



ORIGINAL ARTICLE

# Role of 3-dimensional ultrasonography and virtual cystoscopy in detection of bladder lesions in patients with hematuria



Naglaa H. Shebrya <sup>a,\*</sup>, Hazem F. Abu El Hamayed <sup>a</sup>, Samer M. Botros <sup>a</sup>,  
Mohamed S. Shoeb <sup>b</sup>

<sup>a</sup> Radiology Department, Faculty of Medicine, Ain Shams University, Egypt

<sup>b</sup> Urology Department, Faculty of Medicine, Ain Shams University, Egypt

Received 3 February 2014; accepted 2 April 2014

Available online 26 April 2014

## KEYWORDS

3D bladder US;  
Hematuria;  
Bladder tumors;  
Virtual cystoscopy

**Abstract Objective:** To study the accuracy of three-dimensional (3D) sonography and sonographic cystoscopy in diagnosing bladder tumors in patients with hematuria in comparison with two-dimensional (2D) sonography.

**Patients and methods:** Twenty-seven patients with hematuria underwent a trans-abdominal US for kidney and bladder. Patients with hematuria and free upper urinary tract at ultrasound underwent a 3D US and conventional cystoscopy (CS). The results of 3D US were compared with those of conventional cystoscopy.

**Results:** Conventional cystoscopy revealed 22 tumors in 15 patients, while 12 patients showed no bladder tumors. Overall, 3D US gave a correct diagnosis in 21 of 22 lesions (95.5%) in the 15 patients and effectively diagnosed all the 12 negative cases as being negative. Three dimensional sonography had a sensitivity of 95.5%, specificity of 100%, positive predictive value of 100% and negative predictive value of 92.3% in comparison to 81.8%, 66.7%, 81.8% and 66.7% respectively by 2D US.

**Conclusion:** 3D US was more sensitive than 2D US in diagnosing bladder tumors in patients with hematuria.

© 2014 Production and hosting by Elsevier B.V. on behalf of Egyptian Society of Radiology and Nuclear Medicine. Open access under [CC BY-NC-ND license](#).

## 1. Introduction

Bladder tumors are among the most common neoplasms of the urinary tract, accounting for 6% of all malignancies in men and 2% of those in women (1). Almost all patients with bladder cancer present with painless hematuria with or without irritative voiding symptoms (2). The role of cross-sectional imaging in the initial evaluation of bladder cancer is limited, and computed tomography (CT) and magnetic resonance

\* Corresponding author. Tel.: +20 222724404.

E-mail address: [naglaashebrya@hotmail.com](mailto:naglaashebrya@hotmail.com) (N.H. Shebrya).

Peer review under responsibility of Egyptian Society of Radiology and Nuclear Medicine.

(MR) imaging are usually performed to evaluate extravescical extension or to stage the tumor (2,3). Although conventional cystoscopy is considered the gold standard for urinary bladder evaluation providing diagnostic and therapeutic advantages of biopsy and transurethral resection, it is invasive, time consuming with limitation of bladder neck evaluation. Moreover it is of high cost with risks of urinary sepsis and iatrogenic bladder injury (4).

Trans-abdominal two-dimensional ultrasonography (2D-US) is a good screening modality for bladder tumors, being non-invasive, easy to perform and safe (5). It is often used when a bladder tumor is suspected. Most exophytic tumors can be detected, but especially small papillary tumors, flat tumors and those at the bladder dome are hardly detectable and difficult to differentiate from benign lesions (6).

Three-dimension US imaging has recently become a widely available feature in most ultrasound machines. This technology permits the acquisition and storage of a data set collected from a specific region of interest. This data set is further analyzed by multiplanar display, surface rendering or volume calculation. As there is considerable contrast gradient between the bladder wall and its lumen, the surface rendering algorithm can allow displaying sufficient detail for the surface of the bladder, giving a cystoscopic-like image, enhancing the characterization of the bladder wall abnormalities (7).

The purpose of this study is to evaluate the potential value of 3D sonography and virtual sonographic cystoscopy in detection of bladder tumors, in patients with hematuria in comparison with 2D sonography.

