UIJ UroToday International Journal®

www.urotodayinternationaljournal.com
Volume 3 - August 2010

Value of Office-Based Transrectal Three-Dimensional Ultrasound for Diagnosis of Acute Dysuria of the Prostatic Urethra

Salah Elwagdy,[1] Reda Ramadan,[1] Khaled A-Fatah,[2] Ehab Adel,[3] Maged Shokeir[3]
[1]Department of Uroradiology, [2]Department of Urosurgery, and [3]Department of Radiology, Azhar University, Cairo, Egypt
Submitted May 15, 2010 - Accepted for Publication July 5, 2010

ABSTRACT

INTRODUCTION: The purpose of the study was to compare the accuracy of plain radiography, 2-dimensional (2D), and 3-dimensional (3D) transrectal ultrasound (TRUS) in diagnosing the causes of acute dysuria, as confirmed by urethroscopy or laboratory findings.

METHODS: Participants were 122 men with clinical presentation of acute dysuria who were previously known to be healthy. Their mean age was 28 years (range, 17-49 years). All patients received a plain radiograph of the urinary tract. A SonoAce X8 ultrasound system (Medison America Inc; Cypress, CA, USA) was used to obtain both 2D and 3D TRUS. Voiding-related symptoms, cause of the dysuria, location, and morphology of the lesions were recorded. The results of the plain radiograph, 2D TRUS, and 3D TRUS were compared with the results of urethroscopy or laboratory findings to determine diagnostic accuracy.

RESULTS: Of the total 122 patients, 113 patients (92.6%) had calcular obstruction of the prostatic urethra; 7 patients (5.7%) had variants of severe urethritis; 2 patients (1.6%) had benign urethral polyps. In cases of calcular obstruction, plain radiography revealed 76.7% of radiopaque stones, the 2D TRUS revealed 80.2% of stones, and the 3D TRUS with high threshold revealed 99.1%. Both 2D TRUS and 3D TRUS with low-threshold technique revealed the polyps and accurately defined their pattern and site. Three-dimensional TRUS descriptions of inflammatory lesions and their effect on periurethral tissues were dissimilar from each other and suggestive of different types.

CONCLUSION: Three-dimensional TRUS imaging may play an important role in the pretreatment evaluation of acute dysuria that is caused by different impeding factors.

INTRODUCTION

Conventional contrast-enhanced imaging studies, including retrograde urethrography and voiding cystourethrography, have long been used to demonstrate urethral lesions. Because contrast radiological examination is always imperfect unless reliable voiding films are obtained, the procedure seems impractical for analysis of acute severe voiding symptoms [1-3]. Magnetic resonance imaging (MRI) can provide anatomic details and the orientation of the urethral lesion [4]; however, it is seldom used in urgent urologic situations.

KEYWORDS: Three-dimensional transrectal ultrasound (3D TRUS); Prostatic urethra; acute dysuria

CORRESPONDENCE: Salah Elwagdy, MD, Department of Uroradiology, Azhar University, 133 Shubra Street, Dawaran Shubra, Cairo, 11242, Egypt (salah_elwagdy@yahoo.com).

CITATION: *UroToday Int J*. 2010 Aug;3(4). doi:10.3834/uij.1944-5784.2010.08.16

Abbreviations and Acronyms
2D = 2-dimensional
3D = 3-dimensional
E. coli = *Escherichia coli*
ROI = region of interest
TRUS = transrectal ultrasound
US = ultrasound

The appeal of sonography lies in the fact that it is noninvasive, cost-effective, and easily adapted to routine office use. Many previous reports have explained the role of conventional 2-dimensional transrectal ultrasound (2D TRUS) in the demonstration of prostatic urethral lesions that impede proper voiding. However, the 2D TRUS image contains many small speckles (artifacts), so that the image parts and minute details of anatomy are not definite [5,6]. There is ongoing need for technical upgrade that is more precise than TRUS alone. In particular, there is a need to find a diagnostic modality capable of precise exploration of the prostatic urethra, which is the site that is most responsible for acute dysuria [7-10].

Because of its multiplanar capability, interactive image speckle removal, dynamic scale of enhancement, and three-dimensional (3D) orientation of subtle lesions, 3D ultrasound (3D US) provides better anatomical and pathological details than conventional ultrasound [4,5]. 3D TRUS is well suited for viewing the full range of the prostate gland and prostatic urethra, because it can cover a wide range in 3 directions: X, Y, and Z. Furthermore, the technology results in a standardized display, which reduces the operator dependency and technical difficulty of conventional 2D TRUS [11].

