

URODYNAMIC PRESSURE-FLOW STUDY (PFS) FOR THE PREDICTION OF SURGICAL OUTCOME IN BPH WITH URINARY RETENTION

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Abstract:

Introduction: Urinary retention can be either chronic or acute in onset. Urinary retention can result from impaired detrusor contractility or obstruction of bladder outlet. Twenty five to 30% of men with decreased flow are not obstructed¹. Either uroflowmetry or post-void residue (PVR) can not differentiate obstruction from impaired detrusor contractility. In this study, an effort has been paid to know the usefulness of pressure-flow study in urinary retention due to suspected benign prostatic hyperplasia (BPH) cases for predicting the outcome of surgery.

Methods: This is a before after clinical study, conducted in Bangabandhu Sheikh Mujib Medical University, Dhaka. Total 32 patients were selected for the study. Patients age ranges from 49-78 years. Patients with chronic and refractory urinary retention due to BPH were enrolled for the study. They were divided into group A (pre-operative) and group B (Post-operative). TURP was done in all 32 patients by single surgeon. Study variables were detrusor pressure at maximum flow (Pdet@Qmax), bladder outlet obstruction index (BOOI), bladder contractility index (BCI) and post void residue (PVR).

Result: Total number of patients was 32. Age ranges from 49-78 years. Twenty one (65.6%) had BPH with chronic retention and 11 (34.4%) had BPH with refractory retention. Pdet@Qmax between Group A and Group B was highly significant ($p=0.001$). But difference is not significant in Pdet@Qmax > 40 subgroup of patients ($p=0.673$). Bladder outlet obstruction index between Group A and Group B is highly significantly ($p=0.001$), but, that does not observed in BOOI < 20 subgroup ($p=0.600$).

Bladder contractility index in both Normal (BCI 100-150) and strong (BCI > 150) subgroups are significant ($p=0.001$ and 0.001 respectively). But it is not significant in BCI < 100 subgroup ($p=0.021$).

Post void residue between Group A and Group B is highly significant ($p=0.001$). But in PVR > 300ml subgroup, difference is insignificant ($p=0.120$).

Conclusion: In this study, overall favorable outcome observed in all patients after TURP but Pdet@Qmax < 40 cm of water, BOOI < 20, BCI < 100 and PVR > 300 ml groups of patients are at high risk of unfavorable clinical outcome after TURP. With the help of pressure flow study (PFS) prior knowledge of these factors, it is possible to predict postoperative outcome.

Key words: Detrusor underactivity, pressure-flow study, urinary retention

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Urinary retention can be either chronic or acute in onset. Urinary retention can result from impaired detrusor contractility or obstruction of bladder outlet. Twenty five to 30% of men with decreased flow are not obstructed¹. Either uroflowmetry or post-void residue (PVR) can not differentiate obstruction from impaired detrusor contractility. In this study, an effort has been paid to know the usefulness of pressure-flow study in urinary retention due to suspected benign prostatic hyperplasia(BPH) cases for predicting the outcome of surgery.

Methods:

This is a before after clinical study, conducted in Bangabandhu Sheikh Mujib Medical University, Dhaka. Total 32 patients were selected for the study. Patients age ranges from 49-78 years. Patients with chronic and refractory urinary retention due to BPH were enrolled for the study. They were divided into group A (pre-operative) and group B (Post-operative). TURP was done in all 32 patients by single surgeon. Study variables were detrusor pressure at maximum flow (Pdet@Qmax), bladder outlet obstruction index(BOOI), bladder contractility index(BCI) and post void residue (PVR).

Result:

Total number of patients was 32. Age ranges from 49-78 years. Twenty one (65.6%) had BPH with chronic retention and 11 (34.4%) had BPH with refractory retention.

Detrusor pressure at maximum flow between Group A and Group B was highly significant (p=0.001). But difference is not significant in Pdet@Qmax d" 40 subgroup of patients (p=0.673). It indicates that when bladder outlet obstruction is the cause of reduced flow, patient's symptoms improve after TURP.

