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Transurethral resection of prostate by monopolar diathermy vs high power diode laser vaporisation of prostate – Prospective comparative study

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Abstract

Objective:
Our aim was to compare mono polar transurethral resection of the prostate (m-TURP) versus high power diode laser vaporisation of the prostate (DLVP) In terms of efficacy, safety, long term effectiveness, cost analysis and to judge the overall outcome of each modality for treatment of patients with benign prostate hyperplasia (BPH) in a prospective trial.
Material methods:
From December 2015 to November 2017, a total of 50 patients were
included in the cohort study, of whom 25 patients underwent TURP and 25 underwent DLVP. All patients received pre-operative evaluation and followed up at 1, 3, 6 and 12 months postoperatively. Baseline characteristics, perioperative data and postoperative outcomes were compared.
Results:
Preoperative data, including age, prostate volume, PSA, IPSS and Q max were similar in the
two groups. Functional outcomes regarding IPSS, Q max and residual urine were significantly improved in both the groups at 1 month postoperatively however no difference in the functional outcome was seen in when both groups were compared with each other. Also, significant difference was seen in operative time, catheter removal time, change in haemoglobin and amount of blood loss in favour of DLVP. There was no statistically significant difference between 1 month post op and further follow up at 3, 6 and 12 months postop in both the groups. DLVP showed less complications as compared to TURP, but it did not reach statistical significance
Conclusion:
High power diode laser vaporization of prostate is a feasible procedure in management of benign prostate hyperplasia and is safe, efficacious and a viable alternative to TURP. Only limitation being the cost effectiveness which is poor in comparison to TURP.

Key Words: TURP transurethral resection of prostate, PSA prostatic specific antigen, DLVP diode laser vaporization of prostate, IPSS international Post attic symptom score, PVRU post void residual urine

Introduction:

Lower urinary tract symptoms increase with the age in older men and are associated with benign prostatic hyperplasia these symptoms are initially managed conservatively with medication but finally land up for surgery. [1,2] TURP has been the gold standard for the surgical treatment of BPH [3,4]Fall backs with TURP are bleeding dilutional hypernatremia and need for blood transfusions in larger glands. [5]To overcome such limitations various surgical techniques and lasers have been used in treatment off benign prostatic hyperplasia which include Nd YAG laser (1064nm), Holmium laser (2140 nm), KTP laser(532nm) and the latest thulium laser(2013nm).[6,7,8,)]Recently for photoselective vaporization of the prostate (PVP) the potassium-titanyl-phosphate (KTP) laser (532 nm) has come into vogue. It has excellent haemostasis as highly absorbed by haemoglobin but minimal absorption in water leads to slow ablative properties leading to a prolonged operative time. [9]
We in the study use the diode laser at 980 nm. The diode laser functions at 980nm and penetrates a depth of 0. 5mm.The advantage with diode laser were highest continued absorption in in water and

haemoglobin leading to better tissue ablation and haemostasis, virtually bloodless incision, short duration of procedure and ensures minimal post op bleeding and preservation of surrounding tissue for quick recovery off the patient.
Our aim was to compare TURP with diode laser vaporisation of prostate in terms of efficacy, safety, long term effectiveness, cost analysis and to judge over all outcome of each modality

Material methods

Study design
Two arm prospective randomised control trial

Patient selection
Study compromised off 50 patients from December 2015 to November 2017 at kidney hospital sonwar Srinagar. In this study 50 patients underwent diode laser vaporisation of prostate, and 25 patients underwent mono polar transurethral resection of prostate. Both surgeries were performed by the same surgeon who has an experience off greater than 100 prostate surgeries per year. Patients with unsuccessful conservative medical management for their symptoms were enrolled. All patients underwent baseline investigations like blood sampling, PSA, Ultrasonography abdomen for prostate size and post void residual urine. International prostate symptom score questionnaires were filled out from all patients. Prostate biopsies were performed to exclude prostate cancer in patients with abnormal digital rectal examination or PSA > 4 ng/ml.
Patients with maximal flow of< 12 ml, PVR >150ml, IPSS > 12 , catheterised patients due to retention and moderate to severe Lower urinary tract symptoms in patients on drug therapy.
Patients with neurogenic bladder, prostate or bladder cancer, associated urethral stricture and previous bladder, urethral or prostate surgery were excluded.
Preoperative antibiotics were given one hour before surgery. All surgery were done in lithotomy position under spinal anaesthesia and at the end a 22 Fr Foley's three-way catheter was placed with saline irrigation.

