

GU: Bladder & Urethra

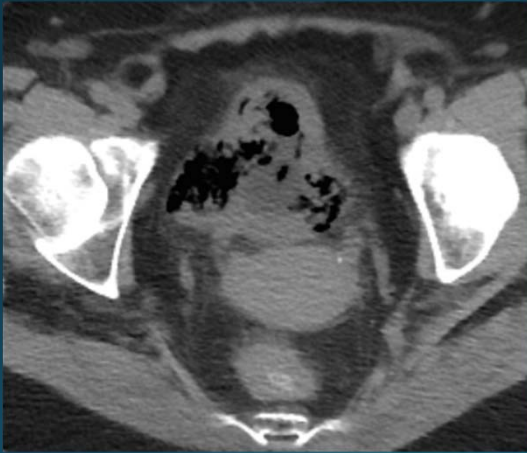
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Our Roadmap

- 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!

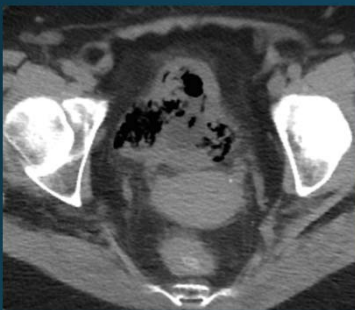
Case 1



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

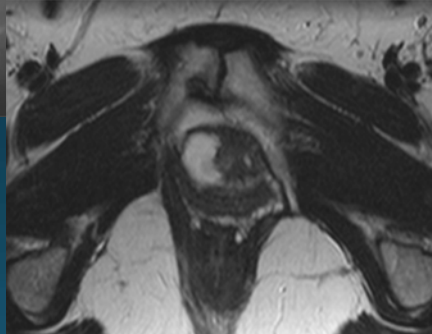
Reference:

Grayson DE, Abbot RM, Levy AD, Sherman PM (2002) Emphysematous infections of the abdomen and pelvis: a pictorial review. *RadioGraphics* 22: 543-561.

Case 2



VCUG



T2-weighted MRI of lower pelvis

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

- Urethral diverticulum
- Cystocele
- Vaginal cyst
- 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 VCUG to differentiate residual/recurrent diverticulum from bulking agent.

Reference:

Chaudhari, VV, Patel MK, Douek M, Raman SS (2010). MR imaging and US of female urethral and periurethral disease. *RadioGraphics* 30:1857-1874

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

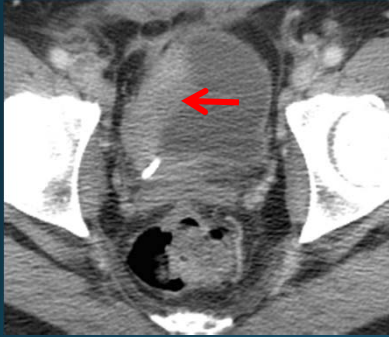
Case 3: Bladder Urothelial Cell Carcinoma (TCC)



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

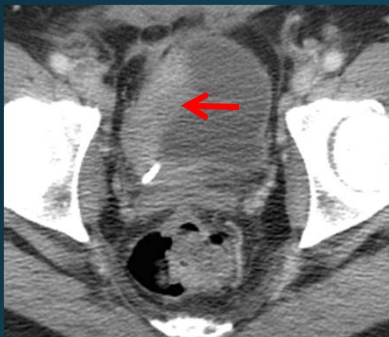
- a. Multicentric bladder tumors are rare
- b. Synchronous and metachronous urothelial carcinomas of the upper tracts occur in 90% of patients with bladder urothelial cancer
- c. Bladder diverticula are associated with an increased risk of urothelial carcinoma
- d. Cystoscopy is not necessary in patients 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)

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:

Wong-You-Cheong JJ, Woodward PJ, Manning MA, Sesterhenn IA (2006) Neoplasms of the urinary bladder: Radiologic-pathologic correlation. *RadioGraphics* 26:553-580.

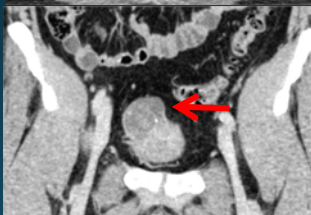


Case 4

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

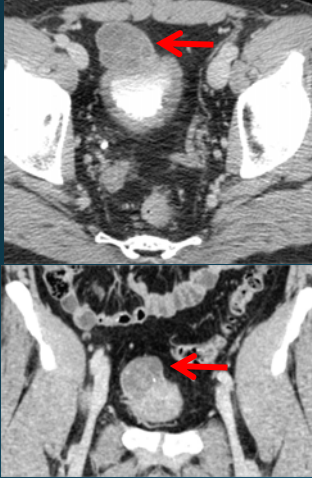
Case 4: Urachal Adenocarcinoma



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 exstrophy 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



