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ORIGINAL RESEARCH

Significance of IPP in Predicting TWOC in Patients Presenting with Acute Urinary Retention (AUR) Secondary to Bladder Prostatic Enlargement (BPE)

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ABSTRACT

Objective: Benign prostatic enlargement (BPE) leads to advancing lower urinary symptoms, and acute urinary retention (AUR) affects a significant proportion of men undergoing prostate surgery. This study evaluates the relevance of intravesical prostatic protrusion (IPP) in predicting trial without catheter (TWOC) success for AUR patients with BPE. **Methods:** A prospective observational study was conductedfrom February 2022 to January 2023.Data from patients≥45years old with AUR from BPE, requiring IPP on suprapubic ultrasound was collected and evaluated. **Results:** A total of 112 patients, with mean age of 63.22 years were included. The mean values of retention volume, prostate volume and IPP werereported 722.06 ml, 60.24 cc7.32 mm, respectively.TheTWOC was successful in 77 (68.75%) patients.Odds ratio (OR) for successful TWOC in patients with IPP grade 1 and grade 2 were2.3 (95% CI: 3.682-31.901) and 1.5 (95% CI: 1.465-15.608) times greater compared to grade 3, respectively. At 3-month follow-up, success rates for grades 1, 2 and 3 were 54.54%, 19.48%, and 9.09%, respectively.The odds of AUR at 3-month follow-up were 1.4 times lower for patients with IPP grade 1 and 0.265 times higher for those with IPP grade 2 compared to grade 3.The odds of successful TWOC were 1.7 times higher in retention volume grade 1 compared to grade 2, and 1.56 times higher in prostate volume grade 1 compared to grade 2. **Conclusion:** The measurement of IPP by suprapubic ultrasound proves to be a valuable parameter for predicting successful TWOC in patients with AUR due to BPE.

Keyword: Acute urinary retention, odds ratio, prostate volume, retention volume, suprapubic ultrasound.

INTRODUCTION

Benign prostatic enlargement (BPE) reported to be important cause of bladder outlet obstruction (BOO) among men above 45 years [1]. Though medical therapies provide relief of symptoms [2], lack of efficacy and dropout rates to medical therapy have been reported in 30-43% patients [3].

It is a progressive condition associated with worsening of lower urinary tract symptoms. Although acute urinary retention (AUR) is not life threatening but it certainly significantly contributes to clinical workload, being the presenting feature in a third of men undergoing prostate surgery [4].Most urologists catheterize patients presenting with AUR due to BPE and then arrange for a trial without catheter (TWOC) 2 to 14 days laterto avoid the morbidity and mortality associated with operating on a every patient with a catheter.[4]Most of them also prescribe an alpha-blocker before the TWOC because thishas been shown to improve the TWOC outcome to approximately50% [5,6].

The prompt identification of men with lower chances of voiding post-TWOC would expedite placement on the surgical waiting list, decrease morbidity related to prolonged catheterization, and cut down on hospital costs.Evaluation of BPE can help to predict the outcome of treatment based on its severity. The utility of uroflowmetry and ultrasound evaluation of post

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void residual urine is well established in evaluation of patient suffering from BPE. However, these tests have limitation during predicting the degree of BOO. Pressure flow study during invasive urodynamic investigation would be preferable [5], but not always recommended by guidelines due to high cost and invasive nature of the test [6].

Several less invasive methods such as bladder/detrusor wall thickness [7], ultrasound-estimated bladder weight [8], non-invasive pressure-flow testing [9], prostatic urethral angle and US measurement of intravesical prostatic protrusion (IPP) [10] have been used to predict the degree of BPE and treatment response. The IPP demonstrates strong correlation with BPE severity, having a positive predictive value of 94% and a negative predictive value of 79% [11].

IPP may also correlate with prostate volume, bladder compliance, detrusor pressure at maximum urinary flow, BOO index and PVR, and negatively correlates with Qmax [12,13]. Furthermore, IPP appears to effectively forecast the outcome of a TWOC following acute urinary retention [14], as well as the efficacy of TURP [15].Less studies are reported on IPP and its clinical significance in patients undergoing medical therapy. The IPP has been negatively correlated with the efficacy of alpha blockers in patients with mild to moderate IPP and prostate volume (<40 ml) [16].However, to our knowledge, less data is available in Indian scenario.Thus, we proposed this study to investigate the siginficance of IPP and its impact on TWOC in AUR due to BPE.

PATIENTS AND METHODS

Study Design and ethical consideration

Aprospective observational studywas conducted at Department of Urology, Indira Gandhi Institute of Medical Sciences, Patna, India, over a duration of one year,from February 2022 to January 2023.The study was approved by the institutional ethics committee and review board. Written informed consent was obtained from all patients in their local language prior to their participation in the study.

