

COMPARISON OF OUTCOME OF TRANSURETHRAL RESECTION OF PROSTATE BETWEEN PATIENTS WITH PREOPERATIVE LOW OR NORMAL AND HIGH VOIDING PRESSURE

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Abstract:

Objective: To compare the outcome of Transurethral Resection of Prostate between Patients with Preoperative Low or Normal and High Voiding Pressure.

Methods: This hospital based prospective observational study was conducted in the Department of Urology of Dhaka Medical college Hospital from July 2008 to June 2010 on male patients aging >59 years having Lower urinary tract symptoms (LUTS) attending to urology OPD & IPD were evaluated by history, physical examination including DRE and necessary investigations like USG of KUB and prostate with MCC & PVR, Q max, IPSS score to identify the potential candidates for TURP. Potential participants were counseled for urodynamic study. Who fulfilled the selection criteria included in this study in outpatient basis or admitted in the urology ward and numbered chronologically and performed urodynamic study and then patients underwent TURP, after 12 weeks of completion of TURP again a follow-up urodynamic study performed in all patients to compare the outcome between two groups.

Sample size was 65, high pressure voiding group were 36 in number and Normal or low pressure voiding group were 29 in number.

Data were collected on variables of interest using a structural data collection format. Data were processed and analyzed using SPSS (Statistical package for social science) software program. The test of significant employed to analyze the data was descriptive statistics and Student's t-test, Paired and unpaired t-test, Fisher exact test. Probability value (P value < 0.05) was considered significant.

Results: In this study the age ranges were 59 and 88 years and mean age was 70.7 ± 6.7 years. the maximum urinary flow rate, residual urine volume and maximum intravesical pressure 3 months after transurethral prostatic resection were significantly better in patients with high detrusor pressure compared to those with normal/low normal/low detrusor pressure (15.9 ± 0.7 vs. 21.3 ± 2.2 ml/sec, $p < 0.001$, 18.1 ± 11.8 vs. 2.9 ± 0.7 ml, $p < 0.001$ and 48.3 ± 6.2 vs. 71.9 ± 15.2 cmH₂O, $p < 0.001$ respectively). The maximum urinary flow rate (Q max), residual urine volume, maximum intravesical pressure and detrusor pressure at peak urinary flow rate and also IPSS score were significantly improved 3 months after operation in both groups, more improvement was observed in preoperative high voiding pressure group. Post-voiding residual urine is a clear indication of poor outcome, and also the maximum urinary flow rate, maximum intravesical pressure and detrusor pressure at peak urinary flow rate all factors may precipitate decompensation of bladder and in low voiding pressure group decompensation of bladder occurs more

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than the high voiding pressure group as the preoperative and postoperative residual urine develops more in low voiding pressure group.

Conclusion: The high voiding pressures (detrusor pressure) may influence in good postoperative outcome and helps in resolution of a significant outflow obstruction, there are good urodynamic reasons for avoiding unwanted TURP rather it could be justified by using urodynamic study which may predict outcome of TURP. So, we may assess properly the patient for prostatectomy by urodynamic study. As if we do this type of evaluation before TURP it may reduce the unwanted operation.

Key words: Urodynamic study, Prostatectomy, voiding pressure.

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Introduction:

Benign prostatic hyperplasia (BPH) is the most common urinary disorder in elderly men. The symptoms of BPH are caused by a complex interaction between the prostate and bladder[1] which gives rise to both filling and voiding symptoms. As the prostate enlarges, urethral resistance may increase and consequently the bladder generates pressure to increase flow. An impaired bladder function may also present with symptoms similar to BEP[2]. Symptomatic BPH represents a combination of voiding and storage symptoms; IPSS cannot reliably predict treatment outcome, uroflowmetry and PVR measurement cannot quantify bladder storage. Filling cystometry objectively can quantify the storage function of lower tract and PFS (pressure flow study) demonstrates and quantify BOO (bladder outlet obstruction). Full Urodynamic study is necessary when Symptomatic BPH co-exist with significant storage symptoms, voiding symptoms, incontinence, neurological diseases like parkinson's disease, cerebro-vascular disease (CVD), spinal dysrhythmism, repeated episodes of urinary retention or long time indwelling catheter and other forms of LUTS.

