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The Role of the Bladder Wall Thickness in the Evaluation of the Male Lower Urinary Tract Symptoms

FADY M. KAMEL, M.Sc.; MOHAMMED KANDIL, M.D. and MAGDY F. MANSOUR, M.D.

The Department of Urology, Faculty of Medicine, Ain Shams University

Abstract

Background: The lower urinary tract symptoms (LUTS) have become very common among adult men. They encompass a variety of storage, voiding, and post-micturition symptoms.

Aim of Study: To determine bladder wall thickness in healthy adult men in correlation with uro-flowmetry to assess its feasibility in diagnosing Bladder outlet obstruction (BOO) in male patients with lower urinary tract symptoms.

Patients and Methods: The present study was conducted on 75 patients with lower urinary tract symptoms and aging more than 18 years old, admitted through the outpatient clinic of Urology in Ain Shams University Hospitals and Ahmed Maher Teaching Hospital through the period from 1/2020 to 10/2020.

Results: Median of Bladder wall thickness (BWT) the non-obstructed patients is 2 (1.7-2.55) and range 1.4-6.5 and the median BWT in the obstructed patients is 7 (6-7.9) and range 2.5-8.8. We found that the cutoff value of 3.9mm for BWT (mainly detrusal) was found to be the best threshold value to distinguish patients with BOO from those without bladder outlet obstruction. The patients were divided into an outlet obstruction group and non-outlet obstruction according to their Qmax. The obstructed group is below Qmax 10 and the non-obstructed above Qmax 10.

Conclusion: USG measurements of BWTare useful in the diagnosisof symptomatic BOO. Moreover, the easy measurement of BWT, by suprapubic USG makes these parameters acceptable to bothpatients and physicians, and can be used for routine clinicalevaluation of patients with symptomatic BOO.

Key Words: *Bladder – Wall thickness – Male – Lower urinary tract – Symptoms.*

Introduction

THE etiology of LUTS is multifactorial and can be associated with pathology of the prostate (benign prostatic enlargement (BPE), prostatitis, urethral stricture, bladder detrusor under/over activity and kidney (nocturnal polyuria) **[1]**.

Correspondence to: Dr. Fady M. Kamel,
E-Mail: 7groupfady@gmail.com

In epidemiological studies, LUTS were present in 57.1% of men and 48% of women **[2]**. As populations continue to age, the prevalence and social impact of LUTS will progressively increase. Urodynamic studies (UDS) are the most definitive tests available to determine the etiology of voiding dysfunction. Although considered the current gold standard for the diagnosis of bladder outlet obstruction (BOO), but it is an invasive, expensive, and time-consuming procedure. The use of catheters in conventional UDS can cause discomfort to patients and is associated with a 19% risk of adverse events e.g. urinary retention, macroscopic hematuria or urinary tract infection **[3]**. It is also possible that the presence of a catheter in the urethra would influence the reproducibility of the patient's symptoms and theurodynamic readings, despite its small size. There are also cost issues and potential embarrassment to the patient. Hence, a number of non-invasive investigations have been developed. The goal is not to replace, but rather to provide alternatives that may better suit patients and the logistics of different environments (e.g. primary care centers, mobile or remote clinics). These innovations in healthcare enable us to expand our knowledge, modify clinical practice and provide better, more tailored service to patients. Bladder wall thickness (BWT) assessment has been shown to be promising substitutes for pressure flow study (PFS) to diagnose BOO, they are noninvasive, easy to perform, and less time-consuming than PFSs **[4]**.

Aim of the work:

The aim of this study is to determine bladder wall thickness in healthy adult men in correlation with uro-flowmetry to assess its feasibility in diagnosing Bladder outlet obstruction in male patients with lower urinary tract symptoms.

Patients and Methods

This was a cross sectional study, conducted on 75 male patients admitted through the outpatient clinic of Urology in Ain Shams University Hospitals and Ahmed Maher teaching hospital outpatient clinic through the period from January 2020 to October 2020.

