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Prediction of Persistent Storage Symptoms after Transurethral Resection of Prostate in Patients with Benign Enlargement of Prostate

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Abstract

Introduction: *Benign enlargement of prostate (BEP) is one of the common problem in elderly male. Most of the patients present with lower urinary tract symptoms (LUTS) which consist of voiding symptoms and storage symptoms. Transurethral resection of prostate (TURP) is the gold standard treatment option for BEP. TURP improves both obstructive and storage symptoms in majority of cases. But sometimes storage symptoms persist after TURP. This study was done to predict the factors for persistence of storage symptoms after TURP by evaluating clinical and urodynamic variables.*

Objective: *To predict the factors for persistence of storage symptoms after transurethral resection of prostate (TURP) by evaluating clinical and urodynamic variables.*

Materials and Method: *This was a prospective analytic study done in the department of Urology, Bangabandhu Sheikh Mujib medical university (BSMMU), Shabagh, Dhaka. In this study, total 60 patients of BEP with the indication of TURP were enrolled. Preoperative data includes Age of the patient, International prostate symptoms score(IPSS), IPSS storage sub score, Q_{max}, QoL scores, Maximum cystometric capacity(MCC), Post void residue(PVR), Pdet$Q_{max,}$ Bladder contractility index (BCI) and postoperative data includes post-operative IPSS storage sub score, Q_{max} were recorded and analyzed.*

Result: *Among preoperative variables, Age (>65y) and IPSS storage sub score has highest predictive value. Bladder contractility index (BCI) and MCC have significant predictive value. Q_{max} and PVR have also predictive value.*

Conclusion: *This study result shows elderly patient of higher age group, preoperative high IPSS storage sub score, smaller MCC & high BCI have chance of persistence of storage symptoms.*

Keywords: BEP, LUTS, IPSS, IPSS storage sub-score, TURP, MCC, PVR (Post void residue), BCI (Bladder contractility index), Q_{max}.

Introduction:

Benign enlargement of prostate (BEP) is one of the most common diseases of aging male causing lower urinary tract symptoms (LUTS) consist of storage symptoms (which include urgency, urge incontinence, frequency & nocturia) and voiding symptoms (which include weak urinary stream, intermittency, dribbling, straining during micturition & sense of incomplete voiding). Among them storage symptoms are most bothersome and associated with poor quality of life[1]. Severity of

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LUTS is assessed by International prostate symptoms score (IPSS) and quality of life score (QoL). IPSS is again divided into IPSS storage sub score and IPSS voiding sub score. The incidence of LUTS is high and increases linearly with age[2].

Transurethral resection of prostate (TURP) is a gold standard operative treatment option for patient of BOO due to BEP. However a large proportion of patients complain of persistent storage symptoms following TURP[3]. Depending on the post TURP storage symptoms score patients are classified into storage symptoms positive group (score 8-15) and storage symptoms negative group (score 0-7). There have been few studies to investigate the risk factors for persistence of storage symptoms. Aim of this study is to determine clinical and urodynamic variables that may be related to persistent storage symptoms after TURP.

Materials and methods:

This prospective analytic study was done in the department of Urology, Bangabandhu Sheikh Mujib medical university (BSMMU), Shabagh, Dhaka from February 2016 to January 2017. The patients of benign enlargement of prostate (BEP) attended to urology OPD of BSMMU, who fulfilled the criteria for TURP (Clinically enlarged prostate patient with refractory retention of urine, complications like recurrent infection, diverticulum formation, back pressure changes with functional renal impairment, H/O failed medical therapy, Q_{max} less than 10 ml/sec, IPSS score more than 20 with poor quality of life) were included in this study. A total sixty (60) patients were included in this study through purposive sampling.

Patient having previous history of prostate & or urethral surgery, preoperatively known prostate cancer, urinary bladder neoplasm, UB stone, acute or chronic prostatitis and stricture urethra were excluded from the study.

All patients were evaluated by the International prostate symptom score (IPSS), quality of life (QoL) score and IPSS sub score for storage symptoms and relevant investigations including urodynamic study. Urodynamic study was done taking standard preparation with withdrawal of some drugs (those might influence voiding parameters). Prophylactic antibiotic was given to the patient two days prior to urodynamic study. Different parameters including $PdetQ_{max}$ and BCI ($BCI = PdetQ_{max} + 5 \times Q_{max}$) were generated from urodynamic study. After proper clinical and anaesthetic evaluation patients underwent TURP by different faculty of urology department of BSMMU. Patients were discharged with advised to come for follow up after 03 months.

