

Role of Gynecological Ultrasound in Evaluation of Pelvic Urologic Pathologies

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ABSTRACT

Background: Advances in examination techniques have improved routine assessment of non-gynecological structures in the pelvis.

Objectives: To describe the sonographic features of incidental urological abnormalities found during gynecological transvaginal ultrasound.

Methods: A retrospective descriptive analysis of patients who underwent gynecological ultrasound and were diagnosed with urologic findings was performed. The sonographic features of the findings including size, echogenicity, and vascularity were examined.

Results: Gynecological ultrasound diagnosed urological findings in nine women. Two had primary neoplasms of the urinary bladder, one had metastases to the urinary bladder, one had polyps in the distal ureters, four presented with calculus in the distal ureters (one of them was 19 weeks pregnant), and one showed diverticulum of the urethra. At presentation five women (56%) had urinary complaints. Two patients (22%) with abdominal pain with distal ureteral calculi had normal transabdominal ultrasound targeted to the urinary system prior to the gynecological sonography.

Conclusions: Transvaginal ultrasound is useful in the diagnosis of urological abnormalities, mainly in the urinary bladder and the distal ureters. We suggest adding transvaginal assessment for female patients with urinary complains in whom transabdominal ultrasound of urinary system was unremarkable.

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KEY WORDS: calculus, polyp, transvaginal ultrasound, ureter, urinary bladder

Ultrasound is used as the primary imaging modality for the evaluation of the uterus and the adnexa because it is a simple, easily available, and cost-effective imaging tool. The transvaginal approach is optimal for the assessment of the uterus and the adnexa. In some cases, the transrectal approach should be used [1]. Advances in transvaginal ultrasound examination technique have allowed for the assessment of pelvic non-gynecological structures as well, including the urinary bladder and

the distal ureters. Previous studies reported that visualization of the distal ureters lasted less than one minute [2,3].

Experts in gynecological ultrasound routinely examine the urinary bladder and the distal ureters as a part of sonographic assessments of women with known or suspected endometriosis [4,5] during the assessment of women with gynecological malignancies [1]. During such examinations, urological findings can be detected.

Several studies have shown that transvaginal ultrasound can be useful in the detection of urinary bladder tumors [6] and lower ureteric calculi [7]. Abdominal examination of the urinary bladder and distal ureters is limited by the thickness of the abdominal wall. Transvaginal probes overcome this limitation due to the proximity of the vagina to the bladder and provide a high-resolution evaluation of the bladder and the pelvic part of the ureters. Nevertheless, vaginal examination is not routinely performed as part of the evaluation of urological symptoms such as hematuria, recurrent urinary tract infections, or pain in the flanks.

The objective of this study was to describe our experience in the detection of various urological pathologies based on the sonographic features of urological findings found during gynecological ultrasound examination.

PATIENTS AND METHODS

A retrospective descriptive analysis of patients who underwent gynecological ultrasound at our ultrasound unit was performed. Inclusion criteria included patients who underwent gynecological ultrasound that detected urological findings. Patients with bladder endometriosis were excluded. The study was approved by the institutional review board of the Sheba Medical Center.

A systematic scan of the urinary bladder and the distal part of the ureters was conducted as a part of gynecological ultrasound examination by experts in gynecological ultrasound. Assessment of the urinary bladder and the distal ureters has been described before [8,9]. The partially filled urinary bladder was

assessed in sagittal plane by a transvaginal probe, starting from a midsagittal section and through the urethra. To evaluate the walls of the bladder the probe was moved laterally toward the lateral pelvic walls in both directions. The distal part of the ureters was identified in parasagittal oblique plane and each ureter was followed from its distal end to the pelvic brim.

Urologic findings that were detected during the scan were measured and recorded. The echogenicity of findings was described as hypo/hyper or iso-echogenic, compared to myometrial echogenic. The vascularity of the findings was assessed subjectively using color or power Doppler and was defined as avascular or mildly/moderately/highly vascular.

Data collected included the age of the women, cause of referral to the ultrasound unit, urological complaints if present, sonographic gynecological findings, sonographic urological findings, final diagnosis, and follow-up information. Data were retrieved from the department's computerized database.

RESULTS

Gynecological ultrasound diagnosed urological findings in nine women. Table 1 presents the characteristics of the patients. One was an asymptomatic woman who came for a routine gynecological ultrasound (patient 1); one was examined due to dysmenorrhea without urinary complaints (patients 4); five women presented with a combination of gynecological symptoms, (including pelvic pain, and urological symptoms (patients 2, 3, 6, 7, 9); one had abdominal pain in pregnancy (patient 5); and another patient had groin discomfort (patient 8).

The urological findings were included two cases of bladder mass [Figure 1], one case of ureteral polyps [Figure 2], four cases of ureteral calculi [Figure 3], one case of diverticulum of urethra, and one case of thickened wall of urinary bladder. Patients 6 and 7 underwent transabdominal ultrasound targeted to the urinary system that was interpreted as normal, and ureteral calculi were later detected by transvaginal ultrasound. Patient 7 was a virgin who was referred for abdominal pain and suspected torsion of the ovary. Transabdominal gynecological ultrasound was unremarkable and transrectal ultrasound demonstrated a calculus in the distal ureter, sparing her unnecessary surgery.