Formerly, the examiner simply observed the act of voiding, noting the strength of the urinary stream, and drawing inferences about the possibility of obstruction of the bladder outlet. In the 1950s, it became possible to observe the lower urinary tract by fluoroscopy during the act of voiding; and in the 1960s, the principles of hydrodynamics were applied to lower urinary tract physiology. The field of urodynamics now has clinical applications in evaluating voiding problems resulting from lower urinary tract disease.

We conducted a prospective trial using urodynamic study (UDS) to determine outcome predictors.

Materials and Methods

This prospective observational study has been carried out in the Department of Urology of Dhaka Medical College and Hospital, over two years from July 2008 to June 2010. Elderly male patients having lower urinary tract symptoms (LUTS), who were attended in the OPD & IPD, were included in the study. Calculated sample size was 65 and purposive sampling method was used. Elderly male patients ≥ 59 years having lower urinary tract symptoms with enlarged prostate on digital rectal examination and confirmed by ultrasonogram showing enlarged prostate with significant post-voidal residue with IPSS score is >20 and $Q_{max} < 10$ ml/sec were included. Patients with benign prostatic hyperplasia with retention of urine, carcinoma prostate (Histopathologically proved carcinoma), patients undergone previous prostatic surgery, patient having radiation in pelvis or perineum and patients who refuses to give the informed consent were excluded.

The study subjects were evaluated first by detail history, physical examinations including DRE and by urinalysis, urine culture and sensitivity, ultrasonography of KUB and prostate volume with MCC & PVR, Q_{max} , Serum PSA and urodynamic study. Then cases of Benign prostatic hyperplasia who fulfilled the selection criteria included in this study and numbered chronologically and divided into two groups on the basis of bladder detrusor pressure namely, preoperative low or normal voiding pressure and high voiding pressure. All patients undergone transurethral resection of prostate. The independent variables were low or normal voiding pressure and High voiding pressure and the dependent variables were Incomplete emptying, Frequency, Intermittency, Urgency, Weak or poor urinary stream, Straining on voiding, Nocturia, Maximum urinary flow rate (Q_{max}), Residual urine volume.

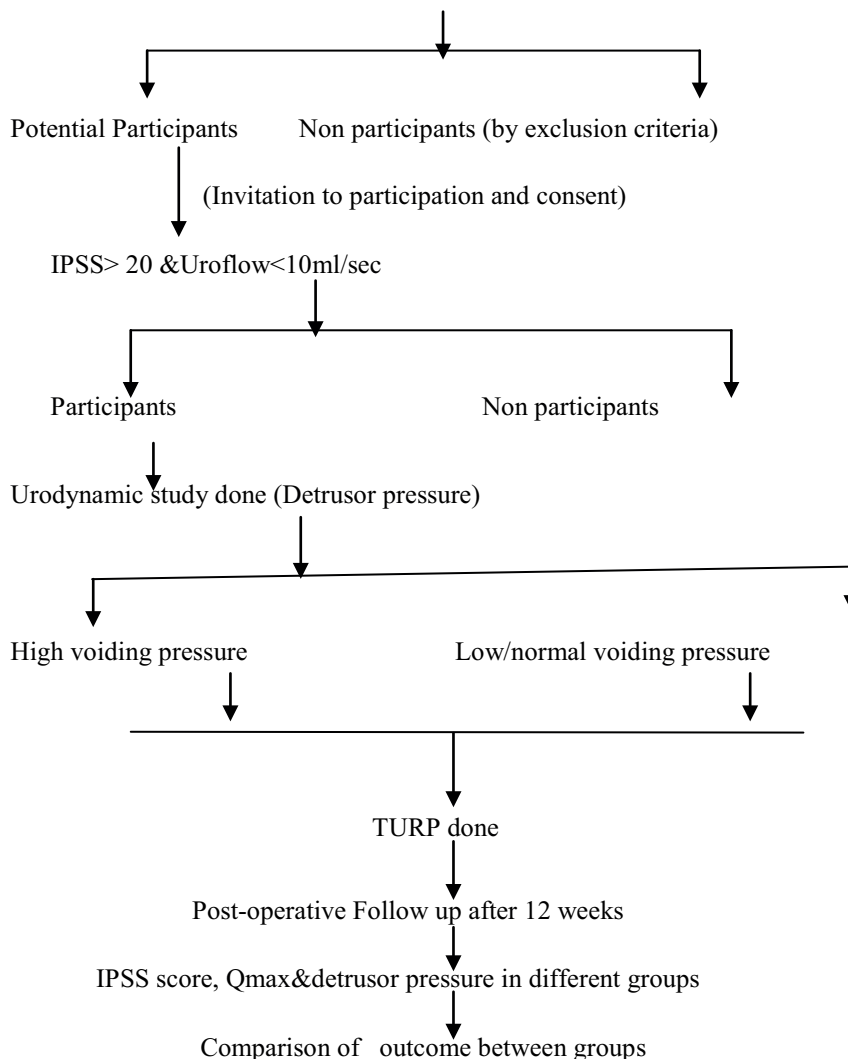
In history, age of the patients, History of cerebrovascular disease, Parkinson's disease and diabetes mellitus were also taken. Focused neurological assessments were done. History of overall general health including hypertension, Bronchial asthma was also taken. Drug history with special attention to anticholinergic and antihistaminergic and antiplatelet medication like aspirin, clopidogrel and warferin were also noted. Normal voiding pressure is 40-60 cm of water, above and below this denoted as high and low voiding pressure respectively. Overall general examinations as well as examination of genito-urinary system, locomotors system and nervous system were done. DRE was done to see the size, consistency and

