



Nasjonalt Senter for Gastroenterologisk Ultrasonografi

National Centre for Ultrasound in Gastroenterology
Haukeland University Hospital, Bergen, Norway

Ultralyd av nyrer, urinveier og milt

Prof. Odd Helge Gilja, MD, PhD

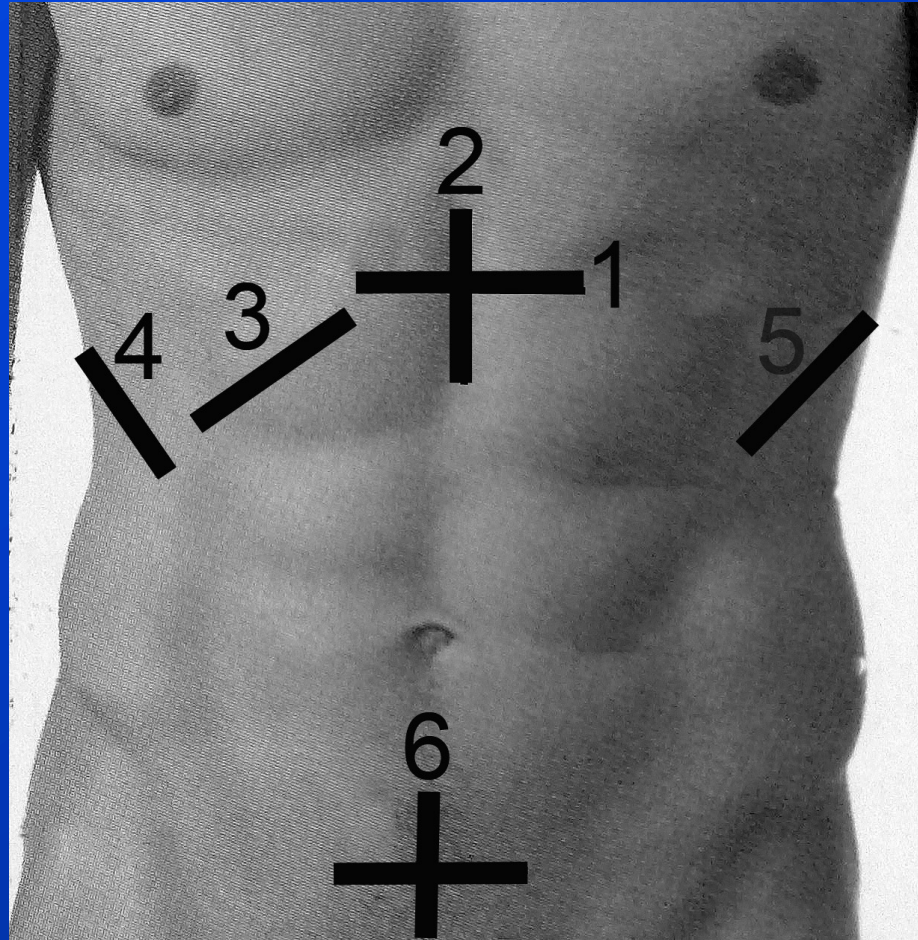
Institute of Medicine

University of Bergen, Norway



6+

A systematic ultrasound examination of the abdomen

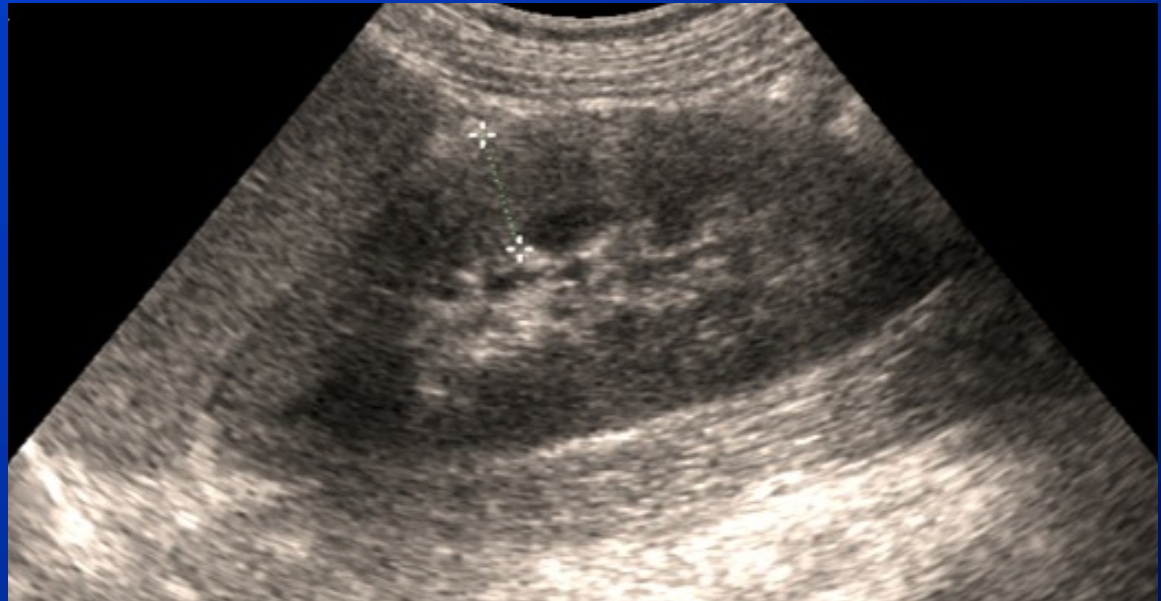
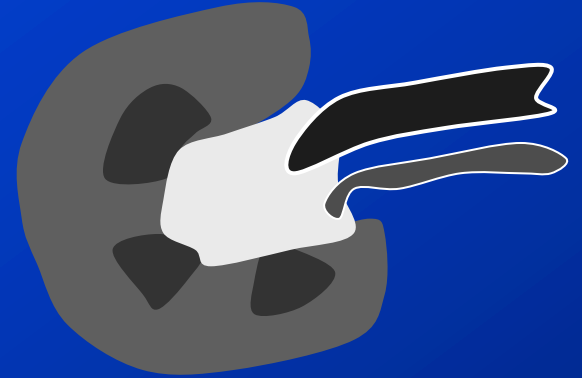




Renal Ultrasound

• Indications:

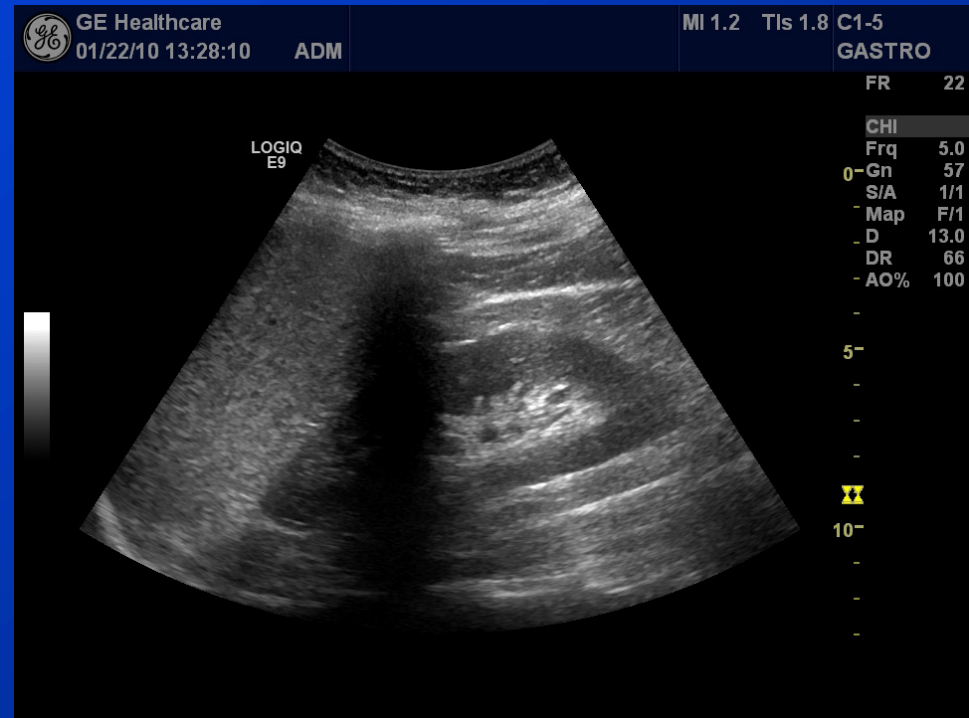
- Flank pain
- Haematuria
- Suspected renal mass
- Kidney failure
- Recurrent infection
- Fever unknown origin
- Anomalies
- Transplanted kidney
- Abdominal ultrasound





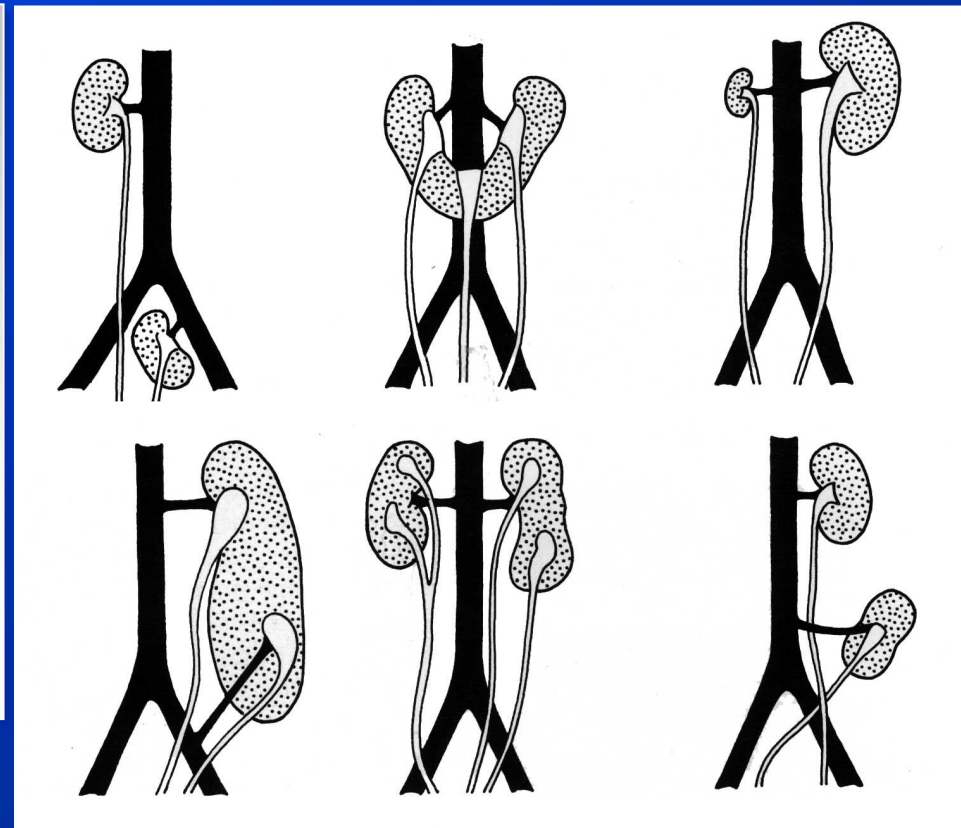
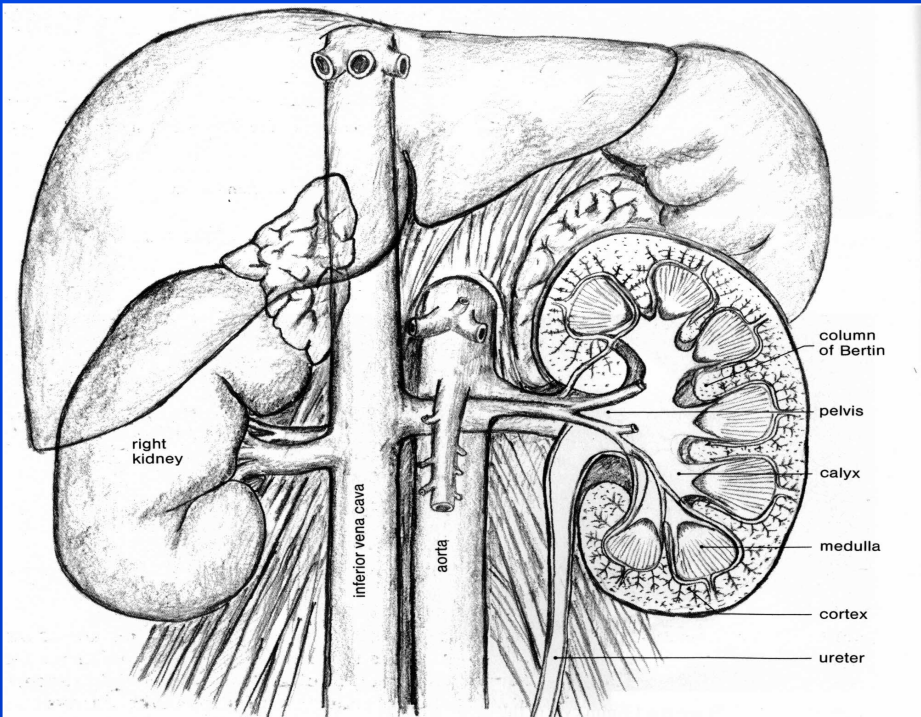
Station 4

- Long and short axis of the kidney from intercostal and subcostal lateral scanning
- Comparing echogenicity of the kidney with the liver





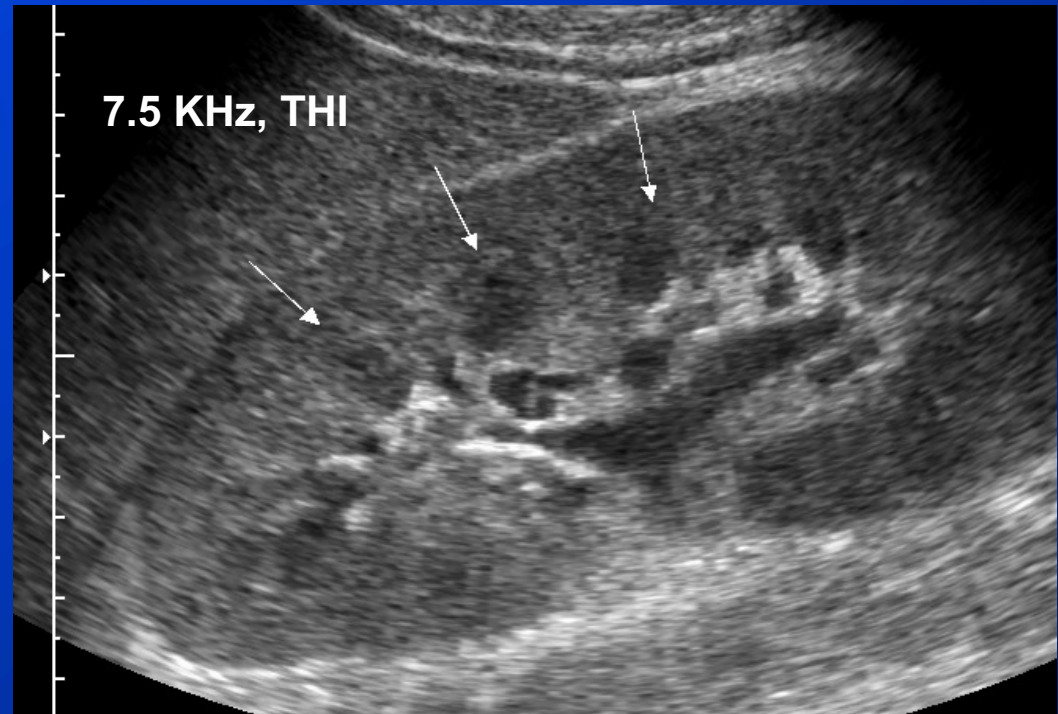
RENAL ANATOMY





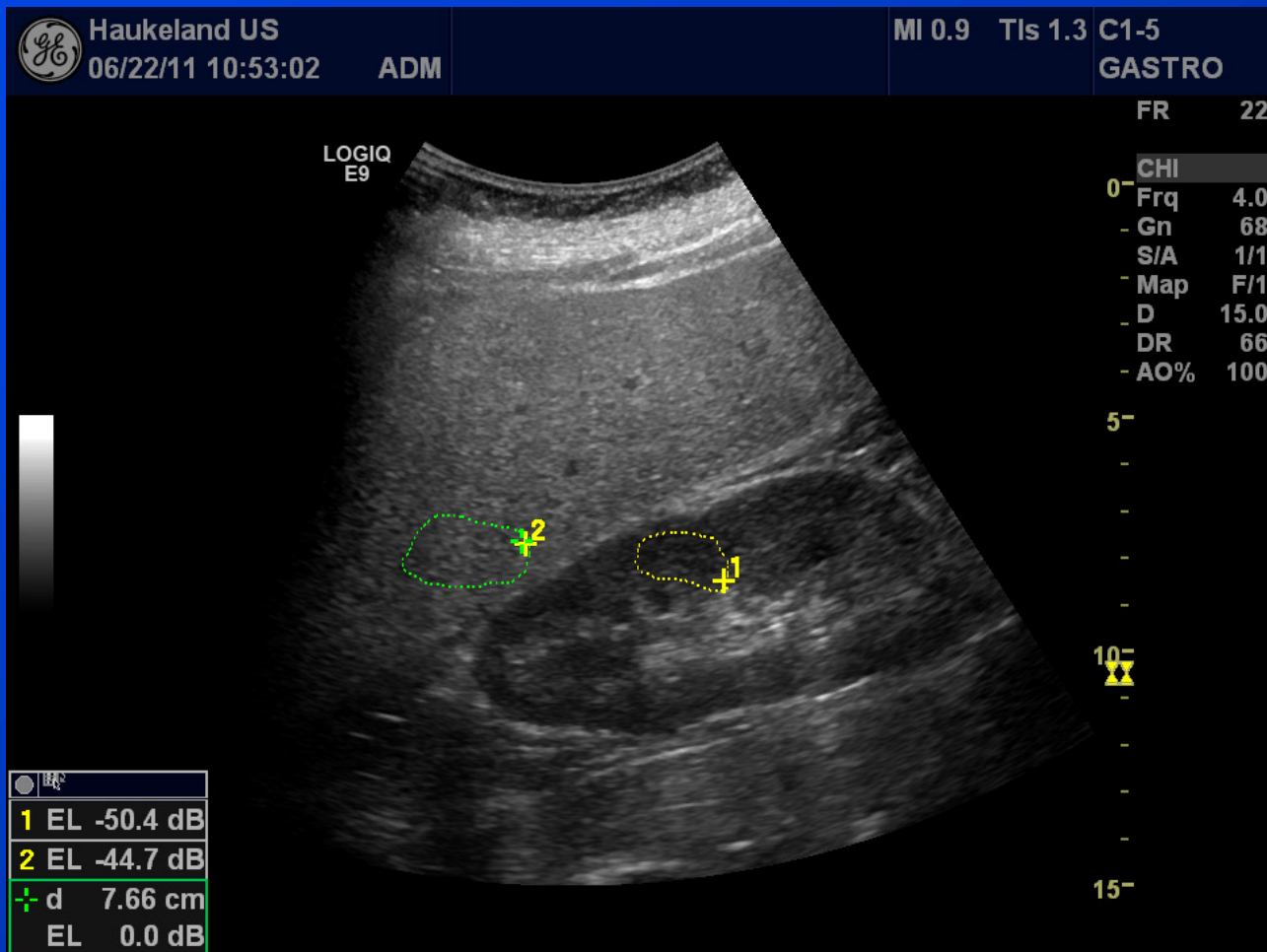
Sonoanatomy

- Ovoid structure
- 95-110 mm length
- Parenchymal width: >10 mm
- Marked "corticomedullary differentiation"
- Parenchyma darker echogenicity than liver
- Normal variations
 - "Junctional parenchymal defect"
 - "Foetal lobulation"
 - "Dromedary hump"
 - Sinus lipomatosis



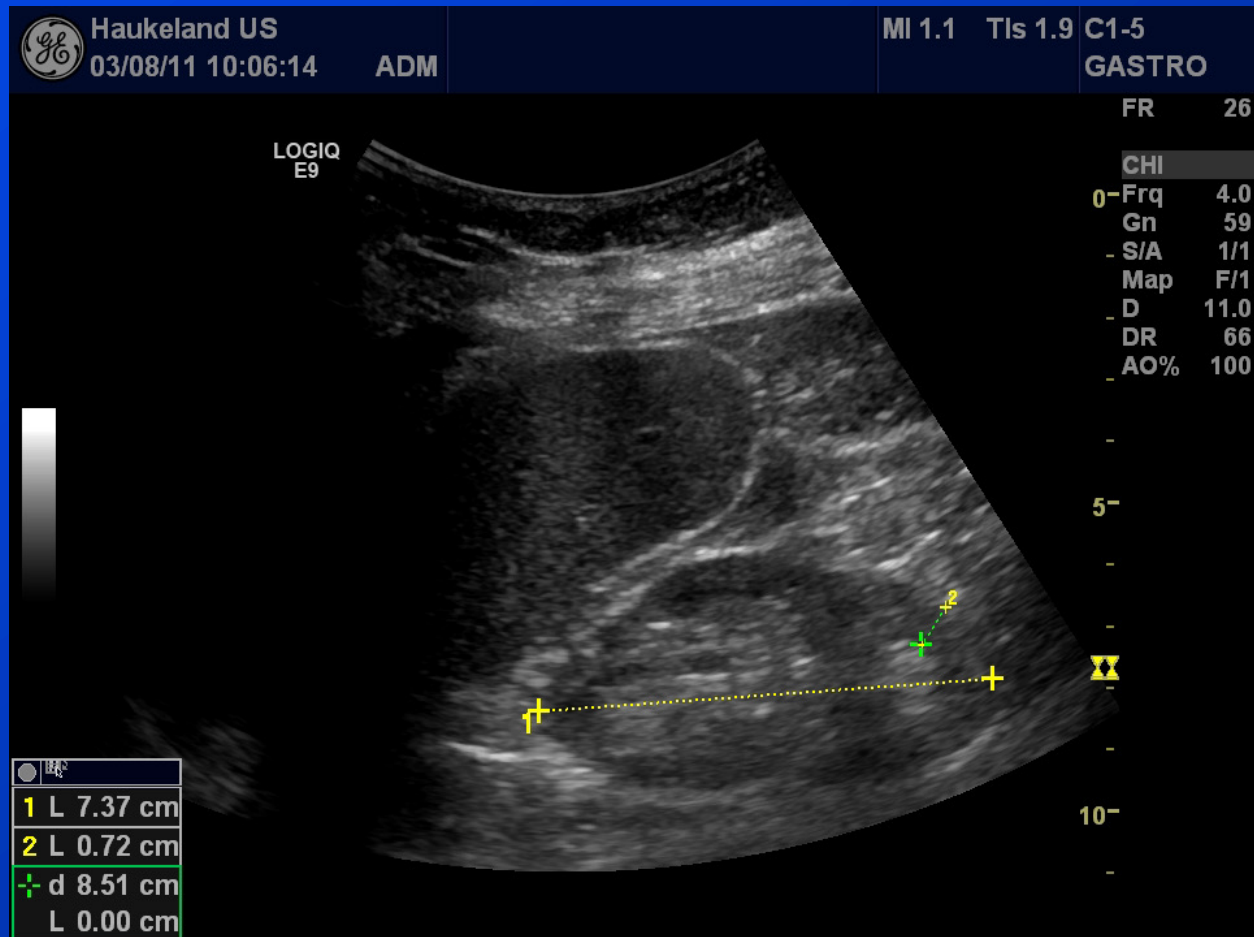


Compared to fatty liver



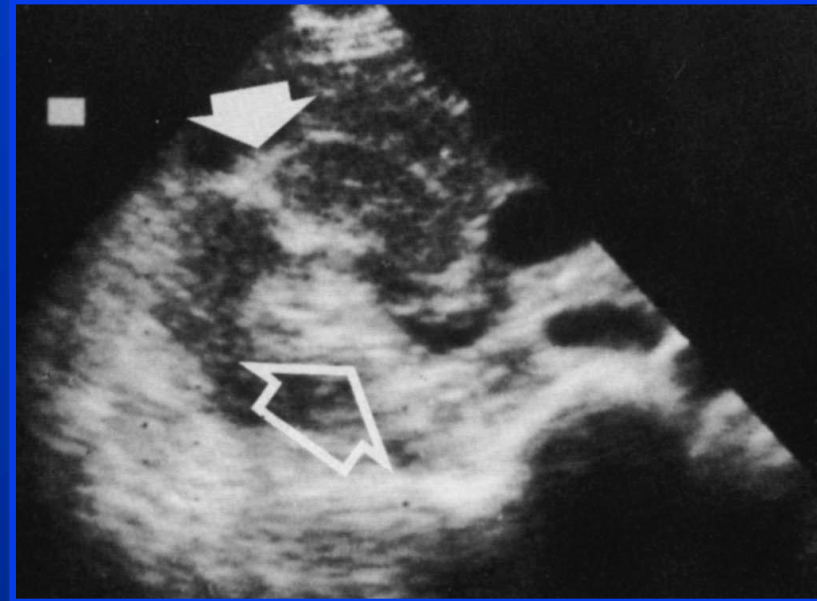
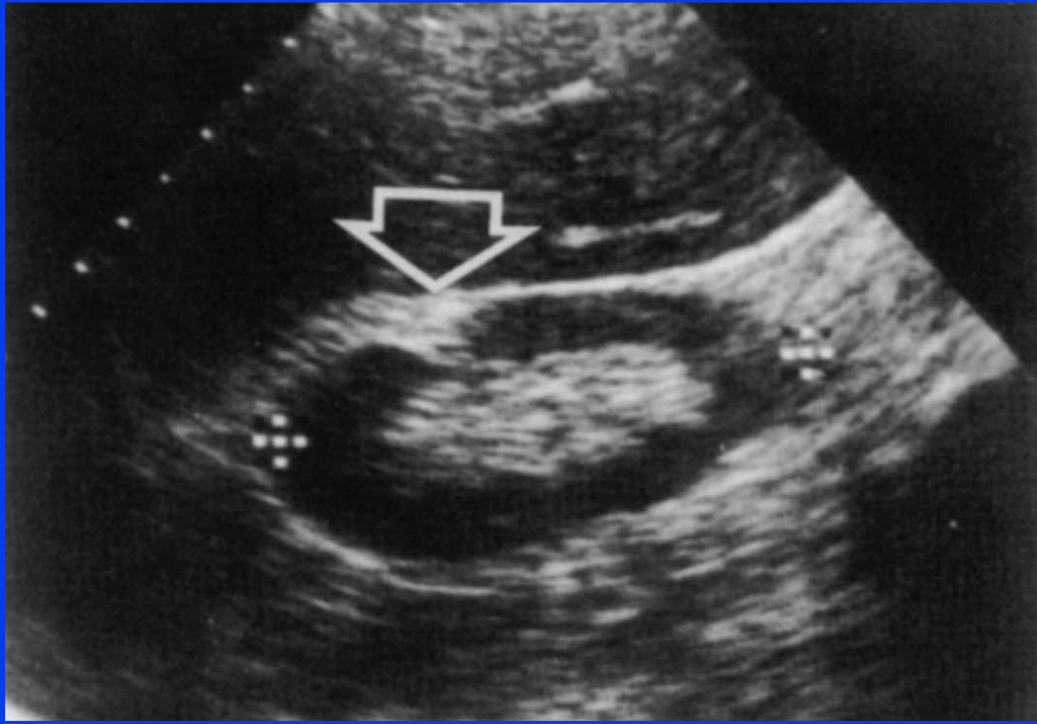


