# **Original Research Article**

DOI: http://dx.doi.org/10.18203/2349-2902.isj20181137

# From gold standard to platinum standard in BPH surgery: a perspective from a tertiary care center of the Indian subcontinent

Rajeev T. P. <sup>1</sup>, Yashasvi Singh<sup>1\*</sup>, Sasanka Kumar Barua<sup>1</sup>, Debanga Sarma<sup>1</sup>, Manash Pratim Kashyap<sup>2</sup>

**Received:** 11 February 2018 **Accepted:** 09 March 2018

## \*Correspondence: Dr. Yashasvi Singh,

E-mail: yashasvisingh075@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

#### **ABSTRACT**

**Background:** For last eight decades, transurethral resection of the prostate (TURP) has remained the mainstay of surgical treatment for BPH, due to the procedure's excellent, well-documented and long-lasting treatment efficacy. Patients with clinically bothersome LUTS suggestive of BPH not relieved with medical treatment benefit from transurethral resection/vaporization of prostate using various energy sources. Monopolar TURP has been the main form of treatment for many years in men with BPH and remains the gold standard against which other treatments are evaluated. The aim of this article is to review the role of m-TURP in contemporary BPH management.

**Methods:** This retrospective study included 275 patients with bothersome LUTS and histologically confirmed BPH, who underwent m-TURP at Deprtment of Urology and Renal Transplantation between July 2010 and July 2015 and were in follow up for at least 24 months in the Urology OPD. The most frequent indication (50-60%) for TURP is LUTS refractory to medical therapy.

**Results:** A total of 274 patients were divided into 3 groups based on prostate volume of less than 40 gram (Group A), 40 to 80 grams (Group B) and more than 80gm (Group C). Statistically, deranged EFG was significantly associated and correlated with Group B). The mean preoperative hemoglobin level for the entire patient population was 13.14±1.26 whereas the post-operative hemoglobin level was 12.22±1.39gm/dl. Similarly, the mean preoperative sodium level for the entire patient population was 137±4.26 whereas the post-operative level was 130±5.04mEq/L.

**Conclusions:** M-TURP is adequate for its intended use as an effective learning tool and as a substantial practical tool for managing BPH; m-TURP results depend on surgeons' experience, the patient's prostate volume- and comorbidities.

Keywords: Benign prostatic hyperplasia, Effective fasting glucose, Erectile dysfunction, Monopolar TURP

# INTRODUCTION

For last eight decades, transurethral resection of the prostate (TURP) has remained the mainstay of surgical treatment for BPH, due to the procedure's excellent, well-documented and long-lasting treatment efficacy.<sup>1</sup>

Nevertheless, the morbidity of the procedure, notably TURP-syndrome, bleeding and urethral stricture, remains significant at 11.1%, based on a prospective, multicentre study of 10,654 men.<sup>2</sup> BPH becomes an increasingly common phenomenon as men age. Patients with clinically bothersome LUTS suggestive of BPH not

<sup>&</sup>lt;sup>1</sup>Department of Urology, Gauhati Medical College Hospital, Guwahati, Assam, India

<sup>&</sup>lt;sup>2</sup>Department of Bussiness Administration, North Eastern Regional Institute of Management, Padma Nath Sarmah Bhawan, Khanapara, Guwahati, Assam, India

relieved with medical treatment benefit from transurethral resection/vaporization of prostate using various energy sources. Monopolar TURP has been the main form of treatment for many years in men with BPH and remains the gold standard against which other treatments are evaluated. Most patients opting for TURP experience a marked decrease in urinary symptom scores with substantial increase in maximal urinary flow rates. Complications associated with TURP have encouraged development of several alternative methods to remove adenomatous tissue using a variety of energy sources. During the past 2 decades, role of m-TURP has been challenged by the development of various other energy sources including laser and robotic approaches. Despite demographic changes towards advanced ageing along with increasing number of patient's being non-compliant and unrelieved with medical therapy, the numbers of prostate surgeries have declined substantially in recent times.

