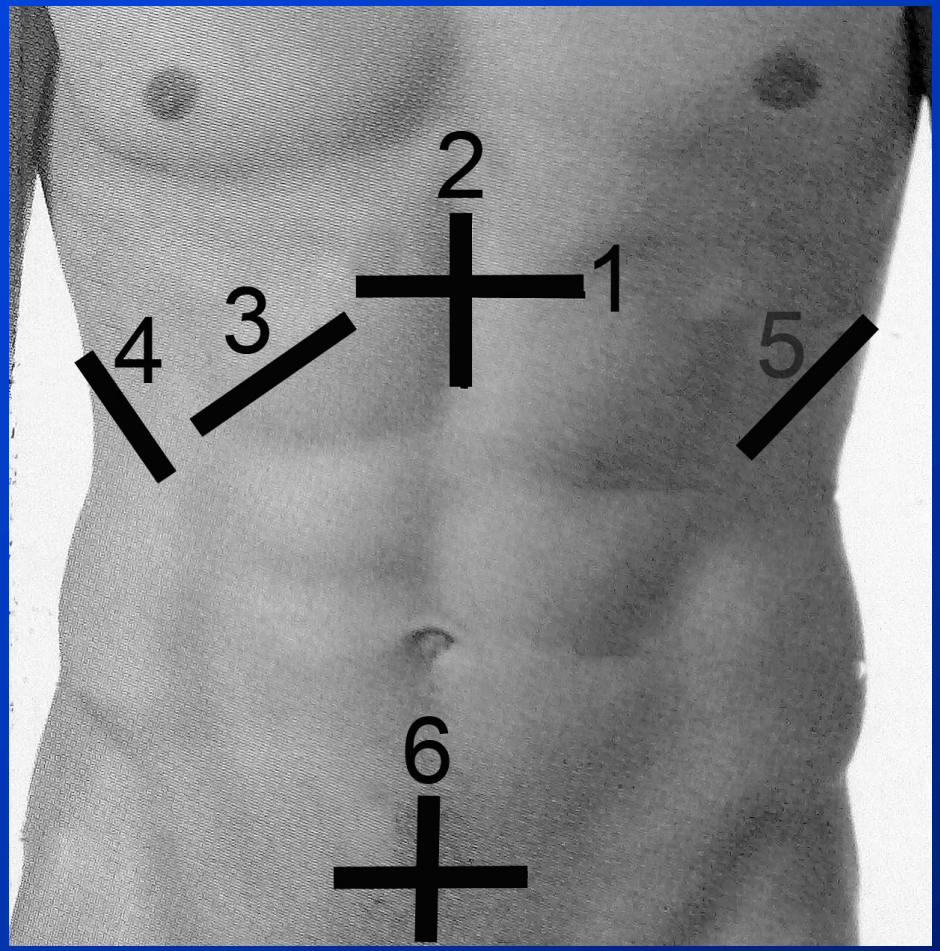
Nasjonalt Senter for
Gastroenterologisk Ultrasonografi
National Centre for Ultrasound in Gastroenterology
Haukeland University Hospital, Bergen, Norway

Ultralyd av nyrer, urinveier og milt

Prof. Odd Helge Gilja, MD, PhD
Institute of Medicine
University of Bergen, Norway

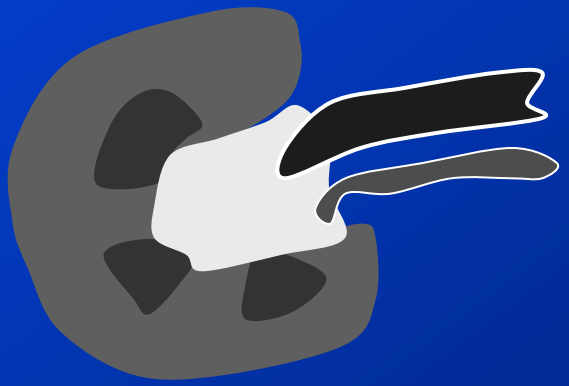
6+

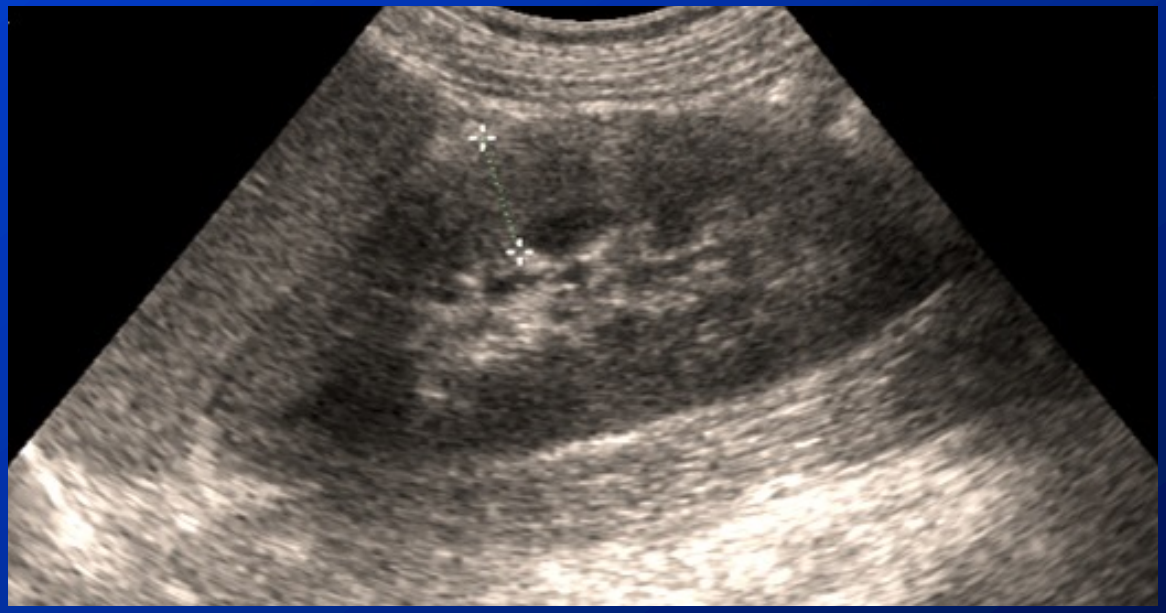
A systematic ultrasound examination of the abdomen



Renal Ultrasound

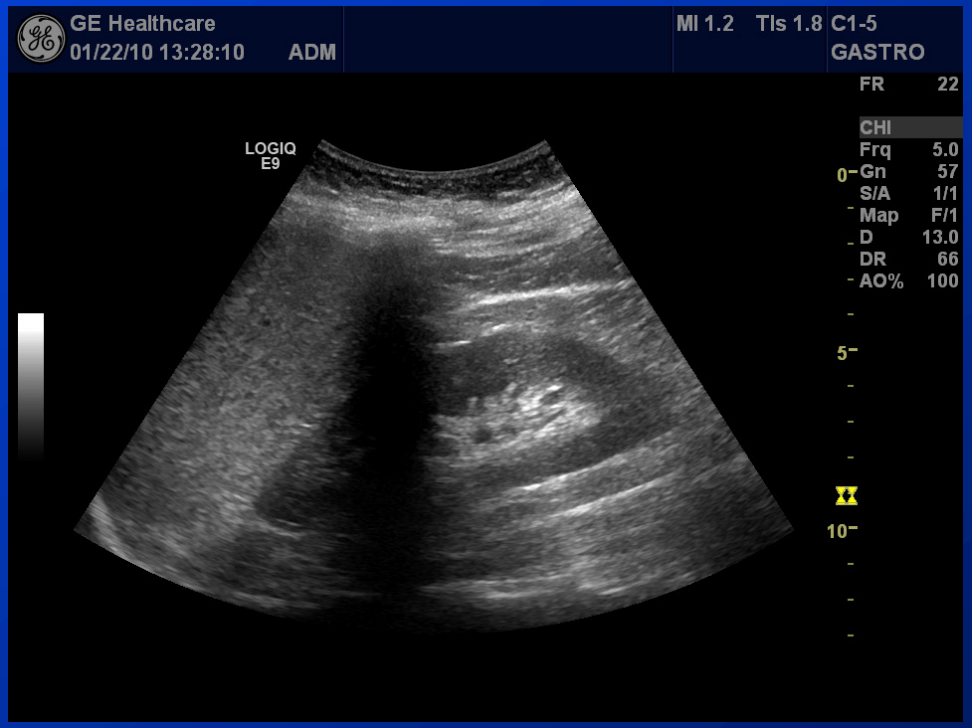
- **Indications:**
- Flank pain
- Haematuria
- Suspected renal mass
- Kidney failure
- Recurrent infection
- Fever unknown origin
- Anomalies
- Transplanted kidney
- Abdominal ultrasound



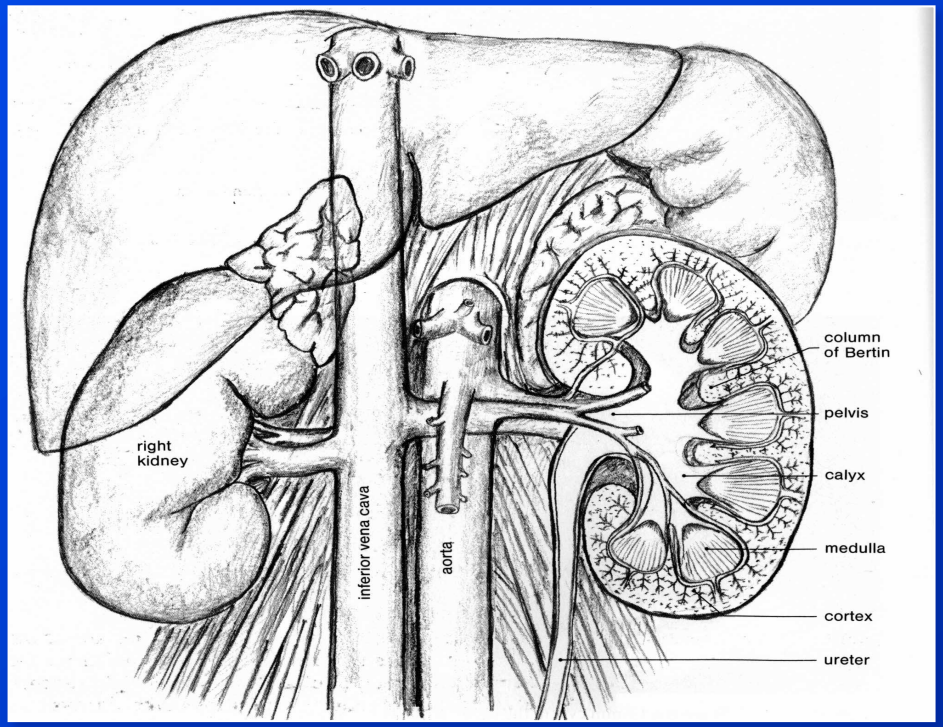


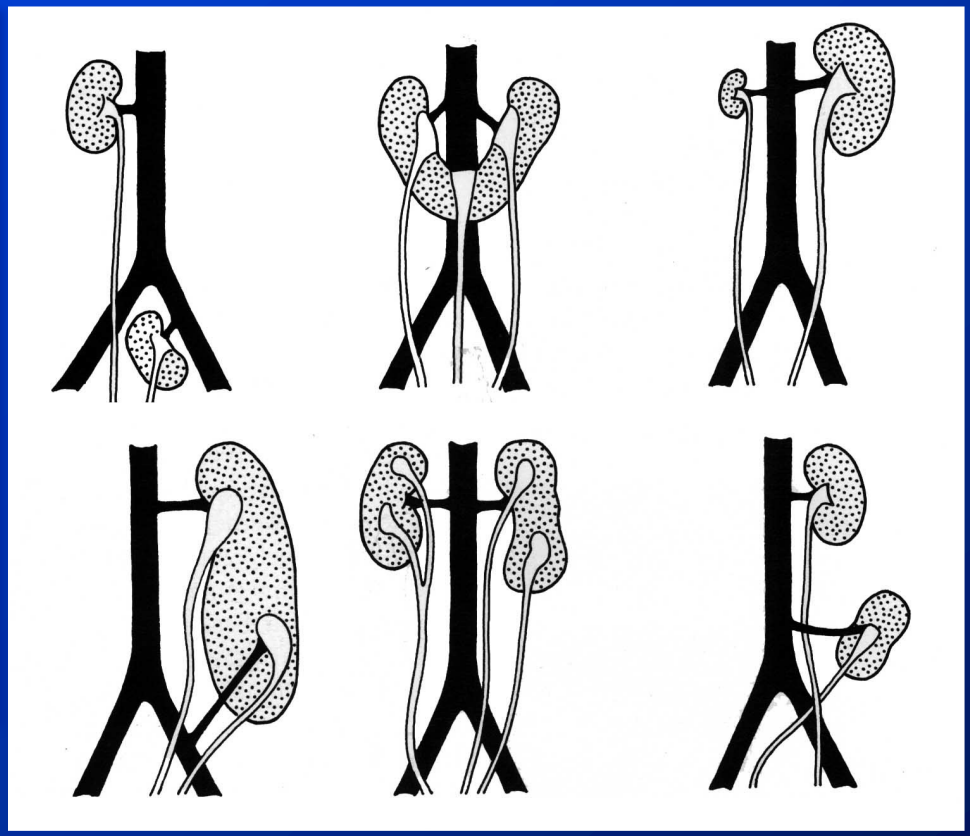
Station 4

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



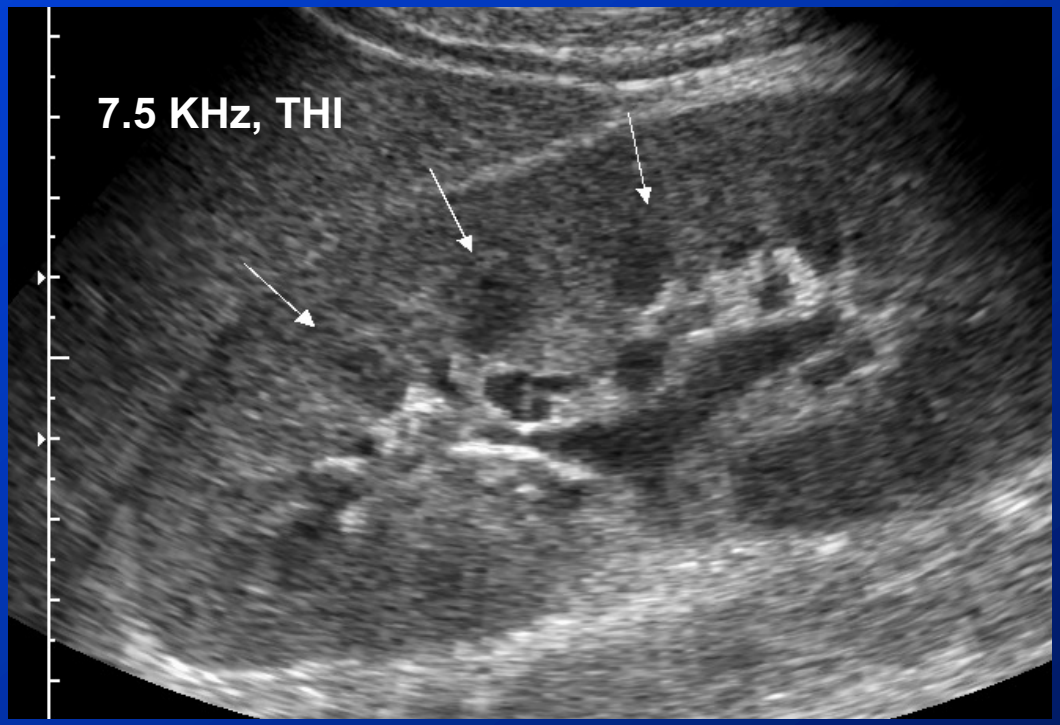
RENAL ANATOMY



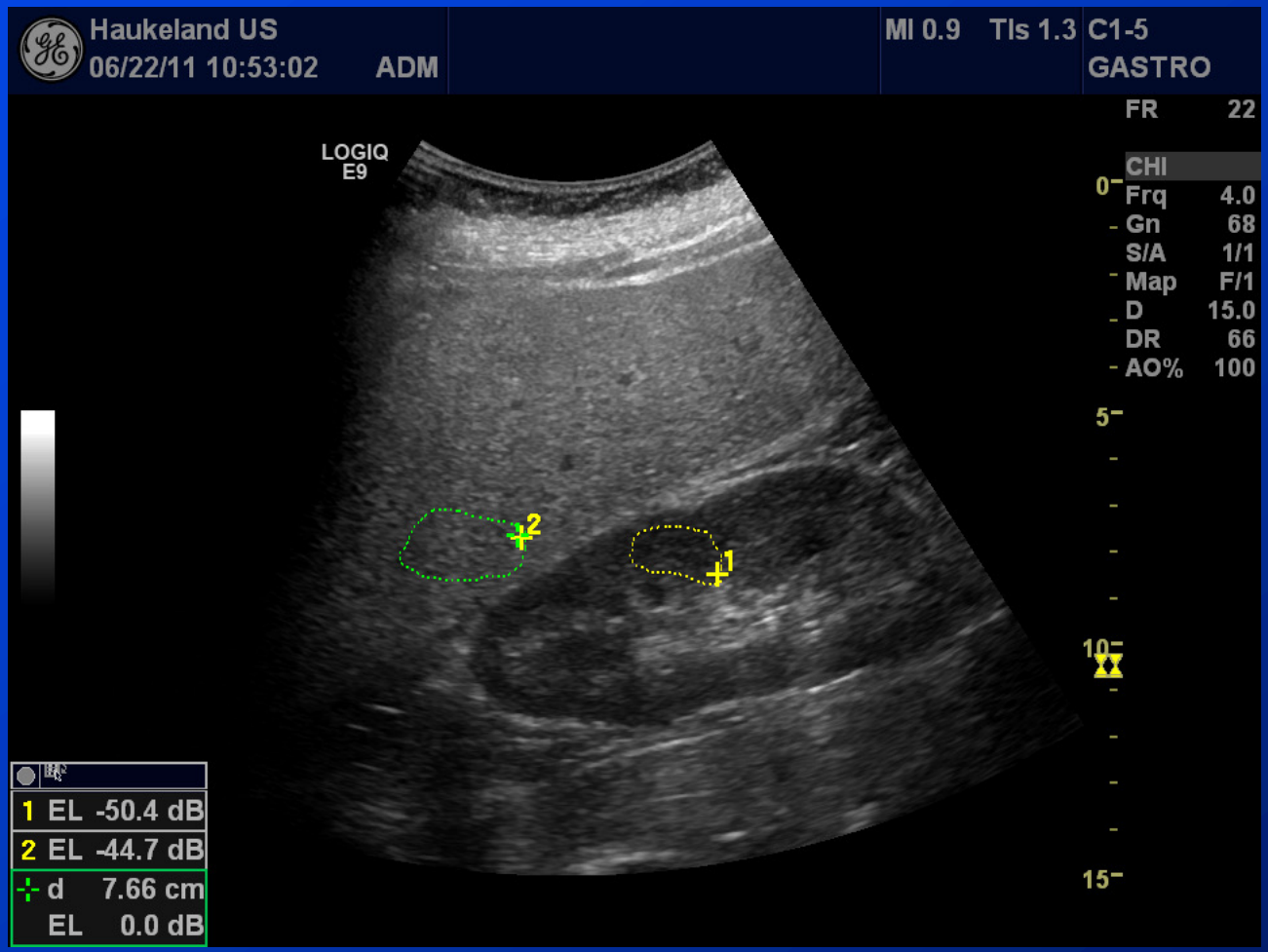


Sonoanatomy

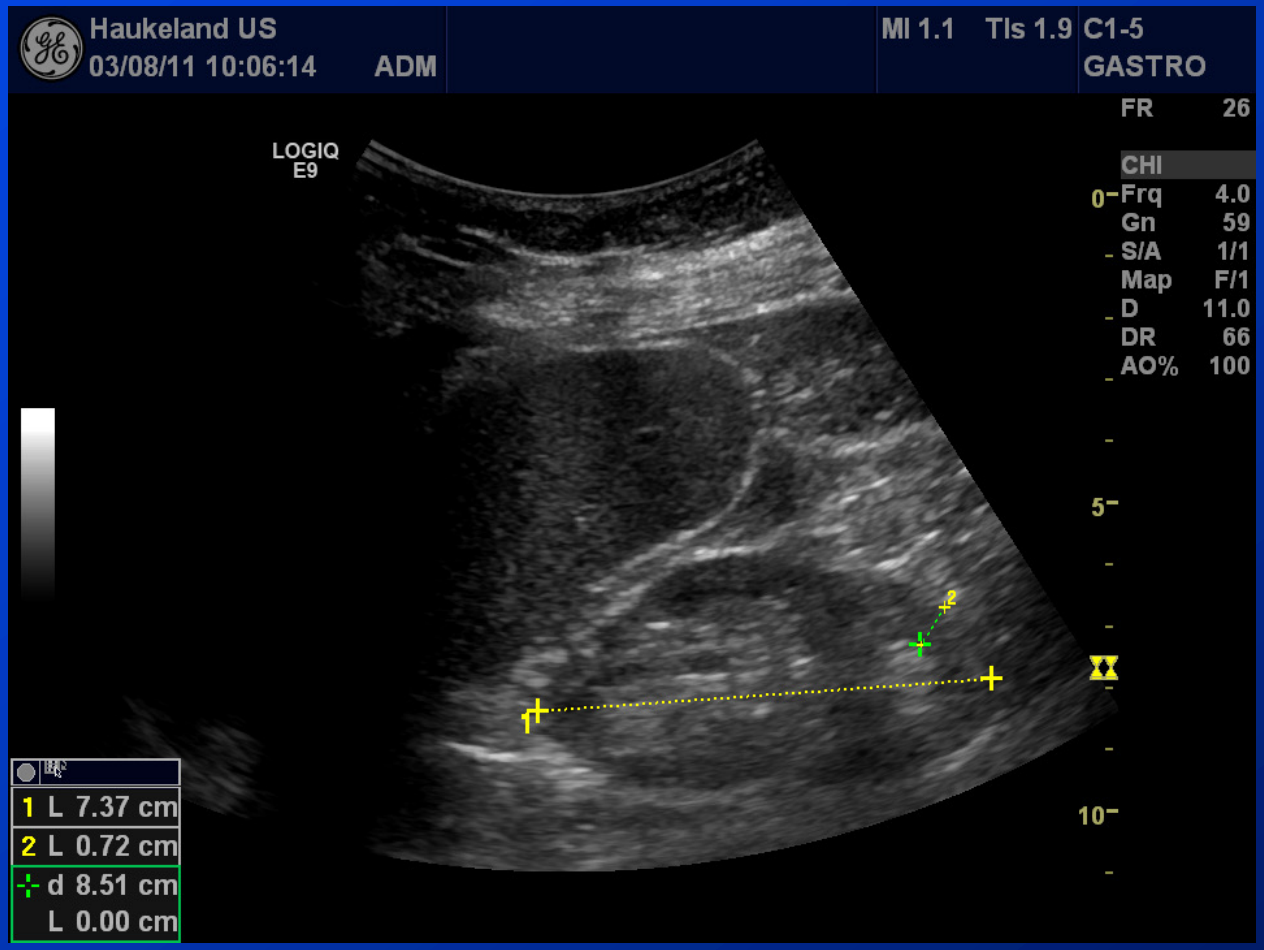
- Ovoid structure
- 95-110 mm length
- Parechymal width: >10 mm
- Marked ”corticomedulary differentiation”
- Parenchyma darker echogenicity than liver
- Normal variations
  - ”Junctional parenchymal defect”
  - ”Foetal lobulation”
  - ”Dromedary hump”
  - Sinus lipomatosis



