Original Article

Changing profiles of patients undergoing transurethral resection of the prostate over a decade: A single-center experience

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Abstract

Context: Patients with benign prostatic hyperplasia (BPH) usually form the bulk in urology outpatient departments. The management options include medical therapy or surgery. Transurethral resection of the prostate (TURP) has been the mainstay of surgical management. The use of medical therapy has increased over the years. This has led to a shift in the profiles of patients undergoing surgical management of BPH.

Aims: We conducted this study to analyze the differences in profiles of patients undergoing TURP over a decade.

Settings and Design: This was a retrospective study.

Subjects and Methods: We retrospectively reviewed the medical records of all patients who underwent TURP from January 1 to December 31 in 2006 and 2016. The age, preexisting comorbidities, prostate volume, operative time, mean prostatic tissue removed, duration of hospitalization, and complications were evaluated among the two groups of patients. Charlson comorbidity index was used to evaluate the preexisting comorbidities, and the modified Clavien classification system was used for evaluating the perioperative and postoperative complications.

Results: A total of 114 and 125 patients underwent TURP in 2006 and 2016, respectively. The mean age of the patients was 62.1 ± 8.22 and 66.94 ± 9.12 years in 2006 and 2016, respectively. The serum prostate-specific antigen levels increased from 4.39 ± 4.425 to 5.59 ± 7.61 ng/ml a decade apart. A number of patients taking medical therapy before surgical intervention increased from 62.23% to 75.2% ($P < 0.05$). There was a significant increase in the mean prostatic volume and weight. There was only a modest increase of 1.94% in the total number of complications ($P > 0.05$) and no significant change in the rates of complications.

Conclusions: Medical therapy for BPH patients has resulted in delayed surgical interventions. The complication rates have not increased. Thus, the increased use of medical therapy in BPH patients is justified though TURP may still be considered the gold standard.

Keywords: Benign prostatic hyperplasia, Charlson comorbidity index, modified Clavien classification system, transurethral resection of the prostate

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INTRODUCTION

Benign prostatic hyperplasia (BPH) is a common urological disease that affects aging men all over the world. It causes urinary tract obstruction due to unregulated growth of the prostate gland causing lower urinary tract symptoms (LUTS).[1] The prevalence of BPH as well as the proportion of men having LUTS due to BPH increases with the increasing age.[2] Thus, if the natural course of disease progression is not altered, it leads to worsening quality of life and complications such as bleeding, acute urinary retention, bladder calculi, and renal functional impairment.[3]

The options for management of BPH include watchful waiting, pharmacotherapy, transurethral resection of the prostate (TURP), and other minimally invasive surgical treatments (MISTs) and open prostatectomy.[4] Most studies consider TURP as the gold standard for surgical management of BPH.[5] Pharmacotherapy, due to its established role in combating LUTS, decreasing prostate size, and steadying disease progression, became the first-line treatment in the management of BPH a few decades back and its use has increased accordingly.[6,7] Consequently, there has been a constant decline in the number of TURPs being performed.[8]

With increasing life expectancy, the burden of BPH has increased.[2] While pharmacotherapy delays the time to BPH-related surgery.[9] Thus, more elderly patients with age-related comorbidities are expected to undergo TURP/MIST. We conducted this study to find the differences in profiles of patients undergoing TURP a decade apart.

SUBJECTS AND METHODS

This study was conducted at the Department of Urology, King George's Medical University, Lucknow, Uttar Pradesh, India. We retrospectively reviewed the medical records of all patients who underwent TURP for BPH over a year and a decade apart from January 1 to December 31 in the years 2006 and 2016.

Ethical clearance for this study was taken from the Institutional Review Board. All procedures were performed or supervised by experienced urologists. Data evaluated included the age, preexisting comorbidities, prostate volume, indication for surgery, use of medical therapy, operative time, mean prostatic tissue removed, duration of hospitalization, and complications.

Prostate size measured by transabdominal ultrasonography was evaluated because transrectal ultrasonography data were available only in few patients (in our institute, we always do a transabdominal ultrasound in all patients, and only in select patients, we do transrectal ultrasound following a transabdominal ultrasound). In our institute, we routinely do a transrectal ultrasound-guided biopsy in patients with prostate-specific antigen (PSA) >4 ng/ml. Those who had prostate carcinoma in the either transrectal or postoperative biopsy were excluded from the study. Standard techniques as described in literature for TURP were used, and we believe that the techniques have remained essentially unchanged a decade apart.[10] As in our institute, only monopolar TURP is done, thus 1.5% glycine is used as irrigation solution. The patients who underwent other MISTs or open prostatectomy were excluded from the study. In the year 2006, there were 2 patients who underwent open prostatectomy while all others underwent TURP, while in 2016, 1 patient underwent open prostatectomy and 11 patients underwent other MISTs.

