



Penn Medicine



DREXEL UNIVERSITY  
College of  
Medicine

# AMSER Case of the Month October 2019

64 year-old male who presents with gross hematuria

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# Patient Presentation

- 64 year old man who presents with 2 weeks of hematuria. Denies fever, dysuria, increased urinary frequency, or costovertebral angle tenderness.
- Past Medical History: Hypertension, GERD
- Past Surgical History: None
- Past Social History: Current smoker with a 40 pack-year smoking history. Denies alcohol and illicit drug use.

# Pertinent Labs

- BMP: Na 142 / K 5.4/ Cl 109/ Co2 25/ Cr 1.51/ BUN 25
- Urinalysis:
  - Glucose- Negative
  - Bilirubin- Negative
  - Ketones- Negative
  - Specific gravity- Normal
  - **Blood- Moderate\***
  - Protein- Negative
  - Leukocyte esterase- Trace
  - Nitrate- Negative

What Imaging Should We Order?

# ACR Appropriateness Criteria for Hematuria

**Clinical Condition:** Hematuria

**Variant3:** All patients except those described in variant 1 or 2.

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen and pelvis without and with IV contrast	9	CT urography. Must include high-resolution imaging during excretory phase.	☼☼☼☼
CT abdomen and pelvis without IV contrast	6		☼☼☼☼
X-ray retrograde pyelography	6	For patient with contraindication to iodinated contrast or strong suspicion of urothelial lesion, to clarify abnormality suspected on CT or IVU.	☼☼☼
CT abdomen and pelvis with IV contrast	5	This procedure may be appropriate but there was disagreement among panel members on the appropriateness rating as defined by the panel's median rating.	☼☼☼☼
US kidneys and bladder retroperitoneal	5		0
MRI abdomen and pelvis without and with IV contrast	5	MR urography. For patients with contraindication to iodinated contrast.	0
MRI abdomen and pelvis without IV contrast	4		0
Arteriography kidney	2		☼☼☼
X-ray abdomen and pelvis (KUB)	2		☼☼
X-ray intravenous urography	1		☼☼☼

