Investigation of the relationship between urinary tract infection and free particles seen within the bladder

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Original Article

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ABSTRACT

Objective: To investigate the frequency of urinary tract infections in free particles seen within the bladder detected by ultrasonography

Design: Retrospective study

Setting: Department of Internal Medicine and Radiology, Adıyaman University, Turkey

Subjects: Eighty-four patients with free bladder particles enrolled in this present study.

Intervention: None

Main outcome measures: Patients' age, gender, ultrasound reports and urine culture results were documented retrospectively from the records of Adıyaman University Medical Faculty Hospital.

Results: Fifty-eight of the patients were female and 26 were male. The mean age of the patients was 32.5 ± 11.4 years. Positive urine culture was detected in 15 patients. The most common etiologic microorganism was Escherichia coli that was detected in the urine culture.

Conclusion: Free particles in the bladder are seen very frequently in daily practice and often identified as cystitis. In this present study, positive urine culture was detected in only 17.9% of the patients with free particles. Therefore, we can say that clinicians should not empirically prescribe antibiotics for particles in the bladder without evaluation of the urine culture results and symptoms.

KEYWORDS: cystitis, ultrasonography, urinary bladder

INTRODUCTION

Urinary tract infections (UTI) are the most common bacterial infections in women, with one-half of all women experiencing UTI at least once in their lifetime[1]. UTIs are a common condition in the general population and they are therefore a frequent cause of visits to the emergency department[2]. Clinical forms of UTI vary from asymptomatic bacteriuria to sepsis[3]. Acute cystitis more commonly affects women. The diagnosis is made clinically[4]. In bladder, the inflammatory process usually extends beneath the mucosa into the submucosal and muscular layers of the bladder and may be associated with white cell infiltration. Varying degrees of fibrosis, which compromises detrusor function, may decrease bladder capacity and/or accumulation of residual urine[4]. The clinical history is the most important tool for diagnosis of the acute uncomplicated cystitis, and it should be supported by a focused physical examination and urinalysis. Classic lower urinary tract symptoms include dysuria, frequent voiding of small volumes, and urinary urgency[5]. It is important to rule out a serious complicated UTI by imaging investigations[6].

Free particles seen within the bladder are reported frequently in patients undergoing abdominal and urinary tract ultrasound. Although free particle echoes noted within the lumen of the renal pelvis are diagnostic for pyonephrosis[7], there are various causes of the particles seen within the bladder[8-10]. However most of the clinicians consider the particles seen within the bladder as an UTI.

More often, unnecessary antibiotics are prescribed by clinicians to these patients with particles. Herein we studied the relationship between UTI and free particles seen within the bladder. Besides, we aimed to prevent unnecessary antibiotic prescription.

SUBJECTS AND METHODS

Eighty-four patients with particles detected within the bladder (Figure 1) by ultrasonography in Adıyaman University Medical Faculty Department of Radiology enrolled in this present study between January 2015 and January 2016. Patients' age, gender, ultrasound reports and urine culture results were documented from the hospital record retrospectively. Ages of patients ranged from 16 to 87 years old and both genders were included. Ultrasound images were acquired on a Toshiba Aplio 500 ultrasound system (Japan) with 3.5-5 MHz transducers. Patients with renal cysts, stones or crystalloid, hydronephrosis, residual urine and urinary abnormalities were excluded from the study.

All analyses were performed using the SPSS for Windows [version 21.0;SPSS/IBM, Chicago, IL]. Normality was tested using the Kolmogrov-Smirnov Test. The descriptive statistics, independent sample T test and Mann Whitney U tests were used for the collected parameters when suitable. The statistical significance level was accepted as a p-value of less than 0.05.

RESULTS

Fifty-eight of the patients (69%) were female and 26 (31%) were male (Figure 2). The mean age of the patients was 32.5 ± 11.4 (min:16 and max:87) years. Positive urine culture was detected in 15 patients (17.9%) (Figure 3). The most common etiologic microorganism detected in the urine culture was E. coli species (60%). The other etiologic microorganisms were: Streptococcus species (26.6%), Staphylococcus species (6.6%) and Candida species (6.6%) respectively (Figure 4). Age and gender were not significantly related to positive urine culture ($p > 0.05$). Table 1 summarizes the factors associated with urine culture proliferation (Table 1).

DISCUSSION

UTIs are the most common bacterial infections in women, with one-half of all women experiencing at least one UTI in their lifetime. Females are susceptible to lower tract infections more than males because of anatomical alterations. The first step is the microscopic and chemical analysis of urine for the diagnosis of UTI. Quantitative urine culture is the gold standard method for the diagnosis of UTI. Thus UTI should be confirmed by urine culture for accuracy diagnosis[11]. Diagnostic images investigations aren't necessary in order to confirm UTI[12]. The history is the most important tool for diagnosing acute uncomplicated cystitis, and it should be supported by a focused physical examination and urinalysis. UTI are more frequently seen in patients with structural abnormalities. It is also important to rule out complicated UTI by diagnostic imaging investigations[13].