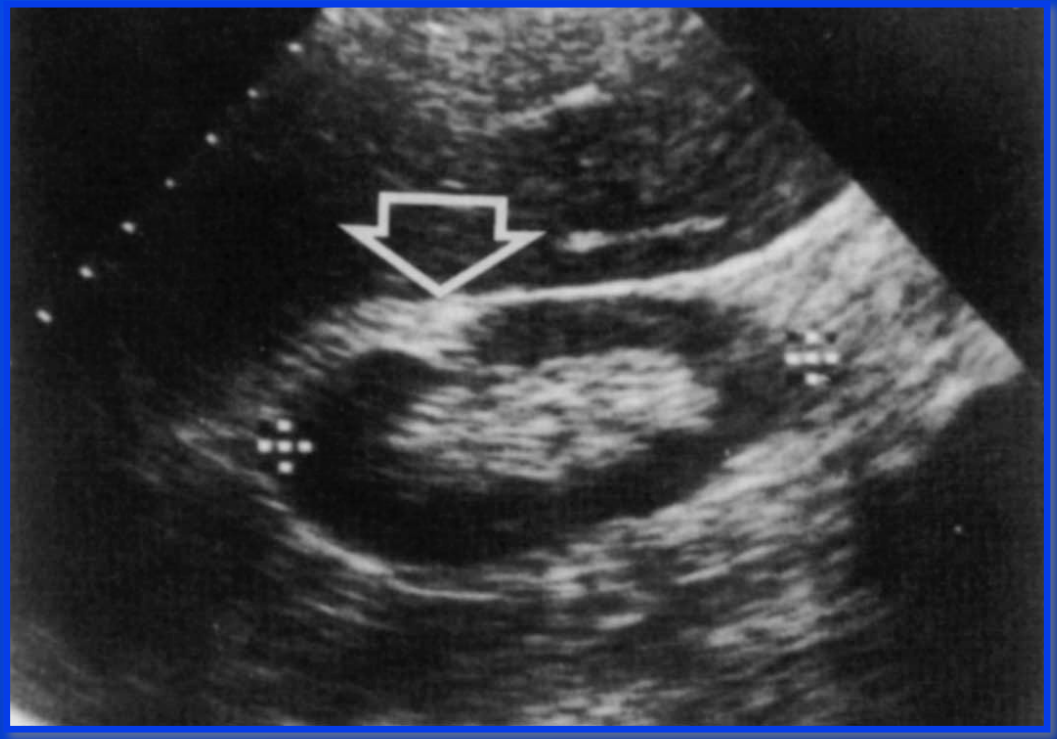
Compared to fatty liver

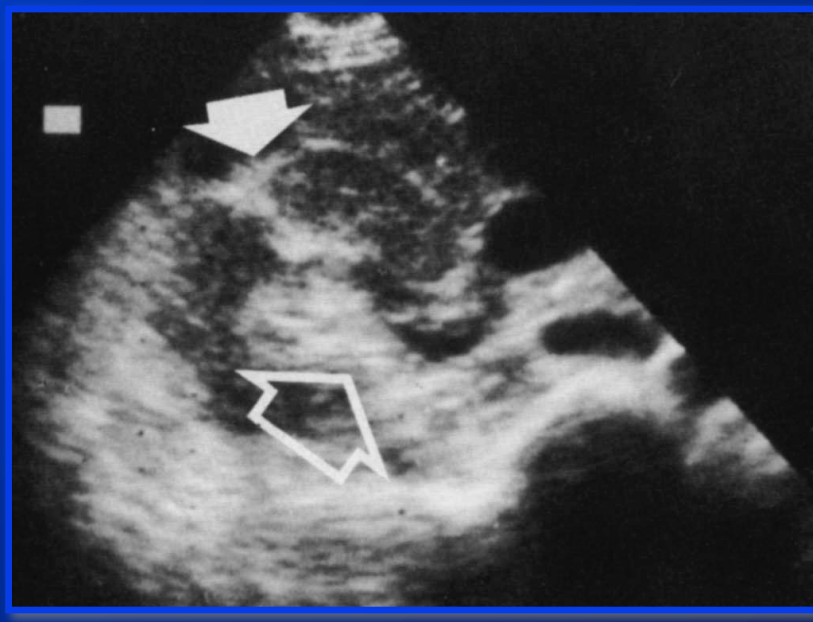


Atrophy of the Kidney

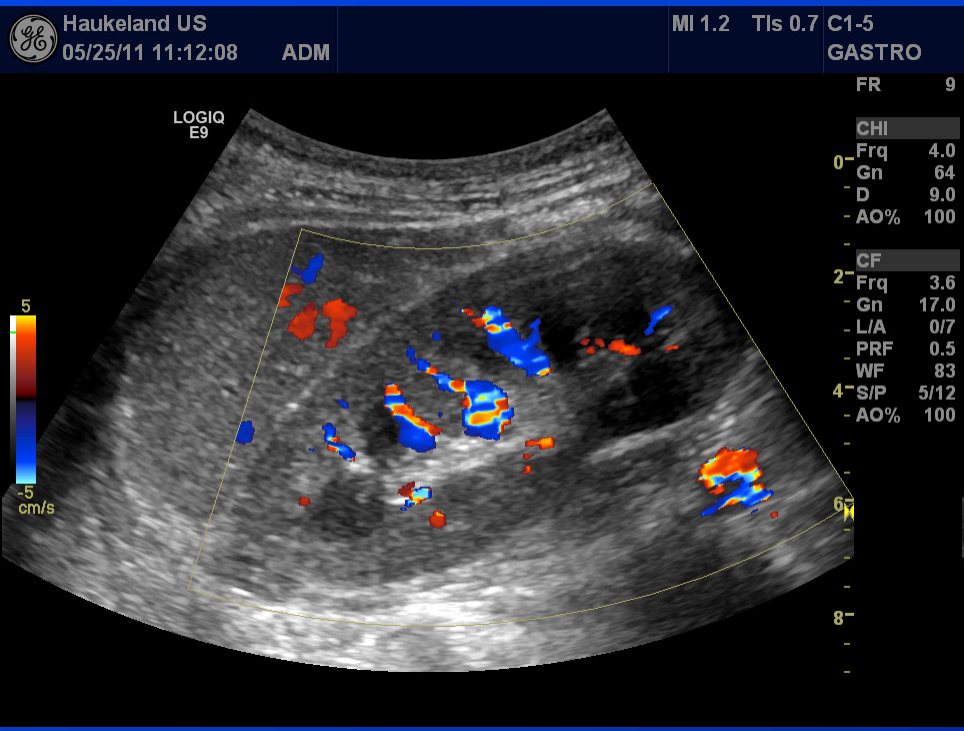


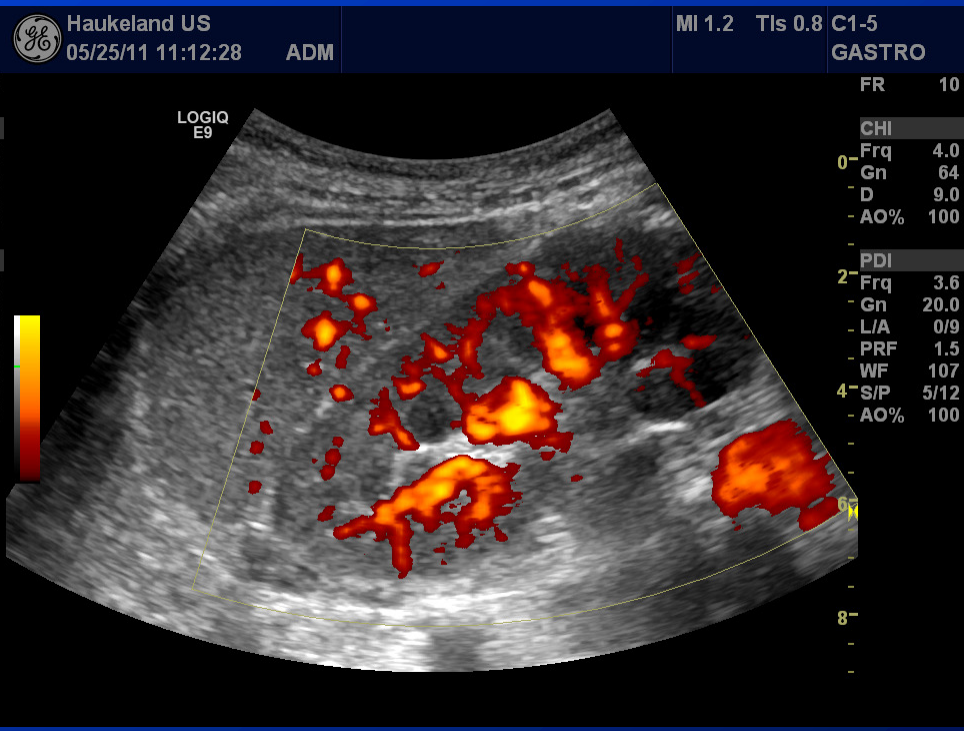
Scar of the kidney



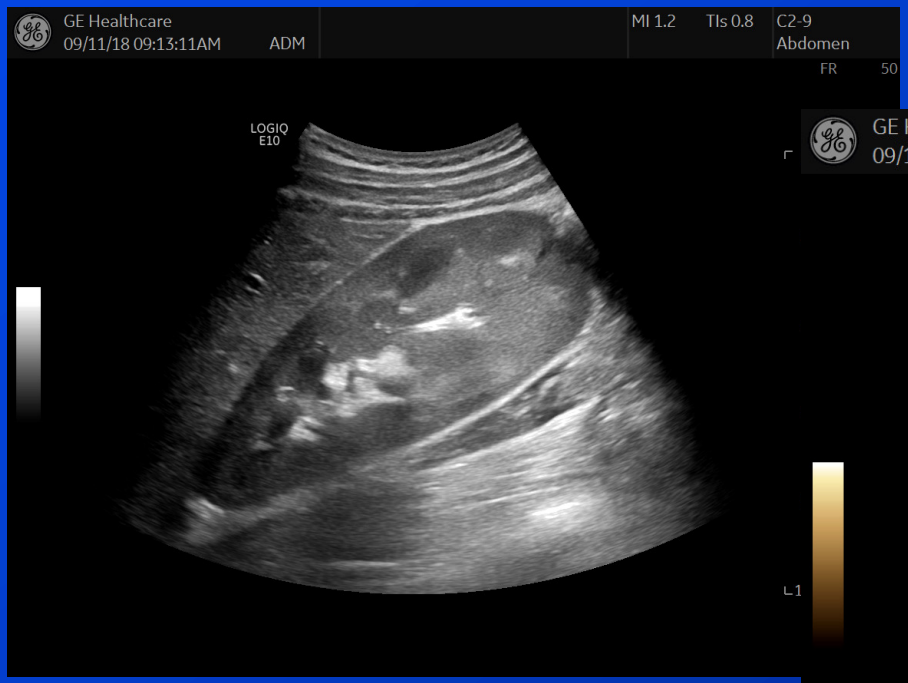


Doppler of the Kidneys





B Flow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ADM
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TIs 0.8
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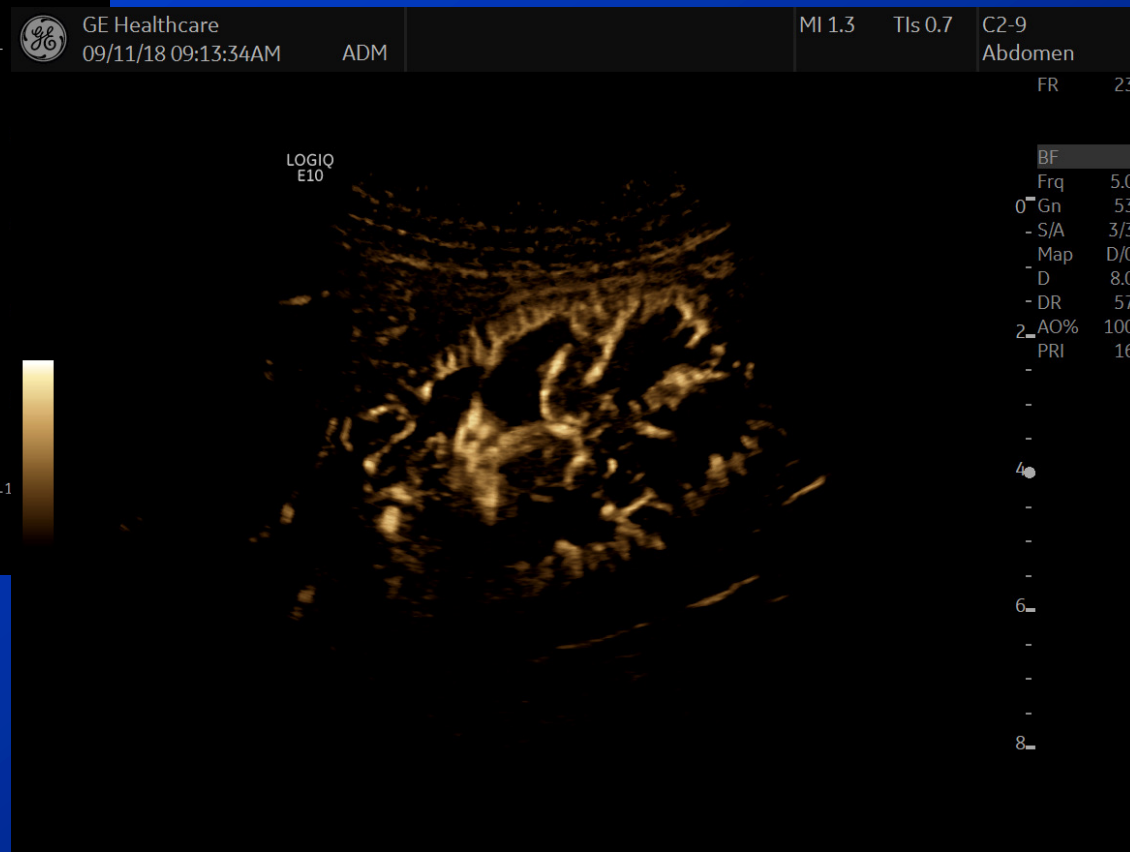
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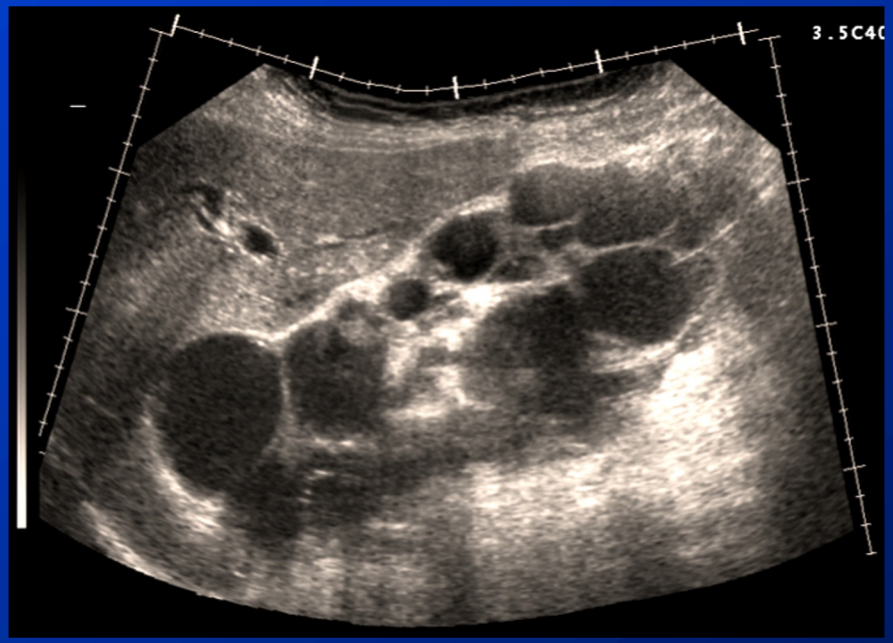
PATHOLOGY

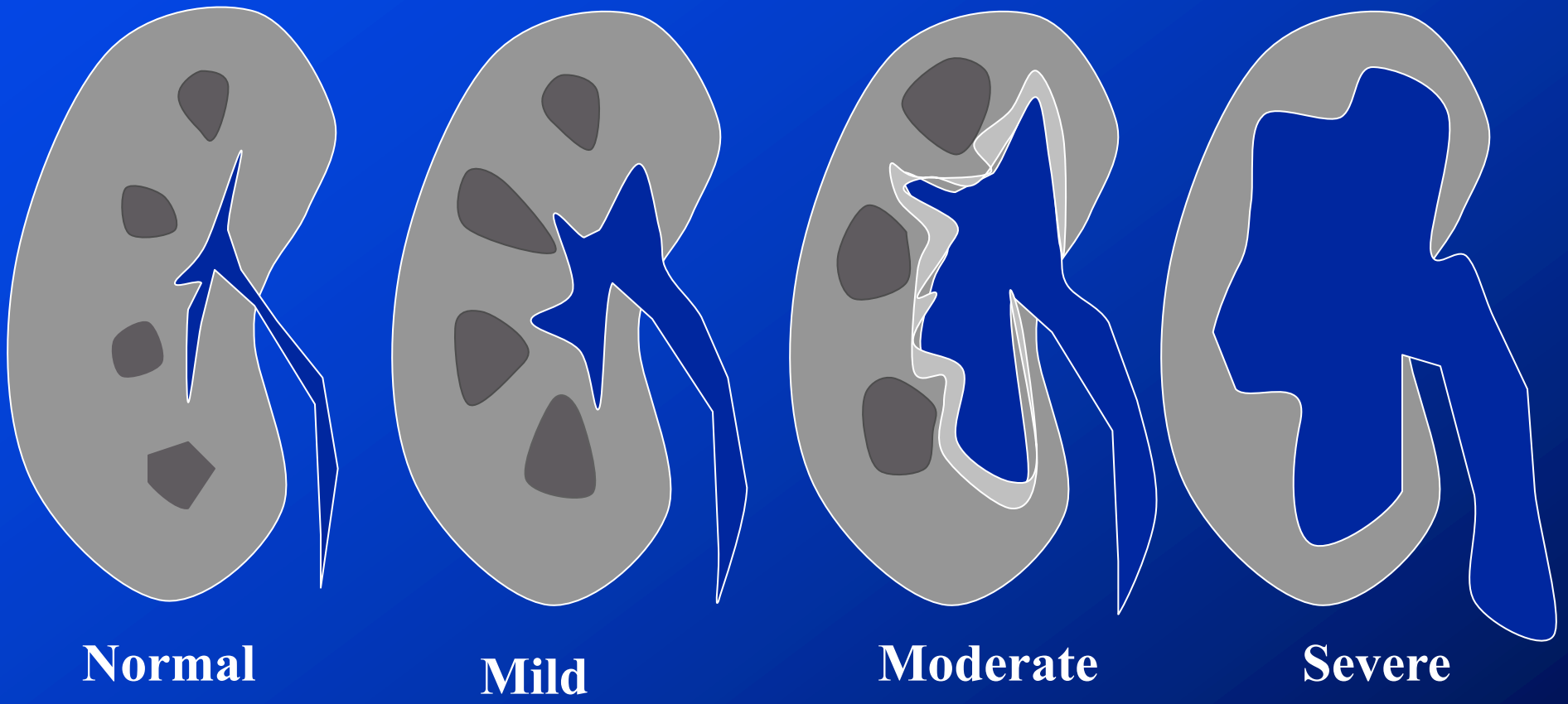
- Hydronephrosis
- Nephrolithiasis
- Parenchymal diseases
- Infection
- Expansive processes
- Transplantation
- Trauma



