

Sonographic assessment of urinary tract tumours

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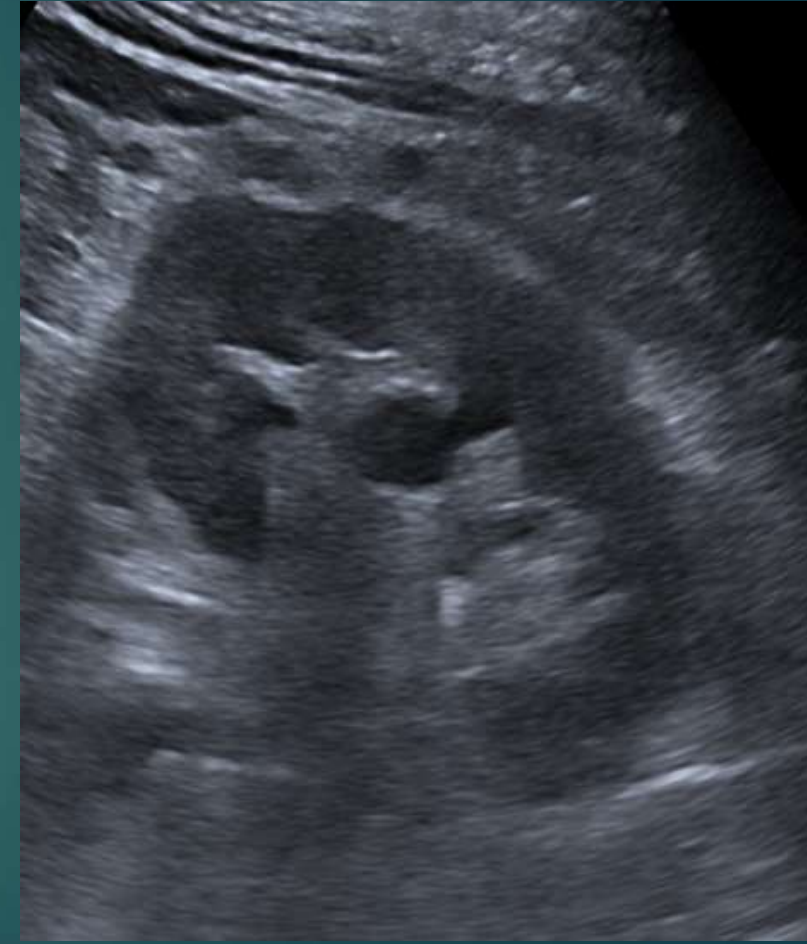


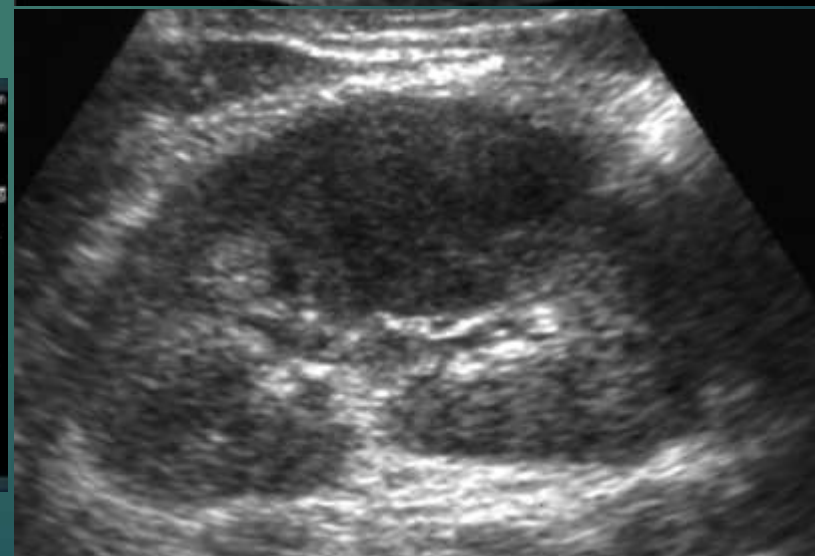
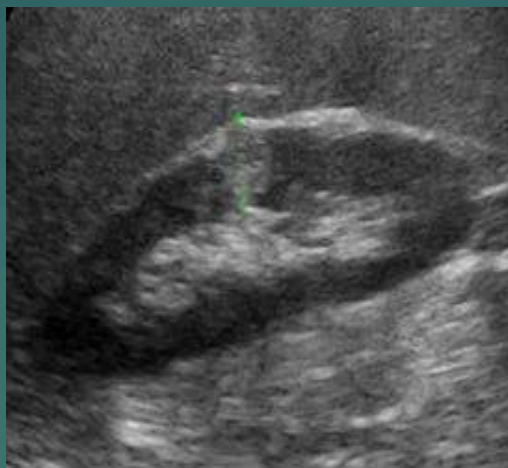
Renal Lesions

- ▶ Exponential growth of imaging continues to feed a marked increase in the detection of renal lesions.
- ▶ >70% RCC are incidentally detected- mostly by US.
- ▶ Huge number of cystic (40 % of all patients have at least 1 cyst) and 'indeterminate' renal lesions detected by US.
- ▶ How confidently do we characterise them?



Hyperdense Renal Lesions





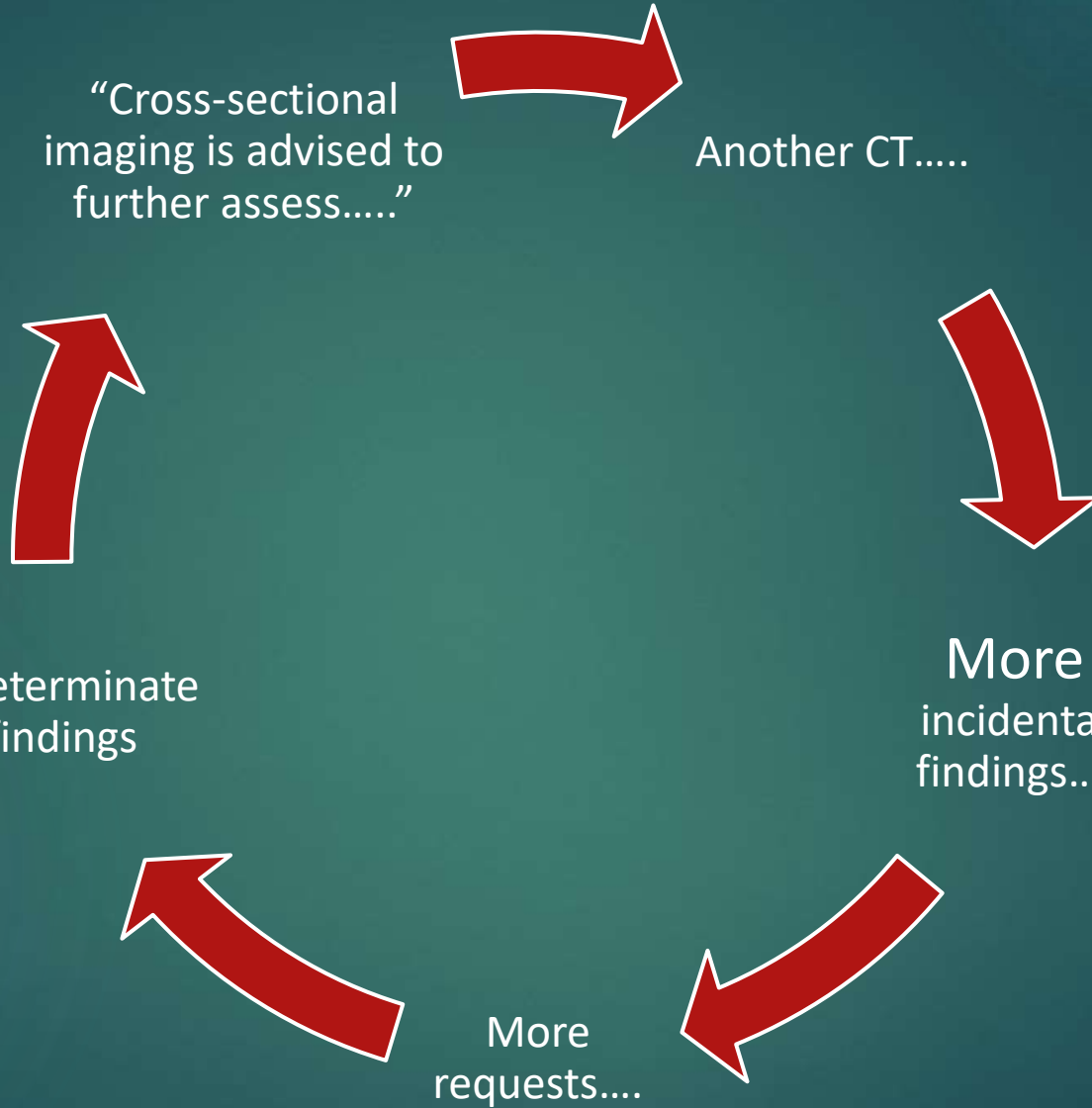
“Cross-sectional
imaging is advised to
further assess....”

Another CT....

More
incidental
findings....

More
requests....

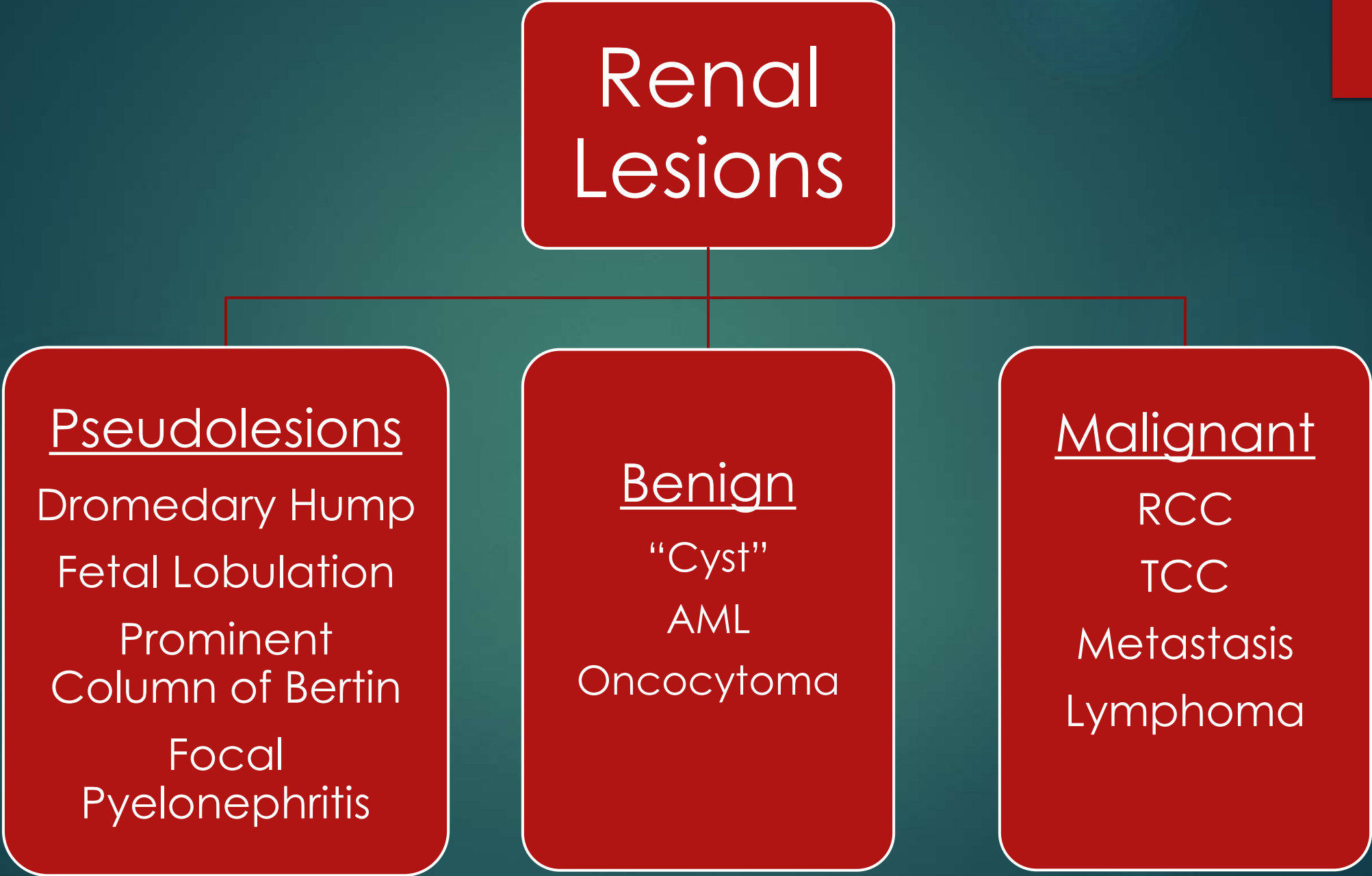
Indeterminate
findings



Incidental Lesion

- ▶ Significant proportion referred to CT and MR for characterisation- large cost- financial and time... stress
- ▶ US should more easily distinguish simple cystic from complex or solid lesions
- ▶ Limited FOV on US depending on body habitus

Renal Lesions



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graph TD; A[Renal Lesions] --> B[Pseudolesions]; A --> C[Benign]; A --> D[Malignant]; B --> B1[Dromedary Hump]; B --> B2[Fetal Lobulation]; B --> B3[Prominent Column of Bertin]; B --> B4[Focal Pyelonephritis]; C --> C1["Cyst"]; C --> C2[AML]; C --> C3[Oncocytoma]; D --> D1[RCC]; D --> D2[TCC]; D --> D3[Metastasis]; D --> D4[Lymphoma];
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A hierarchical flowchart titled "Renal Lesions" in a red box. The title branches into three categories: "Pseudolesions", "Benign", and "Malignant", each in its own red box. "Pseudolesions" lists Dromedary Hump, Fetal Lobulation, Prominent Column of Bertin, and Focal Pyelonephritis. "Benign" lists "Cyst", AML, and Oncocytoma. "Malignant" lists RCC, TCC, Metastasis, and Lymphoma.