Although TURP has persisted for decades, the current procedure differs significantly from that performed 30 years ago. There have been improvements in operative technique, instrument technology, and anaesthetic methods. TURP is now safer, with a much lower mortality rate reported, but the effect these changes have had on long-term outcomes is largely unknown.<sup>3,4</sup> Recent long-term studies which include TURP use the procedure as the control arm. Currently, the standard TURP technique recommends a complete resection of all adenomatous tissue; however, the duration of the operation and the amount of the tissue removed are directly associated with intraoperative and early postoperative complications. The aim of this article is to review the role of m-TURP in contemporary BPH management. In doing so, we discuss (1) diagnostic work-up, (2) indication, (3) technical aspects, (4) short and long-term complication, and (5) clinical outcome.

#### **METHODS**

This retrospective study included 275 patients with bothersome LUTS and histologically confirmed BPH, who underwent m-TURP at Dept. of Urology and Renal Transplantation between July 2010 and July 2015 and were in follow up for at least 24 months in the Urology OPD. The most frequent indication (50–60%) for TURP is LUTS refractory to medical therapy. The following BPH complications are considered strong indications for TURP [2]: (1) recurrent urinary retention, (2) BPH-related macro-hematuria refractory to medical therapy with 5a-reductase inhibitors (5-ARI), (3) renal insufficiency or upper urinary tract dilatation, (4) bladder stones, and (5) recurrent urinary tract infection (UTI). The only contraindications for TURP are untreated UTI and bleeding disorders.

The inclusion criteria were age 45-85 years, IPSS  $\geq$ 13,  $Q_{max} \leq$ 15ml/s, post-voiding residual volume (PVR) of  $\leq$ 300ml, and a prostate biopsy to confirm benign disease,

when prostate specific antigen (PSA) was >2.5-4ng/mL despite of a 3 weeks antibiotic course. The standard protocol was used for the pre and postoperative examinations. Examinations of the patients before their operations included PSA, IPSS, Q<sub>max</sub>, PVR, total prostate volume (TPV). Transrectal ultrasound (TRUS) was used for the total estimation of the prostate and its zones. TURP was performed using standard 24 French resectoscopes with a continued flow according to the technique of a complete adenoma resection, down to the surgical capsule.

In addition to routine examinations, following measures were taken for patients with different internal comorbidities before they underwent M-TURP: 1) controlling blood pressure within 140/90 mmHg in hypertensive patients; 2) maintaining fasting blood glucose at 6-8mmol and 2-h postprandial blood glucose below 11mmol/l; 3) improving and maintaining pulmonary or cardiac function in patients with chronic bronchitis, emphysema, or cardiac dysfunction; and 4) controlling blood pressure or treating anemia with active symptomatic treatment in patients with chronic renal insufficiency. Patients with deteriorating or unstable comorbidities were transferred to other departments for further treatment before being reconsidered for inclusion in the study. M-TURP system was used for treating patient's (100 W for cutting and 50 W for coagulation; 1.5% Glycine as irrigation fluid). All the patients were placed in the lithotomy position and were given SA. The surgical procedures were performed based on the methodology described by Maurmayer. Bladder irrigation was initiated immediately after the patient was transferred to a ward or intensive care unit (ICU). Follow-up was arranged three, six and twelve months after TURP, and included IPSS,  $Q_{\text{max}}$ , TRUS and PVR investigations. The endpoint of the study was an evaluation of the treatment efficacy pre/postoperative changes to IPSS and Q<sub>max</sub>. The cut off of the efficacy of the operation was defined as 50% improvement of each evaluated parameter or decrease in IPSS ( $\geq 10$  points), increase in  $Q_{max}$  ( $\geq 10 ml/s$ ). SPSS software version 13.0 was used for data analysis. Discrete and continuous variables were compared using chi-square test, student t test and post HOC test respectively and correlation coefficient was calculated using the Spearman R analysis. P values less than 0.05 were considered statistically significant. SPSS version 13 was used to evaluate all statistical analysis.

