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"UROFLOWMETRY: A PREDICTOR OF SEVERITY AND OUTCOME IN PATIENTS WITH OBSTRUCTIVE LOWER URINARY TRACT SYMPTOMS"

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ABSTRACT

Background:

Assessment by uroflowmetry forms an essential element in the evaluation of patients with Obstructive Lower Urinary Tract Symptoms (LUTS). Uroflowmetry non-invasively estimates the bladder capacity and delineates Qmax(maximum flow rate) and voiding patterns. It is vitally important to assess the utility of such a non-invasive test in assessing the severity and predicting the outcome in patients with obstructive LUTS(Lower urinary tract symptoms). The study was aimed to study the role of uroflowmetry in adult males presenting with obstructive lower urinary tract symptoms; to statistically analyze and compare the uroflowmetry results in pre-treatment /pre-operative periodwith post-treatment/post-operative period in adult male patients with obstructive lower urinary tract symptoms.

M**ethods:**

This prospective study was conducted from November 2019 over a period of one year. 50 adult male patients over the age of 50 years with obstructive LUTS due to benign prostatic hyperplasia (prostate size more than 30 grams) and bladder neck contractures were included in the study. The patients were treated conservatively or managed surgically based on the prostate size and the willingness of the patient to get operated upon. Uroflowmetry was performed before starting the treatment and post-surgery at the time of discharge and 3months after starting treatment in cases where conservative management was done, and the results were analyzed.

Results:

There was a significantly very high strong positive correlation between the pre-treatment and post-treatment voided volume (r-value = 0.852, $P < 0.0001$) and Maximum Flow rates (r-value = 0.776, $P<0.0001$),There was statistically significant difference of mean between pre-treatment and post-treatment Flow Time (t-value = 4.751, $P < 0.0001$), whereas there was no statistically significant difference of mean between pre-treatment and post-treatment Time to maximum flow (t-value = 1.187, $P = 0.241$).A significantly strong low positive correlation was seen between the pre-treatment and post-treatment for average flow rate. (r-value = 0.42, $P = 0.002$).

Conclusion:

It is evident from this study that there was a significant improvement in post-treatment/postoperative uroflowmetry parameters. There was an evident improvement in the maximum flow rate, and average flow rate in all post-treatment/postoperative follow up. Thus, uroflowmetry can aid in diagnostic evaluation and deciding treatment for these patients. It can also delineate which patients are going to be benefitted from surgery as well as an objective assessment of treatment outcomes.

Keywords: LUTS, Uroflowmetry, BPH, TURP.

Introduction

Lower urinary tract symptoms (LUTS) include storage and/or common voiding disturbances. LUTS may be due to structural or functional abnormalities in one or more parts of the lower urinary tract which comprises the bladder, bladder neck, prostate, distal sphincter mechanism, and urethra. It must also be remembered that LUTS may result from abnormalities of the peripheral and/or central nervous systems which provide neural control to the lower urinary tract. LUTS may also be secondary to cardiovascular, respiratory, and renal dysfunction or disease[1].

LUTS are a major problem for the aging male population. Age is an important risk factor for LUTS and the prevalence of LUTS increases as men get older. Bothersome LUTS can occur in up to 30% of men older than 65 years. This is a large group potentially requiring treatment[2].

Uroflowmetry is the measurement of the rate of urine flow over time. Uroflowmetry is one of the most commonly used forms of urodynamic testing. It is a non-invasive test that measures the rate of urinary flow over a time period. Uroflowmetry involves a well-hydrated patient voiding into a funnel with an attached transducer which is attached to an electronic uroflow meter, which generates a “flow curve”. The flow rate is calculated in milliliters (ml) of urine passed per second and the length of time it takes to empty the bladder. The flow curve is plotted with the urine flow on the y-axis and time on the x-axis. Urinary flow rates depend on voided volumein a nonlinear fashion. Uroflowmetry is extremely useful as a screening test, especially to determine which patients may need further testing with more formal urodynamics, although it cannot determine the exact cause of a patient’s voiding dysfunction.

Uroflowmetry includes:

1. Maximum flow rate

2. Average flow rate

3. Total voided volume

4. Voiding time

5. Time of maximum flow

All patients with LUTS don’t require treatment. With mild symptoms,the patient can be reassured and advised of behavioural and lifestyle modifications. Few patients can be subjected to medical management depending upon the pathophysiology whether voiding or storage symptomatology. Rest can be treated with surgical interventions [3].

