International Surgery Journal
Ugraiah AB et al. Int Surg J. 2020 Oct;7(10):3381-3388
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20204141

Original Research Article

Correlation of international prostate symptom score and uroflowmetry in evaluation of benign prostatic hyperplasia

Anilkumar B. Ugraiah[1]*, Sharvari Shyam[2]

[1]Department of General and Minimal Access Surgery, Fortis Hospital, Cunningham Road, Bangalore, Karnataka, India
[2]Resident Doctor, Fortis Hospital, Nagarbhavi, Bangalore, Karnataka, India

Received: 10 August 2020
Revised: 16 September 2020
Accepted: 17 September 2020

***Correspondence:**
Dr. Anilkumar B. Ugraiah,
E-mail: anilkumar.bu@gmail.com

ABSTRACT

Background: Uroflowmetry is a simple non-invasive technique in evaluating patients presenting with Lower urinary tract symptoms (LUTS), to assess voiding patterns, maximum urinary flow (Qmax), average urinary flow (Qave) and voided urine volume. Uroflowmetry is considered mandatory prior to surgical intervention in diagnosis and assessment of men with LUTS. Correlating the International prostrate symptom score (IPSS) with that of uroflowmetry results will allow a better diagnosis and help in determining more appropriate modality of treatment. Therefore, the purpose of our study is to correlate IPSS and the findings of uroflowmetry in evaluation of Benign prostrate hypertrophy (BPH).
Methods: This was a prospective study of 50 patients presenting with LUTS diagnosed with BPH. Patient's symptoms were initially evaluated by administering a pre-treatment IPSS/Quality of Life Score (QoL) and uroflowmetry. All patients underwent Transurethral resection of the prostate (TURP). A post TURP IPSS/QoL score assessment and uroflowmetry was done. Pre-operative IPSS and uroflowmetry results were correlated using spearman's correlation coefficient. Outcome of IPSS and uroflowmetry following TURP was assessed in terms of percentage improvement.
Results: Statistically significant correlation ($p<0.05$) was seen between IPSS and uroflowmetry results. No correlation was found between prostate volume and IPSS. Significant improvement in symptom severity (IPSS score) and uroflowmetry results was observed in post TURP patients.
Conclusion: IPSS is a valuable tool in the evaluation and grading of LUTS. Correlating both IPSS and uroflowmetry results will help in better diagnosis and management of patients. It can also be concluded that IPSS and uroflowmetry can be used for evaluation and monitoring patients following prostate surgery.

Keywords: Benign prostatic hyperplasia, Lower urinary tract symptoms, Uroflowmetry, International prostate symptom score, Transurethral resection of prostate

INTRODUCTION

Benign prostatic hyperplasia (BPH) involves hyperplasia of prostatic stromal and epithelial cells resulting in enlargement of the prostate. When sufficiently large, it leads to obstruction to the normal flow of urine causing symptoms. There is histological evidence that the incidence of definite or probable BPH exceeds 50% in men older than 50 years. This occurrence rises to 75% as men enter their eighth decade. LUTS affects individual quality of life (QoL) and is a significant economic burden to the society. The periodic update on the diagnosis, prognosis, medical treatment and medical invasive therapies are crucial.[1] Based on the clinical definition of BPH as given by Garraway et al which includes an enlargement prostate (more than 20 gm) an elevated symptom score 11 or higher on a scale of (0-48), the prevalence of clinically defined

BPH ranged from approximately 14% for men in their forties to 40% for men in their seventies.

Caine in 1986, gave the concept of dynamic component which is related to the level of sympathetic stimulation of alpha receptors in the (a) prostatic capsular muscle (b) prostatic adenoma (c) bladder base. This suggested the possibility of treatment with alpha-adrenergic antagonists.[2]

Recent study shows, increased number of prostatic blood vessels allow gland to enlarge thus explaining why severe urological symptoms develop more often in smokers who increasingly undergo prostate surgery.[3]

The development of BPH, as found by Coffey et al in 1990 is an androgen dependent process.[3] Peter et al in 1987, demonstrated that androgen suppression causes reduction in prostatic volume thus decreasing static component of bladder outlet obstruction resulting in BPH.[4] This is the rationale for the use of 5-alpha reductase inhibitors and various anti androgens.