Atrophy of the Kidney



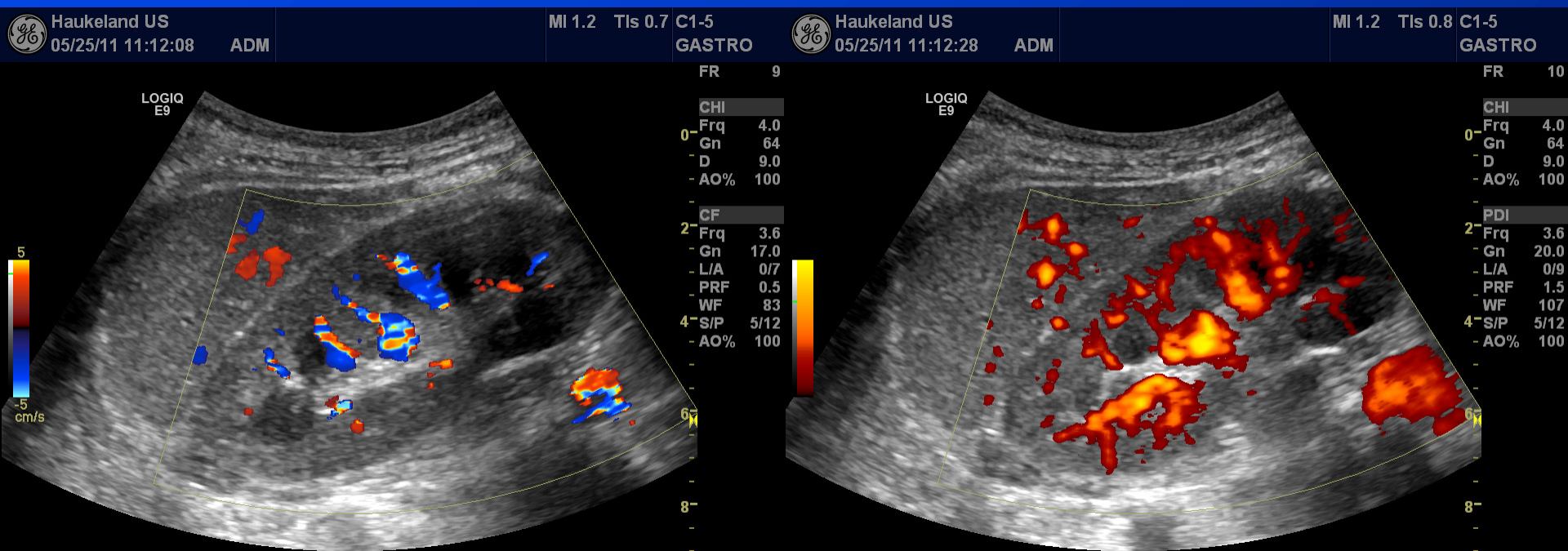


Scar of the kidney





Doppler of the Kidneys







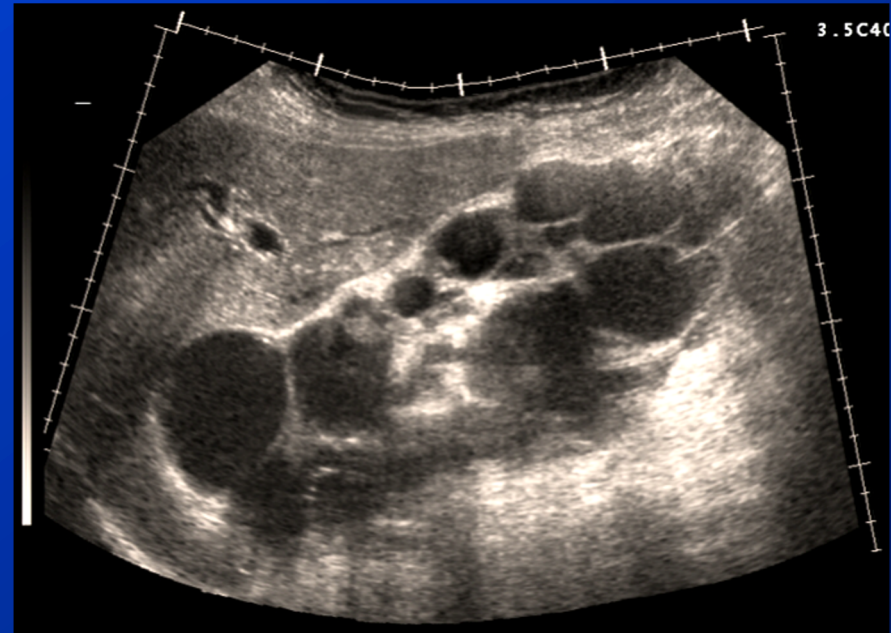
B Flow real-time dynamics





PATHOLOGY

- Hydronephrosis
- Nephrolithiasis
- Parenchymal diseases
- Infection
- Expansive processes
- Transplantation
- Trauma



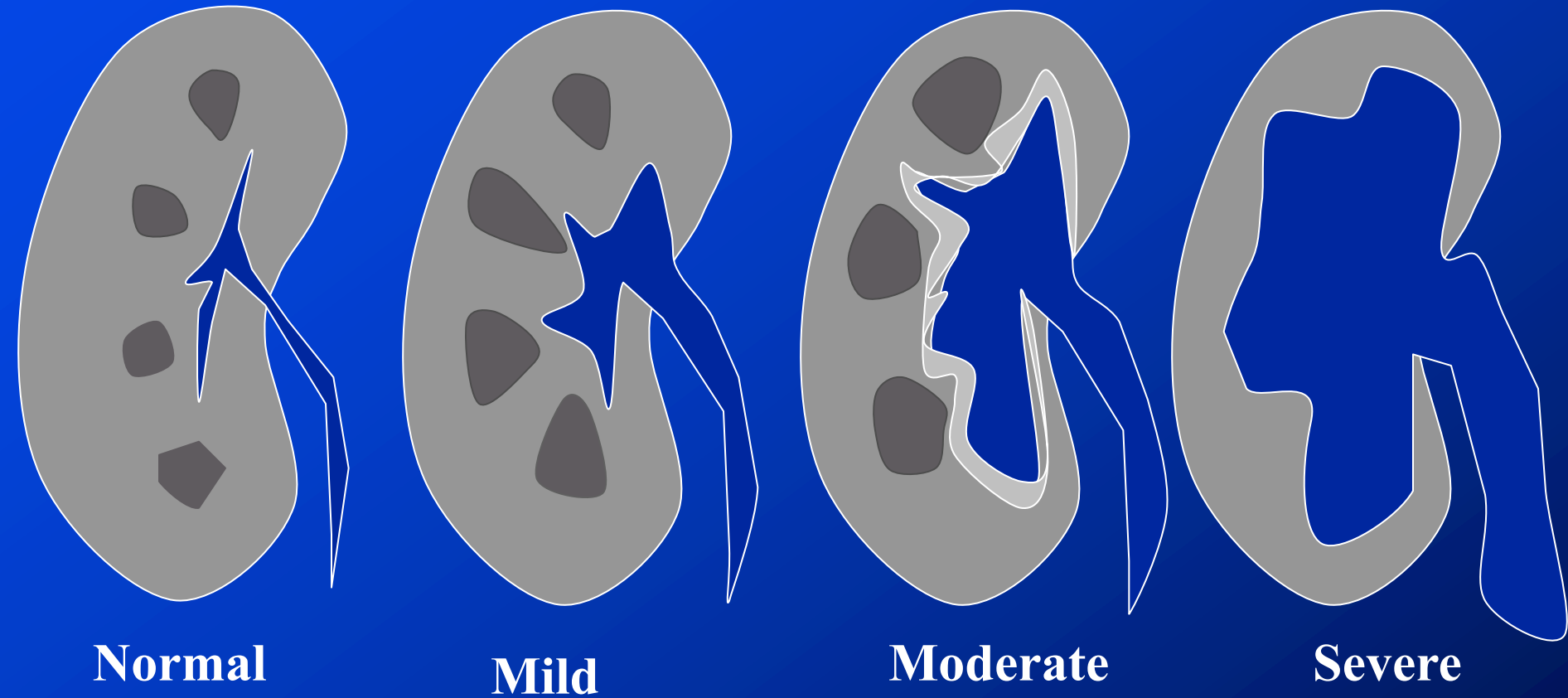


HYDRONEPHROSIS

- Physiological
 - Full U-bladder
 - Pregnancy
- Pathological
 - Congenital
 - Reflux, valves, stenosis, ectopies, uretheroceles, megacalyces/ureters
 - Obstruction
 - Strictures after infection/trauma, prostate hyperplasia, malignancy, stones, retroperitoneal fibrosis, obstipation in children, post-operatively
 - Infection



Range of Hydronephrosis



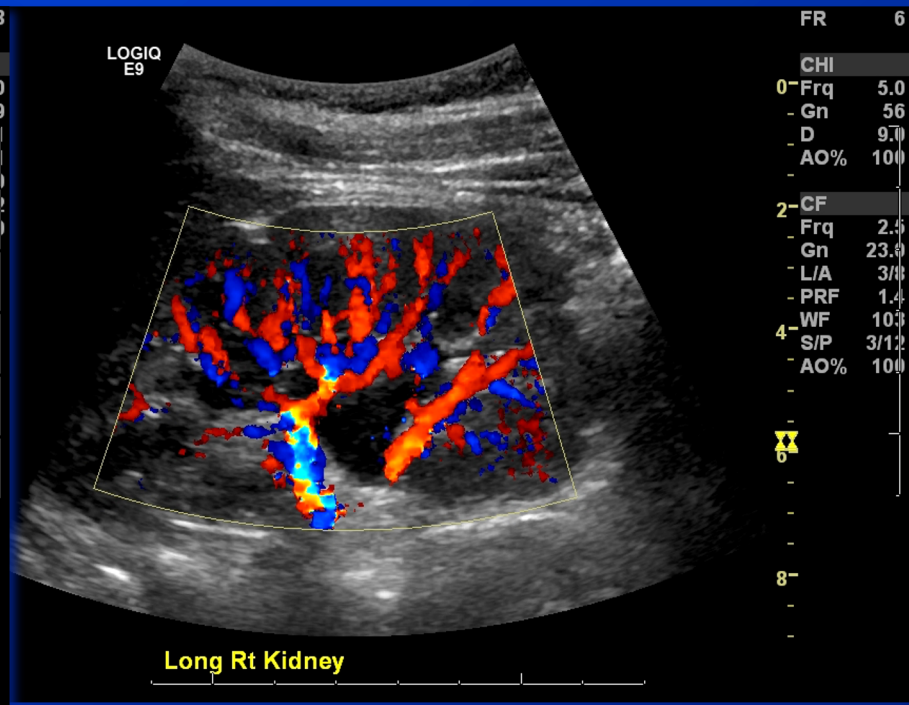
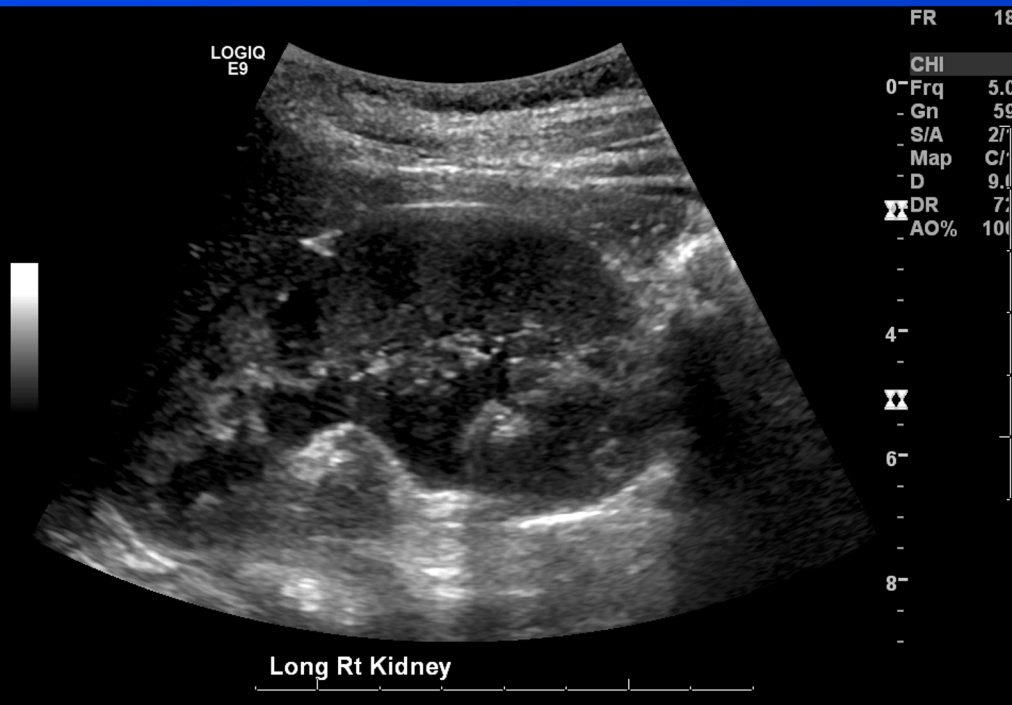


Hydronephrosis



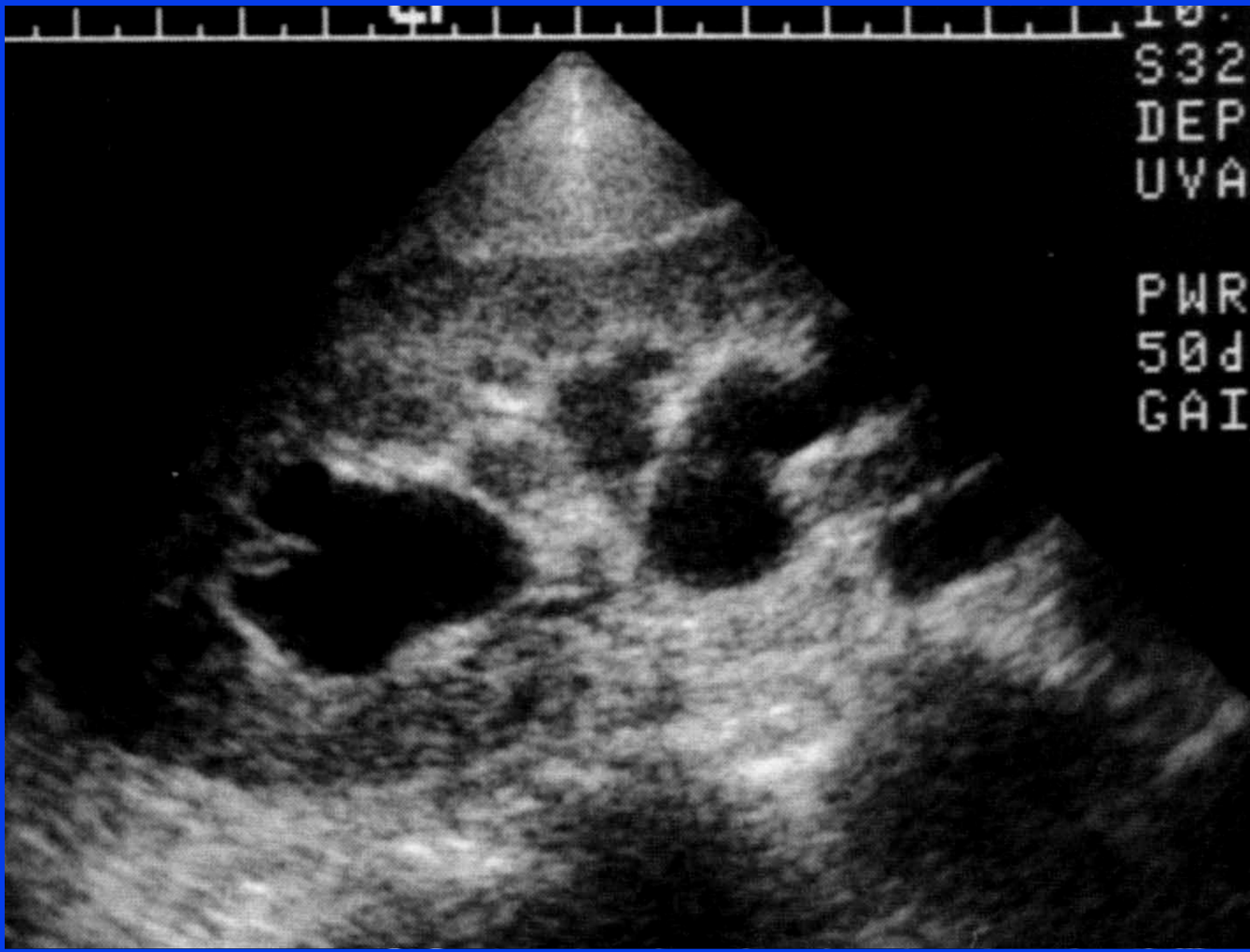


Use the Doppler !



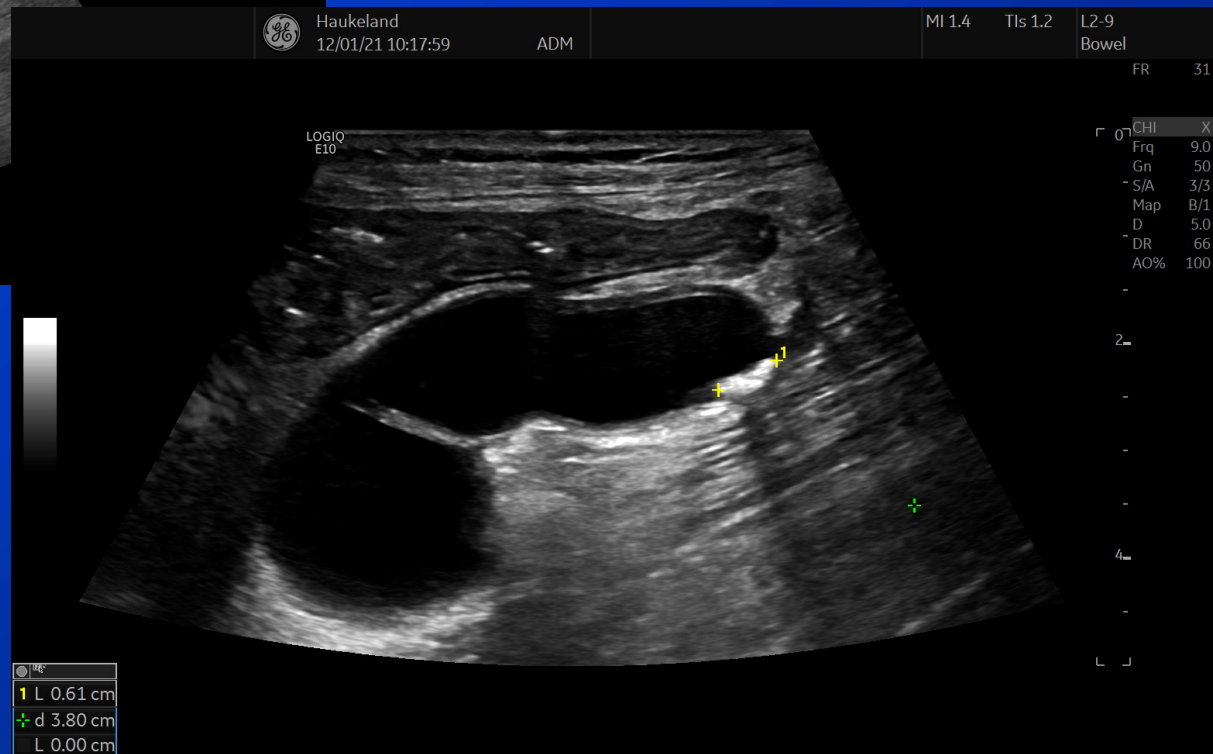
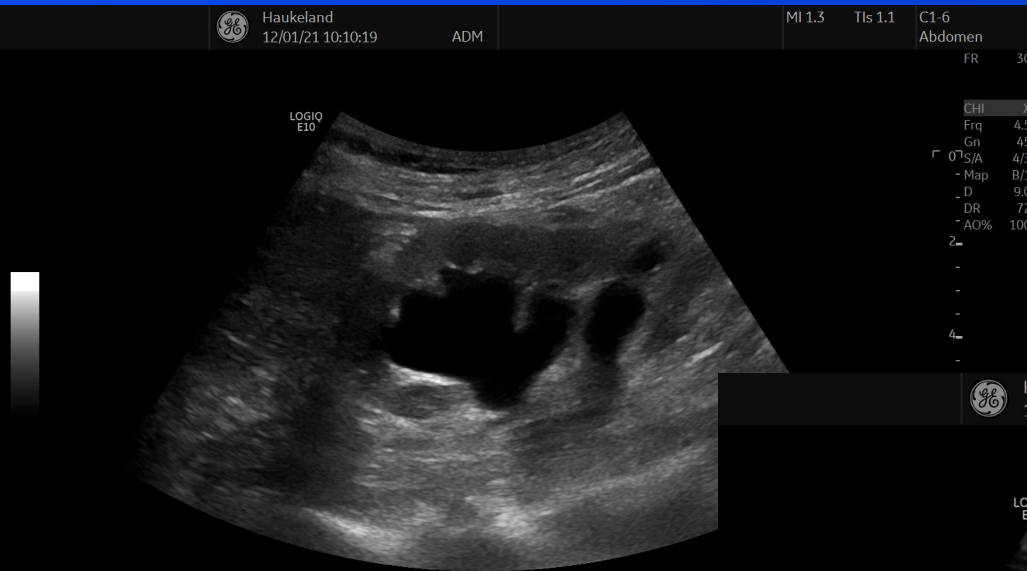


