Transvaginal Ultrasound of the Distal Ureters and Urethra

Disclosures

- Relevant Financial Relationship
  - None

Objectives

- Describe the role and pitfalls of transvaginal US in evaluating for distal ureteral stones in pregnant patients
- Describe the role of transvaginal US to evaluate for urethral diverticula

ACR Appropriateness Criteria 2011

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- Primarily used in pregnant women
- Acute renal colic due to urinary tract stone is the most common non-obstetric reason for hospital admission of pregnant patients

Ureteral Stones

- Location of ureteral stones
  - 60-85% in distal ureter in non-pregnant pts
    - smaller stones tend to be more distal
    - not aware of data in pregnant patients
**Pregnant Patient with Flank Pain**

- Mayo Clinic Rochester - Imaging Algorithm
  - Ultrasound
    - kidneys, bladder, transvaginal US
    - if US negative for stone and still suspect stone
      - repeat US in 24 hours
    - If US still negative for stone, still clinically suspicious, and unable to manage based on clinical and US findings
      - CT (rarely done)

**US Protocol**

- Transabdominal ultrasound (TAUS)
  - hydronephrosis/ hydroureter
  - bladder
    - look for distal ureteral stone
    - look for ureteral jets – look for first with TAUS
  - spectral Doppler: RI, both kidneys
  - Transvaginal US of distal ureter

**Ureteral Jets**

- Asymptomatic pregnant women
  - Unilateral absent jet in 3-50% when supine
    - right more often absent than left
  - Opposite decubitus position usually shows the jet
    - 11% in one small study still had absent jet even after decubitus position* (Karabulut et al. Br J Rad 2002)

**Normal Distal Ureter**

- Location
  - Look along bladder base laterally, often angling transducer toward iliac vessels
  - Literature suggests can see both in 93% of pts, at least one in 100% - but probably less
  - Length seen on TVS
    - ~ 4cm, though literature suggests longer

- Diameter
  - 1.8mm mean diameter at rest
  - 2.9mm with peristalsis

- Peristalsis
  - Mean peristaltic frequency in normal ureters
    - 3.5 waves / minute (range 2.5 to 6.5)
  - not aware of data when ureteral stone present or in pregnancy without stone
Pitfalls

 Where and how to look for distal ureter/stone
   May see transverse but need to look sagittal
   Not looking far enough laterally / posteriorly
   if cervix in image, too medial
   urethra
   Pelvic vessels with slow flow / phleboliths
   don’t rely on negative Doppler US

Urethra

Though may see stone in urethra

Pelvic Vessels / Phlebolith

Contraindications to TVUS

 Second and third trimester
   Bulging membranes
   Ruptured membranes
     Patients with ureteral stones have slightly higher incidence of rupture membranes
     Consider translabial or transrectal US

Ultrasound of the Female Urethra

 Urethral diverticula
 Other lesions will not have time to discuss
   Solid masses (leiomyoma)
   Pelvic floor relaxation (2D or 3D)
   Preop and postop
   Urethral bulking agents
**Urethral Diverticula**

- Estimated prevalence in adult women: 1-6%
- The 3 D's: dribbling, dysuria, dyspareunia
- But may be asymptomatic
- Acquired much more common than congenital
- Most common theory is chronic infection and obstruction of periurethral glands that form abscess and rupture into urethral lumen

**Physical exam**
- Tender anterior vaginal wall mass with palpation induced discharge of urine or purulent fluid
- Classic finding but not always present

**Imaging**
- Voiding cystourethrogram or double-balloon urethrogram
- Ultrasound
- MRI

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**Ultrasound of the Urethra**

- **Technique**
  - Transvaginal
    - Insert transducer only ~1 to 2 cm into vagina
  - Translabial
    - Transducer placed between the labia
  - Transrectal
  - Endoluminal/catheter based system

**Normal:** hypoechoic, not fluid

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**Ultrasound of Urethral Diverticula**

- Adjacent to urethra
- Unclear how often see connection to urethra
- Single or multiple locules
- Focal
- Circumferential
  - Saddlebag or horseshoe diverticulum

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**Urethral Diverticulum**
Urethral Diverticulum

Differential Diagnosis

- Away from urethra
  - Gartner’s duct cyst
    - usually anterior/lateral in upper third of vagina
    - may be associated with ectopic ureter and unilateral renal agenesis
  - Bartholin’s gland cyst
    - paired glands at 4 & 8 o’clock near vaginal orifice
    - lateral aspect of introitus, medial to labia minora

- Vaginal inclusion cyst
  - usually posterior or lateral wall of lower vagina
  - sites of previous surgery/trauma

- Clitoral inclusion cyst
  - complication of female circumcision, aka female genital mutilation
  - usually in/near the scar

- Near urethra
  - Skene’s gland cyst
    - uncommon, usually visible without imaging
    - at posterolateral aspect of external urethral meatus
    - if abscess – ?prodromal stage of diverticulum
      - may be difficult to distinguish from diverticulum when no connection to urethra seen
      - urethral meatus level (cyst) vs deeper (diverticulum)

Cyst in Vaginal Wall

Complications of Urethral Diverticulum

- Stones
  - 1.5 to 10% of patients with diverticulum
- Neoplasm – suspect if solid component
  - Most commonly adenocarcinoma
    - can be transitional cell or squamous cell carcinoma
Summary

✧ Transvaginal US is a helpful tool for
  ✧ Distal ureteral stones
    ✧ Make sure image in sagittal plane and look far enough laterally
  ✧ Urethral diverticula
    ✧ Try to demonstrate connection to urethra but may be difficult