HYDRONEPHROSIS

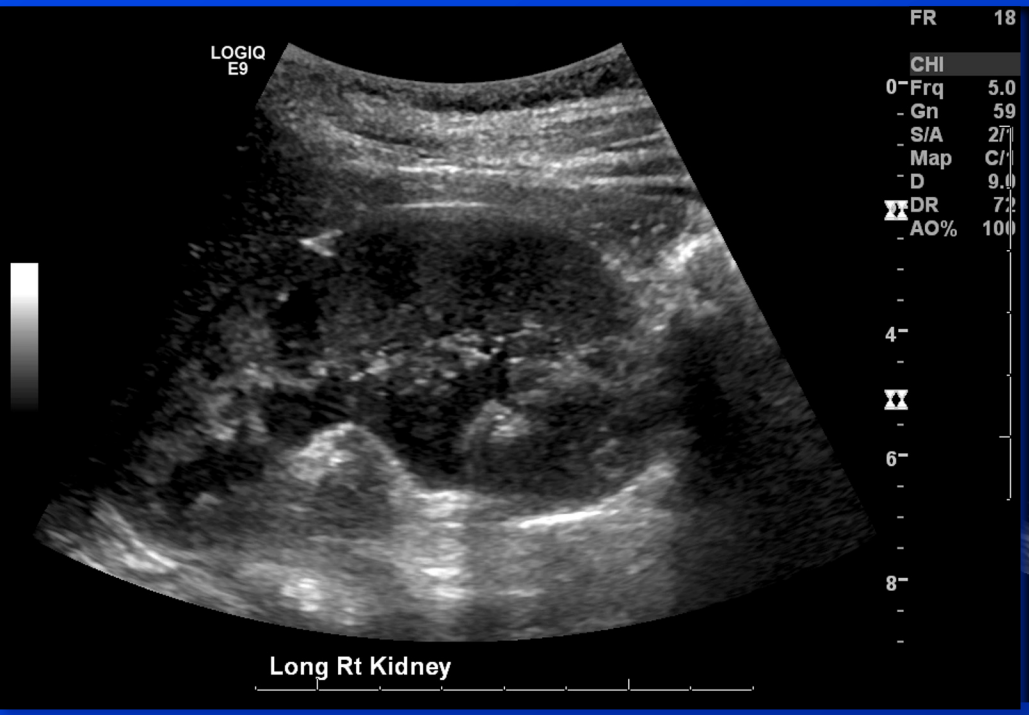
- Physiological
  - Full U-bladder
  - Pregnancy
- Pathological
  - Congenital
    - Reflux, valves, stenosis, ectopies, uretherocele, megacalyces/uretheres
  - Obstruction
    - Strictures after infection/trauma, prostate hyperplasia, malignancy, stones, retroperitoneal fibrosis, obstipation in children,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

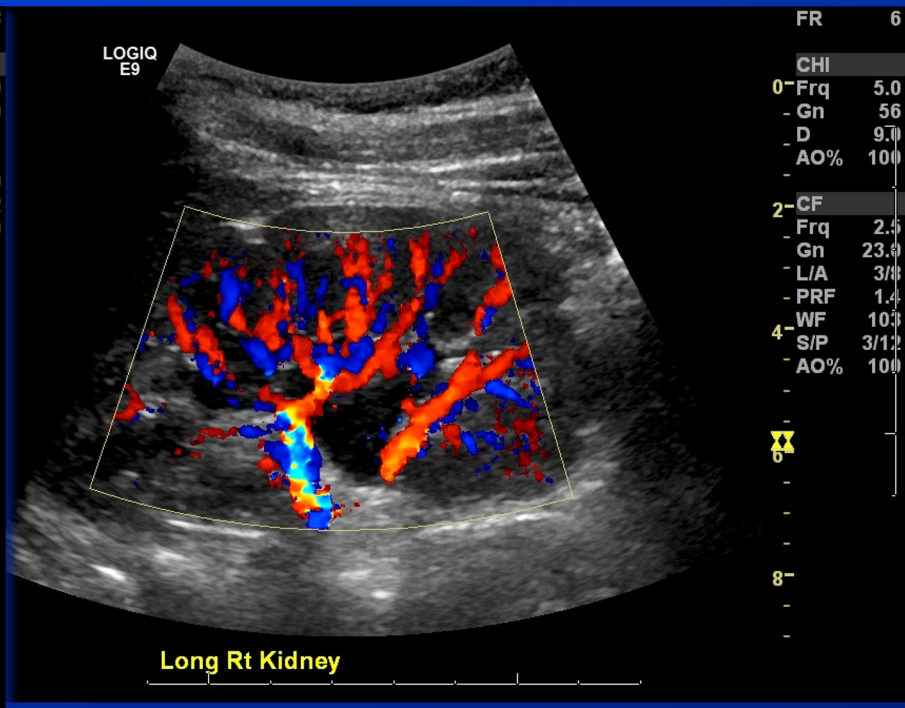
Range of Hydronephrosis



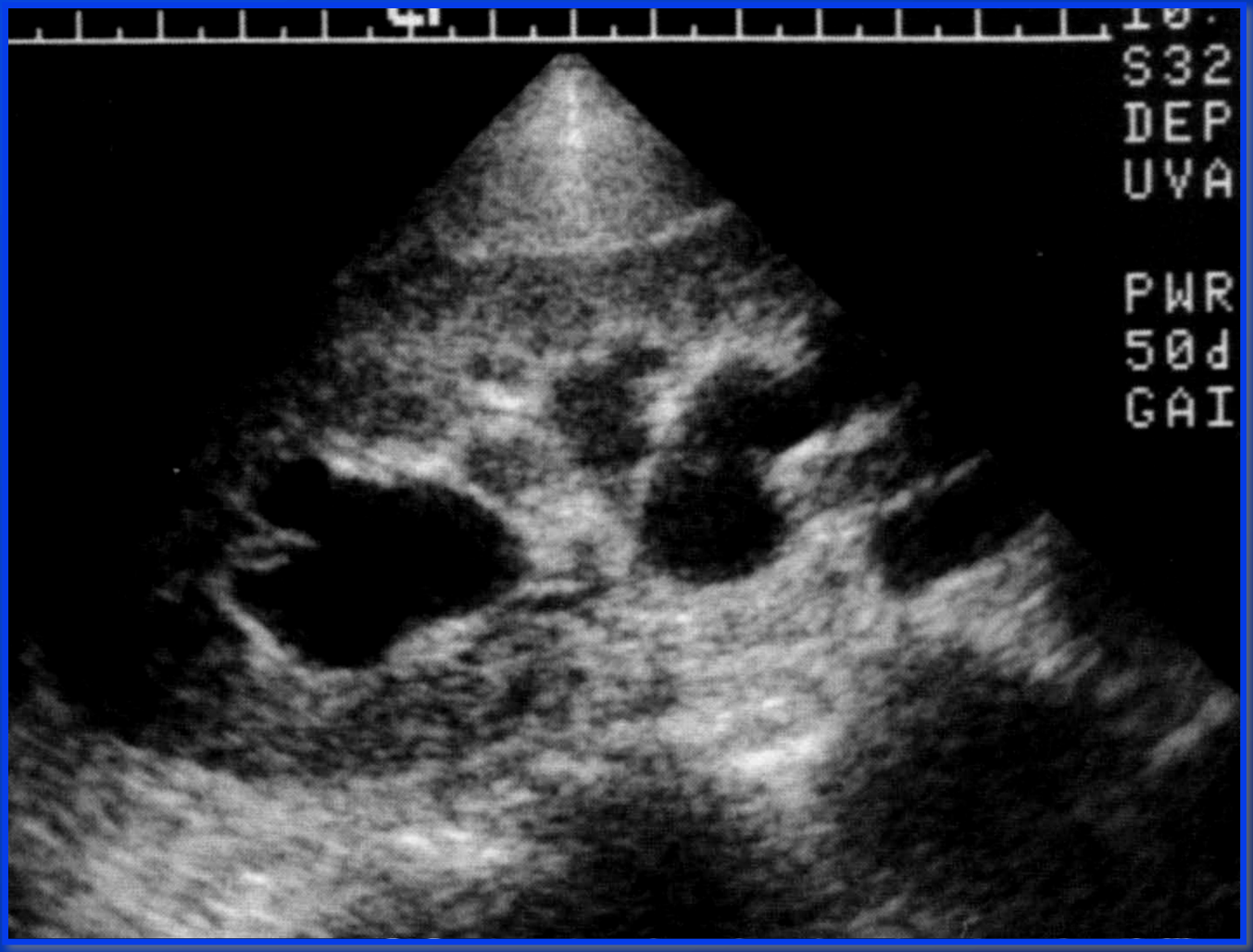
Hydronephrosis

Use the Doppler !

