

**A CORRELATION BETWEEN INTRAVESICLE PROSTATIC PROTRUSION AND PROSTATE VOLUME IN PATIENTS PRESENTING WITH ACUTE URINARY RETENTION – A DESCRIPTIVE STUDY**GAURAV BAJPAI, SAHIL GAMBHIR, BHERU SINGH HARIYAWAT\*<sup>id</sup>

Department of General Surgery, RNT Medical College, Udaipur, Rajasthan, India.

\*Corresponding author: Bheru Singh Hariyawat; Email: bheru80@gmail.com

Received: 13 March 2023, Revised and Accepted: 01 May 2023

**ABSTRACT**

**Objective:** The aim of the study was to study the prevalence of significant intravesical prostatic protrusion (IPP) in patients presenting with acute urinary retention (AUR) due to benign prostatic hyperplasia and to study the correlation between IPP and prostatic volume.

**Methods:** Forty men between 45 and 85 years of age, who presented with AUR. Initial assessment included detailed clinical history, International Prostate Symptom Score, and Quality of Life assessments, and a transabdominal ultrasonogram to measure Prostate Volume (PV) and IPP. IPP is measured by drawing a line corresponding to bladder base on a sagittal view and perpendicularly measuring the distance from the bladder base to the greatest protrusion of the prostate into the bladder. Patients with IPP >10 mm were taken to have significant IPP and those ≤10 mm were taken to be insignificant. Statistical analysis included descriptive analysis and Pearson's correlation coefficient.

**Results:** Of the 40 patients in our study with resented with AUR, 21 patients (52.5%) had significant IPP. Mean IPP was 11.3 mm with a standard deviation of 5.49 mm. All patients with significant IPP had a severe IPPS grade. IPP had a statistically significant correlation with PV.

**Conclusion:** The IPP assessed by transabdominal ultrasound can be used to direct appropriate patients to more aggressive treatment strategies like surgery.

**Keywords:** Acute urinary retention, Intravesical prostatic protrusion, Benign prostatic hyperplasia.

© 2023 The Authors. Published by Innovare Academic Sciences Pvt Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>) DOI: <http://dx.doi.org/10.22159/ajpcr.2023v16i9.47823>. Journal homepage: <https://innovareacademics.in/journals/index.php/ajpcr>

**INTRODUCTION**

One of the most prevalent diseases in older men is benign prostatic hyperplasia (BPH). Histological BPH affects about 40% of men in their 50s and 60s and 90% of men who are over 80 years old, with the prevalence rising with age [1]. One of the most significant and painful occurrences in the course of BPH is acute urinary retention (AUR) BPH. Within the next 5 years, 30% of men in their eighties and 10% of men in their seventies will have AUR. In at least 65% of men who present with AUR, the cause is BPH. Lower urinary tract symptoms (LUTS) were prevalent in men with AUR for an average of 32 months before the AUR [2].

AUR affects up to one-third of BPH patients undergoing surgical treatment (AUR) [2]. AUR is linked to significant patient inconvenience, discomfort, and anxiety. However, the size of the prostate does not entirely determine the signs and obstruction. In contrast, it has been discovered that bladder outlet obstruction (BOO) and intravesical prostatic protrusion (IPP) are related [1]. IPP is a morphological alteration brought on by the prostatic median and lateral lobes' excessive growth into the bladder, which may cause the bladder to move erratically when voiding. The previous research has shown that the ultrasonographic measurement of IPP can quickly and noninvasively identify BOO in BPH patients [1]. Finding significant IPP in LUTS patients may signal the need for early surgical intervention.

To determine the prevalence of intraprostatic protrusion and the relationship between intraprostatic protrusion and prostate volume (PV) in patients who present with AUR due to BPH, we are conducting a hospital-based study in this study.

**Aims and objectives**

The aim of the study was to determine the frequency of significant IPP in people who have BPH and present with AUR (BPH).

**METHODS**

Forty patients who presented with AUR to the department of general surgery at RNT Medical College, Udaipur, between January 2020 and December 2020 were the subjects of the descriptive study. After receiving approval from the institution's ethical clearance committee, the study was started.