Inclusion and exclusion criteria

The study included patients with age 45 years and above who presented with AUR caused by BPE, with the presence of IPP observed on suprapubic ultrasound.Patients with prior urologic surgery, urologic neoplasia, bladder calculus, neurological abnormalities, prior alpha blocker or 5-alpha-reductase inhibitor treatment, absence of intra-vesical prostatic protrusion on ultrasound, urethral stricture, stenosis, phimosis, underactive bladder, history of gross hematuria or UTI, not on alpha blockers during TWOC, and obstructive uropathy were excluded.

Study intervention and procedure

All patients enrolled with AUR due to benign prostatic hyperplasia (BPH) underwent catheterization, followed by treatment with tamsulosin (0.4 mg/day) for 7 days. They were subsequently re-evaluated for the success of TWOC.The TWOC was deemed successful if patients achieved satisfactory voiding within 24 hours after the removal of the urethral catheter without requiring re-catheterization.

Data collection

The enrolled patients underwent a comprehensive baseline evaluation, which included a detailed history and clinical examination, urine routine examination, and a suprapubic ultrasound of the prostate at a bladder volume of 100-200 ml.

Study endpoints

The primary outcomes of the study were to evaluate success of the treatment, defined as post-treatment success of TWOC in three different categories of IPP (< 5mm, 5 mm-10mm, and > 10 mm). The study also aimed to assess the odds of achieving success in the three IPP categories. The secondary outcome of the study was to examine the relationship between IPP grade, prostate volume, urine retention volume, and TWOC success.

Definitions

- IPP was identified according to classification system used by Nose H, et al [17].and it is defined by the distance from the tip of the prostate's protrusion into the vesical lumen to the bladder neck (mm) and assessed by suprapubic ultrasound imaging in sagittal plane. The IPP can differ according to bladder volume, and should be estimated with a volume of 100 to 200ml of urine in bladder.
- The grades of IPP were:

Grade1 (<5 mm)
Grade 2 (5 -10 mm)
Grade 3 (>10 mm)

- The grades for retention volume

Grade 1 (<1500 cc)
Grade 2 (>1500 cc)

- The grades for prostatic volume (PV):

Grade 1 (<45 cc)
Grade 2 (>45 cc)

Statistical analysis

Data were analyzed using theStatistical Package for the Social Sciences (SPSS) software. Demographic and baseline data were descriptively summarized, with frequencies and percentages used for categorical data, and mean (standard deviation) for continuous data.Ninety-five percent confidence intervals (95% CI) were calculated when necessary for the quantitative variables of results associated with the primary and secondary objectives.

RESULTS

A total of 112 patients, with mean age 63.22 years participated in the study. The mean value of retention

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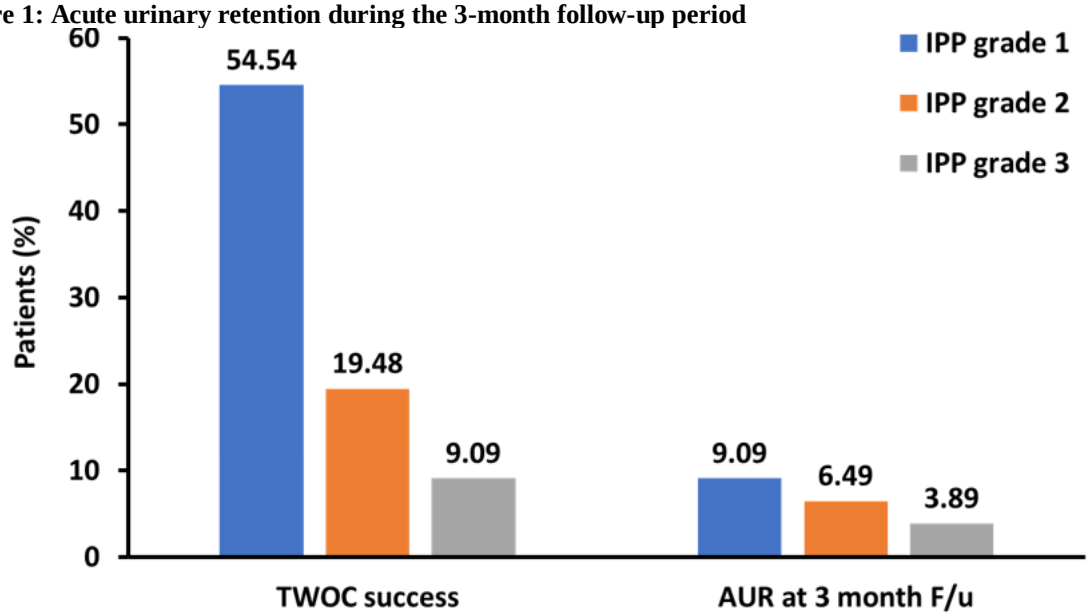
volume was 722.06 ml, prostate volume (PV) was 60.24 cc and IPP was 7.32 mm (Table 1).

