

ORIGINAL ARTICLE**Holmium Laser Versus Bipolar Enucleation of Prostatic Adenoma: A Prospective Randomized Study**Omar Nass⁽¹⁾, A. Ragab⁽¹⁾, Abdellatif M. Zayed⁽¹⁾, Ashraf M. S. Shahin⁽¹⁾*(1)Department of urology, faculty of medicine, Zagazig university, Egypt***Corresponding author**

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dromarnass@yahoo.com**Submit Date** 2020-09-10**Revise Date** 2020-10-04**Accept Date** 2020-10-25**ABSTRACT**

Objectives: To compare the safety and efficacy of holmium laser enucleation of the prostate (HoLEP) and bipolar plasmakinetic enucleation of the prostate (BPEP) for patients with benign prostatic hyperplasia (BPH) and prostate volumes 50-120 mL.

Methods: a total of 52 patients were prospectively randomized and enrolled in this study at Zagazig university hospitals. All patients were preoperatively evaluated using prostate volume measurement, the International Prostate Symptom Scores (IPSS) questionnaire, a quality-of-life (QoL) questionnaire and international index for erectile function-5 (IIEF-5). Measurement of maximum urinary flow rate (Qmax), post-void residual urine volume (PVR) and blood sample analysis for determination of prostate-specific antigen (PSA) and haemoglobin concentration. Patients were evaluated peri-operatively and postoperatively at 1, 3, 6 and 12 months with documentation of any complication.

Results: Of 52 patients enrolled in this study, 47 patients completed 12 months of follow-up. There were statistically insignificant differences between both groups regarding the preoperative and intraoperative data. Perioperatively, bleeding, need for blood transfusion and hemoglobin drop were higher in the HoLEP group. There were no statistically significant differences in the post-operative follow-up data between both groups.

Conclusion: In terms of surgical safety and efficacy BPEP is comparable to HoLEP for moderately to markedly enlarged prostates, with indication for surgical intervention.

Keywords: Benign prostatic hyperplasia (BPH); bipolar plasma-kinetic enucleation of the prostate (BPEP); lower urinary tract symptoms (LUTs); prostate specific antigen (PSA)

**INTRODUCTION**

Surgical treatments of BPH include open prostatectomy, endoscopic and minimally invasive intervention. Transurethral resection of the prostate (TURP) is the gold standard treatment for symptomatic BPH refractory to medical treatment [1]. However, because of the likelihood incidence of significant complications such as bleeding or transurethral resection syndrome (TUR syndrome), especially in patients with comorbidities, there is need to develop new minimally invasive surgical techniques (MIST) with less side effects and results comparable to those of monopolar TURP [2].

Over the past 10 years the trend in surgical treatment has changed from the standard TURP to laser treatments and bipolar plasmakinetic TURP [3]. Use of the holmium laser resection in prostate surgery was first introduced by Gilling et al in 1996, and first report on the morcellation technique

was published 2 years later when they devised a transurethral tissue morcellator to limit time of retrieval of enucleated tissue [4].

Bipolar plasmakinetic enucleation of the prostate (BPEP), has been recently introduced and has proved safety, efficacy and durability for the treatment of LUTS due to BPH [5]. When compared with standard TURP and open prostatectomy, BPEP has been associated with superior outcomes at both short and long-term follow up [6].

In this study we made comparison between HoLEP and BPEP with respect to safety and efficacy and compared our results with results obtained from literature. Neill et al in their study that included 20 patients in each arm found comparable results between both arms except for the operative time that was longer in the BPEP group [7]. In another randomized controlled trial, Enmar et al performed HoLEP for 33 patients and BPEP for 31 patients

with a follow-up period of 12 month. They found insignificant difference between both groups except longer operative time and catheter duration for the BPEP group [8].

MATERIALS & METHODS

Ethical consideration: Written consent was obtained from every patient after explanation of the procedure. Medical research and ethics committee of Zagazig University approved the study. The work was carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Study design: This study was carried out prospectively in Zagazig University Hospitals between January 2018 and January 2020. All patients with symptomatic benign prostatic hyperplasia who fulfilled the inclusion criteria were included in this study. Patients were divided randomly into two groups Group 1 (HoLEP group) and Group 2 (BPEP group). Randomization was carried out using computer generated random table in 1:1 ratio at the date of the operation.