# **RESULTS**

A total of 274 patients were divided into 3 groups based on prostate volume of less than 40 gram (Group A), 40 to 80 grams (Group B) and more than 80 grams (Group C). There were 2 patients in group A, 216 patients in the group B and 56 patients in the group C. All the patients underwent m-TURP with 1.5% Glycine as irrigation fluid under standard electrosurgical settings. Mean values of various biochemical and clinical parameters along with

standard deviation has been shown in Figure 1 for all the

patients together.

Table 1: Distribution of different biochemical and clinical parameters among the patient population with median and interquartile range with respect to prostate volume.

Group	Age	PSA	IPSS (pre- surgery)	Q <sub>max</sub> (pre- surgery)	PVRU (pre- surgery)	AUR (p value)	DM (p value)	HTN (p value)	Dyslipidemia (p value)
B (40- 80gm)	65(59- 72)	4.67(3.91- 5.35)	13.5(11.8- 15.7)	11.64(8.4- 12.8)	178(151- 199)	49/216	67/216	78/216	86/216
C (>80gm)	71(63- 79)	5.35(4.76- 6.12)	23.6(19.7- 27.8)	7.89(6.55- 9.12)	224(198- 256)	11/56 (0.017)	19/56 (0.023)	22/56 (0.025)	19/56 (0.020)

Table 2: Distribution of post-surgery biochemical and clinical parameters among the patient population.

Group	HCT drop	IPSS (pre- surgery)	IPSS (post- surgery 6 month)	IPSS (post- surgery) 12 month	Post-operative urinary retention (within 6 months)	CATH Time (post surgery)	Hosp stay (Post surgery)
B (40-80gm)	8.32±2.45	28.32±3.45	8.55±3.04	9.43±2.25	2.66±0.54 episodes	2.33±.75 days	3.95±1.85 days
C (>80gm)	10.11±3.16	32.26±2.56	10.42±4.24	11.24±3.44	4.13±1.2 episodes	3.12±2.65	4.12±2.68 days

Mean age in the patient cohort was 64.64±8.23 years and mean prostate volume was 70.47±14.35gm. Age (Pearson's R-0.71, p value 0.001) and prostate weight (Pearson's R-0.383, p value 0.001) were significantly correlated with the patient population in both group B and C. Mean serum PSA for the entire patient population was 4.13±1.66ng/ml. Maximum number of patients with deranged plasma glucose were in group B (n=67, 31%). Statistically, deranged EFG was significantly associated and correlated with Group B. Altered waist to hip ratio was most evident in the group B as well (n=80, 37.04%) along with significant association and correlation. Dyslipidemia was evenly distributed in both group B (n=86, 39.8%) and C (n=19, 33.9%) along with significant statistical parameters as shown in Table 1. Hypertension was a very common phenomenon observed in both group B (n=78, 36.1%) and group C (n=22, 39.3%). Preoperative AUR marked its presence mostly in group B (n=49, 22.7%) confirming the previous literature that size was not the only significant criteria determining AUR. Post-operative AUR was vehemently related to the group B (n=22, 10.2%) as well along expected lines. Large prostate glands were related with increased risk of MI and were on regular anti coagulants for the same in group B (n=50, 23.1%).

Applying the Post Hoc test to ascertain the maximum variation among biochemical parameters in between the groups B and C signified that the serum PSA variation were maximum between the group B and C (Tukey HSD (I-J) - 1.31, p =0.001). The mean preoperative hemoglobin level for the entire patient population was  $13.14\pm1.26$  whereas the post-operative hemoglobin level was  $12.22\pm1.39$ gm/dl. Similarly, the mean preoperative sodium level for the entire patient population was  $137\pm4.26$  whereas the post-operative level was  $130\pm5.04$ mEq/L.

Table 3: Post-surgery PVRU and flow parameters at 6 and 12 months with statistical profile.

