Surgery Section

Experience with Uroflowmetry in Evaluation of Lower Urinary Tract Symptoms in Patients with Benign Prostatic Hyperplasia

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ABSTRACT

Introduction: Uroflowmetry is a non-invasive urodynamic tool which is widely used for most of the patients with suspected lower urinary tract dysfunction. The severity of lower urinary tract symptoms (LUTS) can be measured reliably by using a number of validated questionnaires, like International Prostate Symptom Score (IPSS). This study was designed to determine the relationship between the parameters of uroflowmetry and symptom severity.

Materials and Methods: Fifty patients with LUTS caused by benign prostatic hyperplasia were evaluated by using uroflowmetry, IPSS, prostate volume estimation. The correlations between these parameters were quantified by means of Spearman correlation co-efficients.

Results: Statistically significant correlations were found between the IPSS and results of uroflowmetry (peak flow rate and average flow rate) and post-void residual urine. No correlation was found between the IPSS and results of prostate volume measurements.

Conclusion: There was a positive correlation between peak flow rate, as was measured by uroflowmetry and lower urinary tract symptom severity.

Keywords: Benign prostatic hyperplasia, Lower urinary tract symptoms, Uroflowmetry

INTRODUCTION

Benign prostatic hyperplasia (BPH) has been a known cause of urinary obstruction and it is the most common disease which affects ageing men [1]. In patients with BPH, enlargement of the prostate generally leads to bladder outlet obstruction (BOO) and it causes a variety of bothersome lower urinary tract symptoms (LUTS) [2]. One should assess the severity of symptoms rather than the increase in the prostatic volume during the management of BPH [3]. The severity of lower urinary symptoms can be measured reliably by using a number of validated questionnaires, like International Prostate Symptom Score (IPSS), Boyarsky score, Madsen Iversen score and Danish prostatic symptom score. A questionnaire which is called International Prostate Symptom Score (IPSS) has been recommended as a symptom-scoring instrument which can be used for the baseline assessment of the symptom severity in men who present with LUTS. Von Garrelts introduced uroflowmeter in 1957 [4]. It is a useful, simple, non-invasive urodynamic tool which can be used for the objective assessment of intra vesicular obstruction, and it is helpful in the decision-making process and management of benign prostatic hyperplasia [5,6]. Uroflowmetry is indicated in patients who have signs and symptoms which are suggestive of bladder outlet obstruction. A Q max of < 15 mL/s has been interpreted to be suggestive of BOO. Most of the clinical trials use this cut off value as inclusion criteria [7]. Q max is often used equivalently with pressure flow studies to define bladder outflow obstruction [8].

MATERIALS AND METHODS

A hospital based prospective study was carried out on patients who were admitted at Dayanand Medical College and Hospital (DMCH), Ludhiana with lower urinary tract symptoms (LUTS) which were suggestive of benign prostatic hyperplasia (BPH). Due clearance from the ethical committee of the institution was taken prior to start of the study. Fifty consenting patients with LUTS which was suggestive of BPH were included in the study. All these patients were subjected to a detailed history taking, physical examinations, International Prostatic symptom score (IPSS) assessment, digital rectal examinations (DREs), renal function tests (blood urea, serum creatinine), complete urine analysis, ultrasound and uroflowmetry.

Inclusion criteria

1) Patients presenting with LUTS.

2) Those with age > 50 years.

3) Those with IPSS of > 12.

Exclusion criteria

1) Patients who had undergone prior urinary tract or pelvic surgeries.

2) Patients who had past history of prostatic surgery, prostatic carcinoma, urethral stricture, vesical calculus or neurogenic bladder.

3) Patients who had systemic disorders that could influence bladder function, such as neurological disorders, diabetes.

4) Patients whose voided urine volume was less than 180 mL.

5) Patients who were on medical treatment of BPH.

All included patients were evaluated by using IPSS questionnaire. The IPSS is the ideal instrument which can be used to grade baseline symptom severity. The IPSS is based on the answers to seven questions which concern urinary symptoms. Each question is assigned points from 0 to 5 which indicate increasing severity of the particular symptom and a total score which ranges from 0 to 35. Uroflowmetry is a simple procedure which is used to calculate the flow rate of urine over time. The machine gives the result in terms of peak flow rate (Q max), flow time, voided volume and average flow rate. Uroflowmetry is performed in patients with full bladders. Adequate privacy was provided and patients were asked to void when they felt a 'normal' desire to void. Uroflowmetry was performed, by having a person urinate into a special funnel that was connected to a measuring instrument. Patient urinated in a special urinal in toilet which was equipped with a machine, which had a

measuring device. Patients were asked to press a button shortly before starting the urination. The machine gave the result as peak flow rate, voiding time, voiding volume and time to peak flow. The test involved normal urination and so patients didn't experience any discomfort. The data of the patients was analyzed and the patients were divided as per their symptom severities, as was assessed by IPSS. The results of uroflowmetry, as were obtained from these patients, were compared by using various statistical techniques. Pearson's correlation co-efficient was used to assess correlation between various variables.