Hydronephrosis



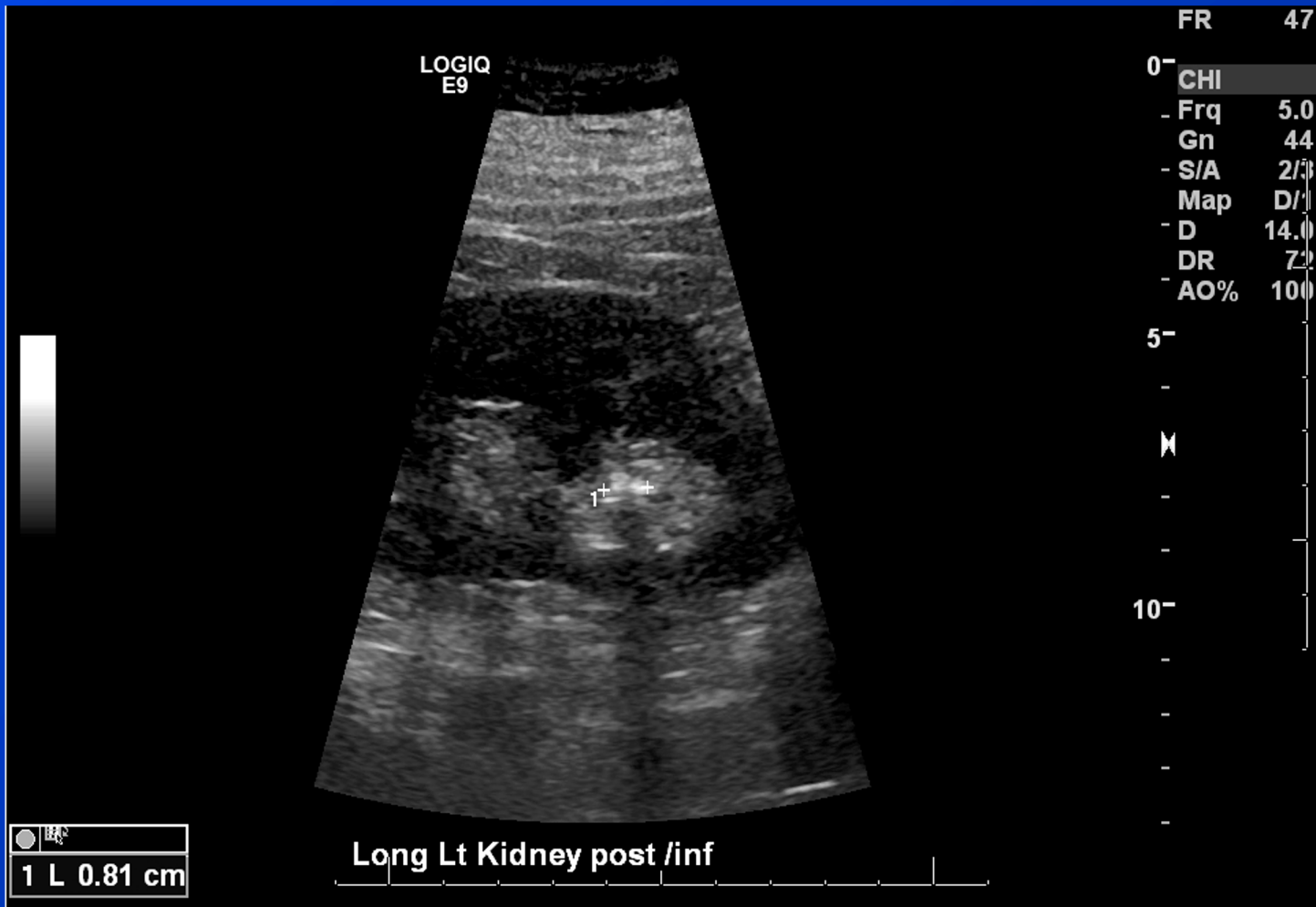


Female, 40 years with Crohn



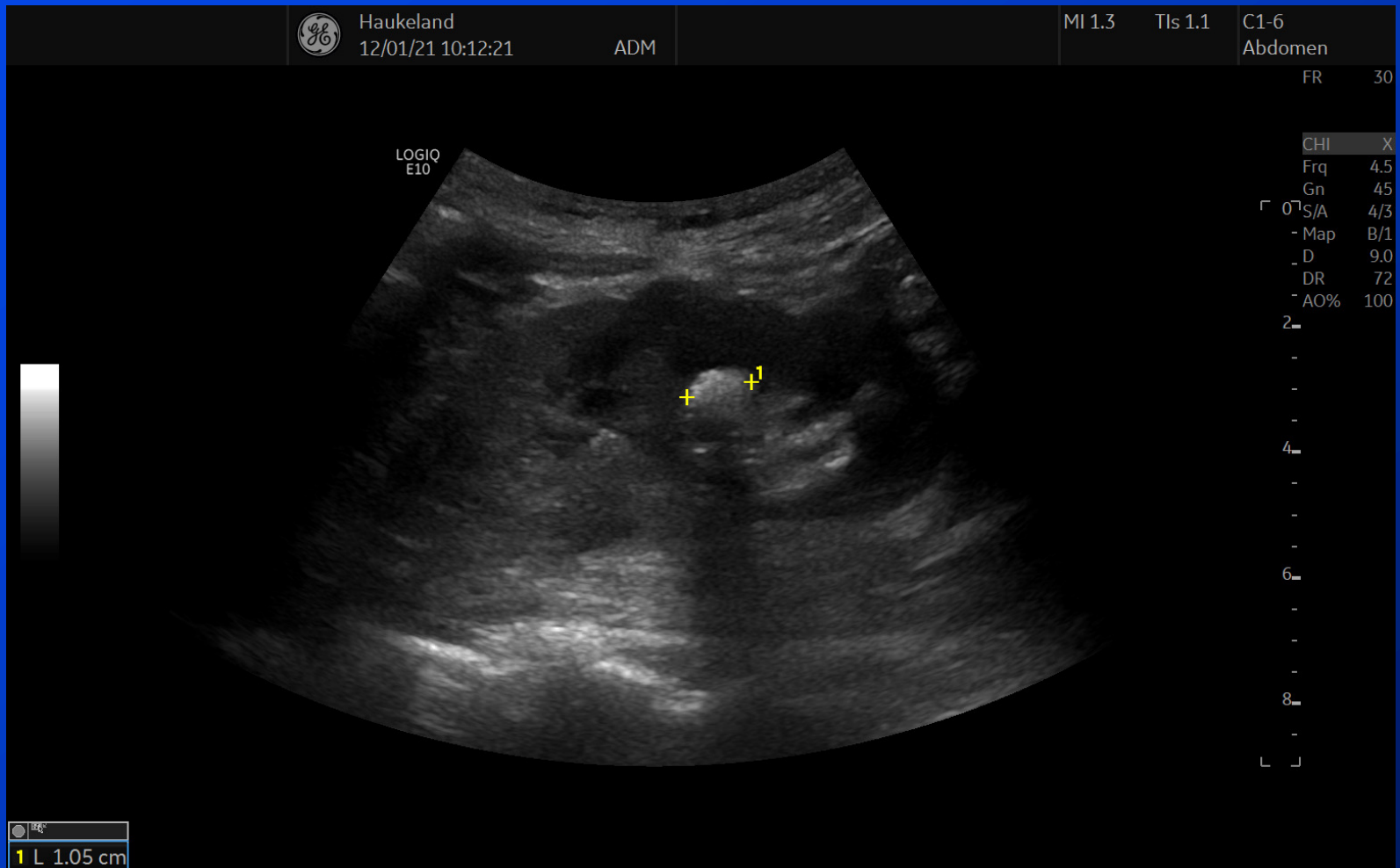


Kidney stone





Kidney stone





Acute Pyelonephritis

ultrasound findings:

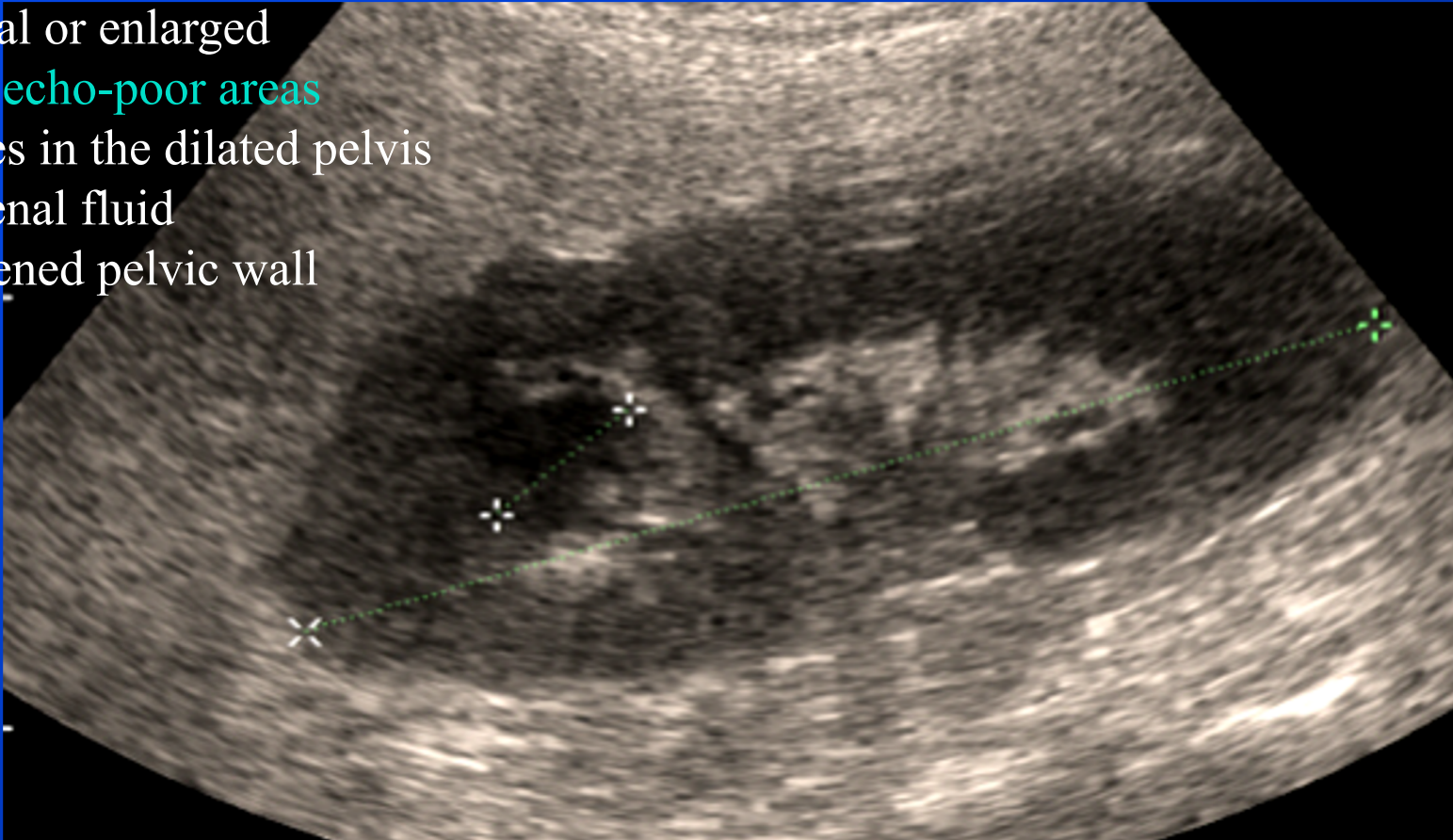
normal or enlarged

focal echo-poor areas

echoes in the dilated pelvis

perirenal fluid

thickened pelvic wall

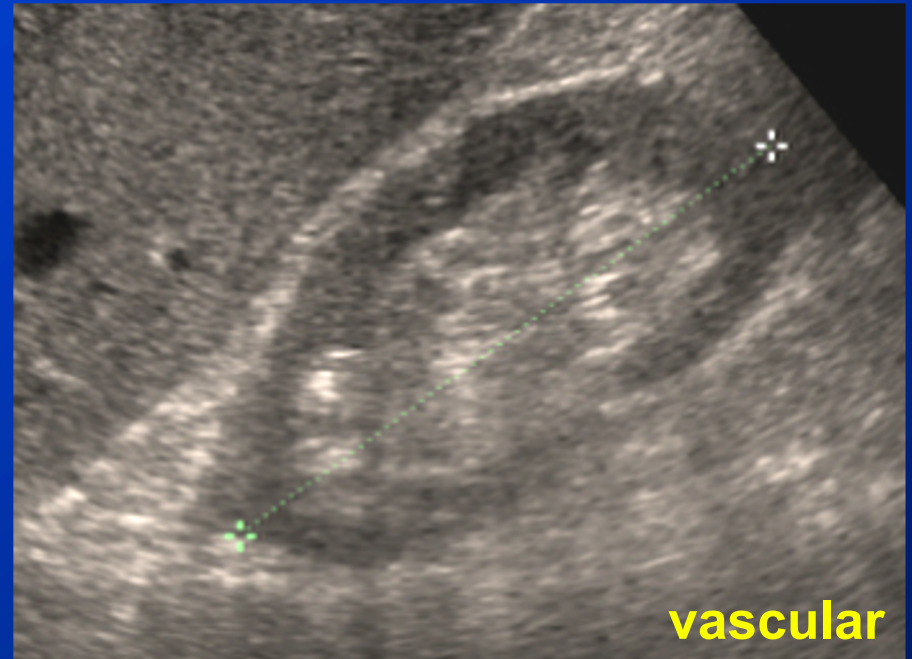
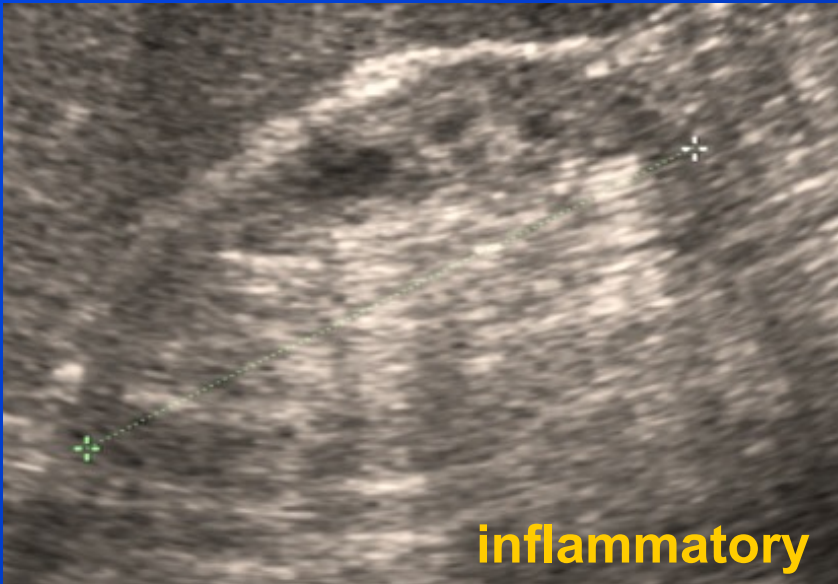




Chronic pyelonephritis

ultrasonic appearance:

- small kidney
- small echo-rich parenchyma
- blurred border between parenchyma and central complex
- scars





Final stage of chronic renal disease: Atrophy or „Putty kidney“





Kidney tumors

- A: Benign

- Cysts
- Angiomyolipoma
- Oncocytoma
- (Pseudotumor)

- B: Malignant

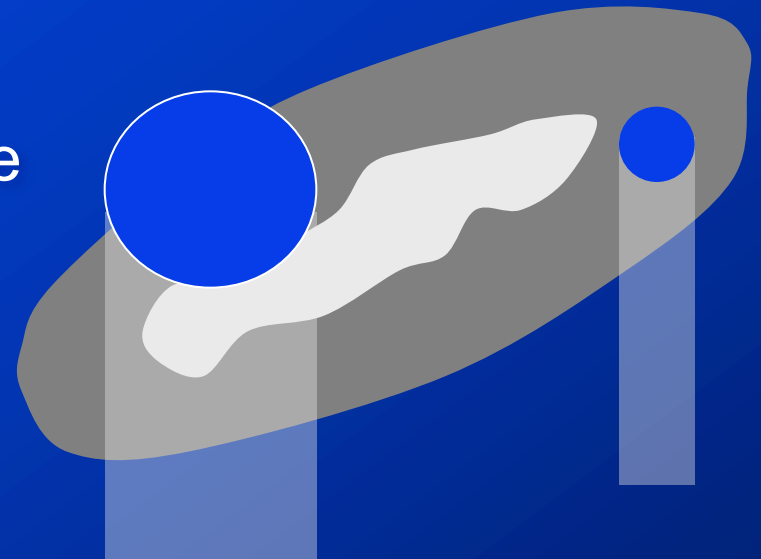
- Carcinoma (RCC)-80%
- Adenoma (10%)
- Urothel-carcinoma
- Lymphoma
- Metastasis



Renal cysts

Simple renal cyst

- Very common! (> 50% of people > 50)
- Clearly defined smooth wall
- Echo-free
- Posterior enhancement
- Hairline septa possible





Haukeland US
08/06/10 10:49:47

ADM

MI 1.1 TIs 1.9

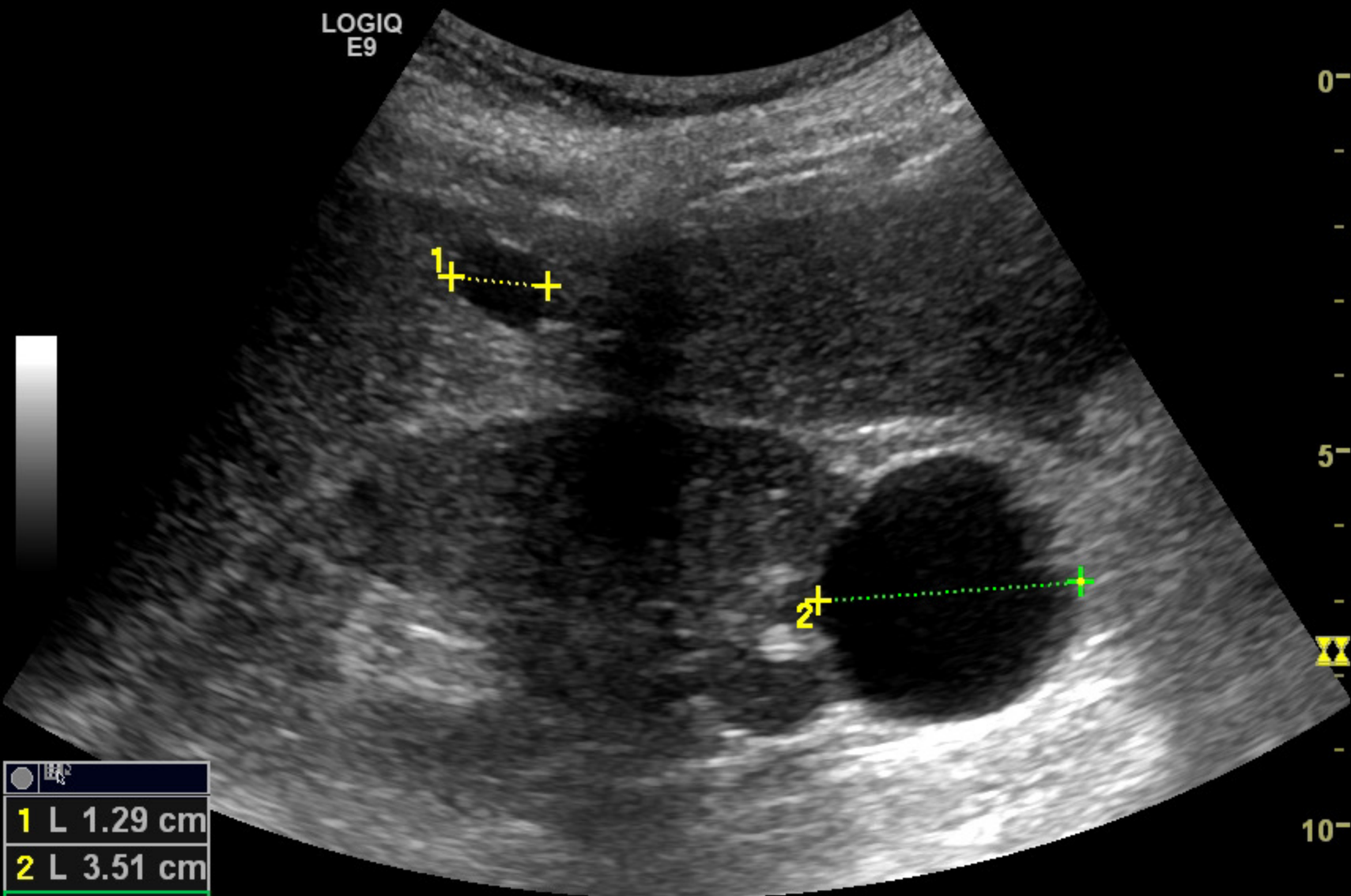
C1-5
GASTRO

FR 26

LOGIQ
E9

CHI

0-Frq	4.0
Gn	64
- S/A	1/1
Map	F/1
- D	11.0
DR	66
- AO%	100



5-



10-

●	MC
1	L 1.29 cm
2	L 3.51 cm
+	d 7.85 cm
	L 0.00 cm



BOSNIAK'S CLASSIFICATION

- Type 1:
 - Smooth wall, anechoic, $< 20\text{HU}$ at CT. "simple cysts"
- Type 2:
 - Thin septa, small calcifications, evt. hyperdense ($< 90\text{HU}$ (blood, proteins).
- Type 3:
 - "Indeterminate". Thick irreg. calcifications, thick septa, irreg. borders
- Type 4:
 - Solid tumors with cystic sections.



New EFSUMB Guidelines

Guidelines & Recommendations

Thieme

EFSUMB 2020 Proposal for a Contrast-Enhanced Ultrasound-Adapted Bosniak Cyst Categorization – Position Statement

EFSUMB 2020 – Vorschlag für eine an den kontrastverstärkten Ultraschall adaptierte Bosniak-Klassifikation von Zysten – Eine Stellungnahme

Authors

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Who was Dr. Morton Bosniak?

