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Outcome of Transurethral Resection of the Prostate in Benign Prostatic Hyperplasia Patients with Urinary Retention and Small Prostate Volume Based on Urodynamic Finding

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***Abstract**--The gold standard of treatment in BPH patients with urinary retention is Transurethral resection of the prostate (TURP). This study evaluated the outcome of TURP in BPH patients and urinary retention with small prostate volumes (20-40cc). The 56 patients aged more than 50 years and clinically diagnosed with BPH and urinary retention with prostate volume 20 cc-40 cc were enrolled in this study. We compared all parameters (age, prostate volume, pre-operative urodynamic study, length of urinary retention prior to TURP, post-operative Qmax and PVR) according to the IPSS following TURP. Three-months following TURP, 28 (50%) patients have mild LUTS and 28 (50%) patients have moderate LUTS. Patients with mild LUTS following TURP had higher The detrusor-pressure during Qmax (PdetQmax), The detrusor-pressure during CCmax (PdetCCmax), preoperative Qmax, Bladder Outlet Obstruction Index (BOOI), Bladder Contractiity Index (BCI) and post-operative Qmax compared to patients who experienced moderate LUTS following TURP (p 0,000; p 0,001; p 0,001; p 0,000; p 0,000 and p 0,000 respectively). Patients with moderate LUTS following TURP had longer in length of urinary retention, had higher The maximum cystometric-capacity (Ccmax), post operative PVR, compared to patients who experienced mild LUTS following TURP (p 0,001; p 0,006 and p 0,000 respectively). No significant differences in age, prostate volume, pre-operative compliance, PVR and weight of resected prostate during TURP between two groups. In almost of all patients with moderate LUTS following TURP had abnormality in bladder contraction (46% with detrusor overactivity and 54% with detrusor underactivity).*

***Key words**--Benign Prostatic Hyperplasia (BPH), outcome, small prostate volume, trans urethral resection of prostate (TURP), urodynamics.*

I. INTRODUCTION

Benign prostatic hyperplasia (BPH) may cause lower urinary tract symptoms (LUTS) or cause more complications such as urinary retention. Treatment options for BPH is watchful waiting, medical treatment, and surgical treatment (open surgery or minimally invasive therapy). Now days, minimally invasive surgery using holmium laser or thulium laser become popular for BPH surgery treatment. However, transurethral resection of the

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prostate (TURP) is still regarded as the gold standard of surgical treatment for BPH, especially for BPH patients with urinary retention .

About 15%-20% of post transurethral resection of the prostate (TURP) patients for BPH have persistent LUTS and requiring further treatment. Accuracy prediction in the postoperative results is essential if surgery is considered as the treatment of BPH. Some studies said several preoperative parameters to predict the results of surgery in BPH such as age , degree of LUTS , prostate size , transition zone index , and urodynamic abnormal findings such as bladder outlet obstruction (BOO) and detrusor overactivity. However, all of these parameters cannot be 100% accurately to predict postoperative results.

The correlation of prostate size in the pathophysiology of lower urinary tract symptoms (LUTS) and urinary retention in patients with BPH and its implication for treatment remain unclear although many studies try to correlate this. Likewise, many authors showed poor correlation between bladder outlet obstruction (BOO) and prostate volume.

Importance prostate size as a prognostic factor in patients who undergo surgery for BPH also remain unclear, many author reporting unsuccessful clinical result after surgery in men with small prostate. Aim of this study to evaluated the outcome of TURP in BPH patients and urinary retention with small prostate volumes (20-40cc) based on urodynamic findings preoperatively.

II. MATERIAL AND METHODS

From January 2010 to December 2015, the records of all men aged above 50 years old with urinary retention suggestive of BPH and a prostate volume 20-40 ml that were referred to our urodynamic center were reviewed.

Patients were referred for urodynamic evaluation by different urologists of our hospital, after an initial investigation that included a detailed clinical evaluation including a complete history and physical examination, urinalysis and measurement of the prostate volume with transrectal ultrasound. Patients with history of previous prostatic or pelvic surgery, prostate or bladder cancer, pelvic radiotherapy, neurological diseases, urethral stricture excluded from this study.

Urodynamics study examined to all patients using Medtronic Duet Urodynamic System © Urodynamic evaluation included filling phase (cystometry) and pressure-flow voiding phase. 6-Fr urodynamic catheters were inserted trans-urethrally. Sterile water (Aquades Wida©) was inserted through the catheters at a rate of 30 ml/min. The other catheter is used to calculate intra-vesical pressure. Rectal balloon catheter is used to measure intra-abdominal pressure. Detrusor pressure was calculated electronically. All operational definitions based on standardized terminology of the International Continence Society .

