

Prostrate-specific antigen level following 120W Green light High Performance System Laser Photoselective Vaporisation Prostatectomy (PVP) & its efficacy and safety of PVP in Benign Prostatic Hyperplasia(BPH)

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Abstract

Background: The Green Light Laser HPS 120W is a widely used procedure nowadays. The latest machines offer major improvements on the first prototypes in terms of speed, efficiency, safety and total PSA and f/t PSA ratio changes postoperatively in BPH patients after using GREENLIGHT HPS 120W.

Objectives: The objective of this study was to analyse the safety, and efficacy of the new technology, the HPS- 120W Green Light Laser in the management of patients who were symptomatic because of BPH postoperatively

Patients and methods: A total of 38 patients who underwent the Green Light Laser PVP at our institution were studied. Serum prostrate-specific antigen level changes were observed postoperatively after 1 month.

Results: The average age of the patients was 63.93 years, range 58-72. The Total average IPSS score was 21.88, range of 18-27. The average PSA level of patients in our study after 1 month was 2.25ng/dl and prostate size of 65.82ml. An average IPSS score measured after 1 month of surgery was 10.05 with a range of 7-13, drop in IPSS score was 11.83 (21.88-10.05) while the average PVR measured after 1 month of surgery was 29.82ml with a range of 18-45ml and average Q max measured after 1 month of surgery was 20.55ml/s with a range of 17.8-24.7ml/s, an increase in Q max was 12.56ml/s (20.55-7.99).

Conclusions: Our study shows that the Green Light HPS 120W Laser is safe and efficacious for the management of BPH.

Keywords: Green Light; 120W; BHP; PSA.

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Introduction

Benign prostatic hyperplasia (BPH), also known as benign prostatic hypertrophy, maybe a histologic determination characterized by the multiplication of cellular components of the prostate. Half of the men in the 6th decade of life exhibit histologic signals of BPH, and almost 90% of men develop histologic BPH by the ninth decade of life (Wein et al., 2007). Manifestations of BPH include urinary frequency, urgency, nocturia, and poor stream. Patients may land up with acute or chronic urinary retention, causing secondary effects, such as renal insufficiency and repeated urinary tract infections (UTIs).

Treatment for BPH is either medical or surgical. The medical treatment does alleviate the symptoms of BPH and may slow progression, but many patients do not respond adequately to medical intervention alone (Wein et al., 2007). Surgical treatment consists of surgery to remove the enlarged prostate gland through a variety of approaches, including open, laparoscopic, or transurethral.

As of now, the standard for the management of BPH is electrocautery-based transurethral resection of the prostate (TURP). TURP in any case, is related to complications and undesirable effects, counting fluid absorption, electrolyte imbalance, intraoperative and postoperative bleeding, and insufficient resection. This has driven the improvement of more secure and more compelling options for treatment. Laser therapy assured numerous advantages over standard TURP, including minimization of complications such as intraoperative fluid absorption, haemorrhage, retrograde ejaculation, erectile dysfunction, and

urinary incontinence. The laser treatment does not require a longer hospital stay and recovery is also fast.

Theoretically, laser prostatectomy treats larger glands with less physiologic stress due to the absence of bleeding and irrigant absorption signifying a role for laser treatment in patients with a high burden of coexisting medical disease. Recent estimates suggest an increasing number of practicing urologists are already performing laser prostatectomies on patients with symptomatic BPH and this number is certain to continue increasing (Lee R et al 2006).

The Green Light Laser was first studied in the 1990s on animals and approved for human use in the early part of the last decade. It quickly evolved from 60W to 80W and then to 120W, and the latest machines offer great improvements on the prototypes in terms of speed, efficiency, safety, energy delivered, and outcomes. The model of the Green Light Laser is the HPS 120W, which is the machine used in this study. In this study, we also studied how total PSA and f/t PSA ratio change with time in patients suffering from BPH after using GREENLIGHT HPS 120W. Only limited perioperative and postoperative data on the use of HPS 120W from Indian institutes. This study is an attempt to add to that knowledge. The objective of this study was to analyze the safety and efficacy of the new technology, the HPS- 120W Green Light Laser in the management of patients with BPH & to determine how serum total PSA and f/T PSA level changes after using GREENLIGHT HPS 120W postoperatively after 30 days, 60 days, 180 days and 240 days.

We intended to analyze the pre-, peri-, and post-operative characteristics of the patients who underwent this procedure at our hospital for us to accumulate international data on the safety, efficacy, and performance of the HPS-120W machine. To date, despite the size of India and the huge aging population which requires intervention for BPH, there are only a few published papers on HPS-120W Laser. It was the endeavor to provide data on patients and operative characteristics which may guide the use of this technology in the future.

Patients and Methods

Study characteristics: The type of study is a Prospective Single center study done in the Department of Urology, Jaslok Hospital & Research Centre, Mumbai, from October 2014- September 2015.

The machine used was GREENLIGHT HPS 120W (American Medical Systems, Minnetonka, MN, USA).

Methods

All data from the Laser PVP surgeries performed using GREENLIGHT HPS 120W (American Medical Systems,

Minnetonka, MN, USA) by surgeons in the Department of Urology, Jaslok Hospital, and Research Centre, Mumbai.

The inclusion criteria were all men undergoing Laser PVP for indications consistent with established guidelines (Kirby and Lepor, 2007) with an IPSS score >12 and prostate size < 80 grams. Exclusion criteria: History of prostate surgery, Patients with carcinoma of the prostate. Patients with large gland size (>80 grams), bladder dysfunction like Neurogenic bladder, bladder diverticula, and urethral stricture disease.

Department of Urology at Jaslok Hospital had performed around 200 cases of Green Light HPS Laser 120W before this study. Most surgeons would qualify as experts in this field based on their experience. According to the International Greenlight Users Group (IGLU) (Muirmet al 2008), the experienced PVP user has operated on 30 patients, while describing the training recommendations for PVP Laser.

A specialized 21F continuous-flow cystoscopic laser sheath with a 70-degree side-firing fiber with a 30-degree cystoscopic lens is shown in (Fig.1).