RESULTS

The mean age of the patients was 67.7 years. A majority of the patients (46%) were in the age group of 60-69 years. As per IPSS scoring, out of 50 patients, 31 patients had severe symptoms, while 19 had moderate symptoms. The mean prostatic size was 60.9 cm³, with a range of 22-110. When the patients were divided as per their symptom severity scores, the mean prostatic size in patients with moderate symptoms was 54.2, and that in patients with severe symptoms, it was 65.0. The p-value was found to be more than 0.05, which was not significant. The correlation co-efficient of prostatic size in patients with moderate symptoms was 0.26, whereas in patients with severe symptoms, it was 0.18. The overall correlation co-efficient of IPSS with prostatic size was found to be 0.24. The mean post voiding residual urine (PVRU) in patients was 117.8, with a range of 25-322 [Table/Fig-1]. In our study, the mean value of peak flow rate was found to be 10.6, with a minimum recording of 3 mL/s and a maximum recording of 19 mL/s [Table/Fig-2]. The mean average flow rate was found to be 6.0 mL/sec, with a minimum recording of 2 mL/ sec and a maximum recording of 14 mL/ sec [Table/Fig-3]. In our study, the mean time to peak flow, voided volume, voiding time and flow time were found to have an insignificant relationships with symptom severity.

PVRU (mL)	Mean (SD)	117.8 (48.5)
	Range	25-322
	Correlation co-efficient (r) with IPSS	0.49
	IPSS Moderate Mean (SD)	92.3 (27.7)
	IPSS Severe Mean (SD)	133.5 (52.1)
	t- test; p-value*	3.2; <0.05, S

[Table/Fig-1]: Showing post voiding residual urine
*NS: Non-Significant; S: Significant; HS: Highly Significant Correlation co-efficient (r) ranges from −1 to +1, with −1 describing a perfect negative linear relationship and +1 describing a perfect positive linear relationship

Peak Flow Rate (mL/sec)	Mean (SD)	10.6 (4.0)
	Range	3-19
	Correlation co-efficient (r) with IPSS	-0.67
	IPSS Moderate Mean (SD)	13.4 (2.9)
	IPSS Severe Mean (SD)	8.9 (3.5)
	t- test; p-value*	4.7; <0.001, HS

[Table/Fig-2]: Showing peak flow rate
*NS: Non-Significant; S: Significant; HS: Highly Significant Correlation co-efficient (r) ranges from −1 to +1, with −1 describing a perfect negative linear relationship and +1 describing a perfect positive linear relationship

Average Flow Rate (mL/sec)	Mean (SD)	6.0 (2.9)
	Range	2-14
	Correlation co-efficient (r) with IPSS	-0.64
	IPSS Moderate Mean (SD)	8.0 (2.7)
	IPSS Severe Mean (SD)	4.8 (2.2)
	t- test; p-value*	4.6; <0.001, HS

[Table/Fig-3]: Showing average flow rate
*NS: Non-Significant; S: Significant; HS: Highly Significant Correlation co-efficient (r) ranges from −1 to +1, with −1 describing a perfect negative linear relationship and +1 describing a perfect positive linear relationship

DISCUSSION

The present study which was done on 50 patients, was designed to determine the relationship among the parameters of uroflowmetry and symptom severity. The mean age of patients in this study was 67.7 years. Most of the patients (46%) were in the age group of 60-69 years. Mebust et al., in their study, displayed almost similar results with patients who had an average age of 69 years, for benign prostatic hyperplasia [9]. Similarly, Iqbal T et al., and Saleem M et al., reported patients with mean ages of 63.4 and 65.6 years respectively.