nodularity of prostate as well as anal tone. Investigations like USG of KUB, MCC, PVR, Uroflowmetry, IPSS was done. Complete Blood Count and blood sugar was also done to exclude infection and diabetes mellitus.

Data were analyzed by using the computer software SPSS (Statistical Package for Social Science, version 18) program for windows. The test statistic used was Student's t-test & Fisher exact test for quantitative and qualitative variables respectively, and p value <0.05 was considered as significant. Protocol of this study was accepted by the Ethical Review committee of DMCH.

Study design:

Selection of study population by History Physical exam & Baseline Investigations (USG of KUB, MCC, PVR, Uroflowmetry, IPSS)



Results:

A total of 65 patients were enrolled in the study. Majority of the patients in both normal and high voiding pressure groups before operation had irritative and obstructive symptom scores >3. In all patients total IPSS was more than 20. And the maximum urinary flow rate and intravesical pressure at baseline were significantly lower in patients with normal/low voiding than those in patients with high voiding pressure (6.8±1.6 vs. 9.8±1.5 ml/sec, p<0.001 and 50.5±8.4 vs. 105.1±17.6, p<0.001 respectively), while residual urine volume was significantly higher in the former group than that in the later group (135.8±34.9 vs. 70.9±28.4 ml, p<0.001). The maximum detrusor pressure at peak urinary flow was also significantly less in the former group than that in the latter group (44.2±5.9 vs. 67.1±11.8 cm of water, p<0.001) (Table II). The mean peak urinary flow rate in patients of low/normal voiders changed from 6.8 ml/sec to 15.9 ml/sec 3 months after operation, while mean voided urine volume reduced from 320.9 ml to 307.9 ml during the same period (p < 0.001 and p = 0.039 respectively). The residual urine volume also drastically decreased from 135.8 ml at baseline to 18.1 ml 3 months after operation (p < 0.001). The intravesical pressure and detrusor pressure at peak urinary flow rate (WFQ_{max}) however, did experience any significant change over same period of time (p = 0.613) (Table

III). And the peak urinary flow rate in patients of high voiding pressure significantly increased from 9.8 ml/sec at baseline to 21.1 ml/sec 3 months after operation. (p<0.001). The voided urine volume, residual urine volume, intravesical pressure and detrusor pressure at peak urinary flow rate (WFQ_{max}) all decreased significantly from their baseline status (p<0.002, p<0.001, p<0.001 and p<0.001) (Table III).

Table I
Distribution of patients by age (n = 65)

Age (years)	Detrusor pressure		p-value [#]
	Normal / Low (n = 29)	High (n = 36)	
<65	4(13.8)	8(22.2)	
65 – 70	2(6.9)	15(41.7)	
70 – 75	9(31.0)	9(25.0)	
75 – 80	7(24.1)	3(8.3)	
≤80	7(24.1)	1(2.8)	
Mean ± SD	73.8 ± 7.4	68.3 ± 4.9	0.001

Figures in the parentheses denote corresponding percentage

Student's t Test and were presented as mean ± SD.