Initial Imaging Ordered

**Rating Scale:** 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

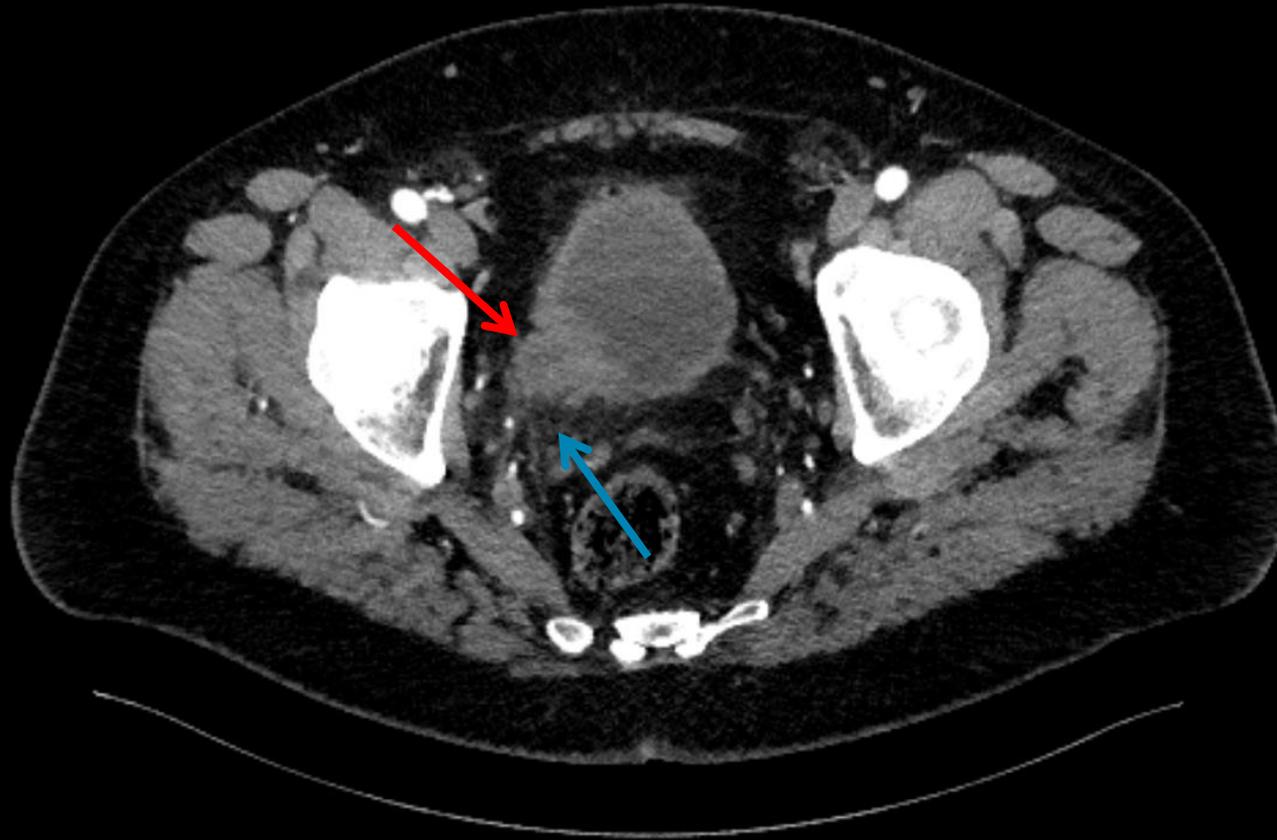
\*Relative Radiation Level



# CT Abdomen and Pelvis with IV Contrast (Unlabeled)



# CT Abdomen and Pelvis with IV Contrast (Labeled)



- Hyperdense mass within a posterolateral right bladder diverticulum (**red arrow**) which projects into the bladder lumen.
- Encasement of the right ureter by the mass at the ureterovesicular junction.
- Minimal nonspecific fat stranding adjacent to the bladder mass (**blue arrow**).

## Differential Diagnosis:

- Urothelial (transitional cell) Carcinoma
- Squamous Cell Carcinoma
- Adenocarcinoma
- Metastasis

## Final Diagnosis:

Muscle Invasive High Grade Urothelial Carcinoma of the Bladder

# Urothelial Carcinoma – Epidemiology and Signs and Symptoms

## Epidemiology

### Incidence:

- ~ 80,000 new cases per year in the US
- Male to female ratio of 2:1

### Risk Factors:

- Advanced age
- Smoking
- Occupational exposures
  - Paint components
  - Polycyclic aromatic hydrocarbons
  - Diesel exhausts

## Signs/Symptoms

- Hematuria
- Dysuria
- Weight loss
- Fatigue
- Persistent back pain

# Treatment of Urothelial Carcinoma of Bladder

**Non-Muscle Invasive:** Transurethral resection of bladder tumor (TURBT) with or without adjuvant intravesical therapy depending on tumor grade

**Muscle Invasive:** Radical cystectomy with urinary diversion

- Urinary diversion - Surgical technique to redirect the stream of urine
- Two major surgical approaches for urinary diversions performed after radical cystectomy: continent and incontinent diversions:
  - Incontinent urinary diversions - a cutaneous ostomy is used for continuous urine drainage (for example, an ileal conduit)
  - Continent diversion procedure - the patient may void through the native urethra or self-catheterize through a surgically created stoma

# Case Continued - Post Operative Surveillance Imaging of Neobladder Urinary Diversion

- Patient underwent **radical cystoprostatectomy with bilateral pelvic lymphadenectomy and neobladder urinary diversion**
- Goals of Post Operative Imaging:
  - Assess postoperative anatomy
  - Detect postoperative complications
  - Evaluate for residual or recurrent tumor and metastatic disease
  - Monitor for upper tract distention and/or deterioration

