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Clinical Value of Intra-Vesical Prostatic Protrusion in the Evaluation and Management of Prostate

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Abstract **Original Research Article**

This was a descriptive cross-sectional study, which was conducted in Khartoum state, Sudan, in different hospitals and medical centers from November 2019 to Jan 2022. The objective was to determine the Clinical value of intra-vesical prostatic protrusion in the evaluation and management of the prostate. A total of 313 males (aged 45 years and above) who presented with lower urinary tract symptoms were recruited. The prostatic volume and the degree of intra-vesical prostatic protrusion were measured by trans-abdominal ultrasonography in the sagittal planes. The IPP is graded as Grade 1 (5 mm or less), Grade 2 (more than 5 mm to 10 mm), and Grade 3 (more than 10 mm). The study showed that the distribution of urinary tract complications is slightly rare, as the normal cases were the commonest (32.3%), while cystitis is the commonest UT abnormality in (28.1%), followed by renal cyst noticed (10.5%). There was a fair positive correlation between the prostatic volume and IPP (Spearman, rs = 0514, P <0.001). Also, a small prostate with normal volume can have an IPP Grade I which is abnormal. On the other hand, IPP for the prediction of surgical treatment was 28.799±7.06mm (95% CI: -21.577- -19.063), while PV for the prediction of surgical treatment was 99.695± 25.9 ml (95% CI: -48.898- -35.69). The narrow range of IPP makes it a stronger predictor for medical management. Patients with IPP> 21.7 mm should be counseled regarding the high chance of the need for surgical treatment. However, Intra-vesical Prostatic Protrusion is a better predictor of a benign prostatic obstruction than prostatic volume.

Keywords: prostate; intra-vesical; ultrasound; urinary.

Abbreviations
IPP: Intravesical prostatic protrusion;
PV: Prostate volume;
PVR: Post-void residual.

INTRODUCTION

Lower urinary tract symptoms (LUTS) often develop as a manifestation of bladder outlet obstruction (BOO) due to benign prostate enlargement. When the prostate enlarges, protrusion into the bladder often occurs as a result of morphological changes in the gland. Prostatic protrusion into the bladder can be measured with ultrasound as an intravesical prostatic protrusion (IPP). Some studies have shown IPP as a reliable predictor of bladder obstruction index (BOOI) as measured by pressure flow studies and in determining the method of treatment. IPP is thereby reliable in assessing the severity of BOO in patients with BPH.

Ultrasonographic measurement of IPP can detect bladder outlet obstruction and other urinary tract changes in patients with lower urinary tract symptoms quickly and noninvasively [1]. An intravesical prostatic protrusion is a distance in millimeters between the tip of the prostate median lobe and bladder neck in the midsagittal plane, using a suprapubically positioned ultrasound scanner. The intravesical prostatic protrusion distance can be divided into three grades: grade I: 0–4.9 mm, grade II: 5–10 mm, and grade III: more than 10 mm [2].

The severity of lower urinary tract symptoms can be measured reliably with a number of validated questionnaires like the International Prostate Symptoms

Score (IPSS), Boyarsky score, Madsen score, Iversen score, and Danish prostatic symptom score. The IPSS is recommended as the symptom scoring instrument to be used for the baseline assessment of symptom severity in men presenting with lower urinary tract symptoms. The LUTS in this study was classified as mild (1 or 2 LUTS), moderate (3 or 4 LUTS), and severe (5, 6, or 7 5 LUTS) (with a range of 1-7), in honor of IPSS (with a range of 5-35) [3].

The present study aimed to determine the Clinical value of intravesical prostatic protrusion in the evaluation and management of the prostate.

METHODS

A total of 313 males (aged above 45 years) who presented with lower urinary tract symptoms (LUTS) were recruited. All had postvoid residual urine (PVR), PV, and the degree of IPP was measured by transabdominal ultrasonography (TAUS) in the transverse and sagittal planes respectively, along with TAUS of the urinary tract.