With 3D TRUS, the urethra can be visualized along its course, which is best evaluated in sagittal plane. To reveal the detailed anatomy of the prostatic urethra, the investigator obtains the region of interest (ROI) active line along its anatomical pathway, guided by the orthogonal planes. In this way, the prostatic urethra and its ventral curvature can easily be viewed at rest and during micturition [11].

3D TRUS is commonly used for guided prostate biopsy. Its value in imaging conditions that abruptly impede the urethral lumen in men is not well investigated. The purpose of the present study was to compare the accuracy of plain radiography, 2D TRUS, and 3D TRUS in diagnosing the causes of acute dysuria, as confirmed by urethroscopy or laboratory findings.

METHODS

The study was a prospective evaluation of patients receiving 3 primary diagnostic procedures. The protocol was formally approved by the local ethics committee; written informed consent was waived because the investigations were part of routine clinical testing.

Participants

The participants were 122 men with clinical presentation of acute dysuria who were previously known to be healthy. Their mean age was 28 years (range, 17-49 years). The patients were referred from the emergency room to the outpatient Urology Department, Azhar Faculty of Medicine, University Hospital, Cairo, Egypt during September, 2009. Patients with previous urinary symptoms, chronic micturition problems such as isolated senile prostatic hyperplasia, chronic urethral stricture, abnormally placed urethral meatus, phimosis, or urethral diverticulum were excluded from the study.

Procedures

As part of routine clinical testing, all patients received a plain radiograph of the urinary tract, urine analysis with culture and sensitivity, estimation of random blood sugar, and renal function analysis. Estimation of postvoid residual urine (PVR) was measured via transabdominal US.

Each patient underwent conventional 2D TRUS screening using an endocavitary mechanical sweep probe (5-9 MHz), followed by 3D TRUS volume acquisition. A SonoAce X8 ultrasound system (Medison America Inc; Cypress, CA, USA) networked to a personal computer installed with Medison Sonoview Pro software: version 5.05.01 was used. The system is capable of both conventional 2D and 3D US assessment. The complete test did not exceed 10 min for each patient.

The urinary bladder and entire prostate was visualized for every patient in a single 3D volume. Manipulations and interpretations of volumes were made once they were stored. Surface rendering along the anatomical location of the bladder neck and the prostatic urethra was primarily performed for each patient. Then, threshold factors and gamma correction levels were adjusted according to the nature of the obstruction, usually until the best views of the lesions were obtained. Threshold factors were frequently obtained at high threshold levels in cases with calcular lesions and low threshold levels to visualize the prostatic urethra and periurethral regions in cases with noncalcular lesions. When calcular obstruction was seen, distal acoustic shadowing could be prevented by manipulating the ROI.

Voiding-related symptoms such as dysuria, urinary frequency, urge, painful pressure in the genital area, and suprapubic discomfort were recorded for all patients. The results of the plain radiograph, 2D TRUS, and 3D TRUS were compared with the results of urethroscopy or laboratory findings to determine diagnostic accuracy. The number of patients correctly diagnosed by each method were tabled and described.

RESULTS

Table 1 contains the results of the voiding-related symptoms and signs demonstrated by all participants. Four patients

Table 1. Results of the Voiding-Related Symptoms and Signs Demonstrated by all Participants (N = 122).
doi: 10.3834/uij.1944-5784.2010.08.16t1

Symptom or Sign	n	%N
Dysuria and frequency	118	96.7
Postvoid residual < 100 mL	113	92.6
Postvoid residual > 100 mL	5	4.1
Urinary retention	4	3.3
Initial hematuria	2	1.6
Fever	5	4.1
Low back pain[a]	1	0.8
Painful digital examination[a]	1	0.8
Fluctuation area in prostate[a]	1	0.8
Purulent urethral discharge	7	5.7
Positive urine culture	7	5.7
Diabetes mellitus	1	0.8

[a]Symptom related to a single case with prostatic abscesses

developed urinary retention; 3 of these patients had urethral calculi (2 with multiple stones) and 1 developed prostatic abscesses. One patient had diabetes mellitus.