**What Imaging Should We Order to Assess Post Operative Status?**

# ACR Appropriateness Criteria for Post Operative Surveillance of Muscle Invasive Bladder Cancer

**Variant 3:** Muscle-invasive bladder cancer (MIBC) with or without cystectomy. Post-treatment surveillance.

Procedure	Appropriateness Category	Relative Radiation Level
Radiography chest	Usually Appropriate	☼
CT abdomen and pelvis without and with IV contrast	Usually Appropriate	☼☼☼☼
Fluoroscopy abdomen loopogram	Usually Appropriate	☼☼☼
CT abdomen and pelvis with IV contrast	Usually Appropriate	☼☼☼
MRI abdomen and pelvis without and with IV contrast	Usually Appropriate	○
CT chest with IV contrast	May Be Appropriate	☼☼☼
CT chest without IV contrast	May Be Appropriate	☼☼☼
FDG-PET/CT skull base to mid-thigh	May Be Appropriate	☼☼☼☼
MRI abdomen and pelvis without IV contrast	May Be Appropriate	○
CT abdomen and pelvis without IV contrast	Usually Not Appropriate	☼☼☼
Radiography intravenous urography	Usually Not Appropriate	☼☼☼
US pelvis (bladder)	Usually Not Appropriate	○
CT chest without and with IV contrast	Usually Not Appropriate	☼☼☼

← Ordered Imaging  
←

# Post-Op Complications

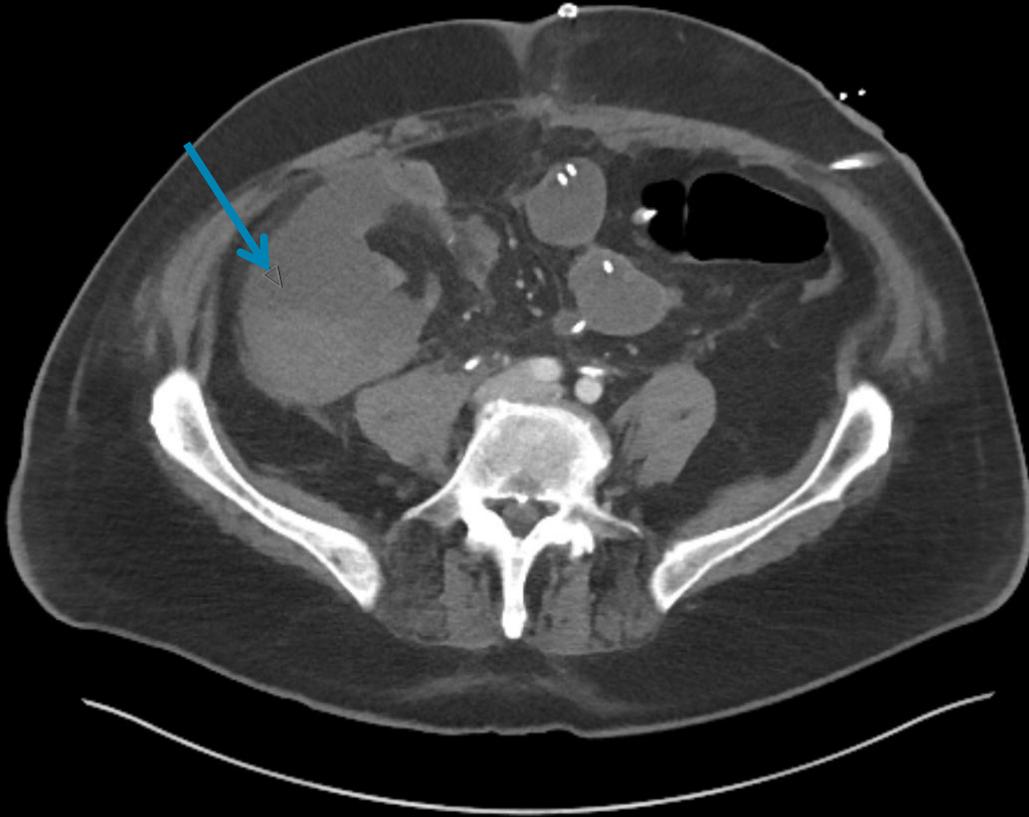


Fig. 1 - CT abdomen with IV contrast 1 week post neobladder formation. Loculated fluid in the RLQ peritoneal cavity with fluid-debris level indicating a hemorrhagic seroma (blue arrow).

