GU: Bladder & Urethra

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Our Roadmap

• Case based review of bladder, urethral, & penile imaging
• Cases presented as unknowns with a multiple choice question (audience response system)
• Some cases may have a second follow up question
• At the conclusion of each case we will review the key learning points and relevant imaging differential diagnostic considerations
• Referenced review paper(s) for each case

Let’s get started!
Case 1

You are shown the CT image to the left. What is the BEST diagnosis?

a. Bladder perforation
b. Emphysematous pyelitis
c. Fournier gangrene
d. Emphysematous cystitis

Case 1: Emphysematous Cystitis

- Rare and potentially fatal infection of the bladder mucosa & musculature by gas-forming organisms (bacteria & fungi)
- Most common in patients with diabetes mellitus.
- Other risk factors include chronic UTIs, bladder outlet obstruction, and neurogenic bladder
- Important to differentiate intramural gas from intraluminal gas
- DDx: instrumentation with mucosal disruption, developing fistulas with vagina or colon, trauma

Reference:
Case 2

You are shown T2-weighted MR image (bottom right) and voiding cystourethrogram (top left) from a female patient. What is the BEST diagnosis?

a. Urethral diverticulum
b. Cystocele
c. Vaginal cyst
d. Bartholin gland cyst

Case 2: Urethral Diverticulum

- Usually acquired due to chronically infected periurethral gland (rarely congenital)
- Prone to stone formation (urine stasis)
- Generally appear as simple cysts on US & MR but can have a complex appearance due to debris and inflammation. Frequently wrap around urethra.
- Low risk for developing malignancy – adenocarcinoma (60%), TCC (30%), SCC (10%)
- Pearl: Some injectable urethral bulking agents can mimic a diverticulum on MRI (high T2 signal) so may need VCGU to differentiate residual/recurrent diverticulum from bulking agent.

Reference:
Case 3

You are shown the CT image of an elderly patient with hematuria and right ureteral stent. What is the BEST diagnosis?

a. Cystitis cystica
b. Urothelial cell carcinoma (TCC)
c. Urachal carcinoma
d. Retained foreign body

Case 3: Bladder Urothelial Cell Carcinoma (TCC)

Regarding urothelial cell (transitional cell) carcinoma of the bladder (choose single best answer)

a. Multicentric bladder tumors are rare
b. Synchronous and metachronous urothelial carcinomas of the upper tracts occur in 90% of patients with bladder urothelial cancer
c. Bladder diverticula are associated with an increased risk of urothelial carcinoma
d. Cystoscopy is not necessary in patients with a negative CT-Urogram
Case 3: Bladder Urothelial Cell Carcinoma (TCC)

a. Multicentric bladder tumors are rare (FALSE – they occur in 30-40% of cases)
b. Synchronous and metachronous urothelial carcinomas of the upper tracts occur in 90% of patients with bladder urothelial cancer (FALSE – 3-5%)
c. Bladder diverticula are associated with an increased risk of urothelial carcinoma (TRUE)
d. Cystoscopy is not necessary in patients with a negative CT-Urogram (FALSE – tumors may be small and sessile so cystoscopy is necessary to evaluate bladder)

Reference:

Case 3: Bladder Urothelial Cell Carcinoma (TCC)

- DDx for epithelial bladder tumor = ~95% TCC, 5% SCC, <2% adenocarcinoma
- Risk factors for TCC include smoking, stones, & recurrent or chronic urinary tract infection
- Bladder TCCs are multicentric in 30-40% of cases and upper tracts need to be screened due to 3-5% risk of metachronous or synchronous urothelial cell carcinoma in upper tracts.
- Most bladder tumors are superficial, but tend to recur.

Reference:
Case 4

You are shown CT images from a CT-Urogram on the left. What is the BEST diagnosis?

a. Urachal adenocarcinoma  
b. Bladder calculus  
c. Bladder diverticulum  
d. Cystitis

Case 4: Urachal Adenocarcinoma

Regarding adenocarcinoma of the bladder (choose single best answer)

a. Adenocarcinoma is much more common than urothelial cell carcinoma (TCC)  
b. Schistosomiasis is a risk factor for development of adenocarcinoma  
c. Bladder extrophy and urachal remnants are risk factors for development of adenocarcinoma  
d. Metastatic adenocarcinoma to the bladder is less common than a primary bladder adenocarcinoma
Case 4: Urachal Adenocarcinoma

- Adenocarcinoma is much more common than urothelial cell carcinoma (TCC) (FALSE)
- Schistosomiasis is a risk factor for development of adenocarcinoma (FALSE)
- Bladder exstrophy and urachal remnants are risk factors for development of adenocarcinoma (TRUE)
- Metastatic adenocarcinoma to the bladder is less common than a primary bladder adenocarcinoma (FALSE)

Reference:

Case 4: Urachal Adenocarcinoma

- Primary adenocarcinoma classified into urachal (1/3) and nonurachal (2/3)
- Secondary (metastatic) adenocarcinoma to bladder more common than primary adenocarcinoma
  - Direct invasion from prostate or colon, or lymphangitic or hematogenous spread from GI or lung primary
- Urachal adenocarcinoma located at the anterior bladder dome usually with an extravesicular component (urachus).
- May have cystic components & calcifications (frequently mucinous adenocarcinoma)

Reference:
Case 5

You are shown CT images from a young woman with a history of dysmenorrhea and a negative cystoscopy. What is the MOST LIKELY diagnosis?

