

RADY 417: Body Imaging Case Presentation

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Radiology Case

51 year old male with one day history of left flank pain and fever

Focused patient history and workup

- Mr. PKD is a 51 year old with HTN, Gout, chronic CMV and ADPKD s/p renal transplant on 12/16/11 c/b delayed graft function on dialysis post-op who presents with one day history of left flank pain and fever.

Differential Diagnosis

- Left flank pain:
 - Colon: colitis, diverticulitis, IBD, IBS, mesenteric ischemia
 - Pelvis: testicular torsion (male)
 - Renal: nephrolithiasis, pyelonephritis
 - Abdominal wall: herpes zoster

(Cartwright and Knudson, 2015)

List of imaging studies

- CT scan without contrast
- CXR
- Transplant renal US

ACR Appropriateness Criteria for Acute Onset Flank Pain

Last review date: 2013

American College of Radiology ACR Appropriateness Criteria®

Clinical Condition: Acute Onset Flank Pain—Suspicion of Stone Disease (Urolithiasis)

Variant 1: Suspicion of stone disease.

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen and pelvis without IV contrast	8	Reduced-dose techniques are preferred.	++++
CT abdomen and pelvis without and with IV contrast	6	This procedure is indicated if CT without contrast does not explain pain or reveals an abnormality that should be further assessed with contrast (eg, stone versus phleboliths).	++++
US color Doppler kidneys and bladder retroperitoneal	6		O
X-ray intravenous urography	4		+++
MRI abdomen and pelvis without IV contrast	4	MR urography.	O
MRI abdomen and pelvis without and with IV contrast	4	MR urography.	O
X-ray abdomen and pelvis (KUB)	3	This procedure can be performed with US as an alternative to NCCT.	++
CT abdomen and pelvis with IV contrast	2		++++

(Moreno et al., 2015)

Additional ACR Criteria

Variant 3: Younger than age 40, negative physical examination, and no other signs, symptoms, or risk factors.

Radiologic Procedure	Rating	Comments	RRL*
X-ray chest	4		⊕
CT chest without IV contrast	1		⊕ ⊕ ⊕
CT chest with IV contrast	1		⊕ ⊕ ⊕
CT chest without and with IV contrast	1		⊕ ⊕ ⊕

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

*Relative
Radiation Level

(Kirsch
et al.,
2013)

