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A prospective study on the correlation between clinical outcome and residual prostatic adenoma weight ratio after transurethral resection of the prostate for benign prostatic hyperplasia

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ABSTRACT

Background: Transurethral resection of the prostate (TURP) has been the most common surgical method for relieving symptoms of benign prostatic hyperplasia (BPH). However, there is no consent regarding the amount of tissue resected during TURP and it's persuading on ruling of symptoms. Therefore the aim of the present study was to assess the correlation between clinical outcome and residual prostatic adenoma weight ratio after transurethral resection of the prostate for benign prostatic hyperplasia.

Methods: A total of 70 patients presenting with obstructive/irritative lower urinary tract symptoms were evaluated for pre and post TURP values of prostatic weight, international prostate symptoms score (IPSS), postvoid residual volume (PVR), maximum flow rate (Q-max) and total prostate volume (TPV). Residual prostatic weight ratio (RPWR) was recorded in each case using transrectal ultrasound.

Results: The effectiveness of TURP was 71.42%. On appraisal of the patients for IPSS, PVR, Q-max and TPV; the difference between pre-operative and post-operative values of these parameters was found to be statistically significant p<0.001. RPWR was found to be significantly lower (p<0.001) in patients who received valuable treatment. A strong linear correlation was found between total prostate and transition zone volumes in all groups.

Conclusions: Values of IPSS, PVR, Q-max, TPV and operative parameters such as RPWR and residual prostatic weight are important parameters for the prediction of treatment outcome.

Keywords: Clinical outcome, Residual prostatic weight, Transurethral resection of prostate, Prostatic hyperplasia

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a pathologic process that contributes to, but is not the sole cause of, lower urinary tract symptoms (LUTS) in aging men. BPH affects both glandular epithelium and connective tissue stroma to variable degrees. It typically affects the sub mucous gland of the transitional zone and this overgrowth compresses the peripheral zone gland into a false capsule and causes the appearance of typical lateral lobe and when sub cervical central zone glands are affected middle lobe

develops. The clinical manifestations of BPH have been attributed to bladder outlet obstruction resulting from prostatic enlargement. Patients with benign prostatic enlargement seek medical treatment for bothersome lower urinary tract symptoms and relief of symptoms is the most frequent indication for intervention.^{2,4} Various symptom score have been developed to quantify lower urinary tract symptoms in men with benign prostatic enlargement, such as Boyarski score, Madsen Iverson score, and American urological association (AUA) symptom index. The AUA symptom index was adopted by the first World Health

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Organization consultation on benign prostatic hyperplasia with the addition of one quality of life question, and is called the international prostate symptom scores (I-PSS).^{5,6} The absence of correlation between total prostate volume and the clinical parameters of BPH may be attributed to the lack of a correlation between total prostate and BPH volumes. Total prostate and transition zone volumes have been estimated by using magnetic resonance imaging (MRI) and trans-rectal ultrasonography.7 Studies have shown that correlation coefficients between the transition zone index versus the AUA symptom score and peak flow rate are greater than the respective correlation coefficients between total prostate volume versus AUA symptom score and peak flow rate.8 The various treatments currently available for BPH include medical as well surgical options, ranging from minimally invasive techniques to open prostatectomy. Transurethral resection of the prostate (TURP) is a safe and effective procedure and remains the standard surgical treatment of BPH despite a variety of treatment alternatives. The outcome of TURP is assessed in terms of symptom improvement as well as improvement in lower urinary tract function measured by simple flow rate measurement and post void residual urine amount. 9,10 The recommended technique of TURP consists of complete removal of all adenomatous tissue. However the preoperative morbidity of TURP in terms of blood loss and fluid inflow is related to the size of the prostate. Hence with the intention to reduce the morbidity of transurethral resection, limited resection techniques (minimal TURP, channel TURP) have therefore been introduced and have gained some popularity. Other techniques of transurethral BPH treatment, such as transurethral needle ablation or interstitial laser coagulation do not aim at complete adenoma removal at all but rely on tissue sloughing or shrinkage in varying degrees. With these different techniques and approaches to the transurethral BPH treatment the question of whether complete adenoma removal is required becomes important again. 11-13 A change in prostate volume on TRUS before and after TURP for BPH has been reported previously, but still no studies have assessed the correlation between adenoma size and outcome after TURP.12 Therefore, the present study aimed to investigate to evaluate any potential correlation between prostate adenoma size and outcome, a new variable, the residual prostatic adenoma weight ratio (RPAWR) was coined.