Group	PVRU (post-surgery 6 months) ml	Post-surgery Q <sub>max</sub> 6 months (ml/min)	Post-surgery Q <sub>max</sub> 12months (ml/min)
B (40-80gm)	51.34±3.43	13.25±2.45	12.12±3.56
C (>80gm)	68.92±2.59	11.45±1.96	10.32±24
In between Group ANOVA F, (p value)	4.556 (0.04)	4.331 (0.01)	3.831 (0.022)

Significant hemoglobin (Tukey HSD (I-J) - 0.169, p = 0.003) and sodium (Tukey HSD (I-J) - 1.196, p = 0.007) drop in pre and post-operative scenarios were also seen between group B and C. On applying the one-way ANOVA hemoglobin drop was found to be significant

when considering intergroup variation (F- 3.45, p= 0.033) but not when analyzing within the same group. The dropin serum sodium concentration (F- 4.19, p= 0.016) was also found to be significant when analyzing the intergroup results than when observing the intra-group

variation. Both sodium (Pearson's R - 0.567, p=0.001) and hemoglobin (Pearson's R - 0.582, p=0.003) variation were significantly correlated among the group B and C.

Post-surgery IPSS and maximum flow velocity showed expected improvement at 6 and 12 months and were maintained thereafter. All parameters were monitored routinely and any patient skipping the regular follow up was omitted from the statistical analysis. Mean PVRU for the group B was 187.45ml which dropped to an average of 50 cc at 6 months of the surgery and was statistically significant thus reinstating the belief in technique and the mode of treatment. Post-surgery Q<sub>max</sub> also improved vitally improving the bothersome symptom of urgency and urgency incontinence which were evident by significant decrease in mean IPSS score. The maximum flow parameters were sustained at 12 months of follow up and patients showed stabilization of the same at further OPD visits. The classical TUR syndrome infamously associated with the m TURP technique was recorded in .08% (n= 27) patients. All patients recovered well on 3% NaCl 100ml i/v slow given over 4 hours till

sodium correction after taking proper nephrology consultation. Urethral catheter was removed on an average on the 3<sup>rd</sup> post-operative day (mean - 71.7 hours).

Urethral strictures were more common in the group B (n=22, 10.2%) followed by the group C (n=10, 17.9%). Mean resection time for the group B was 68.7±4.56 minutes (p= 0.76) and for group C was  $77.45\pm3.12$ minutes (p=0.12). Post-surgery hematuria within 3 months was mostly seen in large prostate gland and amounted to 14.96% of the cases with maximum cases occurring in group C and with infective pre-operative urine culture reports. Majority of the cases were managed conservatively on continuous irrigation but 36.58 % patients amongst the hematuria cohort required clot evacuation under anaesthesia. Sexual dysfunction rate was determined based on IIEF-5 validated questionnaire and sexual activity was advised at beginning of 3 months post-surgery. Majority patients had a prior history of some sort of sexual dysfunction before the surgery and were managed well on psychiatry consultation and medications.

Table 4: Delayed complication profile in the patient population, only 66 patients participated in the IIEF questionnaire among the total patient population.

Delayed complications (with 12 months of surgery)	Incidence	Chi square coefficient	P value	Pearson's R coefficient	P value
Hematuria	41/274	2.13	0.854	0.078	0.551
Urethral stricture	33/274	6.211	0.001	0.87	0.001
AUR requiring catheterization	26/248	8.057	0.017	0.64	0.001
Sexual dysfunction (IIEF-5)	10/66*	0.793	0.673	0.045	0.454
Re-hospitalization	24/274	8.829	0.01	0.133	0.028