Monopolar TURP
Move up who's performed using continuous flow 26 fr respect to scope with glycine1.5% solution at a height of 60 cm. Standard resection technique median lobe first followed by lateral lobes was used. Prostatic chips were evacuated using Toomey syringe. indwelling 22 Fr foleys three way catheter was placed and saline irrigation started at the end of surgery.
Preoperative and post operative vitals were recorded. Intraoperative blood loss was calculated using strip method. Post operative blood samples were measured.

Diode laser vaporisation of prostate
The Ceralas HBD (biolitec, Germany) is a diode laser with an output of 120-150 w in continuous wave mode. The laser light at 980nm is transmitted via a 1000 micrometre, side firing fibre in noncontact mode. A 26 Fr continuous flow laser cystoscope with 30-degree lens and 0.9% saline irrigation were utilised. We started from the lateral lobes and the area between 1 and 11 0 clock positions were vapourised until we achieved an adequate cavity. At the bladder neck and the sphincteric area the power was deceased to 120 w. Irrigation was maintained at 60 cm above the patient head and pulsed mode was used for haemostasis. A 3-way Foleys was placed at the end with saline irrigation.

Pt were discharged on tab cefixime 200 mg bd and tab diclofenac 50 mg as needed.pt were followed with ultrasound abdomen for prostate, post void residual urine, PSA, IPSS and uroflowmetry at 1 months 3 months 6 months and 1 yr.
Statistical analysis:
Using the GPOWER software it was determined that 25 patients were required in each group with 80% power and 5% significance levels. Simple random sampling was used as sampling technique.
Recorded data was compiled and entered in spread sheet and exported to data editor of SPSS version 20.0. continuous variables were summarised as Mean± SD and categorical variables were expressed as frequency and percentages. For Parametric data student independent t test and Mann Whitney U test

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were employed and chi square or fisher exact test were employed for categorial data. P values of less than 0.05 were considered significant

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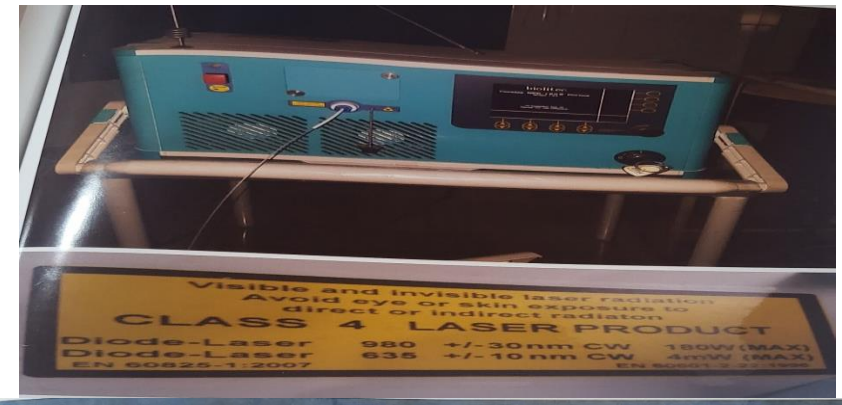

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Results:

Table 1. Demographic data, patient's characteristics, preoperative, intraoperative variables, and functional outcomes of the patients in the two study