The Charlson comorbidity index (CCI) was used to evaluate the preexisting comorbidities of each patient, and the CCI score of every patient was determined.[11] The CCI is given in Table 1, and scores of 1, 2, 3, or 6 are assigned according to the severity of the condition. The score of each comorbidity is added to get a total score, and patients were classified in 3 categories of CCI with scores of 0, 1, or >2.

All patients received antibiotic prophylaxis with intravenous ceftriaxone 1 g according to hospital policy. Postoperatively, body temperature of ≥100°F was considered as significant. Hematuria that persisted >48 h and resolved spontaneously was considered as "transient hematuria." Serum creatinine,

Table 1: Charlson comorbidity index

Charlson score	Comorbid conditions
0	No comorbid conditions
1	Myocardial infarction
	Congestive cardiac failure
	Peripheral vascular disease
	Dementia
	Cerebrovascular disease
	Chronic pulmonary disease
	Conjunctive tissue disease
	Slight diabetes, without complications
	Ulcers
	Mild chronic disease of the liver
2	Hemiplegia
	Moderate or severe kidney disease
	Diabetes with complications
	Tumors
	Leukemia
	Lymphoma
3	Moderate or severe liver disease
6	Malignant tumor, metastases, AIDS

AIDS: Acquired immune deficiency syndrome

electrolyte, and blood counts were obtained in all patients postoperatively. The modified Clavien classification system (MCCS) [Table 2] was used for evaluating the perioperative and postoperative complications.[12] In case of more than one complication in the same patient, categorization was done in more than one grade.

Statistical analysis

Baseline characteristics and pre and postoperative parameters were compared between two groups. Results were given as mean along with standard deviation. Chi-square test was used to compare qualitative data and Student's *t*-test was used for quantitative data. $P < 0.05$ was considered statistically significant. SPSS (Version 21.0, IBM Corp., Armonk, NY) was used for data analysis.

RESULTS

A number of patients who underwent TURP in 2006 and 2016 were 114 and 125, respectively. Table 3 shows the preoperative and operative records of the two groups of patient population. The mean age of patients was 62.1 ± 8.22 years in 2006 and 66.94 ± 9.12 years in 2016, thereby showing a statistically significant increase ($P < 0.001$) over a decade. There was an increase in serum PSA levels from 4.39 (±4.425) to 5.59 (±7.61) ng/ml a decade apart, but it was not statistically significant. The number of patients who had taken medical therapy for BPH before surgical intervention increased from 62.23% to 75.2% ($P < 0.05$).

There was also a significant change in the preoperative comorbidities. The number of patients with CCI score 0 decreased from 77.19% to 64% ($P < 0.05$) while the number of patients with CCI score 1 increased from 17.54% to 29.6% ($P < 0.05$). There was also an increase in the number of patients having CCI score ≥2 from 5.26% to 6.4%, but it was not statistically significant.

There was a statisticaly significant increase in the mean prostatic volume from 52.6 g to 57.97 g and the weight of the prostatic chips resected and from 22.4 g to 26.8 g respectively. However, the operative time and duration of hospital stay did not change significantly.

Table 4 shows the different complications that were recorded according to the MCCS. There was only a modest increase of 1.94% in the total number of complications, which did not attain statistical significance. Similarly, there was no significant change in the rates of complications when stratified according to the different grades of MCCS. A total of 2 patients had transient elevation of serum creatinine which could have been multifactorial, thankfully in repeat measurements, their creatinine normalized, and no further intervention had to be done. One patient suffered pulmonary thromboembolism in the postoperative period; he was immediately shifted to the critical care unit and survived. For the 2 patients who had myocardial infarction, management was done in cardiac critical care and patients survived. Similarly, the patients with urosepsis and Trans Urethral Resection (TUR) syndrome were managed accordingly in intensive care unit.

