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A comparative study between HoLEP and bipolar TURP in the treatment of benign prostatic hyperplasia

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Abstract

Introduction: Benign Prostatic Hyperplasia (BPH) is one of the most frequent diseases in men. The laser treatment for BPH has challenged TURP due to advances in laser technology, a better understanding of tissue-laser interactions and rowing clinical experience.

Objective: To evaluate the safety and efficacy of HoLEP, comparing it to Bipolar TURP.

Material and methods: This was a prospective study to evaluate the outcomes in BPH patients undergoing surgery by HOLEP and Bipolar TURP done between January 2018 to December 2019. A total of 80 Patients were enrolled, 40 undergoing HoLEP and the other 40 Bipolar TURP for BPH. The procedures were performed by a single surgeon. All patients with symptomatic BPH and who were candidates for surgical treatment were included. Patients with previous prostate surgery, urethral surgery, history of prostate cancer or neurogenic bladder were excluded.

Results: Baseline parameters were almost similar between both the groups in terms of age, IPSS, QOL, Q max, PVR, and gland size. Operative time and resected gland weight were more in HoLEP arm ($p<0.001$). Catheter time and Hospital stay were significantly low in the HoLEP group ($p<0.0001$). Hemoglobin drop was not significant ($p=0.148$). IPSS at three months was similar in both groups ($p=0.608$). Qmax improved significantly in both groups, with 18.87 ml/s in TURP and 17.87 ml/s in HoLEP with a p-value of 0.261. PVR and QOL were similar between the two groups ($P=0.914$ and $P=0.781$).

Conclusion: Both Bipolar TURP and HoLEP were effective in relieving BOO. HoLEP has equal efficacy compared to conventional bipolar TURP, with decreased hospital stay and catheter indwelling time. The learning curve of HoLEP is steep; however, it can be overcome gradually.

Key words: benign prostatic hyperplasia (BPH), transurethral resection of prostate (TURP), holmium laser enucleation of prostate (HOLEP), international prostatic symptom score (IPSS), post void residue (PVR)

Introduction

Benign Prostatic Hyperplasia in males is a prevalent condition that has been associated with the physiological process of ageing. The prevalence among 70-year-old men is around 40%. Transurethral Resection of the Prostate (TURP) is the gold standard surgical procedure for BPH [1]. P. Gilling and M. Fraundorfer devised a method of holmium-laser resection of the prostate (HoLRP) in 1996, which was later modified to Holmium LASER Enucleation of the Prostate with the introduction of the Morcellator (HoLEP) [2]. Enucleation-transurethral resection of the prostate (e-TURP) is an evolution of the conventional TURP. As a true anatomical enucleation, it mimics open prostatectomy. The fence at the HoLEP is performed in the layer between the surgical capsule and adenomatous tissue.

In contrast to TURP, the prostate tissue is resected from center to periphery, and in this manner, the

vessels are opened again and again until the capsule level is reached. Because of developments in laser technology, a better knowledge of tissue-laser interactions, and significant clinical experience, the HoLEP laser therapy for BPH has challenged TURP. The holmium: YAG laser is a pulsed solid-state laser with significant advantages for endourological surgery. It has a wavelength of 2140nm, which permits it to be strongly absorbed by tissue water, resulting in fast vaporisation of exposed tissues at a depth of around 0.4mm and coagulation 3 to 4mm beyond the vaporisation surface. This results in a precise, bloodless field that prevents systemic fluid absorption [3]. HoLEP appears to be tough to learn and needs significant endoscopic expertise. The lengthy learning curve has hindered its popularity in the urological field [3].

This study is done to evaluate the safety and efficacy of Holmium Laser Enucleation of the Prostate (HoLEP), comparing it to Bipolar TURP.