Inclusion criteria:

The study included adult men patients (more than 18 years old) with lower urinary tract symptoms suggestive of BOO.

Exclusion criteria:

Patients having urologic surgery, patient with coagulopathy, Patient underwent previous open abdominal surgery, LUTS medications, Small bladder capacity (<150mL), Evident prostate carcinoma or bladder cancer or any other urinary tract malignancy, bladder stones, acute urinary infection, History of neurologic disease or neurologic deficit, any malignancy in the pelvic cavity, urological congenital disease, diabetes mellitus, drug abuse, general disease: Hematologic, cardiovascular, or psychological disorders, congenital disease, severe cardiac patients andpatients who refused to be participate in the study were excluded.

The patients gave their consent to be included in the study:

The patients were informed about the study and divided into obstructed and non-obstructed according to their Qmax in the uroflowmetry study.

Items of study included the following:

1- *History:* Taking the medical history of the patient and its duration.

The patient's history of the following: Irritative Symptoms (Frequency, Nocturia, Dysuria, urgency), obstructive Symptoms (Decreased force of urination, Urinary hesitancy, Intermittency, Post void dribbling, Straining), other urological history (renal pain, heamaturia, incontinence, urethral discharge, fever), other medical diseases and drug history and family and surgical history are taken. Clinical examination included both general local-examinations.

Bladder:

We examined the bladder by palpation and percussion. The bladder was palpated or percussed-when there is at least 150ml of urine in it. At a volume of about 500ml, the distended bladder becomes visible in thin patients asa lower midline abdominal mass.

We begin by percussing immediately above thesymphysis pubis and continue cephalad until there is a change inpitch from dull to resonant. Alternatively, in thinpatients we palpate the bladder by lifting the lumbarspine with one hand and pressing the other hand into the midlineof the lower abdomen.

Rectal and prostate examination:

We do Digital rectal examination (DRE) for all the patients. We begin by separating the buttocks and inspecting the anus for pathology. The gloved, lubricated index finger is then inserted gently into the anus. Estimation of anal sphincter tone is done; a flaccid or spastic anal sphincter suggests similar changes in the urinary sphincter. Then the finger is advanced to the knuckle without causing pain. The index finger is then sweep over the prostate; the entire posterior surface of the gland is examined. The prostate size, consistency, surface and any nodules are detected.

The index finger is extended as far as possible into the rectum, and the entire circumference is examined to detect an early rectal carcinoma. The index finger is then withdrawn gently.

Penis:

We examine the penis as following: If the patient has not been circumcised, the foreskin is retracted to examine for tumor or balanoposthitis.

The position of the urethral meatus is noted. The urethral meatus is separated between the thumb and the forefinger to inspect for neoplastic or inflammatory lesions within the fossa navicularis. The dorsal shaft of the penis is palpated for the presence of fibrotic plaques or ridges typical of Peyronie disease. Tenderness along the ventral aspect of the penis is suggesting periurethritis, which is often secondary to a urethral stricture.

Investigations focused on PSA, fasting blood sugar, renal function test, coagulation profile, Urine analysis and pelvi-abdominal ultrasound is done for all patients.

Bladder ultrasonography is performed with the patient supine and the sonographer on the patient's right side. Pelvic USG is carried out using BK medical, Flex Focus ultrasound diagnostic scanner (Herlev, Denmark) equipped with 3.5MHz abdominal probe Patients are advised to drink plenty of fluids prior to the evaluation, and the USG is performed when patients had a voiding urge or palpable full bladder. The bladder is scanned in a sagittal and transverse manner angling the probe into the pelvis so that the bladder can be visualized

beneath the pubic bone. The size and morphology of the prostate can be demonstrated.

Aside from routine USG, the following parameters are estimated and recorded: Bladder wall thickness (BWT) (mainly detrusor) (the distance measured from the bladder mucosa to the adventitia [mm]).

