The Egyptian Journal of Hospital Medicine (April 2018) Vol. 71 (6), Page 3398-3404

Comparative Study between Residual Prostatic Tissue Size after Bipolar Vaporization of The Prostate versus Transurethral Resection of Prostate in Saline

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ABSTRACT

Objective: To compare the outcomes of plasmakinetic vaporization of the prostate (PKVP) with transurethral resection of the prostate in saline (TURis), mainly residual prostatic tissue size after 3 months**.**

Materials and Methods: In a randomized controlled trials, 30 patients with moderate to severe lower urinary tract symptoms secondary to benign prostatic hyperplasia (BPH) underwent PKVP (N = 15) and TURis (N = 15) between 2017-2018. **The inclusion criteria** were age between 40 and 80 who were indicated and scheduled for prostatectomy, prostate volume of 30-90 ml, serum prostate specific antigen (PSA) < 4 or free/total PSA >0.25, if total PSA between 4 and 10, IPSS (The International Prostate Symptom Score)≥ 20, Qmax≤ 10 mL/s, and failed BPH-related medical therapy. **Exclusion criteria** were abnormal digital rectal exam (DRE) or ultrasonography with suspicion of prostate cancer, history of prostate cancer, bladder cancer, serum PSA < 10 ng/ml or free/total PSA ratio >0.25 if total PSA between 4 and 10, previous urethral or prostate surgery, urethral stricture, neurogenic bladder, bladder calculi, BPH-related hydronephrosis, preoperative hematuria due to any local or general cause, anticoagulant therapy or coagulation disorders. The perioperative and postoperative outcomes were evaluated and the residual prostatic tissue size, IPSS and Qmax were assessed preoperatively and 3 months after procedure in all cases. **Results:** Both groups were nearly similar in patient age, prostate volume, preoperative IPSS, Qmax, hospital stay and catheterization period. The PKVP group had significantly higher mean values of operative time, IPSS. Modified Clavien classification of complications was used to assess complications. No significant changes were seen between the two groups regarding complications (PKVP = 20%; TURis = 26.7%), no cases of TUR syndrome, obturator reflex, urethral stricture, clot retention or epididymitis occurred in both groups. In the transurethral resection in saline (TURis) group, 2 cases were presented by acute retention 2 weeks postoperative, only one case presented with mild to moderate dysuria 1 month post-operative, resolving with anti-inflammatory medication, mild hematuria was seen in 1 case 2 weeks postoperative. In plasma vaporization group, 1 patient had urinary retention which needed catheterization, urinary tract infection and significant bacteriuria occurred in one case which was treated by antibiotics and a mild to moderate dysuria after 1 month was seen in one case. Three months after surgery, two groups had significant improvement in IPSS (more in TURis group), post voiding volume, serum PSA, and mainly in residual prostatic tissue size.

Conclusions: Bipolar electrosurgical technology is a promising modality for surgical treatment of BPH. Regarding bipolar prostatic surgeries we can conclude the following: No significant difference between bipolar plasma vaporization and TURis regarding residual prostatic tissue size, no TUR syndrome, less blood loss especially in vaporization technique, more easy learning curve either in vaporization technique or resection technique (no fear of TUR syndrome so time factor isn't an issue) enabling the surgeon to work slowly and to do adequate hemostasis, vaporization technique is ideal modality for high risk patients (multiple co morbidities, bleeding tendency and patient on anticoagulants). Large prostate volume can be treated either by resection or vaporization technique). We can conclude that the bipolar plasmakinetic energy will be the gold standard in surgical management of BPH in the near future if it not yet.

Keywords: BPH, plasma vaporization, TURis, PKVP, Qmax, IPSS, post voiding volume, serum PSA.

INTRODUCTION

Benign prostatic hyperplasia (BPH) becomes increasingly common as men age. Men with clinically significant lower urinary tract symptoms (LUTS) suggestive of BPH who do not find adequate relief with medical treatment may benefit from transurethral resection or ablation to enlarge the urethral channel by reducing the amount of prostate tissue around the urethra [(1)].

Transurethral resection of the prostate (TURP) is still considered the reference 'gold standard' surgical procedure for low urinary tract symptoms (LUTS) due to benign prostatic hyperplasia (BPH). The high success rate of TURP, proven by substantial and sustained improvements of symptom scores, urinary flow rate and other functional parameters, is still associated with significant morbidity, including perioperative or postoperative bleeding, transurethral resection (TUR) syndrome, prolonged hospital stay, and even urinary incontinence, retrograde ejaculation, and erectile dysfunction [(2)].