METHODS

The present a prospective observational study was carried out in the department of urology at Army Medical College and Research Hospital, Delhi, India from August 2009 to February 2011. A total of randomly selected 70 male patients presenting to the urology inpatient department (IPD) of Army Medical College and Hospital, Delhi with obstructive or irritative lower urinary tract symptoms were selected. Trained interviewers, using a structured questionnaire, interviewed all the participants to obtain the information on socio-demographic characteristics, physical activity, smoking, alcohol drinking habits, dietary

characteristics, personal and family history of diseases, and hospitalization. Anthropometric measurements and others parameters were obtained after complete physical examination. The study protocol was approved by institutional ethics committee human (IEC-H). Informed consent was obtained from all the participants prior to start the study.

Patients with obstructive lower urinary tract symptoms like hesitancy, weak urinary stream, intermittency, incomplete voiding and retention of urine. Sometimes patients also present with irritative lower urinary symptoms like increased frequency, urgency, urgency incontinence were included in this study. Patients with acute urinary tract infection, carcinoma prostate and benign prostatic hyperplasia with neurogenic urinary bladder and not consenting to participate in the present study were excluded from study.

Patient's personal history including full demographic profile, history of present illness, quality of life (QoL) according to IPSS, clinical examination details including digital rectal examination findings; routine investigations including urine analysis, urine culture and sensitivity test, full blood count, renal function test, serum sodium and potassium level were recorded on a predesigned proforma. Ultrasonography (USG) of kidney ureter bladder (KUB) and prostate and trans abdominal ultrasound with measurement of prostate size were done.

Patients were evaluated on basis of the AUA symptom index questionnaire. They were also evaluated by transabdominal ultrasound examination and patients having BPH on USG were further evaluated by uro-flowmetry. TURP was performed using 26-French standard loop resectoscope (Karl Storz Germany). All the resections were performed by same resectionist tissue resected was weighed in the operation theater immediately after the completion of TURP 24-French Folley's catheter inserted and balloon placed in the prostatic fossa with a volume corresponding to the amount of tissue removed. Irrigation was maintained until the next morning. The catheters were removed routinely on the 3rd day following TURR patients were usually discharged 1 day after catheter removal. The RPWR was derived as the weight after TURP divided by the initial weight where the weight after TURP was calculated as the initial weight minus the weight of the TURP specimen. Clinical outcome was evaluated by the difference in AUA score, maximum flow rate (O-max) and average flow rate (Q-avg) before and 2 months after surgery. All patients were divided into four groups depending on the transition zone i.e. adenoma size calculated by TRUS: size up to 30 grams, 31-40 grams, 41-50 gram and above 51 grams. Group 1 included 16 patients who have estimated adenoma size equal or less than 30 grams, group 2 included 28 patients who have estimated adenoma size between 31-40 grams, group 3 included 19 patients who have estimated adenoma size between 41-50 grams, group 4 included 7 patients whose adenomas were larger than 50 grams on estimation with trans-rectal USG.

Statistical analysis

Data was analyzed using statistical package for social sciences (SPSS), version 20 (SPSS Inc., Chicago, IL). Results for continuous variables are presented as mean±standard deviation, whereas results for categorical variables are presented as percentage. For comparison of mean, paired t-test was performed and Pearson correlation coefficients are used to measure the strength of the relationship between two variables. The level p<0.05 was considered as significance.

RESULTS

Out of the total 70 patients underneath study, 32 (45.71%) were in the age group of 60-70 years, 20 (28.57%) in the age group of 50-60 years, 15 (21.42%) in the age group of 70-80 years and only 3 (4.28%) patients were such who were >81 years. The mean age of the sample group was 64.27±5.13 years. Majority of the patients 40 (57.14%) had completed their education up to secondary and higher secondary level, 20 (28.0%) patients were graduates, 5 (7.14%) had acquired only primary education and remaining 5 (7.14%) patients were illiterate. While a great majority of patients were farmers 60.0%, 30.0% were employed, and remaining 10.0% were unemployed. A large majority of the subjects under study 65.0% were engaged in heavy work; while 10.0%, 20.0% and 5.0% patients were engaged in strenuous, moderate and sedentary work respectively. 55 (78.57%) of the patients were Hindu, 10 (14.28.0%) Muslim and rest 5 (7.14%) patients had other religions. Based on dietary preferences, 46.0% patients were vegetarians and 54.0% were nonvegetarians. Clinical symptoms like poor flow, straining,

incomplete voiding, frequency, urgency, and intermittency, hesitancy, dribbling and nocturnal were uniformly distributed among the entire lot of patients with 45 to 65% of patients presenting with these symptoms at the first clinical visit. However, acute urinary retention was observed only in 18 (24.0%) patients.