Table 2 contains the location and morphologic characteristics of the lesions as demonstrated by the 3D-TRUS examination for all patients. Of the total 122 patients, 113 patients (92.6%) had calcular obstruction of the prostatic urethra; 7 patients (5.7%) had variants of severe urethritis: 5 of these patients had sexually transmitted urethritis, 1 had urinary tract tuberculosis, and 1 patient with diabetes mellitus had nonvenereal *Escherichia coli* (*E.coli*) urethritis; finally, 2 patients (1.6%) had benign urethral polyps. Calcular location was described relative to the verumontanum (opposite, proximal, or distal). Approximately 62.5% of the stones were composed of calcium oxalate. Less commonly, some stones were mainly of urate and calcium phosphate, according to the laboratory reports.

Table 3 contains the number of patients that were accurately diagnosed by plain radiography, conventional 2D TRUS, and 3D TRUS, as confirmed by urethroscopy or laboratory findings. In cases of calcular obstruction of the prostatic urethra, plain radiography revealed 76.7% of radiopaque stones, the 2D TRUS

Table 2. Location and Morphologic Characteristics of the Lesions Causing Acute Dysuria, as Demonstrated by 3-Dimensional Transrectal Ultrasound for all Patients (N = 122). doi: 10.3834/uij.1944-5784.2010.08.16t2

Etiology	3D TRUS Features		n	%n
Calcular (No. stones = 116) (n = 113)	Location	Proximal to verumontanum Opposite verumontanum Distal to verumontanum	26 78 12	22.4 67.2 10.3
	Count	Solitary Multiple	111 5	95.7 4.4
	Size	< 1 cm > 1 cm	79 37	68.1 31.9
	Shape	Pyramidal Ovoid Shapeless	9 96 11	77.6 82.8 9.5
	Surface	Speculated Smooth	26 90	22.4 77.6
Urethritis (n = 117)	Venereal	Thickened mucosal margins Extension into seminal ducts Multiple periurethral cavities	5 4 1	71.4 57.1 14.3
	Nonvenereal	Thickened mucosal margins Prominent verumontanum	2 2	14.3 28.6
Urethral polyp (n = 2)	Polyps	Well-defined Pedunculated	2	100

Table 3. The Number of Patients Accurately Diagnosed by Plain Radiography, Conventional 2D TRUS, and 3D TRUS, as Confirmed by Urethroscopy or Laboratory Findings (n = 116; N = 122).. doi: 10.3834/uij.1944-5784.2010.08.16t3

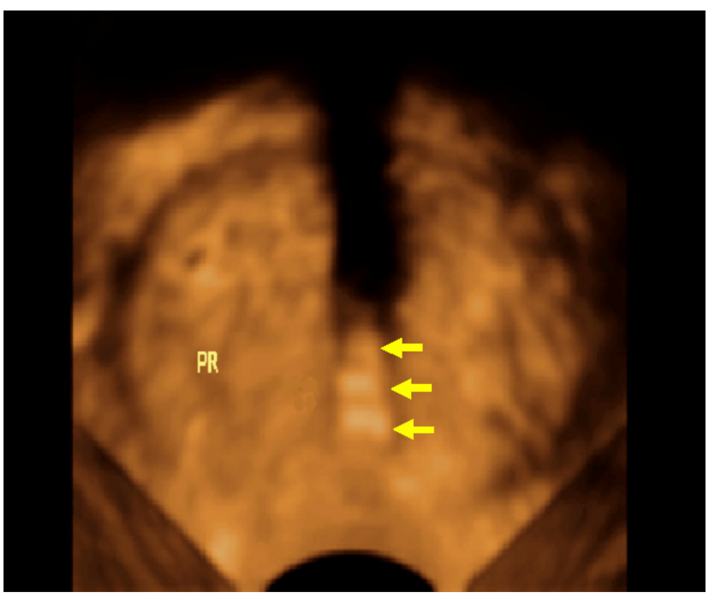
Type of Test	Calcular (n = 116)	%n	Urethral Polyps (n = 2)	%n	Urethritis (n = 7)	%n
Plain radiography	89	76.7				
2D TRUS ± voiding	93	80.2	2	100	1[a]	14.3
3D TRUS ± voiding	115	99.1	2	100	7	100
Urethroscopy	116	100	2	100		

[a]One case associated with prostatic abcesses

revealed 80.2% of stones, and the 3D TRUS with high threshold revealed 99.1% of stones. The 3D TRUS also helped to identify the calcular location, count, alignment, shape, and dimensions (Figure 1). The Magi-cut mode was useful for demonstrating the alignment and shape of the stones within the prostatic urethra for 3 cases (Figure 2).