The International prostate symptom score (IPSS) is recommended as the symptom scoring instrument to be used for baseline assessment of symptom severity in men with BPH presenting with lower urinary tract symptoms (LUTS). The Measurement Committee of the AUA (Barry et a1 1992a, 1992b) developed the IPSS.[5,6] Each question on the IPSS can yield 0 to 5 points, producing a total symptom score that can range from 0 to 35. In this, the symptoms are graded as mild (0 to 7), moderate (8 to 19), or severe (20 to 35). QoL Index is added because this is what brings the patient to the physician. However, patient with a low education status are more likely to misunderstand the IPSS, they tend to misinterpret their symptoms and may receive inappropriate treatment.[7] Uroflowmetry is a simple non-invasive technique in evaluating patient presenting with LUTS to evaluate voiding patterns- maximum urinary flow (Qmax), flow pattern, voided volume. Uroflowmetry is considered mandatory prior to surgical intervention in diagnosis and assessment of men with LUTS.[8] Correlating the symptom score of IPSS with that of uroflowmetry results will allow a better diagnosis and determine the more appropriate modality of treatment. Although there are studies correlating the symptom severity with uroflowmetry, we found very few studies in India.

The aim of this study is to correlate the symptom score of IPSS with results of uroflowmetry in the evaluation and management of BPH at a tertiary care hospital.

METHODS

A prospective observational study was conducted at Department of General Surgery and Urology, Mallya Hospital, Bangalore, a tertiary care hospital from October 2013 to November 2015.

Due clearance from the ethical committee of the institution was taken prior to start of the study. To calculate the sample size, correlation value from the study conducted by Singla et al and Garg et al was taken with 20% precision.[9,10] 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 examination (DRE), renal function tests (blood urea, serum creatinine), complete urine analysis, ultrasound abdomen and uroflowmetry.

A transabdominal ultrasound is used to assess the volume of prostate and grading. An estimated volume is determined from measurements in 3 orthogonal planes (volume=length×height×width×0.52).[11] The grading of prostate was done as follows Grade I=21-30 cc, Grade II=31-50 cc, Grade III=51-80 cc and Grade IV=80 cc and above.[12]

All patients were evaluated preoperatively and 3 months post TURP by using IPSS questionnaire and uroflowmetry. 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 has a total score of 35 which ranges from 0 to 35. Few participants were given a linguistic Kannada version of the IPSS, whenever necessary assistance was provided.

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 (Qmax), voided volume (VV) and average flow rate (Qave). 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. Before starting the urination, patient was informed to press a button. The result was obtained as peak flow rate, voiding time, voiding volume, time to peak flow and average flow rate. The test involved normal voiding and so no discomfort was experienced by the patients. In our study uroflowmetry focus was on peak flow rate, average flow rate and voided volume.

The data of the patients was analyzed and the patients were divided as per their symptom severities into mild, moderate and severe categories, as was assessed by IPSS. The results of uroflowmetry, as obtained from these patients, were compared by using various statistical techniques. Continuous variables were presented as mean and SD and categorical variables were presented as frequencies and percentage. Pre op IPSS score and uroflowmetry values were compared using paired t test. Correlation and significance between prostate size with

IPSS, Pre-op IPSS and Qmax, Pre-op IPSS and Qave were established using Pearson's correlation coefficient and R environment software version 3.2.2. Outcome of IPSS and uroflowmetry following TURP was assessed in terms of percentage improvement.

Inclusion criteria

The inclusion criteria for the study was as follows: all patients with LUTS due to BPH diagnosed on examination and ultrasound, age more than 50 years and IPSS of >12 were included in the study.

Exclusion criteria

The exclusion criteria for the study was as follows: hematuria, carcinoma prostate, patients already under medication for BPH, vesical calculus, neurological disorder, medications interfering with bladder function, renal insufficiency, UTI and stricture urethra.

RESULTS

Our study included total of 50 patients presenting with LUTS and diagnosed to have BPH. All patients underwent TURP. Patients were followed up after 3 months post-surgery and post-operative IPSS questionnaire and uroflowmetry was done for all the patients.

Patients were divided into moderate and severe category based on IPSS scoring. Of these, 11 of them belong to moderate category and 39 into severe category.

The mean age of patients in this study was 69.1 years. 24% of the patients had Grade 1 prostate enlargement, 64% had Grade 2 prostate enlargement and 12% had Grade 3 enlargement as shown in Figure 1.

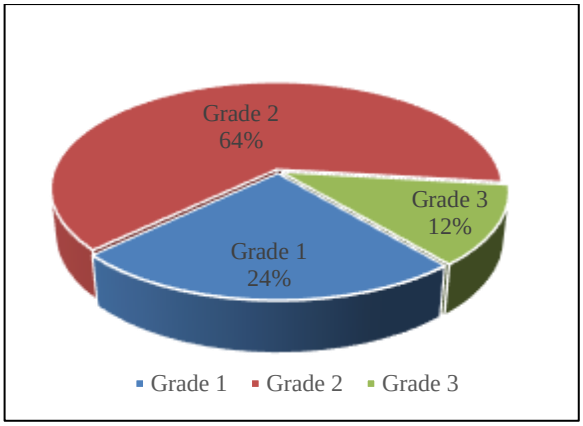

Figure 1: Percentage of grades of prostate enlargement.