As per evaluation of the subjects for IPSS, PVR in milliliters (ml), QoL, Q-max in ml/s and total prostate volume (TPV) in ml; the difference between pre-operative and post-operative values of these parameters was found to be statistically highly significant p<0.001 (Table 2).

The effectiveness of transurethral surgery was 71.42% (n=50, 71.42%). Patients who had greater resected tissue weight with lesser residual prostatic weight showed a more complete resolution of symptoms. Overall, the residual prostatic weight ratio (RPWR) was found to be significantly lower in patients who received effective treatment (Table 2).

Majority of patients who underwent TURP in our series had severe LUTS despite taking medical therapy. They were on medical therapy for variable duration. A total of 10 patients (14.28%) in study had refractory urinary retention and were on indwelling catheter. There was significant positive correlation between the size of the prostatic adenoma and failure of medical therapy as well as failure of catheter free trial (r^2 =0.78) (Table 3). In our study we found a week positive correlation between estimated adenoma size i.e. transitional zone, transitional zone index and preoperative IPSS symptom score and Q max in all the four groups (r^2 =0.15-0.81).

Table 1: Comparison of urology markers (IPSS, QoL, PVR, MFR-Q-max and TPV) of each group, before and after TURP of studied patients.

Urology markers	Pre-operative	Post-operative	P value
International prostate symptoms score (IPSS)	30.20±5.20	15±3.1	< 0.0001
Quality of life	5.10±0.40	1.9±0.2	< 0.005
Post void residual volume (PVR) ml	81.28±14.5	15.34±3.34	< 0.001
Maximum flow rate (Q-max) ml/s	9.20±2.91	12.51±7.92	< 0.005
Total prostate volume (TPV) ml	56.21±17.46	30.15±5.25	< 0.0001

Table 2: Operative parameters according to treatment efficacy of studied patients.

Parameter	Ineffective treatment (n=20)	Effective treatment (n=50)	P value
Resected tissue weight	14.3±2.3	26.7±3.06	< 0.0001
Residual prostate weight	29.6±4.8	18.7±3.20	< 0.0001
Residual prostatic weight ratio	0.89 ± 0.09	0.41±0.06	< 0.05

Table 3: Correlation between total prostate volume versus symptom score and peak flow rate.

Pair wise relationships (r-value) in all four groups					
IPSS symptom score		Q-max			
TZ volume	TZ index	TZ volume	TZ index		
0.114	0.028	0.101	0.027		
P>0.05	P<0.05	P>0.05	P<0.05		

DISCUSSION

In the present study, mean age of all studied 70 patients was reported 64.27 years with a standard deviation of 5.13. Majority of them 32 (45.71%) were in the age group of 60-70 years, 20 (28.57%) in the age group of 50-60 years, 15 (21.42%) in the age group of 70-80 years and only 3 (4.28%) patients were such who were >81 years. In a similar study done by Abrams et al, it was found that majority 46 (46%) of patients were between 61-70 years of age, followed by 31 (31%) patients between 51-60 years of age, 21 (21%) between 71-80 years of age and only 2 (2%) patients were greater than 80 years of age. ¹⁴ A study done by Nesbit et al, reported mean age of all studied patients as 65.6 years which is also very close to our findings. ¹⁵

Severity of symptoms increased with increase in age. A greater percentage of severity of symptoms was observed in older age groups. Another study from coastal Andhra Pradesh done by Alberto et al also reported a higher number of patients with moderate symptoms in the age group of 70–79 years. ¹⁶ The educational status of patients in the present study was found to be in concordance to the findings reported by Hakenberg et al, study who found that majority 39 (39%) patients were educated to secondary and higher secondary level followed by 25 (25%) educated till primary level and only 11 (11%) were graduates while 25 (25%) patients were illiterate. ¹⁷ Our occupation status, type of work, religion, dietary habit findings of patients was also similar to the findings of Nagarathnam et al. ¹⁸