Variables	TURP (n = 25)	Diode Laser (n = 25)	P Value
Age	67.3 ± 7.21	65.8±6.87	0.449
Preop Prostate size	57.2 ± 11.12	56.1±10.23	0.718
Post op Prostate size	20.13 ± 8.43	21.51±7.81	
Preop PSA	2.24 ±0 .98	1.97±1.23	
Post op PSA	1.37±0.72	1.05±0.86	
Operative time	40.3±13.14	63.6±12.01	<0.001
Preop IPSS	20.6±4.03	19.64±3.97	
Post op IPSS	8.60±1.54	8.61±1.56	
Preop PVRU	138.45±68.31	135.87±66.01	
Post op PVRU	27.22±15.87	25.87±15.87	
Pre op Qmax	6.77±3.77	6.34±3.47	
Postop Qmax	21.09±4.32	20.26±3.25	
Change in Hb	2.29 ± 0.767	0.38 ± 0.301	<0.001
Intra op blood loss	673.6 ± 179.19	47.4 ± 16.4	<0.001
Change in sodium	2.04 ± 0.530	1.83 ± 0.504	0.158
Change in Potassium	0.51 ± 0.318	0.47 ± 0.419	0.706
Catheter removal time	35.40 ± 8.82	26.8 ± 6.61	<0.001

25 patients underwent TURP, and 25 patients underwent diode laser vaporisation of prostate. Demographic data and preoperative variables of the patients are shown in Table 1.
Operative time of 40.3±13.14 (TURP) and 63.6±12.01 (DLVP) was not comparable between the groups and showed a significant difference
Catheter removal time for TURP was 35.40 ± 8.82, range 25-62 hrs and DLVP was 26.8 ± 6.61, range 12-50 hrs showed a significant difference.
Change in Haemoglobin in TURP was 2.29 ± 0.7697, range 1.2-4.1 and for DLVP was 0.38 ± 0.301, range 0.1-1.1 showed a significant difference.
Intra op blood loss for TURP was 673.6 ± 179.19, range 400-1000 and DLVP was 47.4 ± 16.4, range 30-90 ml which showed a significant difference.
Change in sodium and potassium concentration was comparable and did not show a significant difference.

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Table 2. Preoperative and postoperative 1 month

Variables	Baseline	Postoperative 1 Month	P Value
TURP			
Prostate size	57.2 ± 11.12	20.13 ± 8.43	<0.001
PSA	2.24 ±0 .98	1.37±0.72	0.006
IPSS	20.6±4.03	8.60±1.54	<0.001
PVRU	138.45±68.31	27.22±15.87	<0.001
Q max	6.77±3.77	21.09±4.32	<0.001
DVLP			
Prostate size	56.1±10.23	21.51±7.81	<0.001
PSA	1.97±1.23	1.05±0.86	0.003
IPSS	19.64±3.97	8.61±1.56	<0.001
PVRU	135.87±66.01	25.87±15.87	<0.001
Qmax	6.34±3.47	20.26±3.25	<0.001

Both groups showed statistically significant improvements in the post op IPSS, PVRU, Q max (Table).

Table 3. Comparison of functional outcome at 1 month

Outcome	TURP	DLVP	P Value
Change in IPSS	11.8 ± 4.466	11.04 ± 4.178	0.496
Change in PVRU	103.86 ± 74.31	98.41 ± 70.47	0.441
Change in Qmax	15.04 ± 5.65	14.36 ± 4.78	0.198

There was no statistically significant difference in the preoperative and postoperative IPSS, PVRU, Qmax in the two groups at 1 month (Tables 1, 3).

Table 4. Follow up data

Variables	1 month	3 months	6 months	12 months
TURP				
Prostate size	20.13 ± 8.43	19.87 ± 9.15	20.04 ± 8.71	19.39 ± 8.52
PSA	1.37 ± 0.72	1.21 ± 0.87	1.15 ± 0.92	1.04 ± 0.79
IPSS	8.60 ± 1.54	8.23 ± 1.27	7.65 ± 1.43	6.97 ± 1.45
PVRU	27.22 ± 15.87	25.21 ± 15.54	24.26 ± 14.98	26.21 ± 14.35
Q max	21.09 ± 4.32	19.5 ± 3.97	20.54 ± 3.69	19.85 ± 4.19
DVLP				
Prostate size	21.51 ± 7.81	20.74 ± 7.63	19.73 ± 8.23	20.17 ± 6.89
PSA	1.05 ± 0.86	1.17 ± 0.96	1.13 ± 0.76	1.05 ± 0.85
IPSS	8.61 ± 1.56	8.19 ± 1.49	7.72 ± 1.42	7.29 ± 1.56
PVRU	25.87 ± 15.87	26.13 ± 16.18	26.85 ± 16.09	25.14 ± 15.57
Q max	20.26 ± 3.25	18.89 ± 3.34	19.7 ± 3.19	19.01 ± 2.92