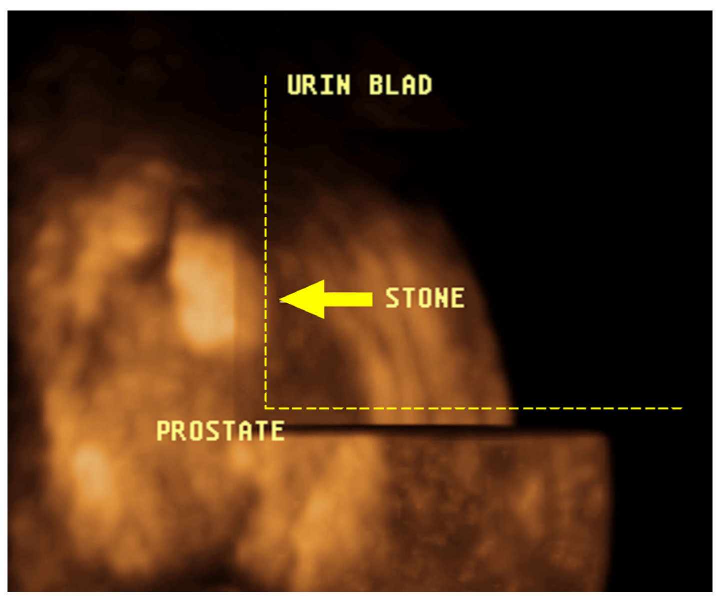
Two patients had noncalcular etiologies of benign urethral polyps. Both 2D TRUS and 3D TRUS with low threshold technique showed the polyps and accurately defined their pattern and site. One of the polyps was found high on the posterior surface of the posterior urethra, very close to the bladder neck; the other polyp originated about 2 cm from the vesicourethral junction. 3D TRUS descriptions were consistent with urethroscopy and showed well-defined, narrow-pedicle structures with relatively high marginal echo intensities and central cores of low echoes. In addition, live 3D imaging during micturition revealed the dynamic nature of these polyps; urge urethral obstruction was seen during voiding (Figure 3). The pathological study revealed that each polyp consisted of a fibrovascular core covered with a

Figure 1. High-Threshold 3D-TRUS Image in Coronal Plane Showing Succession of Three Stones (arrows) in Coronal Plane Within the Distal Portion of the Prostatic Urethra. doi: 10.3834/uij.1944-5784.2010.08.16f1



Abbreviation: PR, prostate

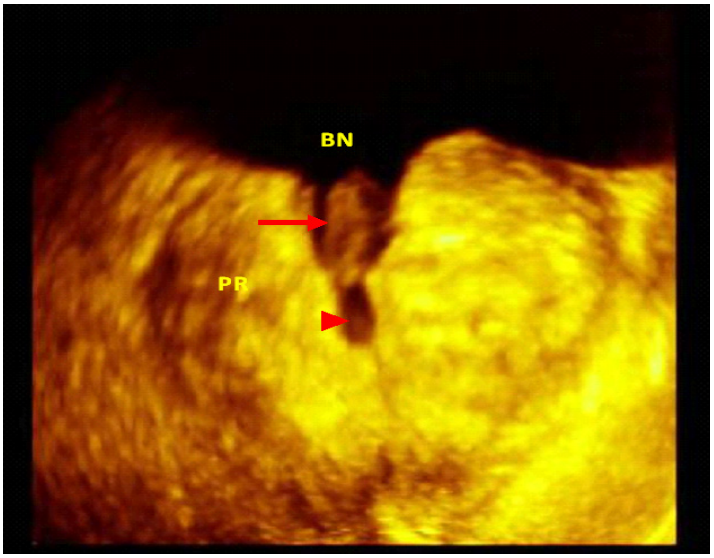
Figure 2. High-Threshold 3D-TRUS Image in Coronal Plane Showing a Solitary, Large, Shapeless Stone (arrow) Within the Limits of the Proximal Portion of the Prostatic Urethra. doi: 10.3834/uij.1944-5784.2010.08.16f2



Removal of unnecessary portion of the prostate by Magi-cut mode (dashed lines) revealed the longitudinal alignment of the stone.
Abbreviation: URIN, urinary bladder.