## **DISCUSSION**

Different surgical options are available for BPH, of which, monopolar transurethral resection of the prostate is the surgical gold standard for prostate volume less than 80ml.<sup>5,6</sup> A recent study analysed long term outcome of monopolar TURP done by single surgeon, including 3589 procedures. They reported that with technical advancement in TURP, stupendous success can be achieved with minimal complication rates.<sup>7</sup> In one analysis, where 467 patients completed 5 years follow up, results of 177.8% increase in Qmax, 91.7% decrease in PVRU, 52.4% decrease in IPSS, 56.2% decrease in QoL and 42.8% decrease in overactive bladder symptom score compared to baseline were observed.<sup>8</sup> Studies comparing monopolar and bipolar TURP reported similar and durable long term efficacy of either procedures. 9-12 Nonetheless, in one prospective study, where 36 patients finished 6 years follow up, authors concluded that  $Q_{\text{max}}$ and IPSS values were notably inferior to b-TURP compared to m-TURP (P<0.05). <sup>13</sup> In a meta-analysis of 9 RCT's, 448 and 441 patients underwent PVP and mTURP respectively, where it was concluded that functional outcomes were similar in six studies, favoured m-TURP in two and PVP in one study. Nevertheless, overall intermediate term efficacy was similar with PVP and m-TURP.14 In the experience we concluded that the combined mean pre-surgical IPSS score for the group B and C was 30.29±2.52 which dropped down and stabilized at 9.48±1.05 at the end of 1 year follow up. The mean catheter time along with hospital time for the entire patient cohort was 2.88±0.88 days and 4.12±1.14 days respectively. Mean maximum flow rate (Q<sub>max</sub>) at the end of 1 year follow up was 12.05±1.22ml/minute. The results and percentage change in the validated parameters were within comparable limits with that of the available published literature. The variation which did happen were mostly because not all surgeries were done by the faculty and resident training program was considered equally important but without compromising patient safety and surgical outcome.

Five RCT's comparing HoLEP with m-TURP found equivalent improvements in IPSS,  $Q_{max}$  and PVR reported

by Tan et al, Kuntz et al, Montorsi et al, Gupta et al, Mavuduru et al. A study reported superior urodynamic relief of bladder outlet obstruction for HoLEP at 6 months, whereas Montorsi and colleagues found no significant difference in urodynamic results at 12 months (Table 5). In an analysis of twenty RCTs reported between 2005 and 2009 and a follow-up of 60 months, m-TURP resulted in an improvement of the mean  $Q_{\text{max}}$ 

(162%), a reduction of the mean IPSS (-70%), and a reduction of mean PVR (-77%).<sup>15</sup> One study reported a remarkable decrease in most symptoms and an improvement in the urodynamic variables after the mean period of 13 years, which demonstrated the efficacy of mTURP in long-term settings. In general, the end result of TURP performed for LUTS is favourable in 78-93% of patients.<sup>16-17</sup>

Table 5: Comparin	g author clinical	parameters with	contemporar	y RCT's.

	Transfusion %		Catheter time (hour)		Hospital (hours)	Hospital stay (hours)		IPSS(% change)		Q <sub>max</sub> (% change)		PVR (% change)	
	HOLE P	mTUR P	HOLE P	mTUR P	HOLE P	mTUR P	HOLE P	mTUR P	HOLE P	mTUR P	HOLE P	mTUR P	
Tan et al	0	3	17.7	44.9	27.6	49.9	83	79	160	122	70	59	
Kuntz et al	0	2	27.6	43.4	53.3	85.8	92	82	469	369	98	88	
Montorsi et al	0	2	31.0	57.8	59.0	85.8	81	82	206	217	NA	NA	
Gupta et al	0	2	28.6	45.7	NA	NA	78	76	387	427	82	76	
Mavudur u et al	0	7	46.6	78.2	NA	NA	81	84	393	302	53	65	
Author experien ce	N/A	10	NA	66.5	NA	96.8	NA	70	NA	220	NA	78	

