Genitourinary Tuberculosis

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Patient SO: History

- 60 year old female
- HPI: Single episode of painless hematuria
  - No associated symptoms
- PMH:
  - Hypothyroidism, hypertension,
    hypercholesterolemia, depression
- Family History:
  - Mother - Renal cell carcinoma
- Social History: 45 pack year smoking history
Imaging Menu of Tests for Hematuria

- Intravenous Pyelography (IVP)
- Ultrasound
- MRI
- CT

- Initial imaging modality of choice for patients with unexplained hematuria
Our Patient: Non-Contrast CT – Complicated Cystic Lesion

Area of inhomogeneity w/ disruption of normal kidney contour

Calcification

PACS, BIDMC
Our Patient: Contrast CT – Complicated Cystic Lesion

Complicated cystic lesion w/ calcification

Area of inhomogeneity w/ disruption of normal kidney contour + peripheral enhancement

Calcification

Axial C+ CT

PACS, BIDMC
Definitions: Cysts and Cystic Lesions

- Cyst – fluid filled lesion
- Simple cysts can be complicated with hemorrhage, infection, inflammation, or ischemia
- Fluid filled renal mass is considered a complicated cyst when it has one of the following features:
  - Calcification
  - High attenuation (>20 HU)
  - Septations
  - Multiple locules
  - Enhancement
  - Wall thickening
  - Nodularity
Our Patient: Differential Diagnosis

- Renal Cell Carcinoma
- Transitional Cell Carcinoma
- Metastases
- Infectious disease
  - Tuberculosis
- Oncocytoma
- Multilocular Cystic Nephroma
  - Benign renal dysplasia
Menu of Tests for Imaging a Cystic Renal Mass

- **IVP**
  - Sensitivity for small renal masses is limited

- **Ultrasound**
  - Strength: reliable identification of simple renal cysts

- **CT**
  - Gold standard for renal mass evaluation

- **MRI**
  - No significant advantage over CT
  - Good for patients with contrast allergy or elevated blood creatinine level
## Bosniak Classification System

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
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<tbody>
<tr>
<td>I</td>
<td>Benign simple cyst with hairline thin wall that does not contain septa calcifications, or solid components.</td>
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<tr>
<td>II</td>
<td>Benign cyst that may contain a few hairline thin septa in which perceived enhancement may be present. Does not require further evaluation.</td>
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<tr>
<td>IIF</td>
<td>Cysts that contain multiple hairline thin septa or minimal smooth thickening of wall or septa. Wall or septa may contain calcification that may be thick and nodular.</td>
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<tr>
<td>III</td>
<td>Indeterminate cystic masses with thickened irregular or smooth walls or septa in which measurable enhancement is present.</td>
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<tr>
<td>IV</td>
<td>Clearly malignant cystic masses that can have all the criteria of category III but also contain enhancing soft-tissue components adjacent to the wall or septum.</td>
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Management of Renal Cysts

- For renal cysts in categories IIF and III, such as our patient, optimal approach is uncertain
- MRI can be used as an additional modality
  - Useful to characterize internal contents of cysts
  - More sensitive at showing enhancement of internal septations
- Our patient underwent MRI for further evaluation of the lesion
Our Patient: T2-Weighted Contrast Enhanced MRI – Complicated Cystic Lesion

- Multi-cystic lesion with areas of low signal
- Multiple internal septations with enhancement

Axial C+ MRI

PACS, BIDMC
Our Patient: T2-Weighted Contrast Enhanced MRI – Complicated Cystic Lesion

- Multi-cystic lesion
- Disruption of normal kidney contour
- Enhancement of internal septations

Coronal C+ MRI

PACS, BIDMC
Due to high suspicion of RCC or TCC, our patient underwent a laparoscopic radical nephrectomy.

Pathology report revealed necrotizing granulomas and active inflammation, likely renal tuberculosis.
Our Patient: More Detailed Family History

- Father hospitalized many years ago for “severe” pulmonary TB
- 18 month old brother died from tuberculous meningitis
- Surviving brother developed TB and was hospitalized for one year
- S.O. and sister told they “could never have a PPD”
Extra-Pulmonary Tuberculosis

- Aside from lymphadenopathy, the genitourinary system is the most common site of involvement by extra-pulmonary TB
  - Accounts for 15% - 20% of infections outside the lung
  - Only 25% of patients have a known history of prior pulmonary TB
  - Additional 25% - 50% of patients will have radiographic evidence of prior sub-clinical pulmonary infection
Our Patient: Pre-Op CXR

Initially read by radiologist as normal

However, upon closer examination...

Chest: Frontal P-A Plain Film

PACS, BIDMC
Our Patient: Evidence of Prior TB Infection on Pre-Op CXR

Granulomas + Fibrosis

Ghon Focus

Chest: Frontal P-A Plain Film, Magnified

PACS, BIDMC
Pathogenesis of Renal TB

- Small granulomas form in renal cortex
- Capillary rupture results in delivery of organisms to proximal tubules and loops of Henle and eventually papillary necrosis
- Host response includes fibrosis, calcium deposition, and stricture formation
Renal Anatomy

Companion Patient #1: Moth-Eaten Calyx on IVU

Abnormal calyx with some loss of renal substance


Abdomen: C+ Frontal Plain Film
Companion Patient #1: Calcification on Plain Film

Calcification in lower pole of kidney

- Present in 24% - 44% of patients with renal TB

Companion Patient #2: Ureter and Bladder Involvement on IVU


Ureteric dilation and distal stricture

Abnormal bladder wall

Abdomen: Frontal C+ Plain Film
Genital Tuberculosis

- Genital TB is usually associated with renal TB
- Male genital TB involves the prostate, seminal vesicles, epididymis, and testes
- Female genital TB can spread to the peritoneum, endometrium, ovaries, cervix, and vagina
Companion Patient #3: Testicular TB on CT

Large, irregular left sided testicular mass

Our Patient: Clinical Course

- Currently being treated with a multi-drug regimen for 12 months:
  - Isoniazid
  - Rifampin
  - Ethambutol
  - Pyrazinamide
Conclusions

- Tuberculosis is not limited to just the pulmonary system
- Even without prior known pulmonary TB infection, TB must be kept on the differential diagnosis for many lesions and pathologies of the genitourinary system
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References