Uroflowmetry study:

We measure urine volume and flow rate during voiding through the uroflowmetry machine. We advise the patient to drink plenty of fluids prior to examination until he feels urge to micturate then he evacute his bladder in the position he is comfortable with, Qmax is regarded as the most useful indication of BOO, Owing to the dependence of Qmax on voided volume (Vvoid), this should be at least 125-150mL, and the patient given adequate privacy to maximise the chance of obtaining a representative measurement. We record the results of total volume, Qmax, flow time,voiding time, voiding delay and pattern of the curve. We do the test once or more if there is abnormal findings.

Statistical analysis:

Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 23. The quantitative data were presented as mean, standard deviations and ranges when parametric and median with inter-quartile range (IQR) when non parametric. Also qualitative variables were presented as number and percentages.

The comparison between groups regarding qualitative data was done by using Chi-square test and/or Fisher exact test when the expected count in any cell found less than 5.

The comparison between two independent groups with quantitative data and parametric distribution was done by using Independent *t*-test while with non-parametric distribution was done by using Mann-Whitney test.

Spearman correlation coefficients were used to assess the correlation between two quantitative parameters in the same group.

Receiver operating characteristic curve (ROC) was used to assess the best cut off point for BWT (dwt) (ml) as a predictor to differentiate between cases with bladder outlet obstruction and cases without bladder outlet obstruction according to uroflowmetry results with its sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and area under curve (AUC).

The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the *p*-value was considered significant as the following: *p*-value <0.05: Significant (S).

Results

Patients' age in the current study ranged from 18 to 85 years with mean±SD of 52.18±16.59. The patients were divided into an outlet obstruction group and non-outlet obstruction according to their Qmax. The obstructed group is below Qmax 10 and the non-obstructed above Qmax 10.

Table (1): Age and uroflowmetry results of the studied cases.

		Total No. = 75
Age	Mean ± SD Range	52.36±16.65 18-85
Qmax	Median (IQR) Range	9.3 (6.3-12.9) 2.4-27.1
Total volume	Median (IQR) Range	237.1 (153.1-360) 125-1052.1
Average flow rate	Median (IQR) Range	5.9 (4.5-8.5) 1.91-17.7
Acceleration	Median (IQR) Range	1.1 (0.3-2.2) 0.09-6.3
Time to max flow	Median (IQR) Range	12.1 (5.8-18.7) 2.2-249.3
Flow time	Median (IQR) Range	27.5 (22.1-42.7) 11.3-254
Voiding time	Median (IQR) Range	31.6 (22.2-47.7) 13.1-257.9
Voiding delay	Median (IQR) Range	14 (9.4-27.7) 2.3-438.5

Table (2): Ultrasound results of the studied cases.

		Total No. = 75
Prostate size	Median (IQR) Range	54 (33-80) 15-150
BWT (dwt) (ml)	Median (IQR) Range	4 (2-7) 1.4-8.8
PVR	Median (IQR) Range	60 (30-170) 5-450

The patients were divided into an outlet obstruction group and non-outlet obstruction according to their Qmax. The obstructed group is below Qmax 10 and the non-obstructed above Qmax 10.

Table (3): Incidence of bladder outlet obstruction among the studied cases according to uroflowmetry results.

Groups	Total No. = 75
Non bladder outlet obstruction	36 (48.0%)
Bladder outlet obstruction	39 (52.0%)

Table (4): Comparison between the studied groups regarding age of patients.

Age	Non bladder outlet obstruction No. = 36	Bladder outlet obstruction No. = 39	Test value	*p*-value	Sig.
Mean ± SD	46.69±15.50	57.59±16.12	–2.978•	0.004	HS
Range	18-70	22-85			

p-value >0.05: Non significant.
p-value <0.05: Significant.
p-value <0.01: Highly significant.
•: Independent *t*-test.

The previous table shows that there was a highly statistically significant difference between the non-bladder outlet obstruction and bladder outlet obstruction groups according mean age 46.16±15.73 and 57.62±15.60 respectively with *p*-value = 0.002.

