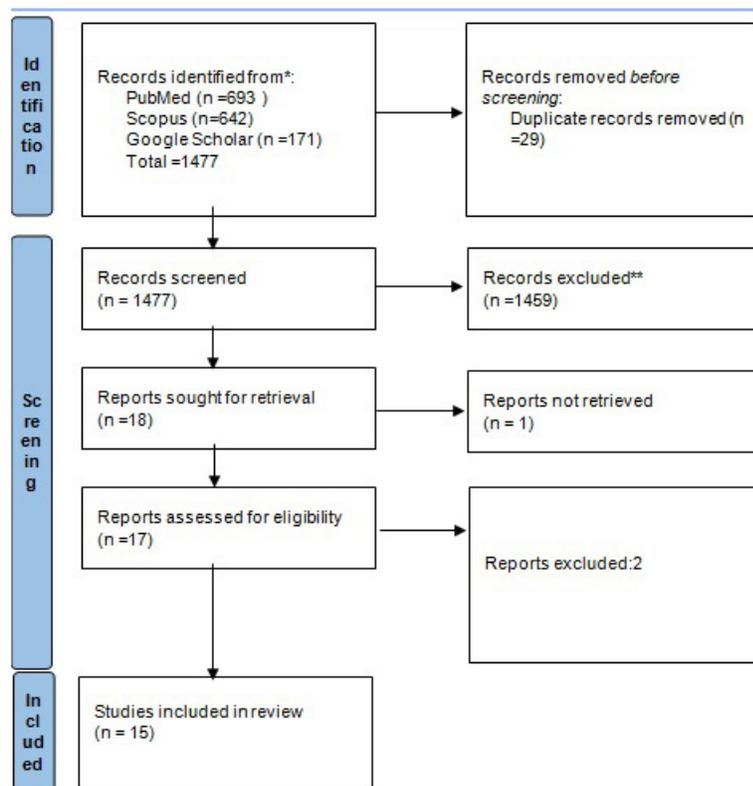


Figure 1: Preferred Reporting items for Systemic reviews and Meta-analyses flow sheet for study selection

Table 1: Benefits of same day discharge after a bipolar resection or laser surgery

Author, Location	Study design	Time of enrollment, year	Patient with BPH, n	Managed as day case surgery, n (%)	Benefits
Gabbay and associates[31] France	Prospective cohort	2013–2014	30	30 (100)	High satisfaction rate among patients, very low complication rate
Lee and associates[37] United Kingdom	Retrospective cohort	2013–2016	210	74 (35)	Improved patient care through increased efficiency.

Cynk and colleagues[29] United Kingdom	Prospective cohort	2011–2012	184	114 (62)	minimally invasive, associated with low perioperative morbidity, has a low complication rate.
Comat and associates[34] France	Prospective cohort	2012–2015	211	90 (43)	Safe
Muhsin and colleagues[35] United States	Retrospective cohort	2017–2018	179	47 (26)	HoLEP is safe and feasible in well-selected patients.
Lwin and associates[30] United States	Retrospective control trial	2013–2018	377	199 (53)	Complications can be managed conservatively
Carmignani and associates[19] Italy	Prospective cohort	2011-2013	53	53 (100)	Reduced cost of treatment.
Assmus and associates[38] Canada	Retrospective cohort	2019-2020	55	38(69)	Safe for large glands>175cc
Klein and associates[39] France	Retrospective cohort	2013-2019	266	214 (80.5)	Day-case HoLEP is a reliable and safe procedure with a high success rate that could be significantly improved over time
Agarwal and colleagues[27] USA	Retrospective cohort	2018-2019	473	181 (38.3)	Same-day discharge (SDD) after holmium laser enucleation of the prostate (HoLEP) is possible and is successful in 87.4% of patients. Potential for significant cost savings.
Agarwal and associates[40] USA	Retrospective cohort	2019-2020	30	27(90)	Safe, feasible, early ambulation reduces the risk of deep venous thrombosis.
Sun and colleagues[13] China	Retrospective cohort	2013-2017	1164	489 (95.9)	This treatment strategy could reduce the waiting time for admission and cost of hospitalization.
Mouton and associates[41] France	Retrospective cohort	2012-2016	1201	706 (58.7)	Low complication rate, shorter hospital stay and shorter catheterization time.
Pham and associates[42] USA	Prospective cohort	2011-2014	104	85(81.7)	Bipolar TURP can be routinely done on an outpatient basis, is safe, effective and time saving modality for treatment of BPH.
Bozzini and colleagues[43] Italy,	Prospective randomized control trial	2014-2015	208		ThuLEP was statistically superior to bipolar TURP in blood loss, catheterization time, irrigation volume, and hospital stay. However, both procedures were safe and effective.