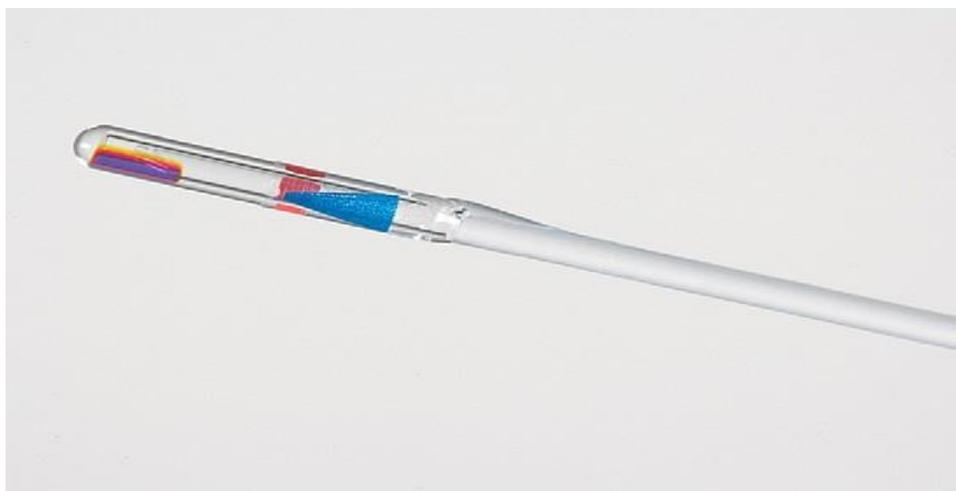


Fig 1 .Green Light HPS laser fibre(532nm)

A working channel was created at an 80W power setting and then increased to 120W power once sufficient space for working was available. The laser fibre was moved in an arc of 60° in paint brush fashion with fibre in near contact (0.5mm) to 3-4 mm from the tissue, avoiding direct contact with the gland.

Cystoscope manipulation was kept as minimum as possible to prevent trauma to the urethra. A laser fiber is kept at a distance from the scope so that the blue mark was visible all time, and the red aiming beam was directed at the targeted prostatic tissues. Green Light HPS 120W Laser screen shown in (Fig.2)



Fig 2 .Green Light HPS 120W Laser screen

Room temperature saline was used for intraoperative irrigation. After completion of the procedure and confirming hemostasis, 20F 3-way foleys were introduced. Intraoperative characteristics like operation time, losing time, and energy used by each patient were recorded. Perioperative

complications were noted for each patient. Postoperative irrigation was given to all patients and reviewed at 6 and 24 hours. For patients on antiplatelet drugs, irrigation continued for 24 hours. Photoselective vaporization of the prostate is shown in (Fig.3).

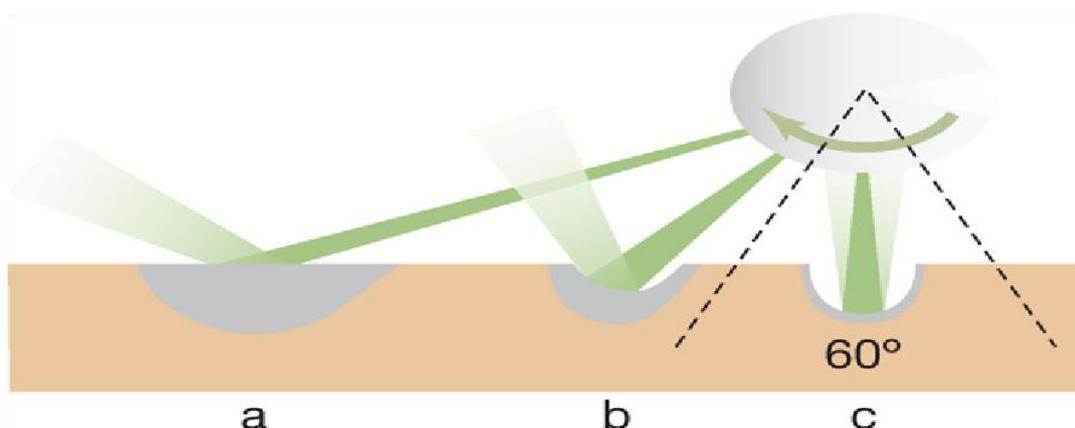


Fig. 3 .Photo selective vaporization of the prostate. The fibre should be rotated in a sweeping fashion with rotation amplitude reduced to an arc of 60° (c). This avoids an increase in the distance from the fibre to the tissue, which would produce an oblique light footprint, reduce vaporization efficiency, increase reflection of light, and increase coagulation (a, b) (Muir, Gordon et al 2008).

Relationship between the cystoscope and the laser fibre is shown in (Fig.4). Schematic showing the modular approach to vaporization of the prostate with the Green Light HPS laser is shown in (Fig.5) GreenLight HPS 120W Laser

Machine, shown in (Fig.6). Dual pedal with vaporization pedal (yellow, left) and coagulation pedal (blue, right) shown in (Fig.7). Intraoperative Procedure Shown in Fig.8-13.

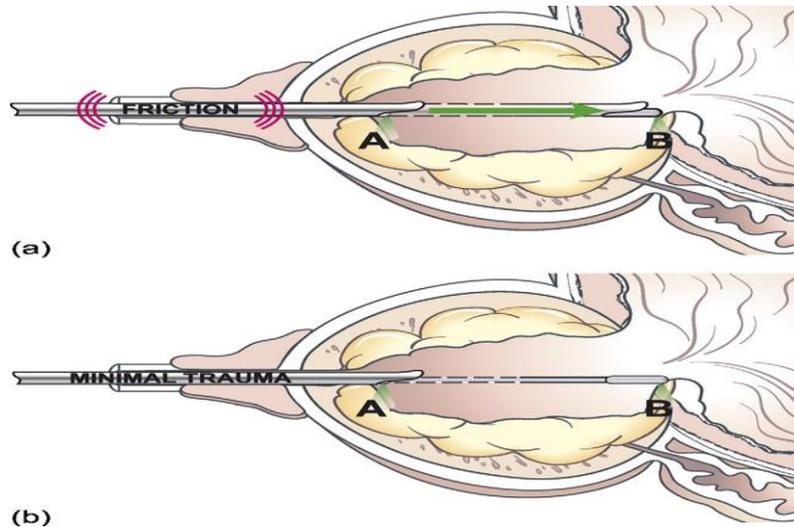


Fig. 4 .Relationship of the cystoscope and the laser fibre: (a) moving the whole cystoscope to go from point A to B while keeping the fibre and cystoscope in close proximity can result in friction; (b) moving the fibre from point A to B while keeping the cystoscope static can minimize trauma to the gland. # IGLU Group (Muir, Gordon et al 2008).