During follow up patients were reassessed by IPSS storage sub score and were sub classified into Storage symptoms positive group and Storage symptoms negative group. Storage symptoms score less than 7(out of 15) was considered as storage symptoms negative group and storage symptoms score more than 7(out of 15) was considered as storage symptoms positive group. The demographic information, relevant history, clinical findings including DRE and investigation reports (both preoperative and post-operative) of all study subjects were recorded in the data collection sheet. Any complication during the procedure and hospital stay was also documented.

Data was compiled and statistical analysis of the results was done by using computer based statistical software, Excel free software, SPSS 12.0 etc. supplied by BSMMU. The Chi-square ($\div^2$) test, paired and unpaired t-test were done to identify the preoperative variables affecting persistence of storage symptoms. Multiple logistic regression analysis was performed to select relevant variables and "p" value <0.05 was considered significant. Receiver operative characteristic (ROC) curves were constructed for each of the predictive variables and the areas under the ROC curves (AUC) were compared.

Results:

It was observed that, among sixty (60) study patients, 18(30.0%) had persistent storage symptoms (>7) and 42(70.0%) patients had no or minimum storage symptoms (<7) after TURP. There was significant difference of age, IPSS storage sub score, quality of life score, maximum cystometric capacity (MCC), maximum flow rate of urine (Q_{max}), $PdetQ_{max}$ and bladder contractility index(BCI) in between positive and negative group. On the other hand, there was no significant difference of IPSS, post void residual urine (PVR) and prostate volume in between two groups.

The mean age was 69.1±5.3 (58-80) years in positive group and 63.5±4.0 (56-76) years in negative group. The mean age is higher in storage symptoms positive group and difference is statistically significant ($p<0.05$). The mean preoperative IPSS storage sub score was 12.0±1.4 (10-14) in storage symptoms positive group and was 10.7± 1.1 (09-12) in storage symptoms negative group which was significantly higher in positive group. The

mean post-operative IPSS storage sub score was 9.1±0.8 (08-10) in positive group and was 5.3±1.0 (04-07) in negative group. The mean postoperative IPSS storage sub score was also higher in positive group and difference was statistically significant ($p<0.05$). The mean preoperative MCC (225.4±81.8) was lower in positive group than negative group (326.8±69.5) and the difference was statistically significant ($p<0.05$). It was also observed that the mean preoperative $PdetQ_{max}$ was significantly higher in storage symptoms positive group. On the other hand, the mean preoperative BCI was 105.4±22.4 (80-162) in positive group and was 95.1±12.7 (73-125) in negative group and difference was statistically significant ($p<0.05$).

Table I: *Comparison of preoperative variables between storage symptoms positive and negative group (n=60)*

Parameters	Positive (n=42) Mean±SD	Negative (n=18) Mean±SD	P value
Age (in years)	69.1±5.3	63.5±4.0	0.001[s]
IPSS storage sub Score	10.7±1.1	7.7± 1.1	0.001[s]
QoL Score	4.1±0.4	3.6±0.6	0.002[s]
MCC	225.4±81.8	326.8±69.5	0.001[s]
Q_{max}	6.2±1.6	7.2±1.7	0.035[s]
$PdetQ_{max}$	50.4±13.8	39.8±11.1	0.002[s]
Bladder contractility Index	105.4±22.4	95.1±12.7	0.027[s]
IPSS	22.1±2.7	21.1±2.3	0.148[ns]
Post void residue	139.1±67.7	105.9±55.4	0.051[ns]
Prostate volume	57.3±15.6	54.5±9.5	0.379[ns]

TableII: *Preoperative and post-operative IPSS storage sub score of both storage symptoms positive and negative group (n=60)*

IPSS storage sub Score	Positive group (n=18) Mean ±SD	Negative group (n=42) Mean ±SD	P value
Preoperative	12.0±1.4	10.7± 1.1	[a]0.001[s]
Range	(10-14)	(9-12)	
Post-operative	9.1±0.8	5.3±1.0	[a]0.001[s]
Range	(8-10)	(4-7)	
p value preoperative vs. postoperative	[b]0.145[ns]	[b]0.001[s]	

s=significant, ns= not significant[a]p value reached from unpaired t- test[b]p value reached from paired t- test

Multiple logistic regression analysis of the preoperative variables showed, an age e"65 years had a 2.04 (95% CI 1.0 % to 24.0%) times increase in odds of having persistent storage symptoms. Preoperative IPSS storage sub Score level e"11 had 6.36 (95% CI 1.30 % to 31.27%) times increase in odds of having persistent storage symptoms. Other parameters (Q_{max}, BCI, MCC and PVR) though have high OR but they were statistically not significant ($P>0.05$). So age of the patient and preoperative IPSS storage sub score has high predictive value.

