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The Effects of Urodynamically Proven Detrusor Underactivity on Trans Urethral Surgery Outcome in Benign Prostatic Hyperplasia: A Quasi-Experimental Trial

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ABSTRACT

Background: Difficult voiding in men can largely be found in detrusor hypo-contractility or bladder outlet obstruction (BOO); still, physicians may miss that both can happen together when only UDs are considered. Initially, there is still no common agreement regarding the urodynamic criteria for diagnosing detrusor hypo-contractility. The purpose of was to evaluate the change in Qmax after treatment with transurethral surgery for benign prostatic hyperplasia.

Methods: A quasi-experimental study was conducted over six months (from May 4 to November 4) at the Department of Urology, SIMS, using a non-probability consecutive sampling technique. A total of 78 patients with BPH underwent TURP (transurethral resection of prostate). Urodynamic assessments measured bladder function using the DUET® LOGIC G2 system, with BCI <100 as the inclusion criterion. TURP was performed under spinal anesthesia, and postoperative Qmax changes were evaluated at three months. Data were analyzed using SPSS version 22, with statistical significance set at $p \leq 0.05$. The study assessed TURP outcomes in patients with detrusor underactivity.

Results: The International Prostate Symptom Score (IPSS) was used to assess symptom severity. The mean IPSS (International Prostate Symptom Score) score before and after 3 months of procedure was 25.24 ± 1.95 and 9.91 ± 3.38, respectively ($p < 0.001$). The mean residual urine output before and 3 months of procedure was 104.21 ± 14.46 and 49.08 ± 17.57. The mean Q-max before and after 3 months of procedure was 7.08 ± 1.48 and 15.64 ± 3.52, respectively. The mean change in Q-max after 3 months was 8.56 ± 2.10.

Conclusion: The study concluded that men with an enlarged prostate and a weak detrusor muscle should consider TURP when medical treatment does not work well for them.

Keywords: Detrusor underactivity, transurethral resection of prostate, underactive bladder, Surgical Outcomes, Q-max.

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INTRODUCTION

The distinctive characteristic of benign prostatic hyperplasia (BPH) lies in the prostatic transition and periurethral zone that are excessively increased in epithelial and stromal cells. It is among the common aging related disorders affecting men which may begin after the age of 40 years[1]. BPH has been associated with sex steroids and there has emerged evidence where the urinary symptoms are associated with the metabolic syndrome[2]. Most men will have prostate cancer by the age of 85 with nearly 50 percent having it in their 6th decades of life. Nevertheless, merely 25%50 of men with BPH acquire bladder outlet obstruction (BOO)[3]. Benign prostatic hyperplasia (BPH) can significantly decrease the quality of life and the functioning of an individual. Transurethral resection of the prostate (TURP) remains the most popular procedure in case of benign prostatic hyperplasia. Numerous studies have demonstrated that both HoLEP and Green Light HPS were equally effective compared to TURP and possibly resulted in less perioperative complication[4]. We imply Urodynamic Detrusor underactivity can be the failure to produce very strong or prolonged contractions by detrusor that results in incomplete bladder emptying in the absence of any block. Detrusor underactivity (DU) is a significant, but underrecognized clinical problem. It is not easy to look at how DU interacts with the body and what can be done to help it, the experts warn that we have yet to know that much about it [5,6]. Most of the DU symptoms and remedies are similar to those of bladder outlet obstruction (BOO)[7]. A recent analysis from 2018 suggests that preoperative detrusor underactivity, assessed by urodynamic studies, is strongly linked to patients who should not be considered for transurethral surgery[8].

In a study done recently, this was measured at 7.6 2.4 and after 3 months, it changed significantly to 13.4 7.2 (ml/s) with a p-value < 0.001.9. The mean change between pre and post Q max (ml/s) was 5.8 4.8 (this is obtained by simple subtraction of pre-Q max from post Q max[9]. The effect of preoperative detrusor underactivity on the transurethral surgery for benign prostatic hyperplasia involving local patients. There is no local study or study that has been done on other populations so far, which would show that there has been a lot of change after such a procedure done[10]. The local evidence that will certainly guide our future practice on whether to change or not regarding preoperative urodynamic detrusor underactivity. Had we had a change as well in Q max, then in the future we should make sure that the use of urodynamic detrusor underactivity is provided to the patient to guarantee improved patient outcome and quality of life[11].

The prostate can be better visualized in older patients as the structural changes and physiological alterations that occur in the zonal signal intensities on MRI provide better visualization of the prostate[12]. Despite advancements in surgical management of BPH, the impact of detrusor underactivity on TURP outcomes remains underexplored. Therefore, this study was conducted to evaluate the outcomes of TURP in patients diagnosed with detrusor underactivity using urodynamic assessment.