The urodynamic parameters analyzed were: maximum cystometric capacity (CCmax), detrusor pressure in the CCmax (Pdet ,CCmax), bladder compliance, detrusor activity, maximum flow rate during pressure-flow study (Qmax), detrusor pressure in the maximum flow rate (Pdet ,Qmax) and residual urine. Detrusor overactivity (DO) was defined as involuntary detrusor contraction during the filling phase. The detrusor contractility was assessed with the bladder contractility index (BCI) with the formula: BCI = (Pdet ,Qmax2) + 5 (Qmax2). The BCI was considered

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normal if >100. Detrusor underactivity (DU) was defined when BCI was <100[15]. BOO was assessed with the BOO index (BOOI) with the following formula: BOOI = (Pdet ,Qmax) – 2 (Qmax). Patients were characterized as obstructed when BOOI >40 and unobstructed when BOOI <20. Intermediary values were considered equivocal [9]. For this study, patients with equivocal obstruction were included in the unobstructed group.

Patients with BOO based on urodynamic study underwent TURP. Three-month following TURP, we evaluated the International Prostate Symptoms Score (IPSS), maximum-urine flow (Q max) and post void residual volume (PVR) in all patients. We compared all parameters (age, prostate volume, pre-operative urodynamic study, length of urinary retention prior to TURP, post-operative Qmax and PVR) according to the IPSS following TURP.

Numerical data were reported as mean ± SD. Categorical variables were reported as number and percentages. Student's t test was used to compare numerical variables and the X2 test or the Fisher's exact test were used for categorical variables. Data were processed using SPSS 20.0 for Windows statistical software and $p< 0.05$ considered significant.

III. RESULTS

56 patients aged more than 50 years and clinically diagnosed with BPH and urinary retention with prostate volume 20 cc-40 cc and also urodinamically proven BOO were enrolled in this study. Mean age of all patients are 67±6,70 years old with mean of prostate volume 30,64±5,01 cc, 20 (35%) patients had DU and 24 (42%) patients had DO with mean length of urinary retention is 22,14±10,65 days. The cystometric findings and the results of the pressure-flow studies pre operatively are summarized in table 1.

Table 1. Cystometric and pressure flow study in 56 BPH patients with urinary retention and small prostate volume (20-40 cc) who undergo TURP

No	Parameters	Mean ± SD
1	Age (Yrs)	67±6,70
2	Prostate volume (cc)	30,64±5,01
3	CCmax (ml)	172,64±107,85
4	PdetCCmax (cmH2O)	82,42±22,15
5	Compliance (ml/cmH2O)	39,35± 10,43
6	Detrussoroveractivity	20(35%)
7	Detrussor underactivity	24(42%)
8	Qmax (ml/s)	5,08±2,79
9	PdetQmax (cmH2O)	80,64±22,35
10	BOOI	70,48±20,01
11	BCI	104,28±26,57
12	Residual urine (ml)	127,35±59,16
13	Length of urinary retention (day)	22,14±10,65

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Three month after TURP mean of IPSS is 10,29±4,47 with mean Q max 14,64±3,20 ml/second and mean of PVR 21,5±4,34 cc. Overall post operative results had shown in table 2.

Table 2. Outcome 3 months after TURP 56 BPH patients with urinary retention and small prostate volume (20-40 cc)

No	Parameters	Mean ± SD
1	IPSS post TURP	10,29±4,47
2	Q max post op (ml/s)	14,64±3,20
3	Prostate resected (grams)	19,29±4,09
4	Residual urine post op (ml)	21,5±4,34

Three-months following TURP, 28 (50%) patients have mild LUTS and 28 (50%) patients have moderate LUTS. No patients experienced severe LUTS.

Patients with mild LUTS following TURP had higher The detrusor-pressure during Qmax (PdetQmax), The detrusor-pressure during CCmax (PdetCCmax), preoperative Qmax, Bladder Outlet Obstruction Index (BOOI), Bladder Contractiity Index (BCI) and post-operative Qmax compared to patients who experienced moderate LUTS following TURP (p 0,000; p 0,001; p 0,001; p 0,000; p 0,000 and p 0,000 respectively). Patients with moderate LUTS following TURP had longer in length of urinary retention, had higher The maximum cystometric-capacity (Ccmax), post operative PVR, compared to patients who experienced mild LUTS following TURP (p 0,001; p 0,006 and p 0,000 respectively). No significant differences in age, prostate volume, pre operative compliance, PVR and weight of resected prostate during TURP between two groups. In almost of all patient with moderate LUTS following TURP had abnormality in bladder contraction (46% with detrusor overactivity and 54% with detrusor underactivity). Table 3 shown comparison between patients who had mild LUTS and moderate LUTS following TURP

Table 3. Outcome 3 months after TURP patient 56 BPH patients with urinary retention and small prostate volume (20-40 cc) based on IPSS score

No	Parameters	Mild LUTS (28 patients)	Moderate LUTS (28 patients)	p
1	Age (Yrs)	64,85±4,53	69,14±7,83	0,064
2	Prostate volume (cc)	31,28±3,83	30±5,96	0,352
3	CCmax (ml)	136±78,87	209±121,19	0,006
4	PdetCCmax (cmH2O)	93±14,21	71,85±23,78	0,001
5	Compliance (ml/cmH2O)	41,57± 2,09	37,14± 14,39	0,596
6	Detrussoroveractivity	10 (35%)	13(46%)	0,001
7	Detrussor underactivity	0	15 (54%)	0,000
8	Qmax (ml/s)	6,18±3,31	3,98±1,55	0,001