The area under the receiver operator characteristic (ROC) curve was constructed by preoperative variables for prediction of persistent storage symptoms. It was observed that, age of the patients had area under curve (AUC) 0.808, (with a cut off value of e"65 years) having sensitivity 88.9% and specificity 67.7% for prediction of persistent storage symptoms. Similarly IPSS storage sub Score had area under curve (AUC) 0.735, (with a

Table III: *Prediction of variables for persistent storage symptoms in multiple logistic regression models (n=60).*

	B	S.E.	df	P value	OR	95% C.I.for EXP(B)	
						Lower	Upper
Age	-3.135	0.869	1	0.001	2.04	0.01	0.24
Initial IPSS storage sub Score	1.850	0.812	1	0.023	6.36	1.30	31.27
Q_{max}	2.270	1.320	1	0.086	9.68	0.73	128.80
BCI	2.260	1.218	1	0.064	9.59	0.88	104.43
MCC	1.225	1.051	1	0.244	3.40	0.43	26.72
PVR	0.915	0.974	1	0.348	2.50	0.37	16.86
$PdetQ_{max}$	0.107	0.931	1	0.908	1.11	0.18	6.90
Constant	-3.793	1.736	1	0.029	0.02		

cut off value of e"11) having 83.3% sensitivity and 40.5% specificity for prediction of persistent storage symptoms. MCC had highest area under curve (AUC) 0.815, with a cut off value of e"238 ml having sensitivity 92.9% but specificity only 27.8% for prediction of persistent storage symptoms. BCI had area under curve (AUC) 0.636, with a cut off value of e"103 having 55.6% sensitivity and 61.9% specificity for prediction of persistent storage symptoms. Among others parameters Q_{max} shows positive predictive value and PVR shows negative value.

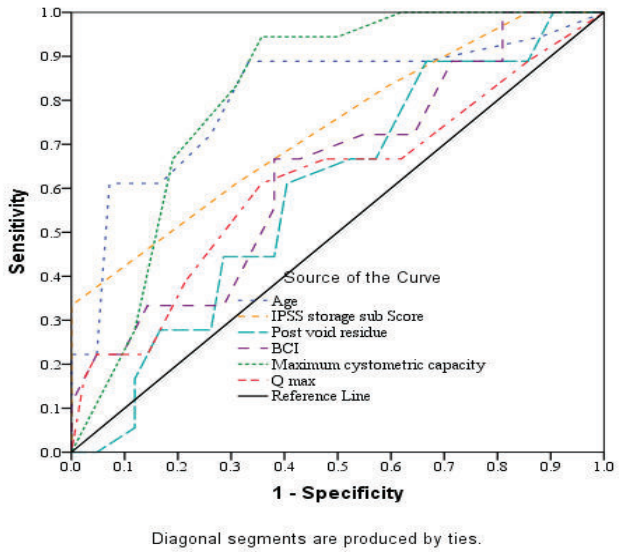

Fig.-1: *Receiver-operator characteristic curves for Prediction of persistent storage symptoms*

Discussion:

This hospital based prospective analytic study was carried out with an aim to determine the causative preoperative factors of persistence of storage symptoms after TURP. A total of 60 patients of benign enlargement of prostate with LUTS were included in the study. The present study findings were discussed and compared with previously published relevant studies.

In this present study, it was observed that nearly one third (30.0%) patients had persistent IPSS storage symptoms (positive group) and nearly two third patients (negative group) had no or minimum storage symptoms three months after TURP. Another study finding was 29 % patients had positive IPSS storage symptoms in their study[4, 5] which is closely resembled with the present study.

In this current study, it was observed that mean age was 69.1±5.3 (58-80) years in positive group and 63.5±4.0 (56-76) years in negative group. It suggests that the mean age was significantly ($p<0.05$) higher in positive group[5, 6]. The higher age and age ranged may be due to geographical variations, genetic causes, racial and ethnic differences.

In this current study, it was observed that the mean IPSS before TURP was 22.1±2.7 in positive group and 21.1±2.3 in negative group which was more or less same in two groups. The difference of mean IPSS between two groups was statistically not significant ($p>0.05$) which was similar to other study[7].

In this present series, it was observed that the mean preoperative IPSS storage sub score was 10.7±1.1 (10-14) in positive group and 7.7±1.1 (09-12) in negative group. The mean preoperative IPSS storage sub score was higher in positive group and difference was statistically significant ($p<0.05$). In similar another study, mean preoperative storage symptom score was found 12.3±3.3 in positive group and 10.5±1.7 in negative group[4, 12]. Both study had common observation that positive group had higher preoperative IPSS storage sub score. In current study 3 months after TURP, the mean IPSS storage sub score was found 9.1±0.9 (8-10) in positive group and 5.6±0.8 (4-7) in negative group. It was also observed that after TURP there was significant decrease of IPSS storage sub score in storage negative group, but no significant decrease in storage positive group.