METHODS

This quasi-experimental study was conducted at the Department of Urology, SIMS, following approval on May 4, 2023 (RC Approval No. SIMS/AL/2023-064), and continued until November 4, 2023. A non-probability consecutive sampling technique was used in this study. According to the research, the sample size was calculated using an assumed prevalence of 26.2% based on global meta-analysis[18], with a 5% margin of error and 95% confidence level. A total of 78 samples were selected based on these parameters. The margin of error (d) of 1 and the total expected change of 5.8 ± 4.8 are expected for Qmax (ml/s). The right patients for our study were male aged 30–80 years with benign prostatic hyperplasia (BPH), set to undergo transurethral resection of the prostate (TURP), whose operational definition of bladder contractility index (BCI) was <100. Patients were not considered for the analysis if they had experienced prior neurological disease, spinal injury or operation, pelvic injury or procedure, diabetes mellitus with associated end-organ harm, urethral condition or previous surgery, or prostate cancer. All those taking part gave informed consent because ethical permission was granted by the hospital. Each person's name, age, and contact information were captured on the flyer.

All the surgeries were carried out by a consultant urologist who has more than five years of practice. Pressure and flow measurements in the bladder

were made with the DUET-LOGIC G2 system by Mediwatch (UK) Ltd., using a 7F catheter and recording the results at a rate of 10–20 ml/min. The bladder was assessed with pressure-flow profiles, and BCI was calculated using the formula BCI = pdetQmax + 5 Qmax; a BCI <100 was considered the patient significant for the study. All patients were directed to no longer take anticholinergics, sedatives, or sympathomimetics for some time before their urodynamic assessment. Following the institution's process, every patient was given preoperative advice about the possible TURP outcomes and the possibility of needing clean intermittent catheterization afterward. A standardized TURP technique was carried out using a tungsten wire loop operating at 160 W for cutting and 80 W for coagulating. The anesthesiologist decided that each procedure should use only spinal anesthesia. Post-surgery, irrigation of the bladder was kept up until there was a substantial lessening of visible blood in the urine.

Three months after the surgery, changes in Qmax were recorded based on the operational definition. The data were gathered by the lead researcher using a drawn-up data form and processed in SPSS software version 22. Average ± standard deviation was determined for age, Qmax, International Prostate Symptom Score (IPSS), and residual urine volume before and three months after the procedure. The data were organized by whether people were in a certain age group, had BPH for a period of time, and whether or not they were obese (BMI >30). Post-stratification testing with a statistical significance cut-off was used for p-values less than or equal to 0.05.

RESULTS

It led to significant improvement in urinary symptoms, a decrease in the volume of residual urine, and an increase in urinary flow rate in six months. There are no significant changes in Q-max improvement with age, obesity severity, and duration of BPH. These outcomes show that the treatment will demonstrate the consistency between various subgroups of patients. The average IPSS and the residual urine volume were also reduced with statistical significance. This pie chart illustrates the age distribution of the study population (N = 78). The majority of participants (60%) were between 30 and 60 years of age (n = 47), while 40% (n = 31) were between 61 and 80 years. This balanced age representation supports the generalizability of treatment outcomes across different age groups in **Figure 1**.

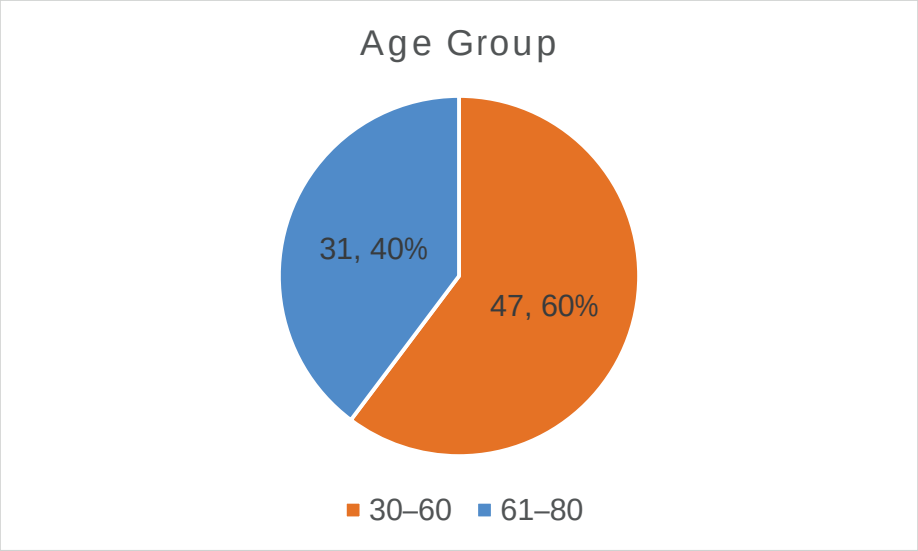

Figure 1: Distribution of Age Groups (years)