Owing to the high prevalence of LUTS and the underlying multifactorial pathophysiology, accurate assessment of male LUTS is crucial to establish a differential diagnosis among possible causes and to define the clinical profile of men with LUTS to provide the best evidence-based care (overall objectives). The assessment should be able to identify patients for whom watchful waiting (WW) or medical or surgical treatment can be recommended, as well as men at risk of disease progression, and to assess patients’ values and preferences[4].

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This present study was conducted to evaluate the role of uroflowmetry in adult males presenting with obstructive lower urinary tract symptoms.

Methodology

This prospective study was conducted in the Postgraduate Department of Surgery, ASCOMS, Jammu from November 2019 over a period of one year. 50 adult male patients presenting to the surgical OPD with obstructive lower urinary tract symptoms were selected after proper history, clinical examination and investigation.

Inclusion criteria-

Adult males more than 50 years of age presenting with obstructive lower urinary tract symptoms due to:

1. Benign prostatic hyperplasia with prostrate size more than 30 grams

2. Bladder neck contractures

Exclusion criteria-

Patients having bladder calculus/ prostate cancer/ neurogenic bladder/ urinary bladder carcinoma/ acute urinary retention or the patients on antipsychotic drugs.

All the patients were subjected to a complete clinical examination after taking a detailed history. All baseline blood investigations were done and the patient subjected to Ultrasound examination to determine the prostate size, echotexture and PVR(Post void residual) urine. Uroflowmetric assessment of the patients was done.

Patients with the prostate size of 30 to 60 grams were subjected to medical management. A combination therapy with Silodosin 8 mg and Dutasteride 0.5 mg was instituted.

Patients with prostate more than 60 grams and not willing for surgery due to economic factors were also subjected to medical management.Patients with prostate size more than 60 grams and willing for surgery were taken up for surgical intervention.Repeat uroflowmetry and ultrasound abdomen was done post-surgery at the time of discharge and 3months after starting treatment in cases where conservative management was done.Then the difference in the pre-treatment / pre-surgery uroflowmetric parameters and ultrasonographic findings and post treatment /post-surgery uroflowmetric findings were evaluated. The results of the two groups were analysed and compared with each other. Results were conducted using Microsoft Excel and SPSS for windows. Variables were presented as mean and standard deviation for quantitative and percentages for qualitative as deemed appropriate. Paired t-test was applied to evaluate differences in mean values. ‘p’-value of <0.05 was considered as statistically significant. All ‘p’-value used were two tailed.

Results

Age wise distribution of patients presenting with lower urinary tract symptoms (LUTS)

		Count	Percentage (%)
Age Group	50-60 Years	13	26.0%
	60-70 Years	24	48.0%
	70-80 Years	13	26.0%
	Total	50	100.0%

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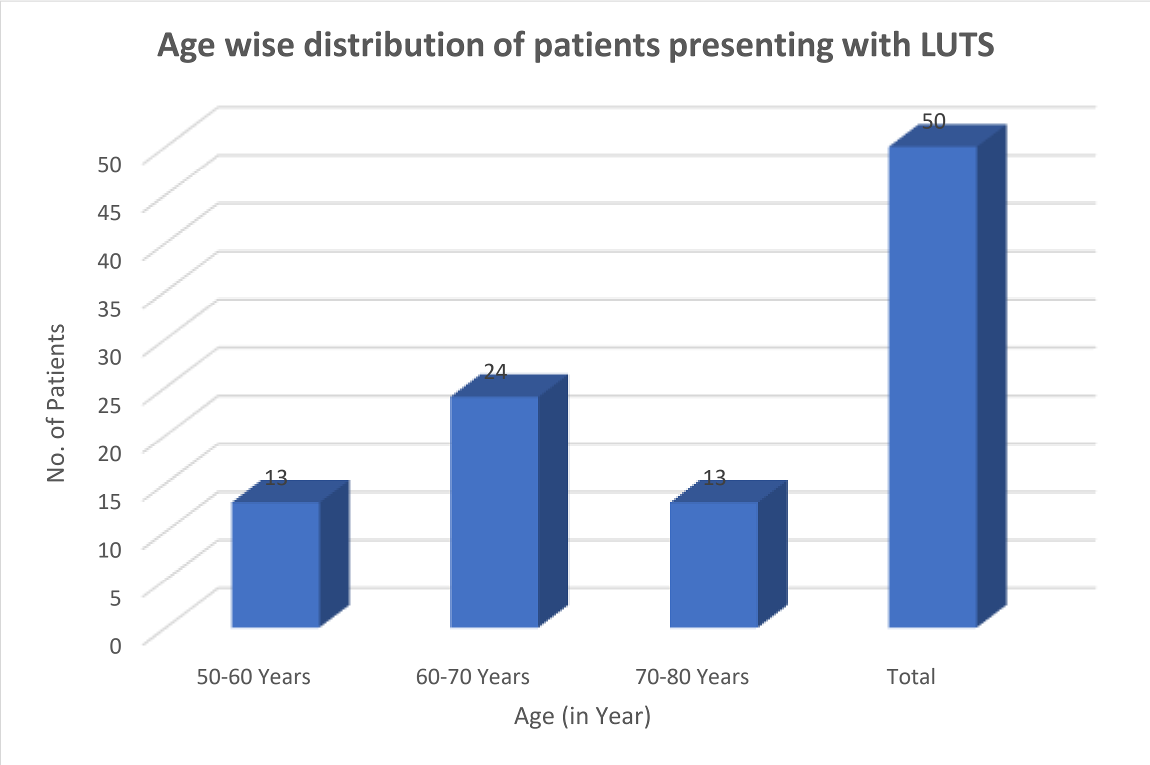