RESULTS

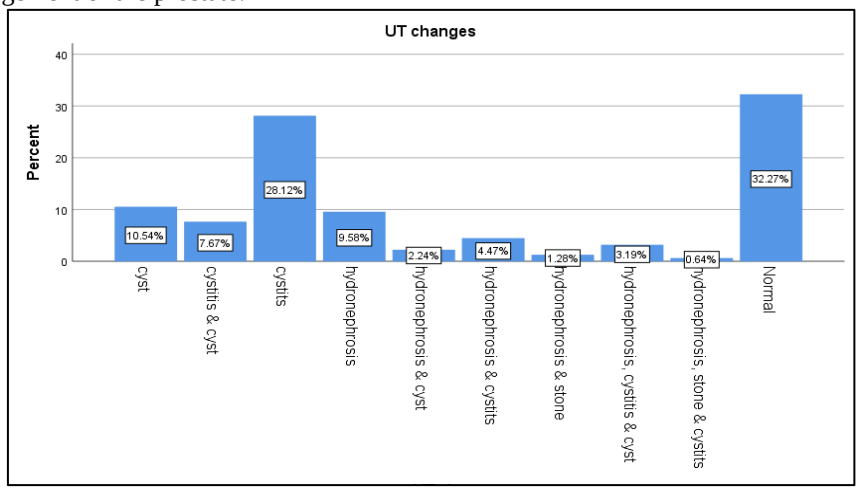

Figure 1: Bar chart frequency distribution of urinary tract changes

Table 1: Distribution and correlation of prostate volume, LUTS degree, and PVR among different grades of IPP

Variables	IPP grade				Correlation with IPP	
	Grade I n=53(16.9 %)	Grade II n=100(31.9%)	Grade III n=160(51.15)	Total N=313(100.0%)	r_s	P value
Prostate volume						
< 40	23(43.4%)	11(11.0%)	0	34(10.9%)	.514	.000
40 - 100	30(56.6%)	87(87.0%)	120(75.0%)	237(75.7%)		
> 100	0	2(2.0%)	40(25.0%)	42(13.4%)		
LUTS Degree						
Mild LUTS	47(88.7%)	60(60.0%)	5(3.1%)	112(35.8%)	.744	.000
Moderate LUTS	5(9.4%)	39(39.0%)	77(48.1%)	121(38.7%)		
Sever LUTS	1(1.9%)	1(1.0%)	78(48.8%)	80(25.6%)		
PVR /ml						
< 50 ml	46(86.8%)	67(67.0%)	21(13.1%)	134(42.8%)	.636	.000
50 - 99 ml	7(13.2%)	33(33.0%)	70(43.8%)	110 (35.1%)		
>100 ml	0	0	69(43.1%)	69(22.1%)		

Table 2: shows compare mean of the age, prostatic volume, IPP, and post-micturition urine volume according to the type of management

A. Mean measurement

Group Statistics					
Variables	**Medical Management**	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Age	Medications	240	66.58	11.728	.757
	Surgery	73	71.49	11.235	1.315
IPP	Medications	240	8.978	4.8986	.3162
	Surgery	73	28.799	7.0609	.8264
PV	Medications	240	57.400	21.0192	1.3568
	Surgery	73	99.695	25.9788	3.0406
PVR	Medications	240	53.717	29.3473	1.8944
	Surgery	73	124.97	58.9708	6.9020

B. Independent Samples t-test for Equality of Means for measurements

t-test for Equality of Means							
	T	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
						Lower	**Upper**
Age	-3.165	311	.002	-4.914	1.553	-7.969	-1.859
	-3.239	123.54	.002	-4.914	1.517	-7.917	-1.911
IPP	-27.081	311	.000	-19.8203	.7319	-21.260	-18.380
	-22.400	94.017	.000	-19.8203	.8848	-21.577	-18.063
PV	-14.211	311	.000	-42.2945	2.9761	-48.150	-36.438
	-12.703	102.30	.000	-42.2945	3.3296	-48.898	-35.690
PVR	-13.919	311	.000	-71.2559	5.1194	-81.328	-61.183
	-9.956	83.114	.000	-71.2559	7.1573	-85.491	-57.020