Table II

Pretreatment irritative and obstructive symptoms of the patients and Preoperative uroflometry between normal/low and high voiding pressure group-

Pretreatment symptoms score	Detrusure pressure		p-value
	Normal / Low (n = 29)	High(n = 36)	
Irritative symptoms ^{#d} >3	2(6.8)27(93.2)	3(8.3)33(91.7)	0.603
Obstructive symptoms ^{#d} >3	3(10.3)26(89.7)	3(8.3)33(91.7)	0.555
Preoperative uroflowmetry ^{###}			
Maximum urinary flow rate (ml/sec)	6.8 ± 1.6	9.8 ± 1.5	< 0.001
Voided urine volume (ml)	320.9 ± 45.9	322.3 ± 28.6	0.886
Residual urine volume (ml)	135.8 ± 34.9	70.9 ± 28.4	< 0.001
Maximum intravesical pressure (cmH ₂ O)	50.5 ± 8.4	105.1 ± 17.6	< 0.001
Pdet at Qmax	44.2 ± 5.9	67.1 ± 11.8	< 0.001

Figures in the parentheses denote corresponding percentage.

Fisher's Exact Test and ### Student's t Test was done and were presented as mean ± SD

Twenty eight (96.6%) of patients had low irritative symptom scores in normal/low detrusor pressure group after operation compared to all of the patients in high detrusor pressure group (p=0.446). No significant difference was observed between low voiding and high voiding groups in terms of postoperative irritative and obstructive symptoms score as well (p=0.397) (Table VI). In low voiding pressure group the 4 patients who had irritative and obstructive symptom more than 3 (total IPSS was about 7) but in high voiding pressure group the 2 patients who had irritative and obstructive symptom more than 3 (total IPSS was about to nil). And the maximum urinary flow rate, residual urine volume and maximum intravesical pressure 3 months after transurethral prostatic resection were significantly

better in patients with high detrusor pressure compared to those with normal/low normal/low detrusor pressure (15.9±0.7 vs. 21.3±2.2ml/sec, p<0.001, 18.1±11.8 vs. 2.9±0.7 ml, p<0.001 and 48.3±6.2 vs. 71.9±15.2 cmH₂O, p<0.001 respectively). There was no significant improvement in voided urine volume after intervention (305.3±13.5 vs. 309.9 ±17.3 ml, p=0.233) (Table IV).

According to symptoms severity score all the patients in both low and high voiding pressure groups before operation had IPSS score 20 – 35 (severe obstruction) which changed to 0 – 7 (mild obstruction) following operation in low or normal voiding group but in high voiding group post operative IPSS was nearly 'o' or nil (Table V &VI).

Table III
Changes in uroflometry after intervention in patients with low/normal voiding pressure and Changes in uroflometry after intervention in patients with high voiding pressure:

Voiding pressure groups	Before Intervention	After Intervention	p-value
Low /normal voiding pressure group#			
Maximum urinary flow rate (ml/sec)	6.8 ± 1.6	15.9 ± 0.7	<0.001
Voided urine volume (ml)	320.9 ± 45.9	307.9 ± 15.7	0.039
Residual urine volume (ml)	135.8 ± 34.9	18.1 ± 11.8	< 0.001
Maximum intravesical pressure	50.5 ± 8.4	48.3 ± 6.2	0.071
WFO _{max}	44.7 ± 7.4	44.2 ± 5.9	0.613
High voiding pressure group:#			
Maximum urinary flow rate (ml/sec)	9.8 ± 1.5	21.1 ± 1.3	<0.001
Voided urine volume (ml)	322.3 ± 28.6	309.9 ± 17.2	0.002
Residual urine volume (ml)	70.9 ± 28.4	2.9 ± 0.7	< 0.001
Maximum intravesical pressure	105.1 ± 17.6	71.9 ± 15.2	< 0.001
Pdet at Qmax	97.1 ± 14.9	67.1 ± 11.8	< 0.001

Paired t-Test was employed to analyze the data and presented as mean ± SD.

