Original Article

Correlation between intravesical prostatic protrusion and maximum flow rate among Nigerian men with Benign Prostatic Hyperplasia

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ABSTRACT

Objective: To determine the correlation between intravesical prostatic protrusion and maximum flow rate in benign prostatic hyperplasia among Nigerian men.

Materials and Methods: A cross-sectional prospective study that included patients who presented to the Urology clinic of Jos University Teaching Hospital with clinical features of BPE. Each had IPSS, Qmax and IPP measured in addition to clinical evaluation. Statistical analysis was done using SPSS(R) version 20 (SPSS, IBM, Chicago, IL, USA). Appropriate test statistics were used with p-value < 0.05 considered as significant.

Results: Eighty-seven patients aged 40 - 86 years were enrolled in the study period. The means of age, IPSS, Qmax, IPP and PV - were 64.6±10.2 years, 16.7±7.6, 8.2± 3.8 ml/s, 12.9±7.0 mm and 70.1± 50.3 mls respectively. IPP correlated negatively with Qmax (r= -0.519, p=0.000).

Conclusion: Intravesical prostatic protrusion measurement is non-invasive, easily accessible, reproducible and more cost effective. It showed a significant correlation with Qmax. Therefore, it is a valuable parameter - for evaluation of patients with BPH.

Conflict of Interest: None

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a common disease of the prostate which affects aging men with an incidence of 40% in men of 50-60 years of age and 90% in men aged over 80 years.[1]The common presentation of BPH is bladder outlet obstruction (BOO). Pressure flow study is the gold standard for diagnosis of BOO but its routine use has been limited by its invasive nature and unavailability in resource poor setting. Currently, international prostate symptom score (IPSS), uroflowmetry, intravesical prostatic protrusion (IPP), post-void residual urine (PVR) are among several parameters identified to be of useful significance in the evaluation of BOO.[2,3]

The IPP is measured as the distance from the tip of the prostate's protrusion into the vesical lumen to the bladder neck measured in millimetres. The measurement is perpendicular to an imaginary line linking the bladder mucosae.[4]

The measurement is categorized into three grades as recommended, i.e. grade I:<5 mm, grade II: 5–10 mm, and grade III:>10 mm.[4,5,6] Measurement of IPP is taken in the sagittal view using the transabdominal ultrasound. It is the vertical height from the tip of the protrusion to the base of the prostate.[7] IPP is a novel and non-invasive predictor of clinical progression in BPE for patients receiving non-surgical treatment.[4,5,6]Uroflowmetry electronically measures urine flow rate throughout the course of micturition

Key Words: *Intravesical prostatic protrusion, Qmax, BPH*

and it has been added to the assessment tools for patients with BPH.[8] Maximum flow rate (Qmax) is important in diagnosis of BPE, when considered together with IPP.

Moon *et al*. found a strong negative correlation between IPP and Qmax (= −0.551, p = 0.000) and concluded that an IPP exceeding 5.5 mm was significantly associated with BOO.[9] Wang and Keqin et al. also reported negative correlation between IPP and Qmax but of a lower correlation coefficient of −0.300 and −0.284 respectively.[10,11]With these findings from previous studies, intravesical prostatic protrusion is a promising and reliable marker in clinical decision making especially in environment where facility for Qmax measurement is not available.

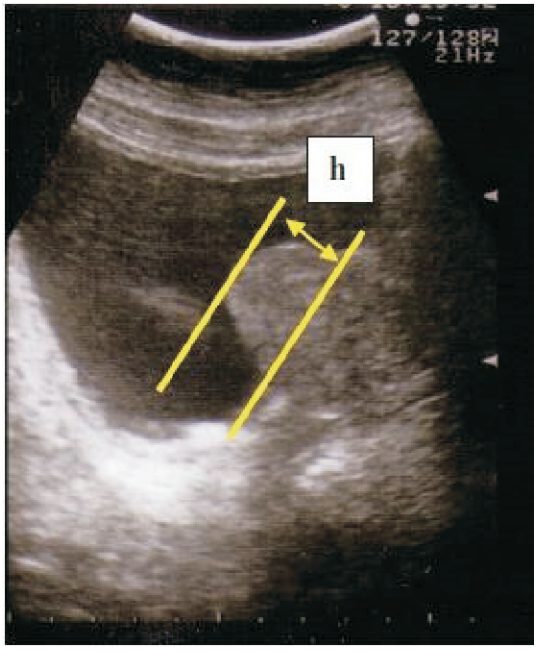
This study aimed to determine the correlation between IPP and Qmax in our environment.

MATERIALS AND METHODS

This was an observational prospective study performed from April 2016 to June 2017 in the outpatient clinic of Jos University Teaching Hospital, Jos, Nigeria after an approval from the ethical committee of the hospital. All patients with clinical assessment of BPH were included in the study while those who had co-morbid conditions that affected lower urinary tract symptoms e.g. diabetes mellitus, urethral stricture, bladder calculi, prostate cancer were excluded.