Table 2: Classification of surgical complications according to the modified Clavien system

Grade	Definition
Grade 1	Any deviation from the normal postoperative course without the need for pharmacologic treatment or surgical, endoscopic, and radiologic interventions. Allowed therapeutic regimens are drugs as antiemetics, antipyretics, analgesics, diuretics, electrolytes, and physiotherapy. This grade also includes wound infections opened at the bedside
Grade 2	Complications requiring pharmacologic treatment with drugs other than such allowed for Grade 1 complications. Blood transfusions and total parenteral nutrition are also included
Grade 3	Complications requiring surgical, endoscopic, or radiologic intervention.
Grade 3a	Intervention not under general anesthesia
Grade 3b	Intervention under general anesthesia
Grade 4	Life-threatening complications (including central nervous system complications) requiring intensive care unit stay
Grade 4a	Single organ dysfunction (including dialysis)
Grade 4b	Multiorgan dysfunction
Grade 5	Death of the patient

Table 3: Comparison of patient data between 2006 and 2016

	2006	2016	*P*
Total patients	114	125	
Mean age (years±SD)	62.1±8.22	66.94±9.123	<0.001
Serum PSA (ng/ml)	4.391±4.425	5.590±7.61	0.1427
Prior medical therapy, *n* (%)	71 (62.2)	94 (75.2)	0.0359
CCI, *n* (%)			
0	88 (77.2)	80 (64.0)	0.0333
1	20 (17.5)	37 (29.6)	0.0336
≥2	6 (5.3)	8 (6.4)	0.7875
Mean prostatic volume (g±SD)	52.6±18.34	57.974±21.79	0.0412
Indication for surgery, *n* (%)			
Moderate to severe LUTS	32 (28.1)	39 (31.2)	-
Recurrent urinary retention	56 (49.1)	63 (50.4)	
Recurrent urinary tract infection	8 (7.1)	7 (5.6)	
Recurrent hematuria	4 (3.5)	3 (2.4)	
Bladder calculus	9 (7.9)	7 (5.6)	
Others	5 (4.4)	6 (4.8)	
Operative time (min±SD)	63.2±26.45	62.6±34.72	0.8815
Weight of prostatic chips (g±SD)	22.4±13.8	26.8±16.7	0.0282
Mean duration of hospitalization (days±SD)	2.56±1.02	2.51±1.36	0.7499

SD: Standard deviation, PSA: Prostate-specific antigen, LUTS: Lower urinary tract symptoms, CCI: Charlson comorbidity index

DISCUSSION

Historically, open prostatectomy was the lone option for management of BPH until the introduction of TURP in

Table 4: Complications of transurethral resection of the prostate classified according to the modified Clavien classification system

Grade	Complication	2006 (*n*=37; 32.46%)	2016 (*n*=43; 34.4%)	*P*
1	Total	25	29	
	Fever	3	4	0.9365
	Transient elevation of serum creatinine	1	1	
	Transient hematuria	5	6	
	Catheter blockage by clots or chips	6	4	
	Failed voiding trial	8	11	
	Urinary incontinence	2	3	
2	Total	6	8	
	Bleeding requiring blood transfusion	2	3	0.9219
	Urinary tract infection	4	5	
3	Total	3	2	
3a	Clot retention	2	1	0.9171
3b	Subtrigonal perforation	1	0	
	Urethral stenosis or bladder neck contracture	0	1	
4	Total	3	4	
4a	Pulmonary thromboembolism	0	1	0.7946
	Myocardial infarction	1	1	
4b	Urosepsis	1	2	
	TUR syndrome	1	0	

TUR: Trans Urethral Resection

the 1930s.[13] It rapidly gained prominence and became the dominant surgery performed for BPH worldwide. Even, the introduction of multiple other MISTs has not been able to detach the tag of "gold standard" surgery that is often branded upon TURP.[5] TURP is done either with monopolar or bipolar current. The advantage of using bipolar TURP includes the ability to use normal saline as irrigation solution intraoperatively, theoretically reducing the risk of electrolyte disturbances and TUR syndrome.[14] Other MISTs for management of BPH include Holmium laser enucleation of the prostate (HoLEP), photovaporization of the prostate (PVP) with green light laser, and most recently, thulium laser vapo-enucleation of the prostate (ThuVEP). The said advantages of these techniques include shorter duration of catheterization, less requirement of postoperative irrigation, shorter length of hospital stay, utility in patients on anticoagulants, and lower rates of postoperative complications. There are disadvantages of these techniques as well that include slower resection rate, higher postoperative dysuria and lack of tissue for histopathology in PVP and higher postoperative urinary retention, transient urinary incontinence, and greater learning curve for HoLEP.[15,16] ThuVEP, on the other hand, has been introduced as a size-independent alternative for management of the prostate in BPH.[17] However, the advent of medical therapy has had the most profound impact on the trends in management of BPH. First introduced in the 1970s, medical therapy gradually gained prominence and has attained first-line therapy status.[7,18] The very fact that "a pill a day can keep surgery at bay" led to the increased prevalence in the use of medical therapy.[19]

The rise in number of patients on medical therapy for BPH was evident in our study. We observed that almost 75% of patients had a history of medical therapy in 2016. Various studies have reported varying rates of medical therapy in patients undergoing surgery for BPH ranging from 73% to 85%.[20-23] All studies reported that the use of medical therapy has increased significantly with time.