The urinary bladder is a hollow muscular organ that serves as a reservoir for urine. The adult bladder normally has a capacity of 400 – 500mL. Bladder can be scanned by the supra-pubic

transabdominal route, whereas the perineal and the intravesical routes are rarely used. Optimal ultrasonic visualization of the bladder and other pelvic structures necessitates a full bladder. On ultrasound the bladder wall appears as a three layer structure. The detrussor muscle is of medium homogeneous echogenicity. The outer serosa (adventita) layer and the inner mucosa (urothelial) layer are hyper-echoic compared with the middle detrusor smooth muscle (muscularis propria) layer[13]. Understanding the layers and regional anatomy of the bladder will help in the assessment of mucosal, mural and juxta bladder pathologies.

The normal ultrasonographic appearance of the bladder is shaped anechoic cystic structure. Ultrasonographic findings of cystitis are varied depending on the severity of the inflammation and type of cystitis[14-18]. Ultrasonography can diagnose predisposing factors, such as bladder calculi, tumors, an enlarged prostate, diverticula, or neurogenic bladder.

In clinical practice, empirical antibiotics are written for the bladder particles (particles) by most of the clinicians. However, UTI is only one reason which makes particles in the bladder. There are many other causes of the particles which are seen within the bladder.

There are few studies on the relationship between UTI and free particles detected in bladder by ultrasonography. Thus, we aimed to investigate the association between UTI and particles seen within the bladder.

In a study conducted on bladder particles which were detected with trans vaginal sonography, Ronald H *et al* found that 75% of the patients' urinalysis were normal[7]. In another study, Wilches C *et al* found that free particles urine as a criterion for UTI has a sensitivity of 72% and a specificity of 48%[2].

In this present study, we investigated the UTI prevalence in 84 patients with particles detected within the bladder by ultrasonography. Patients with urinary stones and crystalloids, cellular debris, mucin, blood, developing gas bubbles secondary to catheter usage, the gas-forming bacterial infection, bladder outlet obstruction induced urinary stasis and residual urine were excluded from this study. UTI was detected in 17.9% (n = 15) of the patients with particles in this present study.

CONCLUSION

We demonstrated that particles may be related to the UTI. However, all the particles seen within the bladder weren't related to UTI. Thus, we can say ultrasonographic findings should be confirmed with the laboratory investigations for UTI.

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The study design was retrospective. Adıyaman University Medical Faculty data records were investigated retrospectively.

Declaration of authorship: All authors have directly participated in the planning, execution, analysis or reporting of this research paper. All authors have read and approved the final version of the manuscript.

Conflict of interest: The authors declare no conflict of interest.

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Table 1: Factors associated with culture positivity

Parameters	Culture positive group	Culture negative group	p-value
Age (Mean±SD) *	31.8±13.1	32.7±11.1	0.78
Gender (M/F) **	35.1	44.11	0.10

* Independent Sample T Test

**Mann Whitney U test (Mean Rank)

FIGURES

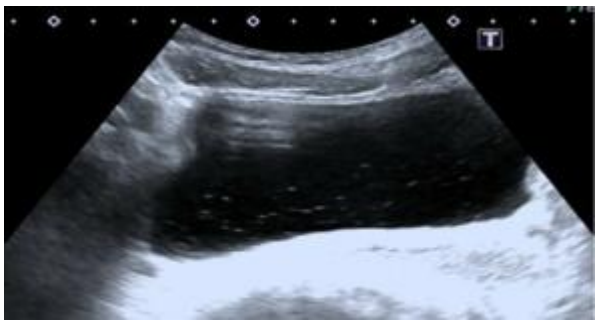

Figure 1: Free particles seen within the bladder detected by transabdominal sonographic examination in the axial and sagittal images

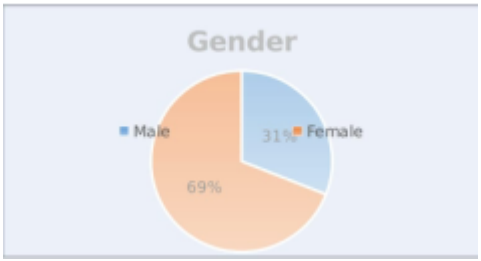

Figure 2: Gender features of the patients

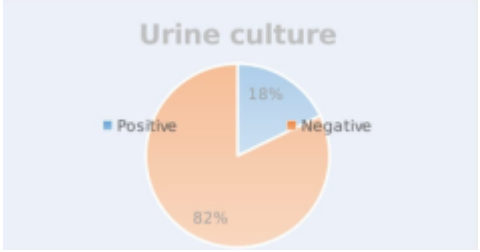

Figure 3: Frequency of the urine culture positivity

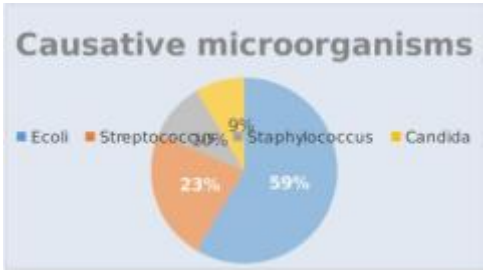

Figure 4: Etiologic microorganisms responsible for the culture proliferation