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Study of Correlation of Anatomical Parameters with Clinical Features and Treatment Outcome in Patients of Benign Enlargement of Prostate

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Abstract

Context: Compared to other modalities, the advantage of IPP in assessing BOO may be its easy applicability and non-invasive nature. Therefore, there is a consideration for a larger role of IPP in bedside assessment and management of BOO in daily practice. *Aims:* To Study of correlation of anatomical parameters with clinical features and treatment outcome in patients of benign enlargement of prostate. *Settings and Design:* A hospital based follow up study was carried out at Institute of Urology. *Methods and Material:* Study was carried out among men above 50 years of age with BEP with lower urinary tract symptoms presenting in outpatient department. Out of 106 patients 55 were in Medical treatment group and 51 in Surgical treatment group. Patients were selected for medical and surgical treatment on the basis of IPSS Score, prostate volume, uroflow parameters and patient willingness based on international literature. *Statistical Analysis:* Inferential Statistics "t"- test; ANOVA was used to find the significant difference between continuous outcome variables. *Results:* Significant negative correlation of prostate volume (PV) with peak urinary flow rate (PUFR) and post void residual urine was observed. Significant positive correlation of intra-vesical prostatic protrusion (IPP) with PV was observed, simultaneously significant negative correlation was present between IPP and PUFR. Negative correlation was noted between IPSS score and PUFR, however we found a weak positive correlations of IPSS score with PV and IPP. More significant improvement was noted in patients with IPP > 10 mm and treated surgically. *Conclusion:* Both medical therapy and surgical treatment are effective in management of BEP as they improve the patient's quality of life in terms of improving their PUFR and IPSS Score.

Keywords: Prostate Volume; Correlation; Post Void Residual Urine.

Introduction

Benign prostatic hyperplasia (BPH) is a common entity among elderly men and is responsible for significant disability. The prevalence of histopathological BPH is age dependent, with initial development usually after 40 years of age [1]. The prevalence of histologically diagnosed prostatic hyperplasia increases from 8% in men aged 31 to 40 years, to 40% to 50% in men aged 51 to 60 years, to more than 80% in men older than age 80 years [2].

Men with benign prostatic enlargement (BPE) presumably have an increase in total prostate volume because of BPH [3]. BPE is a common cause of bladder outlet obstruction (BOO) in men older than 50 years presenting with lower urinary tract symptoms (LUTS). BOO is the initial pathophysiological change caused by an enlarged adenoma and is followed by

detrusor over activity or under activity. The degree of BOO is an important factor that can reflect the severity of disease and can aid in choosing a treatment method as well as in measuring the outcome of the treatment [4].

Intra-vesical prostatic protrusion (IPP) has been shown to have a positive predictive value of 72% for BOO. Studies have also shown that men with higher IPP are poorer responders to medical treatment such as α-blockers. Up to 15% to 25% of men aged 50–65 years have lower urinary tract symptoms (LUTS) of sufficient severity to interfere with their quality of life. Although benign prostatic hyperplasia is an important cause of these symptoms, and can have serious consequences, clinicians should be aware of these other causes so that the appropriate diagnosis is made before invasive treatments are started [5].

Treatment strategies include watchful waiting, medical therapy and surgery. Patient selection for the appropriate treatment strategy is paramount in ensuring the best possible outcome. Currently, evaluation and selection criteria for treatment of benign prostatic enlargement include the International Prostate Symptoms Score (IPSS), prostate size, uroflowmetry, post void residual urine (PVR) or urodynamic study and complications due to the disease. However multiple studies reveal negative correlation between symptom severity, uroflow parameters and prostate size. Compared to other modalities, the advantage of IPP in assessing BOO may be its easy applicability and non-invasive nature. Therefore, there is a consideration for a larger role of IPP in bedside assessment and management of BOO in daily practice [6].

It is with this background that an attempt was made to conduct a study on our local population of symptomatic BEP patientswith regards to their clinical features, anatomical parameters, uroflow parameters and treatment outcome.

Materials and Methods

Study Setting

In the Department of Urology at Institute of Urology, Dhule (Maharashtra).

Study Design

Observational follow up study.

Study Duration

February 2014 till February 2016.