- A radiologist at NYU
- He reported in 1986 a new classification system
 - Based on CT





BOSNIAK'S CLASSIFICATION

Bosniak groups

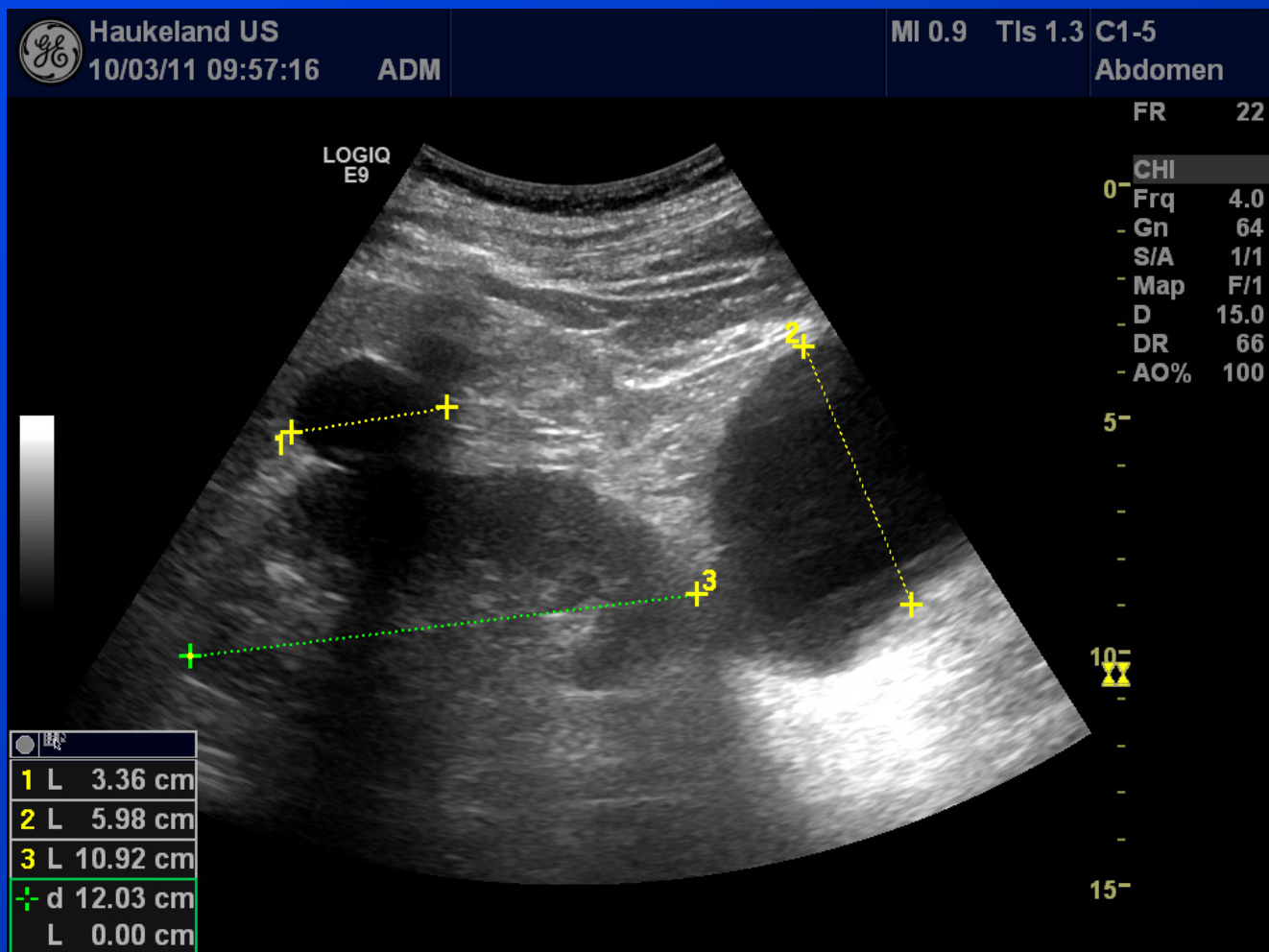
- Bosniak I: simple cyst (benign)
- Bosniak II: minimally complex cyst (benign)
- Bosniak IIF (follow): slightly more complex than II, not yet III (95% benign)
- Bosniak III: complex cysts (40-60% malignant)
- Bosniak IV: mixed cystic-solid lesion (85-100% malignant)

Bosniak classification criteria

- septa
- cyst content
- contrasting
- solid shares

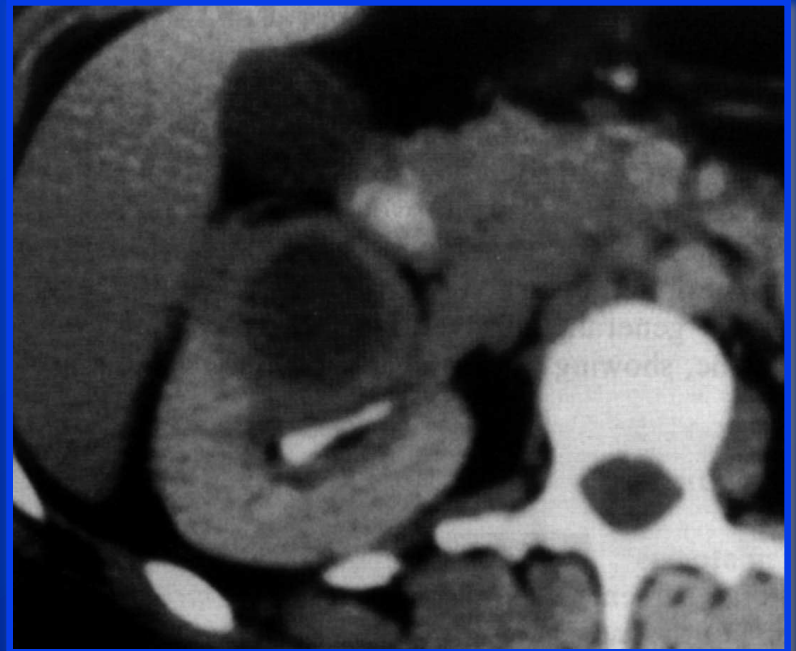
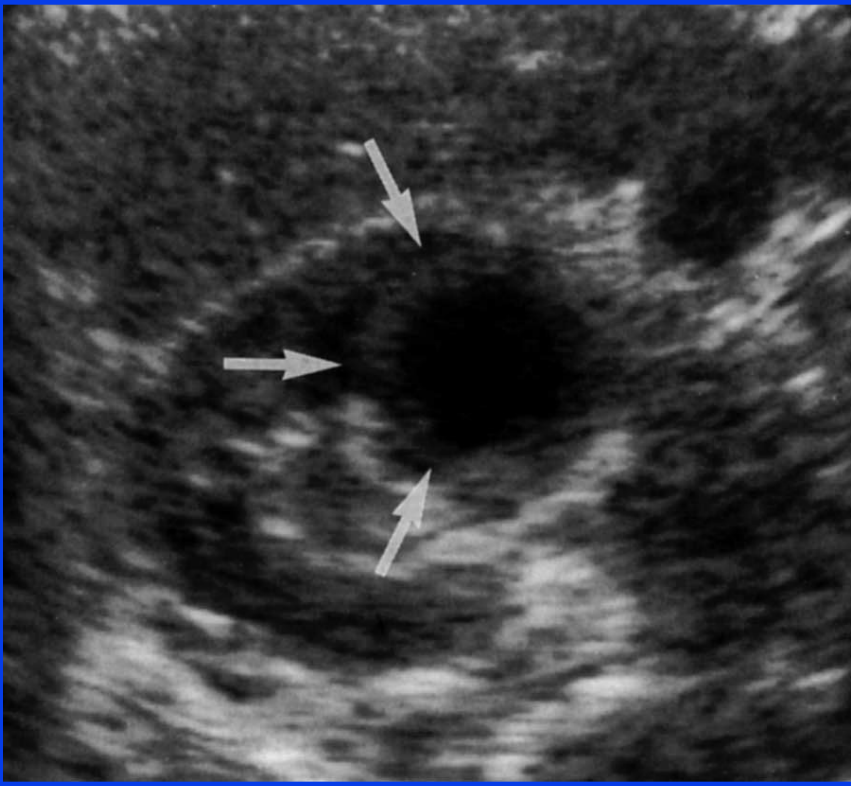


Cysts on left Kidney





Bosniak Type 3



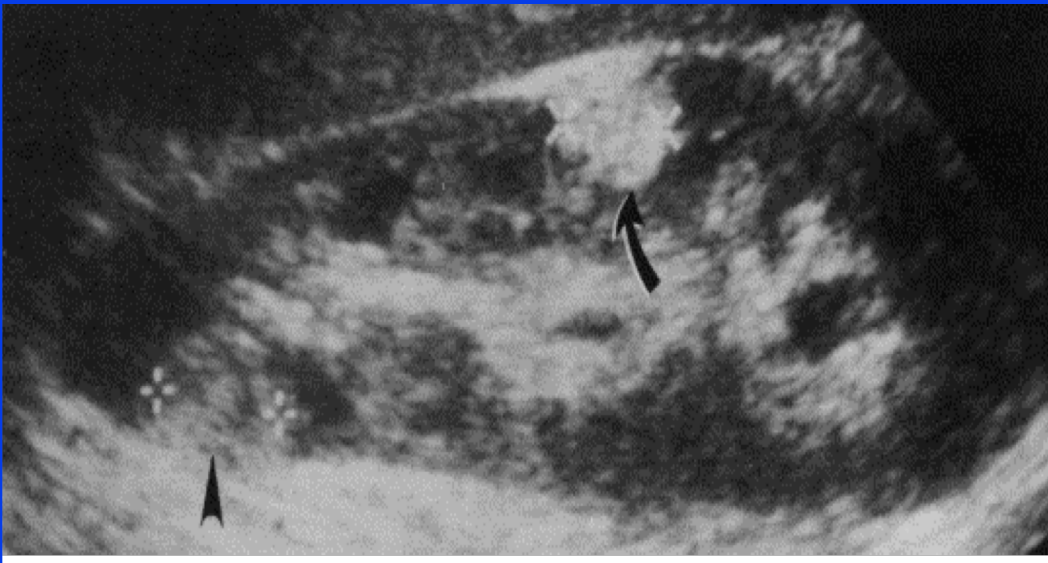


ANGIOMYOLIPOMA

- Hamartoma; vessels, fat and smooth muscle
- Isolated 80%:
 - Most in females 40-50 years
 - Often hemorrhage if > 4 cm
- Part of tuberous sclerosis in 20%
 - 50% are bilaterale and multiple
- Benign tumor
- Hyperechogenic tumors without any symptoms

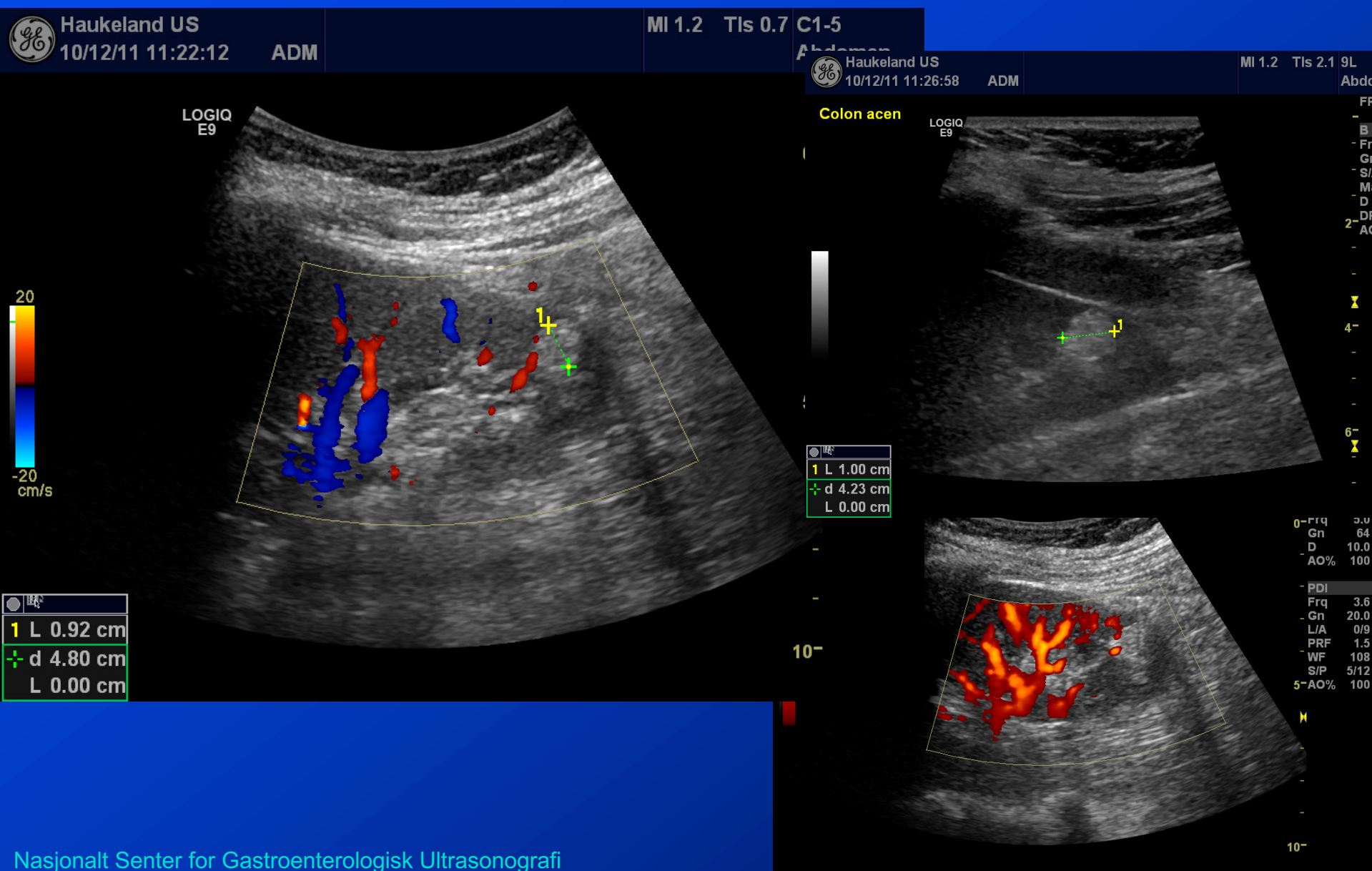


ANGIOMYOLIPOMA





Angiomyolipoma



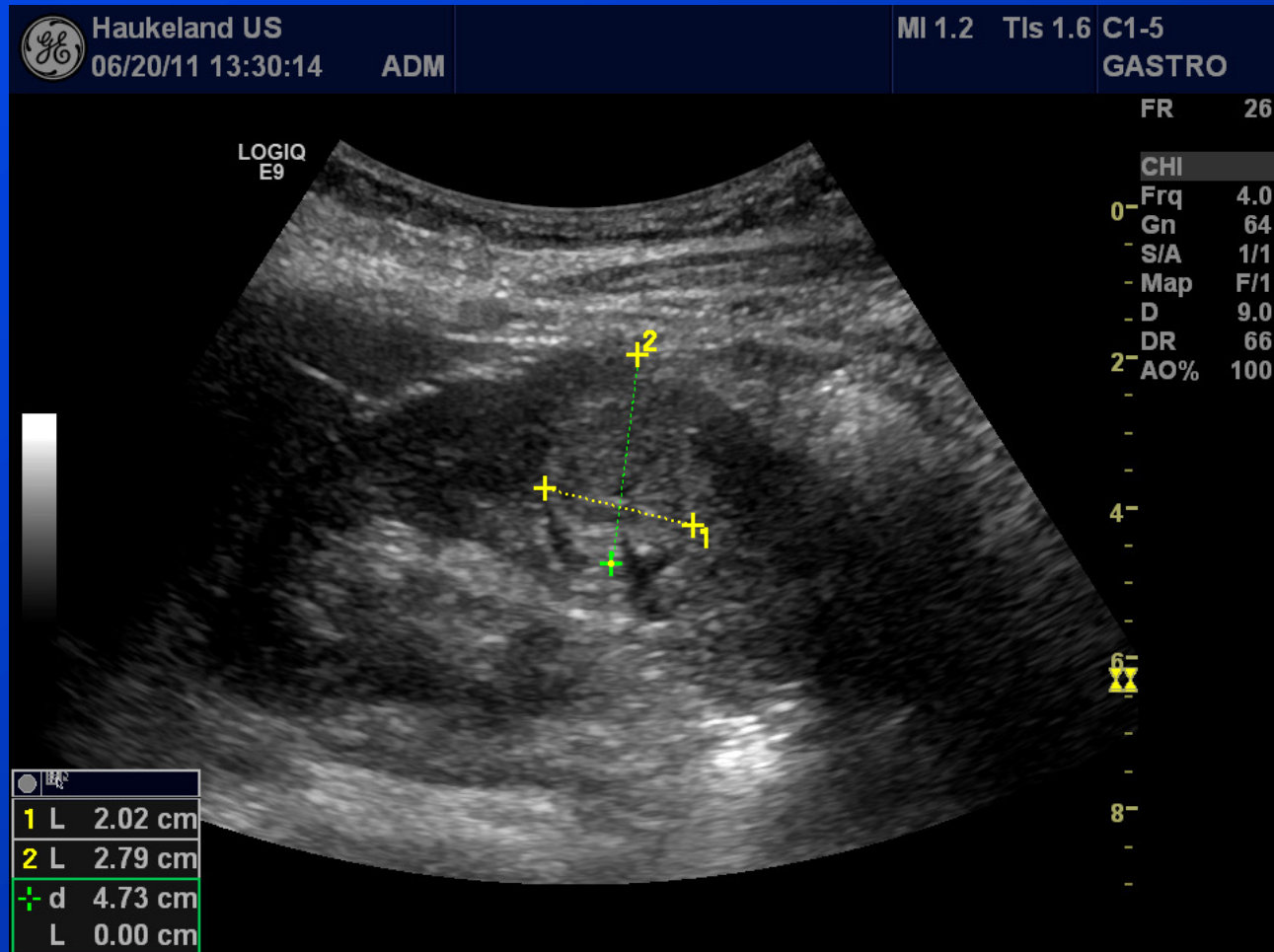


Renal Cell Carcinoma

- 80 % of solid kidney tumors
- Male > Female 3:1
- Incidence: 450/year in Norway
- Increased risk:
 - Hippel-Lindau
 - Chronic dialysis
- 2-3% synchrone tumor in contralateral kidney