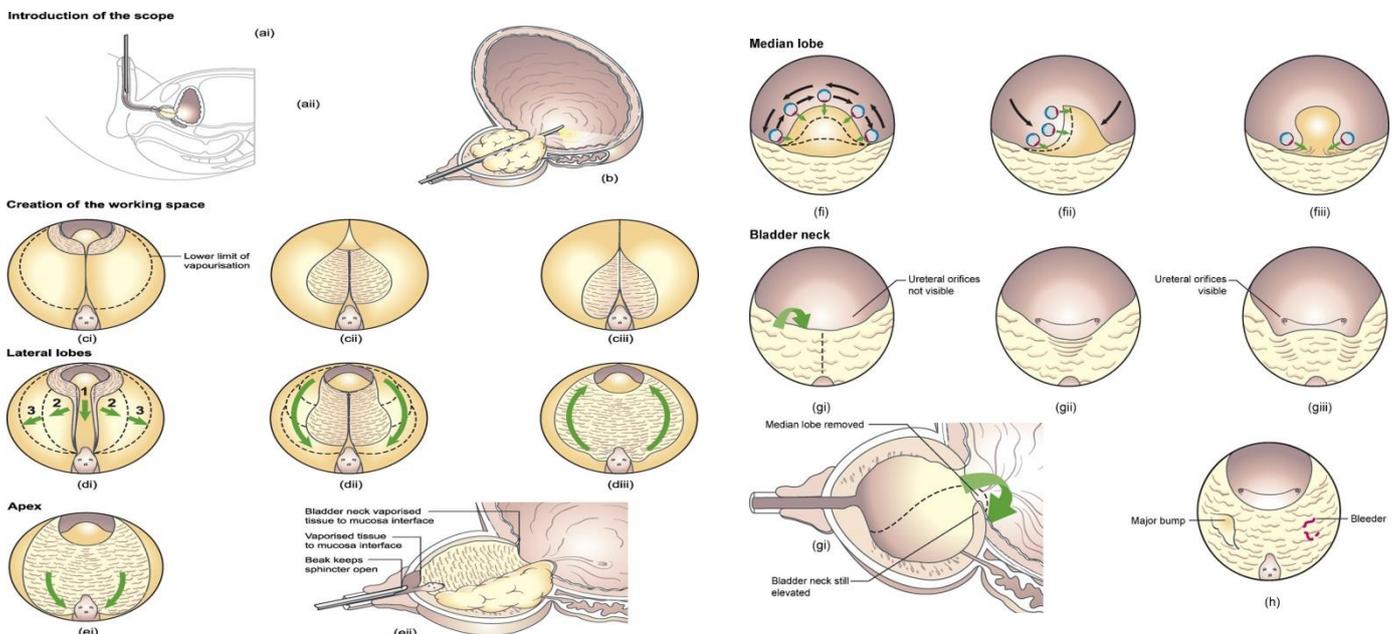


Fig. 5. Schematic showing the modular approach to vaporization of the prostate with the Green Light HPS laser. (a) Introduction of the cystoscope: (i) always look at the anterior urethra (the beak is not visible), (ii) trying to see the whole lumen of the urethra risks damaging it. (b) Careful cystoscopy is conducted to visualize the ureteral orifices and rule out bladder tumours; if the middle lobe is large, then pushing down on it may cause bleeding. (c) Creation of the working space: (i) the anterior start, (ii) central spiral technique, (iii) posterior start. (d) Clearance of the lateral lobes: (i) midline to lateral direction, (ii) descending direction, (iii) ascending direction. (e) The apex: (i) endoscopic view showing the solitary veru montanum, (ii) lateral view.

(f) The middle lobe can be approached in several ways: (i) progressive flattening using the laser in a rotating fashion around and aiming towards the centre of the middle lobe to avoid damaging the ureteral orifices, (ii) sideways lasering, (iii) lasering at the base to enucleate and extract a small middle lobe. (g) The bladder neck: (i) there is still a step down to the trigone; if the urethral orifices are not seen, then a midline incision is made to the circular fibres, (ii) urethral orifices are now revealed, (iii) if the urethral orifices are visible, a bilateral incision opens the bladder neck, (iv) bladder neck still elevated after removal of middle lobe. (h) Final steps: check that no major lumps protrude into the lumen, no bleeders remain, and the cavity remains open when the bladder is empty. # IGLU Group (Muir, Gordon et al 2008).



Fig 6. GreenLight HPS 120W Laser Machine

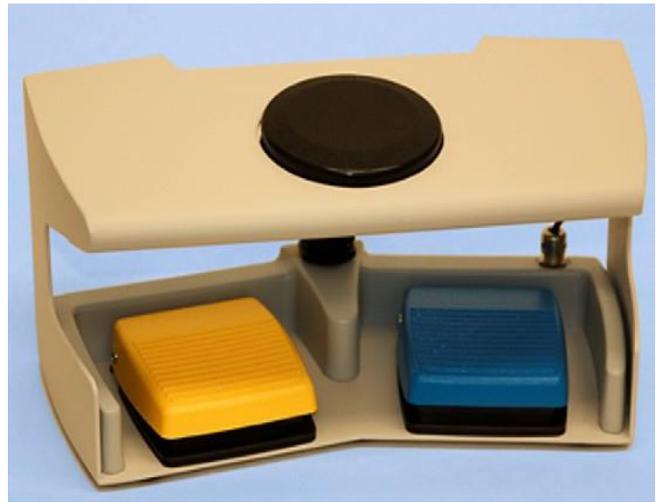


Fig 7. Dual pedal with vaporization pedal (yellow, left) and coagulation pedal (blue, right).