The mean prostatic size was 40.08 cc, with a range of 22-78 cc. When the patients were divided as per their symptom severity scores, the mean prostatic size in patients with moderate symptoms was 42 cc and patients with severe symptoms was 39.54 cc. The overall correlation co-efficient of IPSS with prostatic size was found to be 0.0655 with p=0.651 which is not significant at p<0.05. Hence, no correlation was found between prostatic volume and IPSS as shown in figure 2.

The mean value of peak flow rate was found to be 9.26 ml/s, with a minimum recording of 4ml/s and a maximum recording of 13.6 ml/s. The overall correlation coefficient between Qmax and IPSS was 0.824 with a p value of 0.00001 at p<0.05, which was highly significant. The peak flow rate had a strong negative correlation with symptom score as shown in Figure 3.

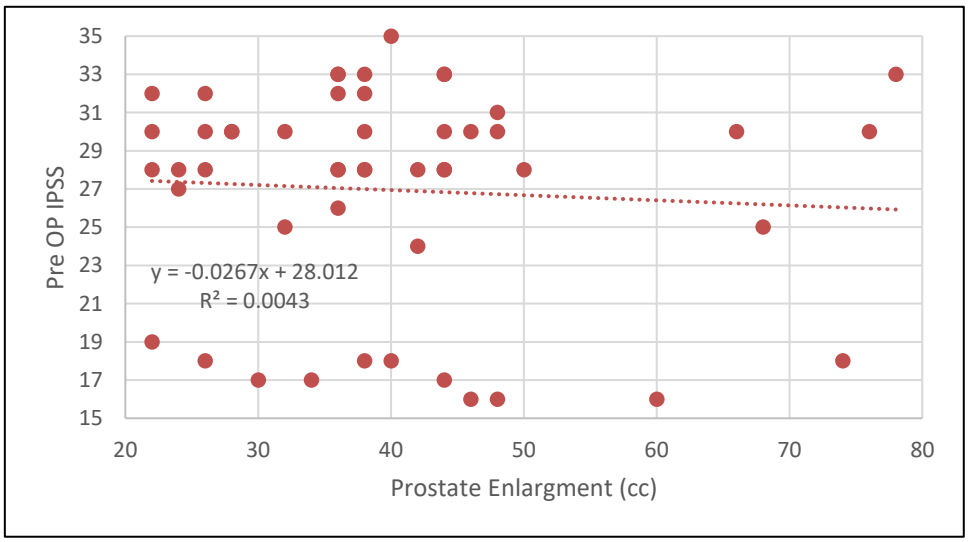

Figure 2: Correlation between prostate size and pre-operative IPSS.

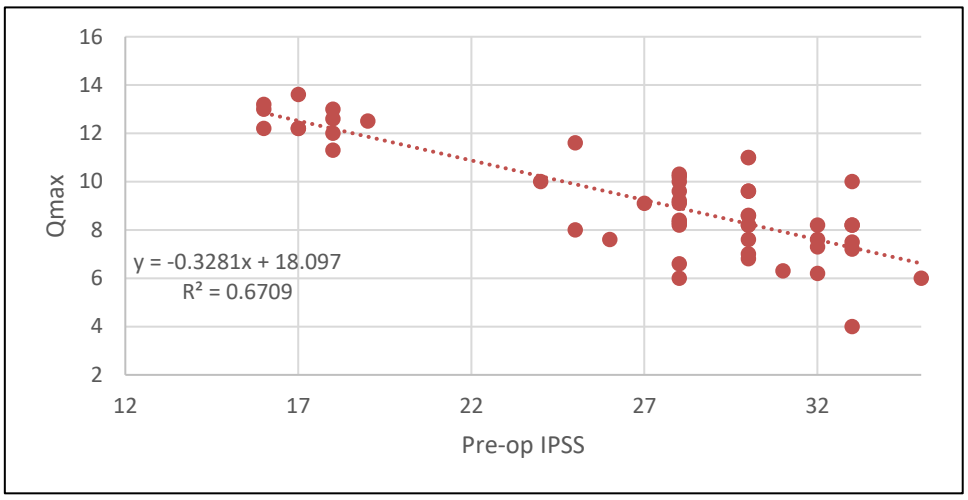

Figure 3: Correlation between pre-operative Qmax and pre-operative IPSS.