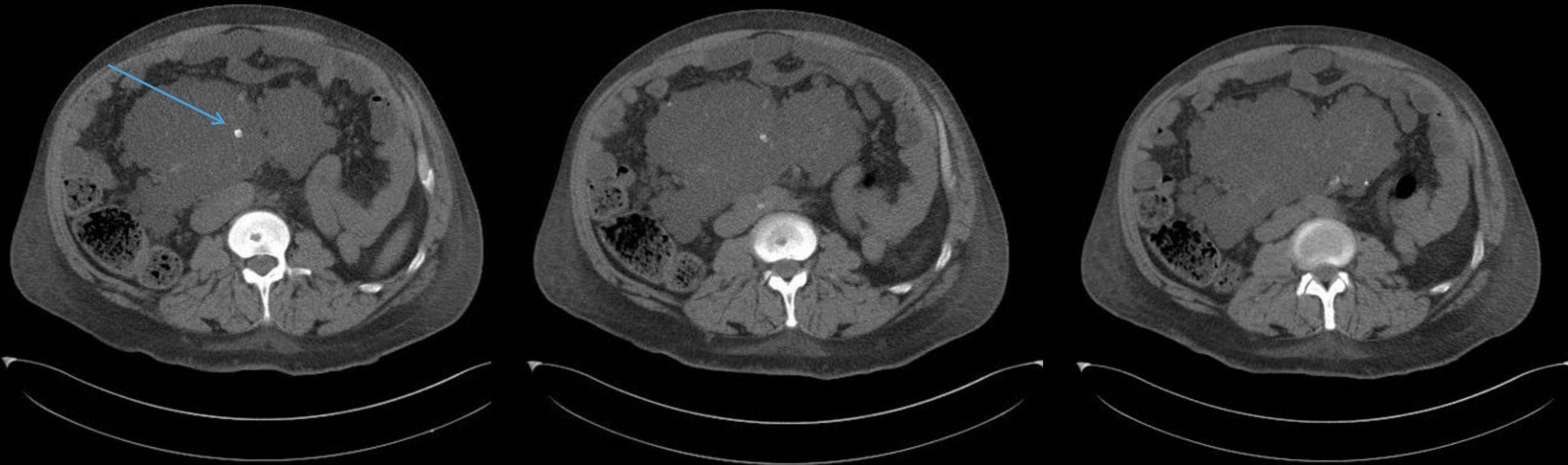
Imaging studies from PACS: CT



Rt Colon

Spleen

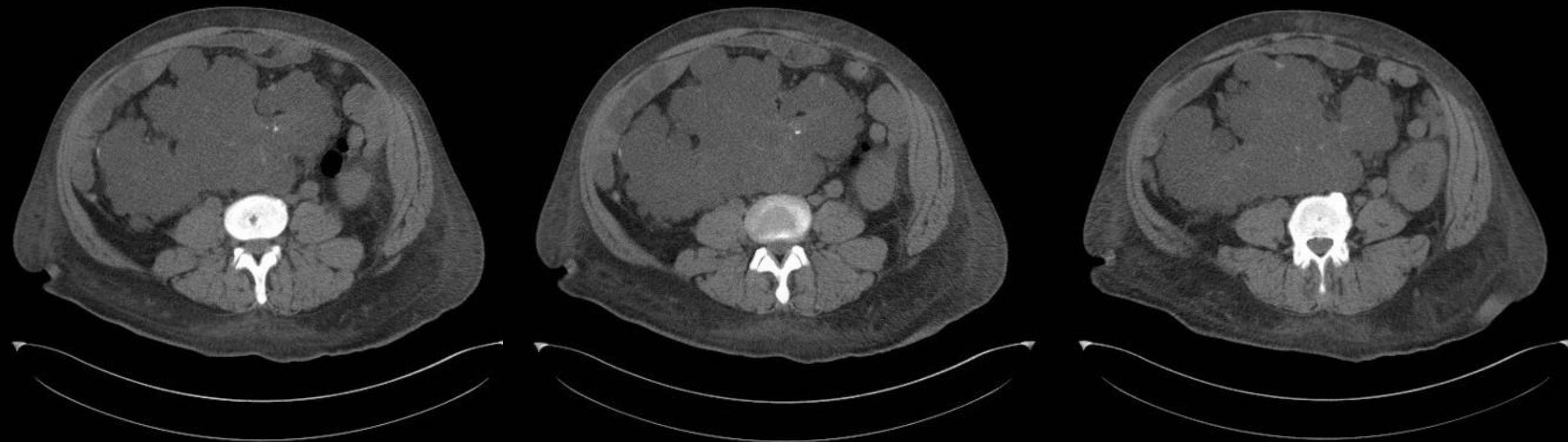
Imaging studies from PACS: CT



Imaging studies from PACS: CT



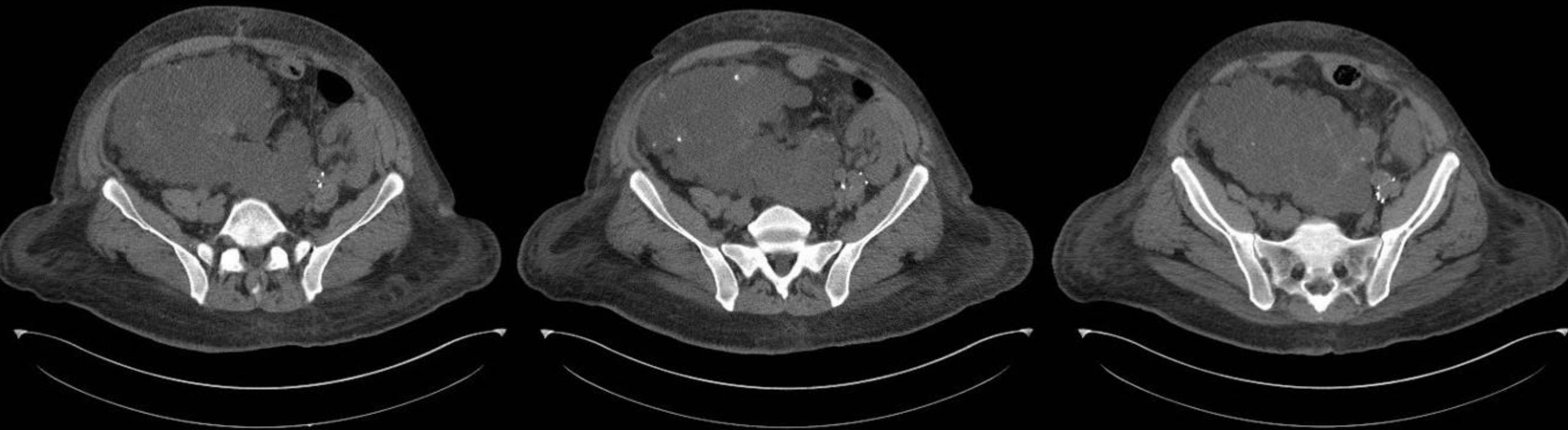
Imaging studies from PACS: CT



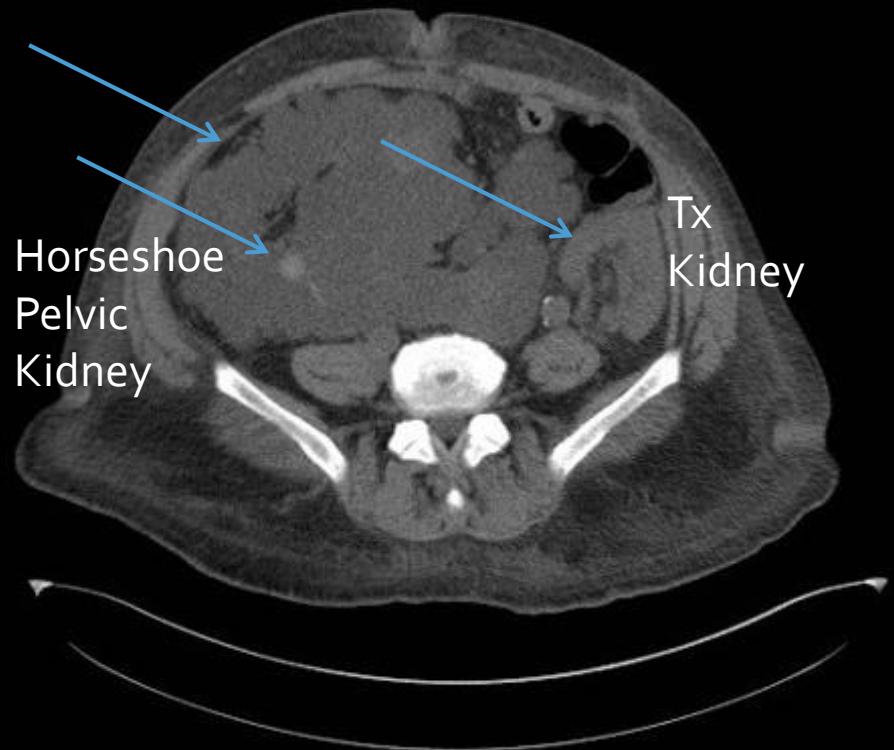
Imaging studies from PACS: CT



Imaging studies from PACS: CT