Study Population

All men above 50 years of age diagnosed with BEP with lower urinary tract symptoms presenting in outpatient department.

Inclusion Criteria

1. Male patients above 50 years of age diagnosed as symptomatic BEP.
2. Patients with the above condition willing to give written informed consent for study.

Exclusion Criteria

1. Patients with calcular disease, with H/O previous instrumentations, on anti-cholinergic medications, neurogenic bladder, stricture urethra, serum PSA value greater than 4.0 ng/ml, deranged renal function test, urinary tract infections.

Study Sample

Symptom severity, anatomical parameters and treatment outcome of all patients fulfilling inclusion criteria were studied. Total 150 study sample were included in the study by convenient sampling, however 44 were lost to follow up.

Methodology

Ethical clearance from college Institutional Ethics Committee was obtained. The necessary permission to carry out the study was obtained from appropriate authority. The piloting of questionnaire was carried out on 6 study participants with predesigned proforma to check the feasibility and to test the proforma, necessary changes in proforma were made after pilot testing.

The interview technique was used as a tool for data collection. Detailed history of all patients was recorded on special history sheet. Apart from routine investigations, some special investigations were done for diagnosis of BEP as per indicated.

Measurement of LUTS

a. *IPSS Score*

Marathi version of IPSS score was used for assessing the symptom severity of patients in our study population

b. USG Parameters

All patients were subjected to pretreatment transabdominal Ultrasonography (NEMIOXG; model SSA-580A; transducer frequency 5 – 7 mHz)

• *Prostate Volume Estimation*

The prostate ellipse formula (0.523) (transverse diameter) (anteroposterior diameter) (cephalocaudal diameter) was used for prostate volume estimation [7].

• *Intravesical Prostatic Protrusion*

IPP was measured as the length from the tip of the protruding prostate to the base at the circumference of the bladder; it was measured in sagittal plane. Patients were accordingly divided in three groups based on IPP value: group I (5 mm or less); group II (5-10 mm) and group III (more than 10 mm) [8].

c. *Uroflowmetry*

Peak flow and average flow were recorded in all patients. Gravimetric equipment named Urocomp2000E; with wet sensor was used for uroflowmetry. Pre and post treatment peak flow and average flow rates were recorded in all patients.

• *Post Void Residue (PVR)*

Post void residue urine was measured using transabdominal USG immediately following uroflowmetry in both pre and post intervention period.

d. Serum PSA Estimation

Serum PSA estimation was done in all patients (Calbitech, Inc (CBI) PSA ELISA Kit). Patients with serum PSA value greater than 4.0 ng/ml were excluded from our study.

Treatment Modality

Patients were counselled for medical and surgical treatment on the basis of symptom severity, prostate volume, uroflow parameters and patient willingness based on international literature.

a. Medical Management

Patients in medical treatment group were managed with alpha blockers or a combination of alpha blocker with anti-cholinergic medication or alpha blocker with 5 alpha reductase inhibitors.

b. Surgical Management: Bipolar Transurethral resection of the prostate (TURP) was done in surgical group patients (GYRUS ACMI). All surgeries were carried by same surgeon. Catheter free trail was given in all patients after 3 days.

Follow up

Symptom severity score (IPSS) and uroflow parameters were recorded after four weeks of treatment in all patients.

Statistical Methods

The information regarding all the cases was recorded in a master chart. The Statistical analysis was done by using OPEN EPI (Version 3.03a). In Descriptive statistics, the continuous variable was expressed as Mean and Standard deviation. Categorical variables were expressed as frequency and percentage. Inferential Statistics "t"- test; ANOVA was used to find the significant difference between continuous outcome variables Chi- square test and fisher's exact test was used to find out association between the categorical variables. p value < 0.05 was considered as statistically significant.

Results

Table 1 shows pre op Parameters of Study participants. There was no significant difference between the two group patients with regard to age, IPSS score, PV, IPP, PF, AF and PVR. Thus both groups were comparable to each other.

Table 2 shows IPSS score in study participants. Majority (51.8%) of the study subjets had severe IPSS score followed by moderate score among 43.3% of subjects.