Patients were evaluated before surgical interference by complete general and urological evaluation with stress on the IPSS, IIEF-5, PSA, HB level, TRUS and uroflowmetry for Qmax. Inclusion criteria were established as patients with prostate volume 50-120ml measured by TRUS, having at least one of the indications of surgical intervention. The following were the exclusion criteria: 1) Patients with significant co-morbidities or unfit for anesthesia; 2) Chronic renal impairment or elevated serum creatinine; 3) Patients with bladder pathology [bladder tumor, bladder stone, neurogenic bladder, bladder cancer]; 4) Patients with history of urethral, bladder neck or prostatic surgery; 5) Patients with suspicious or having prostate cancer; 6) Uncontrolled coagulopathy and bleeding disorders. Equipment:

For group 1 (HoLEP) we used 100-watt holmium: Yttrium Aluminum Garnet laser machine. (SphinX 100 W, holmium-YAG laser, LISA Laser Products–OHG, Germany), Continuous-flow 26 Fr resectoscope and laser guide probe with retracting beaks and 550-um end firing laser fiber.

For group 2 (BPEP) we used: electrosurgical unit (ERBE VIO 300 D, electrosurgical system, item number 10140-100, USA), using a cutting mode settings of 200-280 W and a coagulation mode settings of 80-120 W, active bipolar working element, 26 Fr Karl Storz continuous flow resectoscope and half-moon vaporization electrode.

Surgical procedures:

In the presence of enlarged median lobe we started with median lobe enucleation. Two incisions were

made from the bladder neck at 5 and 7 o'clock till just proximal to the veru, and then transverse incision proximal to the veru was made to join both incisions.

By combining sharp cutting, blunt dissection and gush of water the median lobe adenoma was enucleated in a retrograde manner.

Then we proceeded for lateral lobes enucleation making a longitudinal incision along the 12 o'clock direction, and then we proceeded for upward enucleation of both lateral lobes.

In the absence of median lobe two incisions, one at 6 o'clock and the other at 12 o'clock, were made. Adenoma was left attached to the bladder neck followed by retrieval using mushroom technique [9].

The perioperative parameters including enucleation time, weight of resected tissue, HB level, hospital stay, amount of irrigation fluid and catheterization time were recorded. The post-operative follow-ups were carried at 1 (IPSS, Qmax, and PVR), 3 (IPSS, Qmax, PVR, IIEF-5, PSA and TRUS), 6 (IPSS, Qmax, PVR and IIEF-5) and 12 months (IPSS, Qmax, PVR, IIEF-5 and PSA) and results were compared with the pre-operative data with recording of any complication believed to be related to the procedure. This was done to evaluate safety and efficacy of the procedure both objectively and subjectively and to prove that most of the adenoma was removed by enucleation.

Statistical analysis:

The data were presented by mean \pm SD and analyzed with SPSS version 20 (IBM Corp., Armonk, IL, USA). Mean PSA, QoL, Qmax, PVR, IIEF-5 and prostate volume of each group were compared with preoperative value using paired students t-test. Comparison of both groups was done using the independent sample t-test and chi square test. Statistical significance was considered at $p < 0.05$ for all analyses.

RESULTS

A total of 52 patients with symptomatic benign prostatic hyperplasia who required surgical intervention were included in this study, 26 patients in each group. Patients that completed the follow-up protocol were analyzed, 23 patients in group 1 and 24 patients in group 2, as shown in the flow chart figure.

Regarding demographic and preoperative data of both groups there was statistically insignificant difference between them and the most common presentation in both groups was voiding symptoms not responding to medical treatment, 15 patients in each group (57.7%). (Table 1)

The mean weight of enucleated tissue and enucleation time were comparable for both groups.

However we found statistically significant difference in the volume of post-operative irrigation fluid being more in the HoLEP group (5.38 L± 1.1 vs 4.56 L± 0.99) due to more bleeding and more cases complicated with clot retention in the HoLEP group and required more irrigation. (Table 2)

Two cases in the HoLEP required blood transfusion while one case in BPEP. All cases complicated with BN contracture were managed endoscopically by making bladder neck incision at 5 and 7 o'clock positions at 4th month post-operatively (3 in HoLEP and 2 in BPEP). (Table 3)

HB drop was higher postoperatively in the HoLEP group, owing to more blood loss. TRUS measured 3 months postoperatively revealed 76% and 72% reduction in prostate volume in the HoLEP and BPEP groups, respectively; this was reflected in the PSA decline at one year that was approximately 74% in both groups denoting almost complete adenoma removal. In addition there was comparable improvement in the IPSS, PVR, QoL and Qmax. There was also statistically significant improvement in IIEF-5 in both groups. We thought that improvement in patients LUTs was reflected positively in his sexual satisfaction. (Table 4)