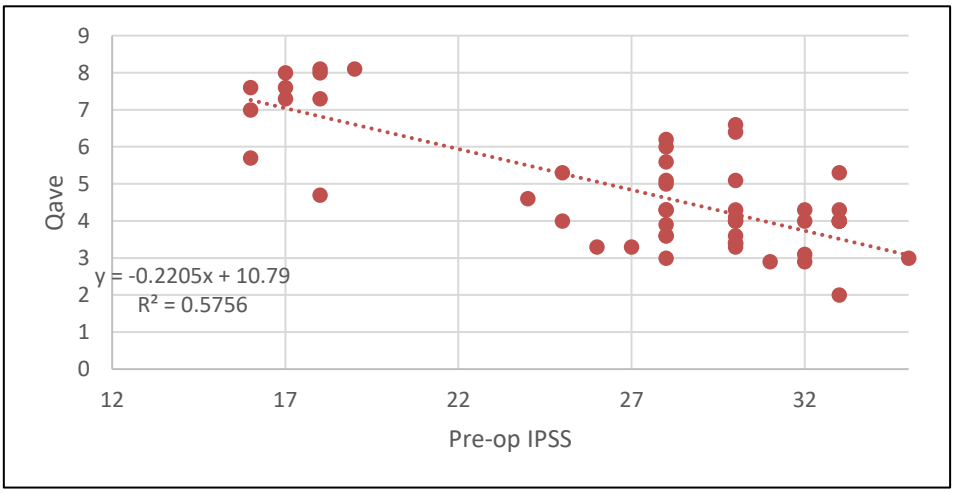

Figure 4: Correlation between pre-operative Qave and pre-operative IPSS.

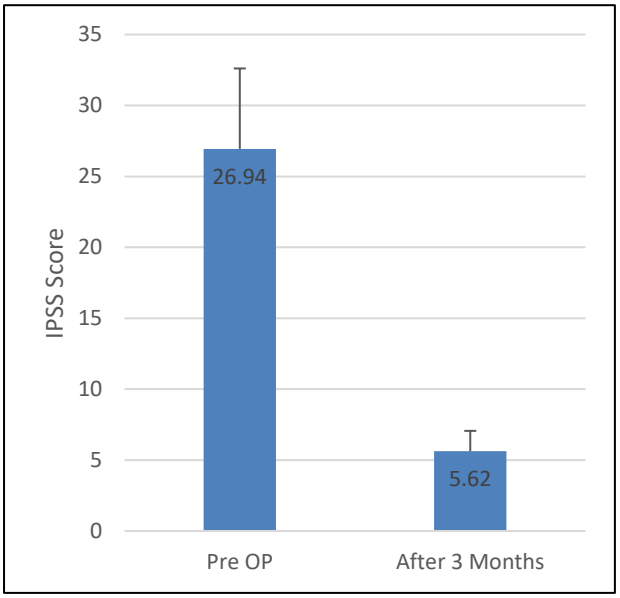

Figure 5: Reduction in IPSS score post TURP.

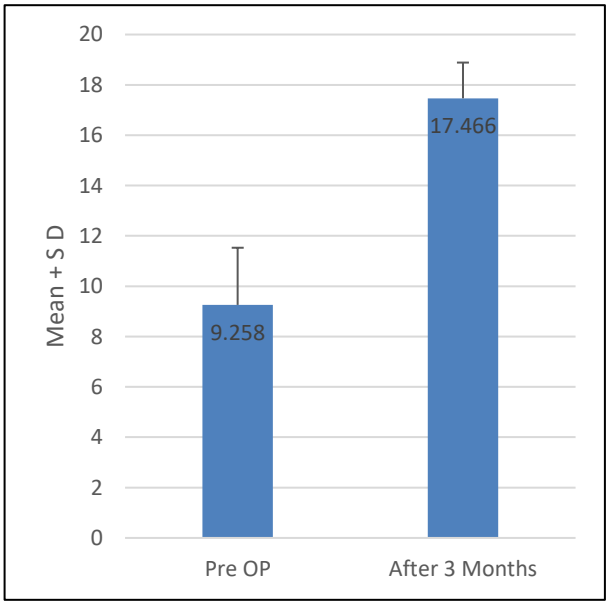

Figure 6: Improvement in peak flow rate post TURP.

Table 1: Outcome results post TURP.