In present study, improvement was reported after TURP in all patients. The IPSS values before and after TURP were 30.20 ± 5.20 and 15 ± 3.1 , QoL 5.10 ± 0.40 and 1.9 ± 0.2 , Qmax 9.20 ± 2.91 and 12.51 ± 7.92 , TPV 56.21 ± 17.46 and 30.15 ± 5.25 . All the above parameters showed a statistically significant difference in the pre and post-operative values. Our findings were in concordance to those of other study (p<0.001). In another study done by Agrawal et al, the IPSS values before and after TURP were 25.6 ± 7.1 and 14.4 ± 7.3 (p<0.05), Q-max 9.6 ± 3.7 and 17.8 ± 6.9 ; differences in which were statistically significant (p<0.05). In another study, IPSS in the permixon treated group was significantly reduced (p<0.006) from 20.0+5.9 to 14.9+3.8 after three months of treatment. In

The data presented in this study indicate that RPWR changed the most significantly when effective and ineffective treatment groups were compared. Patients who had greater resected tissue weight with lesser residual prostatic weight showed a more complete resolution of symptoms (p<0.001). This is similar to findings of Mebust et al.²¹ Efficacy of treatment in this study was estimated following the criteria (pre/post-operative changes of IPSS, QoL, Qmax, and TPV) of the second international consultation on benign prostatic hyperplasia and it differs with aforementioned studies. It means that during the resection of the prostate, at least 30% of the prostate

volume should be removed to avoid an unfavorable outcome. There is always a risk of complication during the surgical management of larger prostate. Complications like intra-operative or post-operative bleeding and TUR syndrome are discouraging factors to perform TURP in large prostates. Although the use of improved instruments, modern irrigation fluids with improved surgical techniques has significantly decreased the incidence of TUR syndrome from 3-5% to <1%, but it still remains one of the major peri-operative complication. ²³⁻²⁶

In a study done on large population of patients (n=3885) who were treated by TURP, it was clearly seen that the complication rate was higher in patients having large prostate and incidence of TUR syndrome was higher (2%) with resection time more than 90 minutes.²⁷

In majority of reports the correlations between total prostate volume versus symptom severity and peak flow rates were not statistically significant in community based BPH cohorts. In the study by Zlotta et al, the r² values for the pair wise relationships between TPVs versus symptom scores ranged from 0.018 to 0.034 (mean 0.022) and those for the pairwise relationships between TPV versus peak flow rate ranged from 0.003 to 0.160 (mean 0.053).²8 These studies provide compelling evidence that TPV is not significantly correlated with symptoms and occasionally weakly correlated with peak flow rate.

Our study demonstrates a strong linear correlation between total prostate and transition zone volumes. A linear relationship was also reported by Desai.²⁹ In our study we found that the significant correlation exists between the residual prostatic adenoma weight ratio and improvement in IPSS as well as improvement in peak flow rate. To best of our knowledge and literature search we found no comparative study in which residual prostatic adenoma weight ratio was compared. However in studies in which residual prostatic weight ratio was compared found a correlation between the AUA symptom score and RPWR after 4 months. There was a close correlation between estimated adenoma weights, total prostate.³⁰

There is no consensus regarding the exact amount of prostatic tissue that should be resected during TURP. Some studies suggest complete resection should be performed for better results while others have suggested that a partial resection is adequate for short term functional results. 31,32 The recommended TURP technique consists of a complete resection of adenomatous tissue inside the surgical capsule for better result in terms of quality of life and symptom improvement.33-36 However, prolonged TURP in medically compromised patients with large prostate may be associated with increased bleeding and TUR syndrome development.³⁷ We found significant difference in preoperative QoL in patients having smaller prostate in comparison to that of patient group having large (>80 grams) prostate size. However, after complete resection of adenomatous tissue, the QoL score after TURP showed no difference between both groups. In present study we also observed a significant improvement in IPSS from severe to mild or zero score level. Similar results with long term efficacy of TURP were found in other studies. 38-40

Limitations

Limitations in this study is that it is a prospective observational study and further longitudinal studies and clinical trial are needed to investigate the correlation between clinical outcome and residual prostatic adenoma weight ratio after transurethral resection of the prostate for benign prostatic hyperplasia. Another aspect is that transabdominal sonography was used rather than TRUS. Although nowadays TRUS is commonly used, many trials failed to show much difference in calculating prostatic weight between the two methods. The last limitation is that prostate-specific antigen (PSA) levels was not measured in our study which may be accountable for to drastically reduce by around 40-60% following TURP.

CONCLUSION

Transurethral resection of the prostate remains a very effective treatment modality of lower urinary tract symptoms because of the benign prostatic obstruction regardless of prostate size. Values of IPSS, PVR ml, Q-max ml/s, TPV ml and operative parameters such as residual prostatic weight ratio and residual prostatic weight are important parameters for the prediction of treatment outcome.

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Institutional Ethics Committee

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