a. Endometrioma
b. Neuroendocrine tumor
c. Bladder calculus
d. Urothelial tumor (TCC)

Case 5: Bladder Endometrioma

- Nonepithelial tumors account for 5% of bladder tumors
- **Leiomyoma, neuroendocrine tumor, sarcoma (leiomyosarcoma, rhabdosarcoma) paraganglioma**
- Endometriomic implants affect urinary tract in 20% of patients with endometriosis but are usually occult except in cases of severe disease
  - Bladder dome & distal ureters are most common locations for endometrial implants in urinary system
  - Implants to the bladder may be serosal or intramural

References:
Case 6

You are shown images through the bladder of an Egyptian male taken from a CT-Urogram. What is the MOST LIKELY diagnosis?

a. Bladder calculus  
b. Iatrogenic hemorrhage  
c. Leiomyoma  
d. Schistosomiasis

Case 6: Schistosomiasis (Bilharziasis)

- **Schistosoma haematobium**
- Eggs in bladder wall incite an inflammatory response that may result in calcification and fibrosis. Calcification may also be present in distal ureters
- Risk factor for squamous cell carcinoma. In endemic areas such as Egypt, incidence of bladder SCC is as common as TCC.
- DDx: Tumor – TCC and urachal mucinous adenocarcinoma (but most any tumor) but rarely visible on conventional radiographs; radiation cystitis; amyloidosis; tuberculous cystitis (rarely calcified)

References:
Case 6
You are shown the CT image to the left. What is the BEST diagnosis?

a. Bladder diverticulum
b. Hydrosalpinx
c. Ureterocele
d. Ovarian cyst

Reference:

Case 6: Orthotopic (adult) Ureterocele

- Dilated intramural segment of ureter protruding into bladder
- Ureteroceles classified as ectopic or orthotopic
- Ectopic ureteroceles seen in association with duplicated collecting systems (upper pole moiety – Weigert-Meyer rule) in children
- Ectopic ureteral insertion medial and inferior to normal insertion, but can be extravesicular leading to incontinence in children
- Orthotopic ureteroceles insert at normal location and occur in adults (?ureteral orifice obstruction)

Reference:
a. Retained foreign body
b. Bladder rupture - intraperitoneal
c. Bladder rupture - extraperitoneal
d. Bladder rupture - combined

Case 7

You are shown images of a CT cystogram from a patient with a known bladder neoplasm after cystoscopy. What is the MOST LIKELY diagnosis?

- Bladder rupture most commonly occurs in setting of blunt or penetrating trauma
- CT cystogram is imaging modality of choice
- Rupture classified by location of extraluminal contrast
  - Intraperitoneal (rupture of bladder dome)
  - Extraperitoneal (rupture of bladder side wall or base)
    - Further classified as to simple (confined to perivesicular space) or complex
  - Combined (intraperitoneal + extraperitoneal)
- Generally intraperitoneal & mixed ruptures required surgery whereas extraperitoneal may be treated conservatively (usually)

Reference:
Case 8

You are shown an image from a retrograde urethrogram. What is the BEST diagnosis?

a. Urethral diverticulum
b. Penile fracture
c. Urethral fistula
d. Multifocal urethral strictures

Case 8: Urethral Strictures

Which cause of urethral strictures is most likely to result in multiple, serial strictures in the anterior urethra (choose best answer)?

a. Urethritis
b. Penile fracture
c. Trauma
d. Iatrogenic
Case 8: Male Urethra Anatomy Review

- Anterior Urethra
  - Penile segment
  - Bulbar segment
- Posterior Urethra
  - Membranous segment
  - Prostatic segment
- Posterior segment frequently not well filled with contrast on retrograde exam (use VCUG)


Case 8: Urethral Strictures

- Urethritis (gonococcal, nongonococcal, & rarely TB)
  - Anterior urethra (usually bulbar segment). Posterior urethra rarely in severe disease
  - Multifocal, tandem, or long strictures
- Iatrogenic (surgery, catheterization, instrumentation)
  - Bulbomembranous junction & penoscrotal junction
  - Variable appearance - stricture may be focal, long, or multifocal
- Traumatic
  - Posterior urethra

Reference & Image:
Case 9

You are shown images of a penile MRI in an elderly man with a penile urethral mass (arrows). What is the MOST LIKELY diagnosis?

a. Squamous cell carcinoma
b. Urothelial cell carcinoma
c. Adenocarcinoma
d. Desmoid

Case 9: SCC Penile Urethra

- SCC (60-80%) > TC (15-20%) > Adenocarcinoma (50-10%)
- 60% of tumors in bulbar segment
- Benign tumors are rare
- Secondary tumors due to direct invasion from adjacent primary tumors (for example, prostate)
Case 10

You are shown images of a penile MRI in a young man with painful perineal mass following long bike ride. What is the MOST LIKELY diagnosis?

a. Penile fracture  
b. Priapism  
c. Partial segmental thrombosis of the corpus cavernosum  
d. Urethral disruption

Case 10: partial thrombosis of corpus cavernosum

- Uncommon entity, but perhaps under appreciated  
- Presents as painful, firm, perineal mass in young men  
- Risk factors include bicycling & vigorous sexual activity  
- Unilateral, incomplete thrombosis of proximal corpus cavernosum  
- Treated conservatively with NSAIDs +/- heparin
Thank you for your attention!!

Questions or comments?

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