**Inclusion standards**

The following criteria were included in the study:

- AUR is present in every BPH patient
- Men between the ages of 45 and 85.

**Exclusion standards**

The following criteria were excluded from the study:

Patients with

- Calculating a bladder
- Neurological conditions that put a patient at risk for neurogenic bladder, such as Parkinson's disease or CVA
- A confirmed malignancy.

Following the ethics committee's approval of the thesis, patients who meet the inclusion criteria and present to the RNT Medical College's General Surgery OPD in Udaipur with AUR will be asked for their informed consent. The patient will be asked for pertinent clinical information (demographics: Age, sex, location, and occupation), as well as their medical history.

**History taking**

Age, sex, address, clinical data, symptoms, predisposing factors, and any prior treatment histories are all recorded on the proforma. In addition, the severity of symptoms is graded using the International Prostate Symptom Score (IPSS) questionnaire.

### Measurements

Trans-abdominal ultrasonography will be used to measure IPP and Prostatic Volume in the Department of Radiodiagnosis at RNT Medical College in Udaipur. IPP is calculated by drawing a line parallel to the bladder base on a sagittal view and measuring the distance from the base of the bladder to the prostate's largest protrusion into the bladder.

- IPP <10 mm is not regarded as significant.
- IPP >10 mm is significant
- The average PV is 15–20 cc.

The prevalence of significant IPP in patients presenting with acute urine retention and the correlation between the IPP and PV was calculated.

### Sampling

- Sampling Technique: Convenient Sampling
- Sample size of each group: Only one Group (n=40)
- Total Sample size of the study: 40.

### Statistical analysis

The information gathered was entered into Microsoft Excel 2010. To conduct the statistical analysis, SPSS trial version 20.0 was used. IPP, PV, and IPSS were compared using descriptive analysis of the data (Mean and Standard Deviation), along with Pearson's correlation coefficients.

### OBSERVATIONS AND RESULTS

The study population's age distribution spans the years 45–85. The study's participants were 66.4 years old on average, with an SD of 8.52 years.

#### Volume of prostate

Between 26 and 104 cu cm of PV are distributed among the study population. Participants in the study had a mean PV of 66.18 cu cm and an SD of 21.73 cu cm (Table 1).

IPP is distributed between 4 and 23 mm in the study population. Participants in the study had an average IPP of 11.13 mm and an SD of 5.49 mm (Table 1).

Grade III prostatomegaly (60–90 g) is present in 35.0% of study participants and Grade II prostatomegaly is present in 37.50% of study participants (40–60 g).

About 12.50% of the participants in our study who had AUR were found to have a Grade I (40 cc) prostate. 15.0 patients had Grade IV prostate, 35% had Grade III prostate, and 37.50% had Grade II prostate (Table 1).

Significant IPP was seen in all individuals with Grade IV prostate and it was most common in older patients (80–89 years).

#### Prostate grade

##### Incomplete emptying of IPSS components

About 15% of patients had the complaint practically constantly, while roughly 32.5% of patients reported having incomplete urination less than half the time. Roughly 37.5% of the patients experienced micturition more frequently than 50% of the time. About 32.5% of the patients experienced intermittent voiding while almost half of them complained of it, while 27.5% complained of it more than half the time. About 32.5% of the patients and 27.5% of the patients reported having weak urinary streams about half the time. A weak urine stream was a complaint among about 32.5% of patients, who had it at least half the time. About 35% of the patients reported having the complaint about half the time and 45% of the patients had to strain to void urine (Table 2).

All of the patients in our study had to urinate more than 3 times each night. About 70% of study participants are dissatisfied (Table 3).

The study population's IPSS distribution spans the ages of 17–33. Participants in the study had an average IPSS of 24.7 and an SD of 4.51. All patients who had AUR had IPSS grades that were at least moderate. The IPSS grade for 87.5% of the study participants is severe (Table 3).