As a consequence, a large number of new minimally invasive therapeutic alternatives have been tested in the last 30 years, including (but not being limited to) laser enucleation, resection or

Received:20 /3 /2018
Accepted:30 /3 /2018
DOI**: 10.12816/0047295**

vaporization of the prostate, bipolar resection and vaporization, transurethral microwave therapy (TUMT), transurethral needle ablation (TUNA), and prostatic stents [(3)].

AIM OF THE STUDY

The objectives of this study are to present the technical principles behind bipolar system and to thoroughly analyze the impact of the this method on the patient outcomes, prostate size, and complication rates, making a direct comparison between residual prostatic tissue size after TURis and plasma vaporization.

PATIENTS AND METHODS

In a randomized controlled trial, 30 patients with moderate to severe lower urinary tract symptoms secondary to benign prostatic hyperplasia (BPH) underwent bipolar PKVP (N = 15) or TURis (N = 15) from 2017 to 2018.

The study was conducted in El Demerdash Hospital between 2017-2018 on simple random sample. Written informed consent was obtained from all patients after full explanation of the benefits of the examination and the privacy of participants and confidentiality of data were guaranteed during the various phases of the study.

The study was approved by the Ethics Board of Ain Shams University.

The inclusion criteria

- Age between 40 and 80 who were indicated and scheduled for prostatectomy, prostate volume of 30-90 ml, serum PSA < 4 or free/total PSA ratio > 0.25 if total PSA between 4 and 10, IPSS ≥ 20, Qmax≤ 10 mL/s, failed BPH-related medical therapy
- **Exclusion criteria:**
- Abnormal DRE or ultrasonography with suspicion of prostate cancer, history of prostate cancer, bladder cancer, serum PSA < 10 ng/ml or free/total PSA ratio > 0.25 if total PSA between 4 and 10, previous urethral or prostate surgery, urethral stricture, neurogenic bladder, bladder calculi, BPH-related hydronephrosis, preoperative hematuria due to any local or general cause, anticoagulant therapy or coagulation disorders.

The perioperative and postoperative outcomes were evaluated and the residual prostatic tissue size, IPSS, Qmax, post voiding volume, serum PSA were assessed preoperatively and 3 months after procedure in all cases.

Analysis of data was done using SPSS (statistical package for social science version 15) and Microsoft Excel 2010 as follow:

* Quantitative variables as mean ± SD and range when applicable.
* Qualitative variables were described as numbers and percentage.
* Paired double-tailed t test was used to compare quantitative variables.
* Complications were compared by Chi^2 test.
*

Significance was defined in the following way:
P> 0.05: Non significant results.
0.001<P<0.05: Significant results.
P<0.001: Highly significant results.

RESULTS

Both groups were nearly similar in patient age, prostate volume, preoperative IPSS, Qmax, hospital stay and catheterization period. The PKVP group had significantly higher mean values of operative time and IPSS. Modified Clavien classification of complications was used to assess complications. No significant changes were seen between two groups regarding complications (PKVP = 20%; TURis = 26.7%). No cases of TUR syndrome, obturator reflex, urethral stricture, clot retention or epididymitis occurred in both groups. In TURis group, 2 cases were presented by acute retention 2 weeks postoperative, only one case presented with mild to moderate dysuria 1 month post-operative, with anti-inflammatory medication, mild hematuria was seen in 1 case 2 weeks postoperative. In PKVP, a mild to moderate dysuria after 1 month was seen in one case. Urinary tract infection and significant bacteriuria occurred in one case, resolving with oral antibiotics. Acute retention was seen in another case and patient was catheterized again.

Three months after surgery, the two groups had significant improvement in IPSS (more in B-TURP group), post voiding volume, serum PSA, and mainly in residual prostatic tissue size.