Table IV
Comparison of postoperative symptoms between groups and Postoperative uroflometry between normal/low and high voiding pressure:

Postoperative symptom	Detrusor pressure		p-value
	Normal/low(n = 29)	High(n = 36)	
Irritative symptoms# ^d >3	28(96.6)1(3.4)	36(100.0)0	0.446
Obstructive symptoms# ^d >3	26(89.7)3(10.3)	34(94.4)2(5.6)	0.397
Maximum urinary flow rate (ml/sec)*	15.9 ± 0.7	21.3 ± 2.2	<0.001
Voided urine volume (ml)*	305.3 ± 13.5	309.9 ± 17.3	0.233
Residual urine volume (ml)*	18.1 ± 11.8	2.9 ± 0.7	<0.001
Maximum intravesical pressure (cmH ₂ O)*	48.3 ± 6.2	71.9 ± 15.2	<0.001

Figures in the parentheses denote corresponding percentage.

Fisher Exact Test was employed to analyze the data.

* Student's t Test was employed to analyse the data and presented as Mean ± SD.

Note: As each irritative and obstructive symptom score is 0-5 and if the individual symptom like frequency, urgency, nocturia, intermittency, poor stream, straining, incomplete evacuation happens in half of the time in last one month than it scored as 3, so here we take 3 as a cut off value.

Table V*Comparison of pretreatment and post treatment IPSS of BPH in patients with normal/low voiding pressure (n = 29)*

	Frequency	Percentage
Pretreatment symptom severity by IPSS Severe (20 – 35)	29	100.0
Posttreatment symptom of severity by IPSS Mild (0 or nil – 7)	29	100.0

Table VI*Comparison of pretreatment and post treatment IPSS of BPH in patients with high voiding pressure (n = 36)*

	Frequency	Percentage
Pretreatment symptom severity by IPSS Severe (20 – 35)	36	100.0
Posttreatment symptom of severity by IPSS Mild (0 or nil)	36	100.0

Discussion

The present study has been designed to compare the outcome of Transurethral Resection of prostate between patients with preoperative low or normal voiding pressures and high voiding pressures. In this study age ranges were 59 and 88 years. The mean age was 70.7 ± 6.7 years.

In Department of Urology, Freeman Hospital, Newcastle[3], performed a prospective non-randomized study with follow up at a mean of 11 months after operation on 217 man undergoing prostatectomy with mean age of patients 69 years (ranged from 48-97). The mean age of the present study is nearly similar to other studies.

In a study[4] shows that the 217 men followed up, 171 (79%) had a satisfactory subjective review and 155 (72%) had a satisfactory review and also low symptom scores. An unsatisfactory outcome was associated with preoperative symptoms of urge incontinence, low voiding pressures, and low urethral resistance. They showed that detrusor pressure <80, 80-100, & > 100 cmH₂O groups, total 83 patient improves more in postoperative variables in them 31 patients was detrusor pressure <80 and 14 patients was detrusor pressure 80-100 and 34 patients was detrusor pressure 80-100 cmH₂O. The main hypothesis was that men with low or normal voiding pressure before operation would not do as well after operation as those with high voiding pressures. Expressed simply, their symptoms might have been caused mainly by poor detrusor contraction rather than outflow obstruction

In this study, the maximum urinary flow rate, residual urine volume, maximum intravesical pressure and

detrusor pressure at peak urinary flow rate were significantly improved; it was > 15ml/sec 3 months after operation. Although the patients did not experience any changes in voided urine volume, there is also improved bladder compliance. Significant improvement in all parameters after treatment specially in high voiding pressure group with a voiding pressures >60 cmH₂O than low voiding pressure group with voiding pressures 40-60 cmH₂O or below. Qmax was significantly improves in both group but more improved in high voiding pressure group (p<0.001) and in terms of symptoms IPSS which was significantly improves in high voiding pressure group and was very minimum, nil or nearly nil, but in low voiding pressure group there was less improvement, which also supports the study.

Study by Emberton et al[5], shows that TURP was effective both in relieving men of their symptoms (83.5% reported a substantial improvement) and reducing their symptoms (71.1% reported a substantial improvement). The rationale for the category, for example, only 51.7% of men with an AUA symptom score reduction of <10 points declared a satisfactory global outcome, compared with 57.7% of men with a symptom reduction of <10 on the AUA scale. They found that preoperative high detrusor pressure group improves more in terms of symptom score.