Parameter	Initial	Follow up	Difference	Improvement (%)
IPSS	26.9	5.6	21.3	79
QoL	4.9	1.0	3.9	80
Qmax	9.26	17.89	8.63	103
Qave	4.85	8.52	3.67	94
VV	272	322	50	84

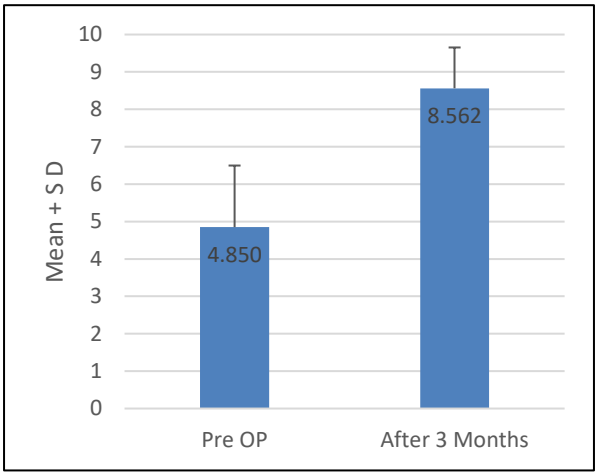

Figure 7: Improvement in average flow rate (Qave) post TURP.

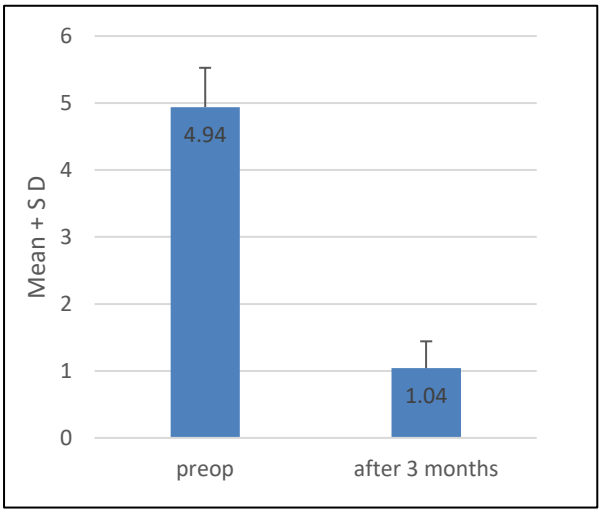

Figure 8: Improvement in quality of life score post TURP.

The mean average flow rate was found to be 4.85 ml/s, with a minimum recording of 2 ml/s and a maximum recording of 8.1 ml/s. The correlation coefficient between Qave and IPSS was 0.7586, the p-value found to be <0.00001, which was highly significant. Hence, a strong negative correlation was found between symptom score and average flow rate as seen in Figure 4.

In our study we found that IPSS was improved on a 3 month follow up. The average decrease in IPSS was 21 points representing a 79% decrease in symptom as shown in Table 1 and Figure 5. The percentage improvement in patients belonging to moderate group was 72% whereas in patients belonging to severe group it was 80%. Hence, patients with higher symptom score showed more improvement in IPSS score. Most of the men at follow up regarded their urinary symptoms as being mild (IPSS<7).

In our study post TURP mean Qmax value was 17.89 ml/s with minimal reading of 8.3 ml/s and maximum reading of 22 ml/s, with only three patients showing Qmax <15 ml/s as shown in Figure 6. Overall, there was 103% significant improvement in Qmax from before to after TURP. Qave showed improvement of 94% from pre-operative to post-operative from 4.8 ml/s to 8.5 ml/s which was also a significant improvement as shown in figure 7. There was a significant improvement in QoL score from 4.9 to 1.0 representing 80% improvement as shown in Figure 8.

DISCUSSION

Our study 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 69.1 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.[13] Similarly, Sanjeev et al, reported patients with mean age of 67.7 years.[7]

Mean prostate size

In our study, the mean prostatic size in patients was 40.8 cm^3. 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 which was measured by Vesely et al in his study which was conducted on 354 patients was 40.1 cm^3, while Dicuio et al., found average prostate volume to be 41 cm^3 in his study which was done on 25 men.[14,15] When the patients were divided as per their symptom severity scores, the mean prostatic size in patients with moderate symptoms was 42 cc and that in patients with severe symptoms, it was 39.54 cc. The overall correlation co-efficient of IPSS with prostatic size was found to be 0.0655 with p=0.651 which was not significant at p<0.05. Hence, no correlation was

found between prostatic volume and IPSS. This data was further supported by other studies which were done by Sanjeev et al and Ezz et al on 803 patients.[7,16] On the contrary a study done by Bosch et al showed a weak correlation between IPSS and Prostate volume.[17]

Mean peak flow rate (Qmax)