Table 1: Descriptive Statistics of IPSS Score Pre and Post 3 Months

Parameter	Pre-Treatment (Mean ± SD)	Post-Treatment (Mean ± SD)	*p*-value
IPSS Score	25.24 ± 1.95	9.91 ± 3.38	<0.001
Residual Urine (mL)	104.21 ± 14.46	49.08 ± 17.57	<0.001
Q-max (mL/s)	7.08 ± 1.48	15.64 ± 3.52	<0.001

The average IPSS also changed significantly to 9.91 (SD: 3.38) with a p-value of <0.001, which means that the numbers of symptoms are statistically reduced. The amount of residual urine volume improved significantly (t < 0.001), showing an average of 104.21 mL (SD: 14.46) to 49.08 mL (SD: 17.57). Maximum urinary flow rate (Q-max) showed an improved state with the mean declining to 7.08 mL/sec (SD: 1.48) and then to 15.64 mL/sec (SD: 3.52) (p < 0.001) as an example of a better excretion of urine. The p-values of the parameters are high, and this means that the effect of the treatment is very effective in improving the urinary symptoms, decreasing the residual urine, and increasing the urinary flow rate over the three months in patients, as shown in **Table 1.**

Table 2: Comparison of Change in Q-max Across Age Groups, BMI Categories, and BPH Duration

Variable	Subgroup	Mean Change in Q-max ± SD	*p*-value
Age Group (years)	30–60	8.38 ± 2.20	0.351
	61–80	8.84 ± 1.93	
BMI Category	Obese	8.00 ± 2.15	0.165
	Non-obese	8.76 ± 2.06	
Duration of BPH	< 4 weeks	8.90 ± 2.17	0.249
	≥ 4 weeks	8.34 ± 2.05	

The mean change in Q-max for ages 30–60 was 8.38 (SD: 2.20) and 8.84 (SD: 1.93) for ages 61–80, with a p-value of 0.351, indicating no significant difference. Obese individuals had a mean change of 8.00 (SD: 2.15), while non-obese individuals had 8.76 (SD: 2.06) (p = 0.165). Patients with BPH for less than four weeks had a mean change of 8.90 (SD: 2.17), whereas those with longer duration had 8.34 (SD: 2.05) (p = 0.249) as shown in **Table 2.**

DISCUSSION

The detrusor hypocontractility or bladder outlet obstruction (BOO) causes most of the voiding problems in men, although in the case of a patient reporting both, physicians might miss the point. Personal detrusor hypocontractility occurs when a person has a Qmax of less than 10 ml/s and a detrusor pressure of less than 30 cmH2O. In some cases, TURP has been prescribed to BPH patients because hypocontractility detrusor has been linked to negative outcomes in at least a few studies, yet other studies have found TURP to be a positive treatment of hypocontractile detrusor in BPH patients[13]. TURP forms one of the primary surgical procedures employed to assist men with benign prostate diseases and lower urinary tract complications. More than one-third of patients with lower urinary tract symptoms have no indications of benign prostatic enlargement. LUTS are still true among 5 to 35 percent of all patients who underwent a transurethral procedure of the prostate (TURP)[14]. In both of these studies, the most common age group affected is 61-70 years old, and this is the same as this study[15].

In these patients, detrusor underactivity normally presents problems in their continence subsequent to the TURP surgery. Referring to the bladder contractility index (BCI), the detrusor contractions were classified as strong (BCI greater than 150), normal (150 is equal to or smaller than BCI), or weak (BCI is smaller than 100). However, there are no standard tests or markers that can be utilized in detrusor underactivity diagnosis[16]. Dissimilar outcomes have been obtained in research, and it is challenging to decide on the effectiveness of TURP on people with BPE and related factors of inactive bladder activity[17].

Though detrusor underactivity is not regarded as a good prognosticator of TURP effectiveness, some medical writers refer to high success rates on the part of the procedure in those with this diagnosis. When long-term obstruction to urine outflow occurs, the detrusor fails due to nerve trauma or trauma-induced structural injury to the detrusor muscle[18]. The mean age of participants in our current study was 54.78, with a range from as low as 30 years and as high as 80 years. The mean IPSS score before and following three months of the surgery was 25.24 ± 1.95 and 9.91 ± 3.38, respectively. The average residual urine output before and three months post-procedure was 104.21 ± 14.46 and 49.08 ± 17.57, respectively.