CT Findings



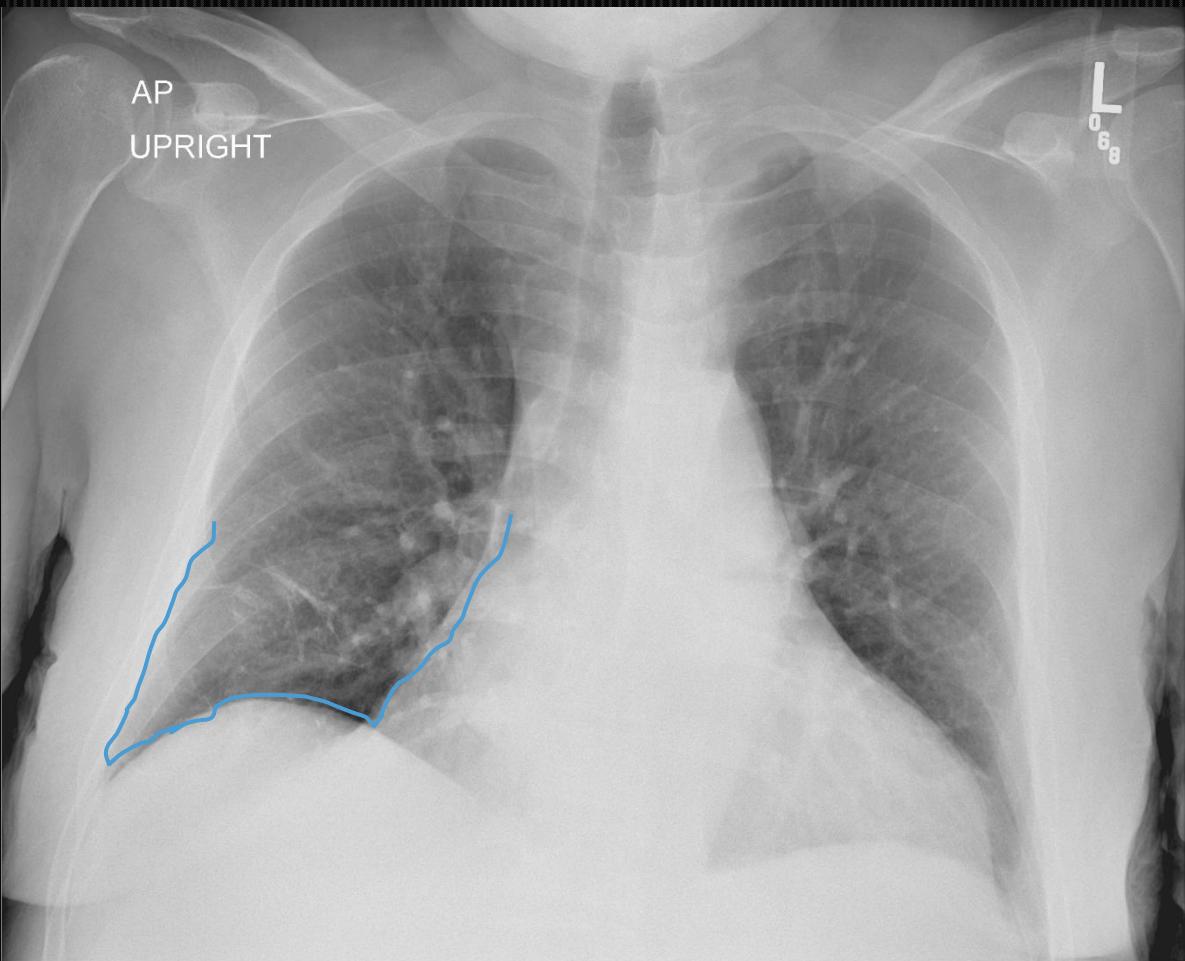
- Kidneys/ureters: many cysts within horseshoe pelvic kidney, some hyperdense cysts with perhaps hemorrhage, LLQ transplant kidney, no surrounding fluid collection
- Bowel: non-obstructed bowel gas pattern
- Soft tissue: soft tissue edema

Imaging discussion 1

- CT scan is the most appropriate scan per ACR criteria in evaluation of acute left flank pain
- Calcifications are best detected in CT without contrast
- US is not needed for further evaluation

(Moreno et al., 2015)

Imaging studies from PACS: CXR



- RLL subsegmental atelectasis
- Enlargement of pulmonary vasculature
- No new nodularity, effusions, or pneumothorax when compared to previous CXR