Each subject had clinical evaluation, IPSS, Qmax, IPP, PVR and PSA assessed. The Qmax was measured using NIDHI flow-814® uroflowmeterThe NIDHI Flow-814uroflowmeter is a fully automated microprocessor-based device with digitally controlled weight-based flow transducer designed to monitor the urinary volume and flow rate within a urine collection beaker during micturition. Its components include a microprocessor-based Ad-On module that provides the statistical parameters of urine flow, a transducer, micturition chair and funnel, urine collection beaker (2000ml capacity), and an EPSON compatible Dot matrix printer. This uroflowmeter uses the gravimetric method of measuring the urinary flow rate. Each patient was subsequently sent to the radiology department to have a transabdominal ultrasound scan (a GE logic S expert 052128 model ultrasound) done by a single radiologist for uniformity and unbiased. A curvilinear probe of 3.5 MHz was used to measure the IPP along the mid sagittal view. IPP was measured from images of the prostate obtained using the midline sagittal image by drawing a line from the anterior to posterior intersections of the bladder base and the tip of the intravesical prostatic protrusion. This was measured in millimetres and divided into three grades- grade I: less than 5 mm, grade II: 5–10 mm, grade III: > 10 mm [Fig 1].

Fig 1: **Measurement of intravesical prostatic protrusion (IPP).**



Transabdominal ultrasound using sagittal view of bladder and prostate: measurement of IPP (h) from the tip of the protruding prostate to the base of the bladder. IPP- grade I- <5 mm; grade II- 5 - 10 mm; grade III > 10 mm

RESULTS

A total of eighty-seven (87) patients were included in the study with a mean age of 64.6 years. (as shown in Table 1) A significant negative correlation between IPP and Qmax (Pearson correlation coefficient = −0.519, p = 0.000) was observed in this study (Table 2).

Table 1: Demographic and clinical characteristics of the Study Population.

Variables	Minimum	Maximum	Mean	Standard deviation
Age (years)	40	86	64.6	10.2
IPSS	3	34	16.7	7.6
IPSS-v	1	19	9.8	3.5
IPSS-s	3	13	6.9	3.3
QoL	1	6	5.2	1.1
Qmax (ml/s)	2	15	8.2	3.8
Voided volume (ml)	152	704	185	141
IPP (mm)	2	24	12.9	7.0
PV (ml)	14	254	70.1	50.3
PVR (ml)	3	398	78.3	69.3
PSA (ng/ml)	0.6	10	7.2	1.9

Table 2 The correlation of IPP with age, IPPS, IPP, Qmax, PVR, QOL

Variable	Correlation Coefficient rp	P value
Age	0.07	0.512
IPSS	0.808	0.000
IPSS-s	0.799	0.000
IPSS-v	0.717	0.000
QoL	0.710	0.008
Qmax	-0.519	0.000
PV	0.332	0.002
PVR	0.306	0.004
PSA	0.348	0.020

DISCUSSION

The finding of a negative correlation between IPP and Qmax as seen in this study is similar to previous reports.[12,13,14] Moon *et al*. found a strong negative correlation between IPP and Qmax (= −0.551, p = 0.000) and concluded that an IPP exceeding 5.5 mm was significantly associated with BOO.[9] Wang and Keqin*et al*. also reported negative correlation between IPP and Qmax but of a lower correlation coefficient of −0.300 and −0.284 respectively.[10.11] The different criteria used for parameter measurement, regional and racial variations were possible reasons for the difference in correlation coefficient reported. Similarly, Lieber *et al.* in their study of IPP measurement among 322 white men residing in Olmsted County, Minnesota, reported a significant negative correlation between IPP and maximum flow rate ($r = -0.18$, $p < 0.001$) and suggested the clinical usefulness of IPP in predicting the need for treatment.[12]

There have been reports on good correlation between IPP and other parameters of BOO.[15,16] This was confirmed in the present study. In the analysis of correlation between IPP and prostate volume, a positive correlation was observed. Studies have reported similar finding of positive correlation between IPP and prostate volume.[17,18] Lee *et al* found a good positive correlation between IPP and PV ($r= 0.747$, $p < 0.001$).[18] This study also showed a positive correlation between IPP and PVR as seen in other previous studies.[18,19]Agranovic*et al* reported while analysing the correlation of IPP with other clinical and radiological factors, a very good correlation was observed between intravesical prostatic protrusion and prostate volume ($r=0.53$, $p < 0.0001$).[15] Chia *et al* reported that the IPP was a better and more reliable predictor of BOO than the other variables assessed (IPSS, PV, PVR).[19]

In addition to the prediction of BOO, other studies have found IPP to predict -clinical progression especially for patients receiving non-surgical treatment, successful TWOC and patients that need more aggressive treatment options, such as surgery.[20]

CONCLUSION

Intravesical prostatic protrusion measurement is non-invasive, easily accessible, reproducible and more cost effective. It showed a significant correlation with Qmax.

RECOMMENDATIONS

1. IPP should be included in the armamentarium for the initial assessment of men with BOO/LUTS due to BPH.

2. Further studies need to be carried out to define a cut-off of IPP as a causative criterion of BOO and its relationship with surgical treatment outcome.

LIMITATIONS OF THE STUDY

1. Urethral stricture was only ruled out clinically. This could have impacted on Qmax in those with coexisting stricture.

2. A complete urodynamic study was not done in this study thus the possibility of some patients with neurogenic bladder being recruited into the study.

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