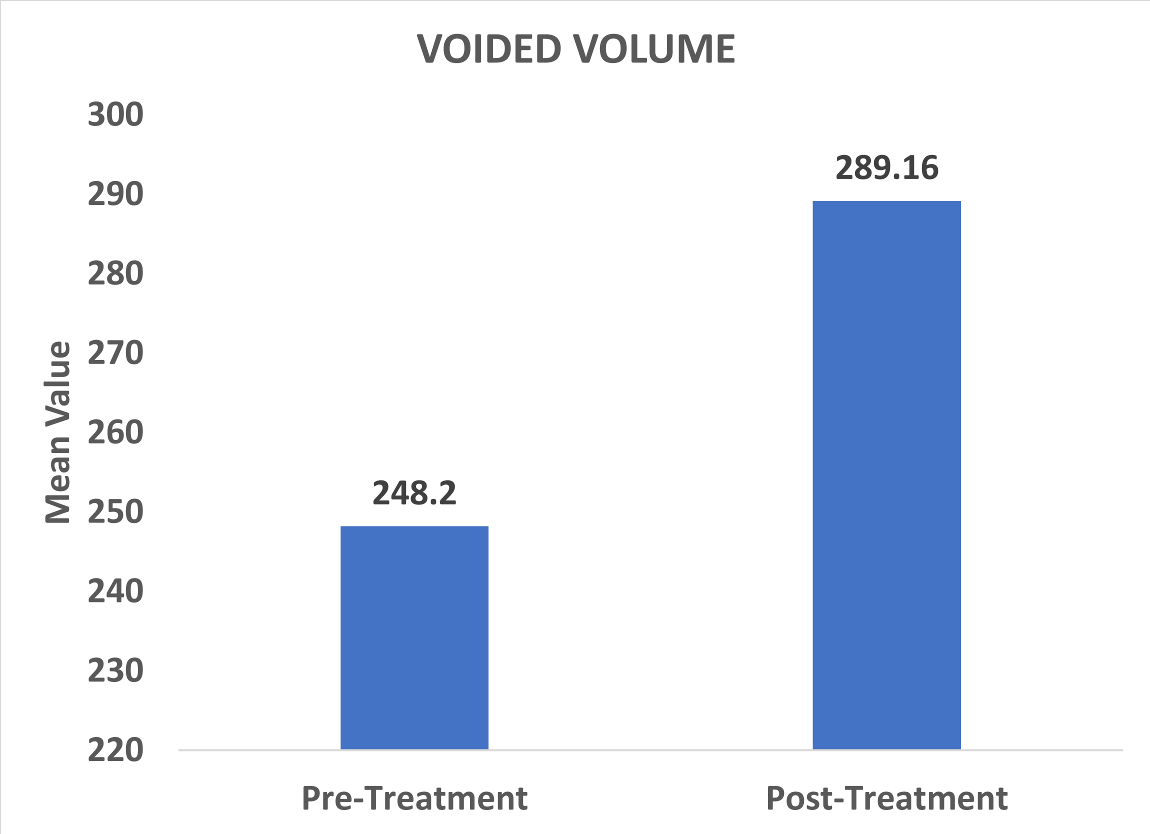
Maximum patients were in the age group 60-70 years (48%).