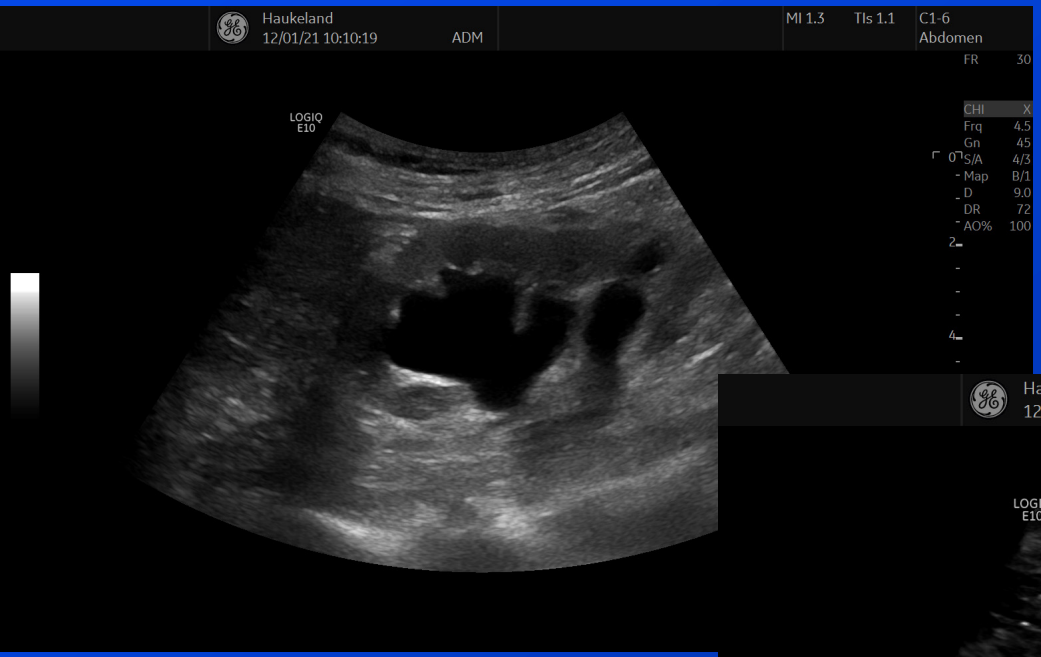


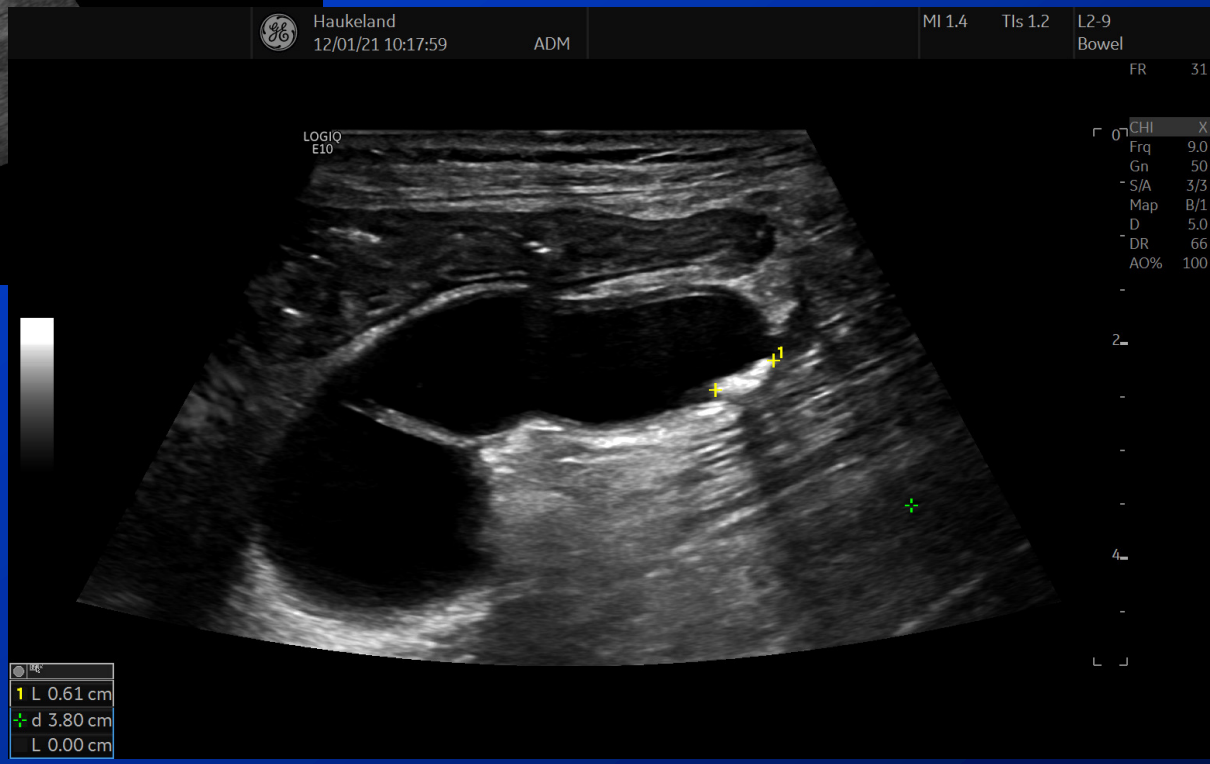


Hydronephrosis

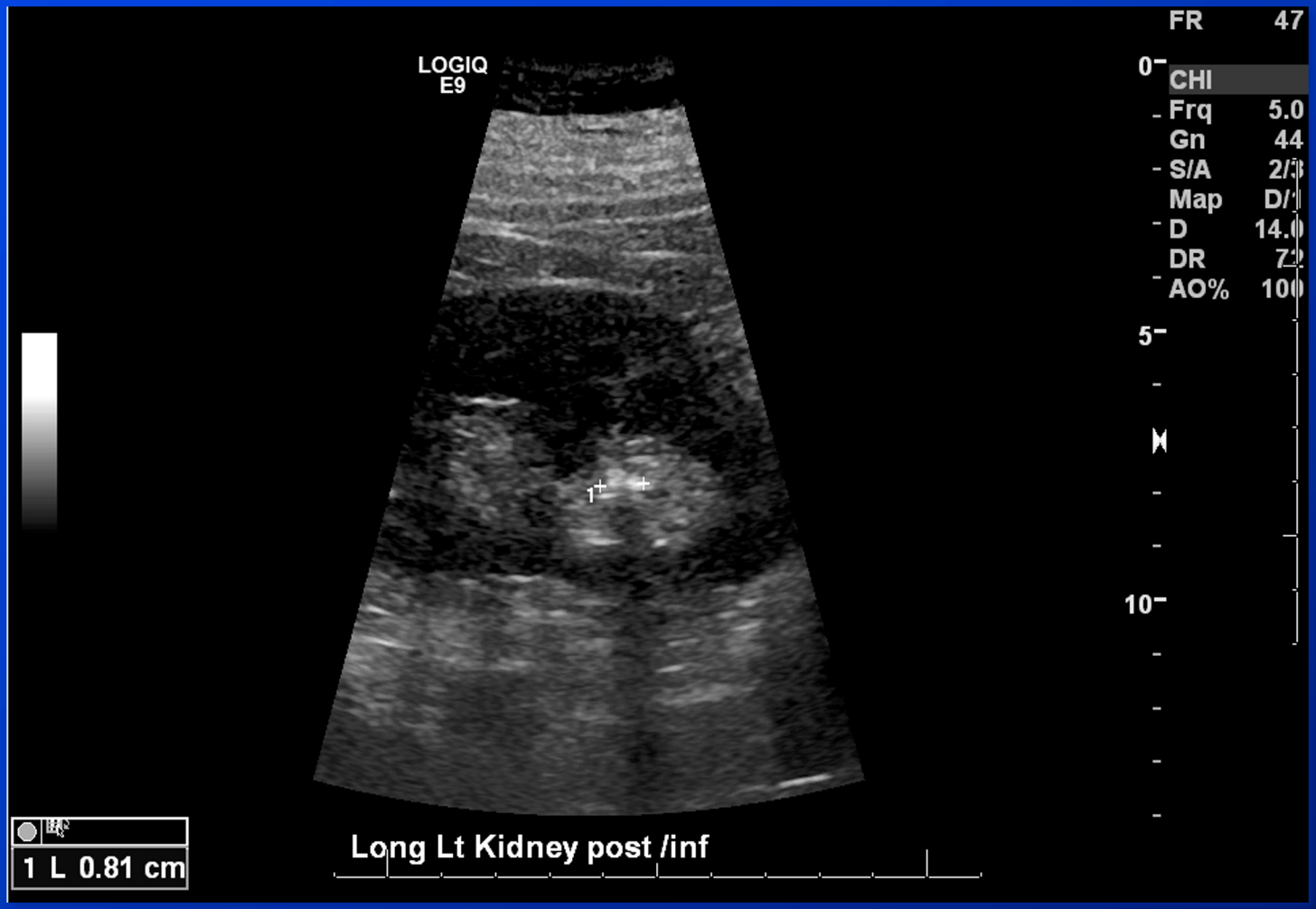


Female, 40 years with Crohn

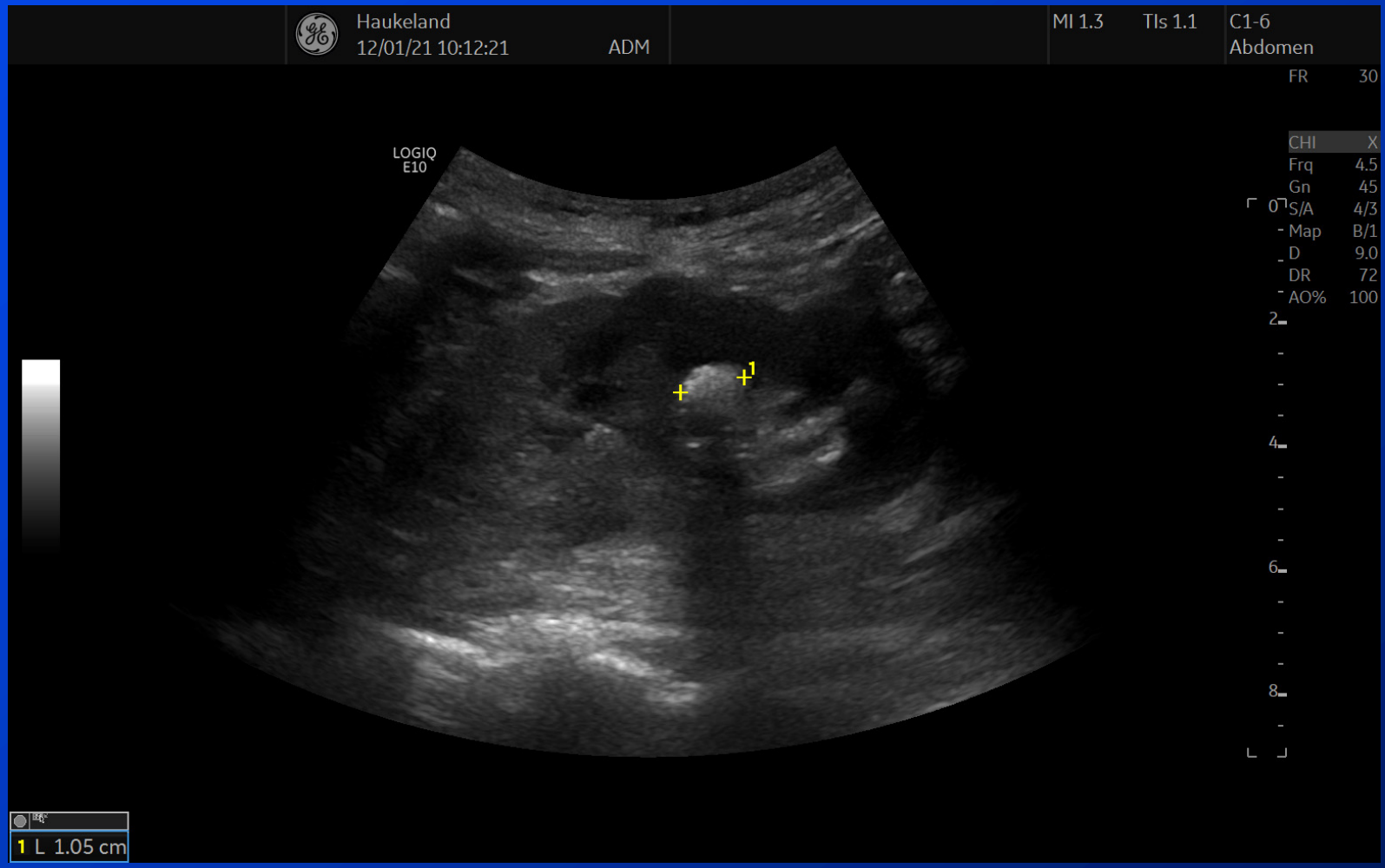




Kidney stone



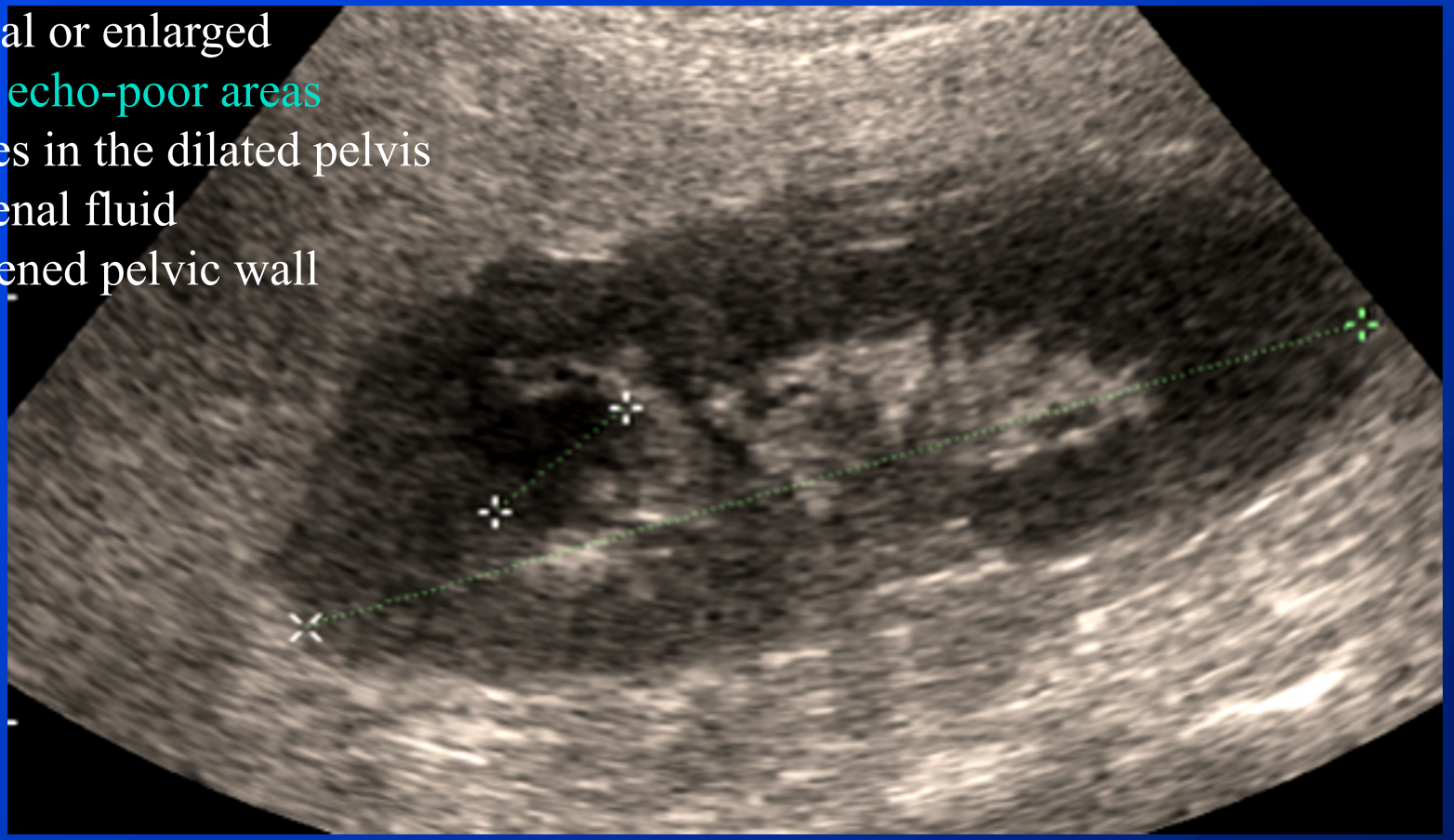
Kidney stone



Acute Pyelonephritis

ultrasound findings:

normal or enlarged
focal echo-poor areas
echoes in the dilated pelvis
perirenal fluid
thickened pelvic wall



Chronic pyelonephritis

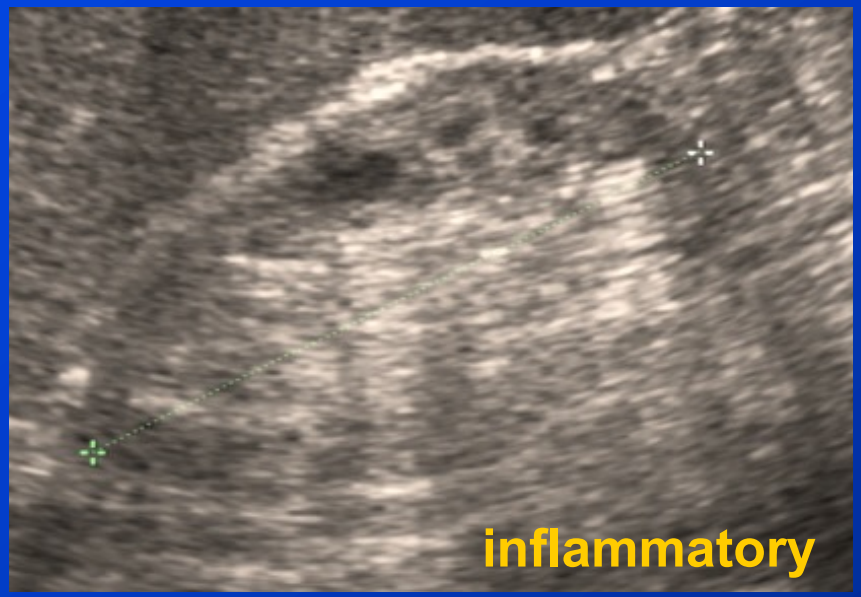
ultrasonic appearance:

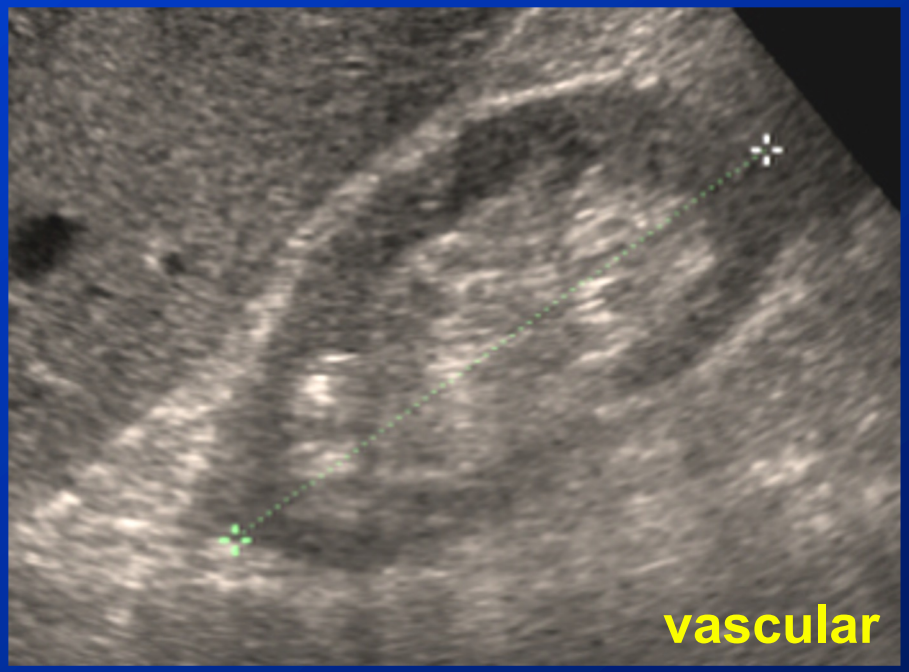
- small kidney

- small echo-rich parenchyma

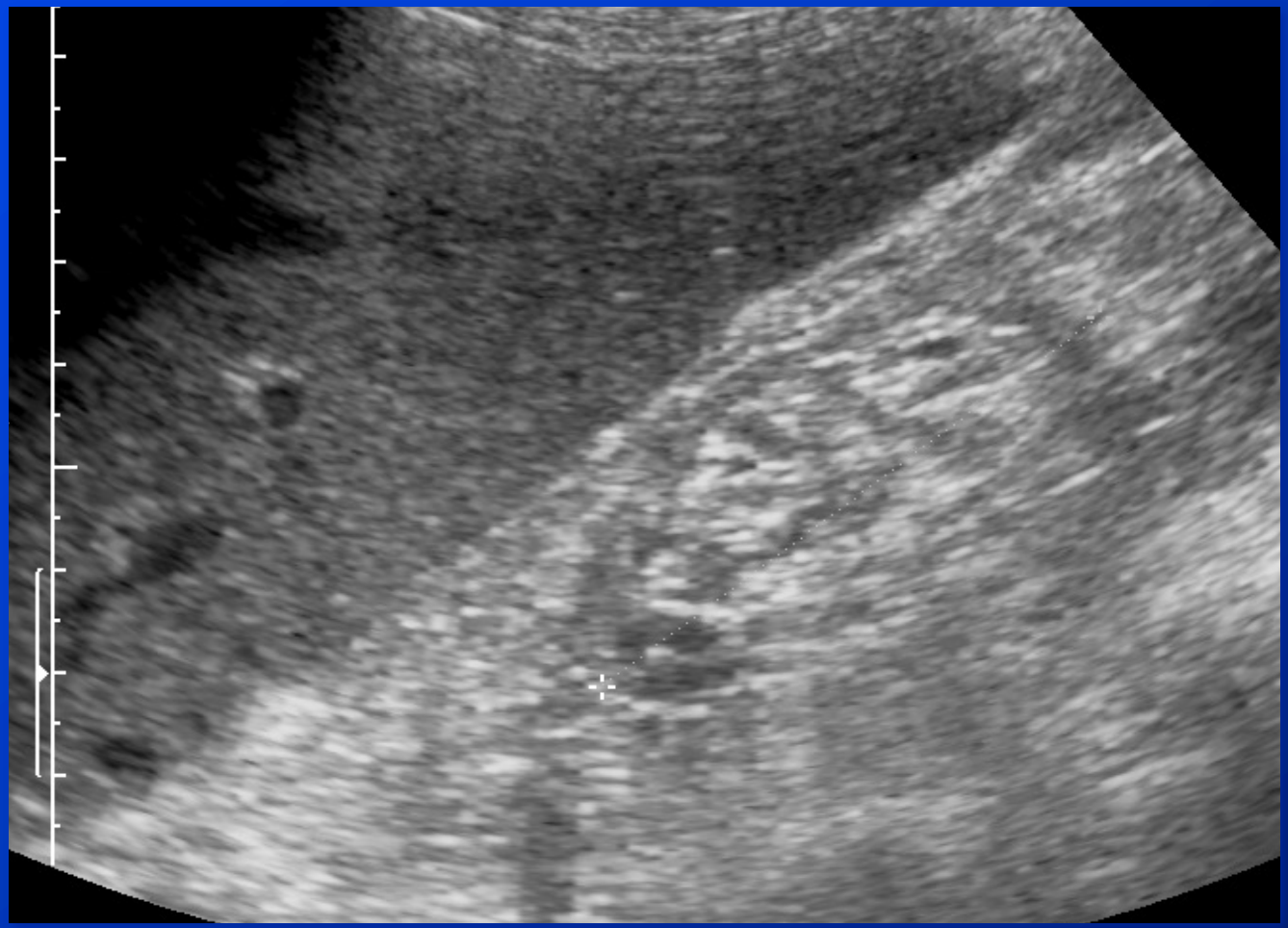
- blurred border between parenchyma and central complex

- scars





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



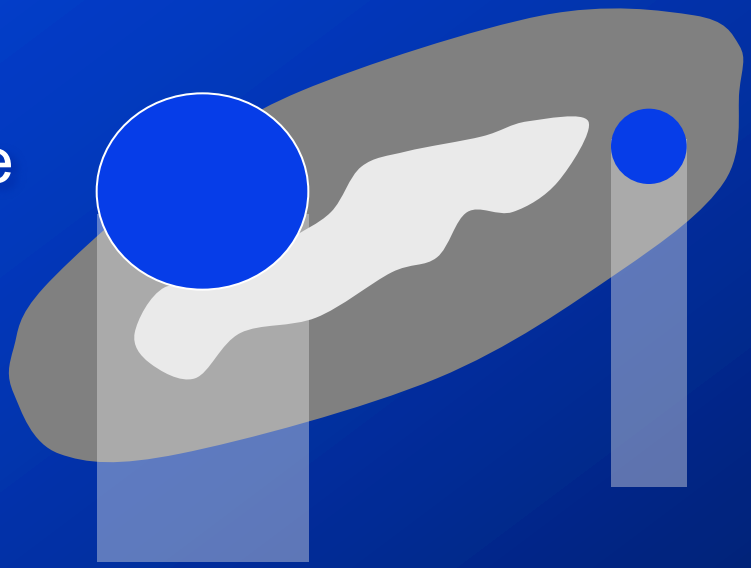
Kidney tumors

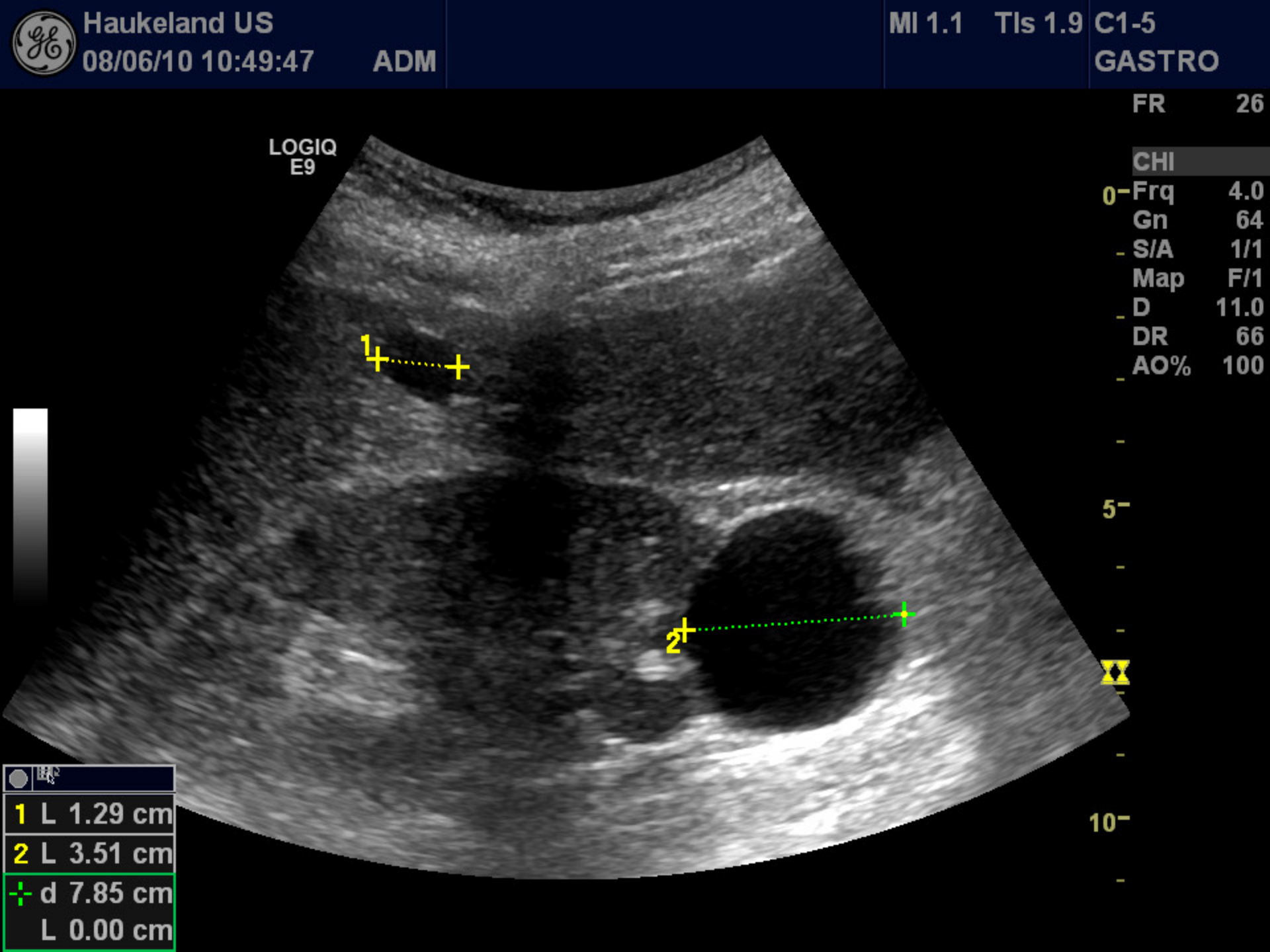
- A: Benign
  - Cysts
  - Angiomyolipoma
  - Oncocytoma
  - (Pseudotumor)
- B: Malignant
  - Carcinoma (RCC)-80%
  - Adenoma (10%)
  - Urothel-carcinoma
  - Lymphoma
  - Metastasis

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
LOGIQ
E9
FR 26
CHI
Frq 4.0
Gn 64
S/A 1/1
Map F/1
D 11.0
DR 66
AO% 100
0
5
10
1
2
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, < 20HU at CT. "simple cysts"
- Type 2:
  - Thin septa, small calcifications, evt. hyperdense (< 90HU (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

Vito Cantisani[1], Michele Bertolotto[2], Dirk-André Clevert[3], Jean-Michel Correas[4], Francesco Maria Drudi[5], Thomas Fischer[6], Odd Helge Gilja[7], Antonio Granata[8], Ole Graumann[9], Christopher J. Harvey[10], Andre Ignee[11], Christian Jenssen[12], Markus Herbert Lerchbaumer[13], Matthew Ragel[14], Adrian Saftoiu[15], Andreas L. Serra[16], Konrad Friedrich Stock[17], Jolanta Webb[18], Paul S. Sidhu[19]

Who was Dr. Morton Bosniak?