Imaging discussion 2

- CXR is an appropriate imaging modality in fever
- Atelectasis is very common and should be correlated with clinical symptoms and picture

Imaging studies from PACS: Renal Transplant US



- Normal left donor kidney parenchyma w adjacent renal parenchyma w cysts, calcifications
- Largely to evaluated flow in donor kidney (LLQ)
- Donor kidney 11.3 cm x 5.1 cm x 5.7 cm
- Main renal artery resistive index: 0.72-0.84
- Main renal vein patent

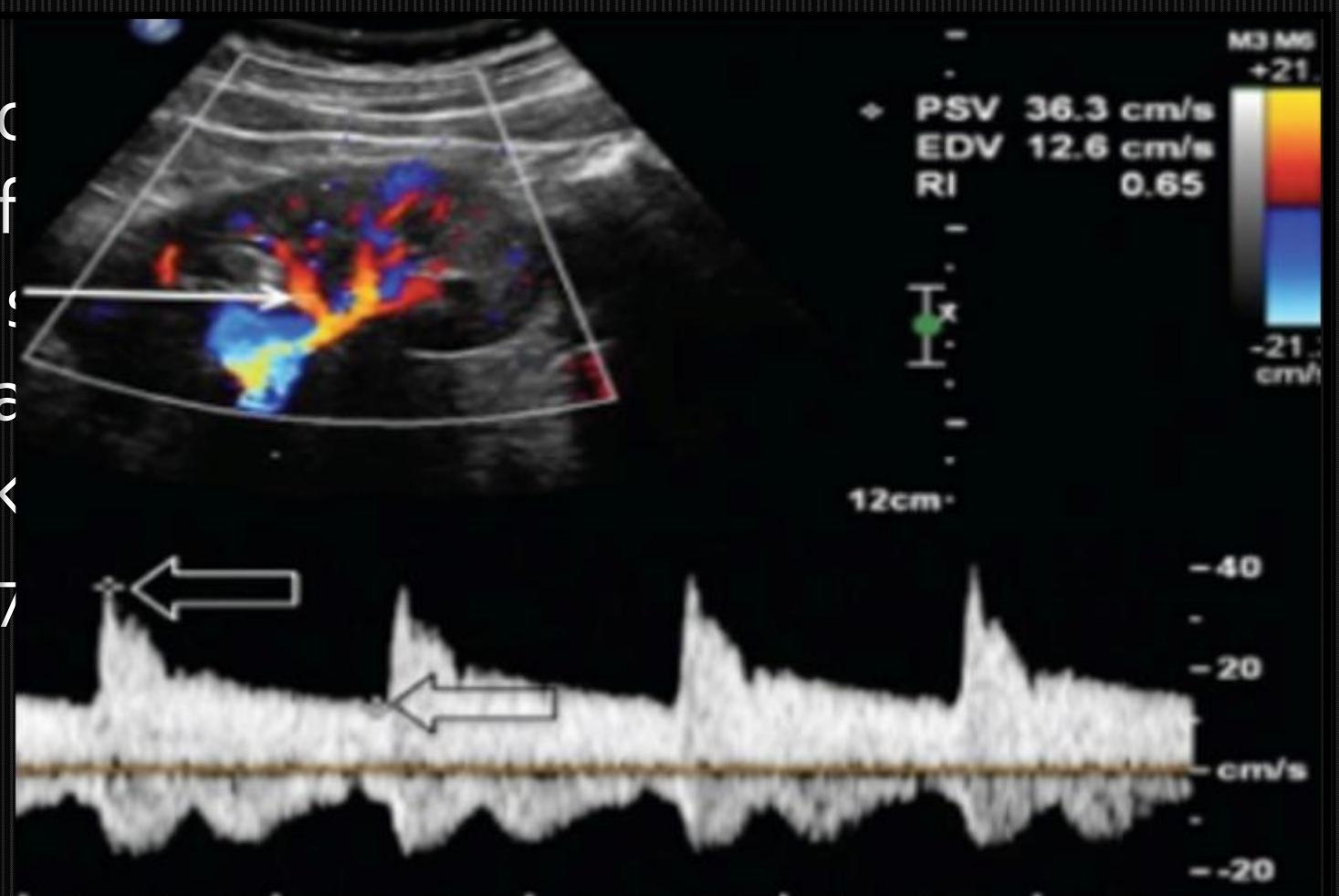
Imaging discussion 3

- Renal US to evaluate flow of transplant kidney
- Useful for evaluation of chronic renal rejection, progression, or assessment of renal stenosis
- Renal resistive index calculated as(peak systolic velocity-end diastolic velocity)/ peak systolic velocity, $0.6 +/ - 0.01$ normal
 - Upper limit of normal 0.7