Table (1): Pre-operative patients' characteristics at baseline:

		TURis group	Plasma vaporization group	Test value•	P-value	Sig.
		No. = 15	No. = 15			
Age	Mean ± SD Range	60.67 ± 9.49 46 – 75	57.13 ± 8.53 45 – 71	1.073	0.293	NS
Prostate volume (mL)	Mean ± SD Range	63.33 ± 9.71 49 – 85	60.33 ± 9.48 45 – 80	0.856	0.399	NS
IPSS	Mean ± SD Range	27.80 ± 3.99 22 – 35	27.67 ± 3.66 22 – 34	0.095	0.925	NS
Q max (mL/s)	Mean ± SD Range	8.47 ± 1.36 6 – 10	8.67 ± 1.18 7 – 10	0.432	0.669	NS
Post voiding volume (mL)	Mean ± SD Range	138.00 ± 40.79 70 – 210	131.20 ± 32.48 88 – 195	0.505	0.617	NS
Serum PSA ng/mL	Mean ± SD Range	5.01 ± 2.12 2 – 9	5.17 ± 2.40 1.5 – 9.1	-0.194	0.848	NS
Hospital stay (days)	Mean ± SD Range	3.50 ± 1.02 2 – 5	2.97 ± 0.58 2 – 4	1.762	0.089	NS
Catheterization period (days)	Mean ± SD Range	4.27 ± 0.68 3 – 5	3.90 ± 0.63 3 – 5	1.532	0.137	NS

P.S.A: prostatic specific antigen, PVR: post void residual urine, Qmax: maximum flow rate, Qav: average flow rate, IPSS: international prostate symptom score

Mean age of studied patients is 60.67 ± 9.49 (46 – 75) years for TURis group, 57.13 ± 8.53 (45 – 71) for PKVP group.

Data are expressed as mean ± standard deviation.

30 patients were enrolled in our study presented to us by: Chronic urine retention (7 patients) 23%, failed medical treatment; (11 patients) 37%, refractory urine retention (12 patients) 40%. Seven patients (23%) of our studied patients had associated comorbidities (DM, HTN, Bronchial asthma and liver cirrhosis), 2 with DM and HTN,1 with bronchial asthma, 2 with HTN,2 were HCV +VE with liver cirrhosis with normal coagulation profile.

- Perioperative mortality include death within 1 month of the operation
- Perioperative morbidity include procedure related complications within 1 month of the operation
- No patient developed TUR syndrome which was a significant advantage for TURis (transurethral resection in saline).
- No patients developed postoperative clot retention

Table (2): Operative parameters in the two group:

		TURis group	Plasma vaporization group	Test value•	P-value	Sig.
		No. = 15	No. = 15			
Operation duration (minutes)	Mean ± SD Range	45.33 ± 7.65 33 – 57	50.67 ± 5.91 4 3 – 60	2.136	0.042	S

❖ **Postoperative parameters**

Our patients were followed up within 1st day postoperative, 1st week, 3 months postoperatively. The patients were followed up after catheter removal by assessment of voiding pattern and any lower urinary tract symptoms. The results were as follow:-

- Mild to moderate dysuria in 2 patients (1 in TURis group and 1 patient in PKVP group 1 month postoperatively).
- Mild hematuria in 1 patient 3 weeks postoperative in TURis group
- Acute retention in 2 patients in TURis group,1 in PKVP group
- 1 patient had UTI in PKVP group

Table (3): Follow up data at 3 months

		TURis group	Plasma vaporization group	Test value	P-value	Sig.
		No. = 15	No. = 15			
Residual size ***(mg)***	Mean ± SD	25.87 ± 3.76	28.20 ± 4.38	1.566	0.129	NS
	Range	20 – 32	22 – 36			
Post voiding ***(ml)***	Mean ± SD	30.93 ± 7.06	33.07 ± 6.13	0.884	0.384	NS
	Range	20 – 44	25 – 44			
Uroflow ***(ml/sec)***	Mean ± SD	19.87 ± 3.78	19.2 ± 3.144	0.525	0.603	NS
	Range	15 – 26	16 – 25			
Complications	Negative	11 (73.3%)	12 (80.0%)	4.377	0.497	NS
	AUR	2 (13.3%)	1 (6.7%)			
	Dysuria	1 (6.7%)	1 (6.7%)			
	Hematuria	1 (6.7%)	0 (0.0%)			
	ED	0 (0.0%)	0 (0.0%)			
	UTI	0 (0.0%)	1 (6.7%)			
IPSS	Mean ± SD	9.27 ± 2.28	11.27 ± 2.55	2.264	0.032	S
	Range	5 – 13	7 – 15			

-P-value > 0.05: Non significant; P-value < 0.05: Significant.

Postoperative uroflowmetry shows marked improvement (Qmax 19.25) in comparison to preoperative parameters (Qmax 8.36) in 30 patients for whose uroflowmetry was done,

Marked improvement in IPSS for all groups and maintained all over the follow up period (maintained efficacy).