In this study 96.6% of patients had low irritative symptom scores in normal/low detrusor pressure group after operation compared to all (100%) of the patients in high detrusor (voiding) pressure group (p=0.446) was <3. Both patients with normal/low and high detrusor pressure group improved their postoperative obstructive and irritative symptom scores. (Normal voiding pressure is 40–60 cmH₂O). No significant

difference was observed between low/normal voiding pressure and high voiding pressure groups in terms of postoperative obstructive symptom scores as well, but 89.7% patients shows reducing obstructive symptoms in low/normal voiding pressure group and 94.4% patients shows reducing obstructive symptoms in high voiding pressure group. But in terms of symptoms score it was more improved in high voiding pressure group.

In postoperative improvement is better in high voiding pressure group than low/normal voiding pressure group. In terms of residual urine volume it also shows that, in low/normal voiding pressure group there was significant PVR rather than high voiding pressure group and post operatively there was marked improvement in high voiding pressure group than low/normal voiding pressure group which also denote that the postoperative improvement is better in high voiding pressure group than low/normal voiding pressure group.

In this study the Comparison of uroflometry, the maximum urinary flow rate, residual urine volume and maximum intravesical pressure 3 months after transurethral prostatic resection were significantly better in patients with high voiding pressure group compared to those with normal/low voiding pressure group. But there was significant improvement in urinary flow rate in both groups, but there is significant difference in between two groups; high voiding pressure group improved significantly than low or normal voiding pressure group.

In this study it shows that the irritative symptoms like frequency was also improved in postoperative period in both groups but especially the high voiding pressure group improved markedly than low/normal voiding pressure group. The high voiding pressure group had minimum or no symptoms postoperatively but in low/normal voiding pressure group had minimum postoperatively. This also shows that the postoperative improvement is better in high voiding pressure group than low/normal voiding pressure group.

Alunet al.⁶ in their study showed the efficacy of TURP with sustained long-term symptomatic and urodynamic improvement following Surgery. Uroflow data on 163 men and pressure flow data on 137 showed significant improvement in most urodynamic parameters. Symptomatically they observed significant sustained objective and subjective improvements in 217 men⁷ reported a mean preoperative Qmax of 8.5 ml per second with postoperative TURP flows of 12.5 and 16.5 ml per second at the 6-month follow up.

In this study, almost identical results with mean preoperative flows of 8.5 ± 2.1 ml per second at 3 months after TURP it was improved significantly. We have no interval data to demonstrate the significant short-term improvements that have been seen in many studies but we believe that it is not an unreasonable assumption. We performed study at our unit examining short-term follow-up (3 months) following TURP highly significant early improvements in Qmax were seen preoperatively vs. 3 months postoperatively. Masumori et al. in their study,^[8] showed that LUTS evaluated by the Madsen-Iversen symptom score which was improved after TURP remained unchanged for 7 years after TURP,⁷ also reported that symptom scores were still reduced after 8 years and the success rate, defined as a 'much better' or 'better' outcome based on the patient's overall subjective evaluation. Thus, TURP contributes to the relief of LUTS and LUTS related bother for >10 years. In this study in 3 months follow-up we observed that IPSS score also improved postoperatively in both groups, significant improvement in high voiding pressure group which also shows that the postoperative improvement is better in high voiding pressure group than low/normal voiding pressure group.

In this study in all 65 patients had significant improvement in obstructive symptoms and also in irritative symptoms. In the Pretreatment symptom of severity by IPSS score was Severe in all patients but the Post treatment symptom of severity by IPSS was mild, in this respect there is also significant improvement in IPSS score also which supports the study by others.^[4,7]

In This study it also shows that significant symptoms improvement post operatively after TURP in terms of pressure and flow but is better in high voiding pressure group than low/normal voiding pressure group.

In a study^[9], a follow up after 12 month shows, there were statistically significant gains in all three measures of the quality of life—the General Health, Mental Health, and Activity indices. Symptoms were not improved for all patients, however. Seven percent of those with severe and 5% of those with moderate symptoms before surgery reported severe levels of symptoms at the end of the first postoperative year.