According to published and validated literature, the premier results for the management of LUTS were evinced after open prostatectomy when up to 97% of the prostate transition zone can be enucleated. 18 The overall thrust of preoperative variables on management related functional outcome or treatment efficiency has been investigated in different prospective RCT's. Symptom differentiation between LUTS due to neurogenic or myogenic causes related to bladder dysfunction and BPH is one of the essential points that can affect post-surgical performance. Nonetheless, recent results on TURP complications reported in the analysis of the contemporary RCT's are not significantly higher in comparison to those observed with other techniques: bleeding requiring blood transfusion (2%), TUR syndrome (0.8%), acute urinary retention (4.5%), clot retention (4.9%), and UTI (4.1%).<sup>19</sup> The duration of the surgery is currently much shorter (mean - 48.5 min), compared with an average of 57 and 62.5 min, respectively, in the past cohort reference studies.<sup>20</sup> However, taking into account the long term complications, studies reported different rates of urethral stricture, bladder neck contracture, residual adenoma requiring reoperation, UTI, dysuria, erectile dysfunction, retrograde ejaculation among others.<sup>21</sup> Author observed similar rates of complications, including dysuria, UTI and urethral stricture among patients of the group B and C at 24 months follow up. At review, men who volunteered to undergo questions about their sexual life (n=66) were asked about their sexual function. Interestingly, 30% of men reported they were not sexually active and so did not finish the IIEF-5 questionnaire. Of the remaining 46 men who completed

this questionnaire, the average score was 15. Unfortunately, no baseline record was available to allow postoperative changes to be calculated. This result can be equated with the general population. Many studies have reported that up to 80% of men over 70 years of age have a degree of sexual impairment. 22-24 While we accept that the data in this series is restricted, it does suggest that m-TURP has had no long-term consequence on erectile function. It does, nevertheless, have a noteworthy impact on antegrade emission. Nearly eighty percent (n=52) of sexually active men revealed loss of emission on orgasm at follow up visits.

#### **CONCLUSION**

Monopolar TURP is still alive and evolving as an effective and foremost weapon in the hands of young urologist in 2017, despite Stamey's affirmation in 1993 that "TURP is now a therapy of history. TURP has taken on many challenges, but still remains the gold standard to which others are compared. M-TURP is adequate for its intended use as an effective learning tool and as a substantial practical tool for managing BPH; m-TURP results depend on surgeons' experience, the patient's prostate volume- and comorbidities. Therefore, in appropriately selected patients TURP has an unrivalled tract record of durability and endurance. M-TURP is one of the first endoscopic procedures that urology residents deliver and is also one of the bread-and-butter operations most urologists perform. The setup is available in almost all hospitals. In our personal experience we would like to conclude that before conquering the unheralded heights of ever changing newer modalities in surgical treatment of BPH, a budding urologist should learn to scale and master each and every trick of m-TURP to achieve maximum success for his patients.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

#### REFERENCES

- Reich O, Gratzke C, Stief CG. Techniques and longterm results of surgical procedures for BPH. Eur Urol. 2006;49:970-8.
- 2. Rassweiler J, Teber D, Kuntz R. Complications of transurethral resection of the prostate (TURP)-incidence, management and prevention. Eur Urol. 2006;50:969-80.
- Mebust WK, Holtgrewe HL, Cockett AT, Peters PC, Bueschen AJ, Carlton Jr CE, et al. Transurethral prostatectomy: immediate and postoperative complications. A cooperative study of 13 participating institutions evaluating 3,885 patients. The Journal of urology. 1989 Feb 1;141(2):243-7.
- 4. Rassweiler J, Teber D, Kuntz R, Hofmann R, Puppo P. Complications of transurethral resection of the prostate (TURP)-incidence, management, and prevention. European urology. 2006;50(5):969-80.
- 5. Yu X, Elliott SP, Wilt TJ, McBean AM. Practice patterns in benign prostatic hyperplasia surgical therapy: the dramatic increase in minimally invasive technologies. J Urol. 2008;180:241-5.
- Ho HS, Yip SK, Lim KB, Fook S, Foo KT, Cheng CW. A prospective randomized study comparing monopolar and bipolar transurethral resection of prostate using transurethral resection in saline (TURIS) system. Eur Urol. 2007;52:517-22.
- 7. Tasci AI, Ilbey YO, Tugcu V, Cicekler O, Cevik C, Zoroglu F. Transurethral resection of the prostate with monopolar resectoscope: single-surgeon experience and long-term results of after 3589 procedures. Urol. 2011;78:1151-5.
- 8. Hu Y, Dong X, Wang G, Huang J, Liu M, Peng B. Five-year follow-up study of transurethral plasmakinetic resection of the prostate for benign prostatic hyperplasia. J Endourol. 2016;30:97-101.
- 9. Neyer M, Reissigl A, Schwab C. Bipolar versus monopolar transurethral resection of the prostate: results of a comparative, prospective bicenter study perioperative outcome and long-term efficacy. Urol Int. 2013;90:62-7.
- Erturhan S, Bayrak Ö, Seçkiner İ, Demirbağ A, Erbağcı A, Yağcı F. Comparative outcomes of plasmakinetic versus monopolar transurethral resection of benign prostatic hyperplasia: 7 years' results. Turkish journal of urology. 2013 Dec;39(4):220.
- 11. Fagerström T, Nyman CR, Hahn RG. Complications and clinical outcome 18 months after bipolar and monopolar transurethral resection of the prostate. Journal of endourology. 2011 Jun 1;25(6):1043-9.