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

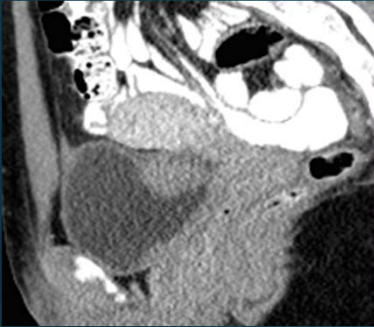
Case 4: Urachal Adenocarcinoma



- 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 extravescicular component (urachus).
- May have cystic components & calcifications (frequently mucinous adenocarcinoma)

Reference:

Wong-You-Cheong JJ, Woodward PJ, Manning MA, Sesterhenn IA (2006) Neoplasms of the urinary bladder: Radiologic-pathologic correlation. *RadioGraphics* 26:553-580.



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)

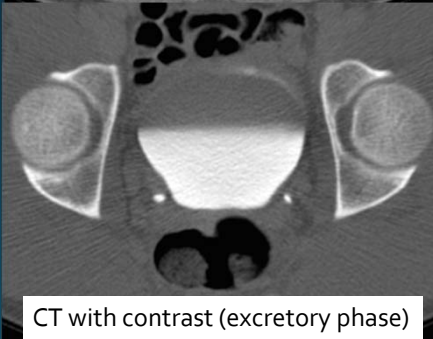
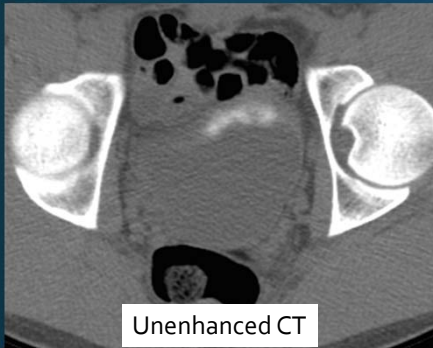
Case 5: Bladder Endometrioma



- 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:

1. Wong-You-Cheong JJ, Woodward PJ, Manning MA, Sesterhenn IA (2006) Neoplasms of the urinary bladder: Radiologic-pathologic correlation. *RadioGraphics* 26:553-580.
2. Woodward PJ, Sohaey R, Mezzetti TP (2001). Endometriosis: radiologic-pathologic correlation. *RadioGraphics* 21:193-216.

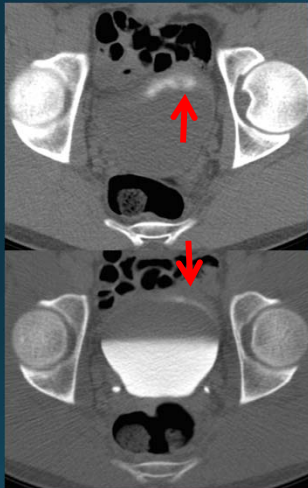


Case 6

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)

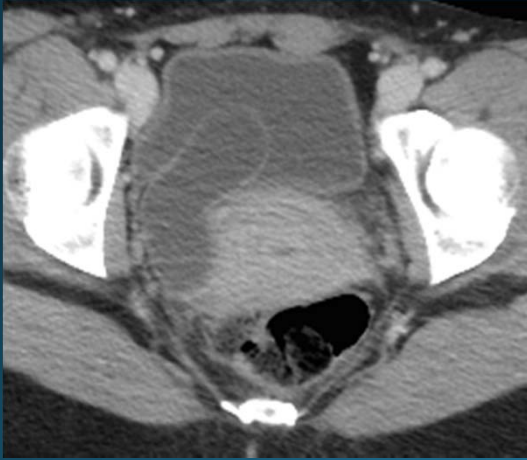


- *Schistosoma haematobium*
- Eggs in bladder wall incite an inflammatory response that may result in calcification and fibrosis. Calcification may also be present in distal ureters
- Risk factor for squamous cell carcinoma. In endemic areas such as Egypt, incidence of bladder SCC is as common as TCC.
- 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:

1. Dyer RB, Chen MYM, Zagoria RJ (1998). Abnormal calcifications in the urinary tract. *RadioGraphics* 18:1405-1424.
2. Pollack HM, Banner MP, Martinez LO, Hodson CJ (1981) Diagnostic considerations in urinary bladder wall calcifications. *AJR* 136:791-797

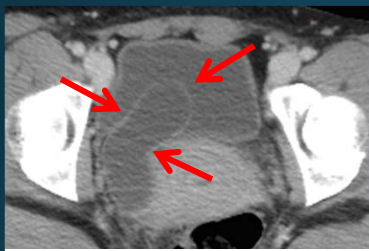
Case 6



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

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

Case 6: Orthotopic (adult) Ureterocele



Basis of "cobra head" sign on intravenous urogram

- 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 extravescicular leading to incontinence in children
- Orthotopic ureteroceles insert at normal location and occur in adults (?ureteral orifice obstruction)