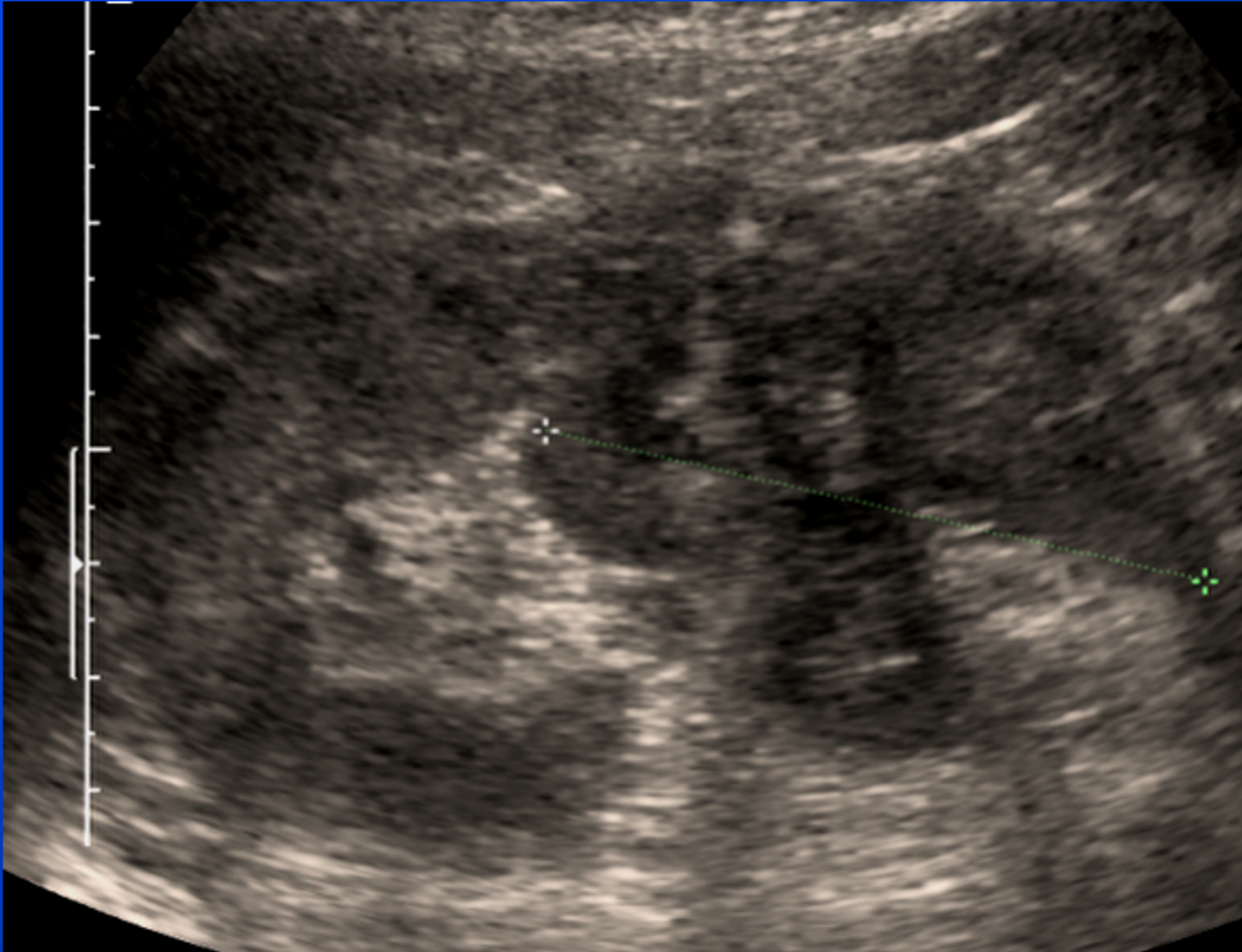


Renal cell carcinoma



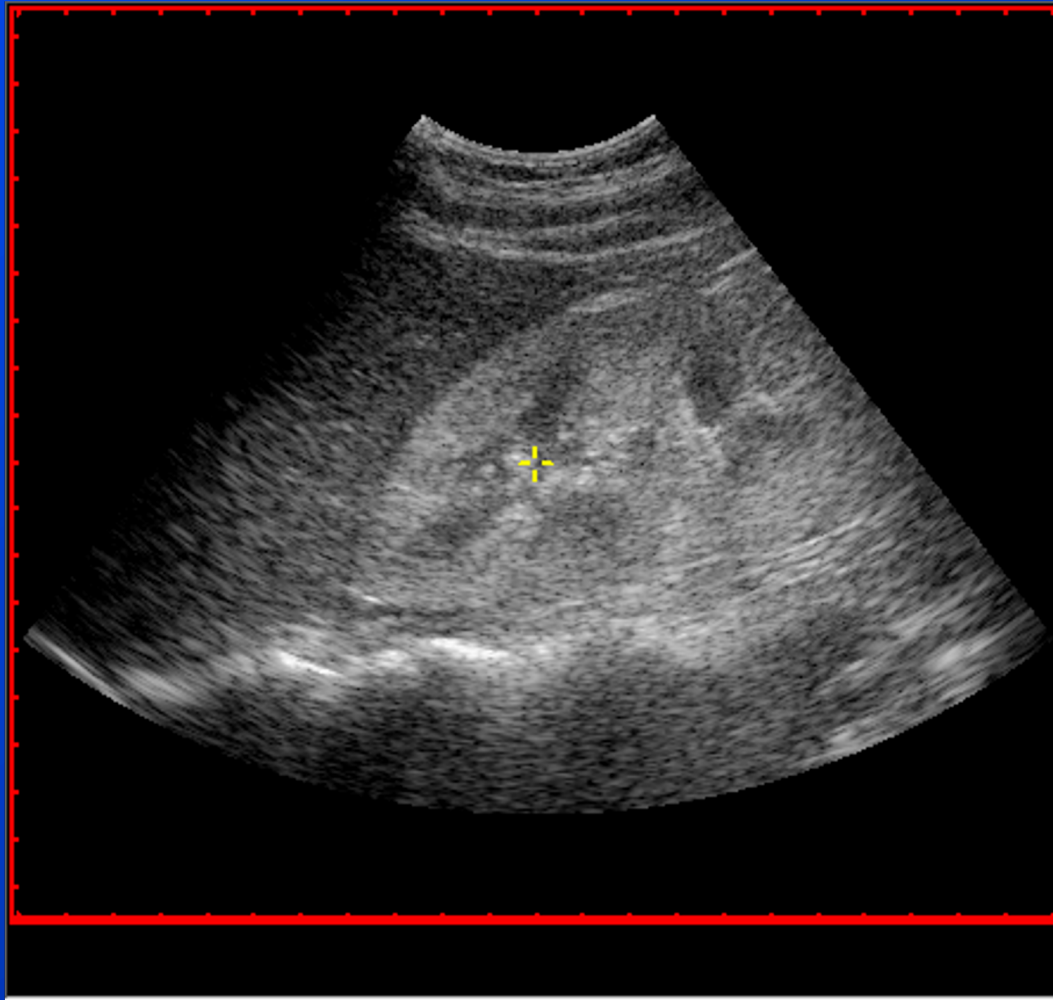


Renal cell carcinoma





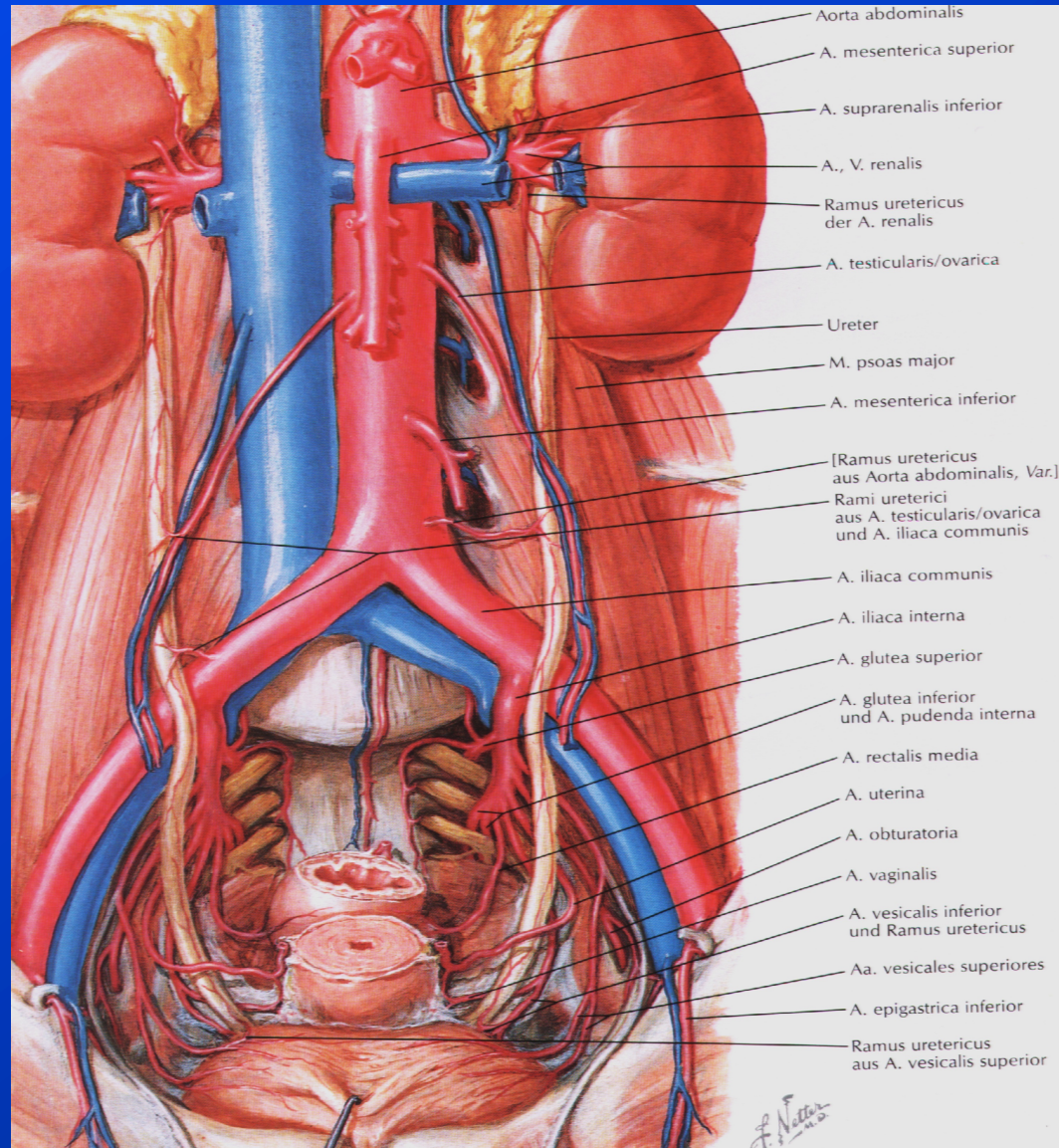
Hyperechogenic kidney



Defroster liquid (Ethylen Glycol) intoxication
with oxalat sedimentation

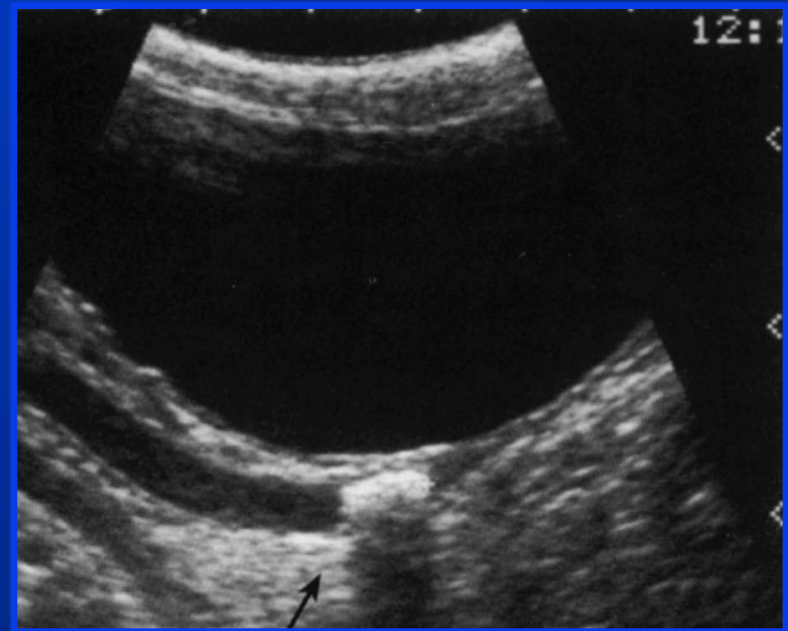
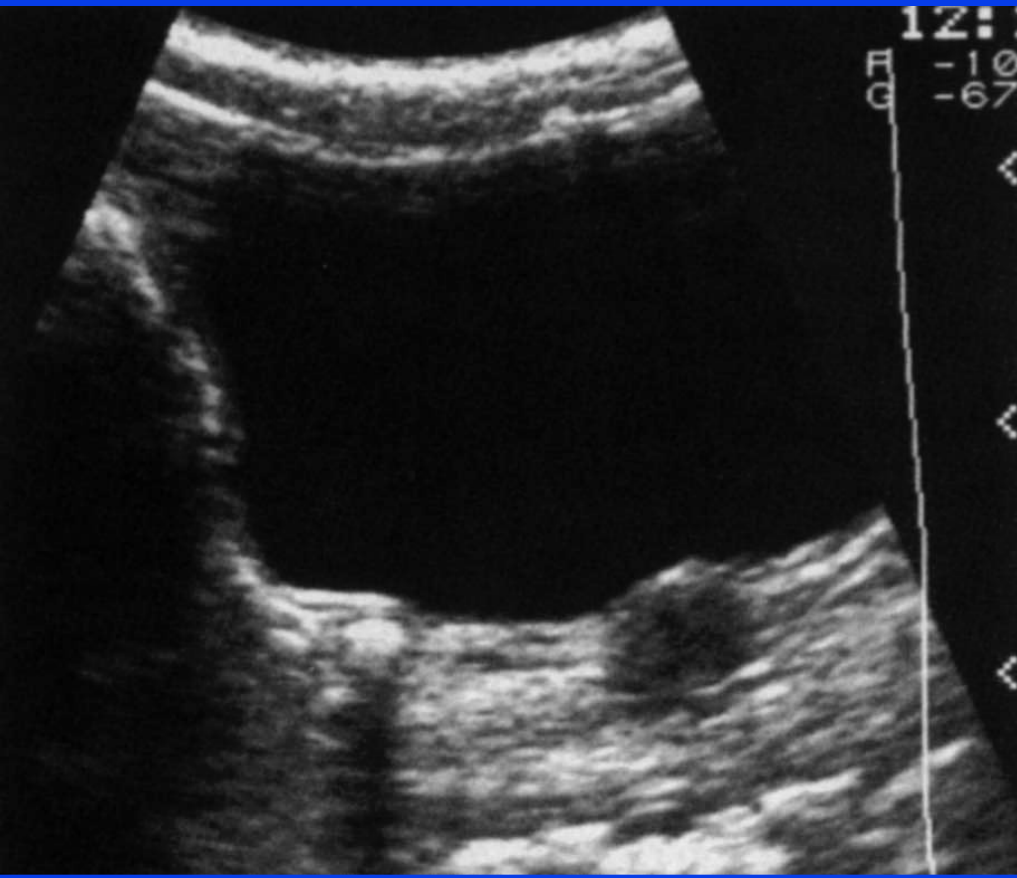


Retroperitoneal Ureter





Ureter Stone





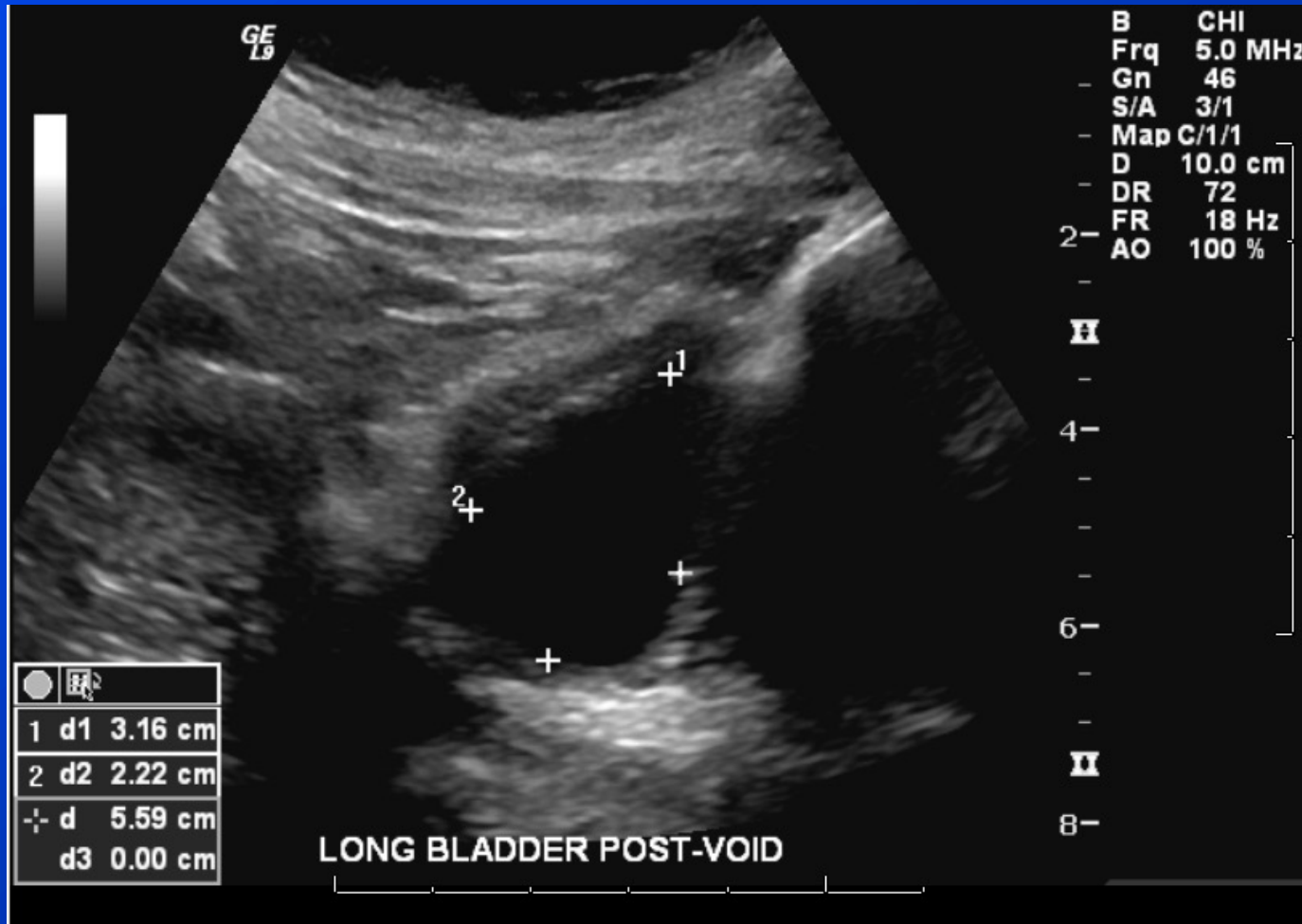
On the importance of a good bladder

With Age comes skills
It's called MultiTasking
I CAN
LAUGH, COUGH,
SNEEZE, AND PEE ALL
AT THE SAME TIME.



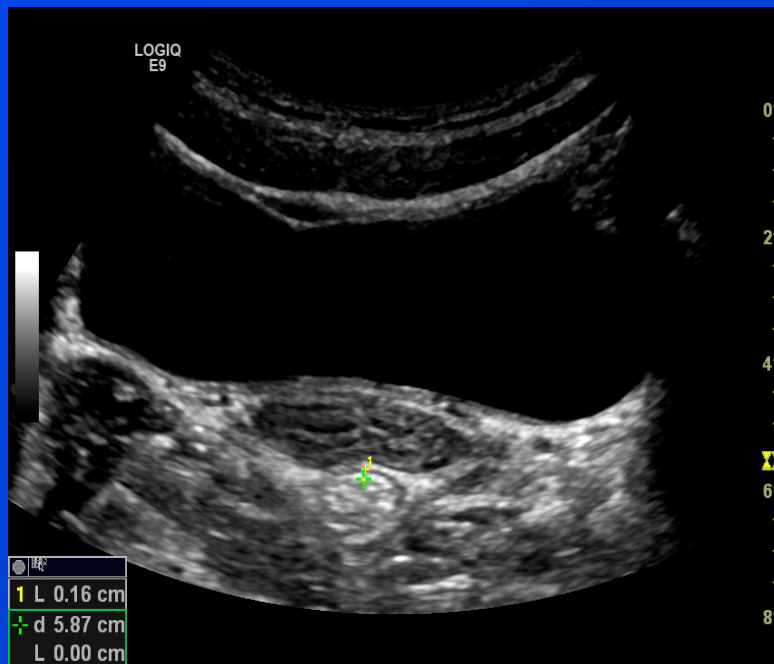


Contracted Urinary bladder

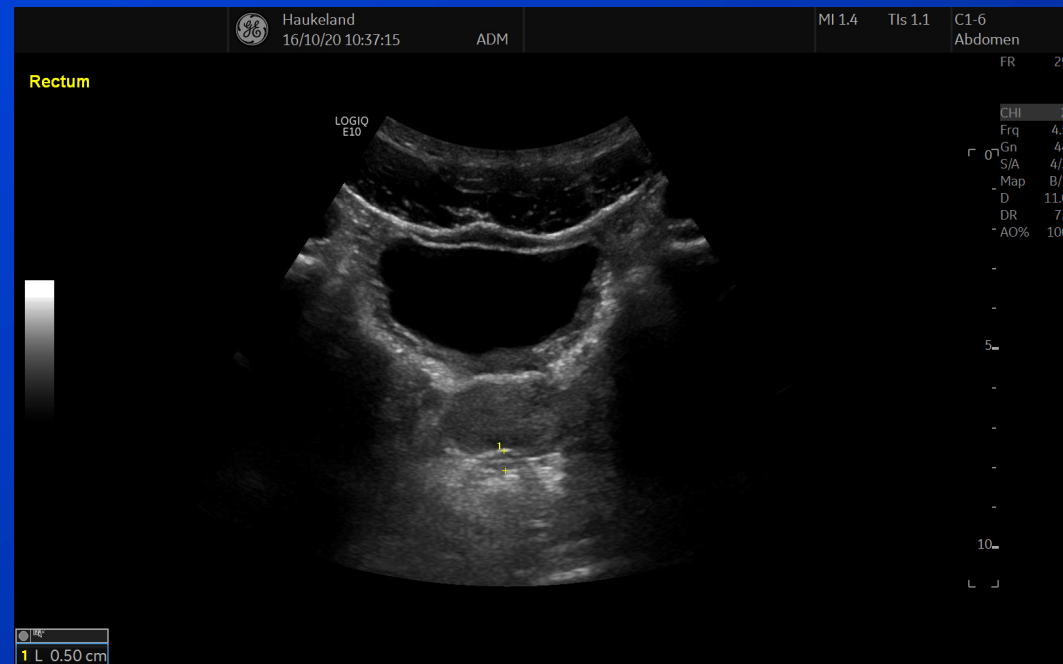




Transverse section



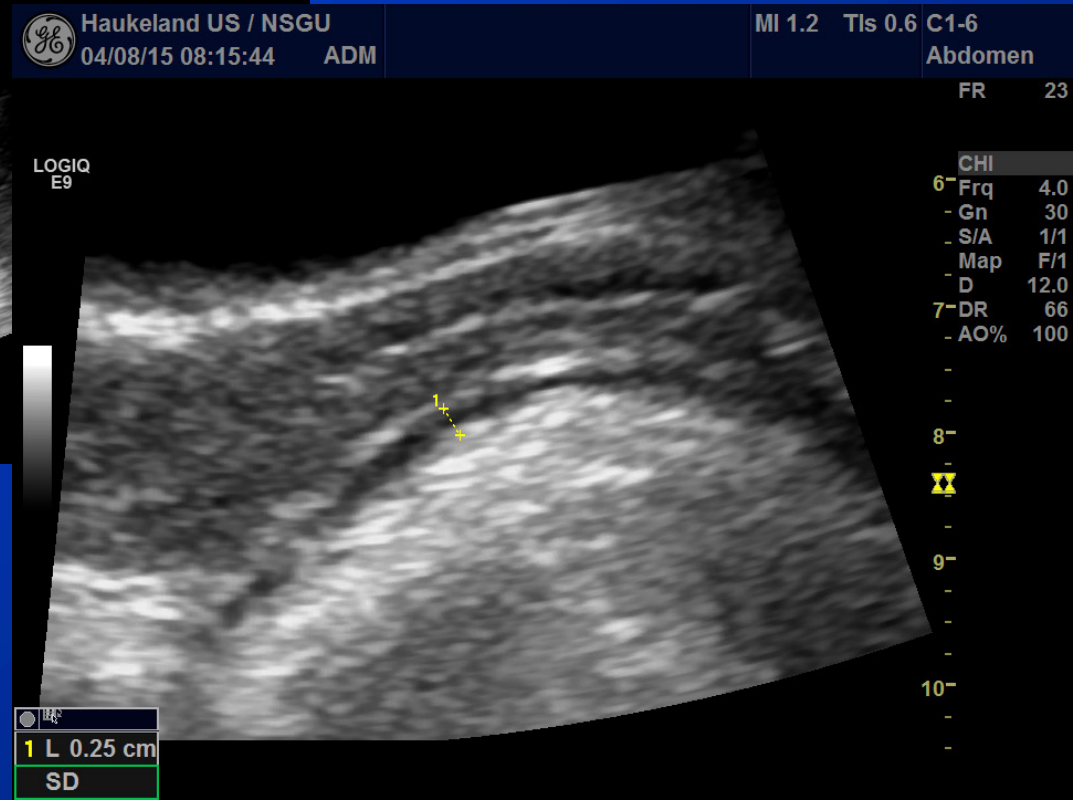
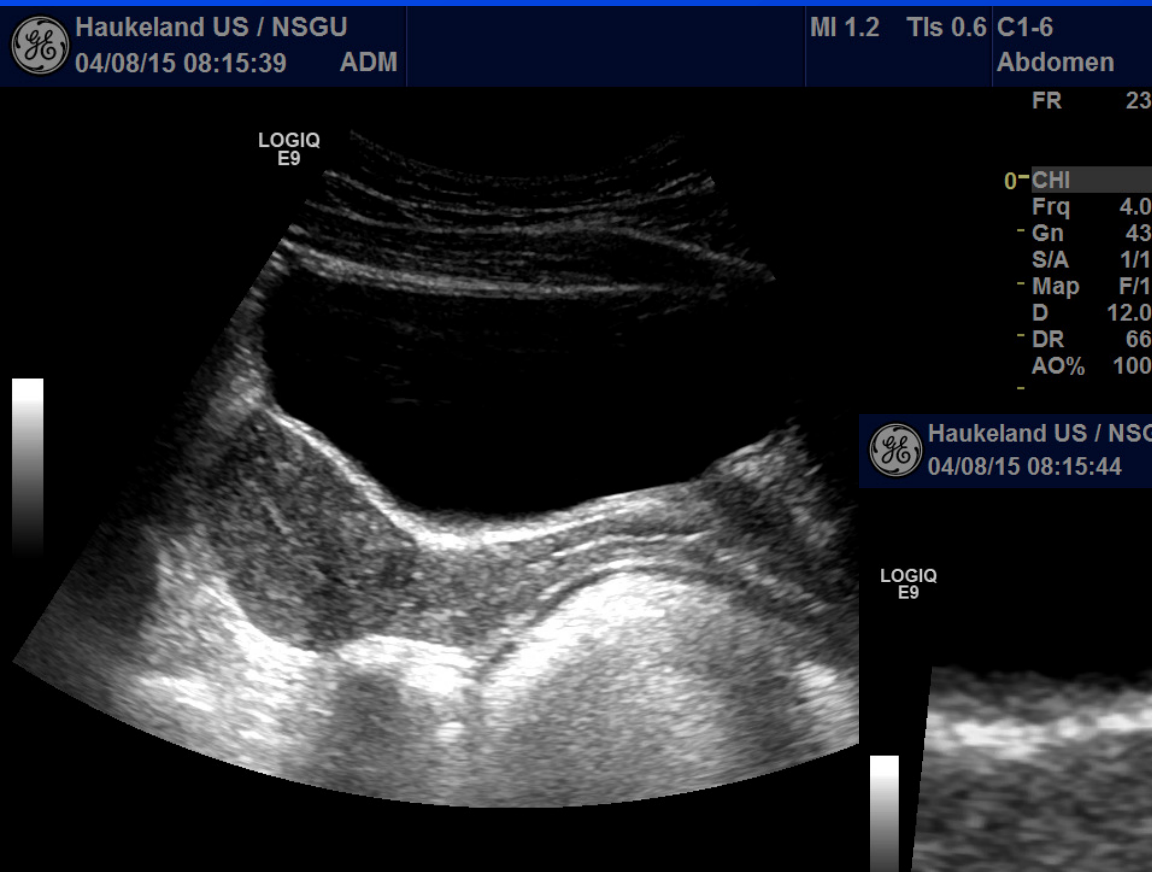
Female