Results of IPSS of different studied groups showed significant reduction in IPSS in resection group after 3 months in comparison to vaporization group.

The mean voided volume during uroflowmetry ranged from 140 to 190 ml which is an indicator for storage capability of the bladder.

Results of post voiding residual urine showed no significant residual urine in all groups with no statistically significant difference in different studied groups.

The incidence of postoperative culture proved infection in studied patients was 7% after 1 month

Summary of the outcome of different modalities of bipolar prostatectomy.

1- **Vaporization group.**

No perioperative adverse effects had occurred in any patient (no blood transfusion, no TUR syndrome, no clot retention and no perioperative mortality)

1 patient developed acute urinary retention after catheter removal. 1 developed UTI, 1 patient developed mild to moderate hematuria 1 month postoperatively

Mean operative was time 50.67 ± 5.91 min.

Mean catheterization was time 3.90 ± 0.63 days, and postoperative hospital stay was 2.97 ± 0.58 days.

The mean PFR after catheter removal after 3 months was 19.2 ± 3.144 ml/s.

The mean IPSS at 3 months was 11.27 ± 2.55.

The mean post voiding RU after catheter removal 3 months was 33.07 ± 6.13.

2-Resection group

No patients required blood transfusion, no TUR syndrome, no clot retention and no perioperative mortality.

2 patients developed acute urinary retention after catheter removal, 1 patient developed mild to moderate dysuria 1 month postoperatively, and 1 patient developed mild hematuria 2 weeks postoperatively.

Mean operative time 45.33 ± 7.65 min, mean catheterization time 4.27 ± 0.68 days, and postoperative hospital stay was 3.50 ± 1.02 days

The mean PFR after catheter removal at 3 months was19.87 ± 3.78 ml/s.

The mean IPSS at 3 months was 9.27 ± 2.28.

The mean post voiding RU after catheter removal 3 months later was 19.87 ± 3.78.

The data from these RCTs (randomized controlled trials) comparing TURis vs PKVP

- Residual prostatic size at 3 months was nearly the same in PKVP and TURis group (28.20 ± 4.38 gm vs 25.87 ± 3.76 gm) **P-value 0.129.**
- Qmax at 3 months was nearly the same in TURis group and PKVP (19.87 ± 3.78 vs 19.2 ± 3.144 ml/sec) **P-value 0.603.**

- Post voiding volume at 3 months was nearly the same in TURis group and plasma vaporization group (30.93 ± 7.06 ml vs 33.07 ± 6.13 ml) **P-value 0.384** (preoperative was 138.00 ± 40.79 ml vs 131.20 ± 32.48 ml)
- IPSS score at 3 months in TURis 9.27 ± 2.28 which was better than PKVP group 11.27 ± 2.55. **P-value 0.032**
- Operation duration was shorter in TURis group in comparison to PKVP group (45.33 ± 7.65 vs 50.67 ± 5.91). **P-value 0.042**
- Complication rate was higher in TURis (27.7%) than PKVP group (20%) but non-significant.
- None of the trials mentioned TUR syndrome as an adverse event of bipolar TURP or vaporization. [5].

DISCUSSION

Transurethral resection of prostate (TURP) is the most effective surgical modality for symptomatic benign prostate hyperplasia (BPH)[4] .Its high success rate is reflected by substantial improvements in symptom scores, urinary flow rate, post void residual urine (PVRU) and a low retreatment rate on long-term follow-up.

However, despite innovations and improvements, TURP is still associated with significant morbidity, particularly in patients with larger prostates, indwelling catheters, bleeding disorders, or those who are undergoing anticoagulation therapy [5].

Complications mainly consist of perioperative bleeding requiring blood transfusion or transurethral resection (TUR) syndrome but also prolonged catheterisation and hospital stay as well as urinary incontinence and retrograde ejaculation. Therefore, many endoscopic technologies have been proposed to replace TURP as the new reference standard and leads to a continuous decrease in the use of TURP.

These are the reasons several novel procedures have been introduced in recent decades, many of them being considered minimally invasive therapies because of their favorable safety profile [6].

Bipolar electrosurgical technology has recently gained worldwide attention, with different companies introducing similar devices on the market with the aim of minimizing the morbidity of the standard monopolar TURP (M-TURP) while maintaining efficacy and durability [6].