Pseudolesions

Dromedary Hump

Fetal Lobulation

Prominent
Column of Bertin

Focal
Pyelonephritis

Benign

"Cyst"

AML

Oncocytoma

Malignant

RCC

TCC

Metastasis

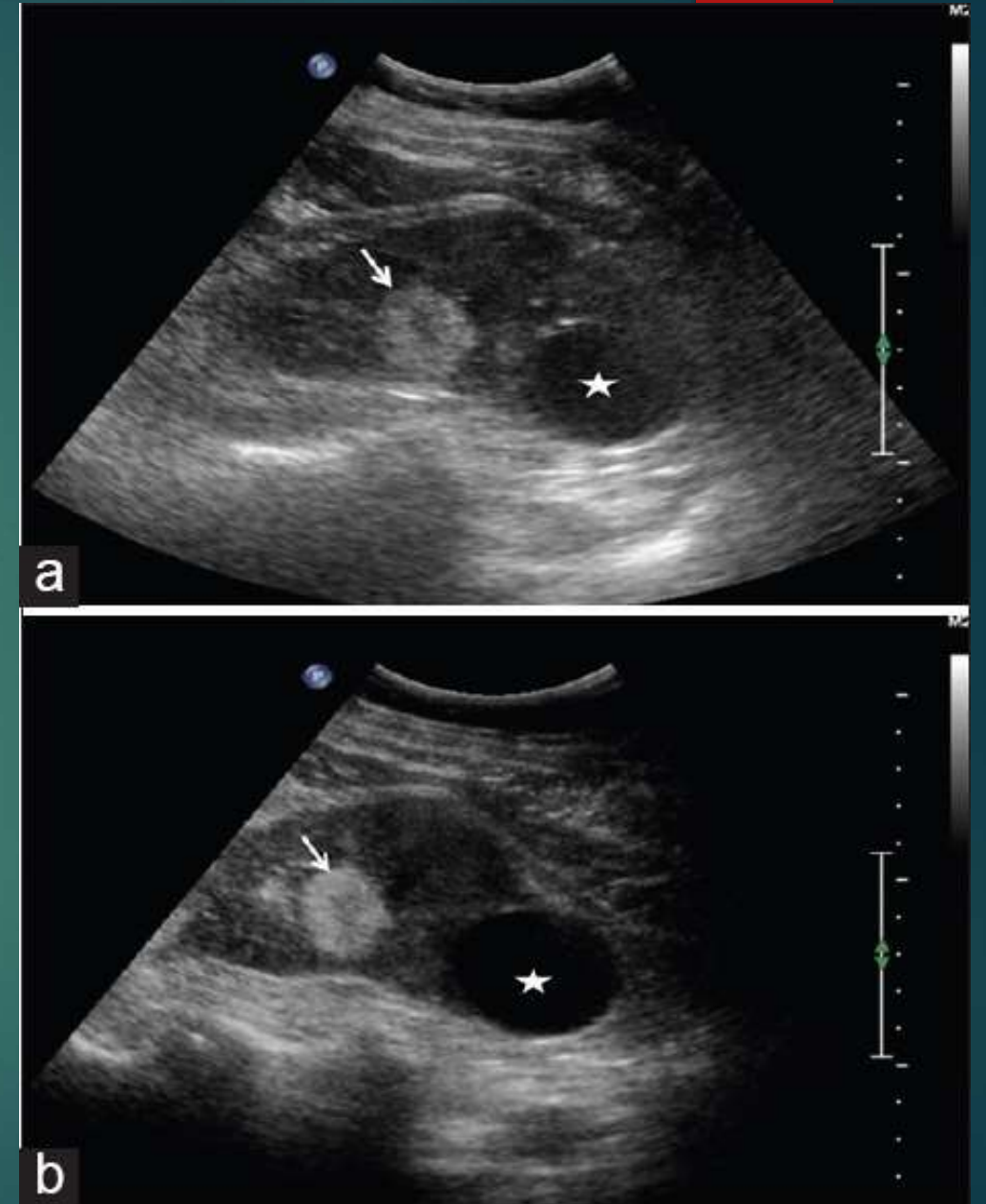
Lymphoma

Available Tools

- ▶ Standard B-mode US
- ▶ Tissue Harmonic imaging (THI)
- ▶ Color Flow Doppler / Microvascular flow
- ▶ Fusion (US to CT / MRI)
- ▶ Contrast Enhanced Ultrasound (CEUS)

Harmonic Imaging

- ▶ Enhances signal:noise ratio
- ▶ Removes reverberation and side lobe artefacts
- ▶ Improves contrast resolution
- ▶ Good for obese patient as harmonics are preferentially produced from deeper tissues.



Improved conspicuity of a cyst and AML with harm
Lal A et al Indian J of Urol 2015; 13:176

Microbubbles

- ▶ Bubble of gas surrounded by a shell
- ▶ Diameter 1-7 μm
- ▶ Vascular markers
- ▶ Resonant Frequency 2-15 MHz
- ▶ Real-time low MI modes to $\downarrow$ destruction
- ▶ Very safe: No nephrotoxicity. Can use in renal failure and obstruction
- ▶ Use when CT/MR agents contraindicated



Renal Contrast Dynamics

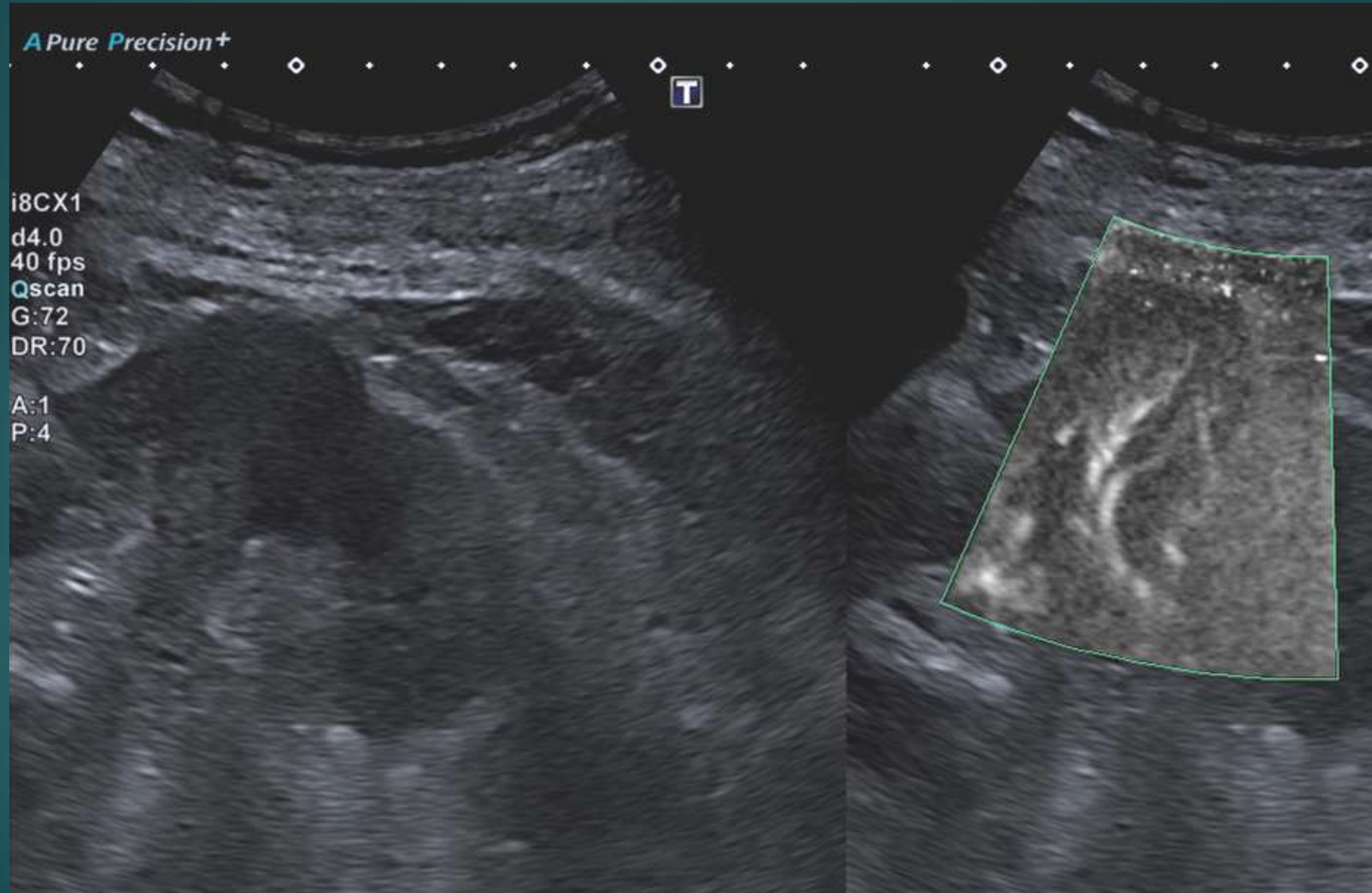
- ▶ Kidneys 20-25% cardiac output
- ▶ Cortical phase starts 10-15 secs after injection and lasts 20-40secs followed by slower medullary phase (via vasa recta) lasting 45-120secs
- ▶ Whole exam 2 mins
- ▶ Lower dose 1-1.5ml (avoid attenuation of deeper part of kidney due to high cortical perfusion)

65

K i d n e y L o n g

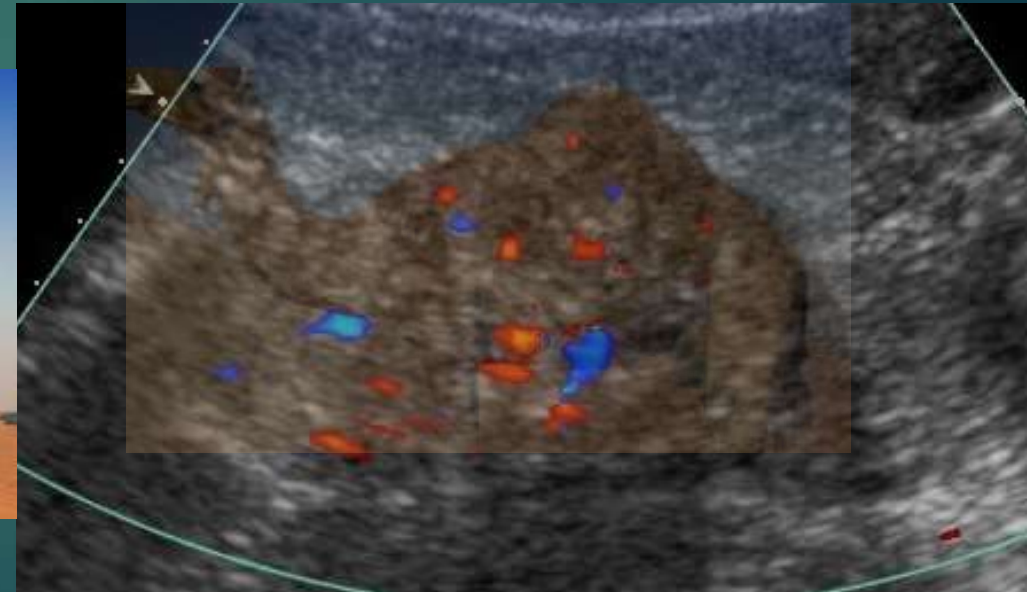
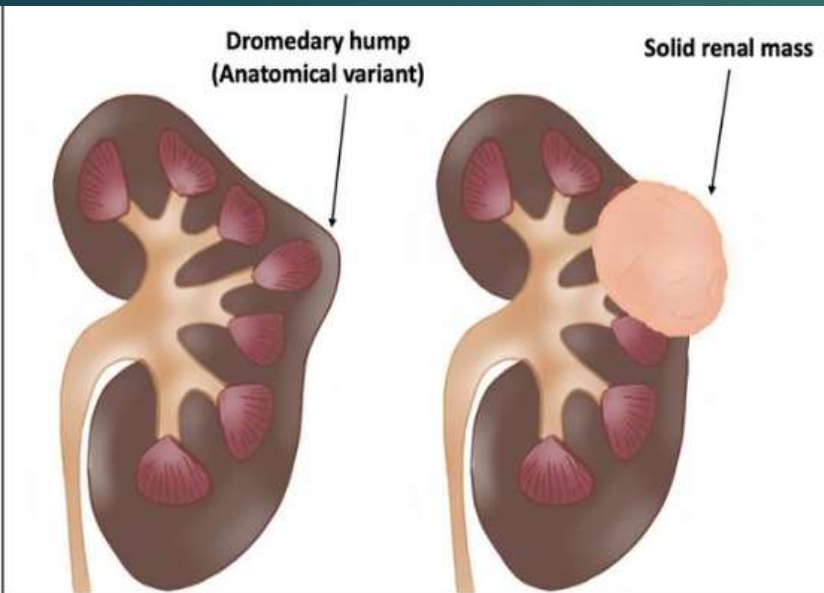