### Connection between prostatic volume and IPP

The study population's previous AUR rate is 23.5%. Pupus cells were found in the urine of 55% of the study participants during routine testing. Just 3 people's (7.5%) prostates are tender (Table 4).

Prostatic volume and IPP have a strong positive correlation (0.632) (Table 5).

### DISCUSSION

Despite not being a life-threatening condition, BPH has a negative impact on quality of life. Most patients go to the doctor to get their annoying symptoms under control [3]. Common causes of BOO include BPH, which has the long-term effect of causing AUR. AUR's effects on patients' health Life quality are similar to a case of renal colic [4]. The gold standard in the diagnosis of BOO is urodynamic testing. However, because it is an invasive, time-consuming, and expensive procedure,

**Table 1: Distribution of prostate grade among patients with significant IPP and different age groups**

Parameters	Significant IPP					
	>10 mm		≤10 mm		Total	
	Freq.	%	Freq.	%	Freq.	%
Prostate grade						
I	2	40.0	3	60.0	5	12.50
II	2	13.3	13	86.7	15	37.50
III	9	64.3	5	35.7	14	35.0
IV	6	100	0	0	6	15.0
Age group (years)						
40–49	0	0.0	4	100	1	2.50
50–59	2	18.2	9	81.2	5	10.0
60–69	7	77.8	2	22.2	19	47.50
70–79	8	80.0	2	25.0	12	30.0
80–89	2	66.7	1	33.3	3	7.50

**Table 2: Distribution of incomplete emptying, frequency, intermittency, urgency, weak stream, and straining**

Parameters	No of cases	Percent
Incomplete emptying		
<1 time in 5	3	7.50
Less than half the time	13	32.50
About half the time	11	27.50
More than half the time	7	17.5
Almost always	6	15.0
Frequency		
Less than half the time	3	7.5
About half the time	12	30.0
More than half the time	15	37.5
Almost always	10	25.0
Intermittency		
Less than half the time	14	35.0
About half the time	13	32.5
More than half the time	11	27.5
Almost always	2	5.0
Urgency		
Less than half the time	8	20.0
About half the time	13	32.5
More than half the time	11	27.5
Almost always	8	20.0
Weak stream		
About half the time	15	37.5
More than half the time	12	30.0
Almost always	13	32.5
Straining		
About half the time	14	35.0
More than half the time	18	45.0
Almost always	8	20.0

**Table 3: Distribution of patients according to Nocturia, quality of life**

Parameters	No of cases	Percent
Nocturia		
3 times	21	52.5
4 times	16	40.0
5 times	3	7.0
Quality of Life		
Mostly dissatisfied	12	30.0
Unhappy	28	70.0
IPSS grade		
Moderate	5	12.5
Severe	35	87.5

**Table 4: Distribution of previous AUR, pus cells in urine routine examination, and prostate tenderness**

Parameters	Frequency	Percent
Previous AUR	11	27.5
Pus cells in urine routine examination	22	55.0
Prostate tenderness	3	7.5

**Table 5: Correlation between intravesical prostatic protrusion and prostatic volume**

Parameters	Prostatic volume
IPP	
Pearson correlation (r)	0.632**
n	40

\*\*Correlation is significant at the 0.01 level (2-tailed)

there are not many clinical uses for it. To gather similar data and target more aggressive therapy at the patients most likely to benefit from it, a number of non-invasive indices have been tried [5].

IPSS is a straightforward tool for evaluating BPH and increasing scores call for action [6].

In their 2010 study, Kim and Kim came to the conclusion that IPP grade was statistically significantly correlated with both AUR and overactive bladder [7].

In 2010, Hossain *et al.* came to the conclusion that IPP, which is stronger than PV, and PV, which is measured through transabdominal USG, are non-invasive, accessible methods that significantly correlate with BOO in patients with BPH [1].

In a 2007 study on the clinical significance of IPP in BPH patients, Keqin *et al.* found that patients with significant IPP had more severe BOO and impaired detrusor function [8].

In 2010, a study concluded that IPP is a quick, non-invasive test to predict clinical progression in BPH and that higher grade IPP is linked to a higher risk of clinical progression of BPH [9].