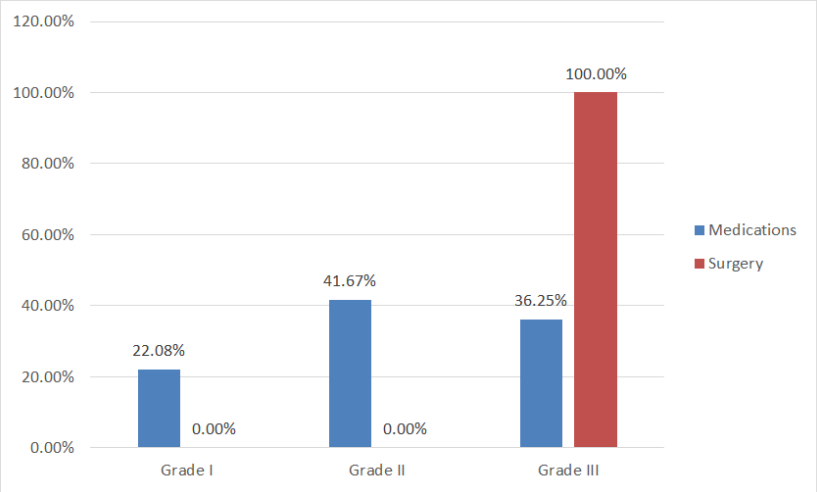

Figure 2: bar chart shows crosstabulation between the IPP grade and type of medical management

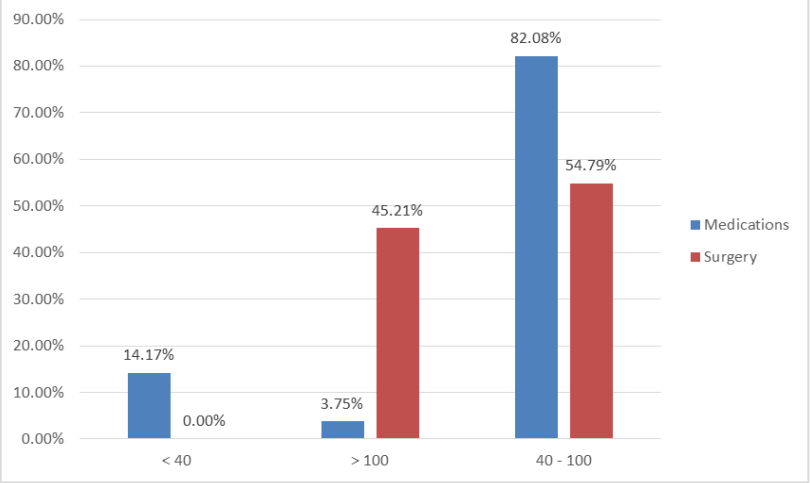

Figure 3: bar chart shows crosstabulation between the PV degree and type of management

DISCUSSION

In our study of 313 patients managed conservatively, with a mean follow-up time of two weeks to know the treatment method either by medication or surgical, 240 patients were found to be treated by medication, and 73 patients were treated surgically (Table 2).