The mean Q-max in the current study was 7.08 ± 1.48 before the operation and 15.64 ± 3.52 after three months. The average change in Q-max after three months is 8.56 ± 2.10. A recent study indicated that the pre-means Q max (ml/s) was 7.6 ± 2.4, which significantly increased to 13.4 ± 7.2 (ml/s) after 3 months, with a p-value < 0.001. The average change in Q max (ml/s) from pre to post was 5.8 ± 4.8, determined by subtracting pre Qmax from post Q max 9. Such results confirm that the increase in Q max after transurethral surgery for benign prostatic hyperplasia is beneficial. The analysis of 10 articles found that both the I-PSS (mean difference -3.73, which represents improvement, in 9 studies with 936 participants) and maximum urinary flow rate (mean improvement of -3.92 in 8 studies with 951 participants) improved significantly. There were no

significant differences in quality-of-life mean scores (pooled mean difference -0.15, 95% CI -0.56 to 0.25 based on 7 studies and 858 participants) or post-void residual volume mean (pooled mean difference -5.57, 95% CI -20.65 to 9.50 based on 9 studies and 971 participants). Even with these stringent forms of selecting the papers, big differences were still experienced in certain aspects. Nonetheless, there were no stark indicators of publication bias in the research. This led to a subsequent set of gathered results in meta-analysis showing that preoperative men who had an underactive detrusor did not experience as much in I-PSS and flow rate as compared to the others following the operation. The conclusion of preoperative urodynamic detrusor underactivity shows that these patients are unlikely to gain any benefit from transurethral surgery[19]. Prostate cancer in the majority of cases develops over a number of years, and the patient is not aware that he or she has a problem until they are diagnosed with a metastasized disease, most commonly to the bones, which is incurable. Therefore, the early screening of men is highly fundamental as far as detection and treatment are concerned[20].

The outcomes and effects of a transurethral resection of the prostate were studied in patients with benign prostatic enlargement and underactive bladder by looking back at old medical data[21]. The group included 174 men who had undergone transurethral resection of the prostate to treat lower urinary tract symptoms caused by benign prostatic enlargement and bladder underactivity from 2008 to 2015. In total, clinical history, physical examination, renal function tests, urinalysis, cystourethroscopy, ultrasonography through the abdomen or rectum, and urodynamic studies were noted. Those with a history of neurological problems, injuries, or surgeries involving the spine or pelvis, end-organ complications from diabetes mellitus, problems with the urethra, and prostate cancer were not included in this study. The average follow-up time was 22.4 months, plus or minus 6.2 months. The measured prostate volume on average was 42.8 ± 6.4 ml, with a mean PSA level of 2.3 ± 1.8 ng/ml. Scores on the International Prostate Symptom Score fell from 24.6 ± 4.2 before surgery to 10.8 ± 5.8 after surgery, making the result significant. The QOL score went down from 4.8 ± 1.2 before treatment to 2.6 ± 0.4 afterward. Of the 174 patients, 22 patients were still dependent on a per-urethral catheter or clean intermittent catheterisation for inability to urinate over one month after the procedure. As a result, TURP offers a possible treatment for males with an enlarged prostate and weak detrusor who have not responded well to medicines used to treat LUTS. Counselling before surgery and monitoring afterward is very important for these individuals[22].

Most of the researches on BPH treatment are related to its effectiveness, and little direct comparison is done between the medical and surgical treatments [23]. This research project attempted to fill that gap by comparing symptom relief, quality of life, urinary flow rates, and complication rates[24]. The small size of the sample and the single-center nature of the study are the limitations that could influence the ability to generalize the results of this study. The response to treatment and adherence of patients is also a variable that is limiting[25].

CONCLUSION

It has been found that there was a considerable change in Q max, following transurethral surgery for benign prostatic hyperplasia. As a result, TURP could be considered an alternative in men with an enlarged prostate and a slow detrusor who did not have a good reaction to drugs.

FUNDING

None

CONFLICT OF INTEREST

None

ETHICAL APPROVAL

Ethical approval was obtained from the institutional ethics review committee of SIMS, Lahore, under reference number (# SIMS/AL/2023-064).

AUTHORS' CONTRIBUTION

All other Authors contributed equally as per IMCJE. All authors agreed to be accountable for all aspects of the research.

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