Male

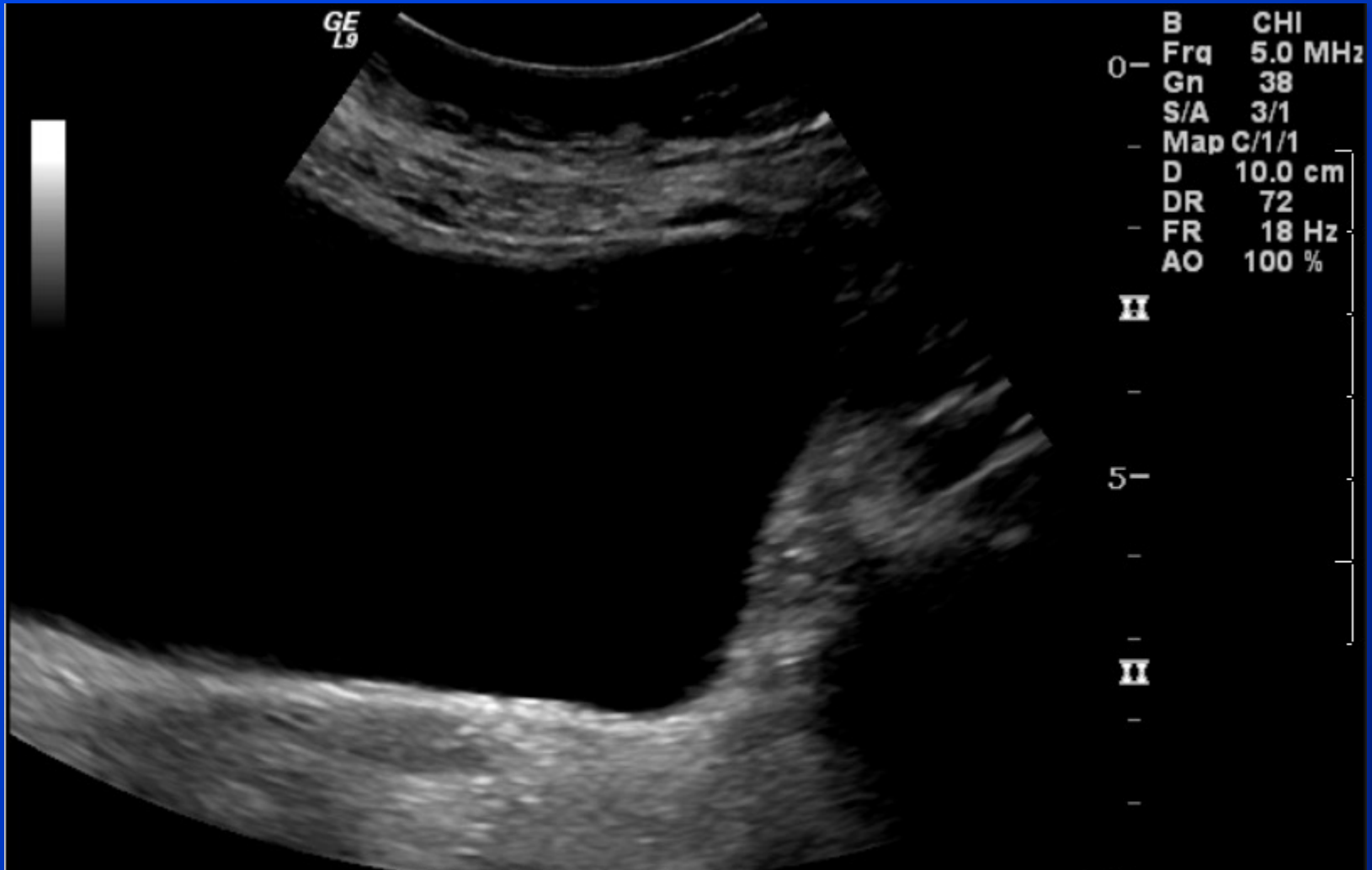


Longitudinal section



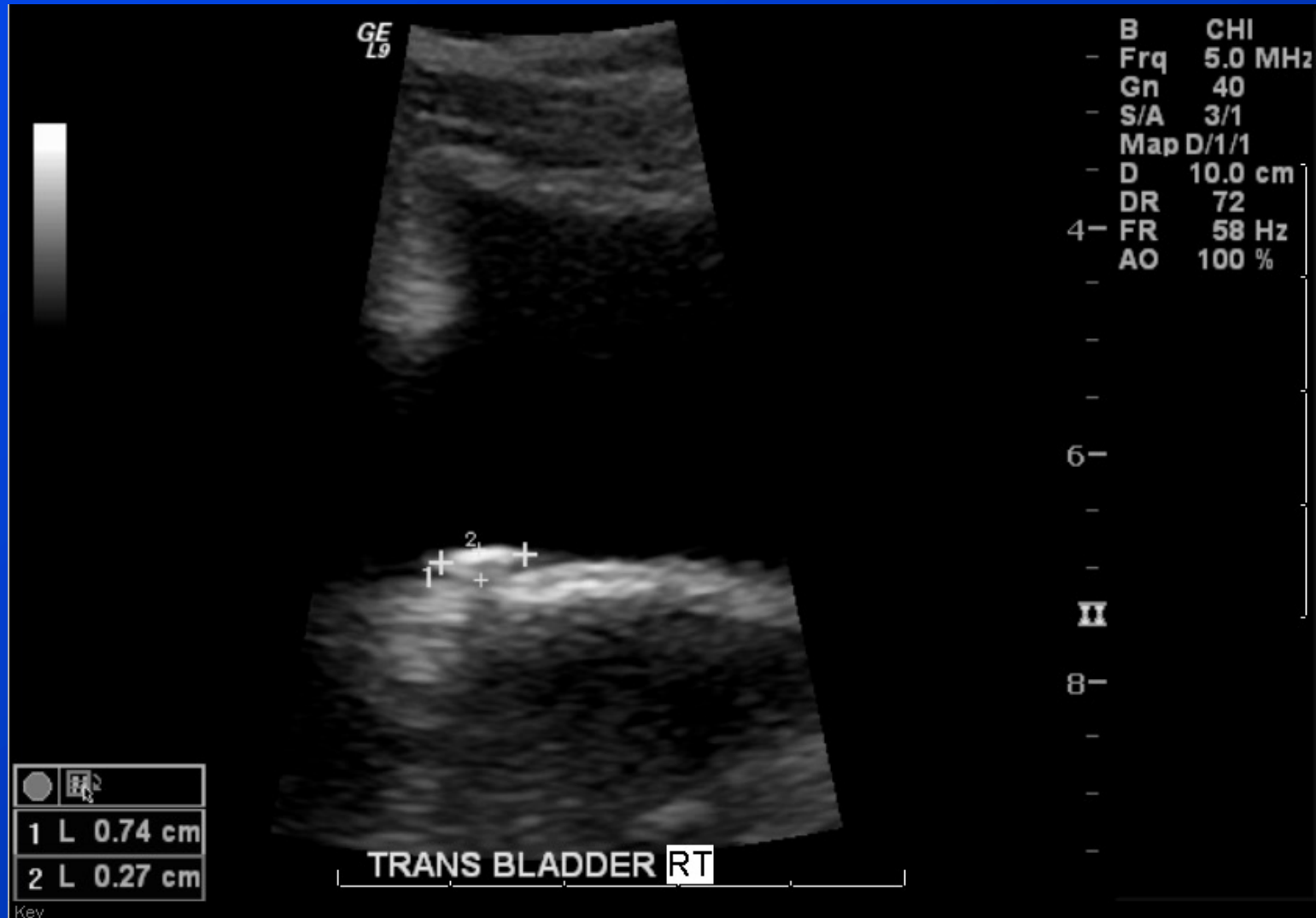


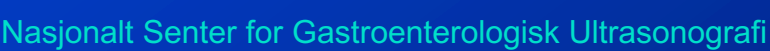
Urinary retention





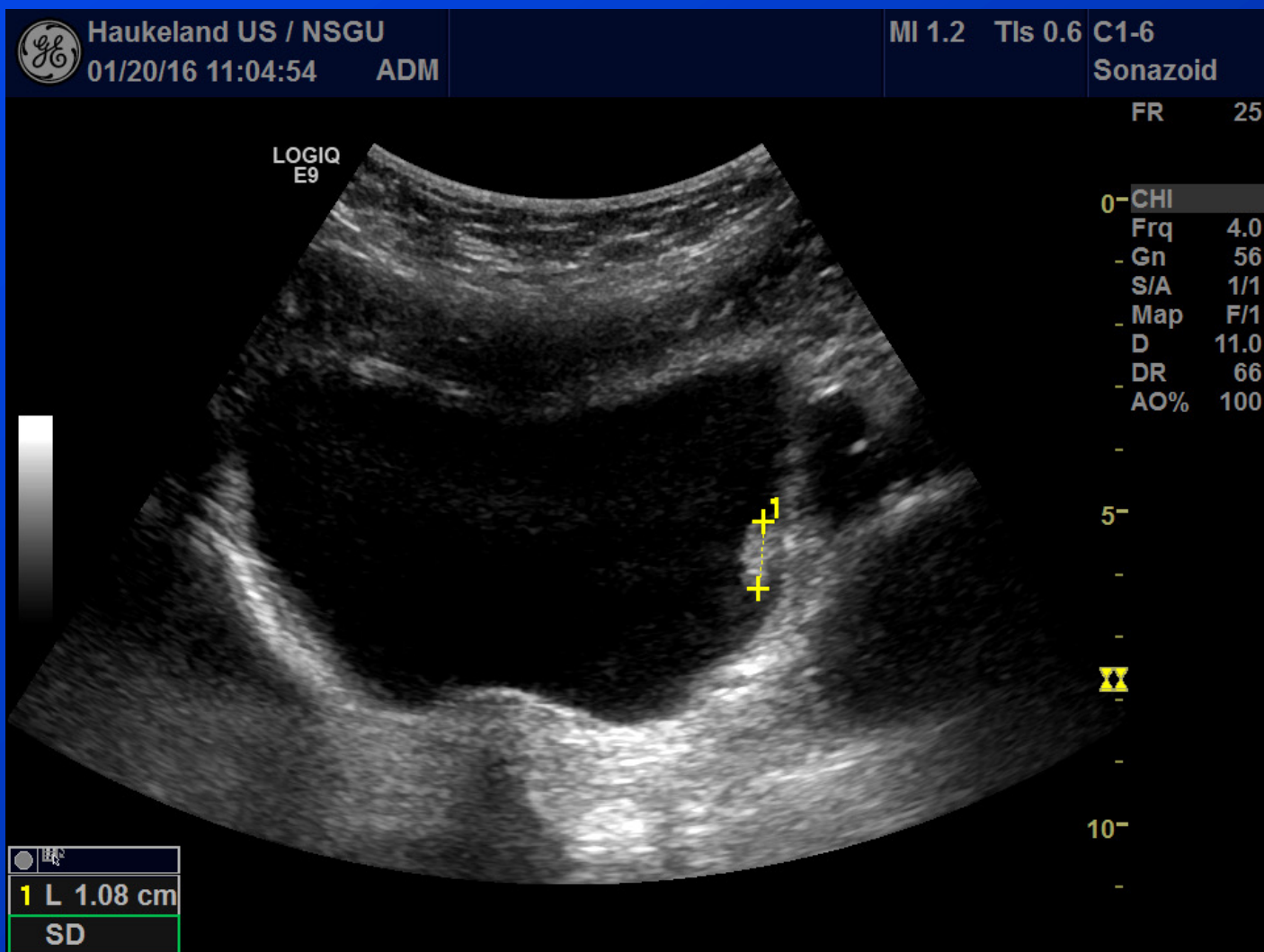
Bladder stone





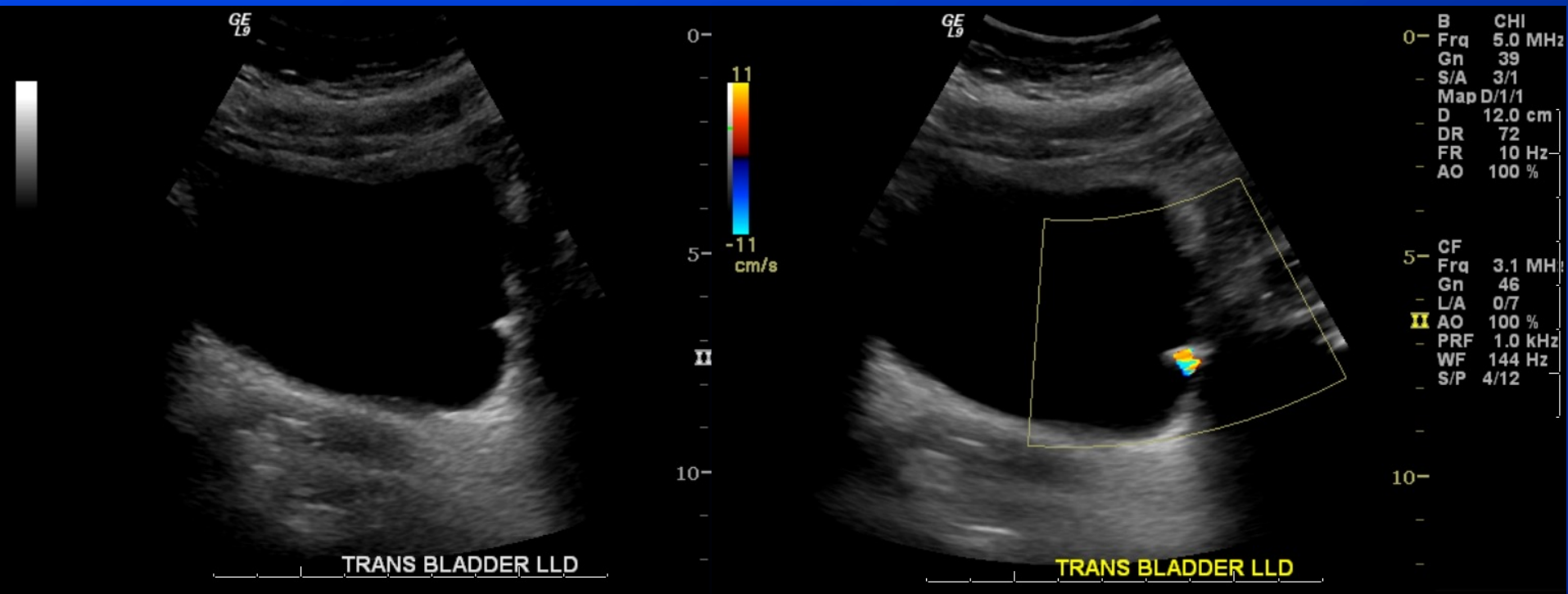


Bladder polyp



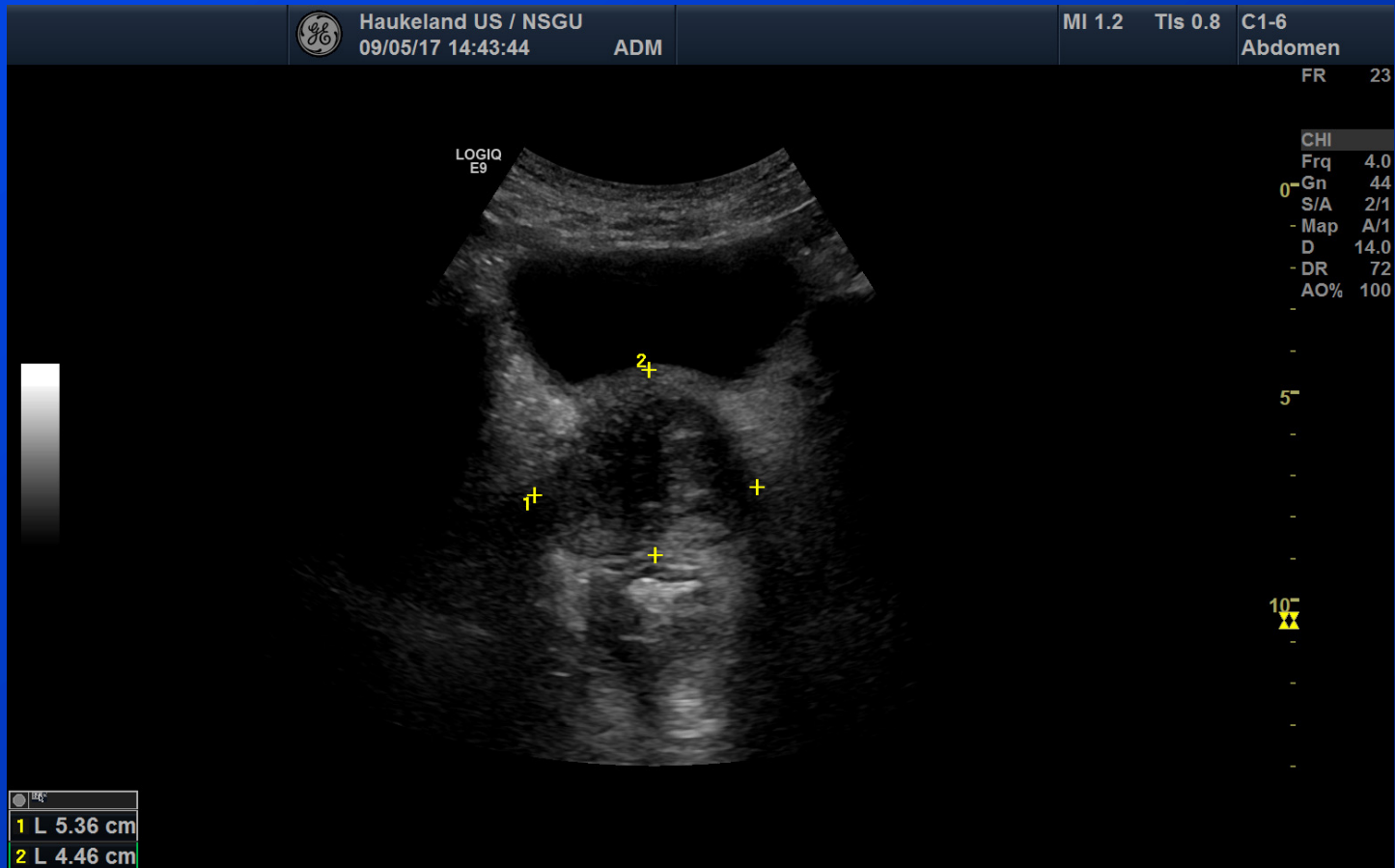


If in doubt, sound it out !



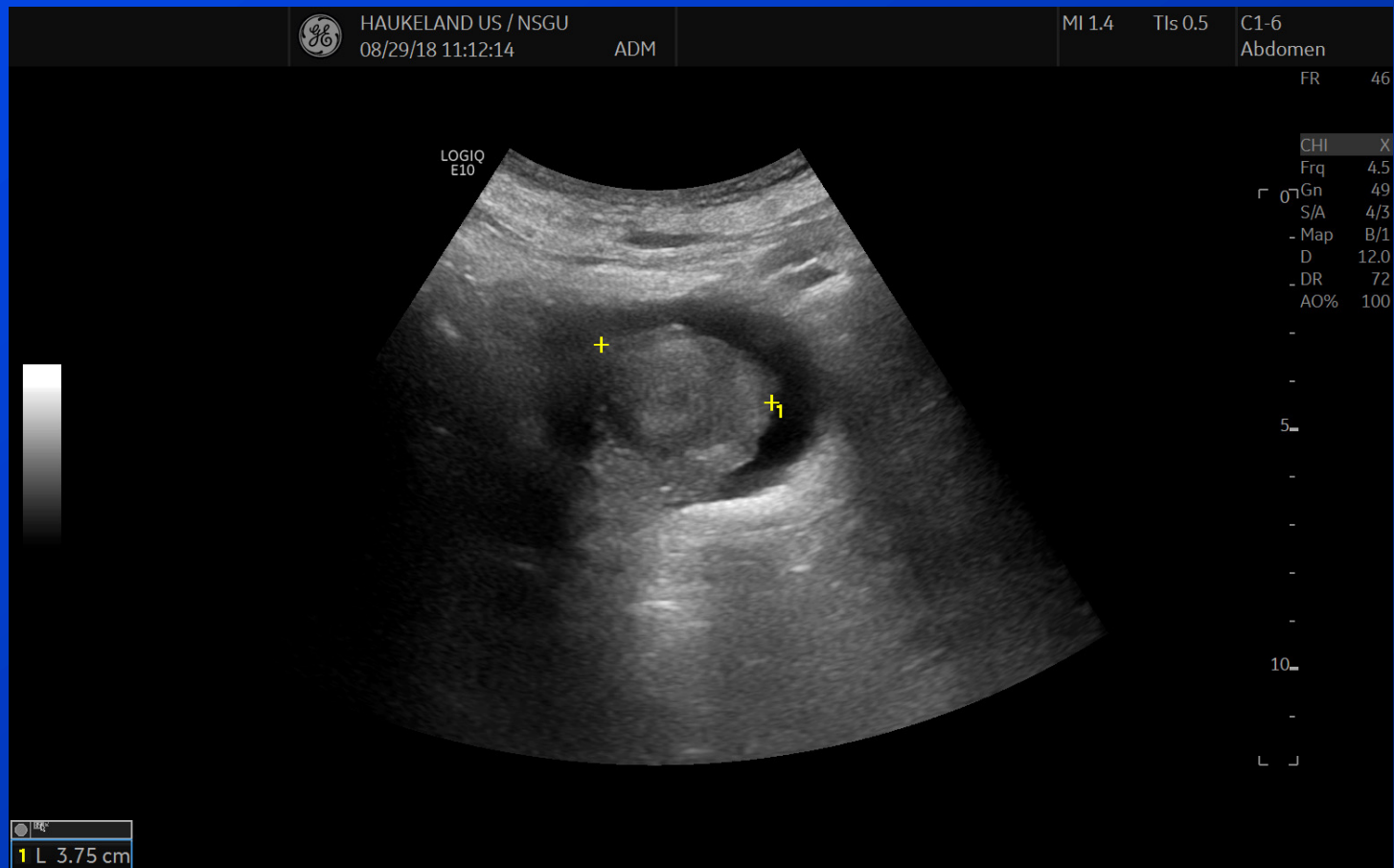


Big irregular Prostate



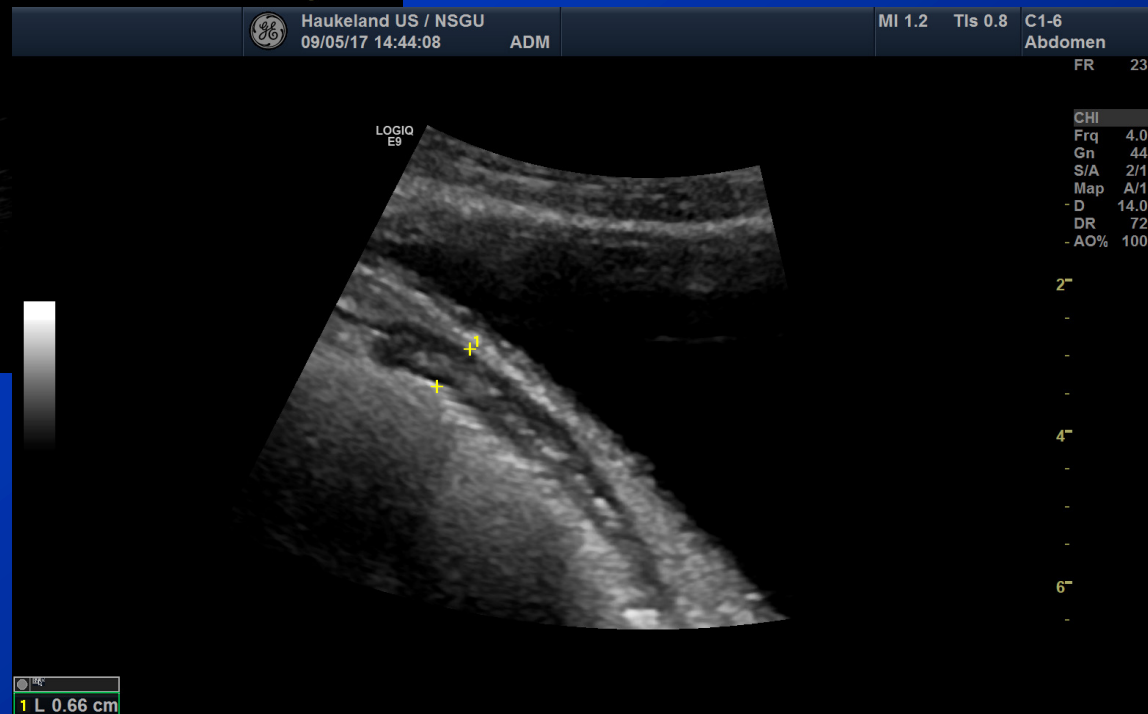
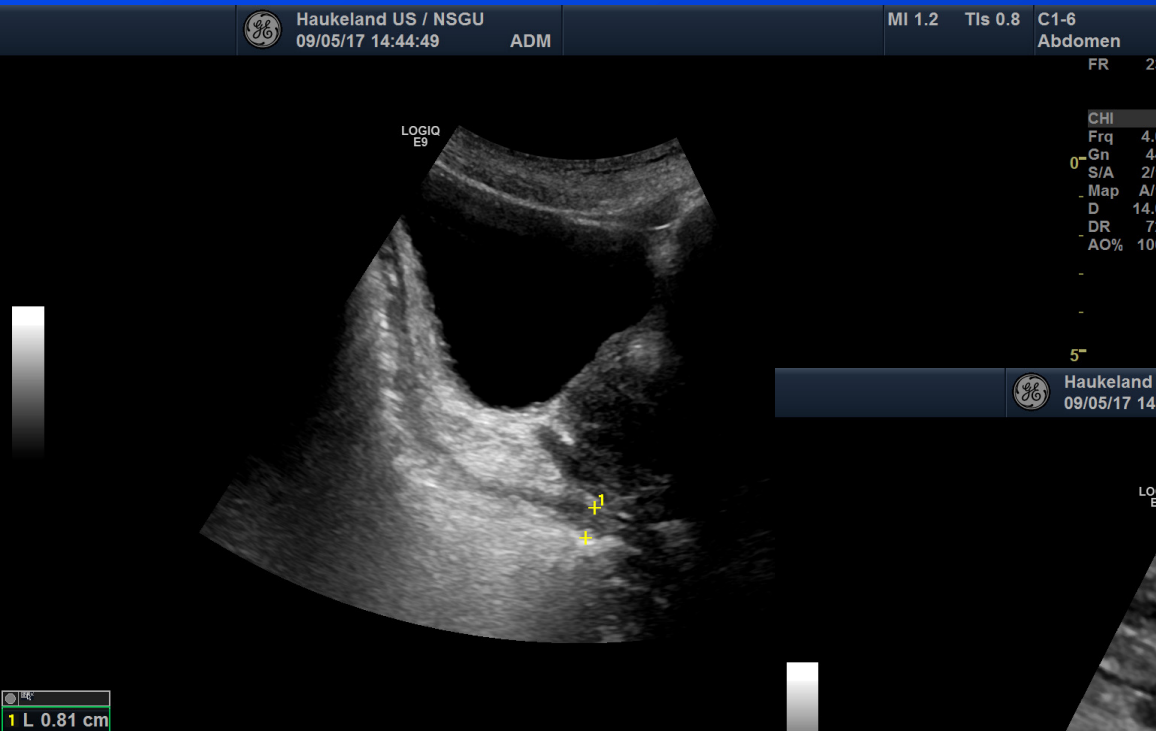


Tumor in the bladder



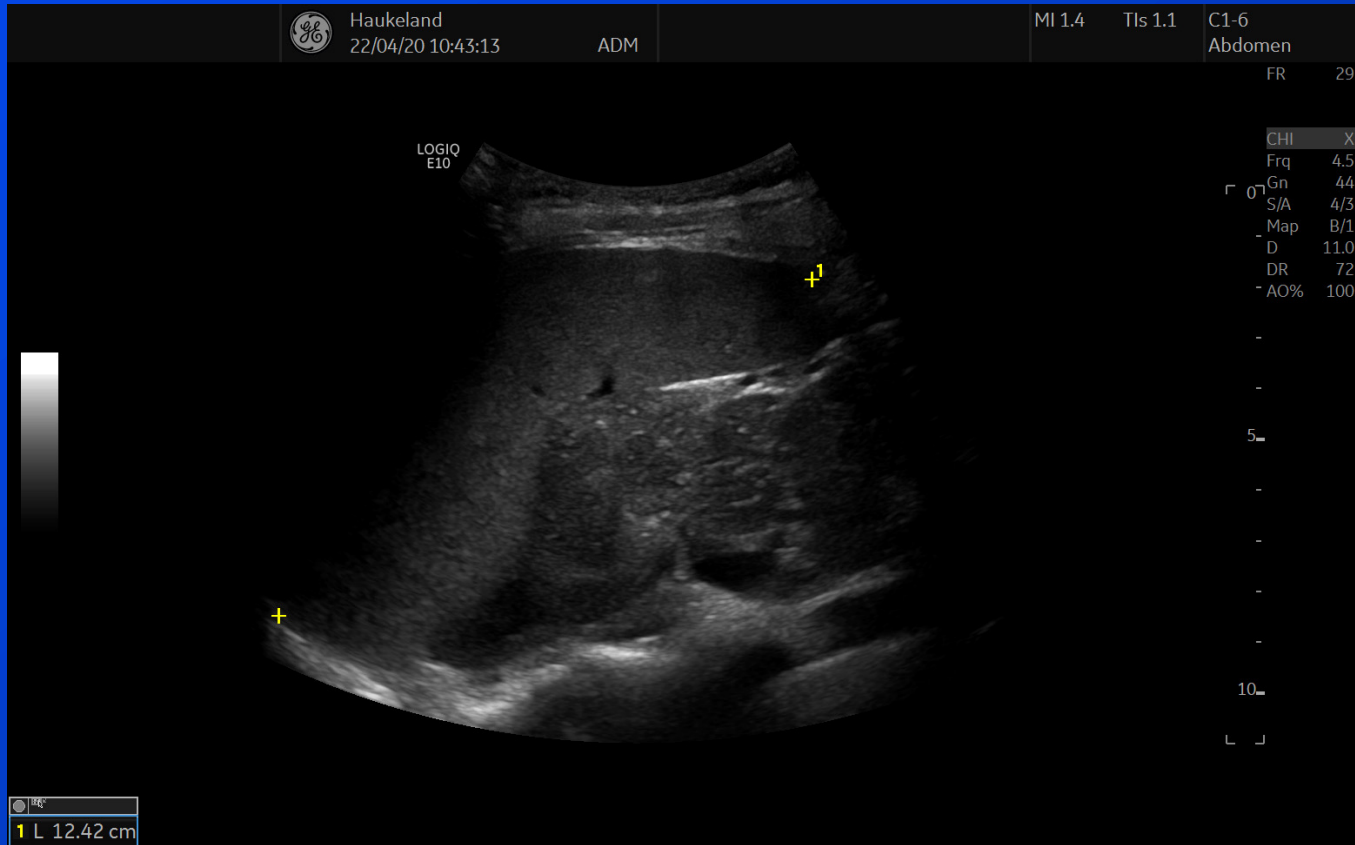


Look beyond the bladder !





