UPJ Obstruction

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HMS IV
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CC: Left flank pain

HPI: 32 yoM who presented to the BIDMC Emergency Department with acute, colicky left flank pain with nausea and vomiting. Pain has actually been long-standing and is exacerbated with large fluid intake.

PMH/PSH: none

Meds: none

ALL: none
Patient presentation (cont.)

- FH: non-contributory
- SH: Bar owner; 2-4 alcoholic drinks/day
- PE:
  - AVSS in NAD
  - significant for left-sided palpable abdominal mass
- Labs:
  - BUN 15, Cr 1.0
  - U/A: Neg for LE and nitrite; occ bacteria
    5 RBC/hpf, 2 WBC/hpf
Clinical differential diagnosis

- Urolithiasis
- Hydronephrosis
- Benign tumor/cyst vs malignant tumor
- Pyelonephritis/Renal abscess
- Renal infarction
- Hematoma
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Axial CT of abdomen/pelvis without contrast at the level of the kidneys suggests hydronephrosis of left kidney.
Our patient AG: axial non-contrast abdominal CT

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Axial CT of abdomen/pelvis without contrast at the level of the kidneys suggests hydronephrosis of left kidney
Axial CT of abdomen/pelvis without contrast at the level of the bladder reveals a small ureteral calculus that is unlikely to be responsible for AG’s symptoms.
Axial CT of abdomen/pelvis with contrast (pyelogram phase) demonstrates delayed excretion of contrast from the left kidney.

Perinephric fat stranding

Dilated extrarenal pelvis

Patient AG
PACS, BIDMC

prone

Axial CT of abdomen/pelvis with contrast (pyelogram phase) demonstrates delayed excretion of contrast from the left kidney.
Our patient AG: axial contrast-enhanced abdominal CT

Axial CT of abdomen/pelvis with contrast (pyelogram phase) demonstrates delayed excretion of contrast from the left kidney.
Our patient AG: coronal contrast-enhanced abdominal CT

Reformatted coronal CT of abdomen/pelvis with contrast (pyelogram phase) illustrates severe hydronephrosis of left kidney with clubbed calyces

“Clubbed” calyx

Dilated extrarenal pelvis

Patient AG
PACS, BIDMC
Hospital course

- Admitted to hospital for pain control and IV hydration

- Cystoscopy and retrograde pyelogram performed
  - *Left uretero-pelvic junction (UPJ) obstruction confirmed*
  - Double J *left ureteral stent* placed to relieve obstruction and reduce hydronephrosis

- Successful stent placement confirmed on KUB
Our patient AG: left ureteral stent on abdominal plain film

Abdominal plain film confirms appropriate placement of stent within left ureter
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- MAG3 scan performed to evaluate differential renal function
** Radionuclide MAG3 scan allows evaluation of renal function and the presence of obstruction

- **Blood Flow Curves**
  - Acquire images Q1-2s for 1 min
  - Assess Renal Perfusion
  - Assign ROI

- **Dynamic Curves**
  - Acquire images Q30-60s for 30 min
  - Assess Tubular Absorption
  - Administer 20-40mg Lasix

- **Lasix Curves**
  - Acquire images Q30-60s for 20 min
  - Assess Excretion

\[ t_{1/2} < 10 \text{ min} \rightarrow \text{No obstruction} \]
\[ t_{1/2} > 20 \text{ min} \rightarrow \text{Obstruction present} \]
Our patient AG: radionuclide MAG3 scan, flow curves

** Flow curves demonstrate comparable renal arterial blood flow to both kidneys

Images courtesy of Dr. Kevin Donohoe
Our patient AG: radionuclide MAG3 scan, dynamic curves

**Dynamic curves demonstrate similar tubular function of both kidneys**

MAG3 scan (Dynamic phase)

Left: 59% function
Right: 41% function

Images courtesy of Dr. Kevin Donohoe
Our patient AG: radionuclide MAG3 lasix scan

Excretion of tracer by left kidney is significantly slowed

** Lasix scan reveals partial UPJ obstruction of left kidney

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Images courtesy of Dr. Kevin Donohoe
Our patient AG: Radionuclide MAG3 scan, real time movie

*MAG3 dynamic flow curves*  
*MAG3 flow curves post-lasix*

** Flow through renal collecting system is shown in real time and illustrates partial UPJ obstruction of left kidney

*Images courtesy of Dr. Kevin Donohoe*
Patient follow-up

- Patient continued to have left flank pain despite ureteral stent placement

- He underwent elective *dismembered pyeloplasty* of left kidney 3 weeks later

- Patient’s pain was relieved following pyeloplasty

- Follow-up IVP 7 months later showed resolution of obstruction despite a persistently dilated left renal pelvis
Repair of UPJ obstruction: dismembered pyeloplasty


*Figure 1 - Anderson-Hynes pyeloplasty.*
**UPJ obstruction is defined as a functional or anatomic obstruction to urine flow from the renal pelvis to the proximal ureter that leads to symptoms and/or renal damage**

Causes of UPJ obstruction

**Congenital (Primary)**
- Failure of recanalization of ureter at UPJ
- Abnormal collagen/muscle within ureter → aperistaltic segment at UPJ (likely etiology in our patient ***)
- Aberrant crossing renal vessels
- High ureteral insertion
- Vesicoureteral reflux → ureteral scarring and strictures
- Atypical mucosal valves, polyps, true ureteral strictures

**Acquired (Secondary)**
- Stricture/stenosis from repeated injury, manipulation, infection, inflammation
- Obstructive stones
- Obstructing tumor
- Retroperitoneal fibrosis

** Histologic analysis of our patient’s diseased UPJ segment revealed muscular hypertrophy and perifascicular fibrosis of the muscularis propria consistent with this etiology of UPJ obstruction.**
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**Radiology has been particularly useful in evaluating whether aberrant crossing vessels are responsible for UPJ obstruction within a patient**
**Aberrant “crossing vessels”** can cross either anterior to or posterior to the ureteropelvic junction and cause obstruction to urine outflow

Crossing vessels on axial contrast-enhanced helical CT with multiplanar reconstruction

Crossing vessels on axial contrast-enhanced helical CT with multiplanar reconstruction

Complications of UPJ obstruction are varied

- Progressive functional impairment of kidneys
- Poor growth in infants
- Urinary stasis
  - UTIs/pyelonephritis
  - Stones
- Hypertension
- Increased susceptibility to renal pelvis rupture with blunt trauma
- Symptoms of pain, nausea, vomiting, and hematuria, especially with large fluid intake ➔ Dietl’s crisis
Some surgical treatment options for UPJ obstruction

- Open dismembered pyeloplasty
- Laparoscopic pyeloplasty
- Antegrade endopyelotomy
  - Percutaneous access to renal calyx with antegrade placement of nephroscope
  - Endoscopic incision of diseased UPJ segment with cutting instrument
- Retrograde endopyelotomy
  - Ureteroscope advanced past diseased UPJ segment
  - Holmium laser incision of diseased UPJ segment
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References


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