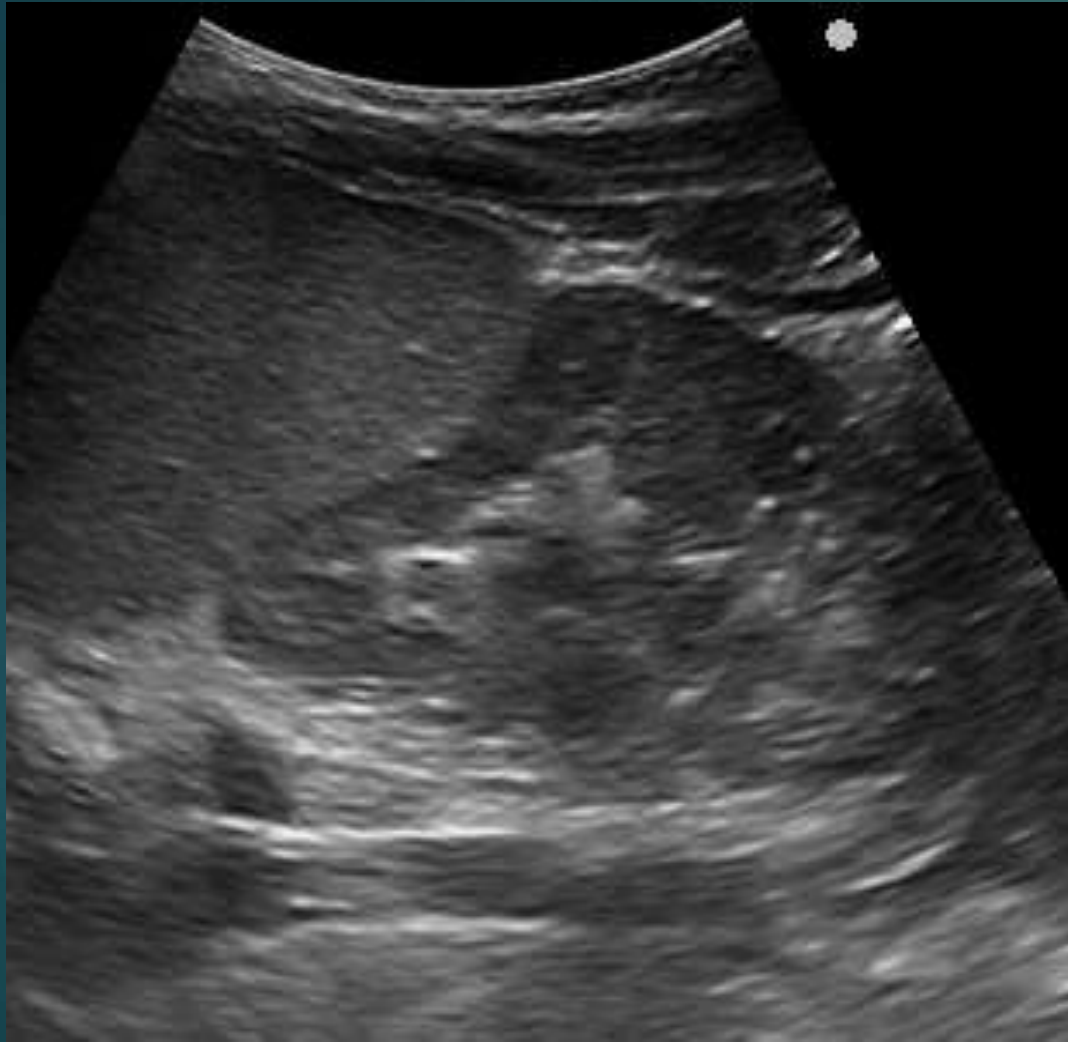
? Interpolar lesion

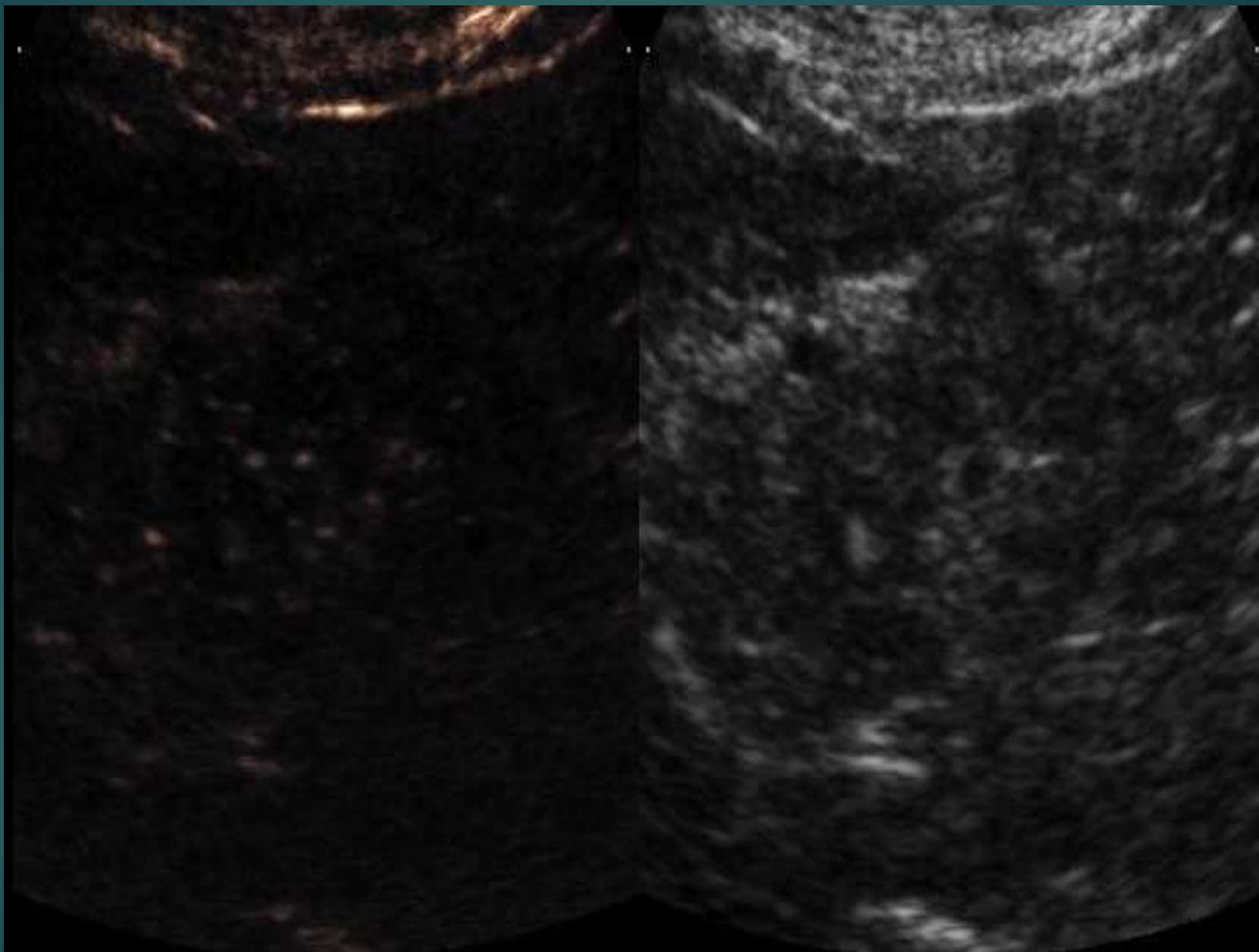


Dromedary Hump

- ▶ Prominent focal bulge on the lateral border of the left kidney caused by splenic impression - mimic renal neoplasm.

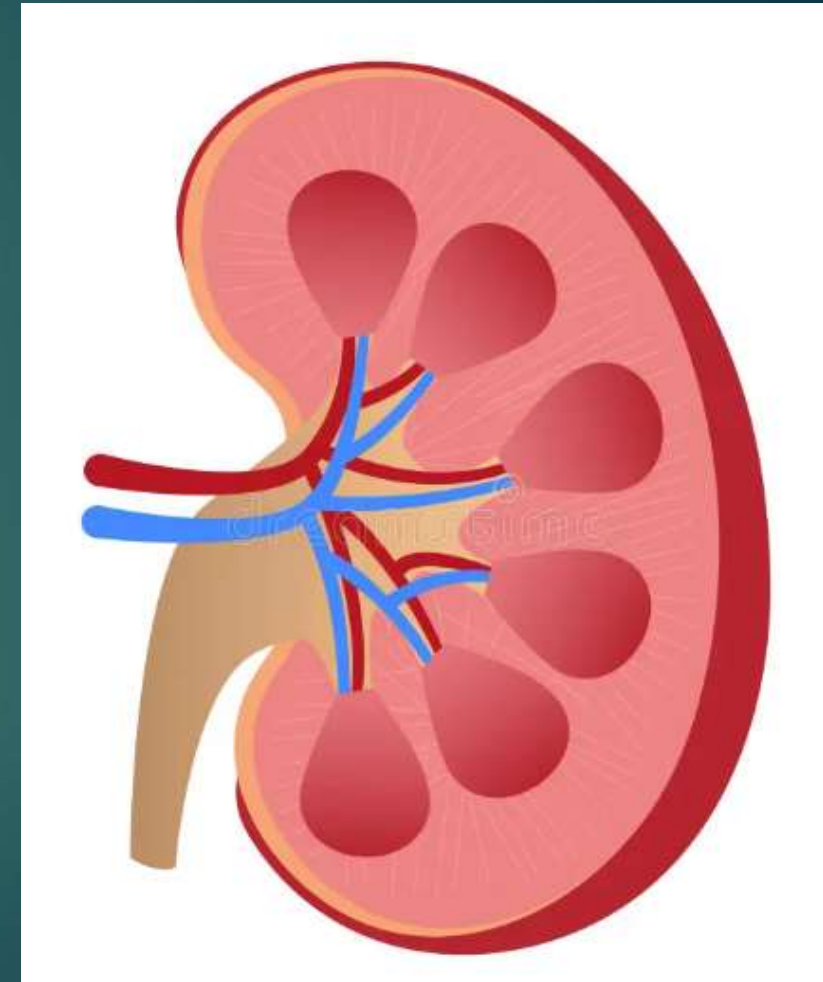


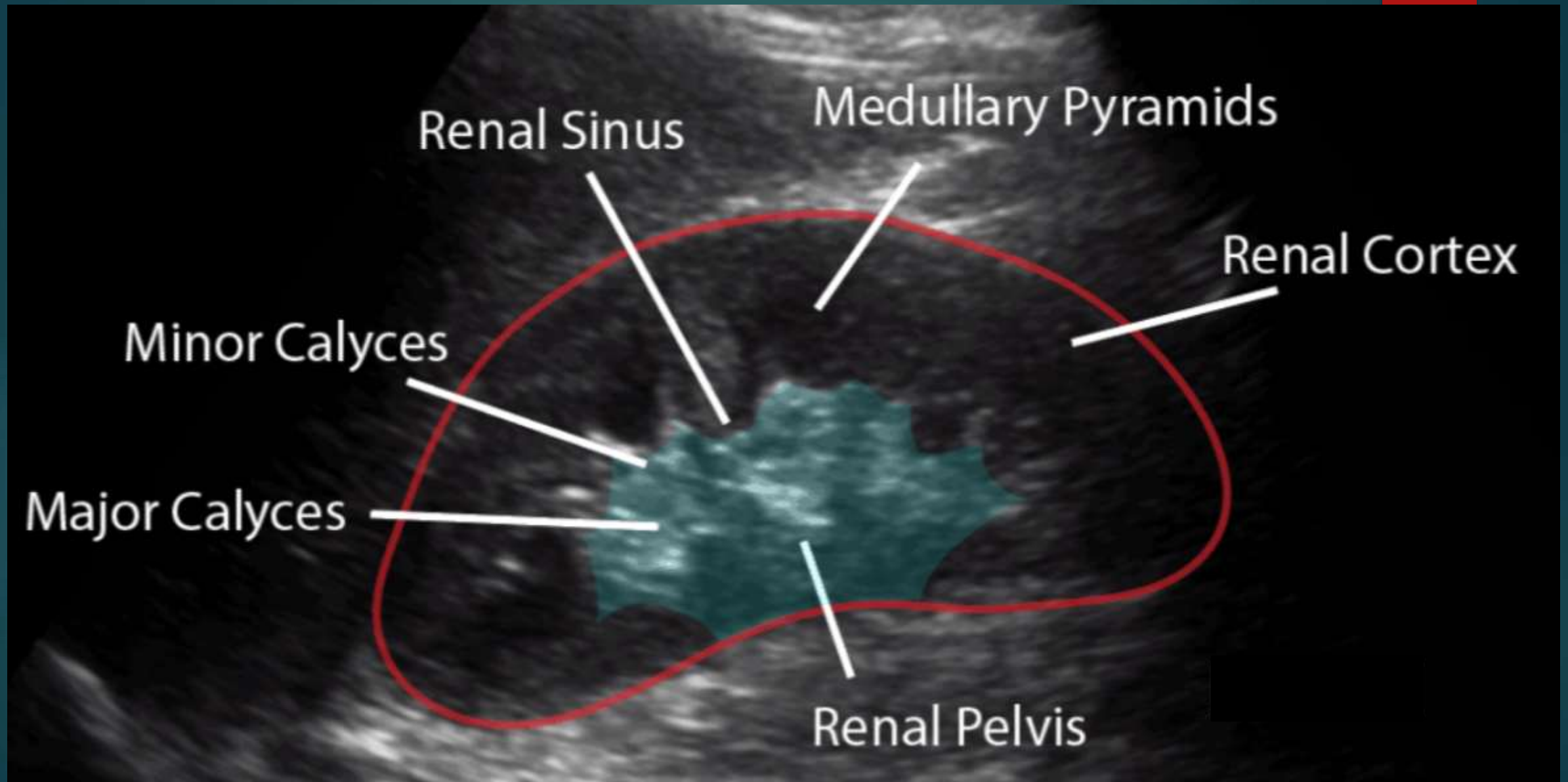


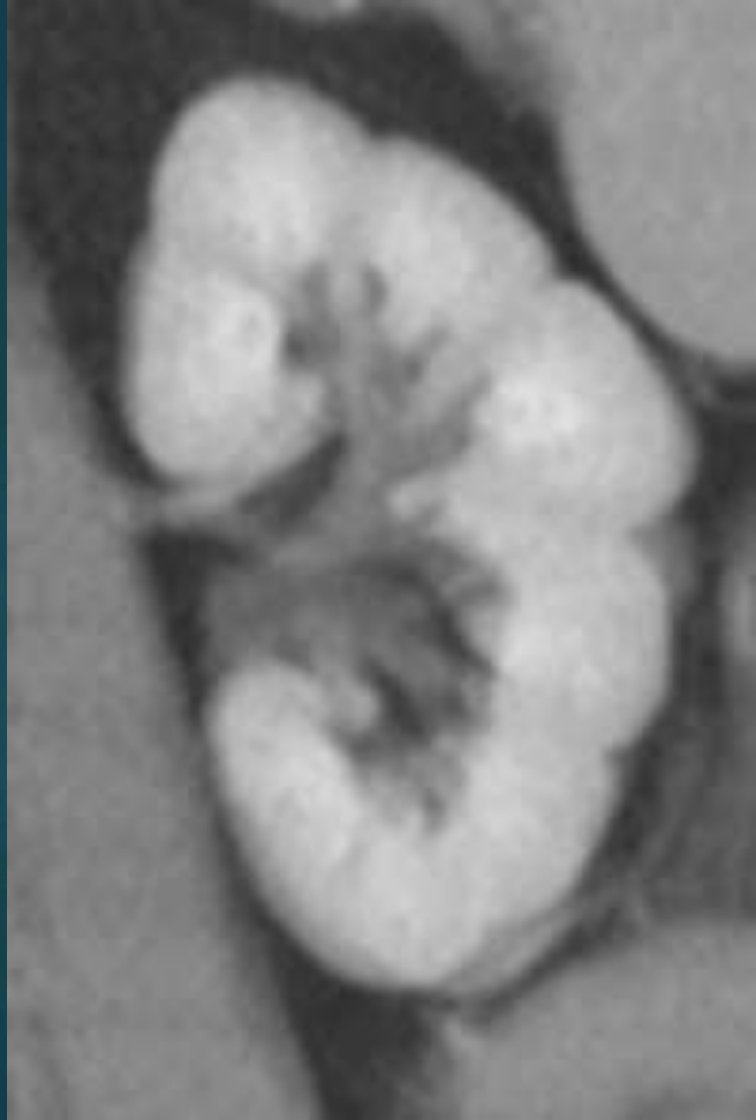


Fetal Lobulation

- ▶ Renal surface indentations
- ▶ Incomplete embryological fusion of developing renal lobules
- ▶ Overlie the space between the pyramids (rather than pyramids = scarring)
- ▶ Can be multiple bilateral..... Or focal unilateral