Bladder outlet obstruction index between Group A and Group B is highly significantly (p=0.001). But, that does

not observed in BOOI <20 subgroup(p=0.600). It indicates that TURP is useful in obstructed group and has no value in unobstructed group.

Bladder contractility index in both Normal (BCI 100-150) and strong (BCI >150) subgroups are significant (p=0.001 and 0.001 respectively). But it is not significant in BCI<100 sub group (p=0.021). It indicates that TURP is useful in normal and strong subgroups but has no value in weak subgroup patients.

Post void residue between Group A and Group B is highly significant (p=0.001). But in PVR >300 subgroup, difference is insignificant (p=0.120). It indicates that patients improve well after TURP when PVR is less than 300 ml. But does not improve well when PVR is more than 300 ml.

Table I
Distribution of study subjects by age group

Age	Frequency	Percentage
≤50	2	6.3
51 - 55	9	28.1
56 - 60	6	18.8
61 - 65	1	3.1
66 - 70	9	28.1
≥70	5	15.6
Total	32	100.0

Table II
Distribution of study subjects by type of retention

Type of retention	Frequency	Percentage
BPH with Chronic retention	21	65.6
BPH with Refractory retention	11	34.4
Total	32	100.0

Table III
Detrusor pressure at maximum flow of study subjects

Group	Group		P value
	Group A (Mean ± SD)	Group B (Mean ± SD)	
All patients	75.64 ± 29.66	47.09 ± 8.22	0.001
BPH with Chronic Retention	80.03 ± 32.81	46.90 ± 8.40	0.001
PVR (<300ml)	83.24 ± 34.22	47.57 ± 8.88	0.001
PVR (>300ml)	60.80 ± 12.99	42.83 ± 2.71	0.094
BPH with Refractory Retention	67.25 ± 21.33	47.45 ± 8.24	0.001
PdetQmax d" 40	31.50 ± 4.70	31.23 ± 4.04	0.673
PdetQmax > 40	80.21 ± 27.24	48.73 ± 6.62	0.001

Paired simple t test is done to measure the level of significance

Table IV
Bladder outlet obstruction index of study subjects

Group	Group		p value
	Group A Mean ± SD	Group B Mean ± SD	
All patients	60.35 ± 29.60	13.53 ± 5.55	0.001
BOOI <20	10.00 ± 1.55	8.60 ± 0.42	0.600
BOOI (20 – 40)	27.92 ± 3.30	12.60 ± 5.10	0.006
BOOI >40	70.86 ± 24.17	14.11 ± 5.73	0.001
BPH with Chronic Retention	64.70 ± 33.21	13.10 ± 5.55	0.001
PVR (<300ml)	67.56 ± 34.67	13.74 ± 5.53	0.001
PVR (>300ml)	47.53 ± 17.26	9.30 ± 1.90	0.050
BPH with Refractory Retention	52.03 ± 19.85	14.34 ± 6.06	0.001

Paired simple t test is done to measure the level of significance

Table V
Bladder contractility index of study subjects

Group	Group		p value
	Group A Mean ± SD	Group B Mean ± SD	
All patients	112.27 ± 35.57	132.15 ± 22.00	0.001
BCI >150	85.32 ± 8.55	118.07 ± 20.50	0.001
BCI (100 – 150)	125.92 ± 14.80	144.74 ± 8.54	0.001
BCI <100	176.60 ± 17.29	154.84 ± 4.81	0.021
BPH with Chronic Retention	118.79 ± 39.51	133.01 ± 22.53	0.014
BPH with Refractory Retention	99.83 ± 23.27	130.49 ± 21.92	0.001