In this study it also shows that significant improvement after TURP in both the groups of patients especially the high voiding group improve more than that of low or normal voiding group. As the follow up study was

shorter possible complications could not found there. Significant symptoms caused by lower urinary tract dysfunction in men are common. The symptoms not only affect the individual's health and quality of life, but also place a burden on the family, and on health and social services.

This prospective study confirms that for most men TURP provides good relief of symptoms and is associated with satisfactory improvement in urodynamic measurements. An appreciable minority of men, however, despite recording some slight improvements were left with persistent symptoms of lower urinary tract dysfunction. The second main finding was that urodynamic studies did not predict the outcome of prostatectomy, although when performed after operation they often explained why the patient had persistent symptoms.

Defining the grade of obstruction by more advanced computer models relating pressure and flow¹⁰ may lead to better prognostic functions being developed. Measuring outcome after operation is never easy because patient and surgeon are hoping for success, but the patients in our study were reviewed to obtain an independent and critical assessment of the results.

Few prospective studies have highlighted this group of men, although Jensen et al found a greater risk of a poor result when the preoperative urodynamic study suggested non-obstructed bladder outflow[7], a smaller study failed to find an effect on outcome of preoperative voiding pressures.¹¹ In men who did not do well because of symptoms of poor flow which was commensurate with their preoperative prostatic volumes.¹² Though men with small prostates undoubtedly may have severe bladder outflow obstruction,¹³ a recent study found that men with small fibrous prostates were less likely to do well after prostatectomy. Outcome is also related to voiding pressure as well, which was showed in different works.

The other main reason for a less than satisfactory outcome was that some men had persistent symptoms of frequency, urgency, and urge incontinence, and these were associated with detrusor instability before operation. This finding has been reported previously, [14, 15] though they found that most men with detrusor instability who had symptoms and a flow rate of < 15 ml/s did well after operation. In contrast with[16] they failed to find that low maximum urinary flow rates before operation were an important predictor of outcome.

In a study,[17] have confirmed that a significant proportion of men undergoing prostatectomy for bladder outflow obstruction have voiding pressures within the normal range. They confined their study to men undergoing prostatectomy for clinical indications and low flow rates. Men with neurological disease and those who had normal flow rates were excluded.

In this study the criteria for selecting patients for operation was also a flow rate of less than 15 ml/s. Postoperative PVR was very minimum or nil in high voiding pressure group rather than low voiding pressure group, in term of uroflowmetry, Qmax was more in high voiding pressure group rather than low voiding pressure group which also simulate with previous studies and clarify the hypothesis of this study.

The hypothesis was that Outcome of Transurethral Resection of prostate in patients with preoperative high voiding pressures is better than with low or normal voiding pressures. A significant deference found in terms of improvement of maximum urinary flow rate, residual urine volume, maximum intravesical pressure and detrusor pressure at peak urinary flow rate were significantly improved 3 months after operation (p-value < 0.001) & there is also in comparison between two groups high voiding pressure group were significantly improved than low or normal voiding pressure group (p-value < 0.001) .

Results of the study suggest that the outcome of transurethral resection of prostate is better in pre operative with high voiding pressure group than those with low or normal voiding pressure group.

Conclusion

In this study we observed the outcome based on symptoms and urodynamic measurements, the proportion of men whose poor urinary flow was associated with normal or low pressure voiding before operation had a less successful outcome after operation than the patients with high pressure voiding group. And also observed that the urodynamic measurements are useful in predicting the outcome of elective prostatectomy.

Limitation of The Study

Like any other scientific study, the present study is not without limitations. As the sample size was small and the study subjects were selected purposively, it is difficult to generalize the findings to the reference population. The study did not have the scope of comparing the sustainability of improvement of voiding

and other symptoms postoperatively due to shorter follow-up and a single center study.

Recommendations

To detect bladder outlet obstruction due to benign prostatic hyperplasia urodynamic study is effective tools to exclude BOO due to other means e.g. Suspected neurogenic bladder dysfunction including those with spinal disc disease, multiple sclerosis, spinal cord injury, Parkinson's disease, and with those who have undergone extensive pelvic surgery. Urologist of our country may utilize this protocol with confidence. A large study may be done to yield more effective result.

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