**Table 2:** The parameters and operative data of one day bipolar resection or laser enucleation surgery from January 2011 to January 2021

## Preoperative Variables

	Gabbay et al	Lee et al	Bozzini et al	Comat et al
Age(years)	63.8	68.9	70.7	65.8
Number of patients	30	74	106	90
Indication for surgery				
PSA(n/ml)			3.6	4.8
IPSS	22.9		18.6	4.9
Qmax(ml/s)	9.5		6.9	8.3
PVR(ml)			112.9	139
Prostatic volume(ml)	75.3			75.9

## Intraoperative Variables

Resection time(min)	61.6	
Enucleation time(min)		75.5
Morcellation time(min)		
Resected volume	48.8	46.8

## Postoperative Variables

Hospital Stay(hours)			
Catheterization time(hours)			26.6
hematuria	9		
Readmission			
Hemoglobin decrease(g/dl)		2.8	
Cost of treatment(rmb)			

## Preoperative Variables

	Muhsin et al	Lwin et al	Carmignani et al	Assmus et al
Age(years)	69.8	70	71.8	
Number of patients	47	199	53	45
Indication for surgery				
PSA(n/ml)		8	4.2	8.6
IPSS		19	16	
Qmax(ml/s)		6	9.3	8.8
PVR(ml)		191		
Prostatic volume(ml)	69	83	56.6	229.9

## Intraoperative Variables

Resection time(min)			71
Enucleation time(min)	46.1	110	
Morcellation time(min)			
Resected volume(ml)		53	27.5

## Postoperative Variables

Hospital Stay(hours)	<4	<24	8.8
Catheterization time(hours)	32	14.8	17
Hematuria	0.5		
Transfusion rate (%)		0	
Hemoglobin decrease(g/dl)		1.1	
Cost of treatment(rmb)			

## Preoperative Variables

	Klein et al	Agarwal et al	Agarwal et al	Sun et al
Age(years)	66.6	68.6	69	69.9
Number of patients	266	30	181	510
Indication for surgery				
PSA(n/dl)	5.0			5.9
IPSS	17.1			27.9
Qmax(ml/s)	8.8	6.4		7.7
PVR(ml)	127	82	90.5	189.5
Prostatic volume(ml)	77.4		88	51.9

## Intraoperative Variables

Resection time(min)				
Enucleation time(min)	55.4	39.5	39	46.7
Morcellation time(min)		5	5	
Resected volume(ml)	42.4	52.5	49	34.4

## Postoperative Variables

Hospital Stay(hours)	2.6		
Catheterization time(hours)	4.9		
Hematuria			
Readmission			
Hemoglobin decrease (g/dl)		1.4	
Cost of treatment(rmb)			9140.6

## Preoperative Variables

	Mouton et al	Pham et al	Cynk et al
Age(years)	70.3	71	74
Number of patients	1201	104	184
Indication for surgery			
PSA(n/dl)			
IPSS			
Qmax(ml/s)			8.7
PVR (ml)			
Prostatic volume(ml)	88.8		

## Intraoperative Variables

Resection time(min)	
Enucleation time(min)	
Morcellation time(min)	
Resected volume(ml)	45

## Postoperative Variables

Hospital Stay(hours)		<24	
Catheterization time(hours)			
Hematuria	84	19	9
Readmission		19	
Transfusion(%)	3.7		
Hemoglobin decrease(g/dl)			
Cost of treatment(rmb)			

#### 4. Evidence Synthesis

Bipolar resection and laser enucleation surgery for BPH is one of the most frequently performed urological procedure worldwide (101420 procedures were performed in the USA and 49868 in France in 2008 8,9) [14, 15]. The benefits to support the development of day-case treatment with these procedures are numerous:

**4.1. Inexpensive and Ttime saving:** Most medical expenses are related to the length of hospital stay, and its reduction is critical to save money for other purposes [16, 17]. Carmignani et al carried-out Thulium laser surgery in 53 patients as a day case with all discharged successfully on the same day, mean preoperative prostatic adenoma volume was 56.6 mL. Mean operative time was 71 minutes. The average catheter time was 14.8 hours, this was found to be a good strategy in cost saving. Agarwal et al in a sim-

ilar manner demonstrated an 87.5% success rate in day case Laser enucleation, For the surgeon and hospital system, there is a significant reduction in physical and human postoperative resources needed and potential for significant cost savings. Sun et al recorded that laser surgery as day case is cheap and time saving; Patients in the 1-day surgery group had a significantly shorter waiting time for admission ( $9.5 \pm 4.8$  vs.  $17.6 \pm 7.4$  days,  $p < .05$ ), and the mean hospitalization cost was lower (CNY\$  $9140.6 \pm 1452.2$  vs.  $10533.4 \pm 1594$ ,  $p < .05$ ). Xu recently analyzed a retrospective study in which 67 BPH patients underwent day case laser surgery and found out that the mean hospitalization cost of the day surgery group was significantly lower than that of inpatient surgery group ( $8360.7 \pm 136.9$  vs  $12350.9 \pm 167.8$  yuan,  $P < 0.05$ ). This strategy reduces the patient's hospitalization costs, waiting time while improving the patient's comfort by reducing preoperative stress

and anxiety subsequently leading to a better quality of life [18-22].