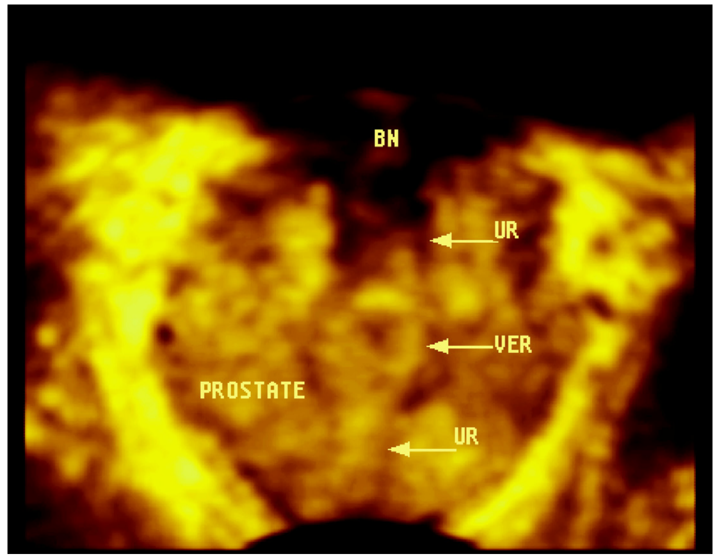
UIJ UroToday International Journal®
original study
Salah Elwagdy, Reda Ramadan, Khaled A-Fatah,
Ehab Adel, Maged Shokeir
www.urotodayinternationaljournal.com

Figure 3. Low-Threshold 3D-TRUS Image Showing Solitary Benign Pedunculated Urethral Polyp (arrow) Within the Prostatic Urethra (arrowhead) During Micturition.
doi: 10.3834/uij.1944-5784.2010.08.16f3



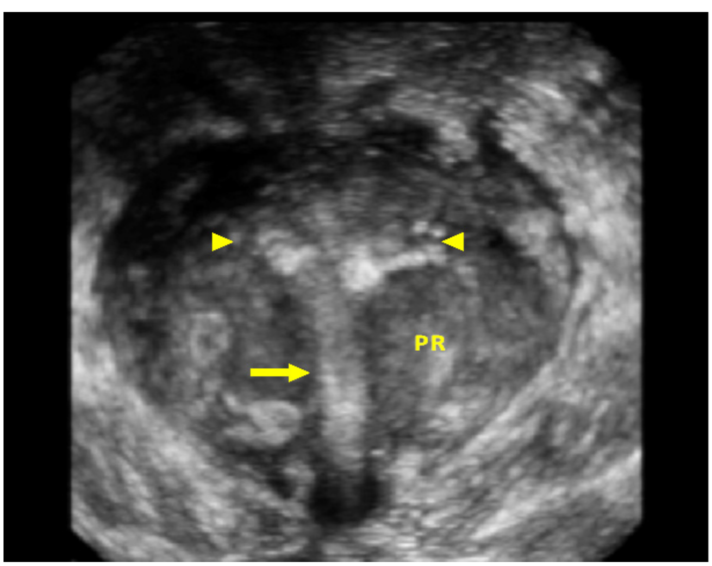
The bladder neck is wide.
Abbreviations: BN, bladder neck; PR, prostate.

Figure 5. Low-Threshold 3D-TRUS Image of the Prostate Gland Showing the Prostatic Urethra (UR arrow) With Thickened Fluffy Margins and Prominence of Verumontanum (VER-arrow) Characteristic of Urethritis from *Escherichia coli*. doi: 10.3834/uij.1944-5784.2010.08.16f5



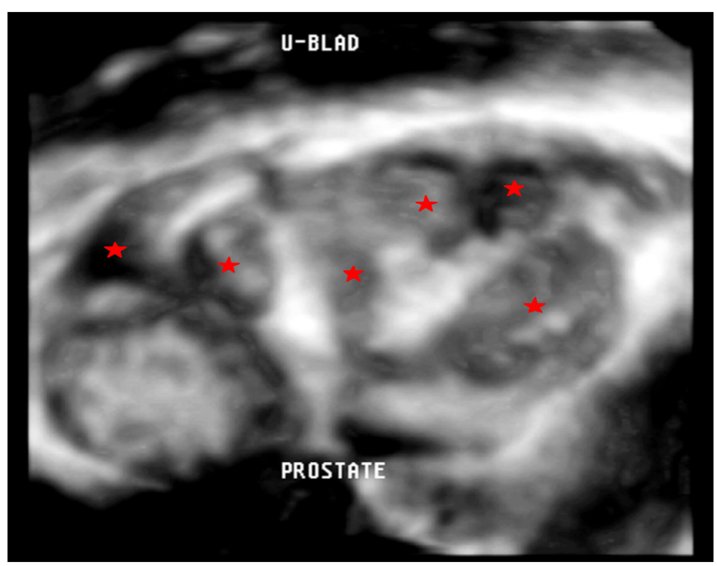
Abbreviations: BN, bladder neck; UR, urethra; VER, verumontanum