Bipolar electrosurgical technology is a new modality, where the current flows from the loop (the active electrode) to the loop tube and the resectoscope itself. A conductive medium (e.g. saline) must be used in order to shorten the current paths, which dramatically reduces the volume of tissue penetrated by monopolar HF currents. Isotonic saline is the perfect choice of an irrigation fluid because it reduces the chances of TUR syndrome. Resection of the tissue is actually performed through the creation of a plasma corona utilizing a controlled energy peak around the electrode [7].

In the current study, thirty male patients with bladder outlet obstruction resulting from clinically diagnosed BPH. As mentioned before, they were randomly subdivided into 2 groups each contained 15 patients.

Measures of the efficacy:

Data on efficacy had been measured by the impact of each technique on residual prostatic tissue size, Qmax, IPSS as well as score and PVRU, compared to baseline, was provided at follow-up periods of 3 months.

Prostate size

In our study, the main objective is a comparison between residual prostatic size between TURis and PKVP, there was no significant difference in residual prostate size in both TURis and PKVP groups.

In TURis group, the mean postoperative prostate size has decreased from 63.33 ± 9.71 to 25.87 ± 3.76 at 3 months follow up ultrasound.

In PKVP group, the mean postoperative prostate size has decreased from 60.33 ± 9.48 to 28.20 ± 4.38 ml at 3 months follow up ultrasound.

Geavlete et al. [1] results at the 1-month follow-up improvements in all the measured variables were better in the TURis group than the PKVP group. The differences remained stable and significant in all regards at the 3 and 6-month follow-ups. At the 6-month evaluation of prostate volume by TRUS there were similar improvements for patients from both series, consisting of a decrease in prostate volume of 70.1% for TURis and 66.8% for PKVP.

Zhigang et al. [8] reported a decrease in the mean prostate size in the PKVP group patients by 38.2 ml at 6 months postoperative follow up visit.) demonstrated that the mean postoperative prostate size has decreased by 37.5 ml in the PKVP group and by 35.3 ml in the TURis group at 6 months follow up visit.

Qmax (compared in patients which were not presented by urinary retention) there was no significant difference Qmax size in both TURis and PKVP groups after 3 months.

The patients of the TURis group in our study, showed improved mean Qmax from 8.47 ± 1.36 to 19.87 ± 3.78 at 3 months.

The patients of the PKVP group in our study, showed improved mean Qmax from 8.67 ± 1.18 to 19.2 ± 3.144 at 3 months.

The demonstrated in patients who underwent changes was highly significant in both groups, ***Zhignag et al.*** [8] PKVP that the mean Qmax has improved by 15.5 ml/sec and 12.8 ml/sec at 3 and 6 months respectively. ***Kumar et al.*** [9] showed improvement of Qmax in TURis group from 7.05 ± 1.87 to 18.07 ± 5.88, 19.27 ± 5.17, 20.48 ± 5.15, 19.93 ± 5.17 1,3,6,12 months respectively. ***Horninger et al.*** [10] also reported similar improvements mean Qmax using the Olympus TURis device, one year after resection.

Post voiding residual urine PVRU:

There was no significant difference PVRU in both TURis and PKVP groups after 3 months. In our study, the mean PVRU was highly improved in the postoperative follow up pelviabdominal ultrasound in both groups. In TURis group, the mean PVRU improved from 131.20 ± 32.48 to 30.93 ± 7.06 at 3 months. The difference was significant.

In PKVP group, the mean PVRU improved from 131.20 ± 32.48 to 33.07 ± 6.13 at 3 months. The difference was significant.

There was no significant difference between both groups at 3 months follow up.

Zhigang et al. [8] demonstrated that in patients who underwent PKVP the mean PVRU has decreased by 85.9 ml and 88.2 ml at 3 and 6 months respectively.

Michielsen et al. [11] reported that, the differences were statistically significant between preoperative and postoperative measurements in both groups.

Catheterization time and hospital stay:

In our study, TURis allowed less catheterization time and hospital stay by a mean of 4.27 ± 0.68 days while in PKVP it was 3.90 ± 0.63 days. The patient was discharged home when there was no fever and no major micturition problems. ***Brathwaite et al.*** [12] reported a mean catheterization time and hospital stay of 81.6 hours in patients who underwent PKVP**.** ***Zhigang et al.*** [8] also demonstrated a mean catheterization time of 80.5 hours in patients who underwent TURis. Also ***Bogdan et al.*** [4] demonstrated catheterization time by a mean of 72.8 hours in the PKVP group and 46.3 hours in the TURis group.