Increased frequency of micturition was the main complaint in 48 patients (n=50). 2 patients had history of nocturia, 3 patients presented with history of urgency and 1 patient complained of incontinence. History of hesitancy was present in 13 patients. 32 complained of passage of poor urinary stream. Intermittency was observed in 8 patients. There was history of straining in 41 patients. 21 patients had history of dysuria. 2 patients complained of terminal dribble and 14 patients had feeling of incomplete emptying of bladder.

Comparison between pre-treatment/surgery voided volume and post-treatment / surgery voided volume (Paired Sample Statistics)

Voided Volume	N	Mean	Standard Deviation	Standard Error Mean
Pre-Treatment / Surgery	50	248.20	68.324	9.662
Post-Treatment / Surgery	50	289.16	148.365	20.982

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 09, 2023



The mean pre-treatment/surgery voided volume was 248.2 ± 68.32 ml which was lower than the mean post-treatment/surgery voided volume which was 289.16 ± 148.37 ml. There was a significantly very high strong positive correlation between the pre-treatment and post-treatment voided volume. (r-value = 0.852, $P < 0.0001$).

The mean pre-treatment/surgery maximum flow rate was 9.8020 ± 7.29 ml/s which was lower than the mean post-treatment/surgery maximum flow rate 16.39 ± 4.38 ml/s. There was a significantly very high strong positive correlation between the pre-treatment and post-treatment Maximum Flow Rate. (r-value = 0.776, $P<0.0001$).

The mean pre-treatment surgery average flow rate was 7.83 ± 4.91 ml/s which was lower than the mean post-treatment/surgery average flow rate 8.96 ± 3.12 ml/s. There was a significantly strong low positive correlation between the pre-treatment and post-treatment for average flow rate. (r-value = 0.42, $P = 0.002$).

The mean pre-treatment/surgery flow time was 44.18 ± 19.67 seconds which was higher than the mean of post-treatment/surgery flow time 33.50 ± 10.34 seconds. There was statistically significant difference of mean between pre-treatment and post-treatment Flow Time (t-value = 4.751, $P < 0.0001$).

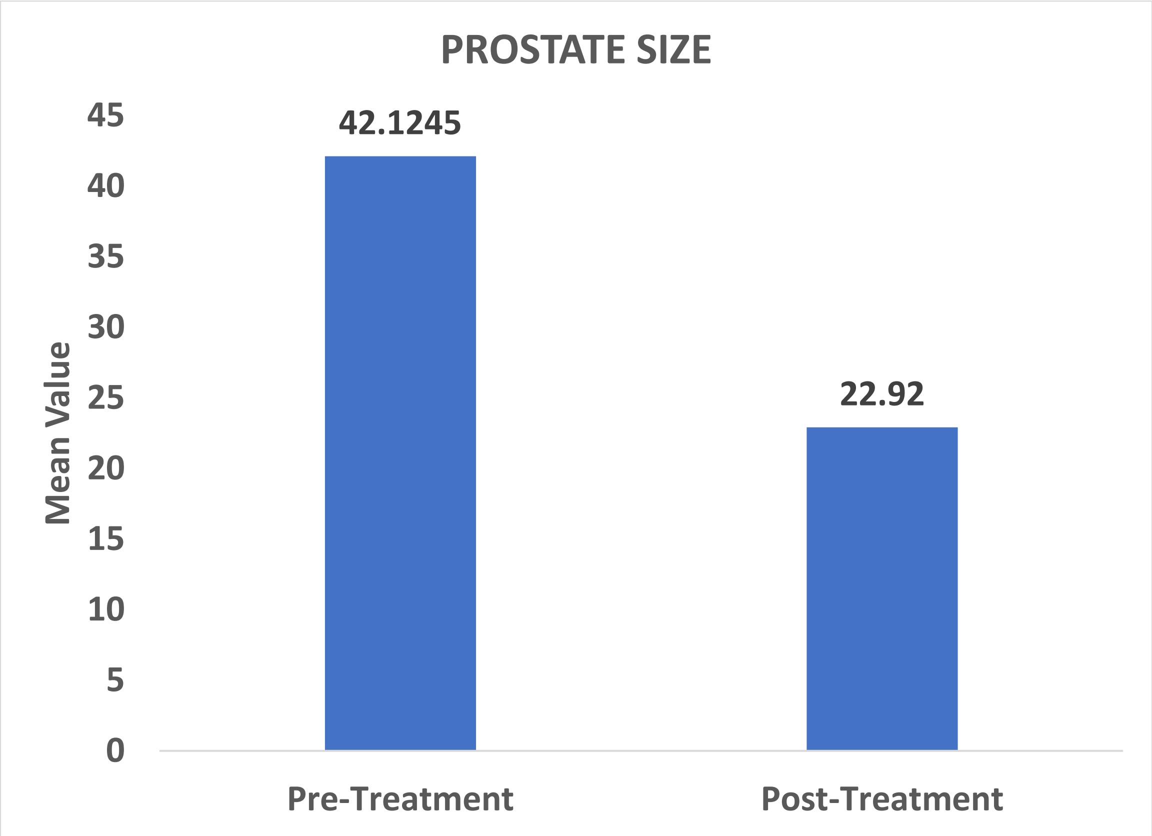
The mean pre-treatment/surgery time to maximum flow was 10.84 ± 11.99 seconds was higher than the mean post-treatment/surgery time to maximum flow 9.04 ± 2.12 seconds. There was no statistically significant difference of mean between pre-treatment and post-treatment Time to maximum flow (t-value = 1.187, $P = 0.241$).