There was no statistically significant difference between 1 month post op and further follow up at 3, 6 and 12 months postop

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Table 5. Complications

Complications	TURP		DLVP		P-value
	No	%	No	%	
Blood transfusion	3	12	0	0	0.235
Cautery burn	1	4	0	0	1.000
Bladder perforation	0	0	0	0	
TUR syndrome	0	0	0	0	
Clot retention	4	16	0	0	0.109
Slough clogging	0	0	3	12	0.235
Dysuria	4	16	2	8	0.667
Increased frequency	3	12	3	12	1.000
Retention after catheter removal	4	16	7	28	0.306
Bladder neck contracture	2	8	0	0	0.489
Stricture formation	1	4	0	0	1.000

Intraop and postop complications are listed in table 5.
3 patients required blood transfusion in the TURP group due to bleeding none in DLVP group.
I patient had a cautery burn in TURP group and none in DLVP group
Clot retention seen in 4 patients in TURP group and none in DLVP group
Slough clogging was seen in 3 patients of DLVP and none in TURP.
Post op dysuria was seen in 4 patients of TURP group while as in DLVP 2 patients had dysuria
Retention of urine was seen in 4 patients of TURP and 7 patients of DLVP
Increased frequency seen in 3 patients of TURP as well 3 patients of DLVP.
Bladder neck contracture 2 patients of TURP group while as in DLVP none.
Stricture formation seen in 1 patient of TURP group. None of the patients developed TUR syndrome or bladder perforation.
On comparing between the groups no statistically significant results were seen.

Discussion

The study was conducted in Department of General Surgery, Kidney Hospital, Sonwar Bagh Srinagar. The study consisted total of 50 patients who were randomized into two groups. Each group consisted of 25 patients. One group was subjected to Trans Uretheral Resection of Prostrate (TURP), whereas another group underwent vaporisation of prostate with Diode Laser at 980nm wavelength (DLVRP group). The two groups were compared with respect to Age, Prostate size, Operative time, IPSS change, Qmax change PVRU change, Catheter removal time, Intraoperative and early complications, Cost and late post operative complications.
Age: In our study, patients in two groups were almost similar with respect to mean age. Mean age of patients was 67.3±7.21years in TURP group and 65.8±6.87 years in DLVRP group. Overall age range was 50-80 years. Majority of our patients presented in 6th to 7th decade of life. In our study age parameter was comparable in two groups. There is no statistically significant difference (p-value-0.499) in the two groups in our study. Cetinkaya Mehmet et al in their study had mean age ± standard deviation was 64.7 ± 10.2 years and 63.1 ± 9.1 years in PVP and TURP groups, respectively. Our results were consistent with the studies.

Prostate size: Mean prostate size of patients was 57.2 ±11.12gm in TURP group and 56.1 ±10.3gm in DLVRP group. Overall prostate size range was 30-90gm. Majority of our patients had prostate size 50-65 gms. In our study age parameter was comparable in two groups. There is no statistically significant difference (p-value-0.718) in the two groups. Razzaghi MR et al [(12)] in their study had Mean prostate volume 61,1±16.1cc. Our results were consistent with the studies.

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Operative time: Among the patients who underwent TURP, 60% patient had operative time ranging from 20-40 min and 32% patient had operative time between 40-60 minutes while 8% had operative time 60-80 min. Mean operative time of patient who underwent TURP was 40.3±13.14 minutes. Among the patients who underwent DLVRP, 4% patients had operative time ranging from 20-40 minutes and 32% of patients had operative timing of 40-60 minutes while 64% patients had operative time ranging from 60-80 minutes. Mean operative time of patients who underwent DLVP was 63.6±12.01 minutes. Mean operative time parameter was not comparable in two groups. There was a statistical difference in the two groups in our study (P-value-0.001). There were different results in different studies.