The previous table shows that there was statistically significant difference found between non bladder outlet obstruction and bladder outlet obstruction groups regarding Q-max, average flow rate, acceleration, time to max flow, voiding time and voiding delay with *p*-value = <0.001, <0.001, <0.001, 0.016, 0.036 and 0.039 respectively while no statistically significant difference found between the two studied groups regarding total volume and flow time with *p*-value = 0.161 and 0.178.

The previous ROC curve shows that the best cut off point for BWT (dwt) (mm) as a predictor to differentiate between cases with bladder outlet obstruction and cases without bladder outlet obstruction was found >3.9mm with sensitivity of 92.86%, specificity of 84.21% and area under curve (AUC) of 94.5%.

Table (5): Comparison between the studied groups regarding uroflowmetry results.

	Non bladder outlet obstruction No. = 36	Bladder outlet obstruction No. = 39	Test value	*p*-value	Sig.
Qmax:					
Median (IQR)	13.15 (12.3-20.9)	6.3 (3.7-8.1)	–7.450	0.000	HS
Range	12.9-27.1	2.4-10			
Total volume:					
Median (IQR)	300.2 (163.9-407.2)	211.3 (150-342)	–1.401	0.161	NS
Range	127-1052.1	125-606.3			
Average flow rate:					
Median (IQR)	8.5 (6.8-14.1)	4.5 (2.4-5.3)	–7.275	0.000	HS
Range	5.8-17.7	1.91-6.1			
Acceleration:					
Median (IQR)	1.8 (1-3.9)	0.4 (0.2-1.4)	–4.741	0.000	HS
Range	0.3-6.3	0.09-2.4			
Time to max flow:					
Median (IQR)	7.1 (5.5-15.3)	14.6 (7.5-34.4)	–2.404	0.016	S
Range	2.2-177.1	2.5-249.3			
Flow time:					
Median (IQR)	25.2 (23.1-36.3)	36 (21.3-45.7)	–1.348	0.178	NS
Range	13.1-250	11.3-254			
Voiding time:					
Median (IQR)	26.7 (24.2-36.15)	39.7 (22.2-51.3)	–2.101	0.036	S
Range	13.1-234	16-257.9			
Voiding delay:					
Median (IQR)	14 (7.7-19.8)	21.9 (9.8-34)	–2.069	0.039	S
Range	3.8-29.1	2.3-438.5			

p-value >0.05: Non significant.
p-value <0.05: Significant.
p-value <0.01: Highly significant.
•: Independent *t*-test.
: Mann-Whitney test.

Table (6): Comparison between the studied groups regarding ultrasound results.

	Non bladder outlet obstruction No. = 36	Bladder outlet obstruction No. = 39	Test value	*p*-value	Sig.
Prostate size:					
Median (IQR)	33 (25-46)	80 (60-90)	–1.805	0.071	NS
Range	15-88	25-100			
BWT (dwt) (mm):					
Median (IQR)	2 (1.7-2.55)	7 (6-7.9)	–7.197	0.000	HS
Range	1.4-6.5	2.5-8.8			
PVR:					
Median (IQR)	32.5 (20-60)	170 (35-220)	–4.568	0.000	HS
Range	5-100	15-450			

p-value >0.05: Non significant. *p*-value <0.01: Highly significant.
p-value <0.05: Significant. : Mann-Whitney test.

Table (7): Correlation of BWT (dwt) (mm) with uroflowmetry results and ultrasound results.

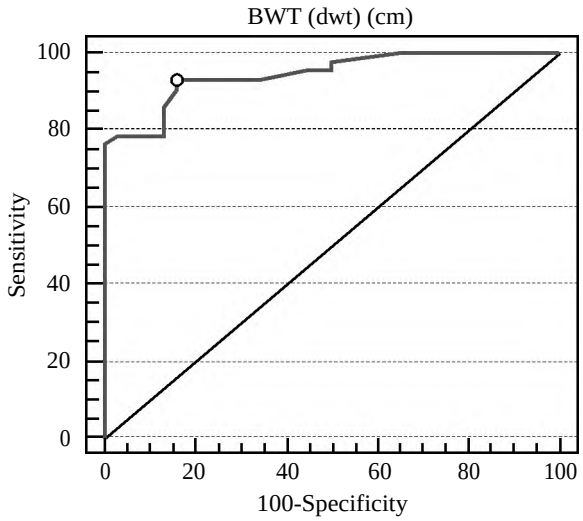
	Prostate size	
	r	*p*-value
BWT (dwt)	0.677	0.000
PVR	0.725	0.000
Age	0.586	0.000
Qmax	–0.606	0.000
Total volume	0.006	0.959
Average flow rate	–0.411	0.000
Acceleration	–0.581	0.000
Time to max flow	0.356	0.002
Flow time	0.249	0.031
Voiding time	0.345	0.002
Voiding delay	–0.049	0.679