Figure 4. Low-Threshold 3D-TRUS Image of the Prostate Gland Showing the Prostatic Urethra (arrow) With Thickened Fluffy Echogenic Margins and Extension of Inflammation Into the Seminal Ducts (arrowheads) Characteristic of Venereal Urethritis.
doi: 10.3834/uij.1944-5784.2010.08.16f4



Abbreviation: PR, prostate gland

Figure 6. Low-Threshold 3D-TRUS Image in Coronal Plane Demonstrating Multiple Abscesses (stars) Involving Nearly the Entire Prostatic Gland.
doi: 10.3834/uij.1944-5784.2010.08.16f6



Abbreviation: U-BLAD, urinary bladder

double-layered, prostatic-type epithelium.

For the 7 patients with urethritis, 3D TRUS was a useful adjunct to urine analysis and culture. Its low threshold factors exposed diffuse thickening and increased echo-intensity of the urethral mucosal line. Prominence and bright intensity of the prostatic seminal ducts was considered a noteworthy feature in venereal disease (Figure 4). Fluffy prominence of the verumontanum was noticed in 2 patients and considered an indicator of severity because these patients had more symptoms than others; 1 patient had *E. coli* (Figure 5) and the second had tuberculosis. The most noteworthy observations for prostatic abscesses were distortion of the anatomy of the prostate gland the presence of multiple hypoechogenic areas of several sizes permeated by hyperechogenic areas (Figure 6).

DISCUSSION

Patients were chosen for this study when they were in an acute stage of dysuria in the emergency room. The purpose of choosing these patients was to determine the best method for early, accurate diagnosis. It was understood that there would be some patients who would continue to have symptoms of frequency and urgency as they passed into their daily life. Some of the impeding etiologies in the present study are rarely seen; however, it is important to be able to differentiate these unusual cases from those with more common etiologies in order to determine the best possible management.

3D TRUS had the highest percentage of accuracy among the diagnostic approaches tested. Using the 3D TRUS test with proper 3D factors provided the best spatial resolution to demonstrate the prostatic urethra and the periurethral prostatic parenchyma. The reasons for higher accuracy with 3D TRUS are: (1) it has the capacity to remove speckles and enhance the image, resulting in disclosure of subtle lesions; these features eliminate debate surrounding the poorer quality image of conventional TRUS and sometimes eliminate the need for further diagnostic tests; (2) it uses advanced image processing algorithms that provide 3D measurements of stones, with identification of their shapes and alignments. This diagnostic method has additional benefits of being noninvasive, cost-effective, and easy to use. It also provides immediate results.

Plain films of the abdomen and pelvis were used in all cases of the present study, despite including radiolucent stones (21.2%); this could have affected the outcome of the film imaging method. On the whole, 3D TRUS imaging proved helpful for calcular visualization, three-plane stone measurements, and stone count (specifically when there were multiple stones in the same patient). Thus, 3D TRUS provided information that was a significant help in determining the management protocol. Furthermore, the distal acoustic shadowing that usually impedes visualization of calcular shape and alignment in conventional ultrasound was not present.

The verumontanum was used as a landmark for localization because it can be easily demonstrated by 3D TRUS. The authors could not find previous reports that used this method of localization. Nevertheless, they could not define specific factors that provided sufficient evidence for persistence of stones within the limits of the prostatic urethra. They believe that the persistence may be due to either a solitary large stone, speculated stone, or a succession of multiple small stones, which might abort the micturition dynamics to forcibly push them. The 3D TRUS method provided information that was helpful in determining the management protocol. The authors' results in large stone extraction are exceeding the success rates of previous studies [12-14], and they believe that this may be due to accurate description of the impeding stones through 3D TRUS.

Benign fibroepithelial polyps of the posterior urethra caused obstructive symptoms in 2 of the present patients. The rarity of the disease is illustrated by the fact that only 37 cases have been reported in 130 years, including all age groups and both genders; most of these 37 cases were in the pediatric age group and are believed to be of congenital origin [15]. At any one time, the polyp might be in motion with the urine stream and induce urethral blockage and painful micturition [15-19]. The 3D TRUS proved useful for live demonstration of the dynamic nature of these polyps by showing urge urethral obstruction during voiding. This observation was important for planning management.