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

BOSNIAK'S CLASSIFICATION

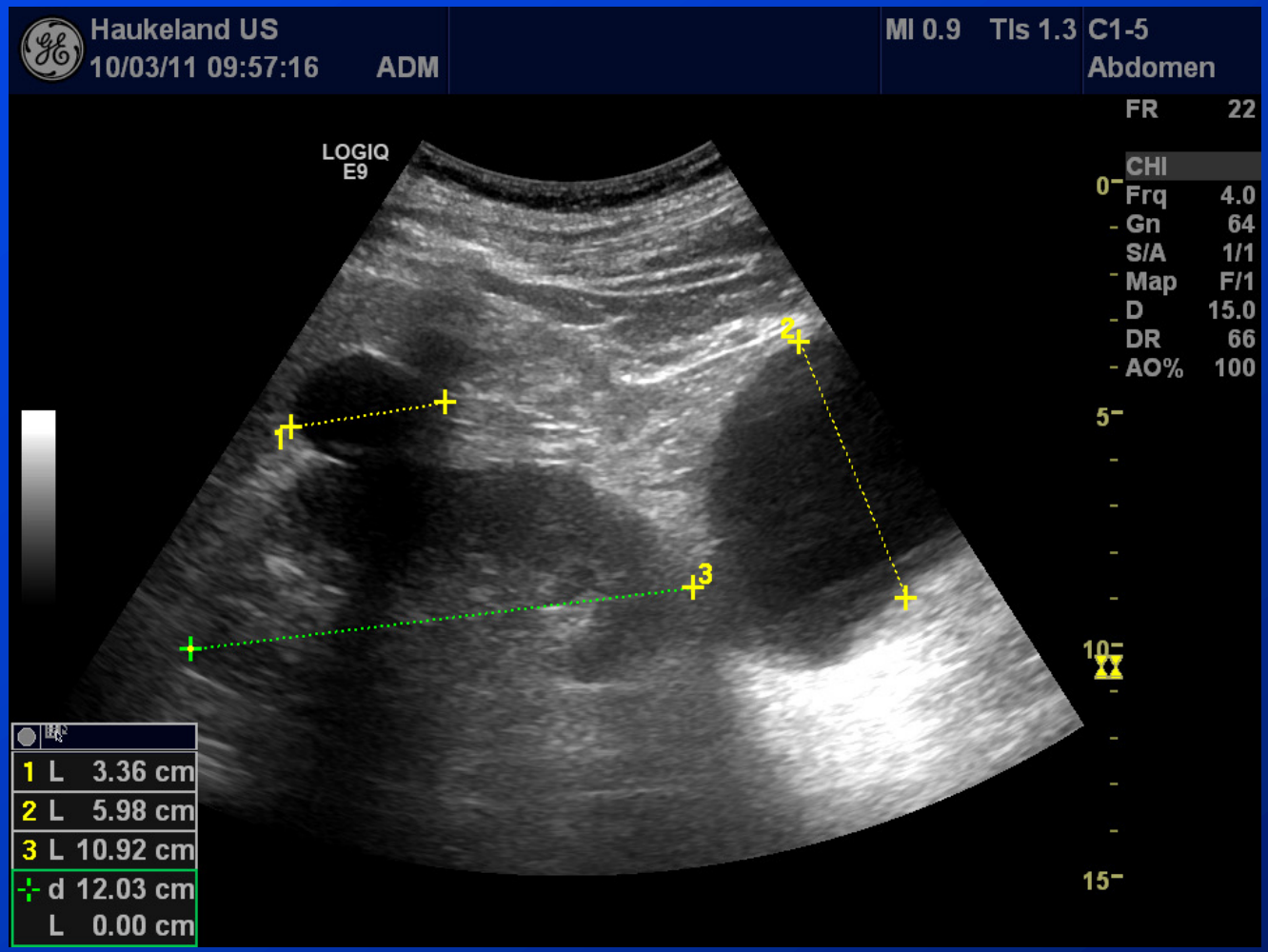
Bosniak groups

- 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)

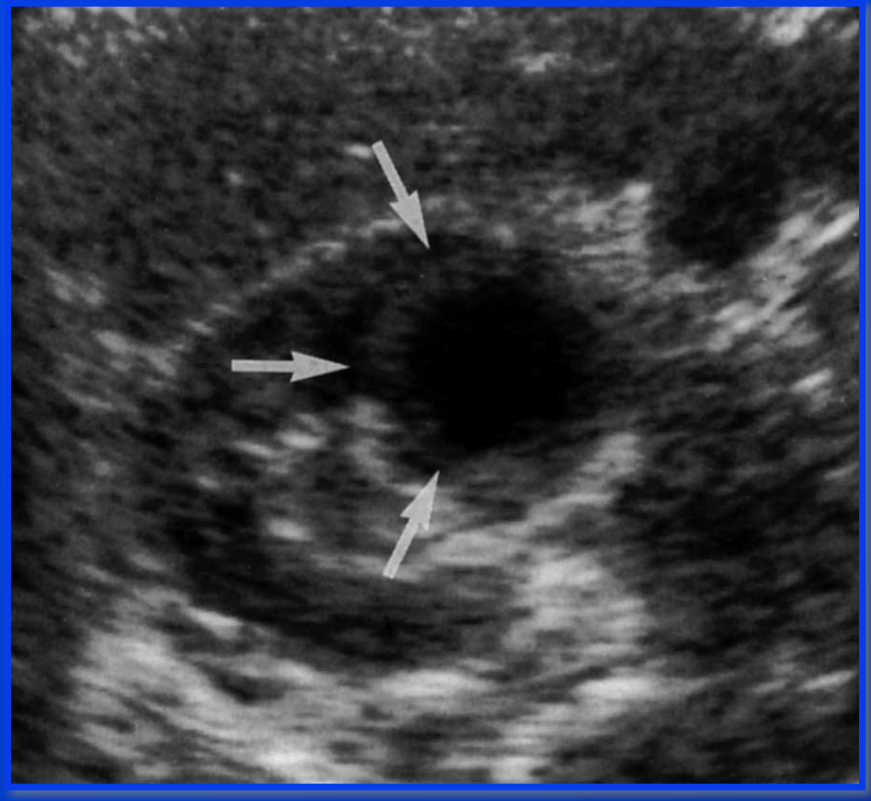
Bosniak classification criteria

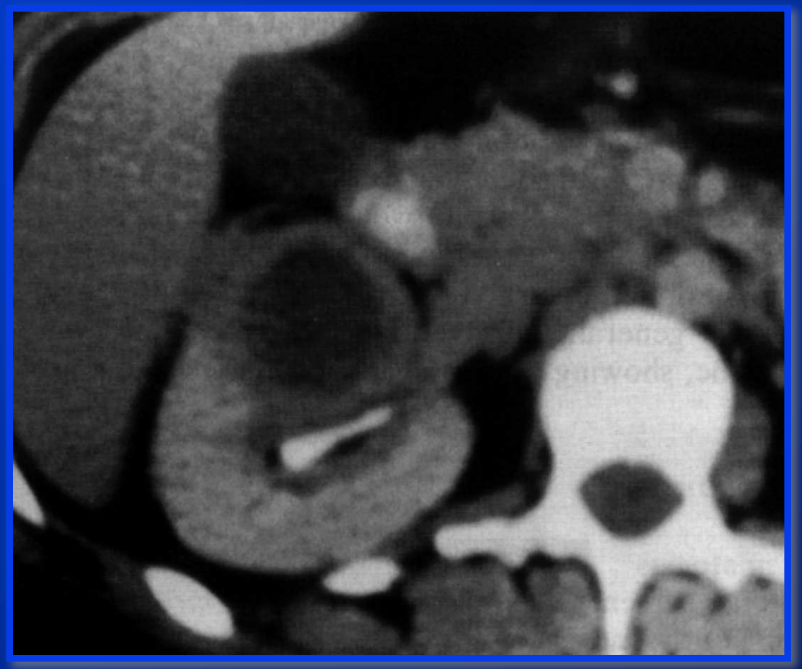
- septa
- cyst content
- contrasting
- solid shares

Cysts on left Kidney



Bosniak Type 3

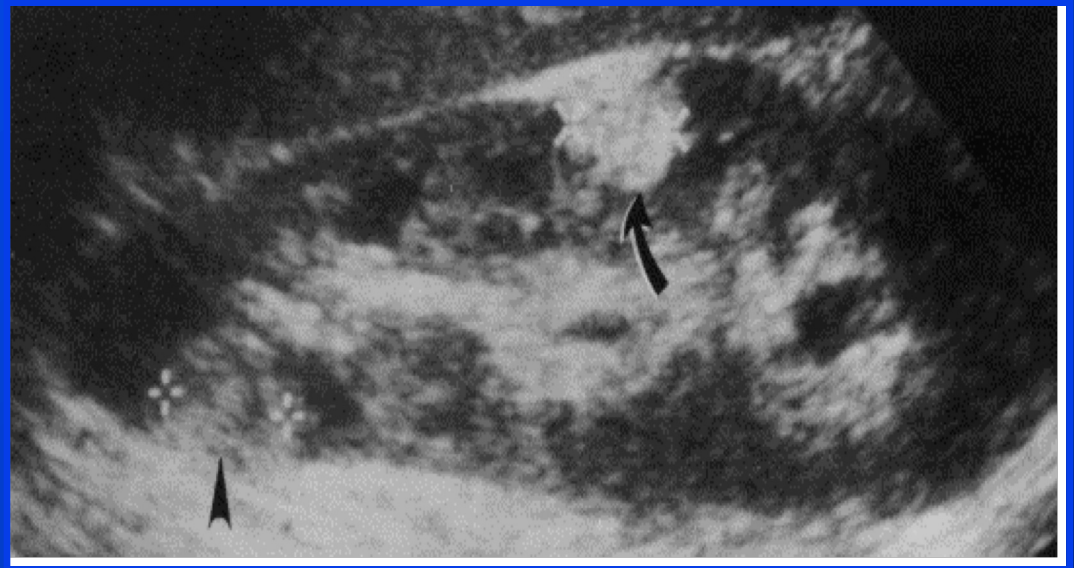




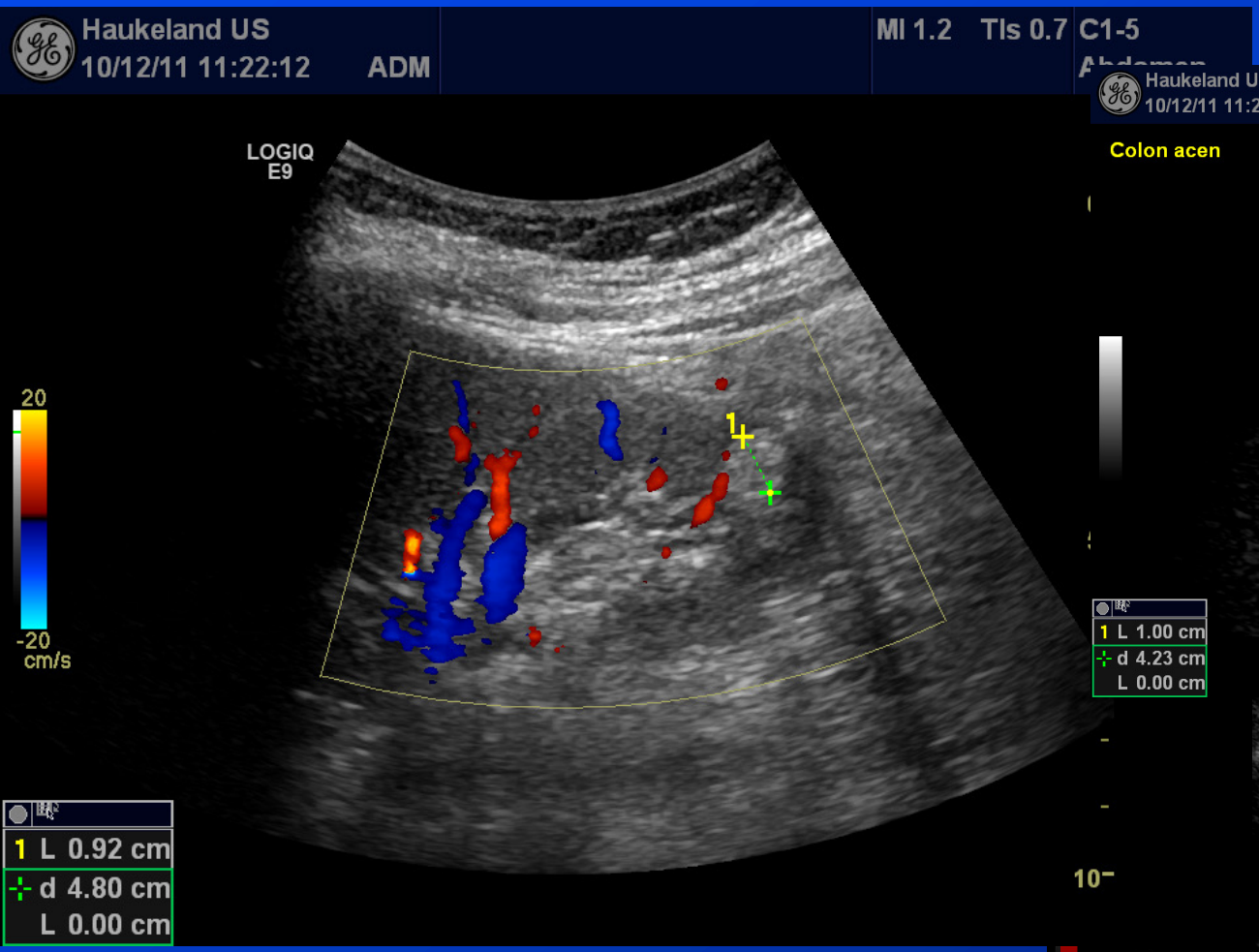
ANGIOMYOLIPOMA

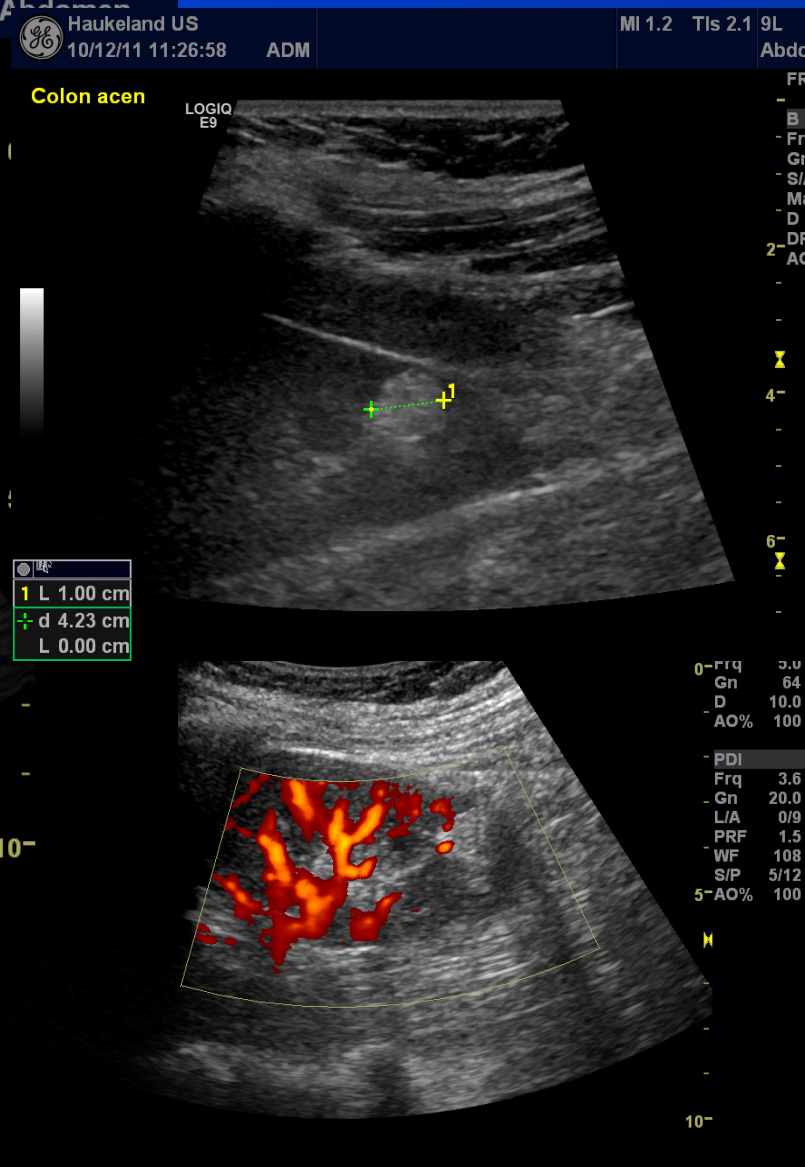
- Hamartoma; vessels, fat and smooth muscle
- Isolated 80%:
  - Most in females 40-50 years
  - Often hemorrhage if > 4 cm
- Part of tuberous sclerosis in 20%
  - 50% are bilaterale and multiple
- Benign tumor
- Hyperechogenic tumors without any symptoms