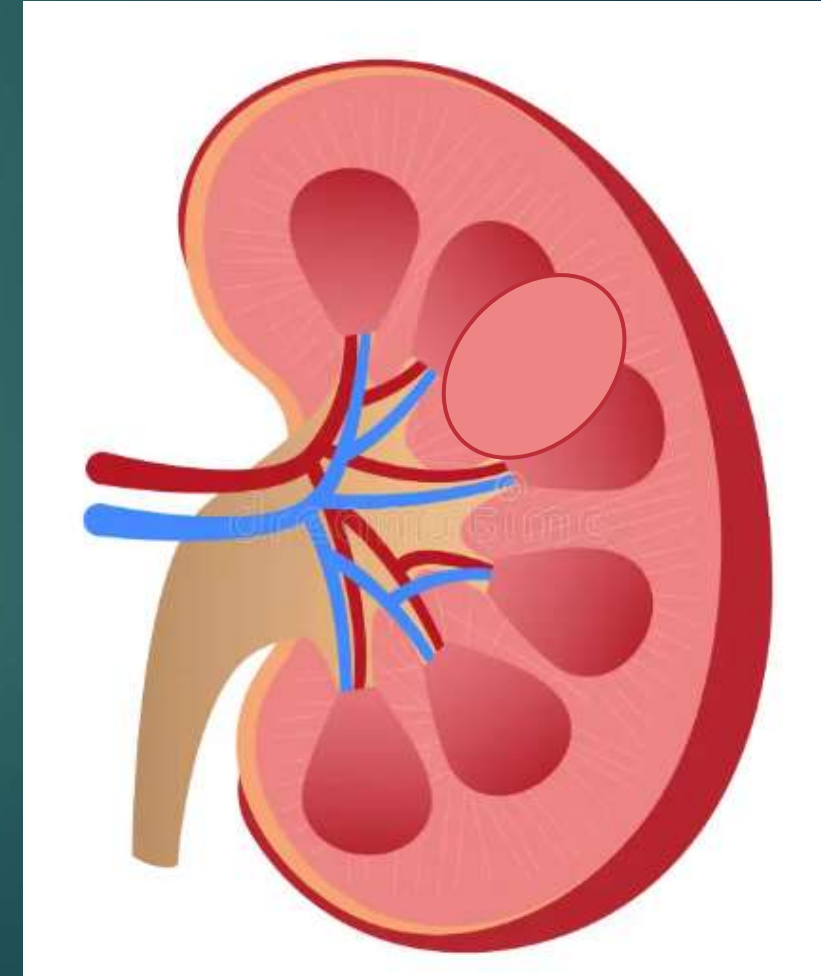


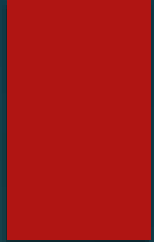




Hypertrophied column of Bertin

- ▶ An enlargement of the extension of renal cortical tissue which separates the pyramids
- ▶ Embryological fusion of adjacent lobules leads to cortical tissue remaining between the pyramids, each column formed by the fusion of two layers of cortex.
- ▶ In continuity with normal renal parenchyma
- ▶ Renal contour is preserved.





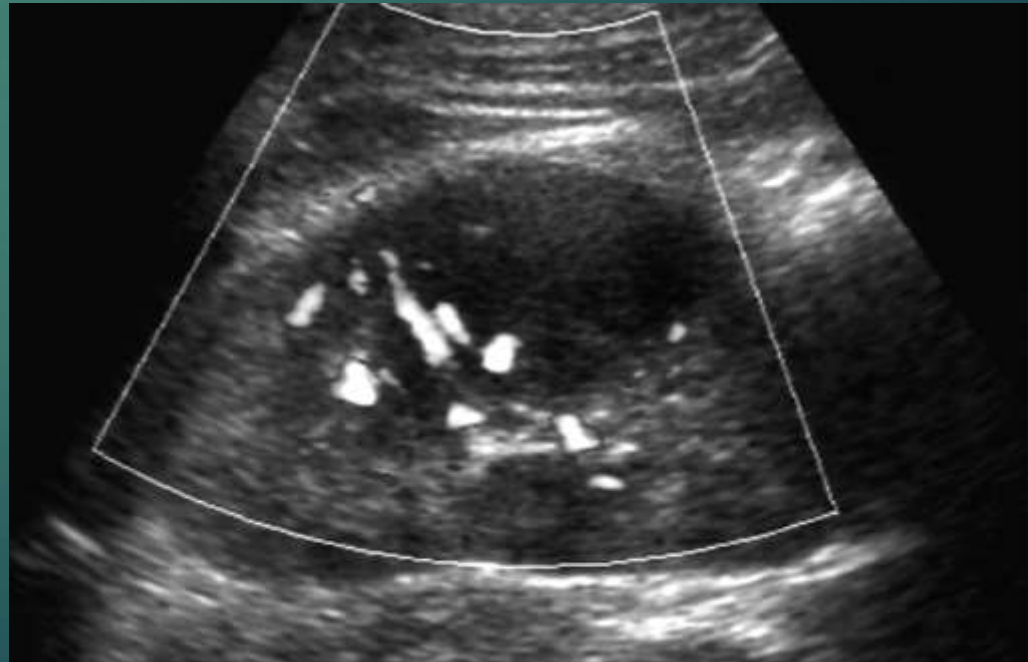
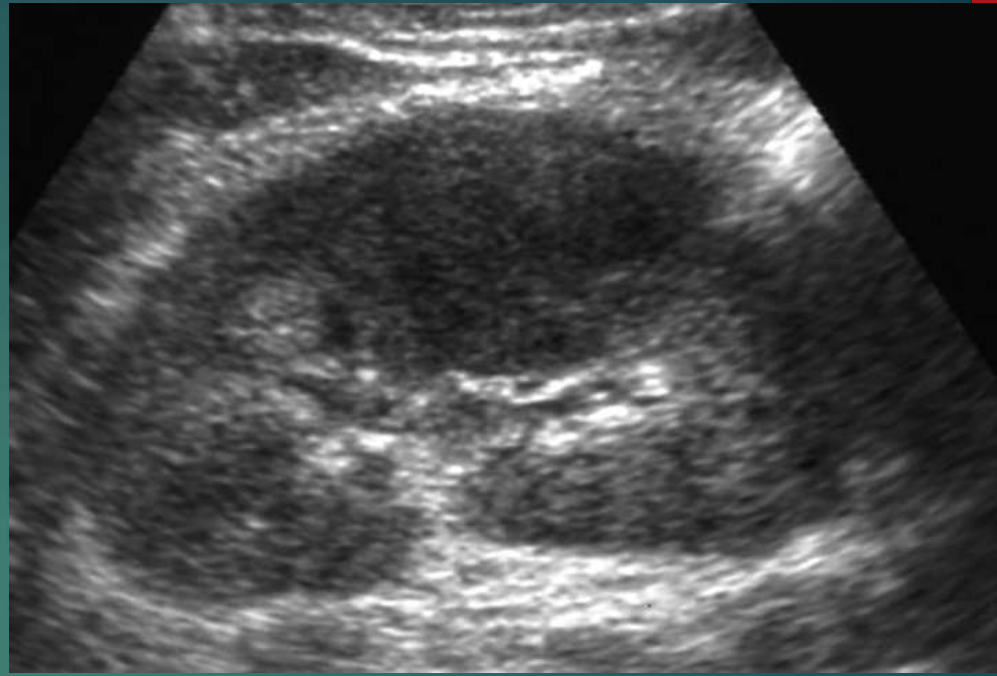


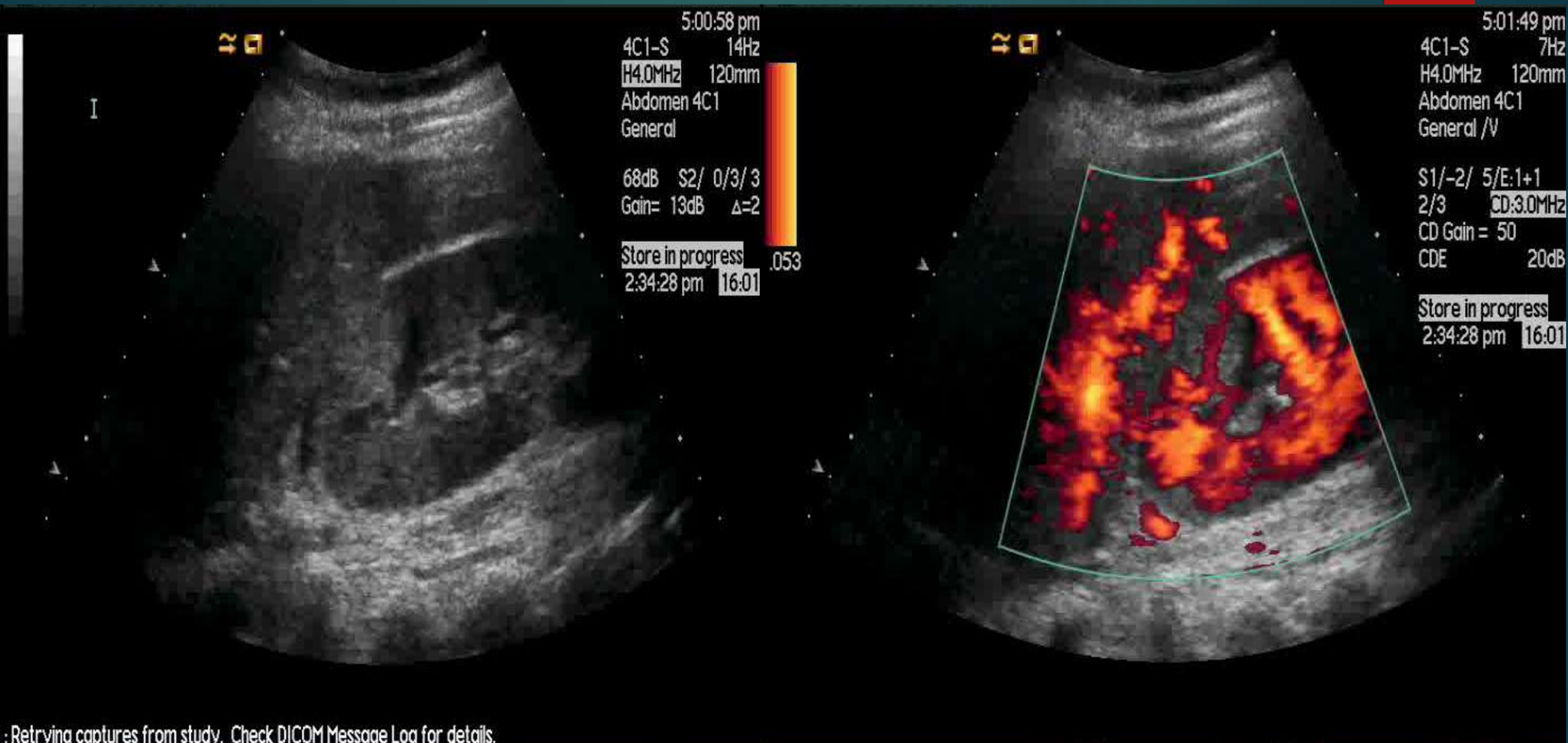
RT

9:54:44 am
4C1-S 19Hz
H4.5MHz R43mm
CPS Abdomen
Baseline /V
Pwr= 0dB
MIF=1.7 MI=1.9
70dB S1/+1/3/2
Gain= 16dB Δ=2
Store in progress
9:53:53 am 00:51

Acute Pyelonephritis

- ▶ Imaging not indicated in straightforward pyelonephritis.
- ▶ Main role of US to exclude complications & underlying anomalies
- ▶ US: **Usually normal**
Enlarged kidney, low / high-reflective masses, abnormal perinephric fat, thickened urothelium, focal hypoperfusion on power Doppler.





: Retrying captures from study. Check DICOM Message Log for details.