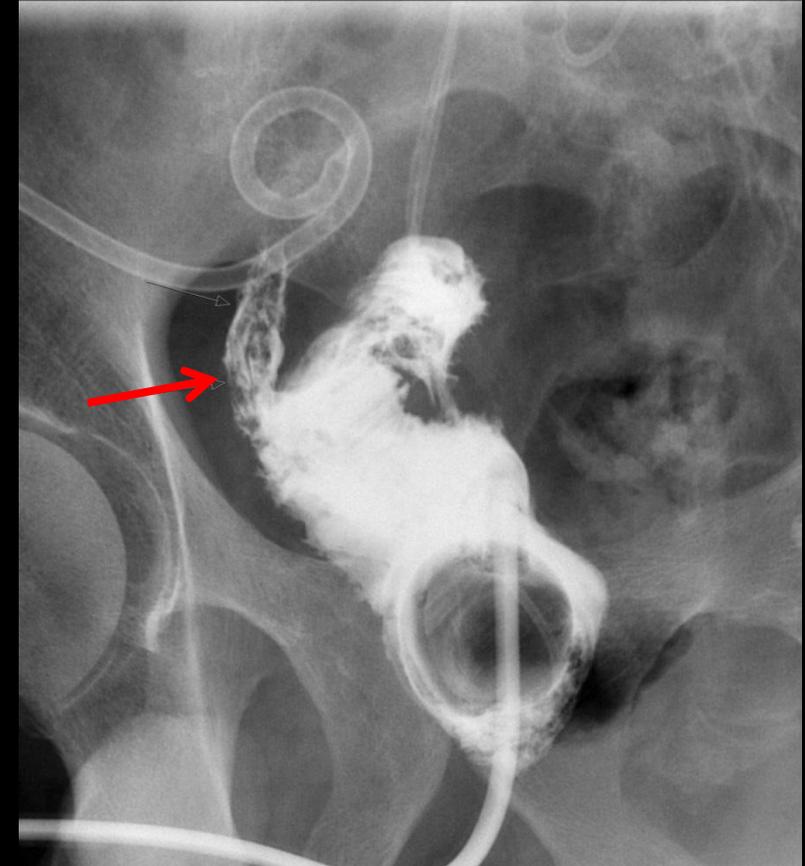


Fig.2 - Fluoroscopic Loopogram 1 month post neobladder formation. Water-soluble contrast is injected, demonstrating a leak (red arrow) from the right lateral wall of the neobladder forming a small urine collection.

# Post-Op Complications- Anastomotic Stricture

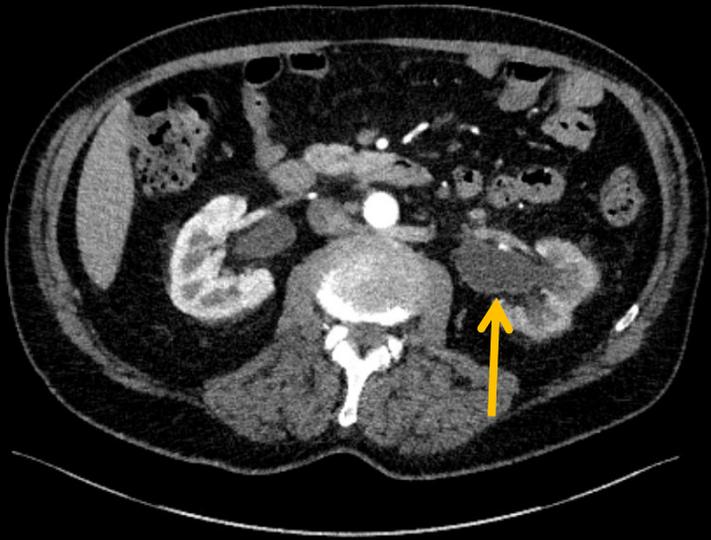


Figure 1. (Axial) Hydronephrosis (arrow)



Figure 2. (Coronal) Ureto-neobladder anastomoses (arrows)