The mean of pre-treatment / surgery for voiding time 46.28 ± 21.16 seconds was higher than the mean of pre-treatment / surgery for voiding time 34.25 ± 10.13 seconds. There was a significantly low positive correlation between the pre-treatment and post-treatment voiding time (r-value = 0.425, $P=0.002$).

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 09, 2023

Comparison between pre-treatment / surgery Prostate size and post-treatment / surgery Prostate size (Paired Sample Statistics)

Prostate Size	N	Mean	Standard Deviation	Standard Error Mean
Pre-Treatment / Surgery	50	42.1245	11.81014	1.68716
Post-Treatment / Surgery	50	22.92	16.506	2.358



The mean pre-treatment/surgery prostate size was 42.12 ± 11.81 grams which was higher than the mean post-treatment/surgery prostate size 22.92 ± 16.51 grams. There was a significantly very high negative correlation between the pre-treatment and post-treatment for prostate size (r-value = -0.767, P<0.0001).

The mean pre-treatment/surgery Total bladder capacity was 210.31 ± 96.55 ml which was lower than the mean post-treatment/surgeryTotal bladder capacity of 212.29 ± 59.65 ml. There was a significantly high positive correlation between the pre-treatment and post-treatment Total bladder capacity (r-value = 0.624, P<0.0001).

The mean pre-treatment/surgery PVR was 61.30 ± 28.50 ml which was higher than the mean post-treatment/surgery PVR of 34.90 ± 10.99)ml.

37 patients i.e. 74% were put on medical treatment and 13 patients i.e. 26% were taken up for surgery.

There was no statistically significant association between age, symptoms and hypertension (P = 0.077).

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 09, 2023

There was no statistically significant association between age, symptoms and diabetes (P = 0.594).

Discussion

In our study, the majority (48%) patients belonged to the 60 – 70 years age group. The mean age in our study was 63.6 years. Similar mean age has been reported by authors in their study of 185 patients with LUTS[5].

Frequency was the major storage symptom of presentation which was present in majority of patients..The prevalence of LUTS has been reported to be around 3.5% at the age of 40s and increased to more than 30% for men older than 85 years by other authors[6].

Uroflowmetry is the simplest non-invasive screening tool to serve as an indicator of possible abnormal voiding especially when combined with PVR. Decreased uroflow is not specific and could be secondary to BOO(Bladder outlet obstruction), impaired contractility, or both[7].

The AUA/SUFU (The American Urologic Association and the Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction) guidelines on urodynamics have recommended uroflow to be used in the initial evaluationand ongoing follow-up in male patients with LUTS suggestive of abnormal voiding[8].

The EAU(European Association Of Urology) guideline also recommends uroflow as a part of the initial assessment of male patients with LUTS[9].

In our study pre-treatment / pre-surgery mean Maximum Flow Rate (Qmax) was 9.08 ml/ sec and post treatment/ post-surgery mean Maximum Flow Rate was 16.39 ml/sec with a p value of <0.0001. In other studies conducted, Ninety percent of male patients with LUTS will have BOO(Bladder Outlet obstruction) when maximum flow rate (Qmax) <10 ml/s and about 71 % with Qmax 10–15 ml/s will have BOO[10].

Other studies estimated that 13 to 53 % with Qmax>10 ml/s showed obstruction on PFUDS (Pressure flow Urodynamic studies) studies[11].