Material and methods

This is a single-center, prospective, observational research to assess the results of BPH patients who underwent HoLEP or Bipolar TURP surgery between February 2018 and January 2019. The research included 80 patients receiving HoLEP and Bipolar TURP for BPH. All patients with symptomatic prostatic hyperplasia who were surgical candidates were included in the study. Patients having a history of prostate cancer, urethral surgery, or neurogenic bladder were excluded from the study. The local ethics committee authorized this study. After obtaining written informed permission, the patients were enrolled. Patients required to have subjective micturition complaints in the form of an AUA symptom score, maximal urine flow rate Q max in the uroflowmetry, and PVR to be evaluated in the research. To rule out any urinary tract infection, a comprehensive urine examination and urine culture were performed in the laboratory. If necessary, a significant urinary tract infection was treated preoperatively with antibiotic coverage. A serum PSA value exceeding 4 ng/ml and a striking digital rectal palpation were indications to carry out a TRUS guided 16 core biopsy when suspected. The patients who had a stricture of the urethra or prior prostate surgery, h/o urethral stricture, bladder tumor, or large bladder diverticula were excluded from the study. Perioperative factors assessed were age, international prostate symptom score (IPSS), peak flow rate (UFR), prostate volume and post-voiding residual urine (PVR). Intraoperative time, mucosal bladder injury, resected gland weight, any intercurrences were recorded. Postoperatively, hemoglobin drop, catheter indwelling time and hospital stay were noted. After 90 days, an assessment of IPSS, UFR and PVR was done.

Statistical analysis

MS Excel was used to enter data values, while IBM SPSS version 24.0 was used for statistical analysis. Data values for continuous variables were reported as mean and standard deviation. The Students t-test was performed to compare the mean differences between the two groups. All p-values less than 0.05 were deemed statistically significant.

Results

We enrolled 80 patients for the study, out of which 40 patients were in the HoLEP group and 40 patients in the TURP group.

Baseline parameters: In the study groups the mean age in TURP and HoLEP was 66.98 and 69.05 years respectively. Mean IPSS symptom score preoperatively was 25.85 in TURP group and 26.33 in the HoLEP group. Base line IPSS QOL was 5.05 in TURP group and 4.98 in HoLEP group. Base line Flow rate (Q max) was similar in both groups, 7.59 ml/s in in TURP and 7.15 ml/s in HOLEP group. Mean PVR in both the groups is comparable, with 195.75 ml in TURP and 197 ml in HoLEP group. Mean Prostatic volume measured pre-operatively by Ultrasound abdomen was higher in the HoLEP arm (52.1cc) compared to TURP (47.73cc) (Table 1).

Table 1 Comparision of base line parameters preoperatively in both study groups

	Base line Parameters	Group	N	Mean	Std. Deviation	p-value
1	Age (years)	TURP	40	66.98	9.47	.331
		HoLEP	40	69.05	9.50	
2	IPSS	TURP	40	25.85	4.817	.621
		HoLEP	40	26.33	3.668	
3	IPSS QOL	TURP	40	5.05	.504	.596
		HoLEP	40	4.98	.733	
4	Q max (ml/s)	TURP	30	7.59	2.22	.489
		HoLEP	33	7.15	2.73	
5	PVR (ml)	TURP	40	195.75	113.63	.966
		HoLEP	40	197.00	144.78	
6	Gland Size (grams)	TURP	40	47.73	15.66	.251
		HoLEP	40	52.10	18.06	

Mean operative time was higher in the HoLEP arm (66.5 mins) compared to TURP (52.03 mins). Resected gland weight was more in the HoLEP group (32.98 gms) compared to TURP (24.03 gms). Catheter indwelling time was comparatively less in the HoLEP arm vs TURP (3.17 vs 2.41 days). Total mean hospital stay was lesser in the HoLEP arm (3.13 days) compared to TURP (3.82 days). Hemoglobin loss was more in TURP than HoLEP (1.09 vs 0.91 gm/dl). Mean serum sodium change in TURP was 2.68 (meq/l) and in HoLEP it was 2.4 (meq/l).

The HoLEP arm had higher operating time and resected gland weight (p-value 0.001). The HoLEP group had considerably shorter catheter time and hospital stay (p-value 0.0001). The decline in hemoglobin was not significant (p=0.148), and the mean salt loss was equivalent to TURP (p=0.956) (Table 2, Figure 1).