ANGIOMYOLIPOMA



Angiomyolipoma

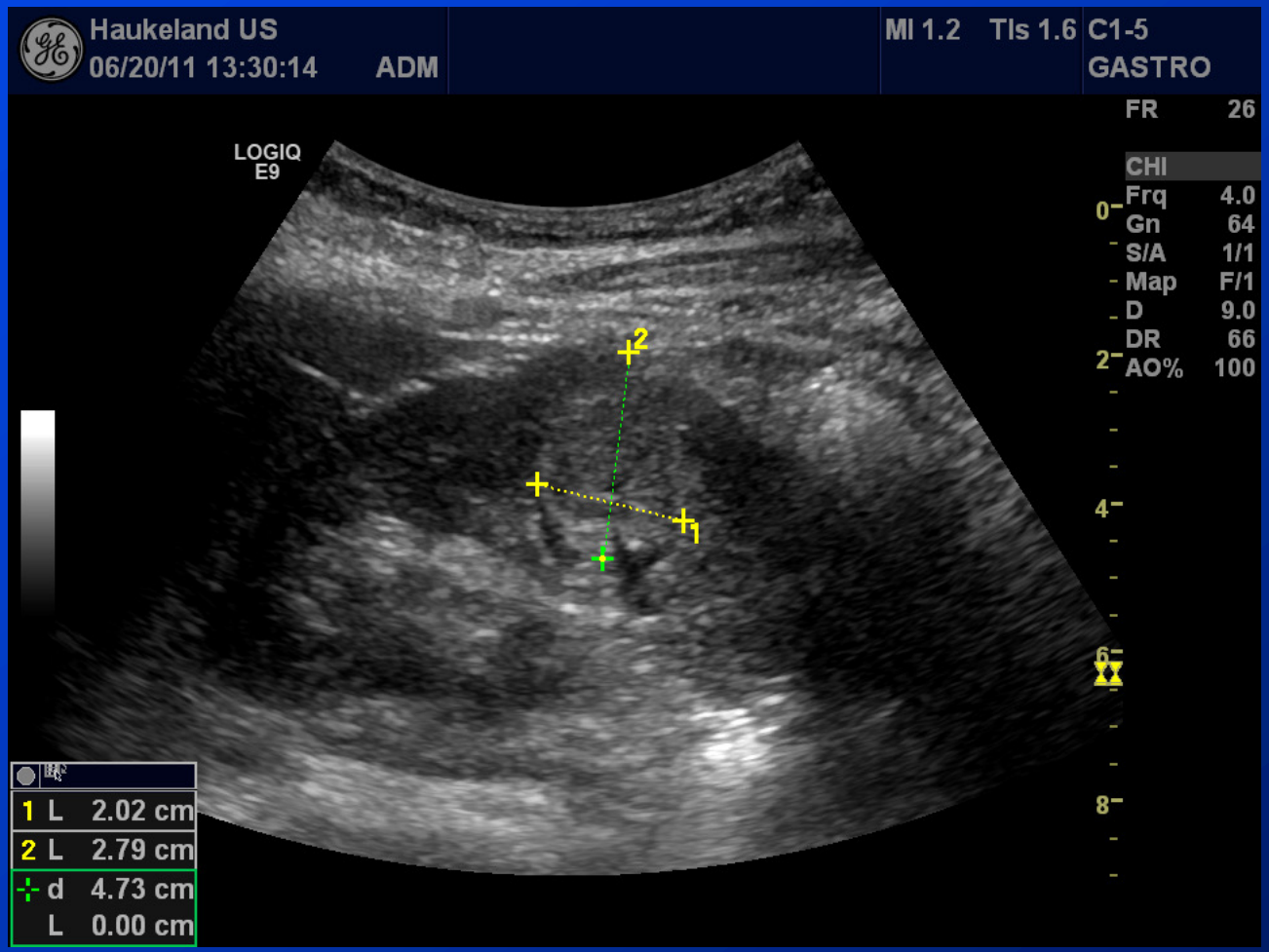




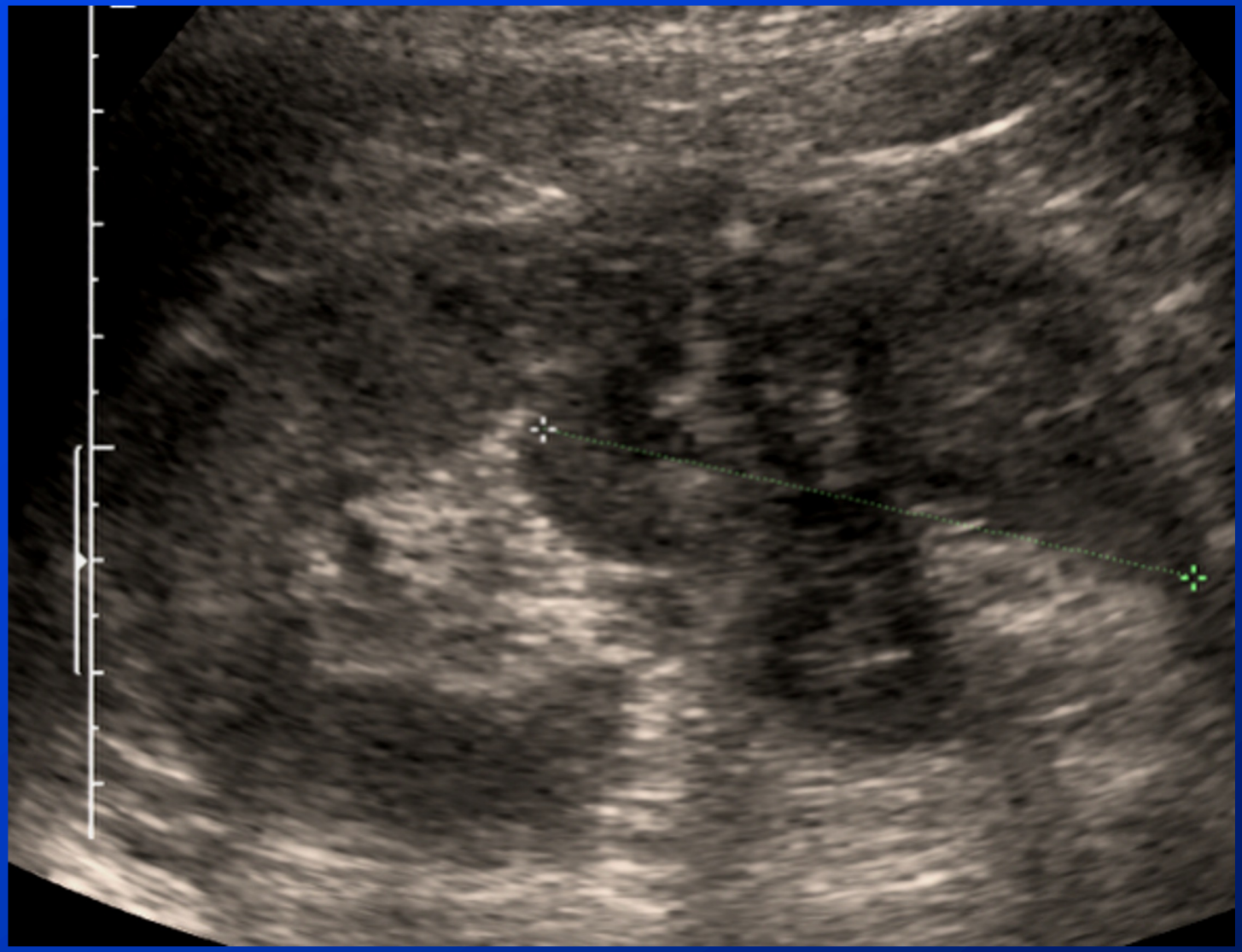
Renal Cell Carcinoma

- 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

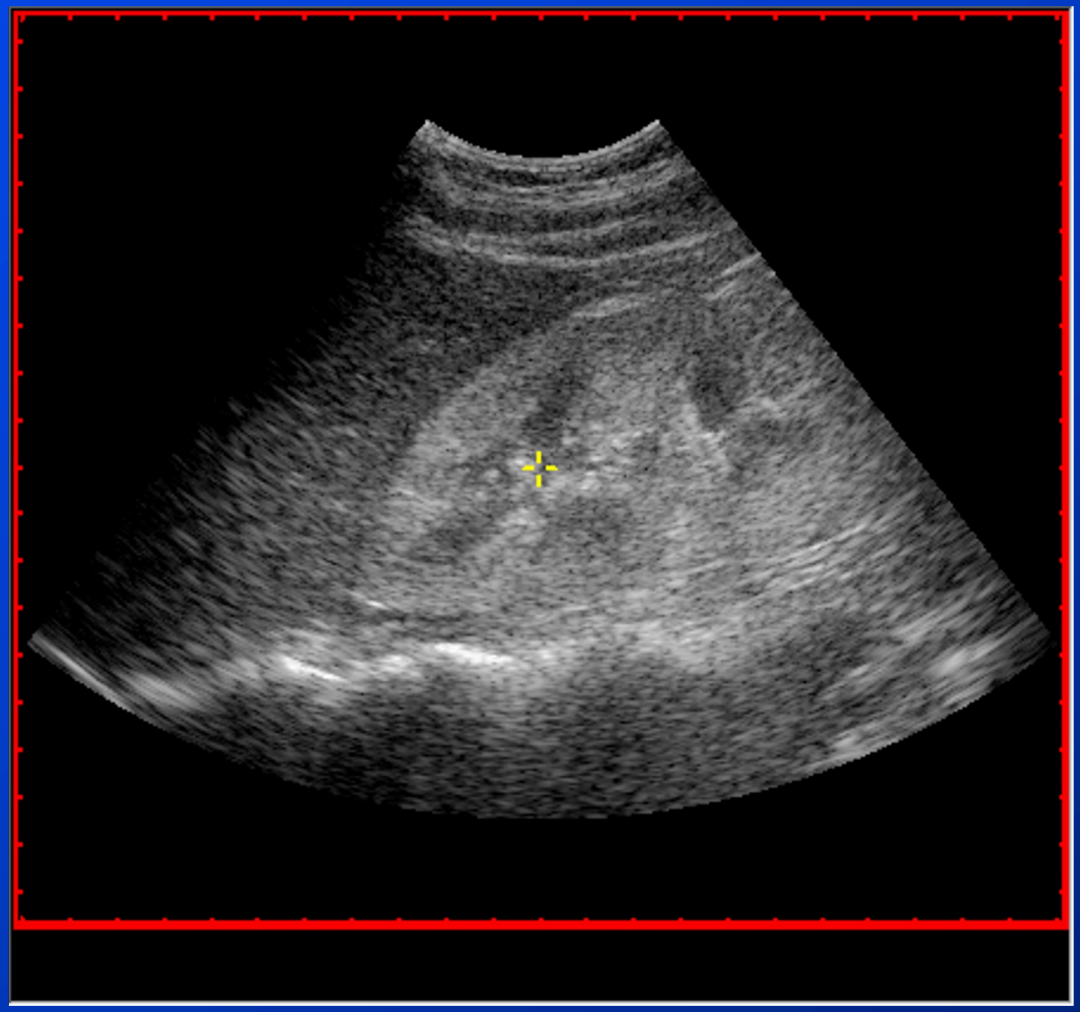
Renal cell carcinoma



Renal cell carcinoma

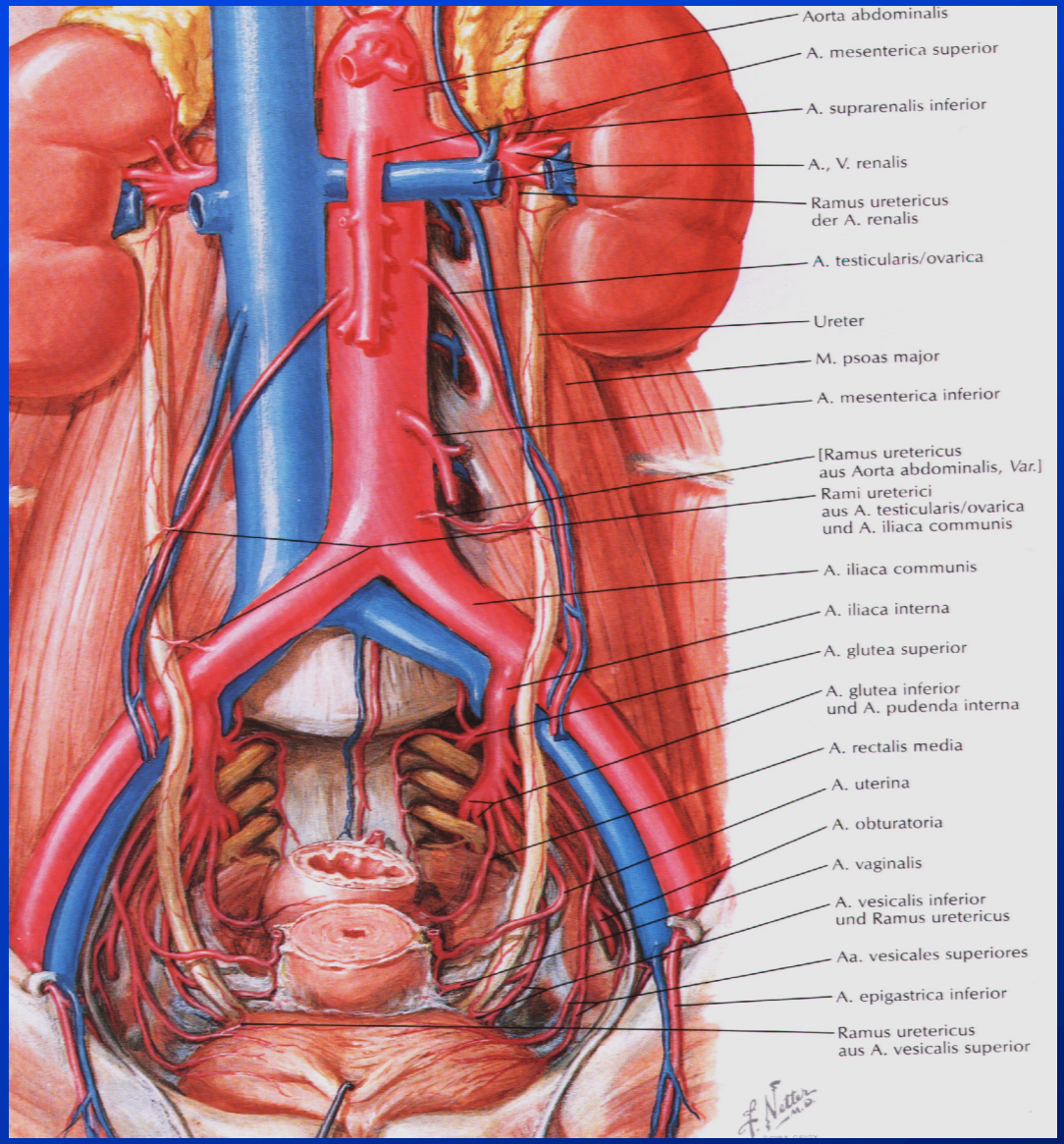


Hyperechogenic kidney

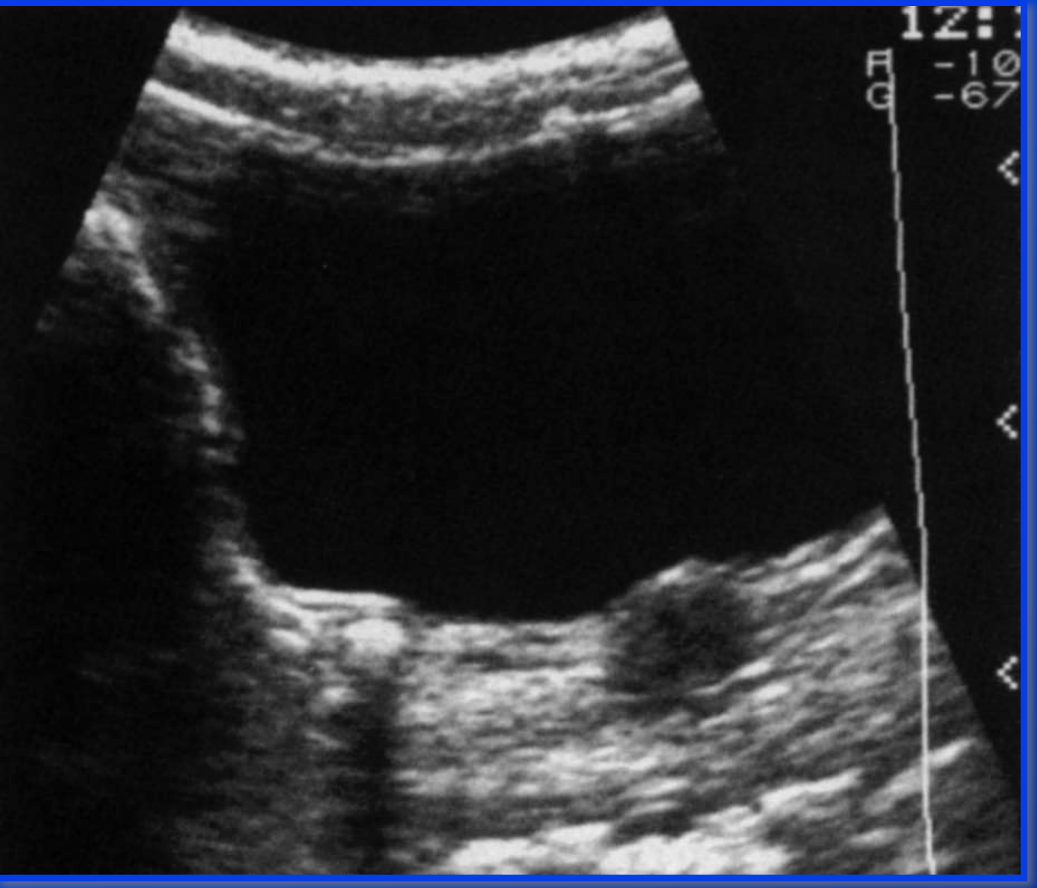


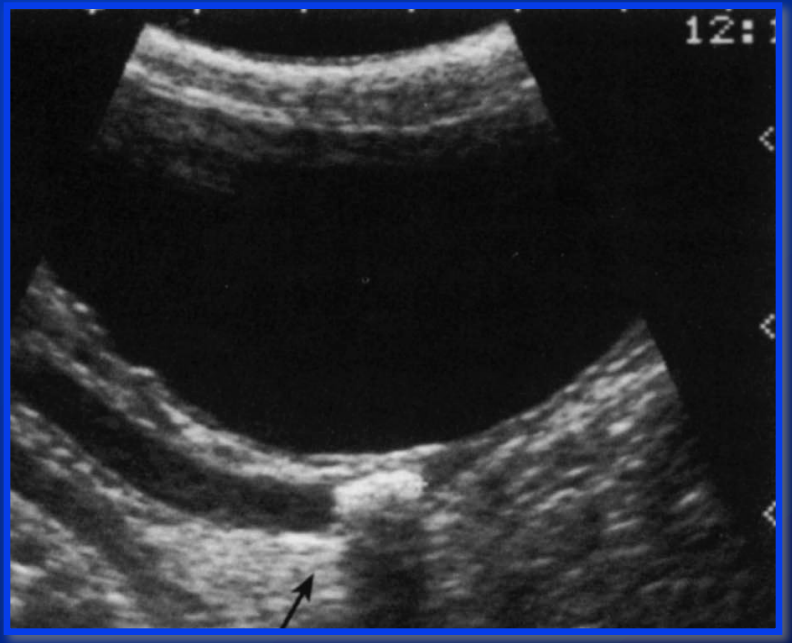
Defroster liquid (Ethylen Glycol) intoxication with oxalat sedimentation