Text 1

Home Set

Home

HRCF/CDE

CD Pan  

CD Pos/Size



LOGIQ
E9



0

5

10



2.4
2.4
cm/s

6C1
diffT5.0
CF 2.5
6 fps

10 • Lt Kidney

RK

Angiomyolipoma (AML)

- ▶ The most common benign solid renal lesion
- ▶ The most common fat-containing lesion of the kidneys.
- ▶ 80% sporadic – 20% in Tuberous Sclerosis
- ▶ Hyperechoic, located in the cortex and with beam attenuation posteriorly (as seen in fatty liver)
- ▶ Can grow in pregnancy (F:M = 2-4:1)
- ▶ Risk of rupture >4cm
- ▶ Observation (6-12 months) / embolization / renal sparing surgery

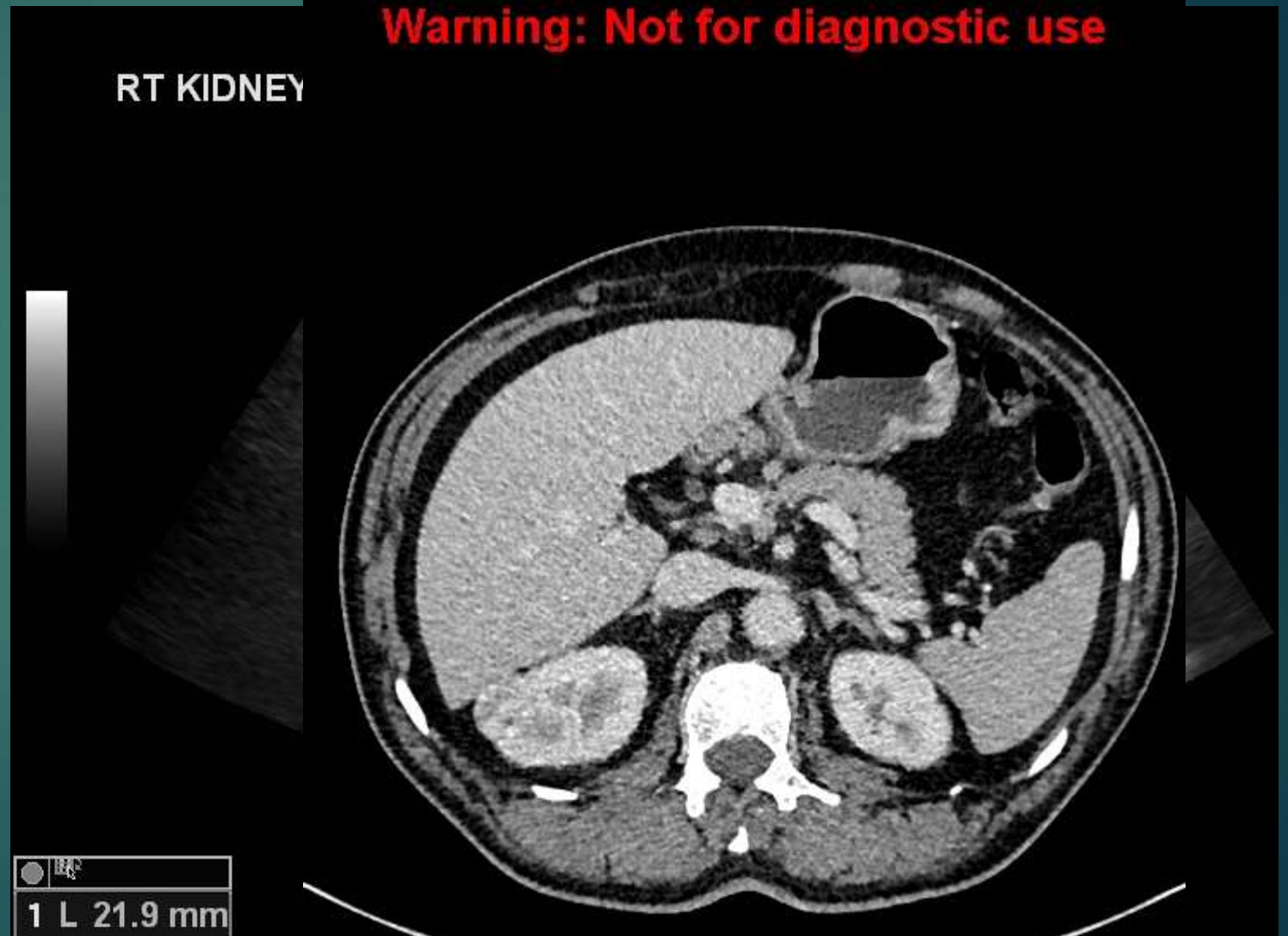


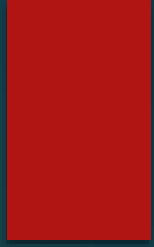


- Tend to enhance peripherally with decreased central enhancement, compared with normal cortex

Echogenic Renal lesions

- ▶ RCC (1/3)
 - ▶ Hypoechoic rim
 - ▶ Calcification
 - ▶ Cystic areas
- ▶ Lipoma / liposarcoma
- ▶ Oncocytoma





Oncocytoma

- ▶ Benign Tumour. 3-7% of all solid renal tumours
- ▶ Difficult to distinguish from renal cell carcinoma in the preoperative setting.
 - ▶ 6-7th Decade
 - ▶ M:F = 2:1
- ▶ Can be hyper/iso/hypoechoic.... +/- central scar (up to 33% - size dependent)
- ▶ Some overlap between RCC, AML and oncocytoma – incl CEUS

LK



4C1-S
H4.0MHz
Abdomen
General

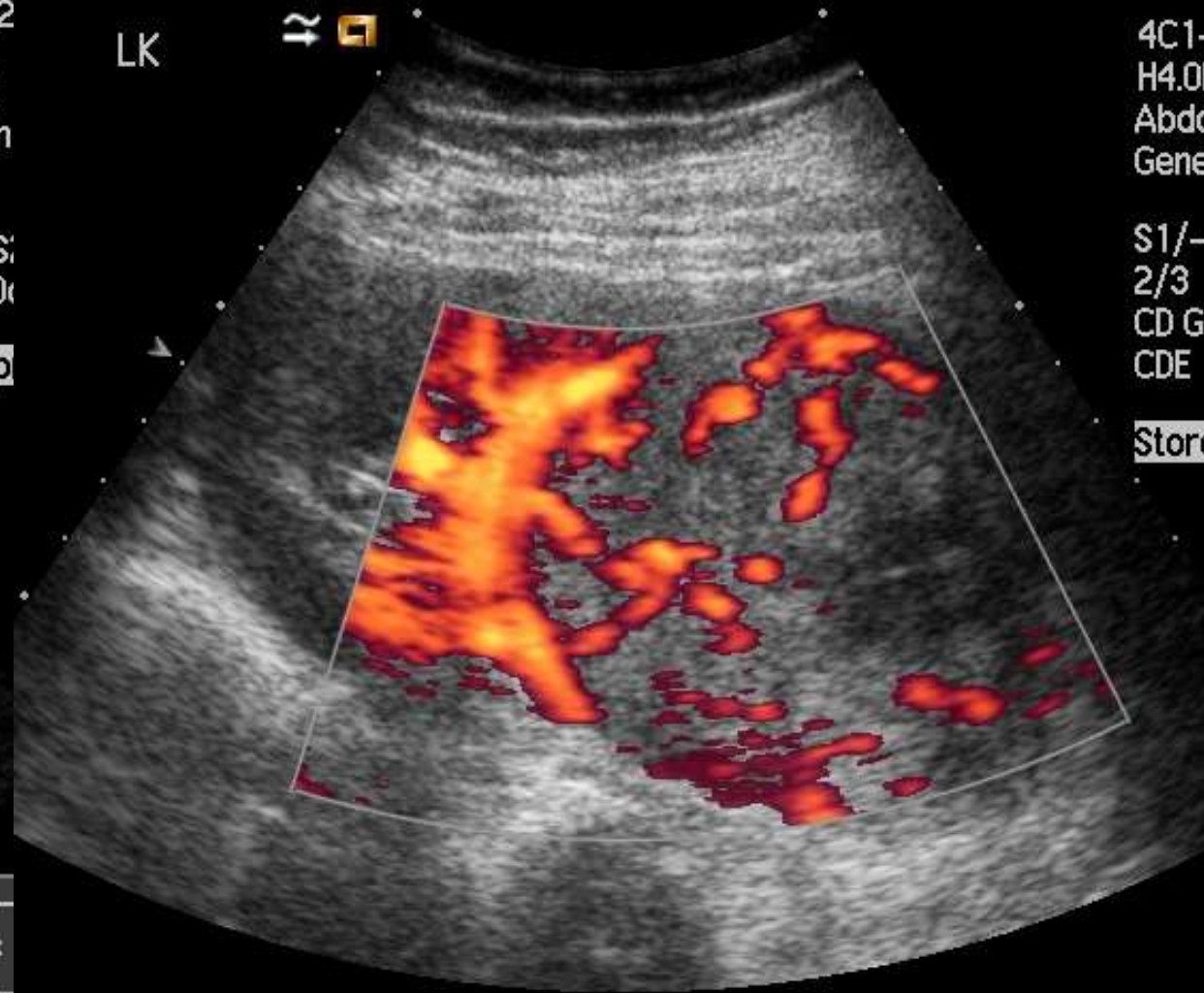
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Gain= 200