Most studies have reported a fall in the number of TURPs as a consequence of increased use of medical therapy.[8,21,22,24,25] In our study, we did not find a decrease in the number of patients undergoing TURP. Similar results were reported from China.[20] India and China are the two most populous countries and the increased penetration of health services; referrals and increased awareness may have contributed to the rise in the number of TURPs. A global, multicenter study may be needed to better understand this phenomenon.

We observed that the patients undergoing TURP were older by 4.84 years than those a decade earlier ($P < 0.001$). This was consistent with global trends that show a consistent increase in the mean age of patients undergoing TURP. Various studies have reported that the patients undergoing surgery were older by a mean of 3.4–9.98 years over a decade.[21,24] An important factor here is that it is expected that patients are to be older due to longer use of prior medical therapy. All these authors also reported a larger sized prostate gland with corresponding increase in the weight of prostatic tissue resected. We found that the serum PSA values have not increased significantly despite of the larger prostate volumes. Guo *et al*. reported a significant rise in preoperative PSA values[20] while others have reported decreased PSA values in men undergoing TURP.[21,24] This

could be attributed to the heterogeneity in the type of medical therapy being taken by the different populations.

We used the CCI score to classify and compare comorbidities. The CCI has been validated earlier in predicting morbidity and mortality associated with TURP.[26-28] In our study, we found that 36% patients had preexisting comorbidities in 2016 as compared to 22.81% in 2006. Earlier studies have reported varying rates of comorbidity ranging from 25.2% to 77%.[29,30] A recent study by Guo *et al*. retrospectively analyzed 2326 cases that underwent TURP at their institution from 1992 to 2013 and reported that patients with CCI score 0, 1, and ≥2 were 32.4%, 63.9%, and 3.7%, respectively.[31] These incongruities can be due to dissimilarities in geographical, socioeconomic, and racial characteristics of the patients as well as due to the differences in the methods of documentation. Despite these differences, various authors have reported the trend of rising preexisting comorbidities, similar to our study[20,21,24]

In a previous study conducted at our institute,[32] it was shown that Grade I–III complications (according to the MCCS) comprised the majority (90%) while Grade IV were fewer (<8%) and Grade V were rare (1%) after TURP. In the present study, the rate of complications of the 2016 cohort in Grade I–III were 90.7%, Grade IV were 9.3%, and none in Grade V, and no significant difference was observed from the 2006 cohort [Table 4].

Although the weight of prostate tissue resected has increased, the operative time and duration of hospitalization have not shown any difference. The close association between weight of resected tissue and perioperative complications was reported by Reich *et al*.[33] Furthermore, increasing age and comorbidities are known to increase complications across all surgical specialties. Contrary to the effect of all these factors, we found no significant increase in the complication rates. All these may be attributed surgical experience with advancements and improvement in technical aspects of TURP, anesthesia, and patient care. The use of 5-alpha reductase inhibitors has been shown to decrease the vascularity of the prostate gland.[34] The increased use of medical therapy by BPH patients may thus have also been the contributory factor for the above results.

Finally, our data are in sync with the global trends of BPH patients presenting for surgery being older with more comorbidities and larger glands. Fortunately, the complication rates have not increased. Thus, the advances in surgical and allied medical fields have offset the negative consequence of increased use of BPH medications on deteriorating preoperative profile of patients.

Our study has its limitations: first, its retrospective design and lack of detailed drug history (nature, duration). Second, we do not have data regarding intraoperative complications, blood loss, and amount of irrigation fluid used. Third, prostate size was measured using transabdominal ultrasound only, and data with transrectal ultrasound for prostate size would have been more desirable. Finally, we have not compared data regarding quality of life and pre- and postoperative American Urological Association symptom score. The importance of our study lies in the fact that to our knowledge, this is the first such study from the Indian subcontinent. The accompanying brief review of literature highlights that although the general trends are the same in most aspects, there are large variations in data reported by studies from different countries

CONCLUSIONS

The increasing use of medical therapy by BPH patients has resulted in delayed progression to surgical management. The preoperative profiles of patients have certainly changed, as compared to the previous decade. Despite this, the complication rates have not increased. This can be due to improved standards of health-care delivery. Thus, the increased use of medical therapy in BPH patients is still justified. TURP has stood the test of time in surgical management of BPH.

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Conflicts of interest
There are no conflicts of interest.

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