Retroperitoneal Ureter



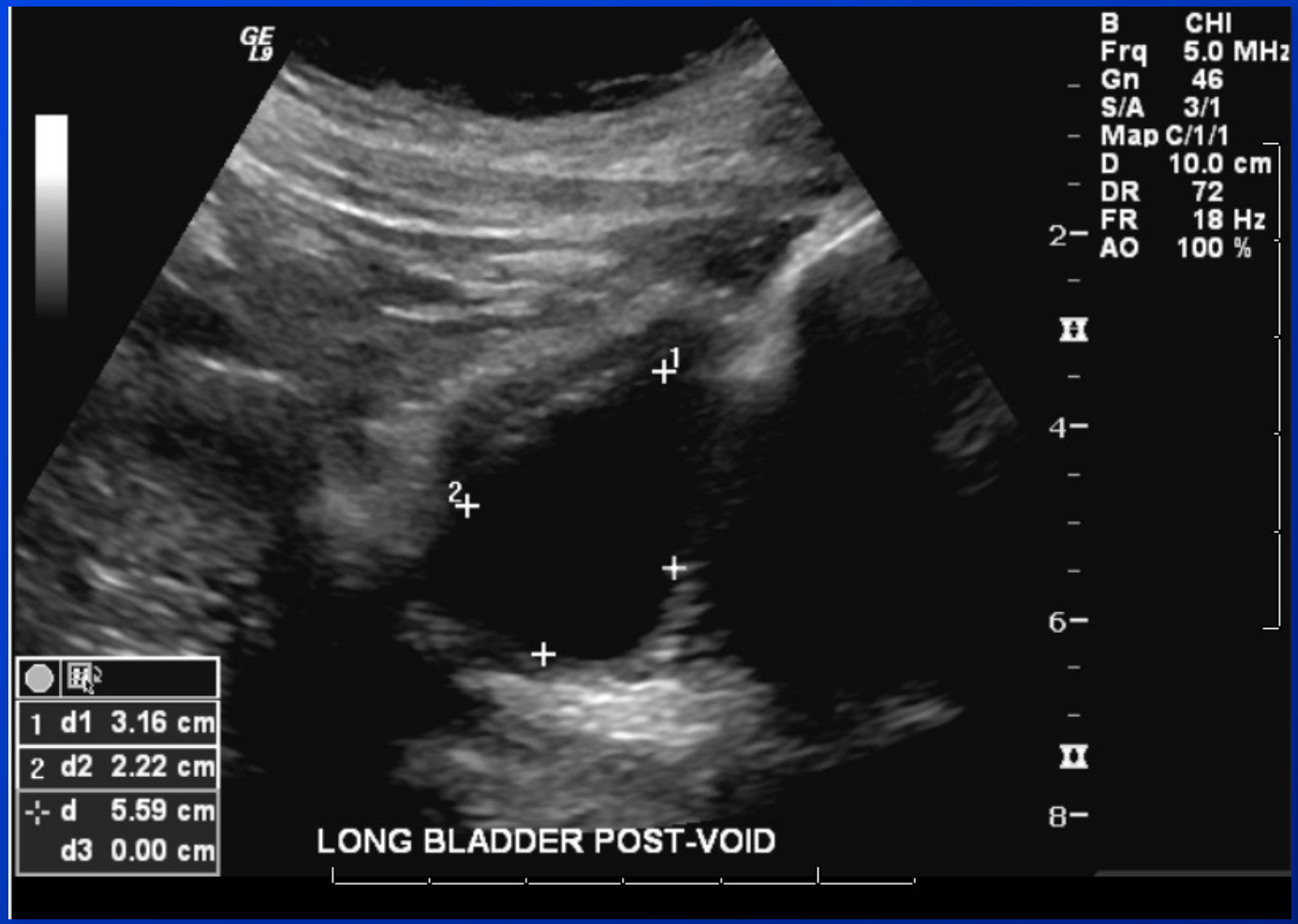
Ureter Stone



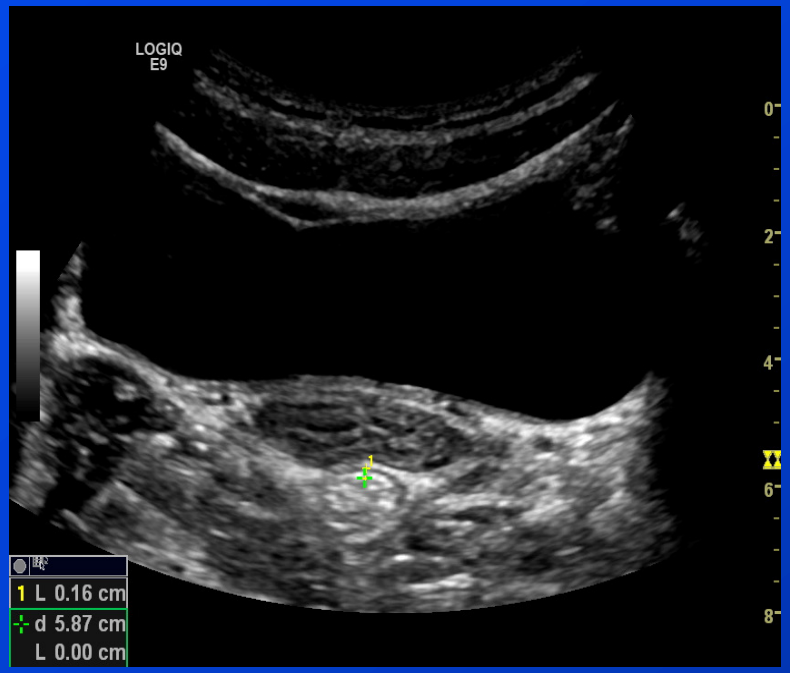


On the importance of a good bladder

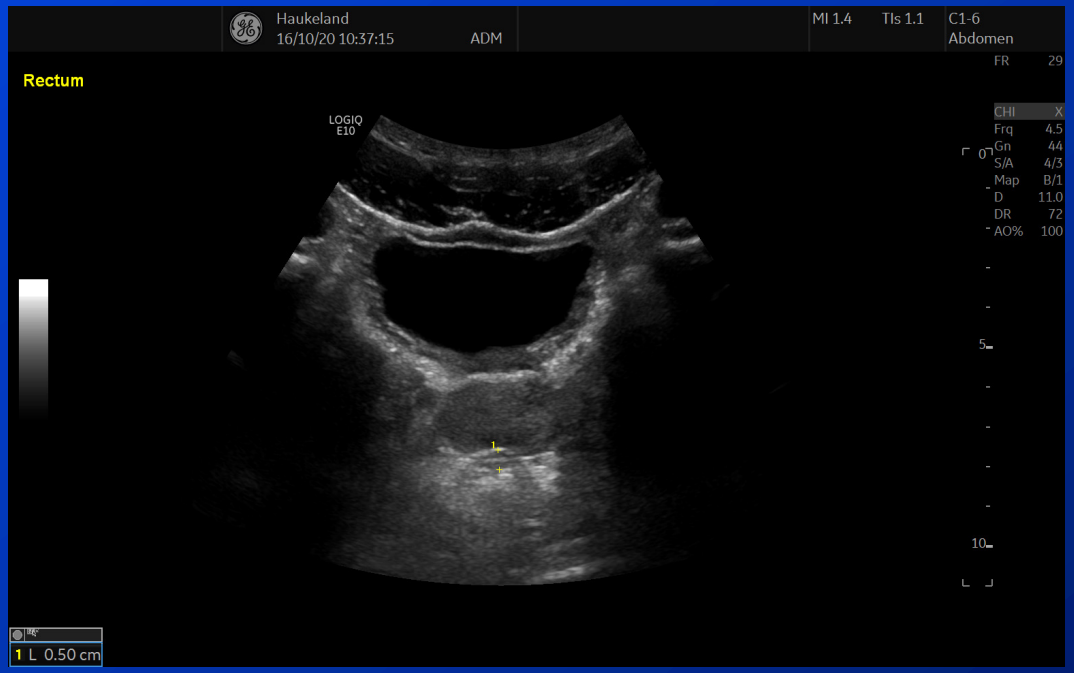
Contracted Urinary bladder



Transverse section

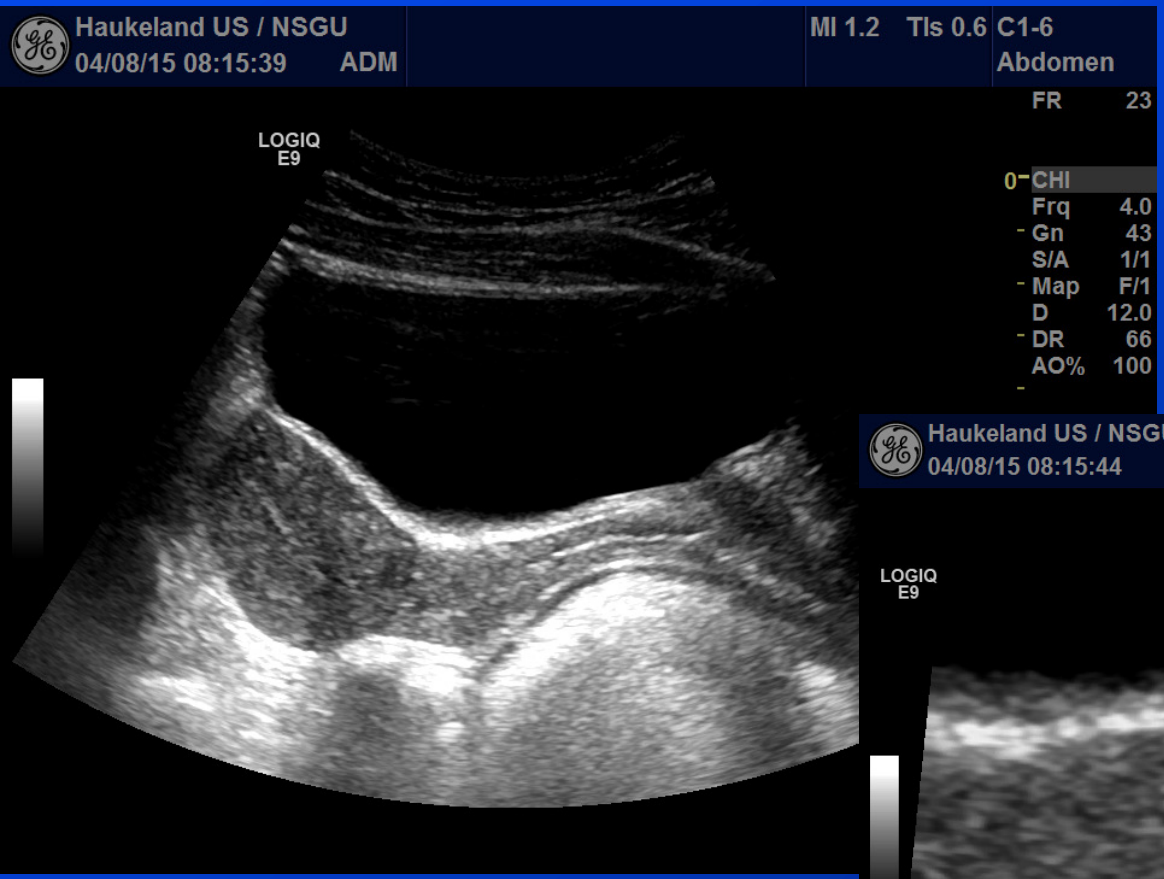


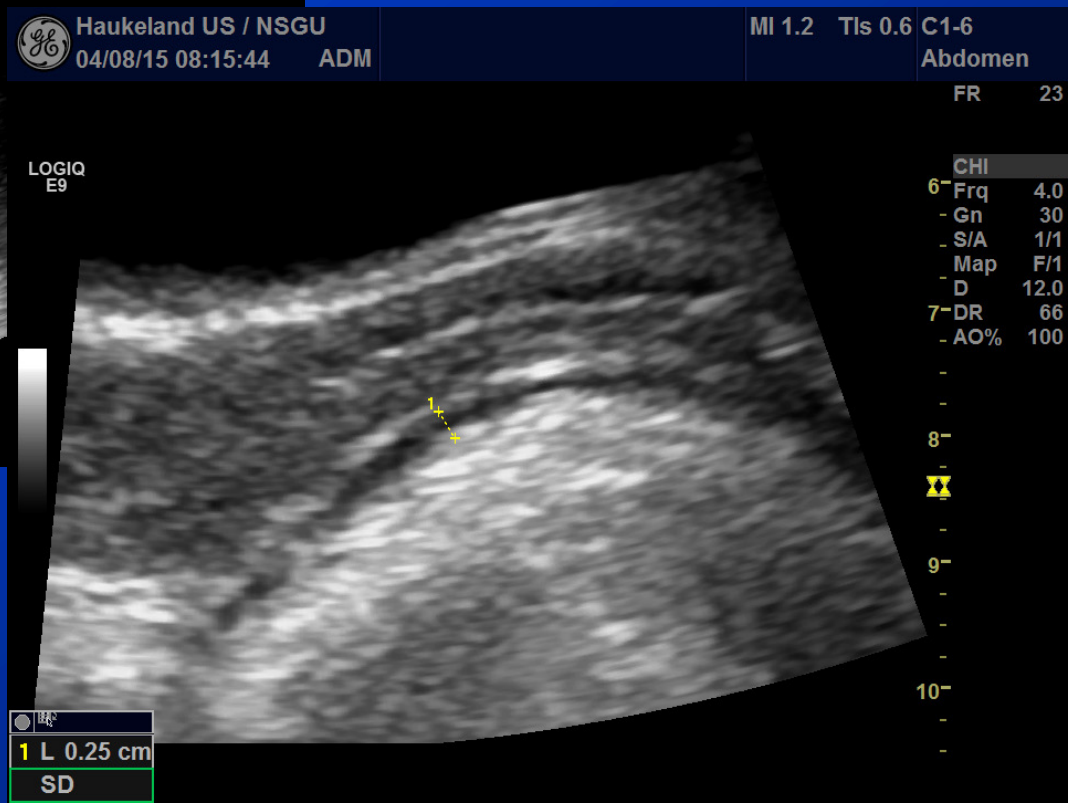
Female



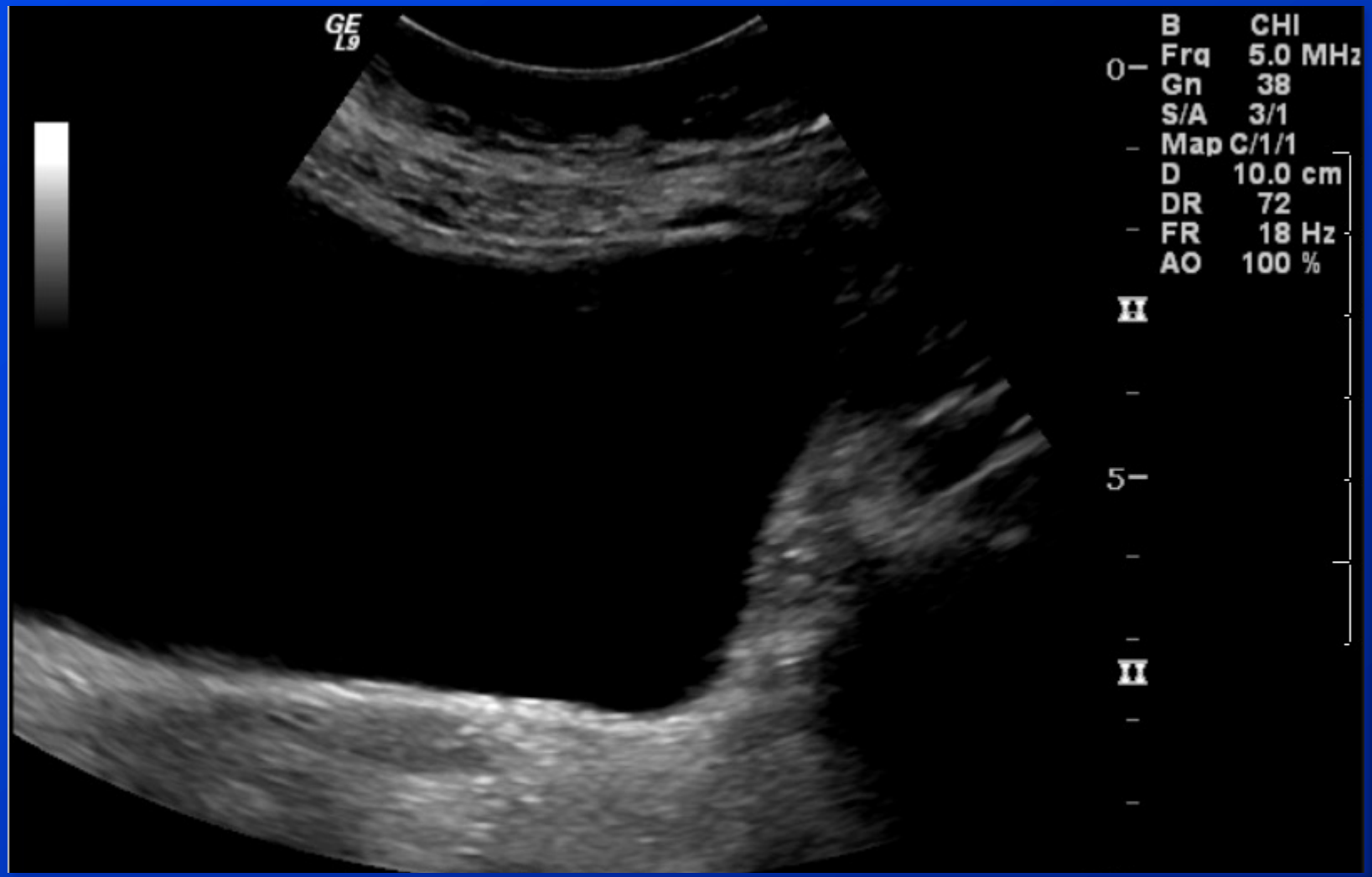
Male

Longitudinal section

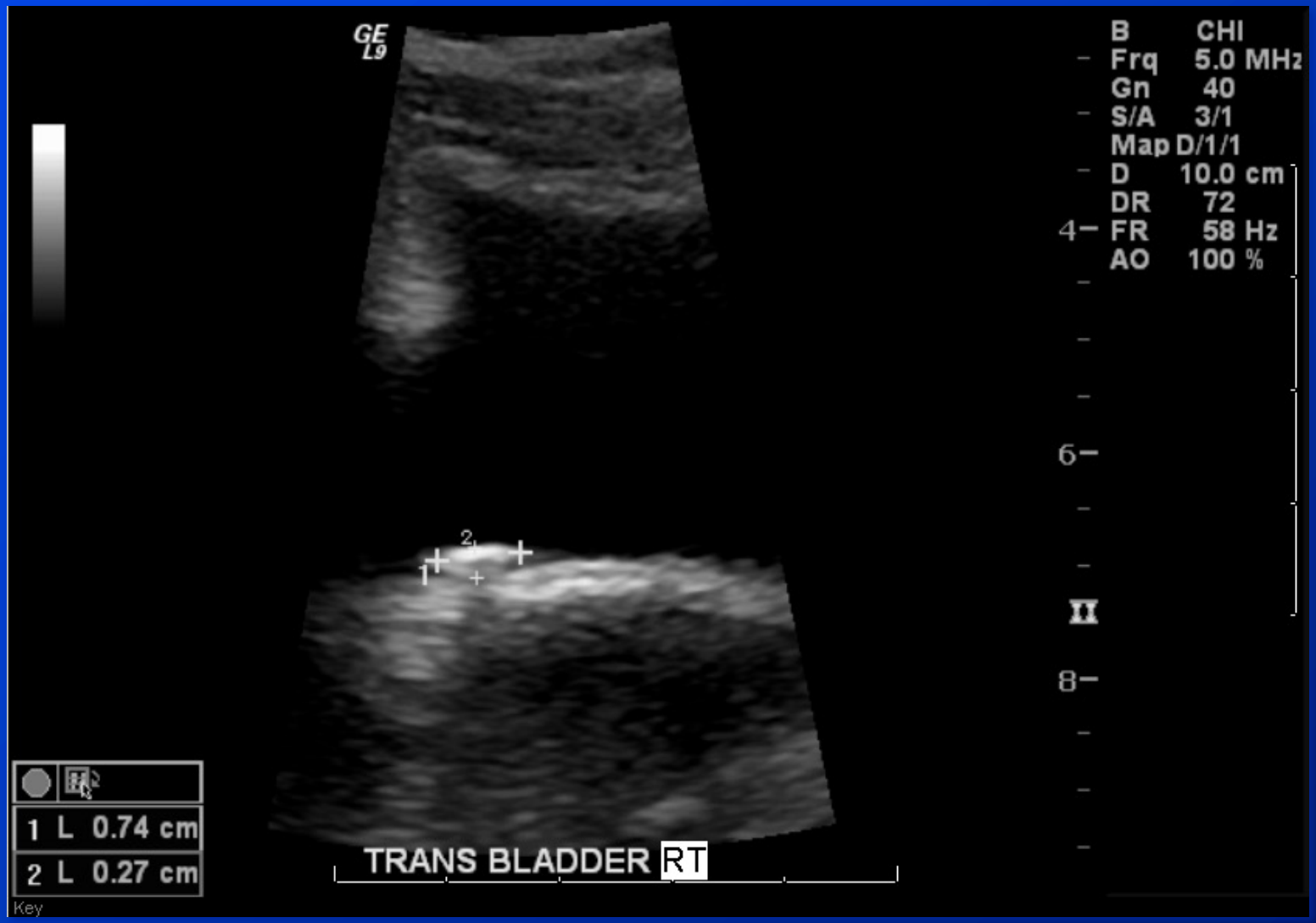