Table 2 Comparision of operative and post operative parameters in both study groups

	Operative Parameters	Group	N	Mean	Std. Deviation	p-value
1	Operative time (minutes)	TURP	40	52.03	16.89	<0.0001
		HoLEP	40	66.50	18.33	
2	Resected Gland weight (grams)	TURP	40	24.03	11.84	.001
		HoLEP	40	32.98	11.27	
3	Catheter Time (Days)	TURP	36	3.17	.971	<0.0001
		HoLEP	37	2.41	.551	
4	Hospital Stay (Days)	TURP	40	3.82	.942	<0.0001
		HoLEP	40	3.13	.607	
5	Haemoglobin drop (gm/dl)	TURP	40	1.09	.65	.148
		HoLEP	40	.91	.44	
6	Sodium Change (meq/l)	TURP	40	2.68	1.61	.956
		HoLEP	40	2.70	2.38	

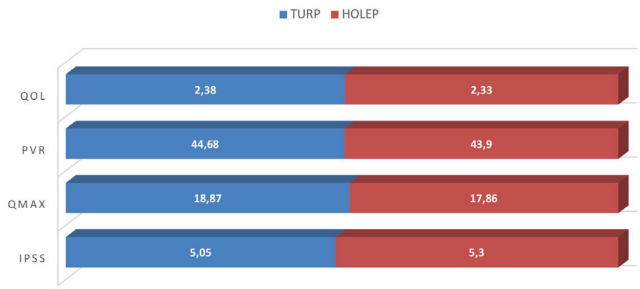

Figure 1 - Comparison of follow-up parameters at 3 months

Complications as graded by Clavien-dindo were comparable between the groups. We had 7 complications in TURP group of which 4 were Grade I, 2 were grade II and 1 was Grade III b complication. In the HoLEP arm we had 8 complications of which 5 were grade I, 1 was Grade II, and 2 were Grade III b complication. Clot retention with clots and stress leaks were considered Grade I, blood transfusion included in grade II, Re-surgery under anesthesia as Grade III b complication. Complications between the groups and was not statistically significant.

Follow up IPSS score at 3 months showed improvement in both groups (p-value = 0.608). Mean Q max was more in TURP than in HoLEP (18.87 vs 17.86 ml/s) with a p-value of 0.261. PVR post-operatively was similar in both the groups (p-value= 0.914). QOL improved in both the groups compared to pre-operatively (p-value=0.781) (Table 3, Figure 2).

Table 3 Comparision of follow up parameters at 3 months in Both study groups

	Follow up parameters	Group	N	Mean	Std. Deviation	p-value
1	IPSS	TURP	40	5.05	2.050	.608
		HoLEP	40	5.30	2.289	
2	Q max (ml/s)	TURP	40	18.87	3.65	.261
		HoLEP	40	17.86	4.34	
3	PVR (ml)	TURP	40	44.68	25.53	.914
		HoLEP	40	43.90	32.99	
4	QOL	TURP	40	2.38	.925	.781
		HoLEP	40	2.33	.656	

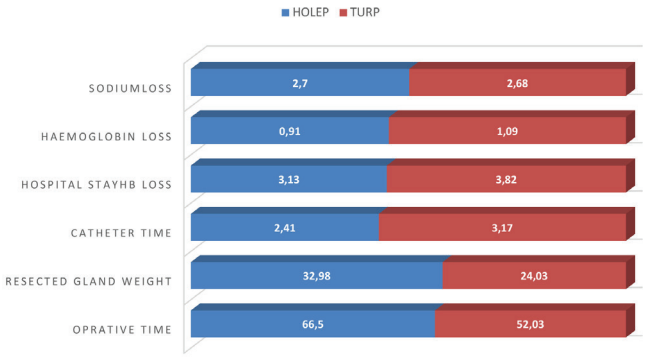

Figure 1 - Comparison of operative and post-operative parameters

Discussion

The present study is a clinical study of 80 cases, which were grouped into HoLEP and TURP, admitted in the urology department at our institute, from January 2018 to December 2019. Both the modality of surgeries was explained to patients, and the choice of surgery was decided by the patient. 40 cases were enrolled in each group and were analyzed and presented. In the study groups, baseline parameters like age, Q max, PVR, gland volume, IPSS and QOL were statistically comparable between both groups. In this study, we found symptomatic improvement of BOO in both groups; IPSS improved from 25.85 to 5.05 points in the TURP group and from 26.33 to 5.30 in the HoLEP group.