Table (1): demographic and preoperative data of both groups

	HoLEP (n=26) mean±SD	BPEP (n=26) mean±SD	P
Age	65 ± 4.36	64.08 ± 5.21	0.517
Voiding symptoms	15 (57.7%)	15 (57.7%)	#1
Preoperative Hb (gm/dl)	12.67 ± 0.74	12.8 ± 0.90	0.615
Preoperative sodium (mmol/l)	140.65 ± 1.92	140.7 ± 2.49	0.932
Preoperative IPSS	25 ± 2.73	24.83 ± 2.84	0.838
Preoperative IIEF-5	13.61 ± 4.37	15 ± 4.58	0.358
Preoperative PSA (ng/ml)	3.039 ± 1.41	3.48 ± 1.41	0.285
Preoperative Q Max (ml/sec)	9 ± 1.964	7.82 ± 2.58	0.161

n= number / P= probability of significance / Used test is independent sample t-test / # used test is chi square test

Table (2) peri-operative data of both groups:

	HoLEP (n=26) mean±SD	BPEP (n=26) mean±SD	P
Duration of enucleation (min)	41.22 ± 4.44	41.58 ± 4.86	0.789
Weight of tissue (gm)	53.826 ± 12.641	53.083 ± 12.264	0.839
postoperative irrigating fluid (L)	5.38 ± 1.1	4.56 ± 0.99	0.011*

P= probability of significance / n= number / *statistically significant / Used test is independent sample t-test

Table (3) Complications of both groups

	HoLEP (n=26)	BPEP (n=26)	P
Capsular perforation	3 (11.54%)	2 (7.69%)	0.666
Conversion to monopolar resection	2 (7.69%)	1 (3.85%)	0.609
Blood transfusion	2 (7.69%)	1 (3.85%)	0.609
Clot retention	2 (7.69%)	1 (3.85%)	0.609
BN contracture	3 (11.54%)	2 (7.69%)	0.666

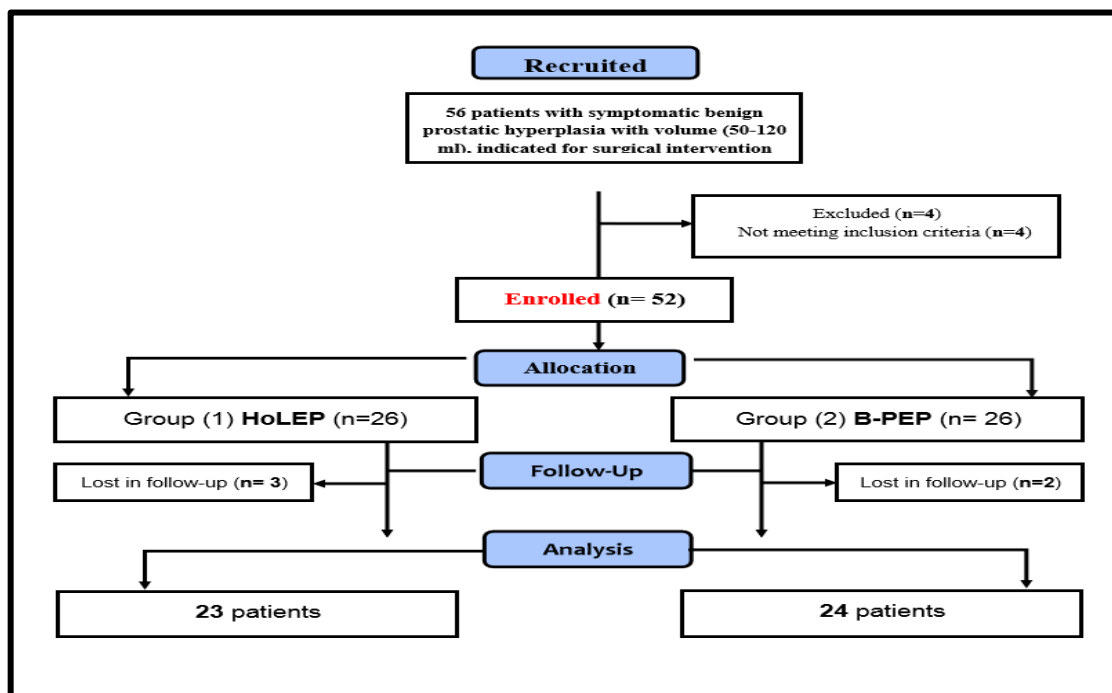
n= number / P= probability of significance / used test is chi square test