Patient 8 presented with a cystic finding close to the anterior wall of the vagina and the urethra, which was first demonstrated by computed tomography (CT). She was sent for further evaluation by transvaginal ultrasound and magnetic resonance imaging (MRI) because it was not clear if the finding was gynecological or urological. MRI diagnosed urethral diverticulum. She was managed conservatively and continued her follow-up with the transvaginal ultrasound. Patient 9 had metastatic progressive breast cancer with complaints of urinary urgency. In her previous abdominal ultrasound, the bladder was not full. ^{18}F -fluorodeoxyglucose positron-emission tomography/computed tomography (^{18}F -FDG PET/CT) demonstrated diffuse FDG uptake in

Figure 1: Polyps in urinary bladder

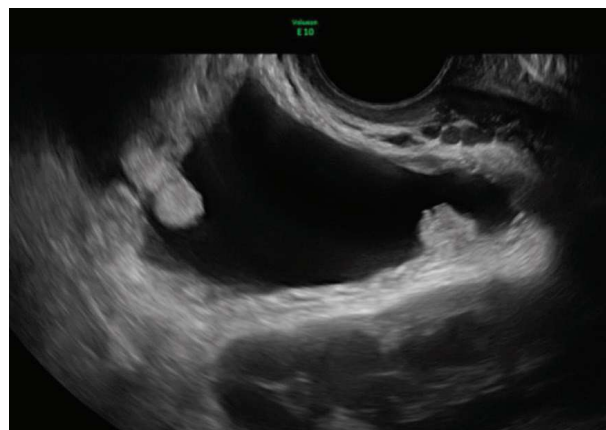


Figure 2: Polyp in distal ureter

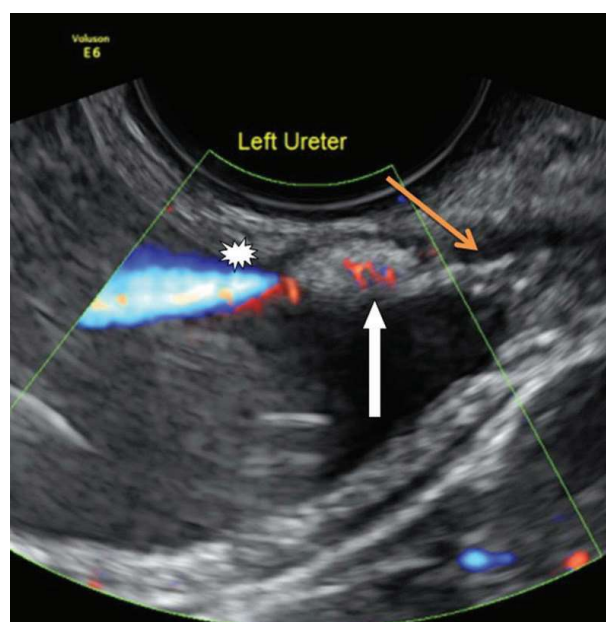


Figure 3: Calculus in distal ureter

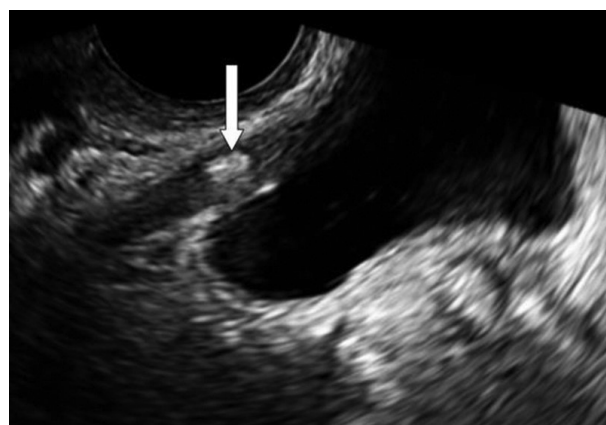


Table 1. Characteristics of the study population

Patient number	Age, in years	Cause of referral	Urological complaints	Past urological history	Sonographic gynecological findings	Sonographic urological findings	Final diagnosis	Follow-up
1	46	Routine examination	None	None	Adenomatous uterus	8 × 9 mm sessile polyp in posterior lateral wall of urinary bladder with feeding vessel	PUNLMP	<ul style="list-style-type: none"> • Transurethral resection • Recurrence • Resection of low grade papillary urothelial carcinoma
2	42	Abdominal pain	Hematuria, 2 months	<ul style="list-style-type: none"> • PUNLMP 2 years earlier • Polyps in urinary bladder detected at cystoscopy 2 weeks earlier 	Normal	Several polyps bulged from bladder wall with irregular margins 12 × 8 × 8 mm with feeding vessels	Low grade papillary urothelial carcinoma	Transurethral resection
3	20	Dysmenorrhea	Recurrent urinary tract infection	Recurrent UTI	Polycystic ovaries	<ul style="list-style-type: none"> • One 4.9 × 3.4 × 8.5 mm polyp in right ureteral • Three 6 × 4.1 × 8.8 mm, 6.6 × 4.1 × 8.4 mm, 2.7 × 4.7 × 3.9 mm polyps in the left ureter • Feeding vessels demonstrated • Ureters not enlarged 	Bilateral ureteral polyps	Resection
4	32	Dysmenorrhea	None	None	Normal	<ul style="list-style-type: none"> • Dilated right ureter 5.7 mm • Right ureteral hyperechogenic mass 2.8 × 4.7 mm • No feeding vessel 		
5	30	<ul style="list-style-type: none"> • pregnancy 19 week gestation • Left abdominal pain 	Left abdominal pain	<ul style="list-style-type: none"> • calculus in proximal left ureter • Conservative treatment 10 months earlier 	Normal pregnancy	<ul style="list-style-type: none"> • Bilateral hydronephrosis • more severe on the left • Hyperechogenic mass in left ureter 15 mm from urinary bladder. No feeding vessel • Dilated ureter 5 mm proximal to mass 	Left ureteral calculus	Conservative treatment

PUNLMP = papillary urothelial neoplasm of low malignant potential, UTI = urinary tract infection

the abdomen as well as in the wall of the urinary bladder. The transvaginal ultrasound demonstrated a thickened wall of the urinary bladder.

DISCUSSION

This study emphasized the importance of a transvaginal ultrasound in the diagnosis of pathologies of the urinary bladder, the distal ureters, and the urethra. The pathologies were detected in patients who presented with urological symptoms (56%) as well as in patients with non-specific symptoms (22%) and in asymptomatic patients (22%). The use of transvaginal ultrasound is of special importance in pregnant patients with urinary symptoms in which the abdominal ultrasound of the urinary system is tech-

nically more difficult. Transrectal ultrasound is helpful in virgin patients with clinical symptoms that cannot be explained by the transabdominal approach.