We observed the similar improvement in urine flow rate from 7.59 ml/s to 18.87 ml/s in the TURP group and from 7.15 ml/s to 17.86 ml/s in the HoLEP group at three months postoperatively. Operative duration and resected gland weight were longer in the HoLEP group than in the TURP group (p-value=0.0001 and p-value=0.001, respectively). Catheter indwelling duration (p-value=0.001) and hospital stay (p-value=0.024) were longer in the TURP group than in the HOLEP group. Hemoglobin drop and sodium loss in both groups were not significant (0.148 and 0.956). Complications, as graded according to the Clavien-Dindo system, were similar in both groups (p-value= 0.836). Follow up at three months with subjective IPSS and objective uroflowmetry was done. Q max, PVR were similar in both the groups at follow up with no significance obtained (p-value= 0.261, p=0.914).

At the follow-up, the IPSS score (p-value=0.717) and QOL (p-value=0.408) were not significantly different between the two groups. There is a considerable amount of literature on comparative comparisons of HoLEP and TURP, with multiple randomized trials indicating the perioperative benefits of HoLEP, the procedures superiority over TURP, with lower perioperative morbidity, improved effectiveness, and shorter catheter duration and hospital stay. At the 12-month follow-up, the results were comparable. Gilling et al. demonstrated that HoLEP is at least similar to TURP in the long run, with fewer re-operations required, in his longest, 7-year follow-up reported in 2011 on 61 patients, 31 in the HoLEP arm and 30 in the TURP arm [4]. Most of the studies have compared HoLEP with monopolar TURP. This makes a difference as the irrigations used in both the surgeries were different, normal saline in HoLEP whereas glycine in monopolar TURP. Studies on Bipolar TURP versus HoLEP, as in our study, are few. The irrigations used in both the surgeries were normal saline, and hence comparison between both the surgeries is more relevant. The baseline comparison of our study groups with other studies on bipolar TURP vs HoLEP is shown in (Table 4).

The sample size in our study was 40 cases of TURP and 40 of HoLEP. Studies in comparison are Fayad et al. [5] from Egypt did a prospective randomized study with a study group comprising of 30 patients each. Chen et al. [6] from china did a randomized study with a larger group comprising 140 patients each in both arms. Wilson et al. [7] from the UK did a retrospective study comparing TURP with HoLEP (425 vs 183). Imran mir et al. [8] from Pune, India, did a prospective study on 100 patients in each of Bipolar TURP and HoLEP arms. The mean age was 66.98 years in TURP vs 69.05years HoLEP in our study, whereas it is high in Chen et al. [6], Wilson et al. [7] study. Fayad et al. [5] study showed lower mean age than the present study (61.20 vs 60.06). Mean IPSS score was high in our study, compared to other studies. The mean Qmax was (7.59 vs 7.15), which was similar to all the study groups. Baseline gland size was comparatively smaller in our present study (47.73 grams vs 52.10 grams). In Fayad et al. [5] study, gland size was 80.60 vs 76.50, whereas, in Chen et al. [6], it was 60.31 vs 56.70, which was higher than the present study.

Various randomized studies on HoLEP demonstrated higher operative time than TURP and higher resected gland weight post-procedure. This is obvious as HoLEP involves

Table 4 Base line comparision of study groups with other studies on bipolar turp and holep (TURP versus HoLEP)

	Study	Year	Type of study	Sample size	Age	IPSS	Q max	PVR	Gland size
1	**Fayadet al[5]**	2011	Prospective Randomised	30 vs 30	61.20 vs 60.06	29 vs 27	6.98 vs 7.39	NA	80.60 vs 76.50
2	**Chen et al[6]**	2013	Prospective Randomised	140 vs 140	73.48 vs 72.11	23.27 vs 23.63	7.21vs 7.20	131.33 vs 128.16	60.31 vs 56.70
3	**Wilson et al[7]**	2013	Retrospective	425 vs 183	74 vs 72	NA	NA	NA	NA
4	**Imran mir et al[8]**	2017	Prospective observational	100 vs 100	NA	22.19	7.47	79.17	NA
5	**Present study**	2019	Prospective observational	40 vs 40	66.98 vs 69.05	25.85 vs 26.33	7.59 vs 7.15	195.75 vs 197	47.73 vs 52.10

removal of the larger gland, hence consumes more operative time and yields more resected weight. Our study also had a statistical significance in terms of higher operative time and higher resected gland weight in HoLEP. Comparatively, we had less operative time in our groups than other studies because of comparatively less mean baseline gland size in our groups. Operative time in our present study was 52.03 minutes vs 66.50 minutes in two groups.