(Moreno et al., 2015), (Viazza et al., 2013).

Imaging discussion 3

- Renal US to evaluate flow
- Useful for evaluation of or assessment of renal blood flow
- Renal resistive index calculated as (peak systolic velocity - diastolic velocity)/ peak systolic velocity
 - Upper limit of normal 0.7



Patient treatment

- No new findings on CXR, CT, US
- Fever workup was a negative, considered potentially 2/2 gout as patient reports knee pain as well and resolved
- Plans for antibiotic 14 day course of levaquin as differential included renal cyst vs. pyelonephritis
- Patient was discharged

ADPKD (Autosomal Dominant Polycystic Kidney Disease)

- ADPKD (Autosomal Dominant Polycystic Kidney Disease), late-onset multisystem disorder with:
 - Bilateral renal cysts (primarily kidney diagnosis) , determined by age, 50% ESRD by 60 years)
 - Liver cyst
 - Increased risk of intracranial aneurysms
 - Additional: pancreatic cysts, dilation of aorta, mitral valve prolapse, abdominal wall hernias (95% of affected have an affected parent, but 10% de novo variant)
- Diagnosis: renal imaging (US, CT, MRI) and heterozygous variant in PKD1, PKD2, and DNAJB11
- Prevalence: 1 in every 400-1000 live births; $\frac{1}{2}$ of these cases are diagnosed in lifetime, $\frac{1}{2}$ are clinically silent

(Harris and Torres, 2018)

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 - Bilateral renal cysts (primarily years)
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- Diagnosis: renal imaging (PKD1, PKD2, and DNAJB1)
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(Harris and Torres, 2018)

Renal fusion abnormality

- Commonly referred to as 'horseshoe kidney'
- Common congenital malformations of renal tissue during embryologic migration, resulting in fusion at renal poles
- Incidence: 0.4-1.6 per 10,000 registered but estimated to be 1/400-1/600 when screened infants less than 6 months
- Most are asymptomatic but has increased risk of renal calculi (20%), metabolic abnormalities, and infection
- Diagnosis: Abdominal CT, Renal US, Excretory urography

(Rosenblum, 2017)

Renal fusion abnormality

- Commonly referred to as 'horse shoe kidney'
- Common congenital malformation due to abnormal migration, resulting in fusion at the midline
- Incidence: 0.4-1.6 per 10,000 newborns; 1/600 when screened infants less than 1 year old
- Most are asymptomatic but have increased risk of metabolic abnormalities, and increased risk of UTIs
- Diagnosis: Abdominal CT, Renal ultrasound



(Rosenblum, 2017)

Polycystic horseshoe kidney

- Rare combination of hereditary autosomal dominant and common renal fusion anomaly during embryogenesis
- Incidence: 1 in 134,000-800,000 live births
- Horseshoe kidney is largely asymptomatic, and the development of renal failure with PKD is not higher with presence of horseshoe abnormality
- Indication for nephrectomy in these cases include:
 - Pyelonephritis, persistent
 - HTN, persistent
 - Renal transplantation

(Chikkannaiah et al., 2018)

Take-Away Points from Case

- ADPKD presents with many cysts in the kidney
- Horseshoe kidney is the most common renal fusion abnormality and has increased risk of renal calculi
- CT without contrast is the best study to evaluate for renal calculi and calcifications (sensitivity 97%, specificity 95%) [ACR criteria]
- US provides valuable information about flow in transplant kidney
- CXR can be helpful in the workup of fever

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