In evaluating BOO in 2006, Lim *et al.* compared IPP, PV, and serum PSA. They came to the conclusion that while PSA, PV, and PSA all correlate well with one another, IPP more accurately predicts BOO [5].

Gyawali *et al.* came to the conclusion that IPP measured by transabdominal USG is more accurate than PV in evaluating bothersome symptoms in men with BPH in 2008 while researching the relationship between IPP and PV [3].

In their study on the correlation between IPP and BOO, Chia *et al.* came to the conclusion that transabdominal USG-assessed IPP is a better and more trustworthy predictor of BOO than a pressure flow study [10].

In 2011, it was found that among patients with LUTS brought on by BPH, PV 40 ml, and PSA 1.5 ng/mL, men with IPP exceeding 10 mm were more frequently poor responders to medical treatment with Tamsulosin [11].

A trial without a catheter is more likely to fail in patients with IPP s larger than 10 mm among white men presenting with AUR [12].

Suprapubic USG of detrusor wall thickness and IPP is a simple, non-invasive, and accurate system to assess bladder prostatic obstruction in patients with LUTS due to BPH, according to Franco *et al.* study [13].

In their study, Lee *et al.* discovered that IPP had a strong correlation with storage symptoms and might be a helpful marker for the diagnosis and treatment of LUTS [14].

IPP and PV as measured by transabdominal ultrasound are both helpful in the diagnosis of male urinary obstructive symptoms, according to Reis *et al.* in their study on Intravesical Protrusion of the Prostate as a Predictive Method of BOO. About 59.5% of the patients assessed had IPP greater than 10 mm [15].

In our study, significant IPP (>10 mm) was present in 52% of the men who presented with AUR.

In our research, we discovered a strong correlation between IPP and PV. A higher grade IPP is also probably present with a larger PV. In addition, every patient in our study with significant IPP had a grade of severe on the IPSS. The importance of measuring IPP is most obvious in small prostate glands with obstruction, despite the fact that our study shows a good correlation between PV and IPP. These glands typically have a high IPP. A protruding median lobe causes a ball-valve effect when voiding, which contributes to the high IPP. Although a strong bladder contraction force could create a channel between the lobes, IPP suffers as a result because it exacerbates the ball valve effect, which raises urethral resistance [16]. In addition, the presence of an enlarged median lobe results in dyskinetic movement during micturition [3,16].

IPP measurement is a simple, non-invasive, repeatable, and economical procedure that can be accomplished with a transabdominal USG in an outpatient setting.

All of the study participants with significant IPP had an IPSS grade of severe. According to earlier research [11,12], these patients have a high likelihood of failing the trial voiding without a catheter. Therefore, placing more emphasis on BPH evaluation when selecting treatment options is warranted.

## CONCLUSION

Our study has found a strong correlation between intraprostatic prostatic protrusion and PV as well as a high prevalence of significant intraprostatic protrusion in patients who eventually develop AUR. All of the study participants with significant IPP had an IPSS grade of severe. IPP can be used to point the right patients in the direction of more aggressive treatment options like surgery.

## CONFLICTS OF INTERESTS

Nil.

## AUTHORS FUNDING

Nil.

## REFERENCES

- Hossain AK, Alam AK, Habib AK, Rashid MM, Rahman H, Islam AK, *et al.* Comparison between prostate volume and intravesical prostatic protrusion in detecting bladder outlet obstruction due to benign prostatic hyperplasia. Bangladesh Med Res Counc Bull 2012;38:14-7. doi: 10.3329/bmrcb.v38i1.10446