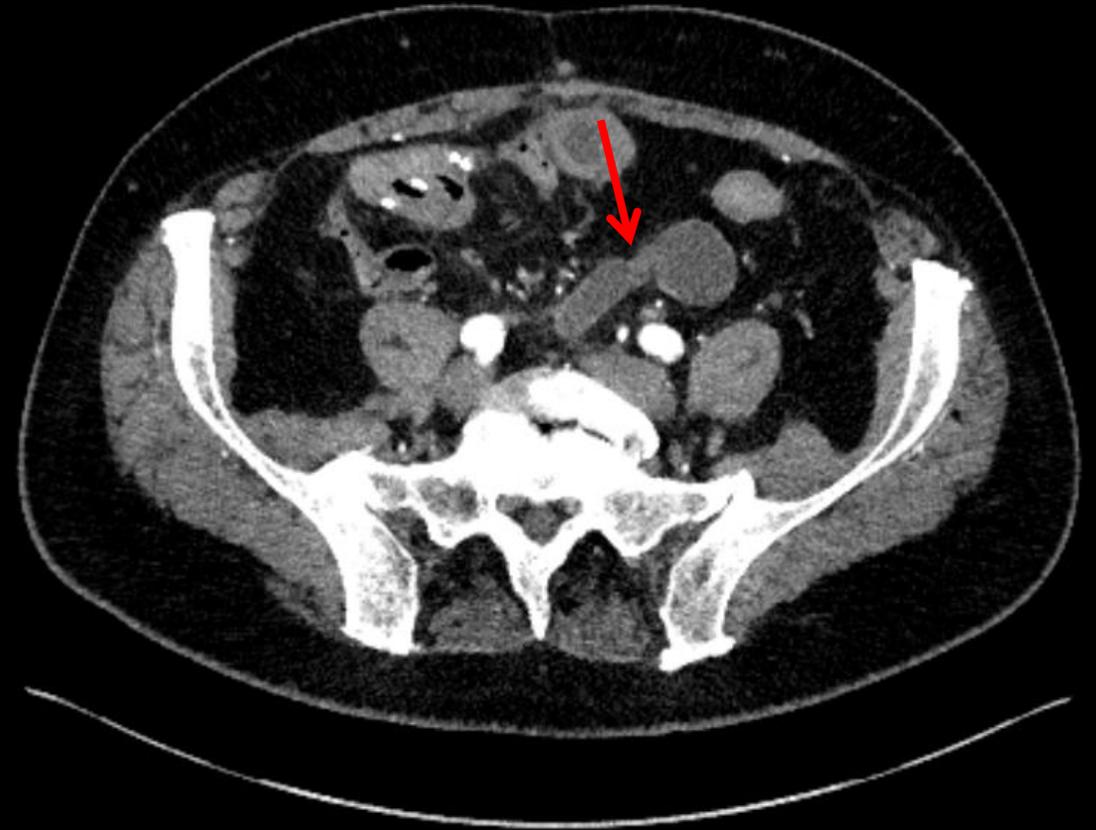


Figure 3. (Axial) Increased moderate left hydronephrosis to the level of the ureteral anastomosis with the afferent limb of the neobladder suspicious for **anastomotic stricture** (red arrow) at the ureto-neobladder anastomoses.

# Complications of Neobladders

## Early:

- **Urine leak**
- Leakage of bowel contents
- Fluid collections (urinoma, abscess, lymphocele, **seroma**, hematoma)

## Late:

- **Fistula:**
  - Most common site: from the anterior neobladder to the ileal-ileal small bowel anastomosis
  - Symptoms: fecaluria, pneumaturia, or recurrent urinary tract infection
  - Radiographic findings: air in the neobladder or upper urinary tract (however, air could also be due to instrumentation)
- **Ureteral stricture:**
  - The rate of ureteroenteric anastomotic stricture is as high as 11% after orthotopic neobladder
  - A significantly lower rate of stricture is seen when a refluxing surgical technique is used to create the anastomosis
- **Subneovesical obstruction:**
  - Rare complication after neobladder formation that occurs in approximately 1% of patients
  - Possible causes include local tumor recurrence along the pelvic floor involving the neobladder neck, stricture of the neovesicourethral anastomosis, and urethral stricture
- **Neobladder Rupture:**
  - Occurs after trauma, radiation therapy, or overdistention (High index of suspicion needed for acute abdominal pain in ER)

# References:

Moomjian, Lauren N., et al. "Follow the stream: imaging of urinary diversions." *RadioGraphics* 36.3 (2016): 688-709.

Nieuwenhuijzen, Jakko A., et al. "Urinary diversions after cystectomy: the association of clinical factors, complications and functional results of four different diversions." *European urology* 53.4 (2008): 834-844.

Wong-You–Cheong, Jade J., et al. "Neoplasms of the urinary bladder: radiologic-pathologic correlation." *Radiographics* 26.2 (2006): 553-580.

Miyazaki, Jun, and Hiroyuki Nishiyama. "Epidemiology of urothelial carcinoma." *International Journal of Urology* 24.10 (2017): 730-734.