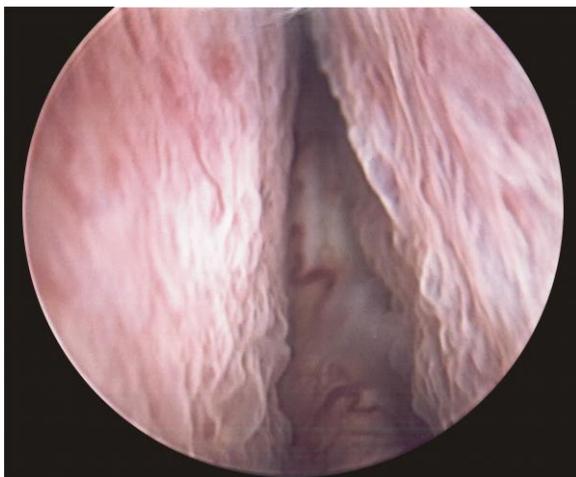


Fig 8. Enlarged Prostate before HPS Laser PVP

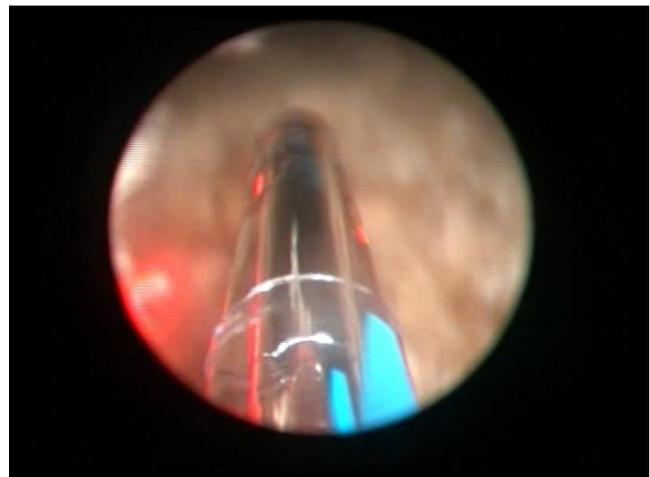


Fig 9. Creation of working channel

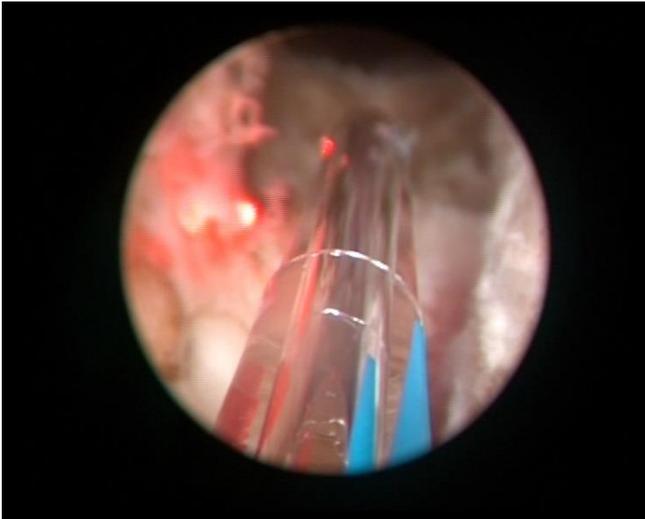


Fig 10. Lateral lobe vaporisation

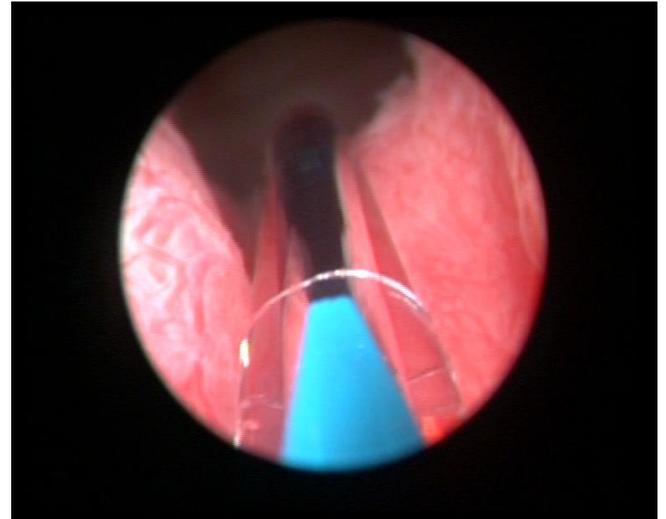


Fig 11. Apical lobe vaporisation

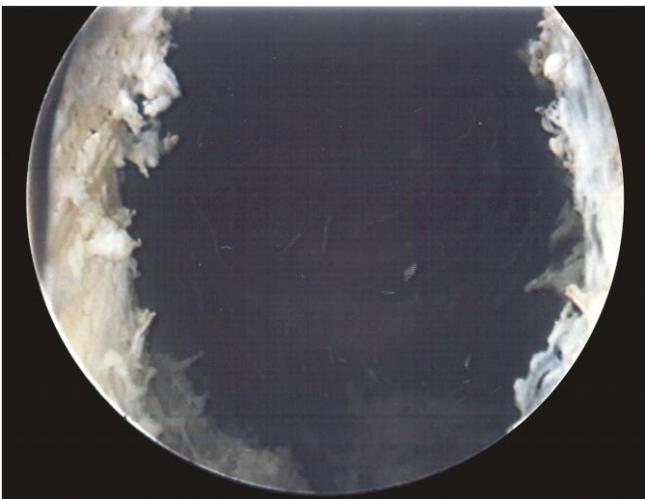


Fig 12. Wide open Prostatic fossa immediately after completion of procedure



Fig 13. Good urine flow seen on table after procedure

Postoperative care

All patients were admitted and stayed overnight in the hospital. Any complication, delay in catheter removal, post-catheter removal retention, or other events were recorded.

Follow up characteristics

All patients followed up after 1 month with IPSS score, Qmax (flow rates), PVR(post-void residue), and all three parameters were compared with respective preoperative values.