The study also showed that the distribution of UT complications is slightly rare, as the normal cases were the commonest (32.3%), while cystitis is the commonest UT abnormality in (28.1%), followed by renal cyst noticed (10.5%), followed by hydronephrosis (9.6%), while only 6 cases presented with renal stone(1.9%) (Figure 1). Some cases showed a combination of the UT changes, patients with hydronephrosis and renal cyst (2.2%), hydronephrosis

and cystitis (4.5%), hydronephrosis, and stone (1.3%). In other words, the most common UT complication was cystitis (44.1%) and renal cyst (23.6%), followed by (21.4%) hydronephrosis (Fig 1). All hydronephrosis cases (67 cases, 100%) were in the IPP grade III group, with a cutoff value of 14mm IPP (grade III), while 82.08% of them were in the severe LUTS group and treated surgically. this result is comparable to the findings of Huang *et al.*, who found IPP grade III to be a significant risk factor for the development of preoperative hydronephrosis and renal stone. The IPP cut-off point for the highest risk of these complications was 19.5mm [4].

Another result of this research is that a small prostate with normal volume can have an IPP which is abnormal.40 ml or less were mainly distributed in Grade I IPP and grade II IPP (23 cases out of 34 cases) (11 cases out of 34 cases), respectively (Table 2). Delin *et al.*, also showed the same result. The small prostate of 20 ml or less was mainly distributed in Grade I IPP, 20 ml to 40 ml prostate in Grade II, and>40 ml prostate in Grade III [5, 6].

Concerning to type of management, the result of this study showed that age, prostatic volume, IPP, and post- void residual urine volume all have a strong significant effect in determining which treatment is better, but the most effective factor in the management of patients (p-value = 0.000, CI = 95%), the post-void residual urine with the strongest factor with a mean difference between surgical and medical management were (-71.22 ml) with (p-value = 0.000, CI = 95%), followed by prostate volume the mean difference between surgical and medical management of PV were (-42.29 ml) with (p-value = 0.000, CI = 95%), followed by IPP the mean difference between surgical and medical management of IPP were (-19.82 mm) with (p-value = 0.000, CI = 95%) and least effective factor on management was the age of the patient (Table (2).

This result disagrees with the previous study and can be justified that in the hospitals where the data was collected, the sonographers and the doctors ware not depend on the IPP in diagnosing BOO and for treatment decisions either by medication or surgical. They are only based on the PV, regardless of IPP or PVR, the larger the volume, the highest the chance for surgical removal.

On the other hand, IPP for the prediction of surgical treatment was 28.799±7.06mm (95% CI: -21.577- -19.063). While PV for the prediction of surgical treatment was 99.695± 25.9 ml (95% CI: -48.898- -35.69). The narrow range of IPP makes it a stronger predictor for medical management.

Patients with IPP> 21.7 mm should be counseled regarding the high chance of the need for surgical treatment following acute urinary retention (Table 2). This result is comparable but different from the result of Rieken, who reported that the area under the curve of IPP for the prediction of BOO was found to range from 0.708 (95% CI: 0.615- 0.791) to 0.858 (95% CI: 0.809-0.908). Analysis of IPP may be regarded as a potential non-invasive alternative to standard PFS in the assessment of BOO. Patients with IPP> 10 mm should be counseled regarding the high chance of the need for surgical treatment following acute urinary retention [7].

Correlation between the IPP grade and type of management show that all patients who had surgical treatment (100%) were with IPP grade III. while for patients with IPP grades, I and II treatment with medication is the first line of management (Fig 2).

Correlation between the prostatic volume grade and type of management show that (54.79%) of patients with prostate volume (40 - 100 mm3) and (45.21%) of patients with prostate volume (more than 100 ml) were treated surgically, while patients with prostate volume (less than 40 ml) the definitive treatment was medication (Fig 3). This result agrees with multiple studies, Sigdel G and Keong Tatt Foo [8, 9] both researchers found that IPP is not only helpful in assessing the severity of LUTS but can help in the choice of appropriate treatment modality.

CONCLUSION

Using this algorithm for management of bladder outlet obstruction (BOO), patients can be classified according to the grade of IPP to predict obstruction and progression of the disease which is better than prostatic volume. The decision for further treatment can be estimated according to the degree of IPP. This is particularly important, especially in countries with limited resources.

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