- 12. Muslumanoglu AY, Yuruk E, Binbay M, Akman T. Transurethral resection of prostate with plasmakinetic energy: 100 months results of a prospective randomized trial. BJU Int. 2012;110:546-9.
- 13. Koca O, Keleş MO, Kaya C, Güneş M, Öztürk M, Karaman Mİ. Plasmakinetic vaporization versus transurethral resection of the prostate: Six-year results. Turkish J Urol. 2014 Sep;40(3):134.
- 14. Thangasamy IA, Chalasani V, Bachmann A, Woo HH. Photoselective vaporisation of the prostate using 80-W and 120-W laser versus transurethral resection of the prostate for benign prostatic hyperplasia: a systematic review with meta-analysis from 2002 to 2012. Eur Urol. 2012;62:315-23.
- Ahyai SA, Gilling P, Kaplan SA, Kuntz RM, Madersbacher S, Montorsi F, et al. Meta-analysis of functional outcomes and complications following transurethral procedures for lower urinary symptoms resulting from benign prostatic enlargement. Eur Urol. 2010;58:384-97.
- Thomas AW, Cannon A, Bartlett E, Ellis-Jones J, Abrams P. The natural history of lower urinary tract dysfunction in men: minimum 10-year urodynamic follow up of transurethral resection of prostate for bladder outlet obstruction. J Urol. 2005;174:1887-91.
- 17. Ameda K, Koyanagi T, Nantani M, Taniguchi K, Matsuno T. The relevance of preoperative cystometrography in patients with benign prostatic hyperplasia: correlating the findings with clinical features and outcome after prostatectomy. J Urol. 1994;152:443-7.
- 18. Illing R. Surgical and minimally invasive interventions for LUTS/BPH: highlights from 2006. European Urology Supplements. 2007;6:701-9.
- 19. Reich O. Bipolar transurethral resection of the prostate: what did we learn, and where do we go from here? Eur Urol. 2009;56:796-7.
- Milonas D, Matijošaitis A, Jievaltas M. Transition zone volume measurement - is it useful before surgery for benign prostatic hyperplasia? Medicina (Kaunas). 2007;43:792-7.
- 21. Finkle AL, Moyers TG, Tobenkin MI, Karg SJ. Sexual potency in aging males: 1. Frequency of coitus among clinic patients. J Am Med Assoc. 1959;170(12):1391-3.
- 22. Kunelius P, Häkkinen J, Lukkarinen O. Sexual functions in patients with benign prostatic hyperplasia before and after transurethral resection of the prostate. Urological Res. 1998;26(1):7-9.
- 23. Stamey TA. Editorial. Monographs in Urol. 1993;12:14-6.
- 24. Kaplan SA. Transurethral resection of the prostate-is our gold standard still a precious commodity? J Urol. 2008;180:15-6.

Cite this article as: Rajeev TP, Singh Y, Barua SK, Sarma D, Kashyap MP. From gold standard to platinum standard in BPH surgery: a perspective from a tertiary care centre of the Indian subcontinent. Int Surg J 2018;5:1499-504.