## 2. Patients and methods

Patients admitted to the urology clinic at the Ain Shams University Hospital with painless hematuria and without history of trauma or evidence of urinary tract infection were prospectively enrolled in our study in the period from October 2012 to November 2013. All patients underwent conventional trans-abdominal 2D US for bladder and kidney in the emergency department by a radiologist. Patients diagnosed with kidney disease, or calculi causing the hematuria were excluded. Patients with hematuria and free upper urinary tract at ultrasound were scheduled for a 3D US examination, usually the next day, followed by flexible or rigid cystoscopy. Written informed consent was obtained from each patient, and the study was approved by our local Ethics Committee.

Sonographic examinations were performed in a private clinic with Voluson E8 GE USA, and a 2–5 MHz multifrequency broadband convex probe. For optimizing scanning, the bladder must be filled to the maximum capacity that could be tolerated by the patient ( $\geq 200$  mL).

Initially routine gray-scale sonography of the pelvis was performed. The device parameter settings were optimized to ensure high-quality 2D images. 2D US was done in the transverse and sagittal plane, and the bladder was carefully evaluated for the presence of abnormalities. 2D US was used to assess the inner surface of the bladder wall, and intravesical pathologies such as bladder tumors. For any lesion seen on the gray scale examination, the size, location and number were recorded.

Subsequently, 3D US of the bladder was done using a free-hand technique. The examiner moved the transducer with a steady, smooth motion and only the angle of the transducer

was changed. After scanning, the software automatically created 3D volume data sets. To examine the bladder surface, volume-rendered, surface-rendered, maximum intensity projection, and minimum-intensity projection algorithms were used. The whole surface of the bladder was examined from anterior to posterior at different angles while displayed on the monitor of the machine. Pathologic findings were recorded as single images. After the examination, multiplanar reconstruction (MPR) with different planes was performed manually and reviewed. For each patient, the 3D sonographic examination and image reconstruction procedures were completed within 10–15 min. The number, location size and morphological features of the lesions were evaluated on 3D virtual and MPR images. The lesions were recorded as polypoid, sessile, or wall thickening. A lesion that was taller than its width was considered polypoid, and a lesion that was wider at the base was defined as sessile. A lesion was characterized as wall thickening when there was elevation of the bladder wall without a discrete mass.

All patients underwent conventional cystoscopy under general anesthesia in the urology department by a urologist who was unaware of the prior sonographic examination results. Bladder biopsy or transurethral resection of bladder tumor, and the histopathological results were then reviewed. The cystoscopy was taken as the reference standard. Comparative analysis was carried out between the imaging findings collected by 2D and 3D US to those of the cystoscopy.

### 2.1. Statistical methods

Continuous variables are expressed as mean and Standard Deviation. Categorical variables are expressed as frequencies and percents. The McNemar test was used for comparing 2D and 3D results. A significance level of  $P < 0.05$  was used in all tests. All statistical procedures were carried out using SPSS version 15 for Windows (SPSS Inc., Chicago, IL, USA).

## 3. Results

Twenty-seven patients were enrolled in the study, the mean age was  $62.8 \pm 10.8$  years ranging between 29 and 77 years; males represented the majority of cases (77.8%) (Table 1).

Conventional cystoscopy revealed urinary bladder tumors (UBTs) in 15 (55.5%) of 27 patients. The total number of lesions detected by conventional cystoscopy was calculated as 22 in 15 patients. Ten (66.6%) patients had solitary and 5 (33.3%) had multiple tumors. Morphologically, the most frequent type of tumor was polypoid in 14 (63.6%) of 22 tumors, while sessile tumors were 8 (36.3%).

Two dimensional (2D) gray scale images showed sessile tumors in 2 patients while 3D US and cystoscopic images revealed these lesions to be a middle lobe prostate. One patient appeared to have a suspicion of a polypoid tumor on 2D US which proved to be a polypoid tumor on 3D US and conventional cystoscopy. Two small sessile tumors were detected by 3D US and conventional cystoscopy that were not shown on corresponding 2D images in one patient (Fig. 5). Conventional cystoscopy revealed a 10 mm polypoid tumor in a patient with normal 3D and 2D sonographic findings. Moreover, 2D US failed to detect a second tumor in 3 patients with double

Download English Version:

<https://daneshyari.com/en/article/4224155>

Download Persian Version:

<https://daneshyari.com/article/4224155>

[Daneshyari.com](https://daneshyari.com)