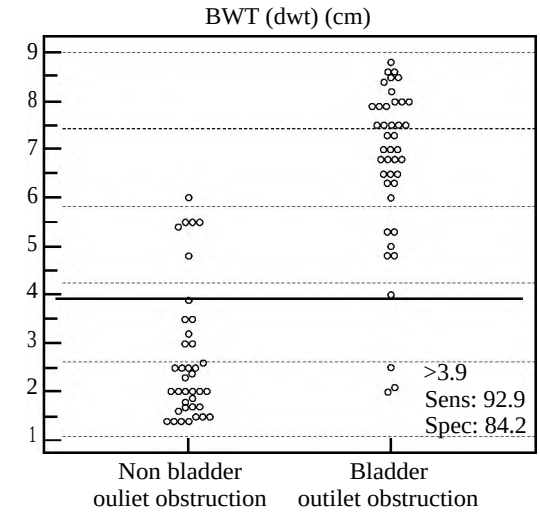
p-value >0.05: Non significant. *p*-value <0.01: Highly significant.
p-value <0.05: Significant. Spearman correlation coefficient.

Table (8): Correlation of PVR with uroflowmetry results.

	PVR	
	r	*p*-value
Prostate size	0.725	0.000
BWT (dwt)	0.516	0.000
Age	0.300	0.009
Qmax	–0.468	0.000
Total volume	–0.042	0.718
Average flow rate	–0.247	0.033
Acceleration	–0.335	0.003
Time to max flow	0.140	0.230
Flow time	0.037	0.750
Voiding time	0.082	0.485
Voiding delay	–0.321	0.005

p-value >0.05: Non significant. *p*-value <0.01: Highly significant.
p-value <0.05: Significant. Spearman correlation coefficient.





	Cut off point	AUC	Sensitivity	Specificity	PPV	NPV
BWT (dwt)	>3.9	0.945	92.86	84.21	86.7	91.4

AUC: Area under curve. PPV: Positive predictive value. NPV: Negative predictive value.

Fig. (1): Receiver operating characteristic (ROC) curve for BWT (dwt) (mm) as a predictor to differentiate between cases with bladder outlet obstruction and cases without bladder outlet obstruction.

Discussion

In our study, the age of the patients ranged from 18 and 80 years with a mean of 52 years. Oelke and associates conducted a study including 160 men between 40 and 89 years (median 62) [5]. While Guzel and coworkers study's mean age was 62.5 (39-77) years [6]. Ahmed and Bedewi [7] study's median age is 65 (55-70).

We divided the patients into bladder outlet obstruction patients 39 (52%) and non-bladder outlet obstruction patients 36 (48%). We found that Median of BWT the non-obstructed patients is 2 (1.7-2.55) and range 1.4-6.5 and the median BWT in the obstructed patients is 7 (6-7.9) and range 2.5-8.8. we found that The cutoff value of 3.9mm for BWT (mainly detrusal) was found to be the best threshold value to distinguish patients with BOO from those without BOO.