Store in p

Dist =

Dist =

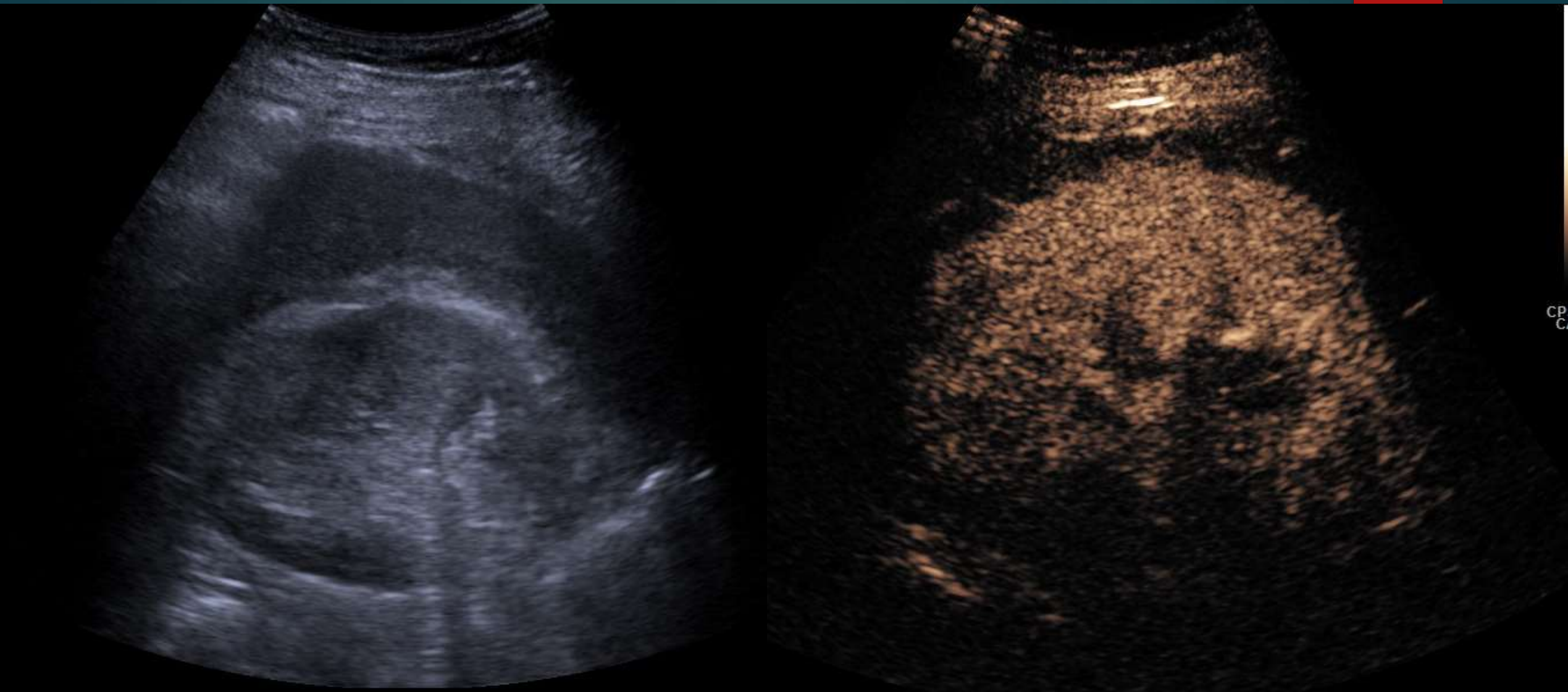
LK



4C1-S
H4.0MHz
Abdomen
General

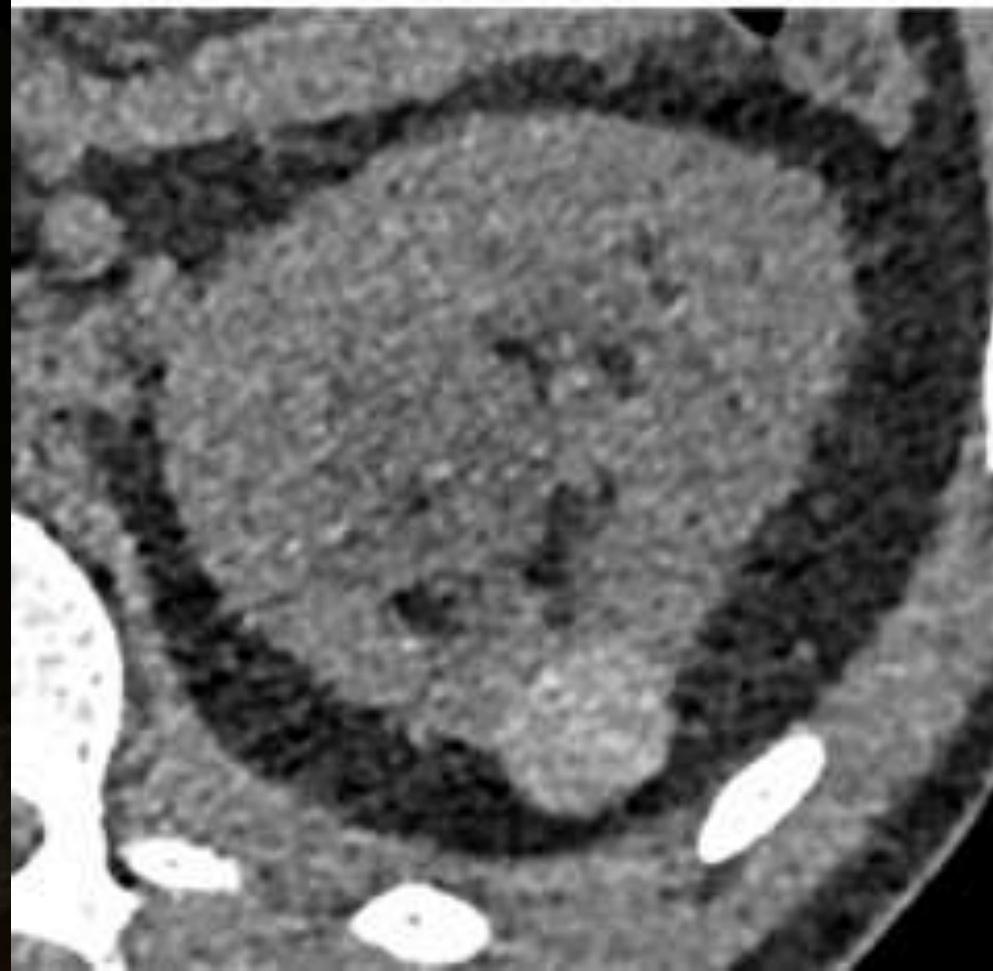
S1/-
2/3
CD G
CDE

Store



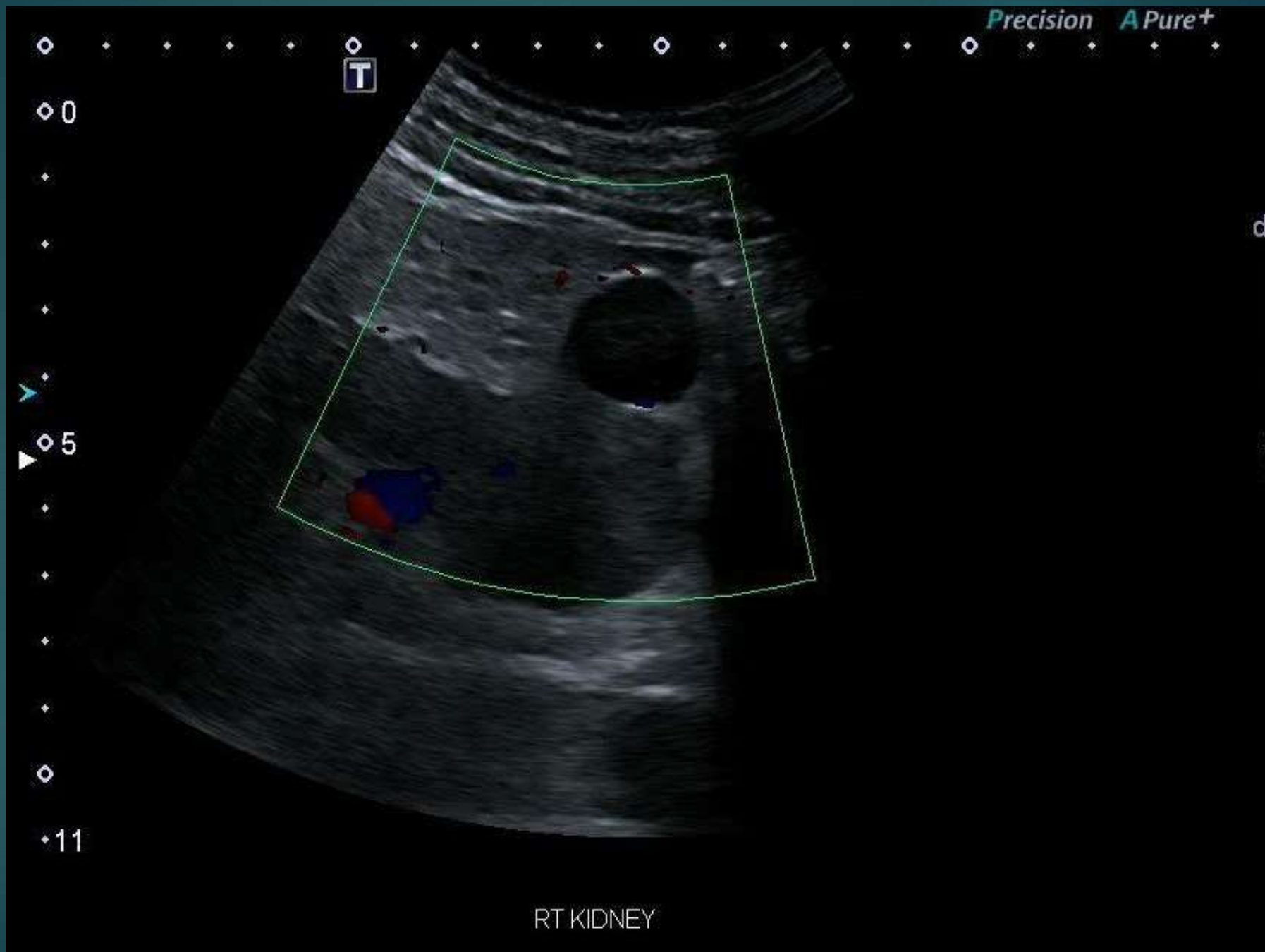
Cyst vs Solid

- ▶ Thin-walled
 - ▶ Anechoic
 - ▶ Avascular
 - ▶ Posterior acoustic enhancement
-
- ▶ Incidental finding on US
 - ▶ Assessment of the suspected hyperdense cyst on CT
-
- ▶ No further follow up required

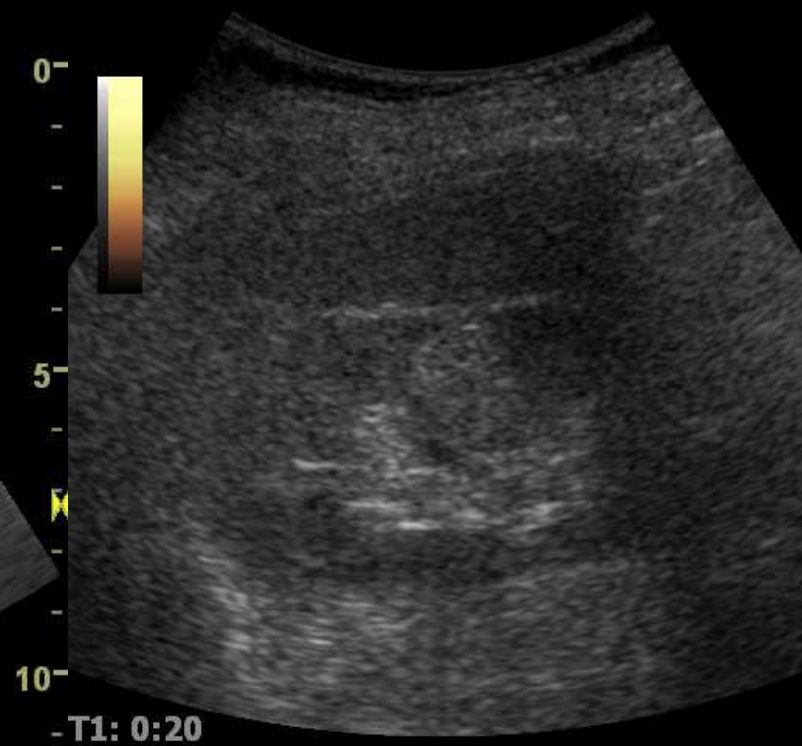
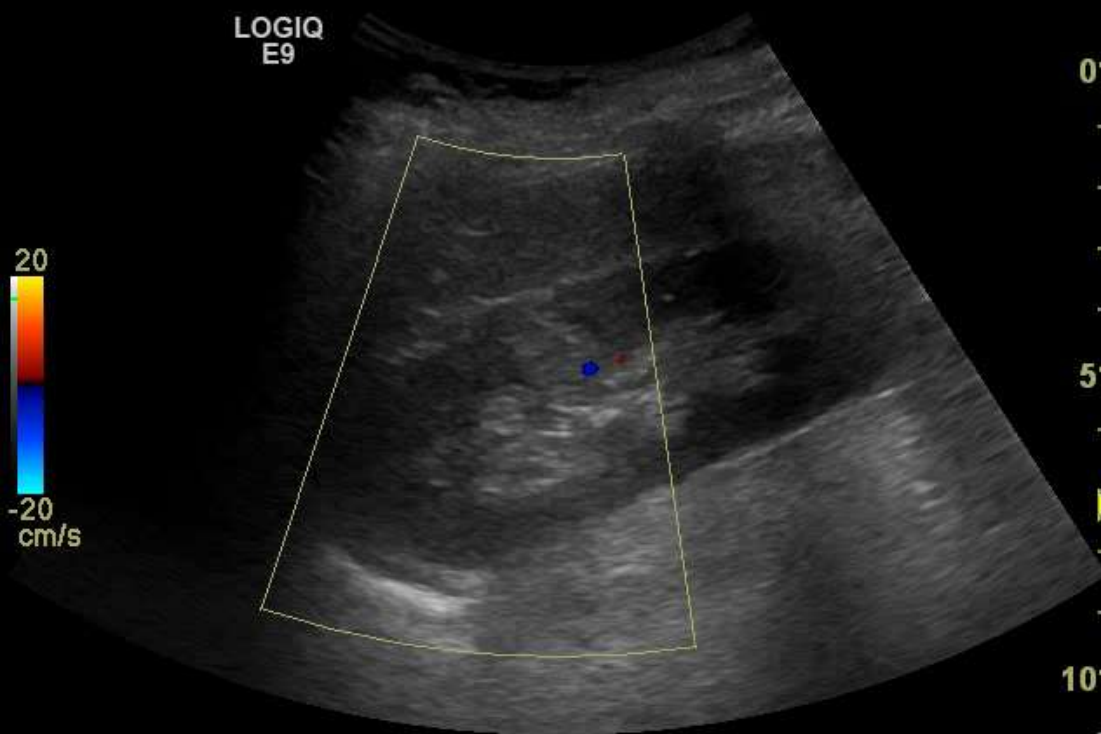