In our study which was conducted on 50 patients, the mean prostatic size in patients was 60.9cm³, with a range of 22-110. An estimation of prostate volume is very useful in a variety of ways. It can help in deciding upon the appropriate therapy. The average prostate volume whch was measured by Vesely et al., in his study which was conducted on 354 patients was 40.1 cm³, while Dicuio et al., found average prostate volume to be 41 cm³ in his study which was done on 25 men [10,11]. The difference which was measured may have occurred due to late presentations of patients, as DMCH was a tertiary care centre. When the patients were divided as per their symptom severity scores, the mean prostatic size in patients with moderate symptoms was found to be 54.2, while in patients with severe symptoms, it was 65.0. The p-value was found to be more than 0.05, which was not significant. The correlation co-efficient of prostatic size in patients with moderate symptoms was 0.26, whereas in patients with severe symptoms, it was 0.18. The overall correlation co-efficient of IPSS with prostatic size found to be 0.24. Hence, no correlation was found in between prostatic volume and IPSS. This data was further supported by other studies which were done by Ezz et al., on 803 patients [12].

In our study, PVRU had a weakly positive correlation with severity of urinary symptoms. Consistent with our results, Kolman C et al., found that PVRU had a statistically significant association with prostate volume, severity of symptoms [13]. Similarly, Barry MJ, Girman CJ, demonstrated in an analysis which was done on 198 patients after treatment of BPH, that reduction of the symptoms score was significantly correlated with improvement of uroflowmetry, including PVRU [14].

The mean value of peak flow rate was found to be 10.6, with a minimum recording of 3 and a maximum recording of 19mL/s. The peak flow rate had a strongly positive correlation with symptom score. Various other studies also observed similar results. Hideaki Itoh et al., studied 206 males and concluded that among the parameters which were obtained by uroflowmetry, maximum flow rate was the most representative, and that it was adopted both in estimate criteria for the diagnosis and severity of BPH, and for the efficacy of treatment of BPH. Barry MJ and Girman CJ, Bosch et al., Din et al., have reported weakly positive correlations between peak flow rate and symptom scores [14-16].

In this study, the mean time to peak flow rate was found to be 11.8, with a minimum recording of 1st and a maximum recording of 71s. On comparing the variables by using Student's t-test, the p-value found to be >0.05, which was non-significant. Most of the studies showed similar results and no correlation was found between symptom score and time to peak flow rate.

In our study, the mean voided volume was found to be 269.6, with a range of 181-584. On comparing the variables by using Student's t-test, the p-value found to be >0.05, which was non-significant. Hence, no correlation was found between symptom score and voided volume. Multivariate logistic regression analyses revealed that the presence of moderate to severe symptoms (International Prostate Symptom Score greater than 7) was independent of prostate volume, but that it was dependent on age, a reduced flow rate, postvoid residual volume, and voided volume.

The mean flow time was found to be 51.9s, with a range of 16-

111s. On comparing the variables by using Student's t-test, the p-value found to be >0.05, which was non-significant. Hence, no correlation was found between symptom score and mean flow time.

In our study, the mean voiding time was found to be 67.4s, with a range of 17-250s. The mean value of voiding time which was found in patients with moderate symptoms was 60.6s and in patients with severe symptoms, it was found to be 71.6s. On comparing the variables by using Student's t-test, the p-value found to be >0.05, which was non-significant. Hence, no correlation was found between symptom score and voiding time. However, there is no data on voiding time and its association with LUTS or symptom scores.

The mean Average Flow Rate was found to be 6.0, with a minimum recording of 2 and a maximum recording of 14s. The mean value of Average Flow Rate which was found in patients with moderate symptoms was 8.0 and in patients with severe symptoms, it was found to be 4.8. On comparing the variables by using Student's t-test, the p-value found to be <0.001, which was highly significant. Hence, a strongly positive correlation was found between symptom score and average flow rate. Hideaki Itoh et al., studied 206 males and obtained relatively high correlation co-efficients of over 0.3 between average flow rate and symptom scores. These results strongly suggested that the time-dependent factors in micturition considerably influenced LUTS in elderly patients [16]. Barry MJ, Girman CJ, reported no significant correlation (r = 0.13) between average flow rate and symptom score [14]. In contrast, a statistically significant correlation (r = 0.16, p < 0.01) between average flow rate and IPSS was reported by Wadie et al.,[17].

CONCLUSION

On the basis of data which was obtained after evaluation of 50 patients with benign prostatic hyperplasia, it can be concluded that prostate size has no correlation with Lower Urinary Tract Symptoms. As the prostatic size which is measured by ultrasound does not consider zonal enlargement, to judge the severity of the disease, uroflowmetry and IPSS should be considered. Post-void residual urine has a strongly positive correlation with the severity of lower urinary tract symptoms. Among the parameters which were obtained by uroflowmetry, peak flow rate was the most representative of the symptom severity of the patient. Parameters like time to peak flow, flow time, voiding time, voided volume had no correlation with the symptoms of the patient. Average flow rate also correlated positively with the symptoms of the patient, and it can be considered to be as good as peak flow rate in the assessment of symptom severity.

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