The diagnosis of male urethritis is mainly performed by microbiological examination [20-23]. However, the authors believe that knowledge of typical symptoms might help to distinguish each type. Patients in the present study presented with severe symptoms, such as moderate or profuse and cloudy or purulent urethral discharge marked by severe dysuria. *Candida*, gonorrhea, *Mycobacterium tuberculosis* and *E. coli* were found. Sending material (eg, pus, urine, blood, and/or a fragment of the prostate) to culture was important in identifying the etiologic agent. The primary diagnosis was confirmed by the laboratory investigation in the inflammatory group of acute dysuria. However, specific features on the 3D TRUS images were dissimilar from other etiologies and suggestive of each type. The present patients presented a mean age comparable to that found in other literature [20-26]. Nevertheless, the lower prevalence of *E. coli* observed in

doi:10.3834/uij.1944-5784.2010.08.16
ISSN 1944-5792 (print), ISSN 1944-5784 (online)

UIJ UroToday International Journal®
original study
Salah Elwagdy, Reda Ramadan, Khaled A-Fatah,
Ehab Adel, Maged Shokeir
www.urotodayinternationaljournal.com

this series is not similar to the findings in previous literature [20,21], indicating that *E. coli* is not the most prevalent bacteria in Egyptian men with urethritis.

Although conventional imaging studies do not have a major role in evaluation of urethral or periurethral inflammation [23], 3D TRUS imaging provided information regarding the orientation of the urethra and periurethral tissues, specifically the degree of involvement of periurethral seminal ducts. This information proved characteristic in cases caused by venereal disease and helpful for proper management. It might also be significant in prevention of infertility following such instances [27,28].

Most published data about prostatic abscess are case reports, and there is no standardization of the diagnostic and therapeutic routine [29,30]. In the present collection, only 1 case was reported. The characteristics of this case suggest that the diagnosis of prostatic abscess should be considered for patients presenting with fever, severe back pain, and persistent irritative voiding symptoms that are progressing to urinary retention.

Not all cases with acute painful micturition are due to sudden-onset urethral impediment; there are other chronic causes. However, careful choice of imaging modality is important in avoiding redundant or ill-advised reports. 3D TRUS imaging has the potential to become a one-step diagnostic modality, providing important morphologic measures in acute dysuria. Moreover, it is noninvasive, less operator-dependant than some other methods, and can store and transmit a large volume of data. These features may be valuable to emergency room personnel.

The present study has some limitations. First, because the study was evaluated only once, interobserver and intraobserver variability could not be observed. There may also have been an order effect, because the tests were always conducted and evaluated in the same order. Second, the authors studied a sample of patients who met eligibility requirements; the estimates of accuracy might have been biased by selection methods. Third, it is not known if the differences in diagnostic accuracy among the 3 evaluation methods were statistically significant.

The present results show that 3D TRUS imaging may play an important role in the pretreatment evaluation of acute dysuria that is caused by different impeding factors. However, further studies, preferably involving multiple centers, are needed to confirm this conclusion.

Conflict of Interest: none declared.

REFERENCES

[1] Kawashima A, Sandler CM, Wasserman NF, LeRoy AJ, King BF Jr, Goldman SM. Imaging of urethral disease: a pictorial review. *Radiographics*. 2004;24(Suppl 1):S195-S216.

[2] Bierer S, Ozgun M, Bode ME, Wulfing C, Piechota HJ. Obstructive uropathy in adults [in German]. *Aktuelle Urol.* 2005;36(4):329-336.

[3] Mihmanli I, Kantarci F, Gulsen F, Kadioglu A. Transrectal voiding sonourethrography for diagnosis of a prostatic urethral calculus. *J Ultrasound Med*. 2006;25(11):1455-1457.

[4] Ryu J, Kim B. MR Imaging of the male and female urethra. *Radiographics*. 2001;21(5):1169-1185.

[5] Scheipers U, Ermert H, Sommerfeld HJ, et al. Ultrasonic tissue characterization for prostate diagnostics: spectral parameters vs. texture parameters. *Biomed Tech (Berl).* 2003;48(5):122-129.

[6] Shankar PM. The use of the compound probability density function in ultrasonic tissue characterization. *Phys Med Biol.* 2004;49(6):1007-1015.

[7] Volkmer BG, Nesslauer T, Kuefer R, Engel O, Kraemer SC, Gottfried HW. Visualization of urinary stones by 3-D ultrasound with surface rendering. *Ultrasound Med Biol.* 2002;28(2):143-147.