In our study the mean value of peak flow rate was found to be 9.26 ml/s. The overall correlation coefficient between Qmax and IPSS was 0.824 with a p value of 0.00001 at $p<0.05$, which was highly significant. The peak flow rate had a strong negative correlation with symptom score. Various other studies like Singla et al, also observed similar results, which was conducted in the year 2013 on 50 patients with LUTS due to BPH. The mean peak flow rate Qmax was 10.6 and mean average flow rate was Qave 6 ml/sec. Both the parameters estimated on uroflowmetry strongly correlated with symptom severity and suggested that time dependent parameters considerably influenced LUTS in elderly patients.[7]

Itoh H 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 et al, Bosch et al, Din et al have reported weak correlations between peak flow rate and symptom scores.[17-19]Another retrospective study conducted by Seki et al showed that there was a correlation between Qmax and symptom severity.[20]

Mean average flow rate (Qave)

The mean average flow rate (Qave) was found to be 4.85 ml/s. The correlation coefficient between Qave and IPSS was 0.7586, the p value found to be <0.00001, which was highly significant. Hence, a strong negative correlation was found between symptom score and average flow rate. Itoh et al conducted study on 206 males and obtained relatively high correlation co-efficient of over 0.3 between average flow rate and symptom scores. The outcome derived was that the time-dependent factors in micturition considerably influenced LUTS in elderly patients.[19] Other studies done by Barry et al reported no significant correlation ($r=0.13$) between average flow rate and symptom score.[18] In contrast, a statistically significant correlation ($r=0.16$, $p<0.01$) between average flow rate and IPSS was reported by Wadie et al.[21] Sanjeev et al also showed significant correlation between Qave and symptom severity.[7]

Outcome analysis

In our study we found that IPSS was improved on a 3 month follow up. The average decrease in IPSS was 21 points representing a 79% decrease in symptom. The percentage improvement in patients belonging to moderate group was 72% whereas in patients belonging to severe group it was 80%. Hence, patients with higher symptom score showed more improvement in IPSS score. Most of the men at follow up regarded their urinary symptoms as being mild (IPSS<7).

Similar results were observed in a descriptive case series study conducted by Bozdar et al which showed favorable outcome in IPSS post TURP at 3 months follow up.[22] Another study conducted at the Uppsala University Hospital, Sweden showed that 86% of clinical BPH patients responded IPSS <7 after TURP in the sequential follow-up on 3, 6 months and 1 year.[2,3]

In other study conducted by Amu et al, post TURP IPSS score showed mean improvement in IPSS score of 70%. This study has shown that the IPSS is a valuable tool in the management of patients with BPH in terms of initial assessment and categorization of patients.[24]

There was a significant improvement in QoL score from 4.9 to 1.0 representing 80% improvement in our study. Similarly, in a study conducted by Zhao et al scores of urinary symptoms and QoL of BPH patients were significantly improved after TURP. The improvement of the symptom scores and QoL are correlated to the preoperative scores.[25]

In a study done by Kallenberg et al which included 91 patients with 70 months of follow up. Six months after TURP he observed improvement in IPSS total score from 17.6 to 5.3 and QoL index from 4.9 to 1.7.[26] In a study conducted Chalise et al at three months follow up, the mean IPSS reduced down to 7.9 and QoL score improved to 1.5. The average change in IPSS and QoL score were 15.6 and 3.6; these changes were statistically significant and correlated with preoperative symptom severity.[27]

In our study post TURP mean Qmax value is 17.89 ml/s with 103% improvement from pre-operatively which was highly significant.

Qave showed improvement of 94% from pre to post TURP from 4.8 ml/s to 8.5 ml/s respectively which was also a significant improvement. In a prospective study conducted by Rahman et al which included 68 patients, significant improvement was observed in terms of Qmax, voided volume, and voiding time in all patients after TURP. Mean (±SD) IPSS change in pre to post TURP was 16.2 (±0.76) ($p<0.05$). The objective parameters of uroflowmetry correlated well with the subjective parameters represented by IPSS in this study.[28]

Similar results were observed in other study conducted by Larosa et al Qmax and average flow (Qave) improved after prostatectomy from 7.1 ml/s to 18.9 ml/s and 4.1 ml/s to 8.3 ml/s respectively.[29] In a study conducted by Kallenberg et al, significant improvement was recorded in Qmax from 8 ml/s to 23 ml/s.[26]

In a study by Nielsen et al, after transurethral resection of the prostate, maximum flow rate at three months follow up was found to be 17.0 ml/s in 84 consecutive patients.[30]

In similar studies by Dorflinger et al and Miah et al on 476 patients after transurethral resection of the prostate at three months follow up, the maximum flow rate was 21.5 ml/s in nineteen patients and 17.47 ml/s respectively.[31,32]

The limitation of this study is that IPSS questionnaire is a subjective scoring scale and each patient will interpret their symptoms differently.