HoLEP is advocated as having better hemostatic properties, and hence lesser irrigations and catheter indwelling catheter time are required, thereby decreasing hospital stay. Various randomized studies show a significant decrease in overall catheter indwelling time and reduced hospital stay favoring HoLEP. Catheter removal times were varied in multiple studies. We had a mean catheter removal at 3.17 vs 2.41 days in two groups. In other studies, Fayad et al. [5] catheter removal was at 24 hrs and 41 vs 48 hrs in Chen et al. [6] study. In Imran et al. [8], the mean catheter removal time was 2.52 vs 2.34 days. In the present study, we had a statistical significance in catheter indwelling time and hospital stays. Compared to other studies, we had a higher catheter indwelling time and hospital stay.

Studies are showing decreased haemoglobin loss in HoLEP, attributing to better LASER coagulation properties. Hemoglobin loss was significantly different in Chen et al., Wilson et al. study, Imran et al. study, Fayad et al. [5] study had no significant Haemoglobin loss. In our research, we had no considerable hemoglobin loss between the groups and the mean serum sodium change was also comparable between the groups.

Complications were graded in our study group based on modified Clavien-Dindo classification, and both the groups had similar complications and were not statistically significant [9]. Mamoulakis et al. [10] implemented the modified Clavien-Dindo classification system to standardize reporting complications in transurethral resection of the prostate in his study group of 198 patients reporting 44 complications and their grades. Also, Jong In Choi et al. [11] used the modified Clavien-Dindo classification for HoLEP surgeries and reported various grades in 402 patients. These studies have validated the classification system in endoscopic surgeries and found it an easily applicable tool for grading perioperative TURP complications.

Follow up in our study was done at three months with both subjective measures in terms of IPSS and objectively using urine flow rates. Both the groups demonstrated improvement in symptoms and urine flow rates compared to the baseline, and Q max and PVR was also not statistically significant between the two groups. Other studies, too, demonstrate the same results in terms of follow up.

In their evaluation using bipolar TURP, Gupta N et al. [12] shown that for big prostate adenoma (>60g), bipolar TURP and HoLEP gave equivalent results. HoLEP is a suitable endoscopic alternative to open prostatectomy for large glands and has proven its adaptability regardless of prostate size. The surgical therapy of a big prostate should be tailored to the patient's comorbidities and the surgeon's skills. Several research, including randomized and meta-analyses, have demonstrated that HoLEP is equal to TURP in terms of outcomes and effectiveness. The high learning curve of Holmium laser enucleation is its principal disadvantage [13-16]. The velocity of the operation can be used to evaluate a subjectively felt comfortable condition during the HoLEP treatment. Our findings revealed a gradual increase in efficiency.

The study's limitations include a non-randomized design, a short follow-up time, and a small sample size. Transurethral resection of the prostate (TURP) is the current standard surgical therapy for men with bothersome moderate-to-severe LUTS related to BPO, according to EAU 2018 recommendations on non-neurogenic male LUTS. When compared to TURP and open prostatectomy, Ho:YAG laser enucleation provides better haemostasis and intra-operative safety. With Level 1a evidence, peri-operative metrics such as catheterization time and hospital stay favour HoLEP, and the EAU highly recommends Ho:YAG laser enucleation of the prostate (HoLEP) to men with moderate-to-severe LUTS as an alternative to TURP or open prostatectomy [17].

Conclusion

Bipolar TURP and HoLEP were both beneficial in treating Bladder outlet obstruction. HoLEP has the same effectiveness as traditional bipolar TURP but requires less hospitalisation and catheter indwelling duration. However, as compared to the HoLEP surgery, bipolar excision of the prostate is a less expensive approach. Although the learning curve is high and there will never be a true plateau of knowledge, steady progress can be obtained as surgical volume increases.

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