Paired simple t test is done to measure the level of significance

Table VI
Post void residue of study subjects

Group	Group		p value
	Group A Mean ± SD	Group B Mean ± SD	
All patients	197.37 ± 154.77	59.66 ± 59.55	0.001
BPH with Chronic Retention	218.28 ± 182.36	62.72 ± 71.48	0.001
PVR (<300ml)	154.50 ± 52.23	60.40 ± 66.35	0.001
PVR (>300ml)	601.00 ± 230.36	76.67 ± 115.45	0.120
BPH with Refractory Retention	157.45 ± 71.22	53.81 ± 26.83	0.001

Paired simple t test is done to measure the level of significance

Discussion:

Benign prostatic hyperplasia (BPH) is observed in about 70% of men in the eighth decade of life. However, only 50% of men have symptoms of infravesical obstruction. It is estimated that out of these 50% men 20% to 25% seek medical counseling, including surgical treatment². A small proportion of those who undergo surgery will not improve as expected because of either inadequate diagnosis of obstruction or more importantly impaired contraction of detrusor muscle. Thus, good surgical results can only be achieved with the correct diagnosis of infravesical obstruction and status of detrusor muscle function. Urodynamic pressure-flow study has the ability to diagnose both of the aforementioned components.

The International Continence Society (2002) refers to the condition of detrusor underactivity, defined as a contraction of reduced strength and/or duration, resulting in prolonged bladder emptying and/or failure to achieve complete bladder emptying within a usual time span. This condition has also been referred to as Hypotonic Bladder, Flaccid bladder, Lazy bladder and Detrusor Hypoactivity. Detrusor underactivity is a medical diagnostic term based on urodynamic testing.

There are multiple possible causes of bladder muscle underactivity. It is sometimes a result of neurological damage, surgery, side effect of drugs and infection. In addition to these sources, the simple act of aging can result in the decline of bladder volume and elasticity.

Djavan et al stated that transurethral prostatic resection led to considerable improvement in symptoms and quality of life, especially in the obstructed group (detrusor pressure at maximum flow rate greater than 70 cm. H₂O)³. Even more evident was the fact that the group without urodynamic obstruction (detrusor pressure at maximum flow rate less than 40 cm. H₂O) showed no statistically significant postoperative difference from the preoperative urodynamic data and clinical assessment, leading to the conclusion that the operation was of no benefit in these cases.

Nitti wrote that, bladder outlet obstruction index (BOOI) is represented by the equation: $BOOI = P_{det} @ Q_{max} - 2 Q_{max}$. $BOOI > 40 =$ obstructed; $BOOI 20-40 =$ equivocal; and $BOOI < 20 =$ unobstructed¹.

Similarly, The bladder contractility index (BCI) is represented by the following formula: $BCI = P_{det} Q_{max} + 5 Q_{max}$. Using this formula, contractility can be divided into strong > 150 , normal 100-150, and weak < 100 ¹.

Both the index require urodynamic pressure-flow testing, which is somewhat invasive, in spite of that, pressure-flow analysis remains the gold standard¹.

Tomoaki et al. studied on the backgrounds of patients with weak detrusor contractility and found that patients with weak detrusor contractility had poor flow and low voided volume compared to patients with normal or strong detrusor contractility⁴.

In a study, Stephan et al. found that, 60% of all men older than 80 years did not have urodynamic obstruction despite a decreased maximum flow rate of 10 to 15 ml. per second, all patients meeting these criteria and having symptoms bothersome enough to justify surgery should undergo pressure-flow studies before surgical intervention⁵.

Conclusion

Transurethral prostatic resection led to considerable improvement in symptoms and quality of life, especially in the obstructed groups. Even more evident was the fact that the patients without urodynamic obstruction (detrusor pressure at maximum flow rate less than 40 cm. H₂O, BOOI < 20) and weak bladder contractility index (BCI < 100) showed no statistically significant postoperative difference from the preoperative urodynamic data and clinical assessment, leading to the conclusion that the operation was of no benefit in these cases. Furthermore, On the basis of this result, prior knowledge of the degree of infravesical obstruction and status of detrusor function makes it possible to predict postoperative clinical outcome.

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