Results

Number of patients

A total of 38 patients underwent the Green Light Laser PVP at our institution between October 2008 and September 2009 who met the criteria of inclusion in our study – namely documented LUTS due to benign prostatic hyperplasia with IPSS score >12 (see **Appendix I**) and prostate gland size <80 gms.

Age

The average age of the patients was 63.93 years, range 58-72.

Symptoms

Patients presented due to LUTS. They were evaluated using the IPSS score. (see **Appendix I**) The Total average IPSS score was 21.88, range of 18-27. A total of 5(13.1%) patients had a history of acute urinary retention so no IPSS was available for them. Among these 5 patients, the average duration of catheterization was 34 days, with a range of 28-40 days.

Diabetes

Ten (26.3%) patients had Diabetes, and 28 patients were non-Diabetic.

Heart disease and hypertension

Twelve patients (31.6%) had documented heart disease. Fifteen (39.5%) out of 38 patients were hypertensive.

Antiplatelet medication

A total of 13 patients (34.2%) were on antiplatelets. Seven patients (18.4%) were taking acetylsalicylic acid (Aspirin) in antiplatelet dose. Three patients (7.9%) took clopidogrel alone and three patients (7.9%) took both while the remaining 25(65.8%) were not on any anticoagulant drugs.

Examination findings

None of the patients had palpable bladder on examination in the hospital. The DRE (Digital rectal examination) findings of patients in this study were not suspicious of malignancy. A total of 3 patients (7.89%) had Grade I prostatomegaly (upper border of prostate easily reached), 29(76.3%) had Grade II prostatomegaly (the upper border is reached with difficulty) and 6(15.78%) had Grade III prostatomegaly (upper border not reached).The size of the prostate for each grade I was 37.33 ± 2.08 gms, grade II was 55.24 ± 4.42 gms and grade III was 76.66 ± 4.41 gms after Ultrasonography.

Investigations

The hemoglobin (Hb) levels for the patients ranged from 10.2 g/dl – 15.1 g/dl with an average of 12.72 g/dl. The average platelet count was 229,000/dl (Range 192,000/dl-361,000/dl). Serum creatinine levels averaged 1.11mg/dl, with a range of 0.8mg/dl-2.1mg/dl. Urine culture was negative in all patients. (3 patients' culture was positive which was treated with appropriate antibiotics before admission and admitted only after the culture was negative).

PSA levels

In this study, the mean PSA before surgery was 7.37 ng/mL. 30 days after using GREENLIGHT HPS 120W, it decreased to 2.25 ng/mL. After 60 days, it was decreased to 1.93 ng/mL, stabilizing at this level until day 180 (1.85 ng/mL) and maintained until 240 days with (1.83 ng/dl).

Before surgery, the mean f/t PSA ratio was 17.9%, it changed to 18.1 % on day 30 after using GREENLIGHT HPS 120W, 18.5 % on day 60, 21 % on day 180, and 20% on day 240. There was no significant difference between preoperative and postoperative f/t PSA ratios. The average size of the prostate gland was 65.82gms, with a range from 35-80 gms.

Post-void residue (PVR) and Flow rate (Qmax)

The average post void residue (PVR) was 103.1ml with a range of 77-230ml. Urine flow rate (Qmax) ranged from 6.8-9.4ml/s with an average of 7.99ml/s. 5 patients' Qmax was not available as they were catheterized due to acute urinary retention and admitted with the catheter in situ.

American Society of Anaesthesiologists (ASA) Grade

ASA grade was measured according to the anaesthesiologist. 28 patients (73.6%) were ASA Class III and 10(26.4%) were ASA Class II.

Surgery characteristics

Anaesthesia

Twenty-five (65.78%) patients underwent the procedure under general anaesthesia (GA) while the remaining thirteen patients (34.2%) under spinal anaesthesia (SA).

Duration of surgery

The average duration of surgery was 100 minutes or 1 hr 40 mins, including anesthesia time. The range was 60 – 120 mins or 1- 2 hrs.

Lasing time and energy used

The average lasing time was 53.2 minutes per case with a range of 28 -72 minutes. The average energy used across all cases was 220.8 KJ, ranging from 135KJ to 265 KJ.

Post-operative characteristics

In all patients, there was mild haematuria post-operatively. In one patient (2.63%) irrigation had to continue for more than 24 hours. He was not on either Aspirin or Clopidogrel. In 35 patients (92.1%) irrigation was for 24 hours while in 2 patients (5.2%) for 6 hours.

Length of catheterization (LOC)

The average length of catheterization (LOC) was 1.42 days or 34.8 hours. Twenty-three (60.5%) patients had their catheters removed on Day 1, fourteen (36.8%) had their catheters removed on Day 2 and 1 (2.68%) had their catheters removed on Day 3. No patient was post-Operatively catheterized beyond 3 days unless the catheter had been removed and the patient was re – catheterized because of retention. Three (7.9%) patients did not pass urine after removal of the catheter, they required re-catheterization and discharged. All 3 patients had severe dysuria (known complication of PVP) leading to retention of urine. All these 3 patients passed urine subsequently when catheter-free trial was given after 7 days on an OPD basis.

Other characteristics

Dysuria was reported by 4 (10.52%) patients [Modified Clavien System (CS) I] shown in **Table. 1**. Frequency (having to go to pass urine every < 2hours) was seen in 22(57.89%) (CS I), urgency (without bacteriuria, not treated) was seen in 20(52.6%)(CS I), retention in 3(7.89%)(CS I), gross haematuria in 1(2.64%)(CS I), urinary tract infection without sepsis in 1(2.64%)(CS I), incontinence(stress) in 1(2.64%)(CS I).

Table 1. Surgical complications based on the modified Clavien system based on (CharalamposMamoulakis et al 2010)

Modified Clavien system Grading	Complications	Number of patients
Grade I	Dysuria	4
	Frequency	22
	Urgency	20
	Haematuria without clot retention	1
	Clot retention with catheter in situ	0
	UTI without sepsis	1
	Urinary retention post-operatively in patients with bladder catheter previously	1

		Urinary retention post-operatively in patients without bladder catheter previously	2
		Stress Incontinence managed with physiotherapy	1
Grade II		Blood transfusion	0
		Storage symptoms requiring treatments on discharge	9
		Sepsis	0
Grade III		Cystoscopy for clot or debris removal	0
		Gross haematuria requiring cystoscopy	0
Grade IV	a	Acute Renal Failure	0
	b	Severe sepsis with multi-organ failure	0
Grade V		Death	0

Retention was managed with catheterisation, gross haematuria without clots was managed by prolonging irrigation along with traction, urinary tract infection without sepsis was managed with appropriate antibiotics, and incontinence(stress) was managed with physiotherapy.