Table 3 shows correlation of Prostate volume with PF, PVR, IPP & IPSS. Prostate volume showed positive correlation with PVR, IPP and IPSS score; the correlation with PVR and IPP was significant, however IPSS score was not significantly correlated. Prostate volume was negatively correlated with PF (ml/sec); it was weak but significant correlation.

Table 4 shows correlation of Intravesical protrusion (IPP) with PV, PF, PVR & IPSS score. Intravesical prostatic protrusion showed significant positive correlation with PV and significant negative correlation with PF. However PVR and IPSS score

showed positive but insignificant correlation with IPP.

Table 5 shows correlation of IPSS score with PF, PVR, IPP & PV. IPSS score had weak negative correlation with PF and PVR (statistically non-significant)

Table 6 shows IPSS score in Study participant's before & after medical treatment. The mean value of IPSS Score of patients improved significantly after medical treatment, values improved from 19.3± 3.8 to 12.2 ± 4.2 after treatment ($p < .005$)

Table 7 shows uroflow Parameters in study participants before and after medical treatment. Peak flow, average flow and post void residual (PVR) significantly improved after medical treatment

Table 8 shows IPSS score in Study participant's before & after surgical treatment. The mean values of IPSS Score improved significantly after surgical treatment, the value improved from 22.3±4.8 to 10.8±4.2 after treatment.

Table 9 shows uroflow parameters in study participants before and after surgical treatment. It was observed from above table that the values ofPF, AF and PVRsignificantly improved after surgical treatment.

Table 10 shows association between Intravesical prostatic protrusion and IPSS score among study participants before and after medical treatment. It was observed that IPSS score improved after medical treatment in all the three groups.

Table 11 shows association between Intravesical prostatic protrusion and IPSS score among study participants before and after surgical treatment. IPSS score was significantly different in all the three groups. It was observed that IPSS score improved after surgical treatment in all patients and more significantly in patients with IPP >10 mm.

Table 1: Pre op Parameters of Study participants

Parameter	Total (n:106) (Mean ± SD)	Medical group (n:55) (Mean ± SD)	Surgical group (n:51) (Mean ± SD)	P value (Significance)
Age (years)	65.7 (± 7.1)	66.3 (± 7.3)	65.1 (± 6.4)	0.31 (NS)
IPSS Score	20.0 (± 4.0)	19.5 (± 8.5)	22.1 (± 7.1)	0.09 (NS)
PV (ml)	37.24(± 21.64)	34.29 (± 18.25)	40.43 (± 24.57)	0.13(NS)
IPP (mm)	5.00(± 2.99)	4.17 (± 2.81)	5.77 (± 2.94)	0.08 (NS)
PF (ml/sec)	8.36(± 2.83)	8.93 (± 2.81)	7.74 (± 2.74)	0.02 (S)
AF (ml/sec)	5.54 (± 2.02)	5.94 (± 2.13)	5.15 (± 1.84)	0.06 (NS)
PVR (ml)	54.83(± 38.6)	42.07 (± 22.26)	68.36 (± 47.06)	0.0003 (S)

S:Significant; NS: Non significant; Values are given in the form of Mean (±SD)
Prostate volume = PV; Intravesical prostatic protrusion = IPP; Peak flow = PF; Average flow = AF; Post void residue = PVR.

Table 2: IPSS score in study participants

Parameter*	No. of Study Participants	Percentage
Mild	5	4.7
Moderate	46	43.3
Severe	55	51.8
Total	106	100%

Table 3: Correlation of Prostate volume with PF, PVR, IPP & IPSS

Measurements	Correlation coefficient (r)	r 2	P value	Significance
Peak flow	-0.1715	0.029433	0.0076	Significant
PVR	0.2211	0.048893	0.05	Significant
IPP	0.5214	0.270	0.001	Significant
IPSS Score	0.0870	0.0064	0.2	Non Significant

Table 4: Correlation of Intravesical protrusion (IPP) with PV, PF, PVR & IPSS score

Measurements	Correlation coefficient (r)	r 2	P value	Significance
Prostate volume	0.5532	0.306	0.04	Significant
Peak flow	-0.0901	0.0081	0.007	Significant
PVR	0.1339	0.0169	0.09	Non- Significant
IPSS Score	0.054	0.003	0.58	Non- Significant