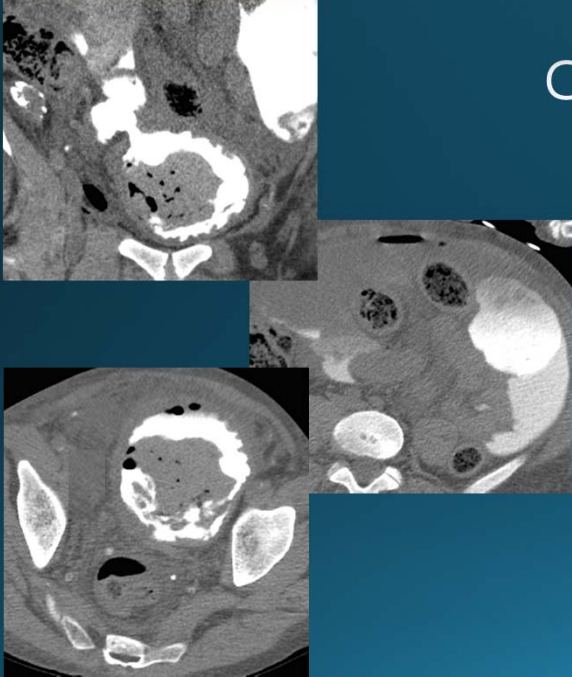
Reference:

Coy DL (2015) "Kidneys, ureters, and bladder" in Body CT: The Essentials McGraw-Hill (eds: Coy D, Lin E, Kanne J) 149-172

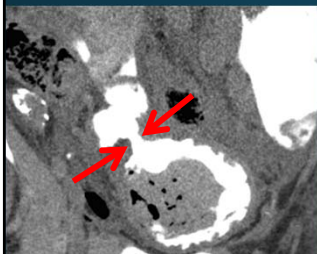
Case 7

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

- Retained foreign body
- Bladder rupture - intraperitoneal
- Bladder rupture - extraperitoneal
- Bladder rupture - combined



Case 7: Intraperitoneal Bladder Rupture



Bladder tumor is a gastric adenocarcinoma arising from a gastric bladder augment performed ~20 years ago

- 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:

Sadro CT, Sandstrom CK, Cheng S (2015) "Trauma" in Body CT: The Essentials McGraw-Hill (eds: Coy D, Lin E, Kanne J) 251-268

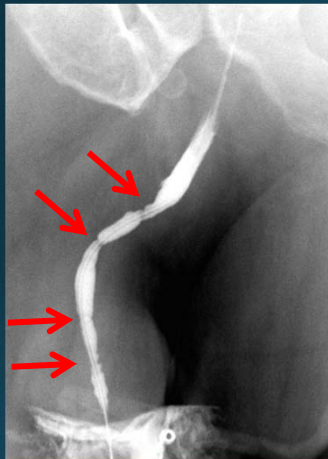
Case 8



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

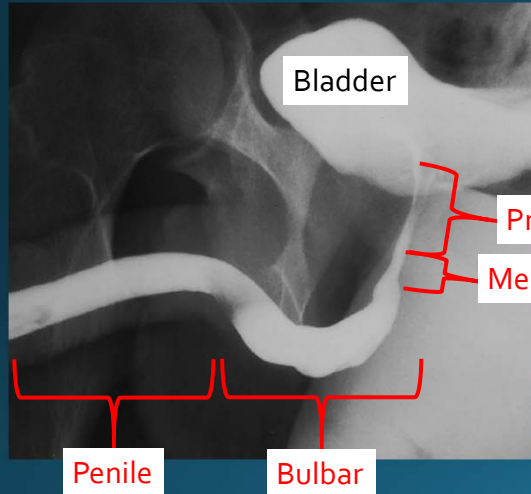
Case 8: Urethral Strictures



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)

Image (modified) from Kawashima *et al.* (2004) *RadioGraphics* 24:S195-S216

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:

Kawashima A, Sandler CM, Wasserman NF, LeRoy AJ, King BF, Goldman SM (2004) Imaging of urethral disease: a pictorial review. *RadioGraphics* 24:S195-S216

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?



- Squamous cell carcinoma
- Urothelial cell carcinoma
- Adenocarcinoma
- Desmoid



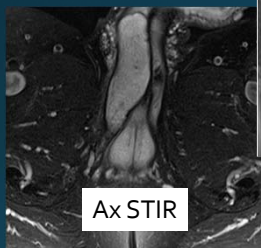
Case 9: SCC Penile Urethra

- SCC (60-80%) > TC (15-20%) > Adenocarcinoma (5-10%)
- 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?

- Penile fracture
- Priapism
- Partial segmental thrombosis of the corpus cavernosum
- 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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