In the study of Güzeland colleagues [6], the mean BWT was 3.8 (1.4-8.7) mm. A positive correlation was found between BWT and PVR and duration of LUTS, whereas a negative correlation was found between BWT and Qmax. BWT was 2.9mm in patients without BOO parameters whereas BWT was 3.5, 4.1, and 4.5mm in patients with any one, any two, and all parameters of BOO, as the number of poor indicators in BOO rose BWT increased about 4.5mm. When they evaluated the patients with IPSS >19, Qmax <15mL/min, and PVR >100cm^3 individually, they cannot give a number of patients with obstruction because not all patients were evaluated urodynamically. However, if the patients with all 3 parameters were accepted as obstructed, according to the ROC analysis. BWT cut-off value was detected as 3.25mm the mean Qmax 13.7 (2-50) mL/s the mean PVR was 89.9 (0-570) mL [6]. While in our study, the mean of Qmax is 9.3 (6.3-12.9) and ranges 2.4-27.1 and the mean PVR is 60 (30-170) and ranges 5-450.

Oelke and his team [5], in their study that included 160 patients,have investigated the correlation between detrusor wallthickness (DWT), uroflowmetry (Qmax, Qave), PVR,and the role of prostatic volume in the evaluation ofBOO and they have compared the results with voidingcystometry. The voiding cystometry study showed thatDWT was better if compared to other diagnostic tests betweenthe groups with obstruction or without obstruction. DWT >2mm was the best predictor value for BOO [5].

However, Kessler and his colleagues have found that DWT >2.9mm had positive predictive value [8].

While Ahmed and Bedewistudy conducted 157 patients. Of these, 48 (30.57%) had BOO and 109 (69.43%) did not. Bladder wall thickness (BWT) the optimal cutoff values distinguishing patients with BOO were BWT of 3.7mm and the median Qmax was 10.8 (9-10.8) as total, 10.8 (8.8-11.8) for BOO group and 16 (14-17) for Non-BOO Group. The median PVR was 36 (0-60) [7].

Chan et al., [9] (3.5mm) 37 patients were included: 17 had BOO and 20 had no BOO. Measurements of bladder wall of patients with BOO were significantly thicker than that without BOO at all bladder volumes. (0.515cm vs 0.382cm at 100mL, 0.395cm vs 0.293cm at 200mL, 0.351 cm vs 0.258cm at 300mL) Exploration of test efficiency identified 0.35cm to be the optimal cutoff value, with higher accuracy at larger bladder volume. BWT appeared to correlate well with BOO. They established an optimal cut-off value of 0.35cm. Measurement of BWT can be incorporated into the initial assessment for male LUTS.

In our study, USG was performed when patients had a sense of bladder fullness (the routine protocol for pelvic USG) or palpable full bladder, and a cutoff value of 3.9mm for BWT was found to be the optimal cutoff value to distinguish BOO from non-BOO by the correlation of the Qmax.

Conclusion:

USG measurements of BWTis useful in the diagnosisof symptomatic BOO. Moreover, the easy measurement of BWT, by suprapubic USG makes these parameters acceptable to bothpatients and physicians, and can be used for routine clinicalevaluation of patients with symptomatic BOO.

References

1- SEXTON C.C., COYNE K.S., KOPP Z.S., IRWIN D.E., MILSOM I., AIYER L.P., et al.: The overlap of storage, voiding and postmicturition symptoms and implications for treatment seeking in the USA, UK and Sweden: Epi LUTS. BJU Int., 103 (Suppl 3): 12e23, 2009.

2- OELKE M., BACHMANN A., DESCAZEAUD A., EMBERTON M., GRAVAS S., MICHEL M.C., et al.: Guidelines on the management of male lower urinary tract symptoms (LUTS), including benign prostatic obstruction (BPO). In: EAU guidelines, edition presented at the 27 th EAU Annual Congress, Paris 2012, 2012.

3- NITTI V.: Pressure flow urodynamic studies: The gold standard for diagnosing bladder outlet obstruction. Rev. Urol., 7 (Suppl 6): S14-21, 2005.

4- MANGAT R., HENRY S.S. and TRICIA L.C.: Non-invasive evaluation of lower urinary tract symptoms (LUTS) in men Asian Journal of Urology, 5: 42e47, 2018.