Table 5: Correlation of IPSS score with PF, PVR, IPP & PV

Measurements	Correlation coefficient (r)	r 2	P value	Significance
PF (ml/sec)	-0.149	0.022	0.12	NS
PVR (ml)	-0.030	0.001	0.67	NS
IPP	0.016	0.000256	0.45	NS
Prostate Volume	0.087	0.008	0.37	NS

Table 6: IPSS score in Study participant's before & after medical treatment

Parameter*	Before treatment (No. of patients)	After treatment (No. of patients)	P value
Mild	5	28	< 0.05 Significant
Moderate	26	23	
Severe	24	4	
IPPS score (mean ± SD)	19.3 ± 3.8	12.2±4.2	< 0.05 Significant

Table 7: Uroflow Parameters in study participants before and after medical treatment

Parameters	Before treatment (Mean (± SD)	After treatment Mean (± SD)	P value	Significance
		Uroflow parameters		
PF (ml/sec)	8.94 ± 2.81	10.38 ± 2.45	0.001	Significant
AF (ml/sec)	5.94 ± 2.13	7.30 ± 2.20	<0.0001	Significant
PVR (ml)	42.07 ± 22.26	35.37 ± 22.68	0.00021	Significant

Table 8: IPSS score in Study participant's before & after surgical treatment

Parameter*	Before treatment (No. of patients)	After treatment (No. of patients)	P value
Mild	0	39	<0.05 Significant
Moderate	20	11	
Severe	31	1	
IPPS score (mean ± SD)	22.3 ± 4.8	10.8±4.2	<0.05 Significant

Table 9: Uroflow parameters in study participants before and after surgical treatment

Parameters	Before treatment (Mean (± SD)	After treatment Mean (± SD)	P value	Significance
		Uroflow parameters		
PF (ml/sec)	7.74 ± 2.74	13.72 ± 2.93	<0.0001	Significant
AF (ml/sec)	5.15 ± 1.84	10.2 ± 2.81	<0.0001	Significant
PVR (ml)	68.36 ± 47.06	23.93 ± 10.98	<0.0001	Significant

Table 10: Association between Intravesical prostatic protrusion and IPSS score among study participants before and after medical treatment

IPP (mm)	IPSS score (mean ± SD)		P value	Significance
	Before treatment	After treatment		
< 5	19.02 ± 8.7	10.05 ± 5.6	<0.0001	Significant
5-10	16.2 ± 9.7	11.5 ± 7.8	<0.0001	Significant
> 10	22.0 ± 6.6	18.0 ± 0.01	<0.0001	Significant

paired t test

Table 11: Association between Intravesical prostatic protrusion and IPSS score among study participants before and after surgical treatment

IPP (mm)	IPSS score (mean ± SD)		P value	Significance
	Before treatment	After treatment		
< 5	23.3 ±6.7	7.18 ± 4.8	<0.0001	Significant
5-10	20.64 ± 7.3	6.8 ± 5.5	<0.0001	Significant
> 10	27.6 ± 5.85	10.6 ± 8.08	<0.0001	Significant

paired t test

Discussion

We observed correlation of IPSS score, PV, IPP, PF, PVR urine with each other in our study population. Majority of study participants were 65 years and above. Mean age of study participants were 65.7 years. Study done by Berry JS et al [2] reported prevalence of BPH 8% at the fourth decade; however, 50% in the age group of 51-60 years.

Clinical BPH is a highly prevalent disease. By the age of 60 years, nearly 60% of the cohort of the Baltimore Longitudinal Study of Aging had some degree of clinical BPH. In the USA, results of the Olmstead County survey, in a sample of unselected Caucasian men aged 40-79 years, showed that moderate-to-severe symptoms can occur among 13% of men aged 40-49 years and among 28% of those older than 70 years. A multicenter study performed in different countries in Asia showed that the age-specific percentages of men with moderate-to-severe symptoms were higher than those in America. The prevalence increases from 18% for men in their 40s to 56% for those in their 70s. There are considerable differences among countries; these differences may be due to population sample bias or may represent true regional differences [9,10,11].