2. Muruganandham K, Dubey D, Kapoor R. Acute urinary retention in benign prostatic hyperplasia: risk factors and current management. *Indian J Urol* 2007;23:347-53. doi: 10.4103/0970-1591.35050, PMID 19718286
3. Gyawali P, Shrestha G, Joshi B, Chalise P, Sharma U. Intravesical prostatic protrusion is better than prostate volume in predicting symptom severity in benign prostatic hyperplasia: A prospective clinical study. *Post-Grad Med J NAMS* 2010;10.
4. Thomas K, Oades G, Taylor-Hay C, Kirby RS. Acute urinary retention: what is the impact on patients' quality of life? *BJU Int* 2005;95:72-6. doi: 10.1111/j.1464-410X.2004.05254.x, PMID 15638898.
5. Lim KB, Ho H, Foo KT, Wong MY, Fook-Chong S. Comparison of intravesical prostatic protrusion, prostate volume and serum prostatic-specific antigen in the evaluation of bladder outlet obstruction. *Int J Urol* 2006;13:1509-13. doi: 10.1111/j.1442-2042.2006.01611.x, PMID 17118026
6. Nose H, Foo KT, Lim KB, Yokoyama T, Ozawa H, Kumon H. Accuracy of two noninvasive methods of diagnosing bladder outlet obstruction using ultrasonography: Intravesical prostatic protrusion and velocity-flow video urodynamics. *Urology* 2005;65:493-7. doi: 10.1016/j.urology.2004.10.014, PMID 15780362
7. Kim KH, Kim YS. Correlation of male overactive bladder with intravesical prostatic protrusion. *Korean J Urol* 2010;51:843-6. doi: 10.4111/kju.2010.51.12.843, PMID 21221204
8. Keqin Z, Zhishun X, Jing Z, Haixin W, Dongqing Z, Benkang S. Clinical significance of intravesical prostatic protrusion in patients with benign prostatic enlargement. *Urology* 2007;70:1096-9. doi: 10.1016/j.urology.2007.08.008, PMID 18158025
9. Lee LS, Sim HG, Lim KB, Wang D, Foo KT. Intravesical prostatic protrusion predicts clinical progression of benign prostatic enlargement in patients receiving medical treatment. *Int J Urol* 2010;17:69-74. doi: 10.1111/j.1442-2042.2009.02409.x, PMID 19919641
10. Chia SJ, Heng CT, Chan SP, Foo KT. Correlation of intravesical prostatic protrusion with bladder outlet obstruction. *BJU Int* 2003;91:371-4. doi: 10.1046/j.1464-410x.2003.04088.x, PMID 12603417
11. Cumanas AA, Botoca M, Minciu R, Bucuras V. Intravesical prostatic protrusion can be a predicting factor for the treatment outcome in patients with lower urinary tract symptoms due to benign prostatic obstruction treated with tamsulosin. *Urology* 2013;81:859-63. doi: 10.1016/j.urology.2012.12.007, PMID 23375910
12. Mariappan P, Brown DJ, McNeill AS. Intravesical prostatic protrusion is better than prostate volume in predicting the outcome of trial without catheter in white men presenting with acute urinary retention: A prospective clinical study. *J Urol* 2007;178:573-7, discussion 577. doi: 10.1016/j.juro.2007.03.116, PMID 17570437
13. Franco G, De Nunzio C, Leonardo C, Tubaro A, Ciccariello M, De Dominicis C, et al. Ultrasound assessment of intravesical prostatic protrusion and detrusor wall thickness--new standards for noninvasive bladder outlet obstruction diagnosis? *J Urol* 2010;183:2270-4. doi: 10.1016/j.juro.2010.02.019, PMID 20400138
14. Lee JM, Chung H, Kim TW, Kim HS, Wang JH, Yang SK. The correlation of intravesical prostatic protrusion with storage symptoms, as measured by transrectal ultrasound. *Korean J Urol* 2008;49:145-9. doi: 10.4111/kju.2008.49.2.145
15. Reis LO, Barreiro GC, Baracat J, Prudente A, D'Ancona CA. Intravesical protrusion of the prostate as a predictive method of bladder outlet obstruction. *Int Braz J Urol* 2008;34:627-33, discussion 634-7. doi: 10.1590/s1677-55382008000500012, PMID 18986567
16. Kuo HC. Clinical prostate score for diagnosis of bladder outlet obstruction by prostate measurements and uroflowmetry. *Urology* 1999;54:90-6. doi: 10.1016/s0090-4295(99)00092-8, PMID 10414733