5- OELKE M., H¤OFNER K., JONAS U., et al.: Diagnostic accuracy of noninvasive tests to evaluate bladder outlet obstruction in men: Detrusor wall thickness, uroflowmetry, postvoid residual urine, and prostate volume. Eur. Urol., 52: 827-834, 2007.

6- GÜZEL Ö., ASLAN Y., BALCı M., TUNCEL A., KETEN T., ERKAN A. and ATAN A.: Can bladder wall thickness measurement be used for detecting bladder outlet obstruction?. Urology, 86 (3): 439-44, 2015.

7- AHMED A.F. and BEDEWI M.: Can bladder and prostate sonomorphology be used for detecting bladder outlet obstruction in patients with symptomatic benign prostatic hyperplasia?. Urology, 98: 126-31, 2016.

8- KESSLER T.M., GERBER R., BURKHARD F.C., et al.: Ultrasound assessment of detrusor thickness in men-can it predict bladder outlet obstruction and replace pressure flow study? J. Urol., 175: 2170-2173, 2006.

9- CHAN T.C., KAN R.W., LI T.C., NG C.M., KAN C.F., KAM Y.C., HUI P.Y., TO H.C., NGAI H.Y. and AU W.H.: The role of bladder wall thickness in the evaluation of male lower urinary tract symptoms. In BJU International, 123: 4-4, 2019.

دراسة دور سمك جدار المثانة فى تقييم أعراض السبيل البولى السفلى عند الذكور

المقدمة: أصبحت أعراض المسالك البولية السفلية شائعة جداً بين الرجال البالغين. وهى تشمل مجموعة متنوعة من أعراض الاحتباس والإفراغ وما بعد التبول.

الهدف من الدراسة: تهدف هذه الدراسة إلى تحديد سمك جدار المثانة لدى الرجال البالغين الأصحاء بالارتباط مع قياس تدفق البول لتقييم جدواه فى تشخيص انسداد المجرى البولى السفلى والمثانة فى المرضى الذكور الذين يعانون من أعراض المسالك البولية السفلية.

المرضى وطرق البحث: أجريت هذه الدراسة على ٧٥ مريض يعانون من أعراض المسالك البولية السفلية وكبار السن فوق ١٨ سنة، تم قبولهم من خلال العيادة الخارجية لجراحة المسالك البولية فى مستشفيات جامعة عين شمس ومستشفى أحمد ماهر التعليمى خلال الفترة من ٢٠٢٠/١ إلى ٢٠٢٠/١٠.

النتائج: متوسط سمك جدار المثانة للمرض غير المعو قين هو ٢ (١.٧–٢.٥٥) والمدى ١.٤–٦.٥ ومتوسط سمك جدار المثانة فى المرضى الذين يعانون من الانسداد هو ٧ (٦–٧.٩) والمدى ٢.٥–٨.٨. وجدنا أن قيمة الفصل البالغة ٣.٩ مم لسمك جدار المثانة (والعضلة الدافعة للبول بشكل أساسى) هى أفضل قيمة أولية لتمييز المرضى الذين يعانون من انسداد المجرى البولى السفلى والمثانة عن أولئك الذين لا يعانون من انسداد مخرج المثانة. تم تقسيم المرضى إلى مجموعة انسداد مخرج وانسداد غير مخرج حسب ١٠ Qmax. المجموعة المسدودة أقل من والمجموعة غير المسدودة فوق ١٠ Qmax.

الاستنتاج: تُعد قياسات سمك جدار المثانة من خلال التصوير بالموجات فوق الصوتية مفيدة فى تشخيص انسداد المجرى البولى السفلى والمثانة المصاحب للأعراض. علاوة على ذلك، فإن القياس السهل لسمك جدار المثانة، بواسطة الموجات فوق الصوتية فوق العانة يجعل هذه المؤشرات مقبو لة لكل من المرضى والأطباء ،ويمكن استخدامها للتقييم الإكلينيكى الروتينى للمرضى الذين يعانون من أعراض انسداد المجرى البولى السفلى والمثانة.