CONCLUSION

The study showed that IPSS and uroflowmetry can be used for evaluation and monitoring the outcome of patients following prostate surgery. IPSS alone cannot be used to evaluate the patients with LUTS, it has to be correlated with uroflowmetry results to assess the severity of obstruction and the need for therapeutic intervention to relieve LUTS. Uroflowmetry is regarded one of the most useful, simple urodynamic technique for objective assessment in BPH. Most of the patients showed significant improvement in IPSS and uroflowmetric parameters post TURP, hence combining IPSS and uroflowmetry helps in increasing the diagnosis of obstruction in BPH patients presenting with LUTS.

Following our study, we recommend that all patients with BPH presenting with LUTS should undergo initial evaluation with IPSS questionnaire and uroflowmetry and should consider it as a baseline investigation prior to any intervention, either medical or surgical treatment. Uroflowmetry helps in making decision about the need for therapeutic intervention. IPSS can be used in evaluation of treatment outcome like in detecting, monitoring and measuring change in symptoms following the prostate surgery. Uroflowmetry can be used for follow-up of post TURP patients to assess the treatment outcome. All clinical personnel should be educated in eliciting correct IPSS score. Uroflowmetry should be made available at all centres because it's a simple non-invasive investigation and easily affordable.

ACKNOWLEDGEMENTS

The authors would like to thank Dr. Nagasubramanyam and Dr. Mahendra Jain, Consultant Urologists at Mallya Hospital, Bangalore and Dr. Girishekar A, Consultant General and Laparoscopic Surgeon, Mallya Hospital, Bangalore

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Garraway WM, Collins GN, Lee RJ. High prevalence of benign prostatic hypertrophy in the community. Lancet. 1991;338:469-71.
2. Caine M. The present role of alpha-adrenergic blockers in the treatment of benign prostatic hypertrophy. 1986;1361-4.
3. Coffey DS, Walsh PC. Clinical and experimental studies of benign prostatic hyperplasia. Urol Coin North. 1990;17:461-75.
4. Peters CA, Walsh PC. The effect of Nafarelin acetate, a luteinizing hormone releasing hormone agonist, on benign prostatic hyperplasia. N. Engl J Med. 1987;317:599-604.
5. Barry MJ, Fowler FJ, O'leary MP. The American Urological Association Symptom Index for benign prostatic hyperplasia. Journal of Urology. 1992;148:1549-57.
6. Barry Mi, Fowler FJ Jr, O'Leary MP. The AUA Measurement Committee: Correlation of the American Urological Association Symptom Index with self- administered versions of the Madsen-Iverson, Boyarsky and Maine Medical Assessment Program Symptom indexes. J Urol. 1992;148:1558-63.
7. Kaplan, Abrams. Evaluation and non-surgical management of BPH. Campbell Walsh Urology. 10th edition. 2012;2611-54.
8. Rosette JDL, Alivizatos G, Madersbacher S, Sanz CR, Nordling J, Emberton M. European Association of Urology Guidelines on BPH. Smith's Textbook of Endourology 3rd edition. 2002;2:1453-1455.
9. Singla S, Garg R, Singla A, Sharma S, Sethi JSP. Experience With Uroflowmetry In Evaluation Of Lower Urinary Tract Symptoms, J Clin Diagn Res. 2014;8(4):N01-03.
10. Hulley SB, Cummings SR, Browner WS, Grady D, Newman TB. Designing clinical research: an epidemiologic approach. 4th ed. Philadelphia, PA: Lippincott Williams & Wilkins. 2013;6C:79.
11. Halpern EJ. Measurement of the prostate gland. In: McGahan J, Goldberg BB (eds). Atlas of Ultrasound Measurements. 2nd ed. Chicago, IL: Mosby Year Book; 2005.
12. Aguirre. Evaluation and comparison of prostate volume with open prostatectomy surgical specimen. J. Urol. 1980;86:675-79.
13. Holtgrewe HL, Mebust WK, Dowd JB. Transurethral prostatectomy: Practice aspects of the dominant operation in American Urology. Urol. 1989;141:248-53.
14. Vesely S, Knutson T, Damber JE. Relationship between age, prostate volume, prostate-specific antigen, symptom score and uroflowmetry in men with lower urinary tract symptoms. J Urol Nephrol. 2003;37:322-8.
15. Dicuio M, Pomara G, Vesely S. The use of prostatic intravesical protrusion correlated with uroflowmetry: a new method to measure obstruction in patients with