Change in IPSS, Qmax and PVRU: The change in functional outcomes were measured in terms of pre-operative and 1 month post operative change in IPSS, Post voidal residual Urine and Qmax. Mean change in IPSS was decrement of 11.66±4.46 and 11.04±4.178 in TURP and DLVRP groups respectively. There was no statistical difference in the change of IPSS between the two groups (p-value-0.496). In our study change in IPSS parameter was comparable in two groups. In Cetinkaya Mehmet et al study, the postoperative IPSS change to decrement of 9.90±3.61 and 6.59±6.06 ml/s from baseline in the TURP and PVP groups, respectively. Our results were consistent with the studies.
Mean change in Qmax was increment of 15.04±5.65 and 14.36±4.78 in TURP and DLVRP groups respectively. There was no statistical difference in the change of Qmax between the two groups (p-value-0.198). in our study change in Qmax parameter was comparable in two groups.
Mean change in PVRU was decrement of 103.86±74.31 and 98.41±70.47 in TURP and DLVRP groups respectively. There was no statistical difference in the change of PVRU between the two groups (p-value-0.442). In our study changes in PVRU parameter was comparable in two groups.

Catheter Removal time: In our study, mean catheter removal time of patients in TURP group was 35.40±8.82 hours while it was 26.8±6.61 hours in DLVRP group. Overall age range was 25-62 hours in TURP group and 12-50 hours in DLVRP group. Majority of patients were removed their catheter after 36 hours in both groups. In our study Catheter removal time parameter was not comparable in two groups. There was a statistical difference in the two studies (p-value<0,001) Cetinkaya Mehmet et al [(13)] in their study had Mean catheterization time was 1.45±0.75days and 2.63±0.49 days in the PVP and TURP groups, respectively (p<.01). Our results were consistent with the studies.

Haemoglobin Change: Mean preoperative and postoperative Haemoglobin in TURP group was 12.32±1.443 and 10.01±1.282 respectively. Mean Haemoglobin change in TURP group was decrement of 2.29±0.767. There was statistically significant difference in the preoperative and postoperative amount of Haemoglobin in TURP group (p-value- <0.001). Range of Hb change in TURB group was 1.2-4.1
While in DVLRP group, mean preoperative and postoperative Haemoglobin was 11.19±1.563 and 10.84±1.588 respectively. Mean haemoglobin change was 0.38±0.301. There was no statistical difference in the preoperative and postoperative amount of haemoglobin (p-value-0.374). Range of Hb change in DLVRP group was 0.1-1.1.
There was statistical difference in the amount of Haemoglobin change between the two groups (p-value-<0.001). Razzaghi Mr et al had preop and postop Hb 13.0±1.8 and 12.9±1.8 respectively p value-0.321) in their diode laser studies. Our results are consistent with their studies.

Na+ and K+ conc. Change: The mean change in preop and postop concentration of sodium (Na+) & potassium (K+) were decrement of 2.04±0.530 and 0.51±0.318 respectively from baseline concentration in TURP group. While in DLVRP group, the mean change in preop and postop concentration of Na+ & K+ were decrement of 1.83±0.504 and 0.47±0.419 from baseline Conc respectively. There were no statistically significant difference in the Na+ and K+ conc change above or below in either group. And there is no statistical difference in preop and postop concentration of Sodium (Na+) and Potassium (K+) between the two groups (p-value-<0.158 and p-value-0.706) respectively. Razzagahi MR et al had similar results in their studies. Our results are consistent with their studies.

Conclusion

High power diode laser vaporization of prostate is a feasible procedure in management of benign prostate hyperplasia, with less intra operative and post operative complications than transurethral resection of prostate. This procedure provides a surgical option which is virtually bloodless and is safe to use in patients with bleeding diathesis or on anticoagulant and in patients having implanted pacemakers or any metallic prosthesis. The limitation of this procedure is the long intraoperative time and the costly accessories which are required.

Overall, the high-power diode laser vaporization of prostate is a safe equally efficacious and long term effective alternative to TURP in surgical management off benign hyperplasia prostate patients

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