[8] Strasser H, Pinggera GM, Gozzi C, et al. Three-dimensional transrectal ultrasound of the male urethral rhabdosphincter. *World J Urol*. 2004;22(5):335-338.

[9] Bermudez Villaverde R, Marron Penon MC, Arnaiz Esteban F, Martinez Perez E, Espuela Orgaz R. Tridimensional ultrasound of the prostate [in Spanish]. *Arch Esp Urol.* 2006;59(4):377-384.

[10] Huang WC, Yang SH, Yang JM. Two- and three-dimensional ultrasonographic findings in urethral stenosis with bladder wall trabeculation: case report. *Ultrasound Obstet Gynecol*. 2006;27(6):697-700.

[11] Elwagdy S, Samy E, Sayed M, Gamal AH. Benign prostatic hyperplasia: clinical benefits on Three-Dimensional Ultrasound eXtended Imaging (3D-XI). *Int J Urol*. 2008;15(4):332-339.

[12] Zhong W, Zeng G, Cai Y, Dai Q, Hu J, Wei H. Treatment of lower urethral calculi with extracorporeal shock-wave lithotripsy and pneumatic ureteroscopic lithotripsy: a comparison of effectiveness and complications. *Chin Med J (Engl)*. 2003;116(7):1001-1003.

[13] Ener K, Agras K, Aldemir M, Okulu E, Kayigil O. The randomized comparison of two different endoscopic techniques in the management of large bladder stones: transurethral use of nephroscope or cystoscope? *J Endourol*. 2009;23(7):1151-1155.

[14] Viprakasit DP, Clemens JQ. Use of resectoscope to aid in bladder stone extraction. *Urology.* 2005;65(6):1219-1220.

[15] Roller MF, Naranjo CA. Benign urethral polyp of prostatic urethra. *Urology*. 1975;6(1):34-36.

[16] Aita GA. Begliomini H, Mattos D Jr. Fibroepithelial polyp of the urethra. *Int Braz J Urol*. 2005;31(2):155-156.

[17] Li H, Sugimura K, Boku M, Kaji Y, Tachibana M, Kamidono S. MR findings of prostatic urethral polyp in an adult. *Eur Radiol*. 2003;13(Suppl 6):L105-L108.

[18] Foster RS, Garrett RA. Congenital posterior urethral polyps. *J Urol*. 1986;136(3):670-672.

[19] Segal AS, Kan IaD, Dunaevskii IaL, Dolgopiatov DG. Benign neoplasms of the urethra in men [in Russian]. *Urol Nefrol (Mosk)*. 1996;(3):39-42.

[20] Takahashi S, Takeyama K, Kunishima Y, et al. Analysis of clinical manifestations of male patients with urethritis. *J Infect Chemother*. 2006;12(5)283-286.

[21] Kohl PK. Gonorrhea [in German]. *Urologe A*. 2006;45(12):1501-1503.

[22] Agrawal SK, Reddy BS, Bhalla P, Kaur H. Utility of Direct Fluorescent Antibody Test for detection of Chlamydia trachomatis and its detection in male patients with non gonococcal urethritis in New Delhi. *Indian J Dermatol Venereol Leprol.* 2003;69(2):144-147.

[23] Bally F, Troillet N. Diagnosis and treatment of urethritis [in French]. *Rev Med Suisse*. 2006;2(82):2282-2284.

[24] Newman LM, Moran JS, Workowski KA. Update on the management of gonorrhea in adults in the United States. *Clin Infect Dis*. 2007;1(44)(Suppl 3):S84-S101.

[25] Gupta N, Mandal AK, Singh SK. Tuberculosis of the prostate and urethra: A review. *Indian J Urol*. 2008;24(3):388-391.

[26] Hughes G, Fenton KA. Recent trends in gonorrhoea - an emerging public health issue? *Euro Surveill*. 2000;5(1):1-2.

[27] Ochsendorf FR. Sexually transmitted infections: impact on male fertility. *Andrologia*. 2008;40(2):72-75.

[28] Noguchi M. Sterility and STD [in Japanese]. *Nippon Rinsho*. 2009;67(1):185-189.

[29] Oliveira P, Andrade JA, Porto HC, Filho JE, Vinhaes AF. Diagnosis and treatment of prostatic abscess. *Int Braz J Urol*. 2003;29(1):30-34.

[30] Faris G, Metz Y, Friedman B, Appel B, Stein A. Prostatic abscess--diagnosis and treatment [in Hebrew]. *Harefuah*. 2008;147(7):594-596.