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9	PdetQmax (cmH2O)	100±12,09	61,28±9,70	0,000
10	BOOI	87,71±11.09	53,25±8,79	0,000
11	BCI	124,42±20.21	84,14±13,72	0,000
12	Residual urine (ml)	118,85±66,9	135,85±50,03	0,113
13	Length of urinary retention (day)	12,57±2,82	31,71±5,88	0,001
14	Q max post op (ml/s)	17,43±1,2	11,86±1,84	0,000
15	Prostate resected (grams)	20±2,72	18,57±5,07	0,130
16	Residual urine post op (ml)	18±2,03	25±2,98	0,000

IV. DISCUSSION

Difficult to urination (voiding difficulty) is a problem that can lead disruption of daily activities for those who experience it. BPH is the most common cause of urinary disorders, especially in elderly men. In older man, the prevalence of BPH is increases . Today, European Association of Urology (EAU) recommends examination of LUTS degrees (through IPSS quitionary), digital rectal examination , serum creatinine , urinalysis , voiding diary and uroflowmetry to estimate the degree of the disease and the possibility of surgical treatment in patients with BPH .

Treatment options for BPH is watchful waiting, medical treatment, and surgical treatment (open surgery or minimally invasive therapy), however, minimally invasive treatment using transurethral resection of the prostate (TURP) is still regarded as the gold standard of surgical treatment for BPH. About 29% of patients with BPH undergo some type of surgery (13). About 15%-20% of post transurethral resection of the prostate (TURP) patients for BPH have persistent LUTS .

Age are one of the prognostic factors of the BPH patients had been known. But in our study no significant differences in age between groups with mild LUTS and moderate LUTS after TURP. Prostate volume increases with increasing of age. The increasing of age will lead to changes in pathology and pathophysiology of the bladder too, and could be worsening BPH symptoms. Some studies show changes in pathology and pathophysiology of bladder directly due to age, beyond the presence or absence of obstruction in the distal of the bladder. Increasing age could make the incidence of over active bladder will increase too. Some studies also indicate an increase in age would decrease bladder muscle tone. When associated with BPH, although patients had successful surgery, but change in muscle tone bladder (overactive or underactivity) because of the aging bladder still exist, LUTS will remain persistent or only slightly improved after the surgery, especially in patients with advanced age . In our study 46% patients with moderate LUTS following TURP had DU and 54% had DO preoperatively, this is significant if compared with patients who had mild LUTS following TURP. Patients with mild LUTS following TURP just had 35% DO and no one had DU preoperatively.

Study from Sumitr Anutrakulchai found that most patients who undergo TURP following BPH with persistent LUTS have DU. The second cause of the symptoms is DO. The third is the combination of DO and BOO or DU. Only 2.6% have BOO alone. Residual LUTS post TURP can be prevented if patients received conscientious pre-operative evaluation. Abram found 62% reversal of DO after TURP but Gormley et al found in only 9%.In the

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previous study by Anutrakulchai of an immediate results of detrusor response after TURP, the same result (8% reversal) was obtained. It is probable that there is a real difference in reversal rate between younger and elderly patients with prostatic obstruction. This suggests that DO in elderly is not secondary to BOO. It may becaused by brain lesion due to senile change. Kageyama et al performed pre-operative SPECT in 14 patients and reported that persistent DO after TURP was shown in 8 patients who had low cerebral blood flow in the frontal region.

Total volume of the prostate not directly correlated with the degree of obstruction in patients with BPH. If the prostate volume not too large and patients had micturition disturbance or urinary retention , maybe there are other factors must be considered, so that although it has been done successful surgery, then the symptoms will remain or only slightly improved. Study from Yun Jin Kang showed that TURP does not produce good results when performed on patients with small prostate volume, patients still had LUTS after surgery. Improvement of LUTS not only from reduced prostate volume, but also due to the destruction of the alpha 1 sympathetic receptors on the prostatic stromal during TURP. When TURP done in a small prostate, just a small number of prostate volume is reduced and the number of destructive alpha 1 sympathetic receptors during TURP also small, causing persistent LUTS after surgery, especially in storage symptoms.

In patients with BPH who underwent TURP, there are significant differences in length of urinary retention in patients with mild LUTS and moderate LUTS following TURP. The use of urinary catheters for long periods will reduce bladder capacity. Research from Kristiansen mentions that the use of the urinary catheter during the year to quickly reduce the bladder capacity from 360 ml to 220 ml and for 8 years was reduced to 150 ml , so even though it has done successful surgery, bladder capacity remain contracted (small) and LUTS will still exist , particularly for storage symptoms**.**

V. CONCLUSION

Considering that patients with urinary retention, small prostate and BOO had abnormal bladder contraction either underactivity or overactivity that affected the outcome of TURP, we emphasize the value of urodynamics and informed-consent to the patients prior to surgical procedure.

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