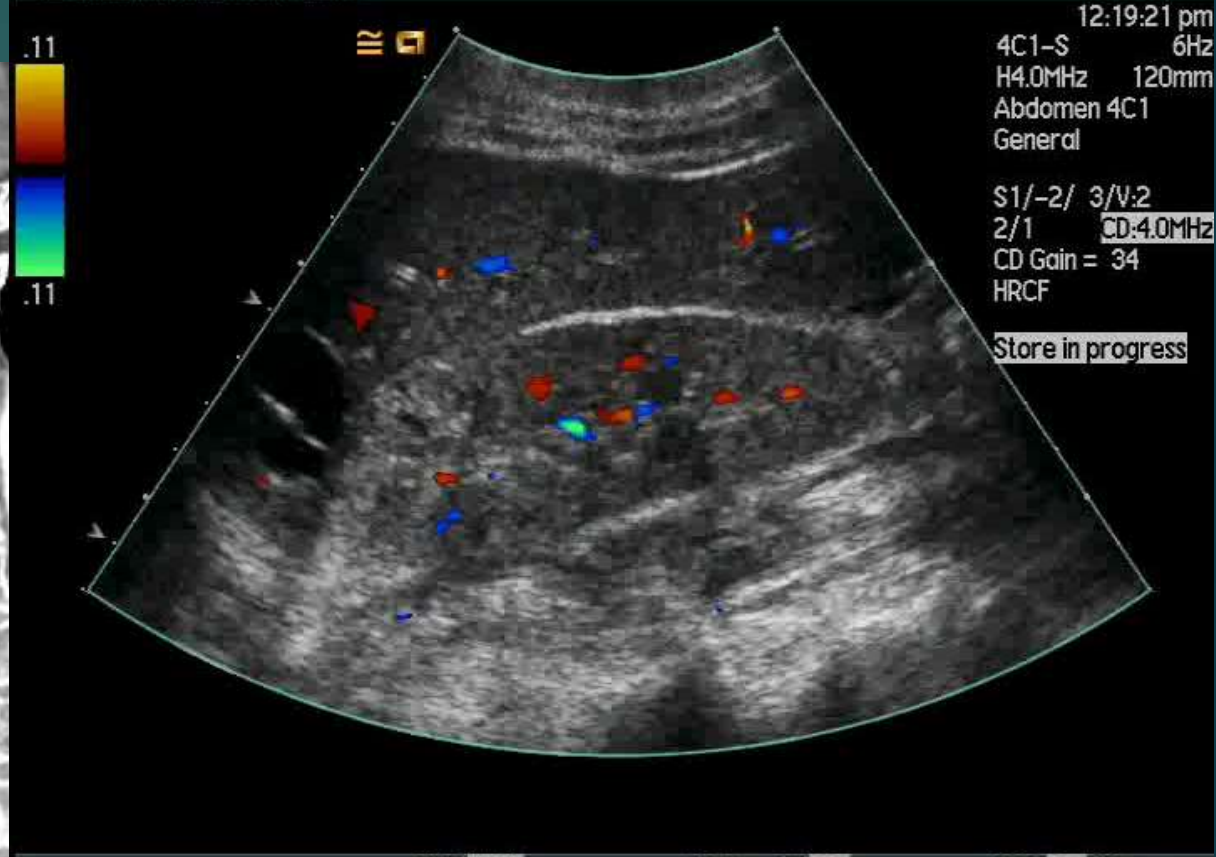
Cyst vs Solid

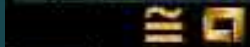








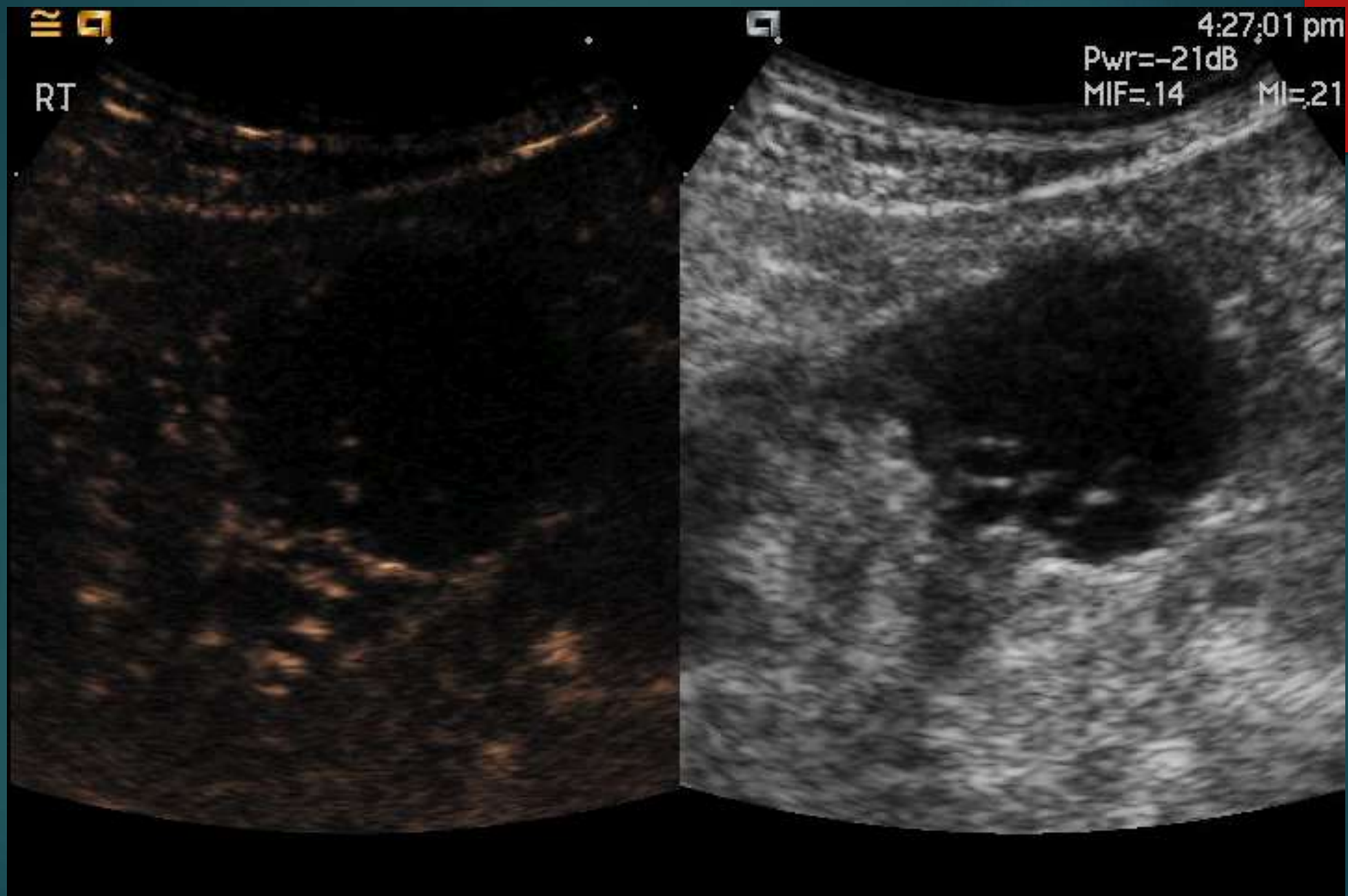




CPS
CA



12:26:46 pm
Pwr=-21dB
MIF= 11 MI=21
12:26:38 pm 00:08



UCC/TCC

- ▶ The most common primary malignancy of the urinary tract - found along its entire length, from renal pelvis to bladder.
- ▶ Older Males
- ▶ Smoking + Industrial chemical exposure
- ▶ Horseshoe kidney and calculi
- ▶ Haematuria, Pain (hydronephrosis)
- ▶ Bladder 97%

UCC / TCC

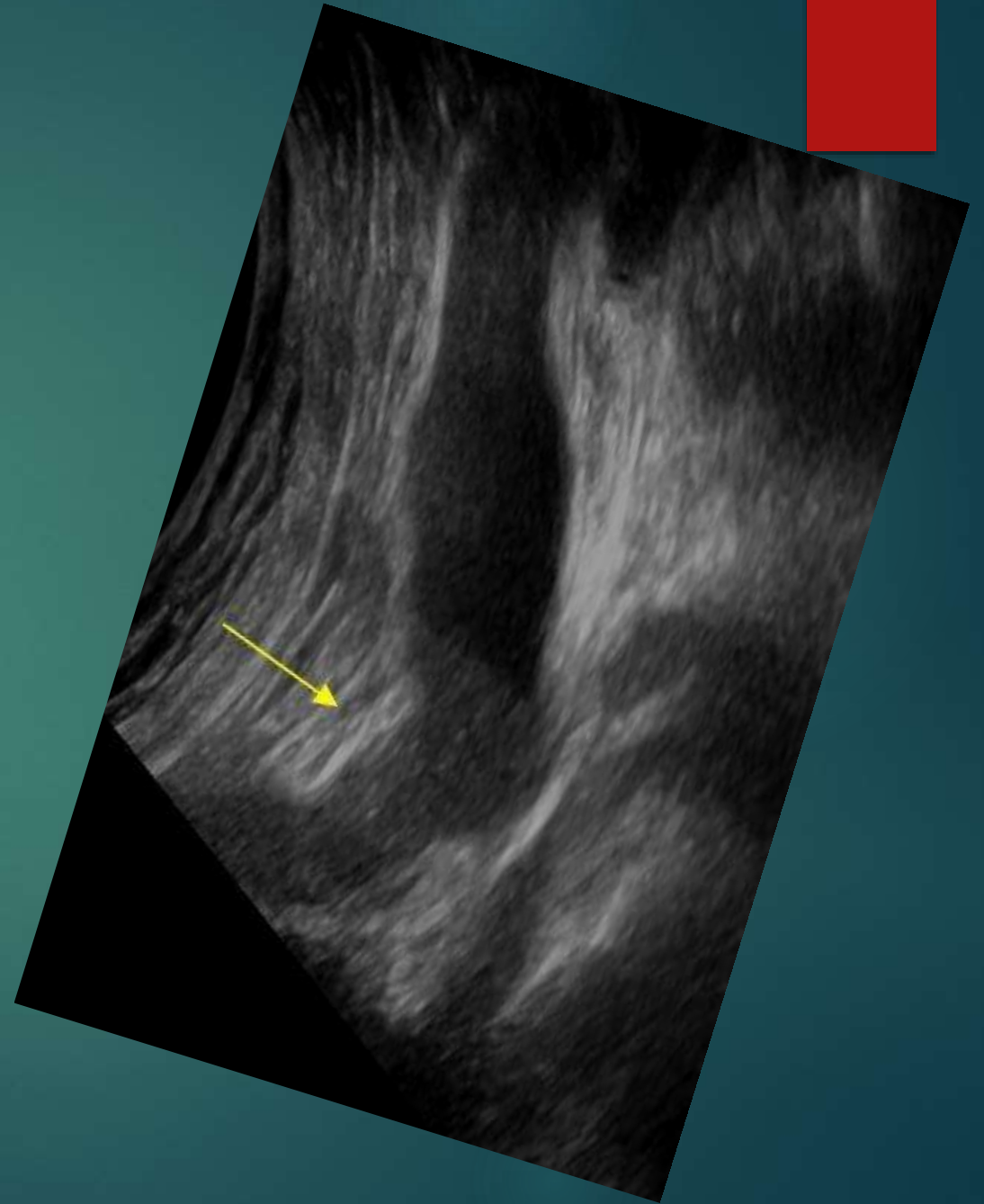
- ▶ May be seen as a hyperechoic mass, often centrally located, with subtle posterior acoustic shadowing.
- ▶ Similar reflectivity to sinus fat.
- ▶ + /- hydronephrosis / dilated calyx
- ▶ Typically infiltrative and do not cause renal contour distortion
- ▶ Differential includes blood clots, sloughed papilla, or fungus ball
- ▶ Small non-obstructing TCCs may be impossible to visualize.

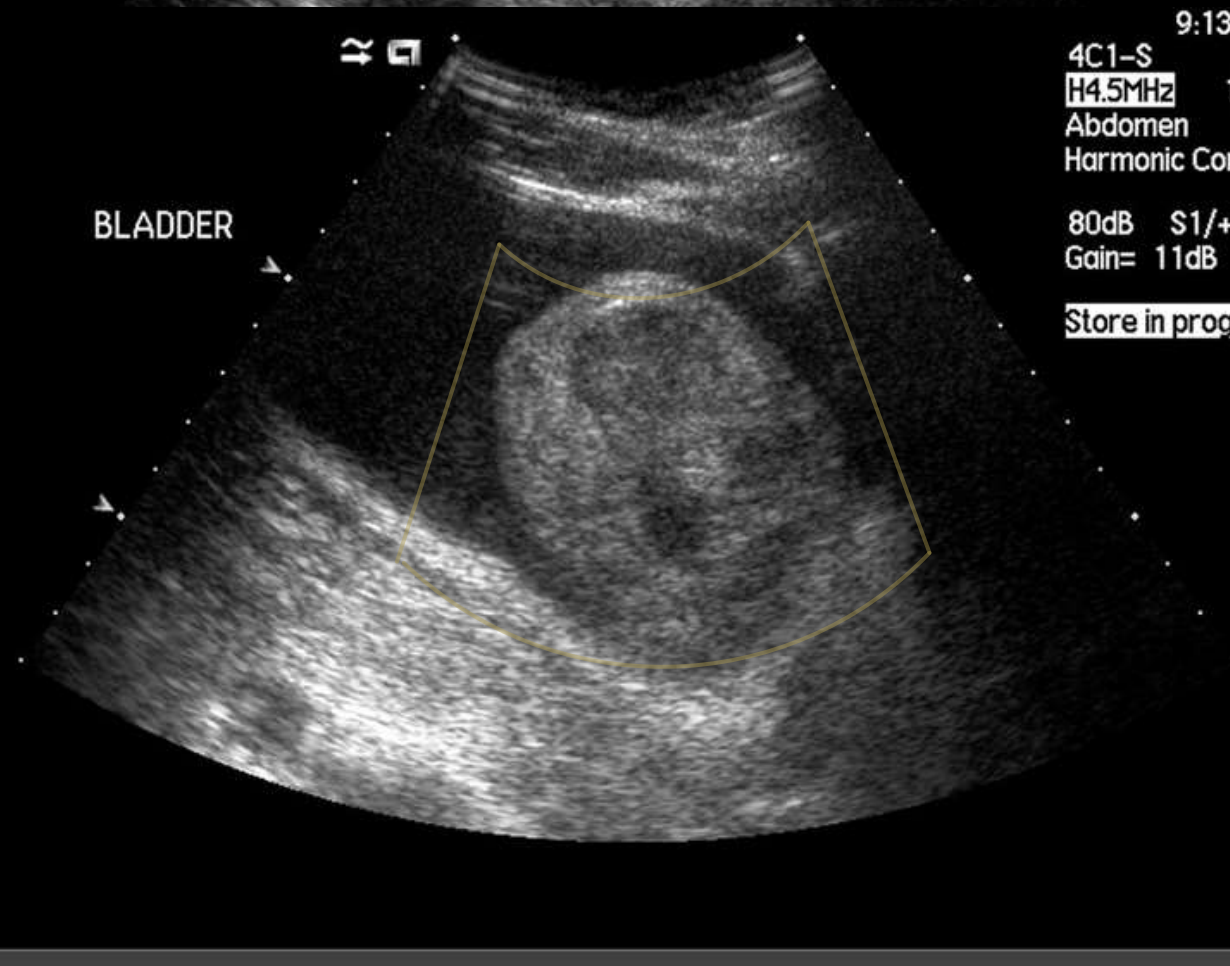
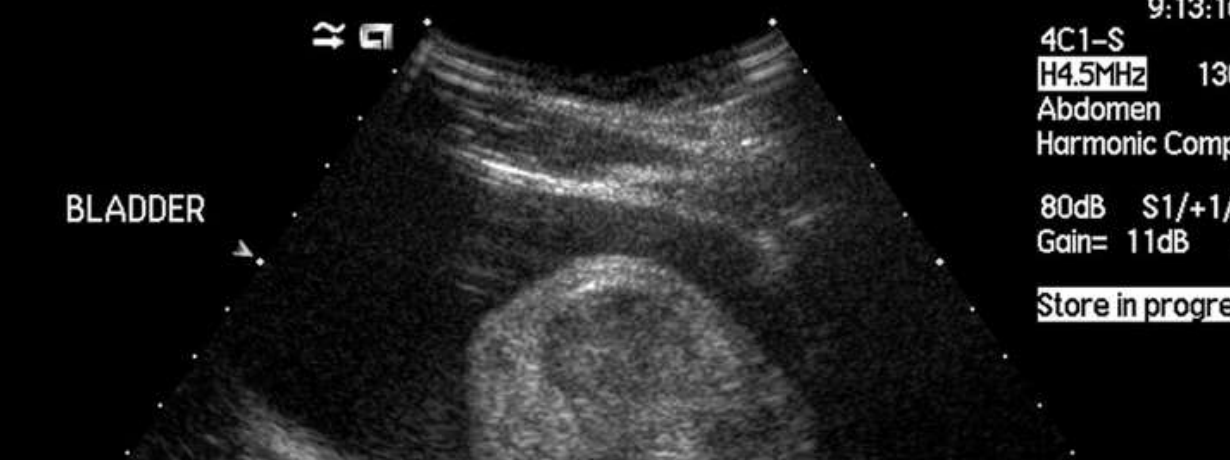
LOGIQ
E9