No patient required a blood transfusion. No patient developed symptoms of confusion, blurred vision, or altered state of consciousness suggestive of TURP syndrome. No patient required cystoscopy for washing of clots or debris postoperatively. No patient developed clot retention with the catheter in situ.

Length of stay (LOS)

Mean admission duration was 2.92 days(range:2-5days). No patient stayed longer than 5 days postoperatively. Most (26, 68.4%) patients were admitted the day before surgery. 12(31.6%) were admitted on the day of surgery and the average length of stay was 2 days in this group.

One Month follow-up parameters

IPSS Score

An average IPSS score measured after 1 month of surgery was 10.05 with a range of 7-13. The drop in IPSS score was 11.83(21.88-10.05).

Post void residue (PVR)

An average PVR measured after 1 month of surgery was 29.82ml with a range of 18-45ml.

Flow rate (Qmax)

An average Qmax measured after 1 month of surgery was 20.55ml/s with a range of 17.8-24.7ml/s. An increase in Qmax was 12.56ml/s (20.55-7.99).

Discussion

Age

The average age of the patients in our study was 63.93 years with a range of 58-72 years. Comparison of Mean Age (in years) shown in(**Table .2**).

Symptoms

We evaluated and scored the LUTS of our patients based on the IPSS score (see **Appendix I**). The average IPSS score in our patients was 21.88. In the study by (**Spaliviero et al.,2009**) the average IPSS score was 22, with a range of 9-33 in the studied 70 patients. It compares favourably with our study. However, in the study by (**Alivizatos et al., 2008**) the average IPSS score was 20, which is lower than our study while in the study by (**Bouchier-Hayes et al.,2006**) the average IPSS score was 25.7, which was higher than our study

Table 2. Comparison of Mean Age(in years)

Series	Mean age(in years)
Al-Ansari et al (2010)	66.3
Bouchier- Hayes et al (2006)	65.2
Spaliviero M. et al (2009)	67

History of retention

In our study, a total of 5 (13.1%) patients had a history of retention. This compares with (Al-Ansari et al .,2010) in which 10% in 120W HPS Laser group while 8.3% in TURP group had a history of catheterisation. In the study by (Capitan et al.,2011) the number of patients with pre-op catheterisation in the cohort (50 patients) who underwent Green Light HPS 120W laser PVP was 12 (24%).

Antiplatelet medication

A total of 13 patients (34.2%) were on antiplatelets. Seven patients (18.4%) were taking acetylsalicylic acid (Aspirin) in antiplatelet dose. Three patients (7.9%) took clopidogrel alone and three patients (7.9%) took both. In all the patients, medication was continued up to the day of surgery, and after the surgery as well. In all patient's irrigation was continued for 24 hrs, no patient required >24 hours of irrigation. No patient required blood transfusion perioperatively in our study. One patient in our study required >24 hours of irrigation due to haematuria and managed conservatively, was neither taking Aspirin nor Clopidogrel. This compares well with a study by (Ruszat et al .,2007), wherein 61% were on Aspirin, 7.8% were on Clopidogrel and 31% were on coumarin derivatives. While comparing patients on ongoing anticoagulation with the control group (not on any anticoagulant drugs), they observed no clinically significant intraoperative bleeding, and no blood transfusions were required.

PSA level and prostate size

In this study, the mean t PSA before surgery was 7.37 ng/mL. 30 days after using GREENLIGHT HPS 120W, it decreased to 2.25 ng/mL. After 60 days, it was decreased to 1.93 ng/mL, stabilizing at this level until day 180 with (1.85 ng/mL) and maintained until 240 days with (1.83 ng/dl) with slight variation. The average size of the prostate gland was 65.82 gms, with a range from 35-80 gms.

The average t PSA level of patients in our study was 2.25ng/dl. In the study by (Al-Ansari et al .,2010) the average PSA was 2.6 ng/mL and prostate size was 61.8 gms in the cohort who underwent HPS 120W. The PSA level and prostate size in the study by (Ruszat et al .,2007), were 3.9 ng/mL and 62 gms respectively. In the study by (Spaliviero et al.,2009) the PSA level was 1.4 ng/mL while the prostate size was 61.6 gms. The PSA levels and prostate sizes amongst our patients are comparable to those in other studies.

PVR and Qmax (flow rates)

In our study, the average PVR was 103.1ml while the average Qmax was 7.99ml/s preoperatively. In the study by (Ruszat et al .,2007) preoperative PVR and Qmax were 128 and 8.1 respectively. While in the study by (Al-Ansari et al .,2010) preoperative PVR was 53.2 and Qmax was 6.9.

Comparison of Operative characteristics shown in(Table.3).

In our study, the average duration of surgery was 100 minutes with an average

lasing time of 53.2 minutes and the average energy used was 220.8 KJ. In the study by (Al-Ansari et al., 2010) operation duration was 89 minutes, and lasing time and energy used were not recorded in this study. In the study by (Capitan et al., 2011) the average operation duration was 54.13 minutes, lasing time of 36.5 minutes, and

average of 238.4KJ energy was used. While (**Ruszat et al., 2007**) in their study found the average duration of operation was 67 minutes with 221KJ energy used, lasing time was not recorded separately. Our study compares favourably with these studies.

Table 3. Comparison of Operative characteristics

Series	Prostate size (Gms)	Duration of operation (minutes)	Lasing Time (minutes)	Energy used (KJ)
Al-Ansari et al(2010)	61.8	89	Not Available	Not Available
Ruszat R. et al (2007)	62	67	Not Available	221
Capitan C. et al (2011)	51.29	54.13	36.5	238.4
Present study	62.82	100	53.2	220.8

Length of catheterisation (LOC)

The average LOC in our study was 1.42 days or 34.8 hours. This compares favourably with the study by (**Al-Ansari et al., 2010**) in which the average duration of the catheter was 1.4 days. (**Alvizatos et al., 2008**) found the average LOC as 24 hrs or 1 day. In the study (**Ruszat et al., 2007**) the average LOC was 1.8 days.