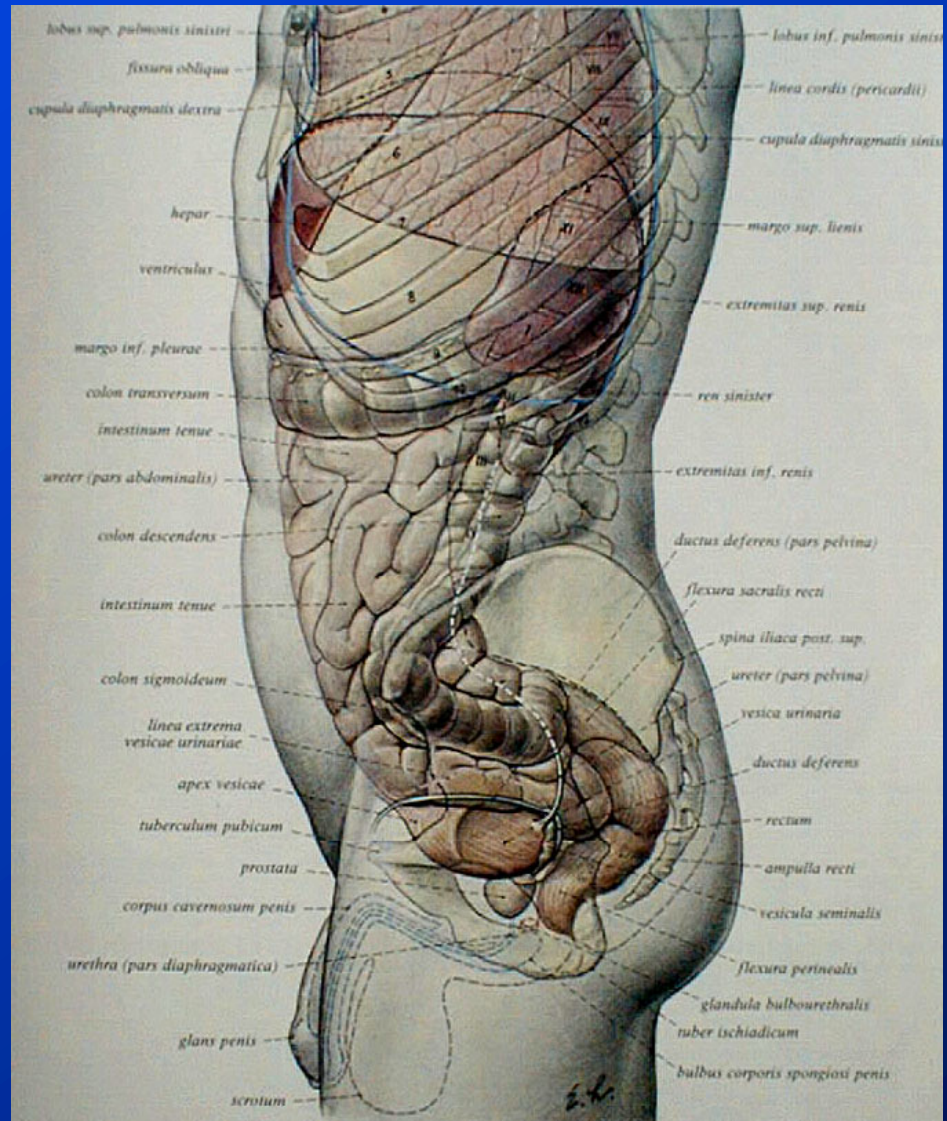
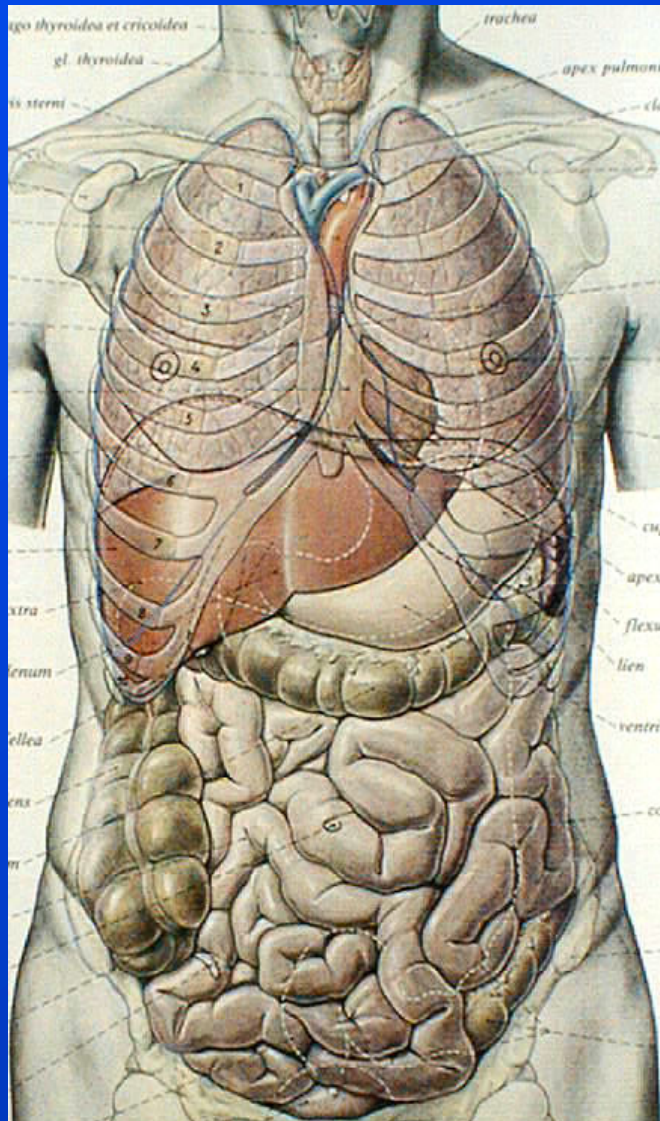
The spleen



- Maximal ultrasonographic size: 12 x 8 x 4 cm
- The size tends to decrease in high ages
- 2-3 % of normals have accessory spleen

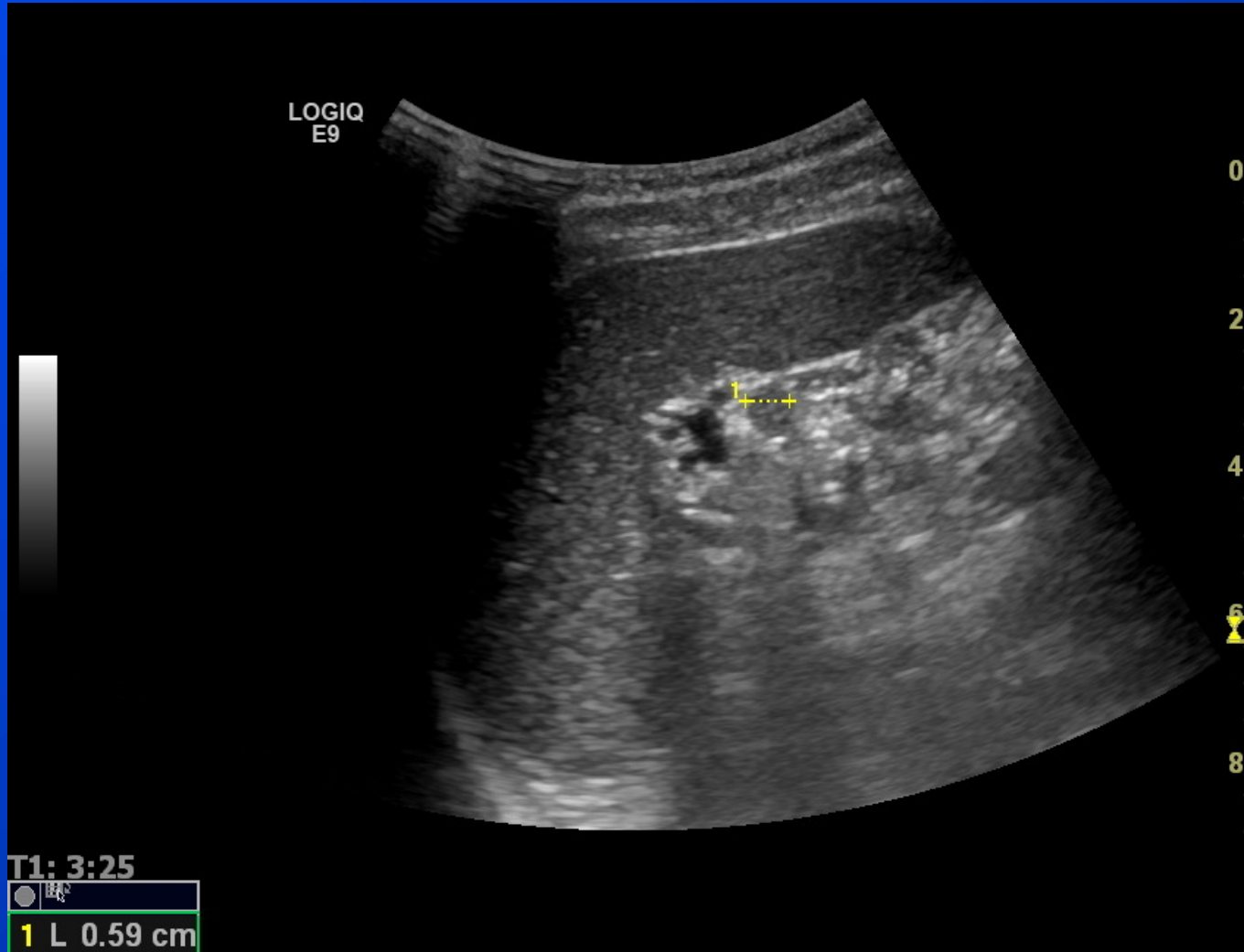


Organ Projection



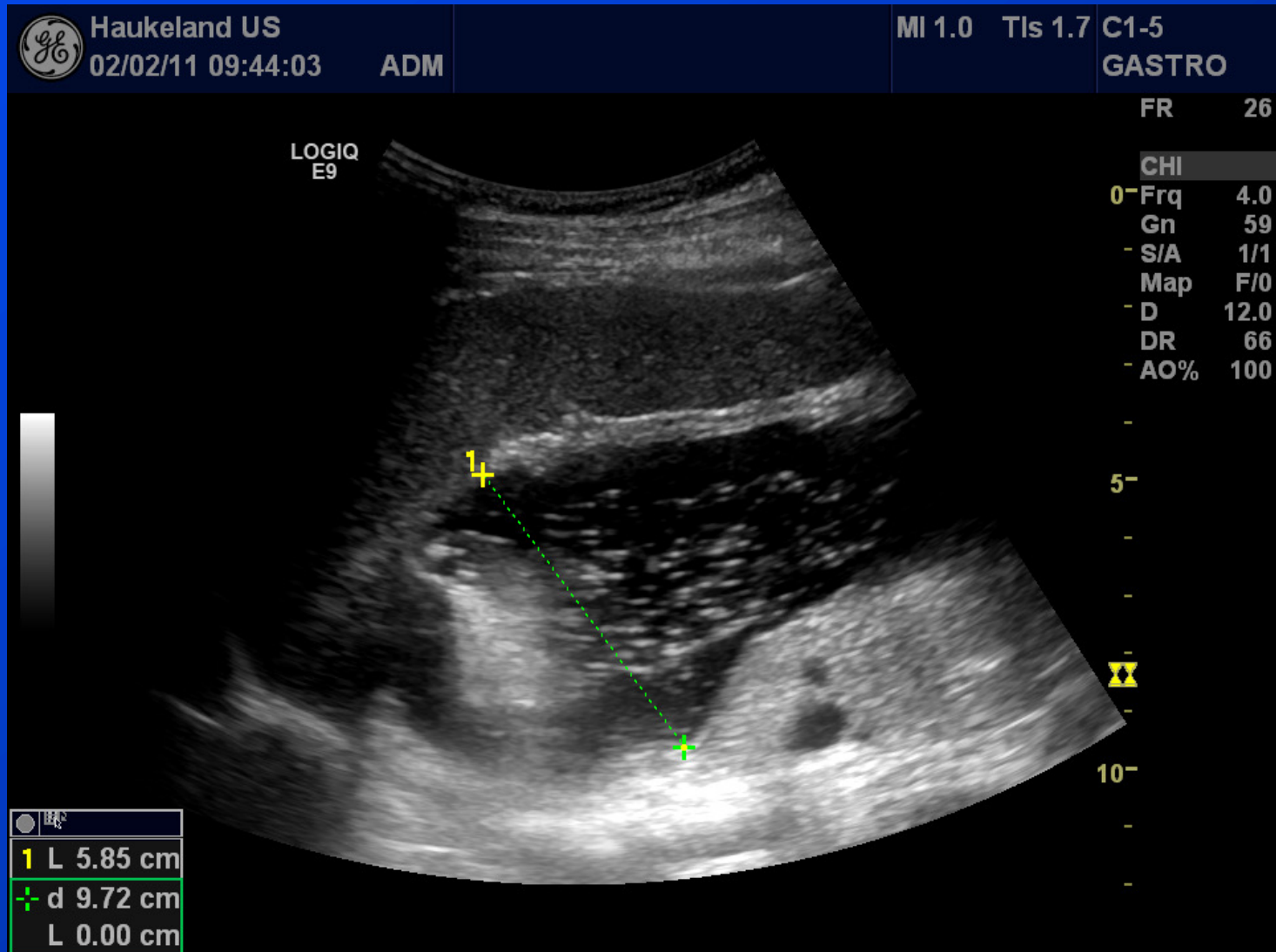


Accessory Spleen



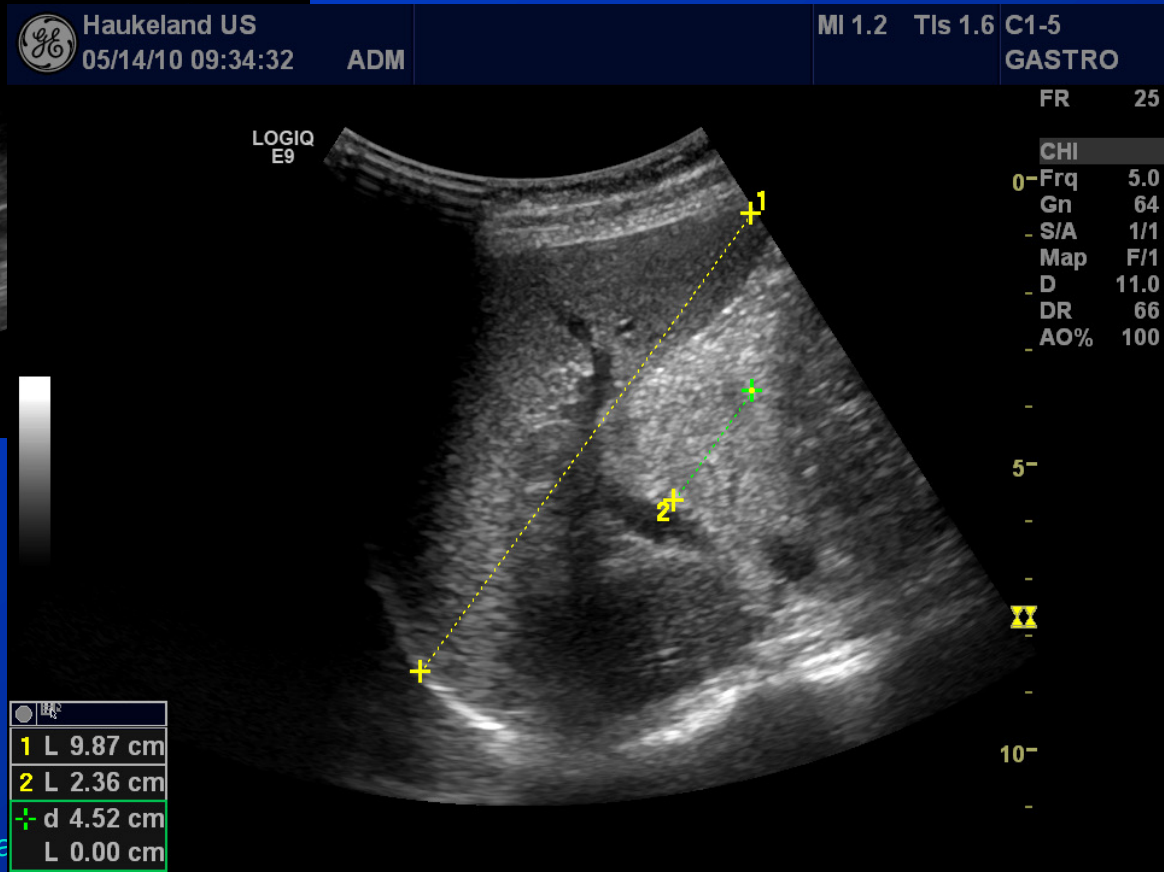


Spleen as acoustic window





Pancreas viewed through the spleen



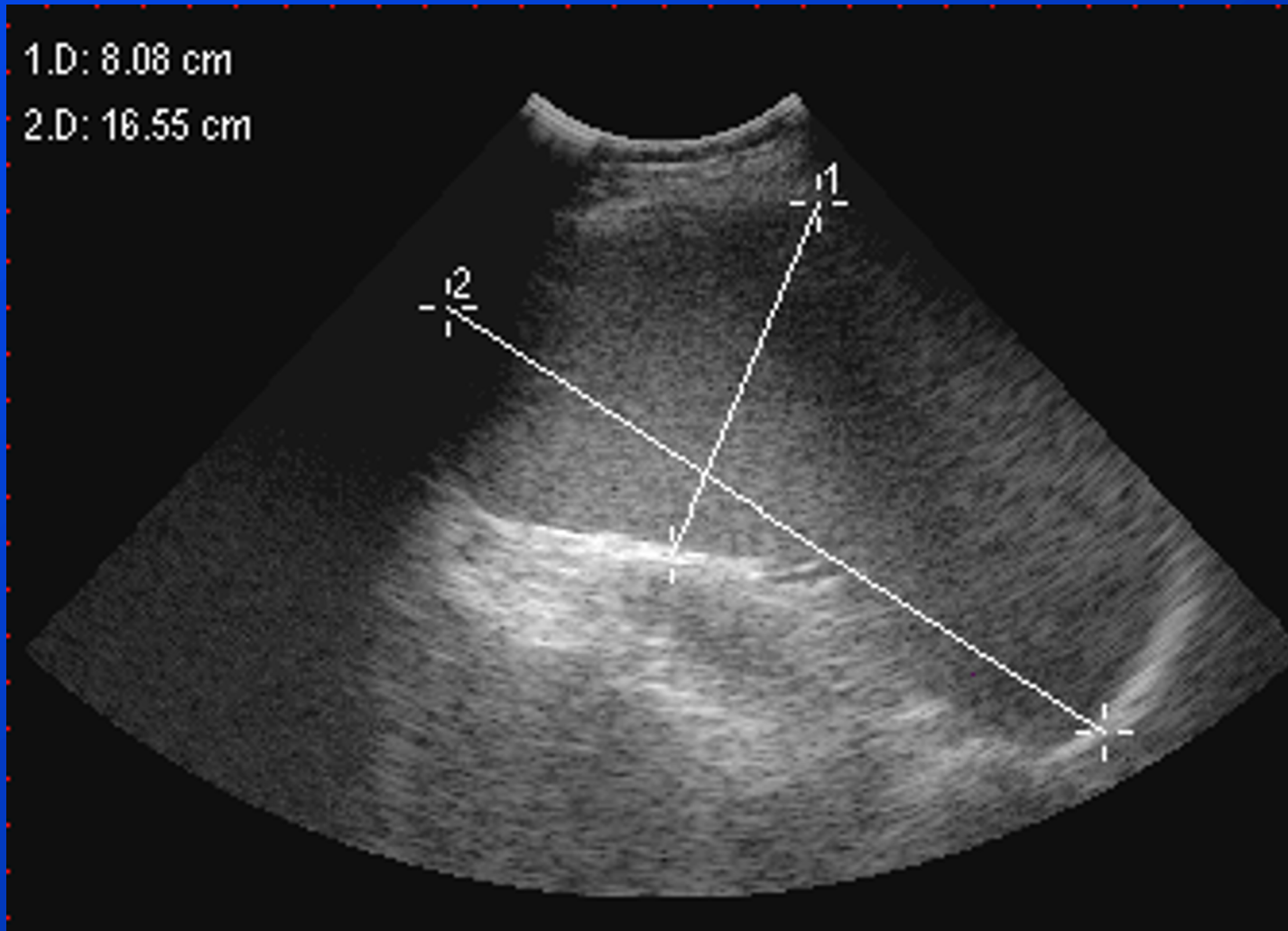


Diffuse splenomegaly

- Inflammation and immunology
 - Infectious: Endocarditis, mononucleosis, tuberculosis, brucellosis, schistosomiasis, CMV, syphilis, histoplasmosis, malaria, HIV
 - Connective tissue diseases: RA, SLE, Felty's s.
 - Sarcoidosis
- Blood disorders
 - Neoplasms: Lymphomas, leukemias, histiocytosis, myeloproliferative disorders
 - Hemolytic anemia, hemoglobinopathies
- Congestive splenomegaly
 - Cirrhosis, portal or splenic vein thrombosis
- Metabolic diseases
 - Gaucher, Niemann-Pick, Amyloidosis



Splenomegaly



DX: Mononucleosis

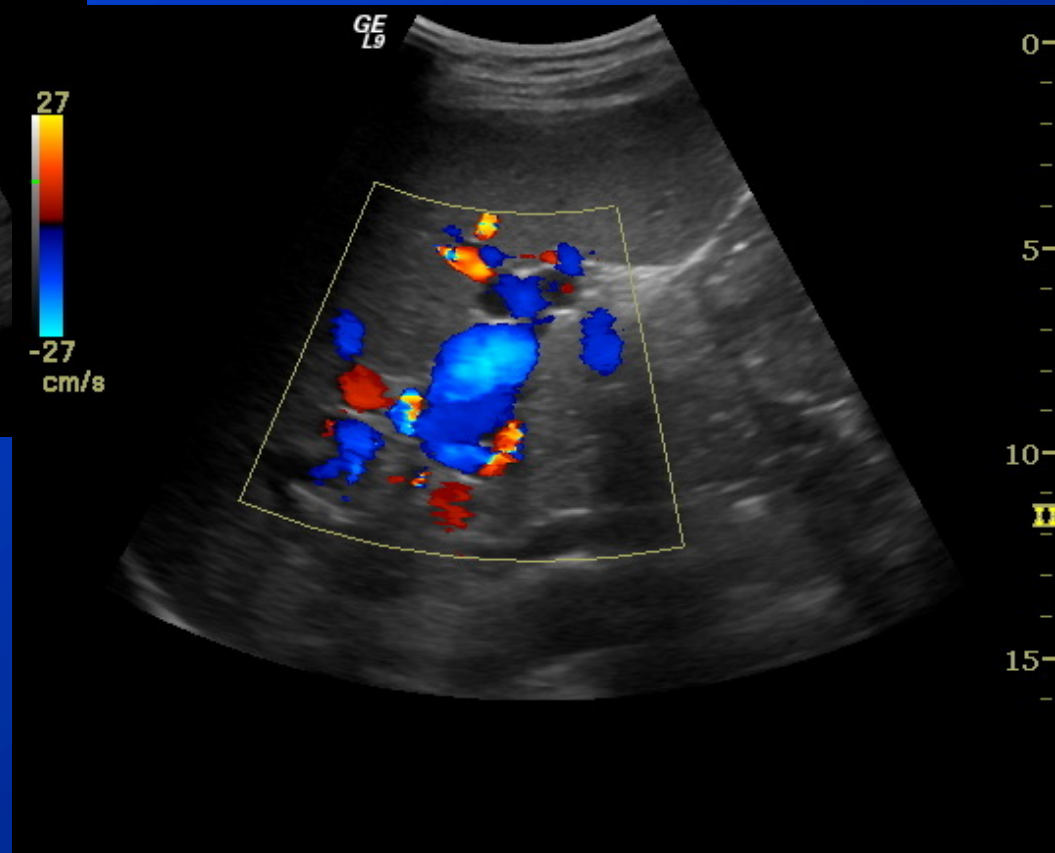
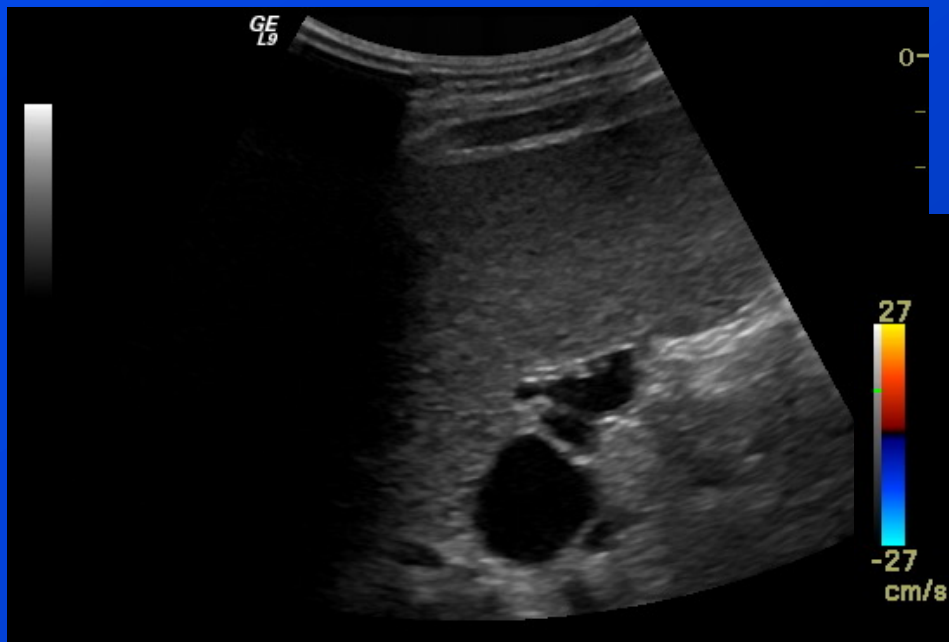


Massive splenomagali





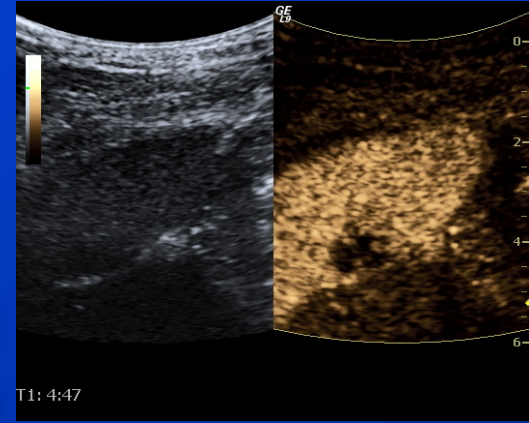
If in doubt, sound it out !