The TWOC was successful in 77 (68.75%) patientswho returned to satisfactory voiding within 24 h following removal of the urethral catheter without re-catheterization and failed in 35 (31.25%) patients. Among the study population, success, and failure rates ofTWOCin patients with IPP grade 1 were 66.23% and 28.57%, respectively, followed by those with grade 2(23.37% and 22.85%) and grade 3 (10.38% vs. 48.57%)(Table 2).The odds ratio for a successful TWOC was 2.3 (95% CI: 3.682-31.901) times higher for patients with IPP grade 1 and 1.5 (95% CI: 1.465-15.608) times higher for IPP grade 2, compared to those with IPP grade 3.

At the 3-month follow-up, TWOC was successful in 64 patients, with success rates of 54.54% for patients with IPP grade 1, 19.48% for IPP grade 2, and 9.09% for IPP grade 3. The AURwas reportedin 15 patients at the 3-month follow-up, with 9.09% for patients with IPP grade 1, 6.49% for IPP grade 2, and 3.89% for IPP grade 3(Figure 1).During the 3-month follow-up, the odds ratio for experiencing AUR for patients with IPP grade 1 was 1.4(95% CI: 0.074–0.717) times lower compared to IPP grade 3. In contrast, patients with IPP grade 2 had 0.265(95% CI: 0.422–4.027) times higher odds of AUR compared to grade 3.

Chances of having successful TWOC in retention volume grade 1was 1.7 (95% CI:0.572 to 5.052) times more than patients with retention volume grade 2**.** Chances of having successful TWOC in PV grade 1) was 1.56 (95% CI:0.640 to 3.802) times more than PV grade.

Figure 1: Acute urinary retention during the 3-month follow-up period



AUR, acute urinary retention; F/U, follow up; IPP, intravesical protrusion of prostate; TWOC, trial without catheter.

Table 1: Demographics Characteristics:

Parameters	Number of patients (N=112)
Age (years)	63.22 (8.70)
Retention volume(ml)	722.06 (208.65)
PV(cc)	60.24 (16.19)
IPP (mm)	7.32 (5.29)
Data presented as mean(SD). IPP, intravesical protrusion of prostate; PV, prostate volume.	

Table 2: TWOC outcomes in relation to IPP grades: success and failure rates

IPP grade	TWOC failed (N=35)	TWOC successful (N=77)
IPP grade 1	10 (28.57)	51 (66.23)
IPP grade 2	8 (22.85)	18 (23.37)
IPP grade 3	17 (48.57)	8 (10.38)
Data presented asn (%). IPP, intravesical protrusion of prostate; TWOC, trial without catheter.		

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DISCUSSION

Benign prostatic enlargement which results from the histologic condition of BPH, is often related with BOO [3]. However, the enlargement of the prostate does not occur homogenously. Morphological changes contribute to the protrusion of enlarged prostate tissue into the bladder, giving rise to IPP [4].According to Chia et al [10]., the protrusion of the prostate creates an obstruction resembling a "ball-valve," which interferes with the funneling effect of the bladder neck and results in abnormal bladder movement during voiding.

Longitudinal population-based studies and placebo arms of randomized controlled studies have established that increased prostate volume increases the risk of AUR [18,19].PSA as a indicative marker of prostate volume has also been shown to predict AUR [20].Secondary episodes of AUR and prostate surgery (after an initially successful TWOC) are also more likely in men with larger prostates [21].These findings were supported by the half yearfollow-up of the ALFAUR (ALFuzosin in Acute Urinary Retention) study in which a higher PSA was associated with greater risk of further AUR or surgery [22].

A previous study also suggested that failure of TWOC was associated with larger prostate volume [23].Criticism has been directed at methodology of this study, as they relied solely on DRE for a quantitative assessment of prostate volume, which is known to underestimate it, rendering this approach unreliable [24,25].

On the other hand, IPP measured by transabdominal ultrasonography has only been evaluated as a predictor of TWOC result by a group from Singapore [26].In this study, grade 1 IPP was found to be a predictor of successful TWOC. Similarly,Roehrborn CG, et al [26]. demonstrated IPP as a strong predictor of outcome and found PV not to be predictive, simultaneously showing that there was an almost 70% risk of failure if the IPP was more than 10 mm. Additionally, a study conducted by DE Nunzio C, et al [27].reported that IPP<10 mm [OR (95% CI): 6.62 (2.94-14.9 P=0.001)] was a strong predictor for successful TWOC.

Other factors known to improve the outcome of TWOC in patients under the age of 65 years are detrusor pressure above 35 cm H2O, spontaneous AUR and retention volume below 1,000 ml [28].These factors have not been used consistently as predictors of outcome following TWOC largely because a formal urodynamic assessment of all men presenting with AUR is not practical. On the other hand, IPP is an easily measured parameter and appears to be a strong, consistent predictor of TWOC outcome.

CONCLUSION

In conclusion, the findings revealed that higher IPP grades were associated with lower TWOC success rates, and IPP demonstrated a strong correlation with BPE severity. Additionally, IPP emerged as a consistent predictor of TWOC outcomes, offering a valuable parameter for clinical decision-making. These results highlight the potential clinical relevance of IPP in assessing and managing AUR in the context of BPE, providing insights for improved patient care and treatment strategies.

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