LUTS due to BOO without using P/F studies. Arch Ital Urol Androl. 2005;77:50-3.
16. Ezz el Din K, Kiemeney LA, de Wildt MJ, Debruyne FM, de la Rosette JJ. Correlation between uroflowmetry, prostate volume, postvoid residue, and lower urinary tract symptoms as measured by the International Prostate Symptom Score. Urology. 1996;48(3):393-7.
17. Bosch JLHR, Hop WCJ, Kirkels WJ, Schröder FH. The International Prostate Symptom Score in a community-based sample of men between 55 and 74 years of age: prevalence and correlation of symptoms with age, prostate volume, flow rate and residual urine volume. British Journal of Urology. 1995;75:622-30.
18. Barry MJ, Girman CJ. Using repeated measures of symptom score, uroflowmetry and prostate specific antigen in the clinical management of prostate disease. Benign Prostatic Hyperplasia Treatment Outcomes Study group. J Urol. 1995;153(1):99-103.
19. Din KEE, Kiemeney LAAM, Wildt MJAM, Debruyne FMJ, Rosette JJMC. Correlation between uroflowmetry, prostate volume, postvoid residual, and lower urinary tract symptoms measured by the International Prostate Symptom Score. Urol. 1996;48:393-7.
20. Seki N1, Yunoki T, Tomoda T, Takei M, Yamaguchi A, Naito S. Association among the symptoms, quality of life and urodynamic parameters in patients with improved lower urinary tract symptoms following a transurethral resection of the prostate. Neurourol Urodyn. 2008;27(3):222-5.
21. Wadie BS, Ibrahim E-HI, de la Rosette JJ, Gomha MA, Ghoneim MA. The relationship of the International Prostate Symptom Score and objective parameters for diagnosing bladder outlet obstruction. Part 1: when statistics fail. J. Urol. 2001;165:32-4.
22. Bozdar HR, Memon SR, Paryani JP. Outcome of transurethral resection of prostate in clinical benign prostatic hyperplasia. J Ayub Med Coll. 2010;22(4):194.
23. Harvey MH, Leese T, Lloyd D, Osborn DE. Antibiotic prophylaxis and secondary hemorrhage following transurethral resection of the prostate: a prospective trial. Br Urol. 1986;58:450-2.
24. Amu OC, Udeh EI, Ugochukwu AI, Dakum NK, Ramyil VM. The value of international prostate symptom scoring system in the management of BPH in Jos, Nigeria. Niger J Clin Pract. 2013;16(3):273-8.
25. Zhao Z, Wang G, Na YQ. Changes of urinary symptoms after transurethral resection of the prostate and its correlation with clinical parameters. Zhonghua Wai Ke Za Zhi. 2007; 45(14):957-9.
26. Kallenberg F, Hossack TA, Woo HH. Long-Term Followup after Electrocautery Transurethral Resection of the Prostate for Benign Prostatic Hyperplasia. Advances in Urology. 2011;2011(359478):6.
27. Chalise PR, Agrawal CS. Changes in urinary symptoms and quality of life in men with benign prostatic hyperplasia after transurethral resection of prostate. Nepal Med Coll J. 2007;9:255-8.
28. Rahman MH, Islam MA, Joarder AI, Mannan M, Bhuiyan MR, Paul BK. Uroflowmetry before and after transurethral resection of prostate for bladder outlet obstruction. Mymensingh Med J. 2010;19(4):601-7.
29. Larosa M, Ferretti S, Salsi P, Simonazzi M. Uroflowmetry in the assessment of patients with benign prostatic hyperplasia. Acta Biomed Ateneo Parmense. 1993;64(1-2):17-22.
30. Nielsen KT, Christensen MM, Madsen PO, Bruskewitz RC. Symptom analysis and uroflowmetry 7 years after transurethral resection of the prostate. J Urol. 1989;142(5):1251-3.
31. Dorflinger T, England DM, Madsen PO, Bruskewitz RC. Urodynamic and histological correlates of benign prostatic hyperplasia. J Urol. 1988; 140(6):1487-90.
32. Miah ZI, Bhuiyan ZH. Outcome of 500 cases of transurethral resection of Prostate in District level teaching Hospital. Bangladesh Journal of Medical. 2013;12(2):186-91.

Cite this article as: Ugraiah AB, Shyam S. Correlation of international prostate symptom score and uroflowmetry in evaluation of benign prostatic hyperplasia. Int Surg J 2020;7:3381-8.