Other studies havefound the sensitivity and specificity of 82 and 38 % for BOO(Bladder outlet obstruction) when Qmax was <15 ml/s[11].

However, it should be noted that about 25% of men with flow rate <10ml/s at Qmax is not from obstruction; however, multiple studies have showed that specificity wentup to 90 % of BOO when Qmax was <10 ml/s in multiple flows. Therefore, International Consultation on Urologic Disease (ICUD) on male lower urinary tract dysfunction has recommended multiple measurements with a Qmax<10 ml/s to have a reliable diagnosis of BOO[1].

In our study, the mean pre-treatment/surgery voided volume was 248.2 ± 68.32ml. There was a significantly very high strong positive correlation between the pre-treatment and post-treatment voided volume. (r-value = 0.852, P < 0.0001). The mean pre-treatment/surgery maximum flow rate was 9.8020 ± 7.29 ml/s. There was a significantly very high strong positive correlation between the pre-treatment and post-treatment Maximum Flow Rate. (r-value = 0.776, P<0.0001). The mean pre-treatment surgery average flow rate was 7.83 ± 4.91 ml/s. There was a significantly strong low positive correlation between the pre-treatment and post-treatment for average flow rate. (r value = 0.42, P = 0.002). The mean pre-treatment/surgery flow time was 44.18 ± 19.67 seconds. There was statistically significant difference of mean between pre-treatment and post-treatment Flow Time (t-value = 4.751, P < 0.0001).. The mean of pre-treatment / surgery for voiding time was 46.28 ± 21.16 seconds. There was a significantly low positive correlation between the pre-treatment and post-

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treatment voiding time (r-value = 0.425, P=0.002). The mean pre-treatment/surgery prostate size was 42.12 ± 11.81 grams. There was a significantly very high negative correlation between the pre-treatment and post-treatment for prostate size (r-value = -0.767, P<0.0001).

Other authors in similar studies have found that mean voided volume before TURP was 186.02±71.47 mL, with a mean maximum flow rate of 10.44 ± 2.83 mL/s, mean average flow rate of 4.37 ± 1.03 mL/s and mean voiding time was 63.42±24.25 sec. After transuretheral resection of prostate, mean voided volume was 194.56 ±75.69 mL, mean maximum flow rate was 21.39 ± 3.39 mL/s, mean average flow rate was 13.65 ± 2.22 mL/s and mean voiding time was 20.68±8.5 sec. It was found that post TURP, all uroflowmetry parameters showed improvement in both obstructive and irritative symptoms assessed by UFM (Uroflowmetry) and correlated with IPSS(International Prostate Symptom Score)[12].

Similar findings have been reported by many authors with Mean voided volume before prostatectomy was 46.1 ± 10.5 mL with a mean maximum flow rate of 2.5 ± 5.3 mL/s and mean average flow rate of 0.8 ± 1.7 mL/s. After suprapubic prostatectomy mean voided volume was 229.9 ± 43.4 mL, mean maximumflow rate was 24.0 ± 8.5 mL/s and mean average flow rate was 8.2 ± 3.5 mL/s[10].

Similar uroflowmetric parameters and improvement post TURP have been reported by authors who showed a preoperatively voided volume of 165.54 ± 49.60 ml, mean maximum flow rate of 7.60 ± 2.41 ml/sec and average flow rate of 4.44 ± 1.28 ml/sec. The three month follow up uroflowmetry values post TURP were voided volume of 240.32 ± 49.91 ml, mean maximum flow rate of 27.24 ± 5.11 ml/second the average flow rate was 13.48 ± 2.08 ml/sec[13].

A prospective series of 253 patients, who all received urodynamics prior to TURP were assessed by American Urological Association (AUA) symptom score before and after surgery. The study found that the degree of obstruction on urodynamics correlated with improvement in symptom score and in those patients, who were not obstructed, there was no improvement after surgery[14].

A small retrospective study of 45 patients found minimal improvement in IPSS(International Prostate Symptom Score) and flow rate in patients who had no obstruction or mild obstruction on urodynamics[15].

Conclusion

It is evident from this study that there was a significant improvement in post-treatment/postoperative uroflowmetry parameters. There was an evident improvement in the maximum flow rate, average flow rate in all post-treatment/postoperative follow up. Thus, uroflowmetry can aid in diagnosticevaluation and deciding treatment. It is a non-invasive investigation. It can also delineate which patients are going to be benefitted from surgery as well as objective assessment of treatment outcome.

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ISSN: 0975-3583,0976-2833 VOL14, ISSUE 09, 2023

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