We observed the mean (SD) value of IPSS Score of the 106 patients was 20±4; with the frequencies of mild, moderate and severe scores as 4.7%, 43.3% and 51.8% respectively.

In a study conducted by Itoh et al [12] on patients with BEP observed frequencies of slight, moderate and severe symptoms as 23.8%, 50.0% and 26.2% respectively.

Average PV was 37.24±21.64 cm^3 measured by USG via trans abdominal route. The prostate ellipse formula was used for prostate volume estimation [7]. The average PV in symptomatic patients of BEP measured by Vesely et al [13] ranged from 40 cm^3 to 60.9 cm^3.

We found that PVRU was 54.83±38.6 ml. Singla et al [14] observed mean PVRU of 117.8 ml with a range of 25-322 ml.

In present study Average IPP among study participants was 5.006±2.99. Puthenveeti et al [15] found that IPP was 5.2±4.5.

In present study mean (SD) peak urinary flow rate (ml/sec) among study participants was 8.36±2.83 ml/sec before treatment. Singla et al [14] studied fifty patients with lower urinary tract symptoms caused by benign prostatic enlargement. In his study he found the mean value of peak flow rate was 10.6 ml/sec with a minimum recording of 3 ml/sec and a maximum recording of 19 ml/s which is more than our study.

In the present study we attempted to observe the correlation of symptom severity score (IPSS score), anatomical parameters (PV and IPP) and uroflow parameter (PFR, PVR urine) with each other. In our study we observed strong positive correlation of prostate volume with post void residual urine, weak positive with IPSS scores, and negative correlation with Peak flow rates. Similar results were observed by Warner Schafer et al [16] they have shown that low peak urine flow rate and high post void residual volume were associated with large prostate volumes.

We observed a significant positive correlation of IPP with prostatic volume and negative correlation with Peak urinary flow. Study done by Chia et al [17] showed similar results, the IPP not only correlated well with BOO (PPV 94%; NPV 79%) but also correlated well with the severity of obstruction as defined by the higher BOO index ($P < 0.001$).

However IPP showed non significant correlation with IPSS and PVR urine. Lieber MM et al [18] in their study also observeda weak correlation of increasing IPP with obstructive symptoms and decreasing peak urinary flow rate. These correlations thus suggest a vital clinical role of intra vesical prostatic protrusion in predicting the needand outcome of treatment.

In present study the IPSS score was negatively correlated with Peak urinary flow rate (ml/sec) and Post void residual urine (ml), however the correlation was non-significant. Puthenveetil et al [15] similarly observed only weak correlation between maximum flow rate and symptom scores. In our study we observed the treatment outcome in both medical and surgical groups in terms of change in symptom severity scores and uroflow parameters.

A significant improvement in mean values of IPSS score and uroflow parameters were observed after medical treatment. IPSS score can be used to monitor changes in symptoms over time or following a conservative or surgical management. IPSS score may be one of the more powerful predictors of symptomatic outcome. Kimio Sugaya et al [19] studied subjects who had LUTS and BPH. IPSS improved in both groups after conservative management.

We observed a significant improvement in symptom severity score, Peak Flow; Average Flow and Post void residual urine was observed. Masanori Yamamoto et al [20] found that surgery was significantly associated with improvement in peak

urinary flow rate, post void residual urine and symptom severity and sexual performance. They concluded that for patients with moderate symptoms of benign prostatic hyperplasia, surgery is more effective in improving genitourinary symptoms and quality of life and suggested medication should be reserved for patients who are less bothered by urinary difficulties or do not want surgery.

We observed a significant improvement in IPSS score in all three groups post intervention. However in patients with IPP > 10 mm and treated surgically a more significant improvement in IPSS score was observed. Lieber MM et al [18] observed in their studythat men with IPP 10 mm or greater were more than 3 times more likely to be taking LUTS/BPE related medications.

Conclusion

For management of benign enlargement of prostate, we therefore need to look at the whole picture, the adenoma (PV, IPP), the obstruction (Peak flow rate and PVRU), and the symptoms (IPSS). Both medical therapy and surgical treatment are effective in management of benign enlargement of prostate as they improve the patient's quality of life in terms of improving their urine flow rates and symptom severity scores (IPSS Score).

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