**4.2. Low complication rate:** Morbidity after day case bipolar TURP is still significant, most related to bleeding complications [23, 24] especially in patients on anti-coagulation (AC) therapy or bleeding disorders. Indeed, treating patients on AC with TURP adds a dual risk: bleeding if done under AC, thrombo-embolism with AC suspension. Thus, alternative treatments to TURP are preferred. Laser-based endourologic techniques are reported with adequate safety profile in patients on AC [25, 26]. Mouton et al reported in a retrospective study a low complication rate, shorter hospital stay and shorter catheterization time with laser enucleation. One thousand two hundred and one patients were included. The overall complication rate was 19.15%. The transfusion rate was 3.7%. The study demonstrated that the age at procedure ( $P = 0.019$ ), an ASA score  $> 2$  ( $P = 0.0019$ ), a high prostatic volume ( $P = 0.011$ ), an anticoagulant intake ( $P = < 0.0001$ ), a poor-urologist experience ( $P = 0.048$ ) and a long operative time ( $P = 0.0144$ ) were at risks of complications. Compared to TURP, laser-based therapy showed longer operation time but shorter hospital stay and shorter catheterization time. Agarwal also reported a low risk of developing deep venous thrombosis in day case laser prostate surgery due to early ambulation of patients [27]. Length of hospital stay remains strongly associated with nosocomial infections that are particularly frequent in patients with urinary catheter [28], reduction in the risk of developing deep venous thrombosis, low complications which can be managed conservatively and better coagulation are all in favor of same day discharge using bipolar TURP or laser therapy [27, 29, 30].

**4.3. Patient satisfaction:** Shorter hospital stay and day-case surgery are associated with higher general satisfaction [31, 32]. Gabbay et al conducted a study on 30 BPH patients that underwent laser surgery and reported a 100% patient satisfaction rate which encourages the practice and advancement of this protocol. Sun et al also reported a high satisfaction rate especially among elderly patients who want to return home immediately after surgery.

safety and efficacy Same day discharge after laser surgery for BPH is both safe and efficient and should be considered regardless of prostate size, comorbidities, age, or anticoagulation status to decrease hospital stay and medical care costs. HoLEP patients can be offered same day discharge after surgery if they live in relative close proximity, and have good functional status with ECOG 0-2 [33]. Given the favorable outcomes and technical improvements in bipolar TURP and laser therapy, multiple groups have assessed the safety and efficacy of performing BPH surgery as an ambulatory procedure. There has been varied success, with same-day discharge rates of 35.3–97.3% [31, 34-36]. Meanwhile multiple studies have confirmed the efficacy and safety of bipolar TURP and laser techniques in day case BPH management [34, 35, 37, 38]. Lee et al reported in a retrospective study with 210 BPH patients that HoLEP as day case results in increased efficiency. Assmus et

al in a similar manner reported the first outcomes of preoperatively planned same-day discharge for HoLEP in large glands ( $\geq 175$  cc) and concluded that its safe and efficient. 55 patients with a preoperative prostate size  $\geq 175$  cc (39 CT, 12 MRI, 4 transrectal ultrasound), of which 45 were scheduled for same-day discharge and 10 for admission. Mean preoperative prostate size was 229.9 cc (range 175-535 cc) and 36 (65.5%) were in urinary retention. Mean preoperative prostate-specific antigen (PSA) was 8.58 ng/mL, American Urological Association Symptom Score (AUASS) 22.3, and Qmax 8.8 mL/second. At 3 months postoperative follow-up mean AUASS was 6.7, PSA 0.87 ng/mL and Qmax 20.4 mL/second. All came same-day discharge rate was 70% (38/55). Of patients planned for same-day discharge 38/45 (84%) were effective. Average length of stay for all patients was 11.8 hours with catheterization of 21.2 hours. When compared with 2010 published large gland outcomes, it represents a 220% reduction [38-41]. Pham et al in a prospective study recorded that Bipolar TURP can be routinely done on an outpatient basis, is safe, effective and time saving modality for treatment of BPH. This study is not without drawbacks which includes the 11-year study duration which is relatively short to give us results that are highly representative but however most technological advances and surgeons experience are at its optimum within the last 11 years, this represents a major factor for a successful day case prostate surgery. More studies are still required to be carried out in the aspect of bipolar TURP as same day discharge to access its benefits for there are very few studies compared to laser enucleation.

## 5. Conclusion

The benefits of same day discharge after transurethral bipolar resection or laser enucleation exhibited to be safe, effective, with very low complication rates, shorter hospital stay, shorter catheterization time, overall cost saving, high patient satisfaction and practicably successful even with large size prostate glands if done according to the specific guidelines. More investments should be made in developing countries to increase the rate of day case prostate surgery as found to have many benefits. Urologists can therefore consider bipolar resection or laser enucleation as an important means to achieve a successful same day discharge in selected and well-informed patients.

## 6. Conflict of Interest

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

## 7. Authors' contributions

The first author (Henry Kimbi Yisa) and second author (Lioa Yun Fen) have given substantial contributions to the conception or the design of the manuscript, the third author and fourth author to acquisition, analysis and interpretation of the data. All authors have participated to drafting the manuscript, the first author revised it

critically. All authors read and approved the final version of the manuscript. All authors contributed equally to the manuscript and read and approved the final version of the manuscript.

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