Comparison of Post-operative Complications shown in (Table 4).

In our study dysuria was reported by 4 (10.52%) patients [Modified Clavien System (CS) I]. retention in 3(7.89%) (CS I), gross haematuria in 1(2.64%)(CS I), urinary tract infection without sepsis in 1(2.64%)(CS I), incontinence(stress) in 1(2.64%)(CS I). No CS III, IV, V complications were seen in our study. This compares favourably with the studies by (**Woo H. et al., 2008**), (**Ruszat et al., 2007**), and (**Spaliviero et al., 2009**) as follows:

Table 4. Comparison of Post-operative Complications

Events	Woo H. et al(2008)	Spaliviero M. et al(2009)	Ruszat R. et al (2007)	Our study
Hematuria	0%	1.4%	Not Available	2.64%
Intra-operative bleeding	2.6%	0%	13%	0%
Dysuria	2.6%	0%	18%	10.52%
UTI	4.3%	4.3%	15%	2.64%
Incontinence	0.7%	0%	0%	2.64%
Recatheterisation	4.6%	2.9%	8%	7.89%
Blood transfusion	0%	0%	0%	0%
TURP syndrome	0%	0%	0%	0%
Re-operation	0.7%	0%	1.6%	0%

Length of stay (LOS) is shown in (Table.5)

The average LOS was 2.92 days in our study, more than the average of almost 24 hours in the study of (Alivizatos et al., 2008). It compares favorably with the study by (Ruszat et al .,2007), with an

average LOS of 3 days in patients with an anticoagulant medication arm. In the study by (Bouchier- Hayes et al .,2006) , the average stay was 1.08 days, which is far less than seen in our study. (Al-Ansari et al .,2010) in their study found an average stay of 2.3 days.

Table 5 . Comparison ofLength of Stay (LOS)

Series	LOS (days)
Alivizatos G. et al (2008)	2
Ruszat R. et al (2007)	3
Al-Ansari et al(2010)	2.3
Bouchier- Hayes et al (2006)	1.08
Our study	2.92

Follow up parameters

Reduction in IPSS score

In our study, an average IPSS score measured after 1 month of surgery was 10.05 with the average reduction in IPSS score was 11.83(21.88-10.05). In the study by (Alivizatos et al., 2008), a 1month follow-up IPSS score was 12 with an average reduction of 8(20-12). (Spaliviero et al.,2009) also found a

reduction in IPSS score after 1 month by 16 with 1 month follow up IPSS score of 6(22-6). (Al-Ansari et al .,2010) found a reduction in IPSS score by 14.6(27.2-12.6), while (Capitan et al.,2011) found a reduction in IPSS score by 11.64(23.52-11.88), favourably comparing with our study. Comparison of Reduced IPSS in Different Studies shown in Fig.14 & Reduction in IPSS Score shown in Fig.15.