IPSS score:

In this study, TURis was superior to PKVP in improving IPSS score

In TURis group, the mean IPSS score improved from 27.80 ± 3.99 to 9.27 ± 2.28 at 3 months. In PKVP group, the mean IPSS score improved by from 27.67 ± 3.66 to 11.27 ± 2.55 at 3 respectively.

In agreement with our study, ***Michielsen et al.*** [11] reported that both techniques were equally effective, and the significant improvements compared to baseline were maintained at 48 m.

Zhigang et al. [8] results as regarding the PKVP group showed an improvement of the mean IPSS score by 17.1 and 17.4 at 3 and 6 months respectively. Mean QOL has improved by 2.8 and 2.6 at 3 and 6 months respectively. ***Horninger et al.*** [10] demonstrated that the clinical improvement after surgery was maintained at 12 months of follow-up. The mean IPSS were comparable between both groups with no statistical difference. They achieved their improved status by 3 months.

In this study, the mean age of patients was 60.67 ± 9.49 years for T.U.R.is group and 60.33 ± 9.48 years for the PKVP ***Bogdan et al.*** [4] in their study comparing PKVP, TURis and TURP demonstrated that the mean age of patients was 67 years.

In our study, 7 patients (23.3%) were presented with chronic urinary retention, 1 with failed medical therapy and 12 with chronic refractory retention. ***Brathwaite et al.*** [12] demonstrated that 23% of patients in the PKVP group has presented with urinary retention. The higher incidence of patients presented with urinary retention in our study may be attributed to the late presentation of patients in our country due to social and economic factors.

In our study, patients were divided into two groups where 23 patients had no comorbidities and the remaining 7 patients had comorbidities. There was no significant difference between the results of the two groups as regards duration of catheterization and hospital stay.

Measurements of safety:

Operative time:

In our study, there was significant difference in the mean operative time which was 45.33 ± 7.65 minutes in T.U.R.is group and 50.67 ± 5.91 minutes in PKVP group.

Bogdan et al. [4] has demonstrated in their study that the mean operative time was 52.1 and 55.6 minutes in the TURis and PKVP group respectively. ***Michielsen et al.*** [11] reported a longer operation times with TURis. They reported that some RCTs on bipolar technology do not reveal longer operation times ***Tefekli et al.*** [13]even reported statistically significant lower operation times with Gyrus. Only ***Michielsen et al.*** [11] reported a longer operation times with TURis. However, this last study was criticized by ***Horninger et al.*** [10] for its heterogeneous operator experience. In this larger clinical study, there was

no statistically significant difference in operation times.

Early and late postoperative complications:

In this study, early postoperative complications were seen. In TURis group, only two of patients had urinary retention following catheter removal and needed recatheterization, another one had mild to moderate dysuria resolving with anti-inflammatory medication, another one had mild hematuria 1 week postopeatively. In PKVP group, 1 patient had urinary retention which needed catheterization, Urinary tract infection and significant bacteriuria occurred in one case which was treated by antibiotics and 1 had a mild to moderate dysuria after 1 month was seen in one case.

Bogdan et al. [4] demonstrated that 5.9% of patients who underwent TURis needed recatheterization. Dysuria was seen in 10.6% in the TURis group respectively. Also 2.9% of patients in the TURis group had UTI.

Chapple et al. [14] results as acute and late complications were less frequent in the TURIS group. In their study, eight patients (16%) in the TURis had self-limiting transitory urge incontinence after surgery, which probably resulted from the high energy applied to the capsule, whereas there were none with stress incontinence in the TURis group. The complications such as urethral stricture and bladder-neck contracture were not significantly different between the groups.

CONCLUSION

Bipolar electrosurgical technology is a promising modality for surgical treatment of BPH. There was no significant difference between bipolar vaporization and TURis regarding residual prostatic tissue size.

Advantages of this technology:-

- No TUR syndrome
- Less blood loss especially in vaporization technique
- More easy learning curve either in vaporization technique or resection technique (no fear of TUR syndrome so time factor isn't an issue) enabling the surgeon to work slowly and to do adequate hemostasis.
- Vaporization technique is ideal modality for high risk patients (multiple co morbidities, bleeding tendency and patient on anticoagulants)
- Large prostate volume can be treated either by resection or vaporization technique)

– Urethral stricture is not higher with bipolar technology.

We can conclude that the bipolar plasmakinetic energy will be the gold standard in surgical management of BPH in the near future if it not yet.

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