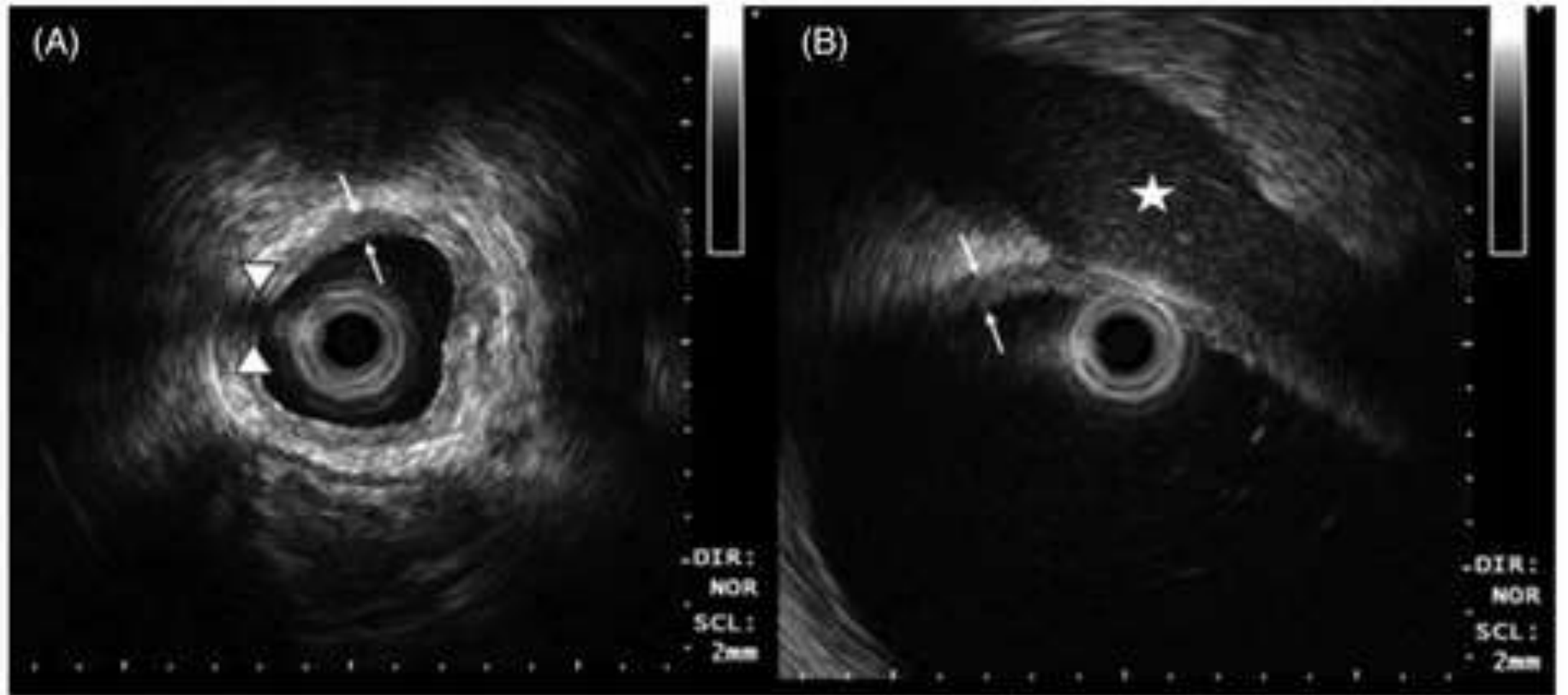


RT KIDNEY

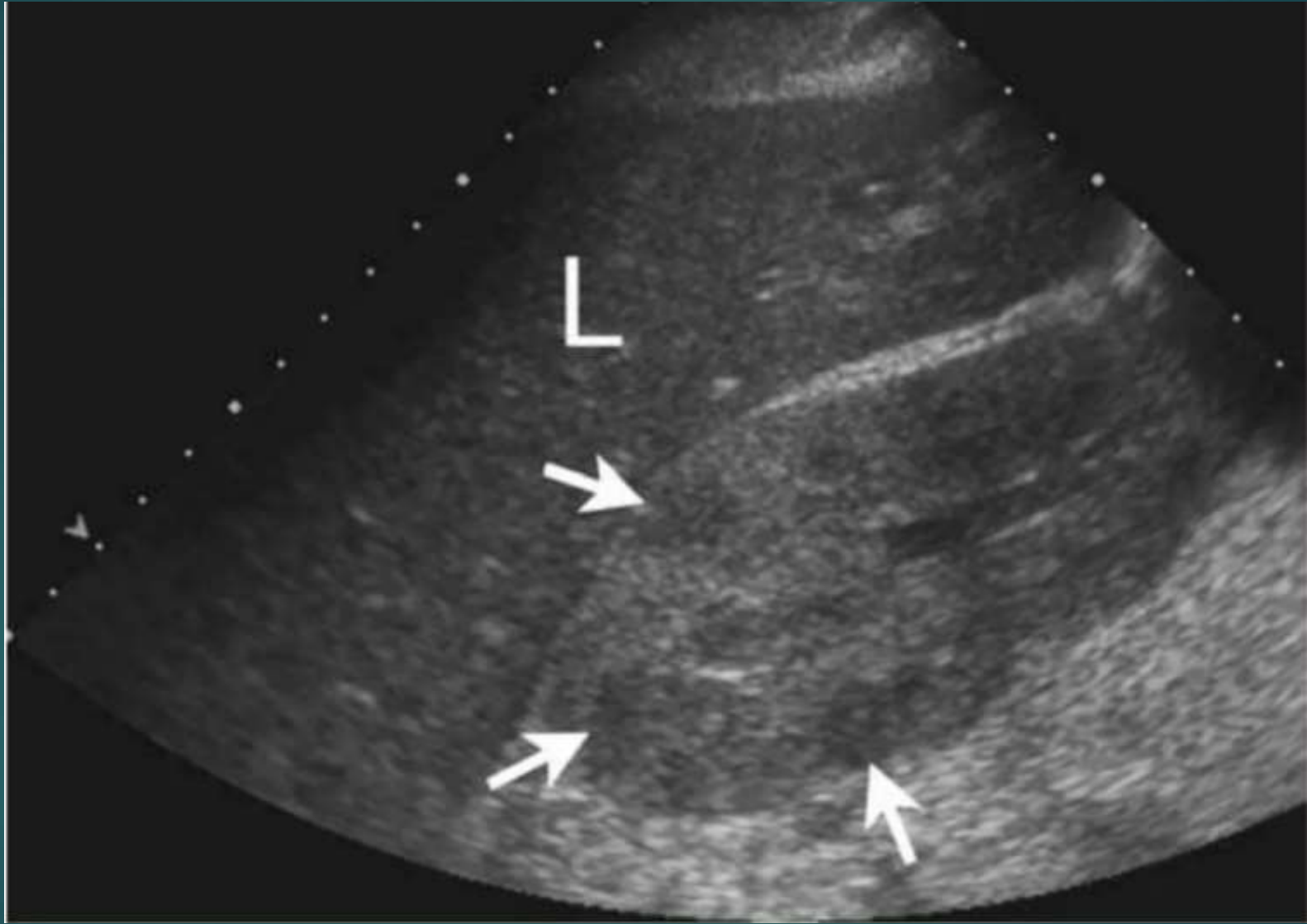
UCC/TCC elsewhere





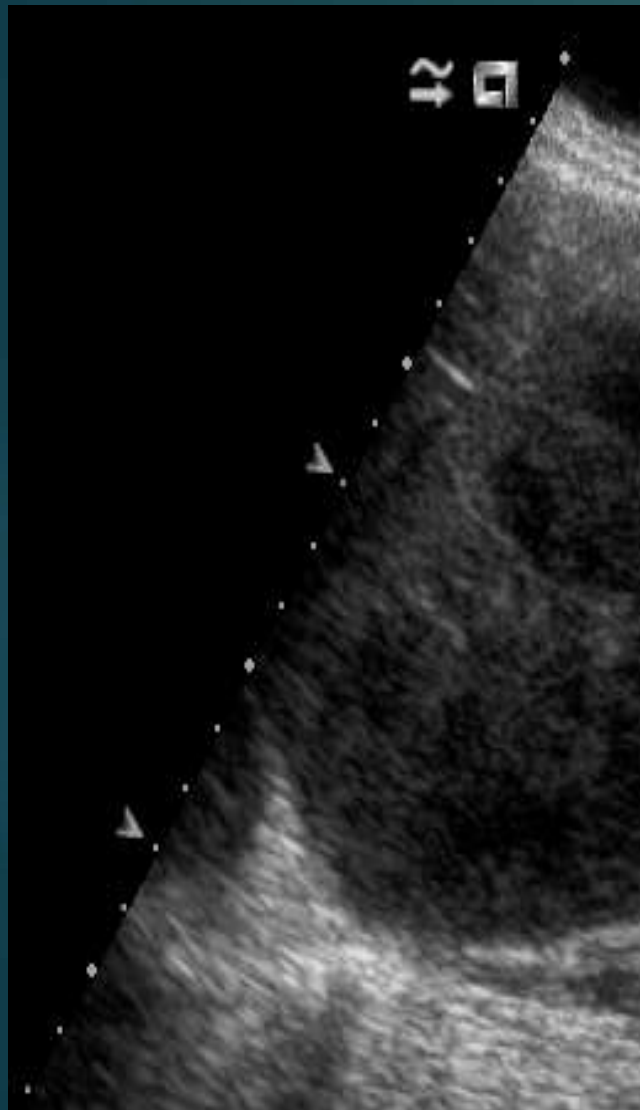


Endo-ureteric ultrasound



Renal Mets

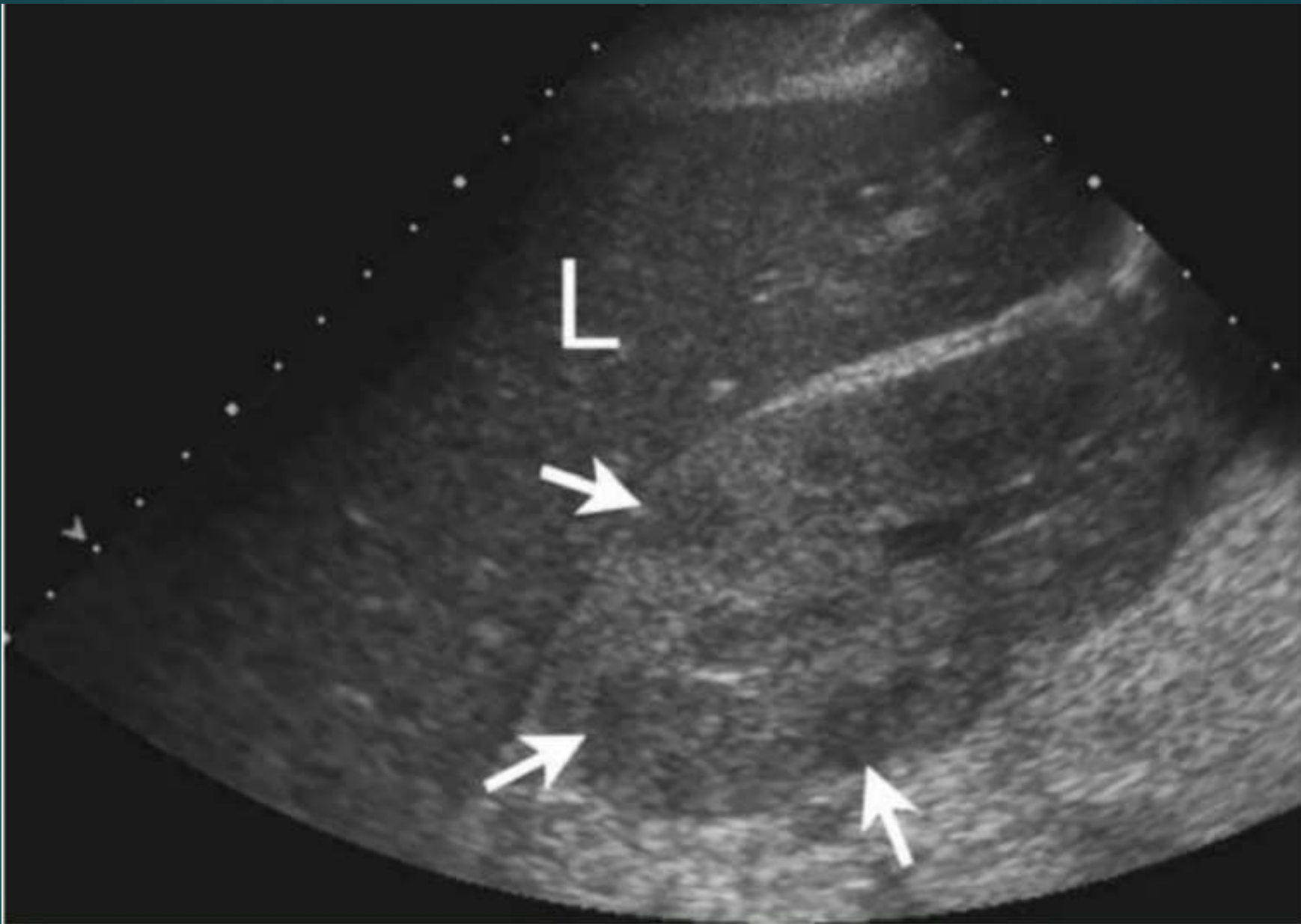
- ▶ Lung, breast, gastrointestinal tumors and melanoma.
- ▶ Usually late in the course of a known malignancy as part of widespread disease.
- ▶ Rare as a solitary lesion and may be hard to differentiate from a renal cell carcinoma.
- ▶ Small, multifocal, bilateral
- ▶ Hypovascular



Lymphoma

- ▶ Solitary lesion (10-25%) vs Multiple lesions (50-60%) vs Diffuse infiltration
- ▶ Renal sinus involvement and perinephric space (Primary renal lymphoma).
- ▶ Hypovascular
- ▶ Direct extension from retroperitoneal adenopathy
- ▶ ?Known widespread lymphoma..... biopsy

?



Context is key!

Take Home Points

- ▶ Maximise the use of available tools on the day – is there anything I can do here and now...?
- ▶ If in doubt – seek a radiologist in the department to review any previous cross-sectional imaging or help clinically contextualise - before patient leaves
- ▶ If still indeterminate – for cross-section

Special thanks

- ▶ Dr Chris Harvey
- ▶ Prof Adrian Lim