Table (4) Follow up data of both group

	HoLEP (n=23) mean±SD	BPEP (n=24) mean±SD	P
Hb drop (gm/dl)	-1.34±0.49	-0.78±1.13	0.034*
postoperative sodium(mmol/l)	140.39 ±1.70	140.42 ± 2.50	0.968
%IPSS improvement at 1 year	79±4.71	79.37±4.39	0.778
% improvement of IIEF-5 at 1 year	32.63±33.52	22.57±20.88	0.308
% of PSA decline at 1 year	74.58±5.53	74.62±6.19	0.982
% change of TRUS	76.2±6.63	72.96±8.51	0.153
% Improvement of Qmax at 1 year	144.097±47.63	159.18±57.86	0.449
%Improvement of PVR at 1 year	87.11±4.24	85.56±5.204	0.350
% improvement of QoL at 1 year	72.9±15.62	71.65±14.81	0.781

n= number / P= probability of significance / *statistically significant / Used test is independent sample t-test.

Flow chart figure



DISCUSSION

Open prostatectomy is effective in managing adenoma larger than 80 gm through more thorough adenoma removal but it's more invasive in comparison with the currently available endoscopic enucleation. Regarding open prostatectomy, there are wound related complications, prolonged postoperative catheterization and risks of hemorrhage [10].

Transurethral resection of the prostate is the gold standard intervention for men with symptomatic LUTS which are refractory or can't tolerate medical therapy [11]. Despite being minimally invasive and the use of more advanced endoscopes, TURP for prostates more than 80gms remains challenging due to the increased morbidity related to excess glycine absorption during prolonged resections. In addition to problems related to inadequate resection e.g. persistent urinary retention and recurrence of symptoms [12].

Many therapeutic modalities have been developed to overcome these side effects. They include plasmakinetic resection of the prostate, plasmakinetic enucleation of the prostate, HoLEP, holmium laser resection of the prostate and PVP [13].

In literature there are little studies that compare HoLEP and BPEP. Neill et al, in their study included 20 patients in each arm with a follow-up period of 12 month. Except for the operative time that was longer in the BPEP group (60.5min± 6.1) results were comparable [7].

We had longer operative time for both arms as we operated on larger prostates, beside we didn't use

morcellator. Catheter duration was longer in our study because of cases that complicated by capsular perforation (31.30 ± 16.87 and 29 ±14.12hrs for HoLEP and BPEP groups, respectively vs 25.1±7.5hrs for the HoLEP group and 24.8±6.3 hrs for BPEP). Neill et al didn't report blood transfusion, bladder neck contracture, capsular perforation or conversion to trans-urethral resection. In this study we left the adenoma attached to the bladder neck and removed by mushroom technique. This increased the incidence of capsular perforation and bladder neck contracture. Conversion occurred in 8.7% and 4.2% of cases of HoLEP and BPEP groups, respectively because of difficult bleeding control. We found that hemostasis was more easy and fast in the BPEP group using the half-moon electrode. We reported improvement in all post-operative parameters of both arms similar to Neill et al, study; however they didn't measure the IIEF-5.

Enmar et al performed HoLEP for 33 patients and BPEP for 31 patients, with mean prostate volume 125 and 102 ml, respectively and a follow up for 12 months. They found no statistically significant difference between both groups except longer operative time and catheter duration for the BPEP group. There was insignificant difference regarding total complications. They didn't encounter blood transfusion, capsular perforation occurred in 3.2% of BPEP cases and bladder neck contracture occurred in 3% of HoLEP cases. There was statistically significant improvement in all follow-up parameters; however both techniques

didn't affect erectile function as evaluated by IIEF-5 [8].

We found that operation time was comparable in both arms. It was shorter for the BPEP group than that of Enmar et al, because we used the half-moon electrode, and comparable to that of HoLEP. We had longer hospital stay and catheterization duration for both groups. Capsular perforation, bladder neck contracture and blood transfusion were higher in our study. Regarding the follow-up parameters our results were comparable to Enmar et al, except for the IIEF-5 that was higher in our study. Also they had higher PSA decline, as they operated on larger prostates with more tissue resected.

CONCLUSION

Enucleation removes most of the prostatic adenoma as confirmed by TRUS done at 3rd month post-operatively. Both BPEP and HoLEP were comparable regarding surgical safety and efficacy for moderately to markedly enlarged prostate. Either procedure can be used safely as a surgical option for patients with BPH and candidate for surgical intervention.

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Conflict of Interest: Nothing to declare.

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