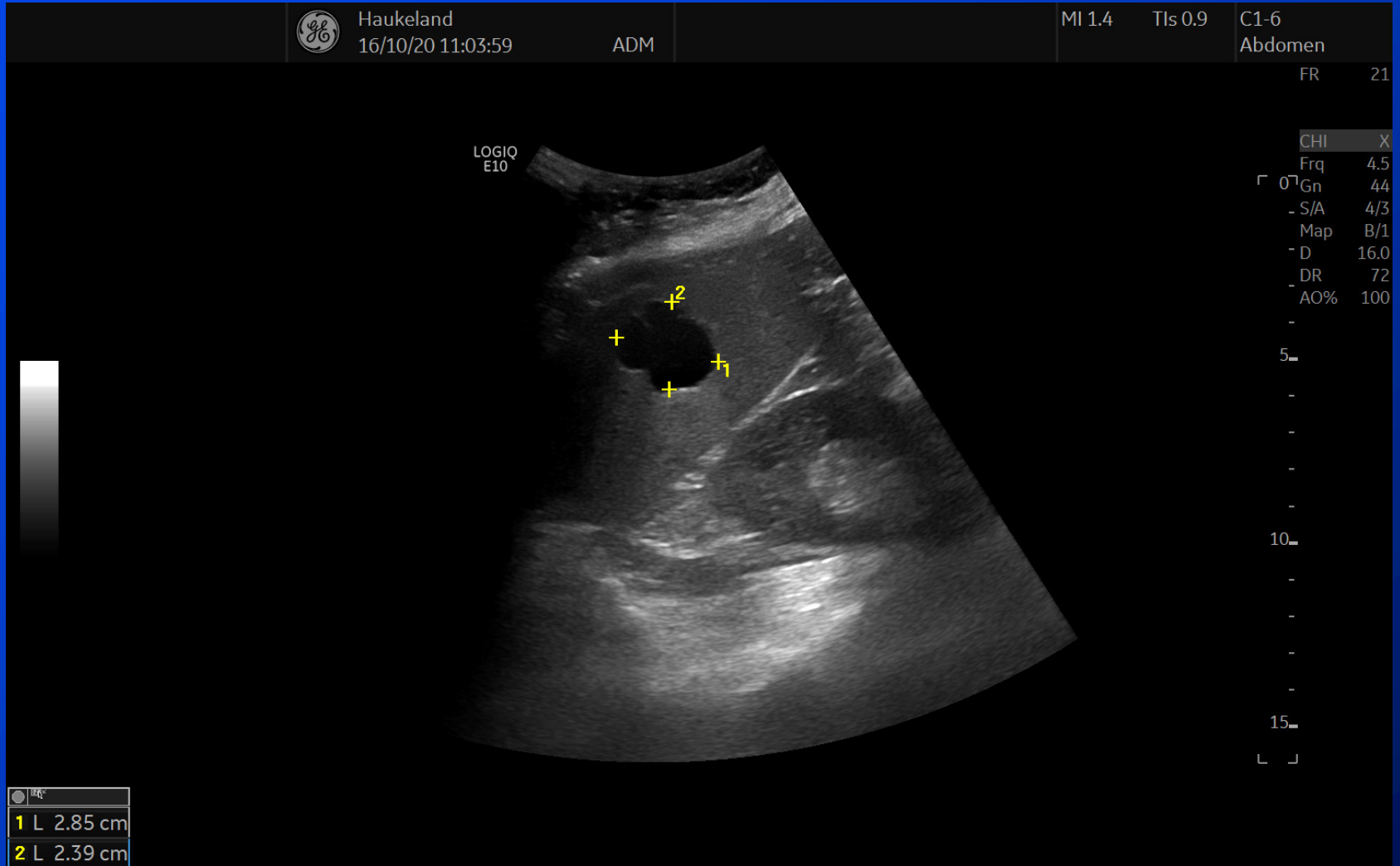
Neoplasms of the Spleen

- Hemangiomas
 - Most frequent benign lesion
- Cystic lesions
 - Congenital (may contain cholesterol debris)
 - Post-traumatic lesions (residual hematoma)
 - 4 times more common than true cysts
 - Pancreatic pseudocysts
 - Echinococcus-cyst (usually multilocular)
- Lymphoma
- Primary angiosarcoma
- Metastasis
 - Rare, melanoma is most frequent, then ovaries
 - Usually hypoechoic, but hemorrhagic necrosis within tumor can appear hyperechogenic





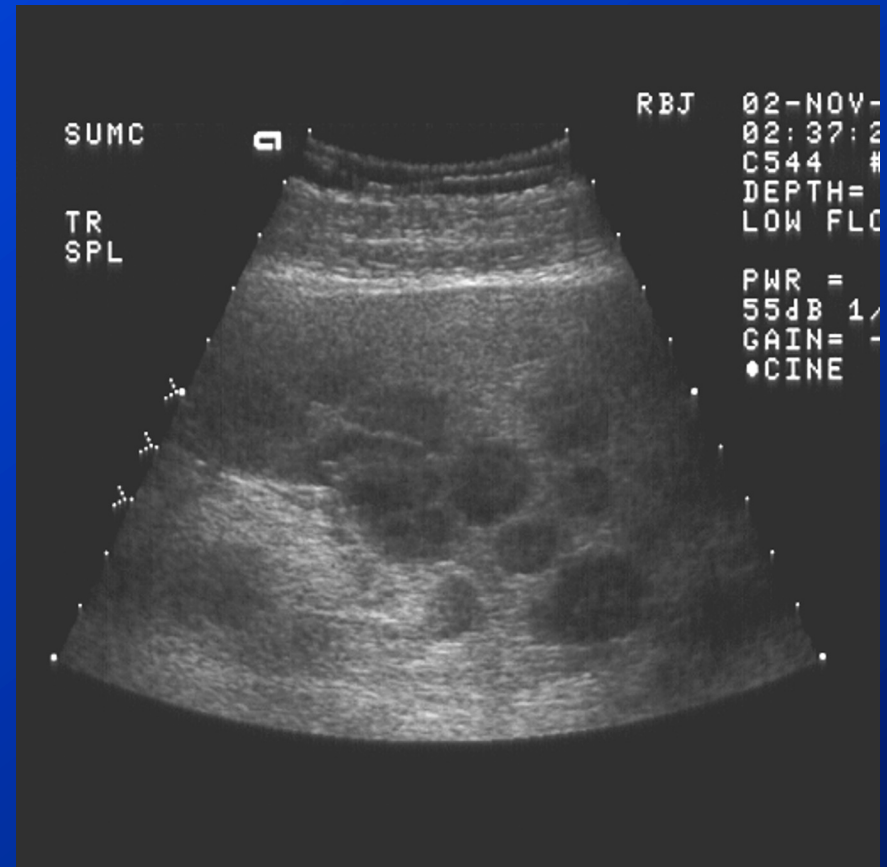
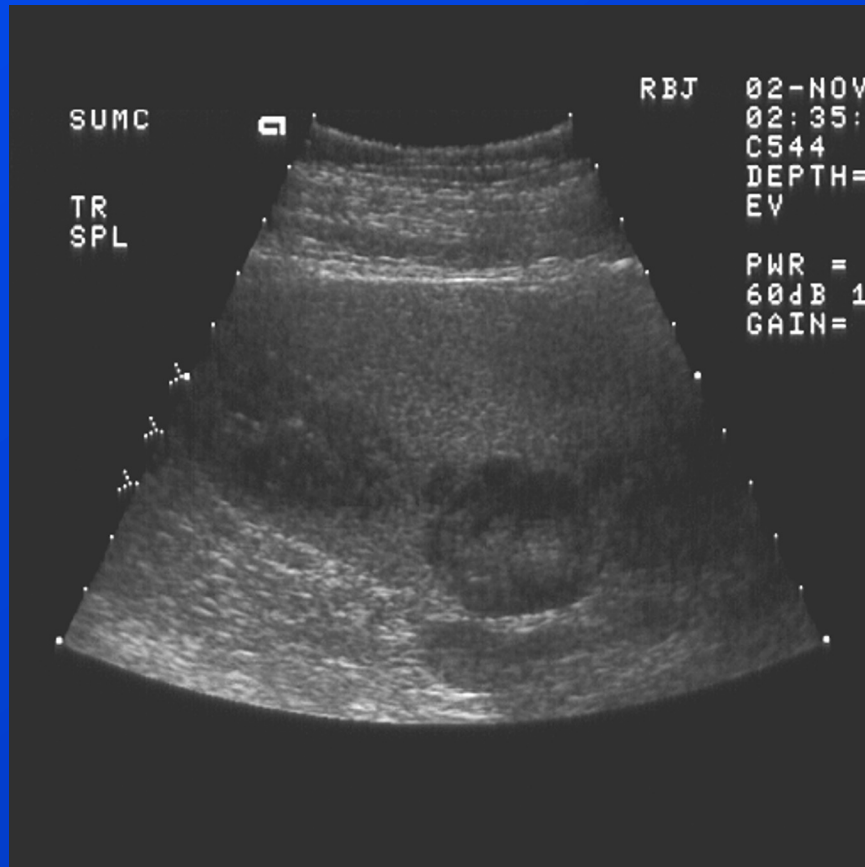
Simple cyst





Lymphoma of the spleen

HISTORY: 39-year-old male with vague left upper quadrant pain



Transverse sonograms of the spleen demonstrating multiple rounded hypoechoic lesions with little enhanced sound transmission.



03-NOV
11:54:
C544
DEPTH=
SUMC

PWR =
55dB 1
GAIN=
◆CINE

SUMC
LO SPL

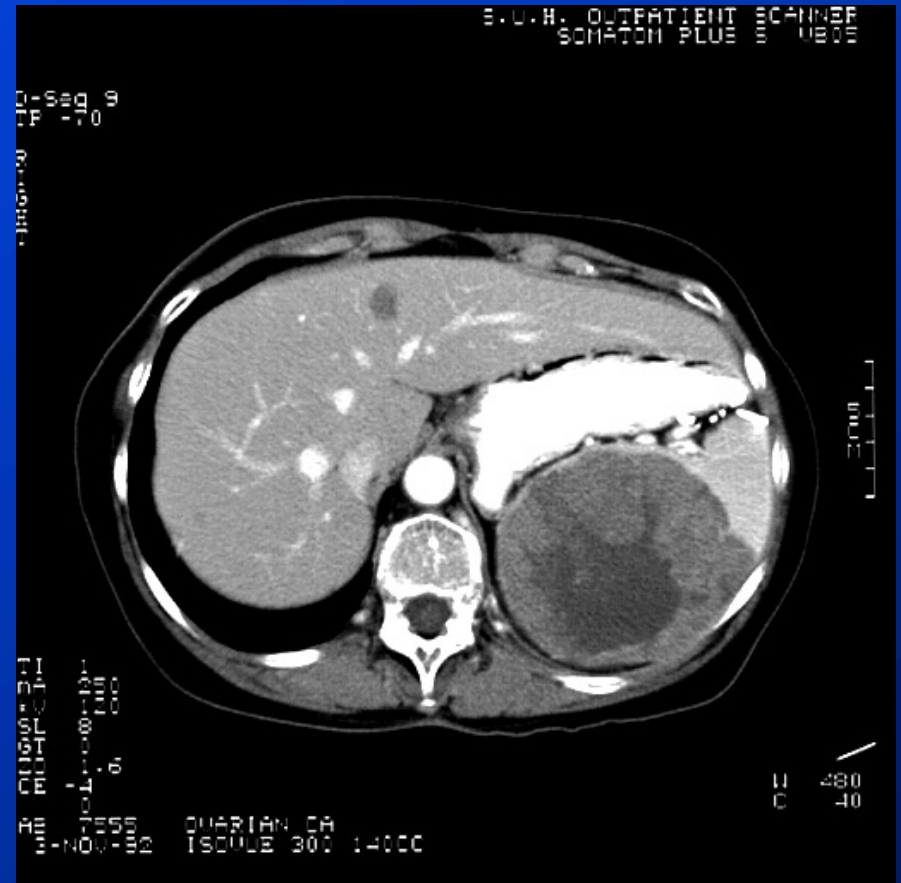


Image 2: Contrast-enhanced CT scan demonstrating a large low attenuating splenic lesion with areas of decreased attenuation centrally, probably related to necrosis.

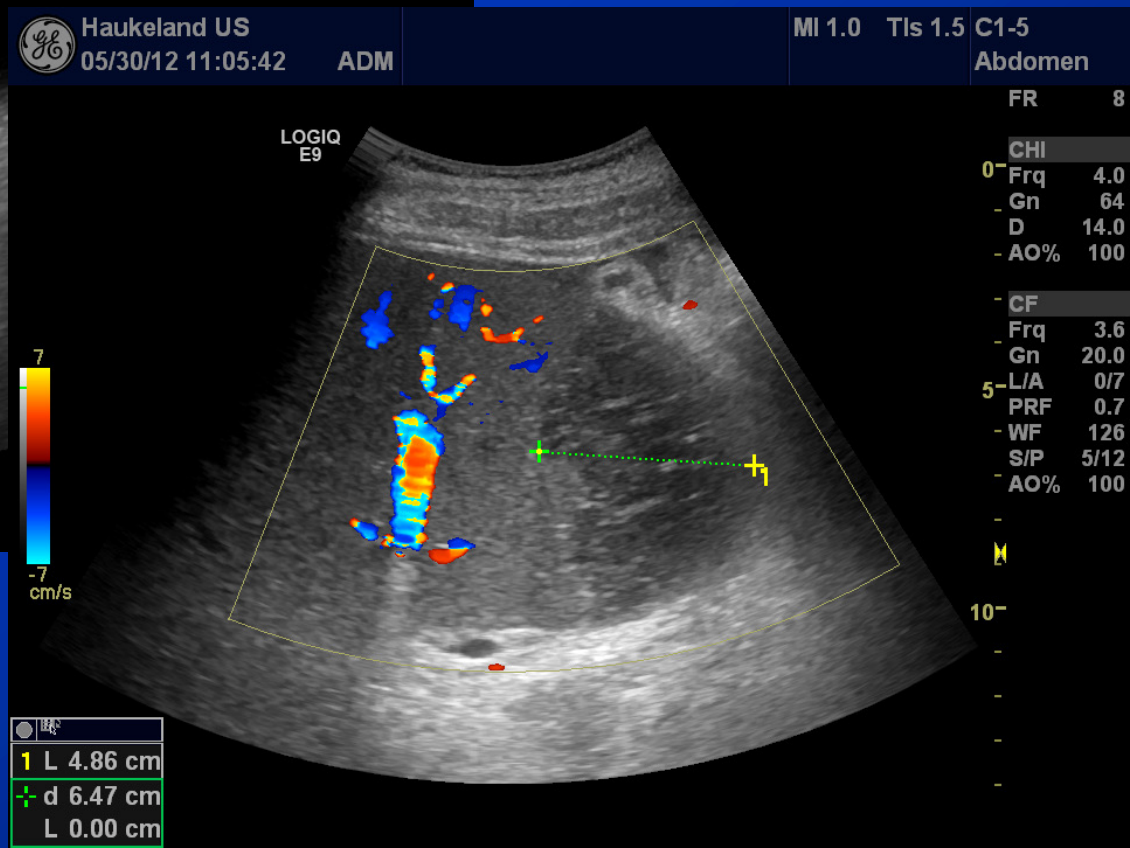
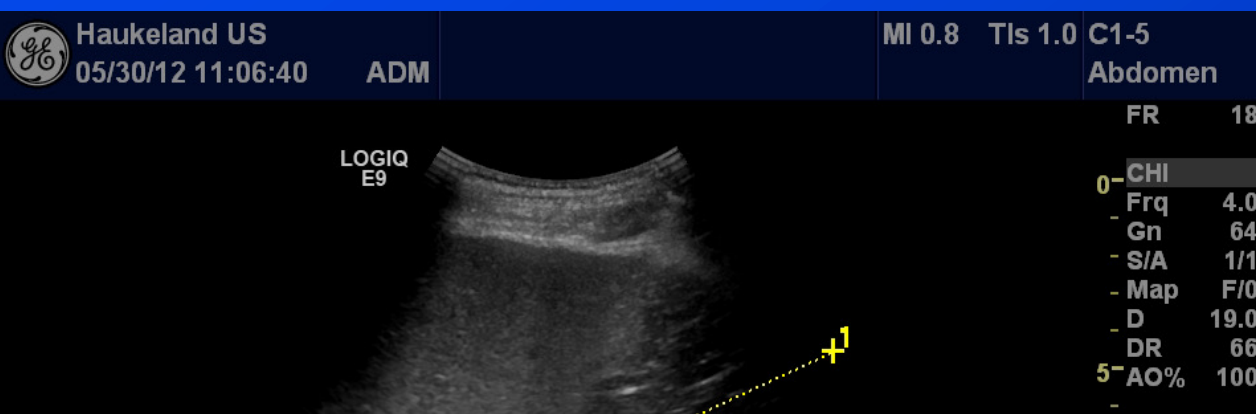


Vascular Lesions of the Spleen

- Infarction
 - Wedge-shaped, often peripheral
 - Usually hypo-echoic
 - Septic infarcts may turn into a rounded lesion
- Aneurysm
 - Often related to atherosclerotic disease
 - Lesions larger than 1 cm should be followed
- Subcapsular hematoma
 - Often following trauma or massive splenomagaly
 - Look for discontinuity of the capsula and locations of free fluid



Splenic infarction

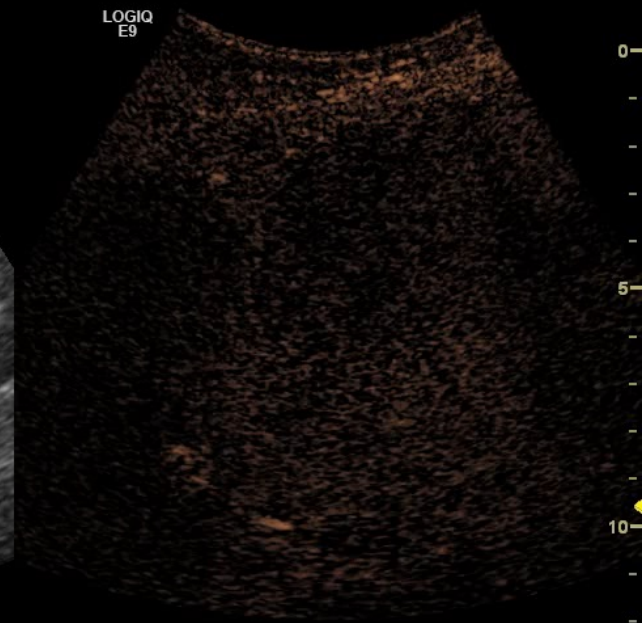
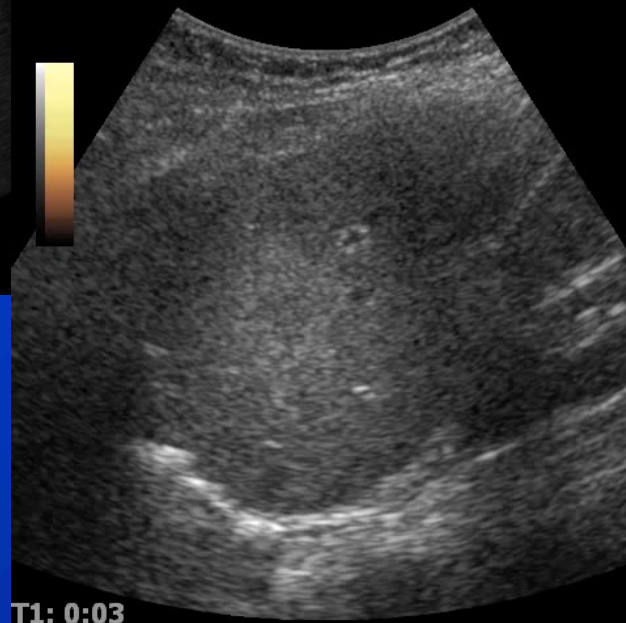
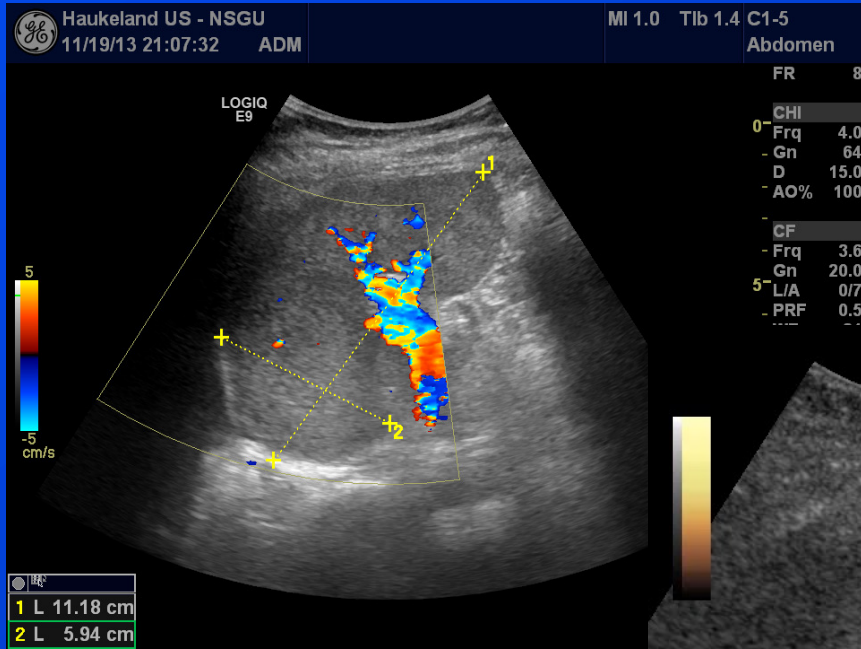


1 L 22.12 cm

1 L 4.86 cm
d 6.47 cm
L 0.00 cm



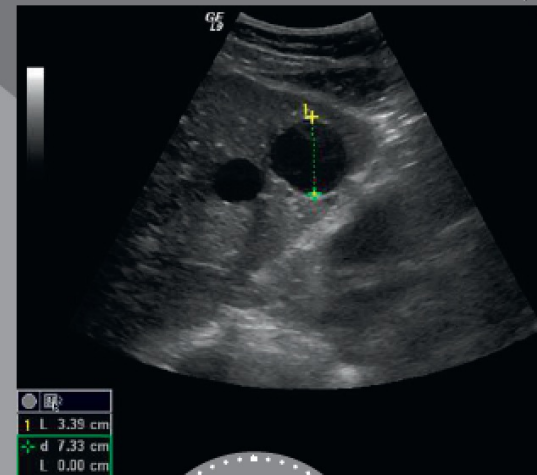
Splenic lesion – Previous trauma





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Haukeland University Hospital, Bergen, Norway



Ultrasound takes you rapidly from vision to decision



Just like the Lammergeier
(bearded vulture) uses its
Very sharp vision to pick
out its prey.

Photo: OH Gilja