Transabdominal ultrasound of the urinary tract was unremarkable in 25% of patients, reflecting the fact that a high frequency probe that is placed close to the pelvic parts of the urinary system may provide information that cannot be obtained by a transabdominal approach. Knez et al. [10] reported that only 33% of women with bladder tumors found on transvaginal ultrasound had urinary symptoms. In our series we found one case of a mass in the urinary bladder that was detected in an asymptomatic patient during routine vaginal ultrasound examination (patient 1) and was diagnosed as papillary urothelial neoplasm of low malignant potential (PUNLMP). Although PUNLMP rarely

progress into high grade or invasive carcinoma on long-term follow-up [9,11], another patient who had PUNLMP in the past (patient 2) came back with low grade papillary urothelial carcinoma that was well demonstrated using the vaginal approach.

Urolithiasis occurs in 1:200 to 1:2000 women, with similar incidence in pregnant and non-pregnant population of reproductive age [6,12], and is the most common cause of urological-related abdominal pain in pregnant women after urinary tract infection. During pregnancy, the frequency of calculi localization is twice as high in the ureter than in the renal pelvis or calyx [9]. Urolithiasis is usually associated with flank pain and dysuria, as in patients 5, 6, and 7, or may present as an incidental finding such as in patient 4 [8,10]. The sensitivity and specificity of the transabdominal ultrasound for detection of ureteric calculus was reported to be 45% and 94%, respectively [13,14]. The addition of transvaginal ultrasound increased this sensitivity to 98% [6].

In their study on 468 women with clinical symptoms of ureteral calculi, Pandey and co-authors [7] performed transvaginal ultrasound that demonstrated calculi in the distal ureters in 79 participants. In our study the detection of calculi in the distal ureter directly influenced clinical management for patients 5 and 7. In patient 5, we ruled out obstetrical causes for pelvic pain such as placental abruption, uterine contractions, and ovarian torsion. In patient 8 unnecessary diagnostic laparoscopy was avoided.

Benign ureteral polyps are rare, with a frequency of 1:5000 in urological patients [13]. They account for less than 1% of genitourinary neoplasms [15]. There is male predominance, and they are most often located in the proximal ureter [15,16]. The presenting symptoms are usually hematuria and flank pain [16-18]. This condition was not demonstrated in patient 3, who was referred due to dysmenorrhea and reported recurrent urinary tract infections. Hence, the ureteral polyps in this case could be interpreted as an incidental finding.

Transvaginal ultrasound can also be used for follow-up of urological findings as in the case of a patient with urethral diverticulum (patient 8) because it is widely available, relatively cheap, does not use ionizing radiation, and is able to provide diagnostic information [19]. Although in this case diagnosis was made by MRI, further follow-up was easily performed by transvaginal ultrasound.

CONCLUSIONS

It is important to use transvaginal ultrasound in the diagnosis of urological abnormalities of the urinary bladder, the urethra, and the distal ureters. We suggest incorporating transvaginal ultrasound in the evaluation of female patients who present with urological symptoms if abdominal approach did not provide explanation to their complaints.

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The universe is made of stories, not of atoms.

Muriel Rukeyser (1913–1980), poet, playwright, biographer, children's book author, and political activist