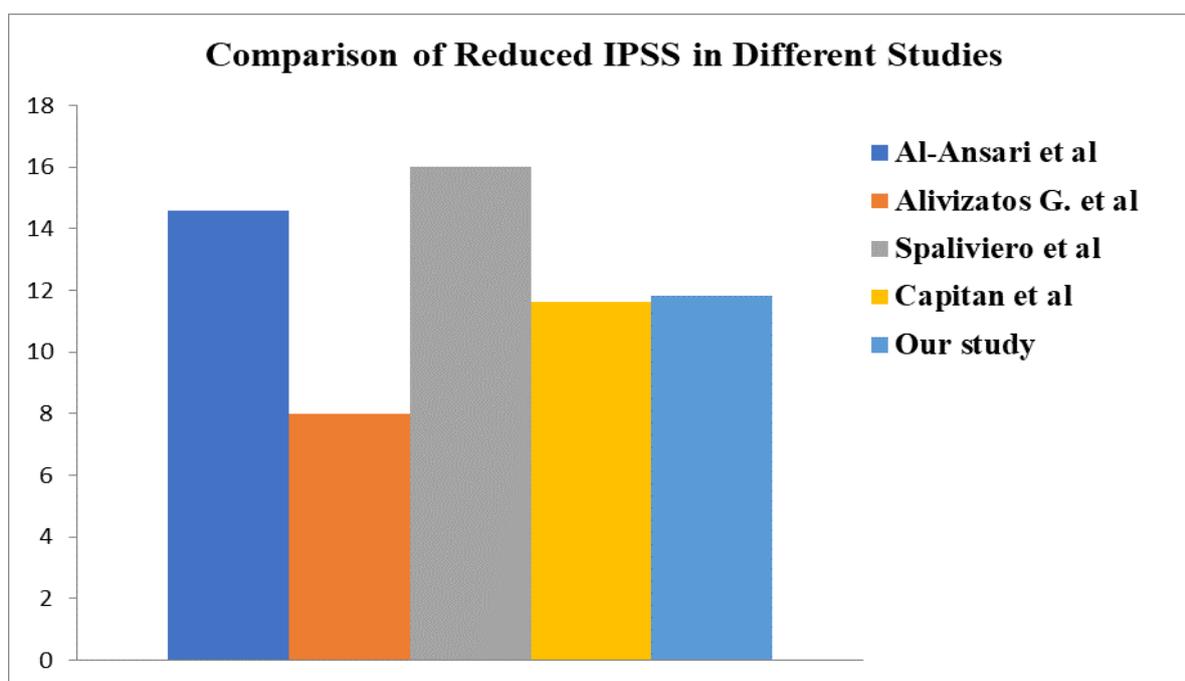


Fig 14. Comparison of Reduced IPSS in Different Studies

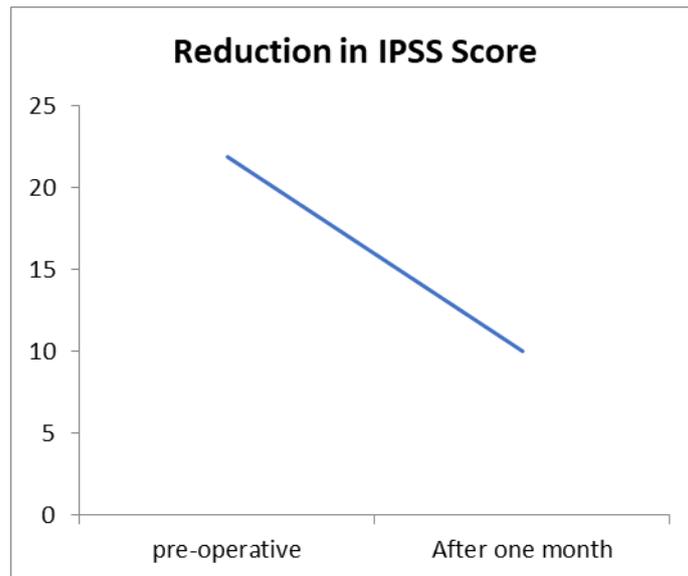


Fig 15. Reduction in IPSS Score

Increase in Qmax (flow rate)

In our study, an average Qmax measured after 1 month of surgery was 20.55ml/s with an increase in Qmax was 12.56ml/s (20.55-7.99). In the study by (Al-Ansari et al., 2010) found an average Qmax of 20.9 after 1 month follow-up with an average increase by 14(20.9-6.9). (Capitan et al., 2011) also found an average increase in Qmax after 1 month was 11.76 (20.64-8.88). (Spaliviero et al., 2009) also found a similar increase in Qmax by 10.9 (20.3-9.4) at 1 month follow-up. These values compare favourably with the results of our study. In the study by (Alivizatos et al., 2008), they found an increase in Qmax of

4.8 at 1 month which further increased to 7.2 with Qmax of 16 at 3 months follow-up.

Comparison of Increased Qmax in Different Studies shown in Fig.16 & Increased Qmax in our study shown in Fig.17

PVR at 1 month

In our study, an average PVR measured after 1 month of surgery was 29.82ml. It compares favourably with the study done by (Spaliviero et al., 2009) with PVR after 1 month follow up was 31. Studies were done by (Al-Ansari et al., 2010) and (Alivizatos et al., 2008), also found PVR after 1 month of 38.7 and 25 respectively.

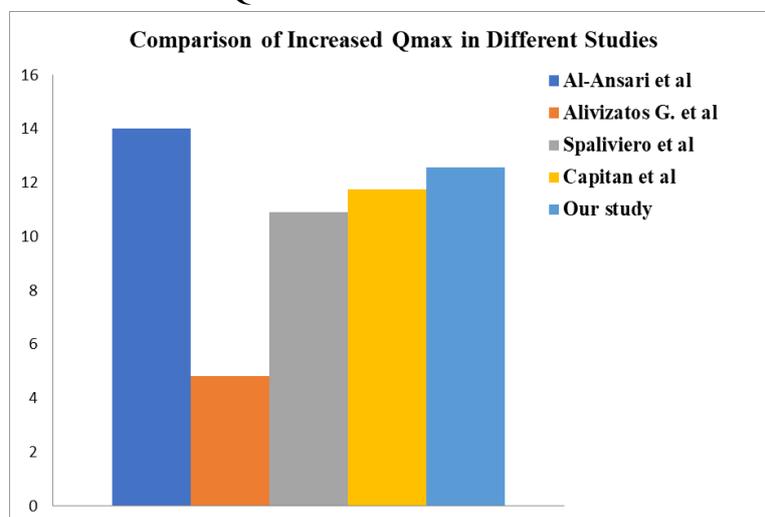


Fig.16. Comparison of Increased Qmax in Different Studies

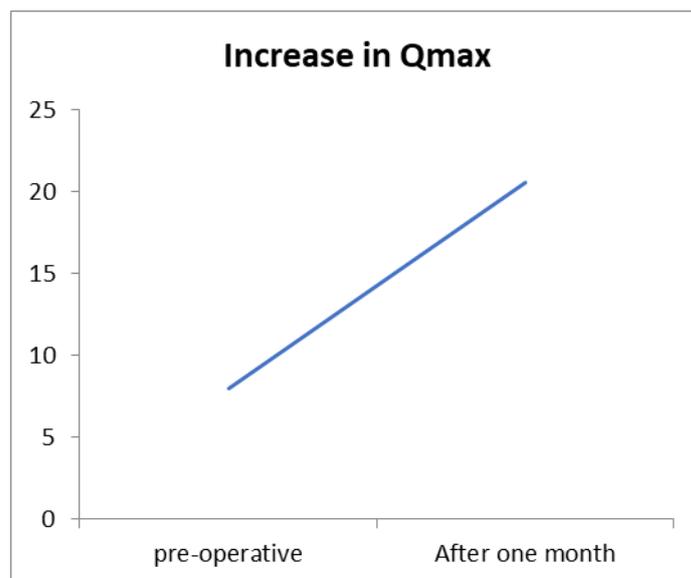


Fig.17. Increased Qmax in our study shown in

Conclusion

In our study, both the safety and efficacy of HPS 120W Laser are studied. Safety is measured in terms of complications, hospital stay, and blood transfusion while efficacy is measured by both subjective parameters of IPSS score and objective parameters of flow rates (Qmax), PVR(post-void residue) taken preoperatively and after 1 month postoperative follow up.

Our study shows that the HPS 120W is safe, efficacious, and can be used in the treatment of patients with LUTS due to BPH. Rates of haematuria, postoperative retention, blood transfusion, incontinence, and other complications are low.

It has also demonstrated its safety and efficacy in patients who are on anticoagulants even up to and during the surgery.

The HPS 120W machine is considered an improvement over the 80W KTP Laser machine. This study did not compare the outcomes of 80W KTP and 120W HPS, but based on published data and data acquired by this study, it has been shown that HPS 120W reduces lasing

time, and operative time, thus improving efficacy and potentially reducing costs.

Since our sample size was small (38 patients), non-randomized prospective single center (Jaslok Hospital & Research Centre, Mumbai, India) study, further studies are recommended to confirm what has been observed in this study and to compare outcomes in a randomised form with TURP.

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