In this current study, it was observed that the mean preoperative quality of life (QoL) score was 4.1±0.4 (3-5) in positive group and 3.6±0.6 (3-5) in negative group. The mean preoperative QoL score were significantly ($p<0.05$) higher in positive group. Another study was done among 116 patients of BEP who underwent TURP which finding was similar to this study[4, 7].

In this present study, it was observed that the mean preoperative prostate volume was 57.3±15.6 (25-75) in positive group and was 54.5±9.5 (25-68) in negative group. There was no significant difference of prostate volume between two groups[4, 8]. Jensen reported that the degree of the im-provement of symptoms is not affected by the prostate volume following surgery[9].

In this present study it was observed that the mean preoperative MCC was 225.4±81.8 (125-460) in positive group and 326.8±69.5 (245-546) in negative group. The mean preoperative MCC was lower in positive group and difference between two groups was statistically significant ($p<0.05$). Cause of smaller bladder capacity

in positive group may be due to significant increase of collagen fibers in the sub mucosa and around the neurovascular bundles caused by aging. In many previous studies it was found that small bladder capacity was associated with poor prognosis following TURP[4, 6].

In this present series it was observed that the mean preoperative post void residual urine (PVR) was 139.1±67.7 (20-250) in positive group and 105.9±55.4 (25-241) in negative group. The mean preoperative PVR is relatively higher in positive group but difference of mean PVR in two groups was statistically not significant (p value- 0.051). Other study observation was preoperative PVR influence the improvement of flow rate but not in symptoms after TURP [5, 10].

In this current study, the mean preoperative maximum flow rate (Q_{max}) of urine was 6.2±1.6 (4-9) in positive group and 7.2±1.7 (4-9) in negative group. The mean preoperative Q_{max} is lower in positive group and the difference was statistically significant ($p<0.05$). Other study observation was preoperative Q_{max} more impaired in the patients with BOO than in those without it[7, 8] which is similar to this study.

In this present study the mean PdetQ_{max} was 50.4±13.8 (30-132) in positive group and 39.8±11.1 (22-80) in negative group. The mean PdetQ_{max} was higher in positive group and different was statistically significant ($p<0.05$). Another similar study showed, the mean PdetQ_{max} was 39.9±12.2 in positive group and 48.2±13.9 in negative group[4, 11]. In this study the mean BCI was 105.4±22.4 (80-162) in positive group and 95.1±12.7 (73-125) in negative group. The mean BCI was higher in positive group and was statistically significant ($p<0.05$). However some study found that patients with obstructed and normal bladder contractility were more satisfied after TURP than those with weak bladder contractility [11, 13].

In this current study multiple logistic regressions analysis was done which showed age e"65 years had a 2.04 times increase in odds of having persistent storage symptoms. Initial IPSS storage sub score level e"11 had 6.36 times increase in odds of having persistent storage symptoms. Other parameters (Qmax, BCI, MCC and PVR) though have high OR but they were statistically not significant ($P>0.05$). Other study suggested that older age (OR=2.96), degree of worse initial storage symptom score (OR=8.32) and small FBC (OR=4.31) were consistently associated with persistence of storage symptoms[4, 11] which was similar to this study.

In this present study the receiver operator characteristic (ROC) curves for prediction of persistent storage symptoms showed, MCC had highest area under curve (AUC) 0.815, with a cut off value of e"238 ml. Age had area under curve (AUC) of 0.808 (with a cut off value of e"65 years), IPSS storage sub score had area under curve (AUC) 0.735 (with a cut off value of e"11) and BCI had area under curve (AUC) 0.636, with a cut off value of e"103 for prediction of persistent storage symptoms. Among others parameters Q_{max} shows positive predictive value and PVR shows negative value. Similar findings were found in some other study[4, 11].

In this study preoperative IPSS storage sub score, age of the patients, MCCand BCI were identified as independent predictor for an improvement of storage symptoms. Thus these predictors may be effective to reduce unnecessary discomfort of the patient as well as to save medical resources.

Conclusion:

This study was undertaken to predict the persistence of storage symptoms after TURP by evaluating clinical and urodynamic variables. This study result shows elderly patient of higher age group, preoperative high IPSS storage sub score, small MCC & high BCI have chance of causing persistence of storage symptoms in postoperative period. Study suggests that various preoperative variables with cutoff values are available for prediction of improvement of storage symptoms following TURP.

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Conflict of interest: None

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