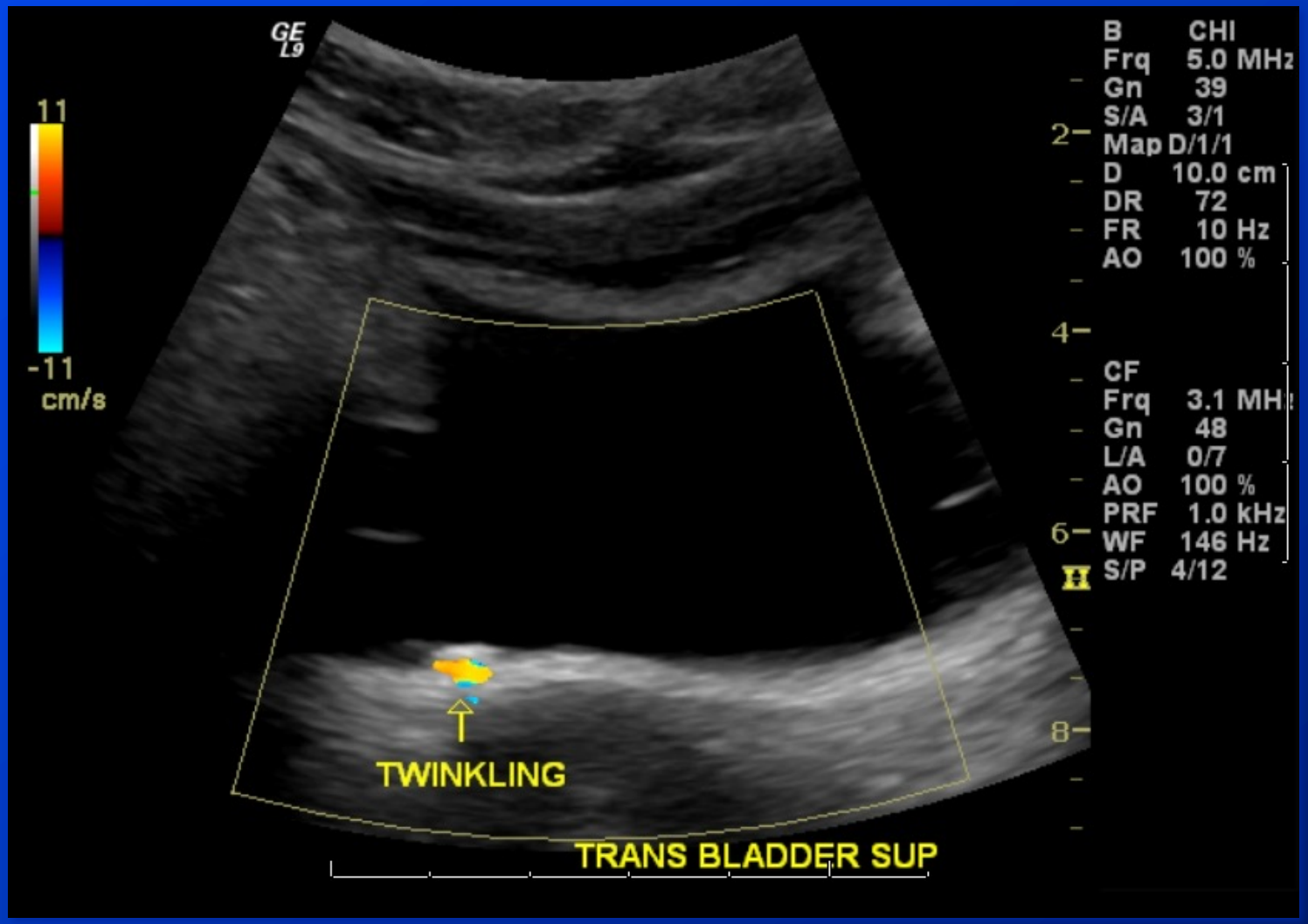
Urinary retention



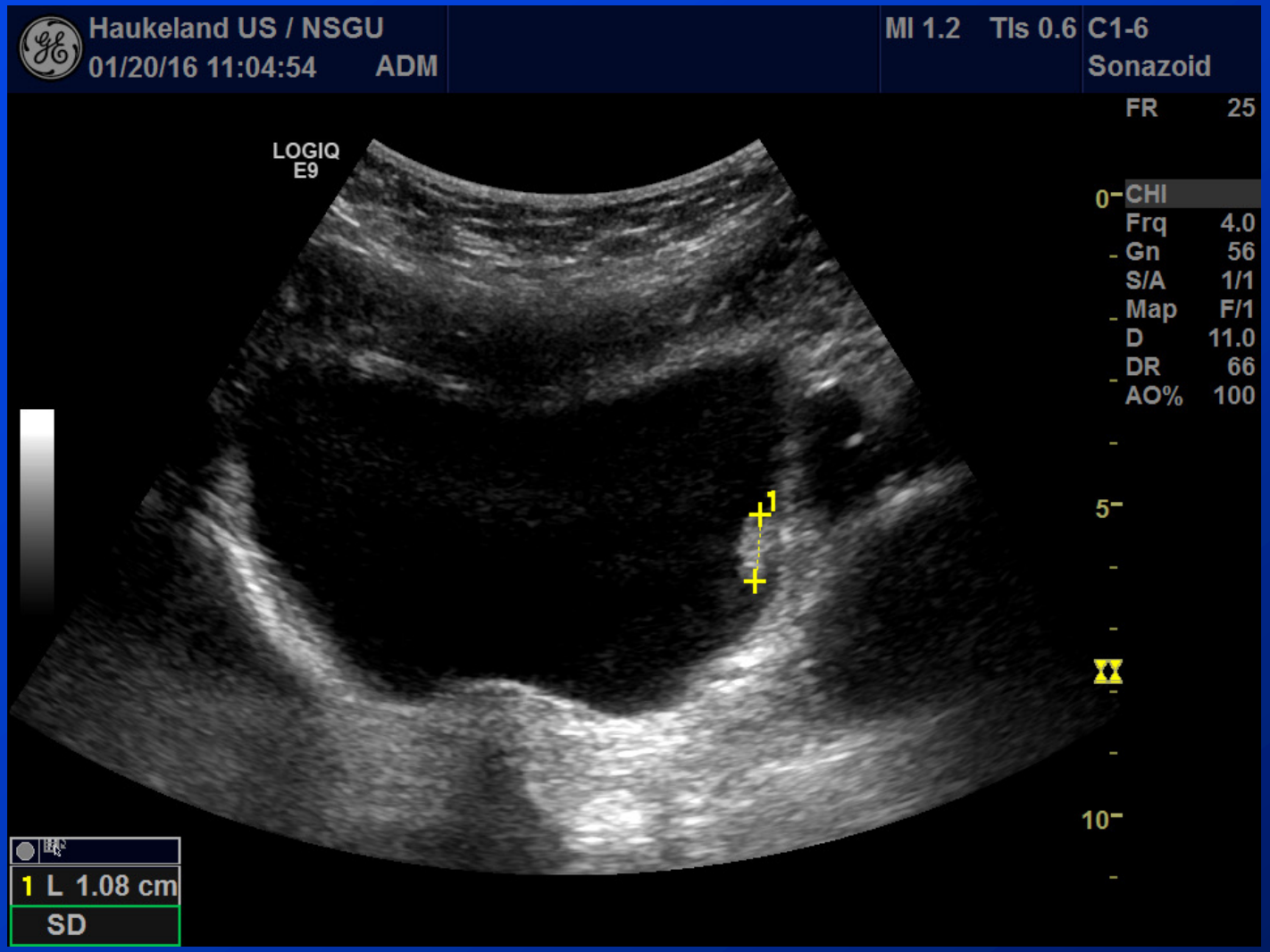
Bladder stone



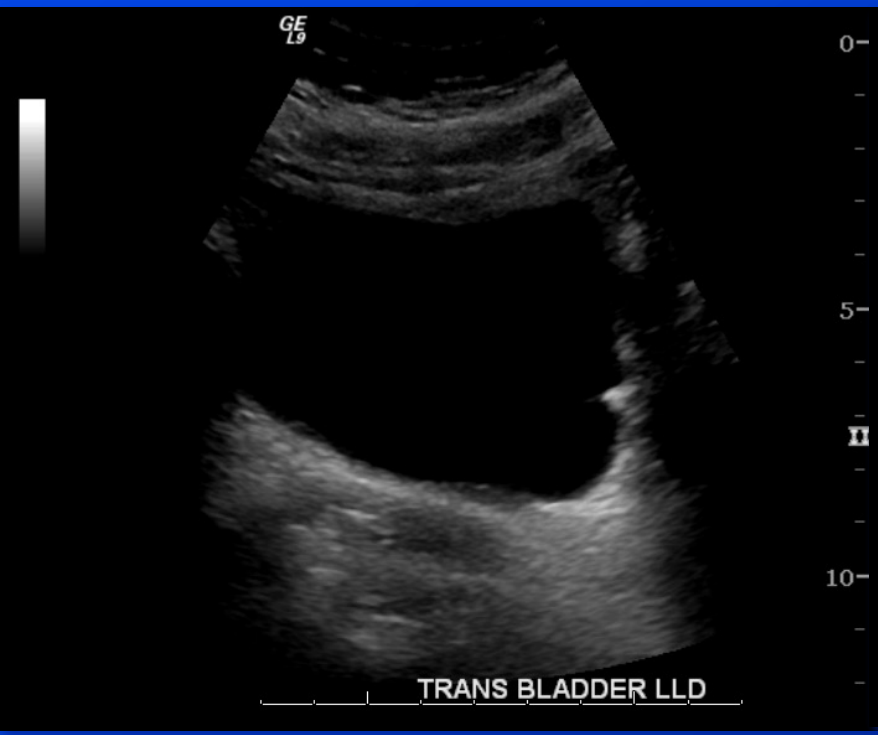
Twinkling artifact at Doppler us.

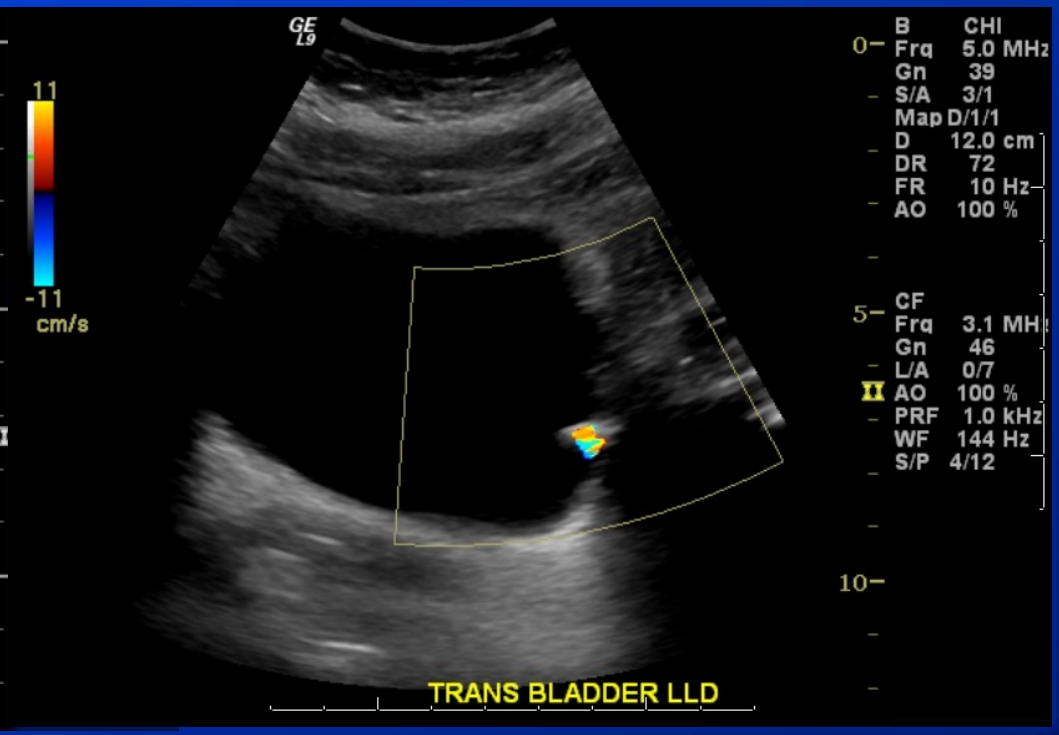


Bladder polyp

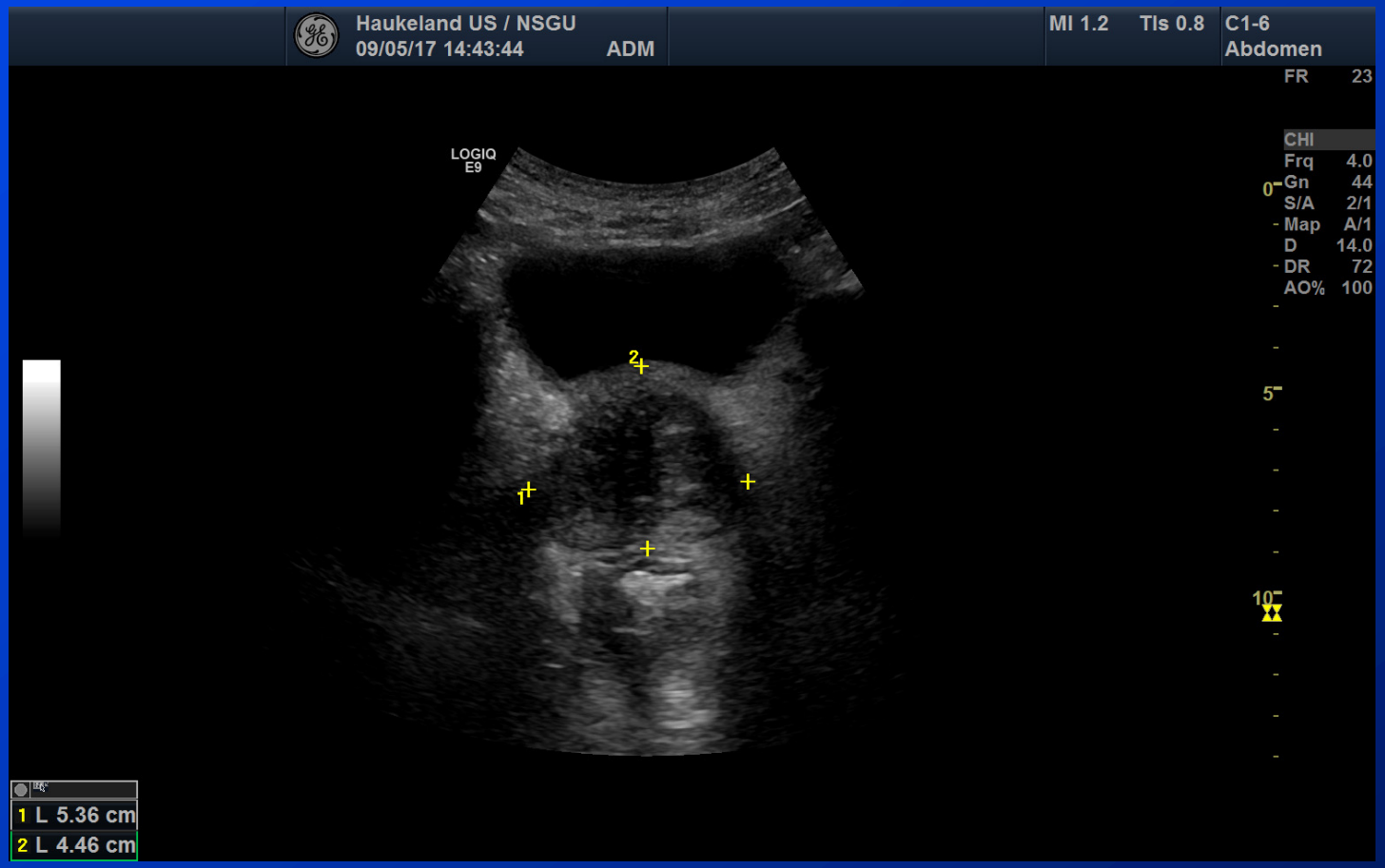


If in doubt, sound it out !

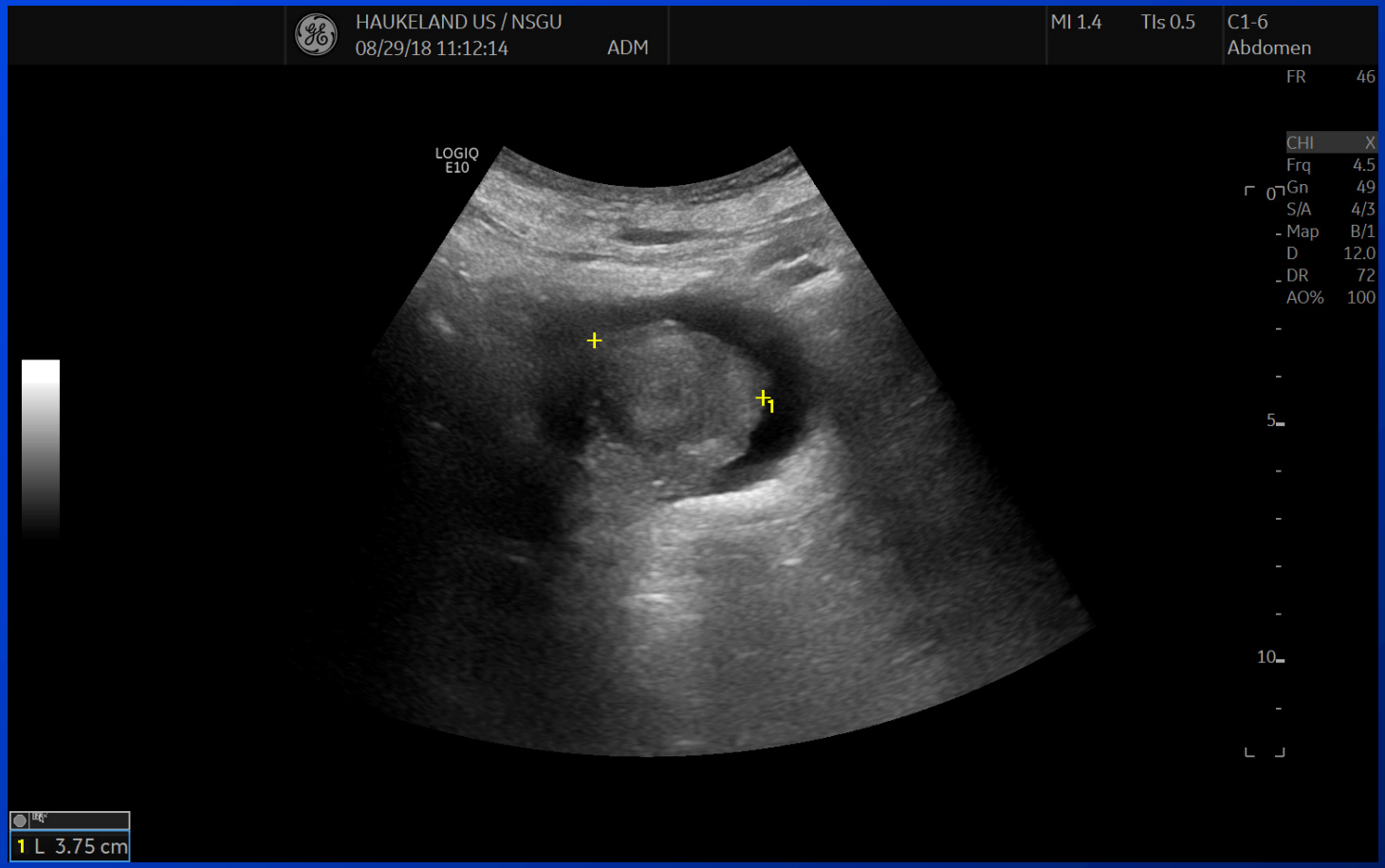




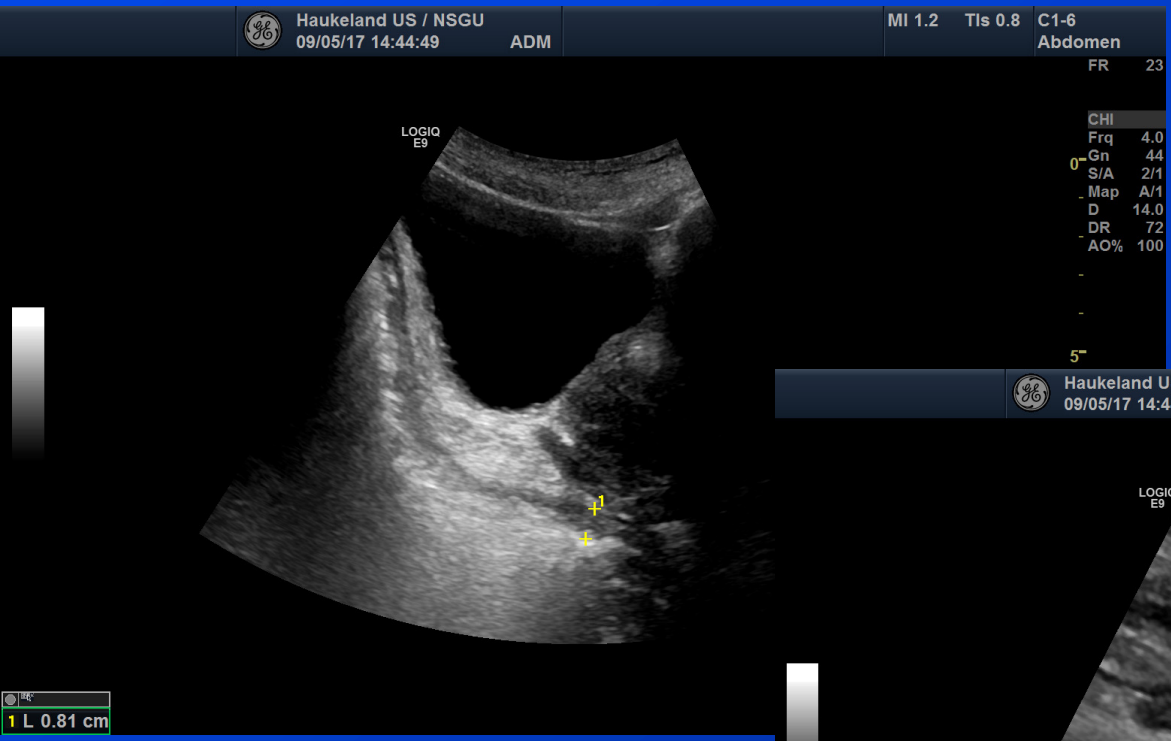
Big irregular Prostate

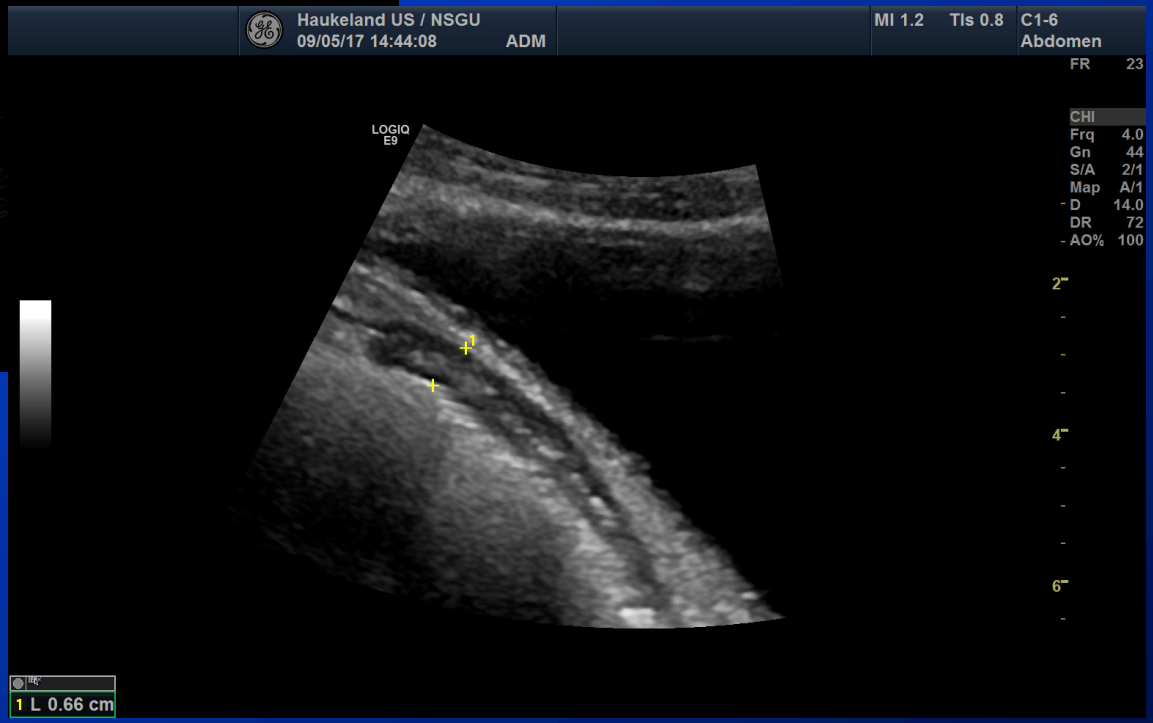


Tumor in the bladder

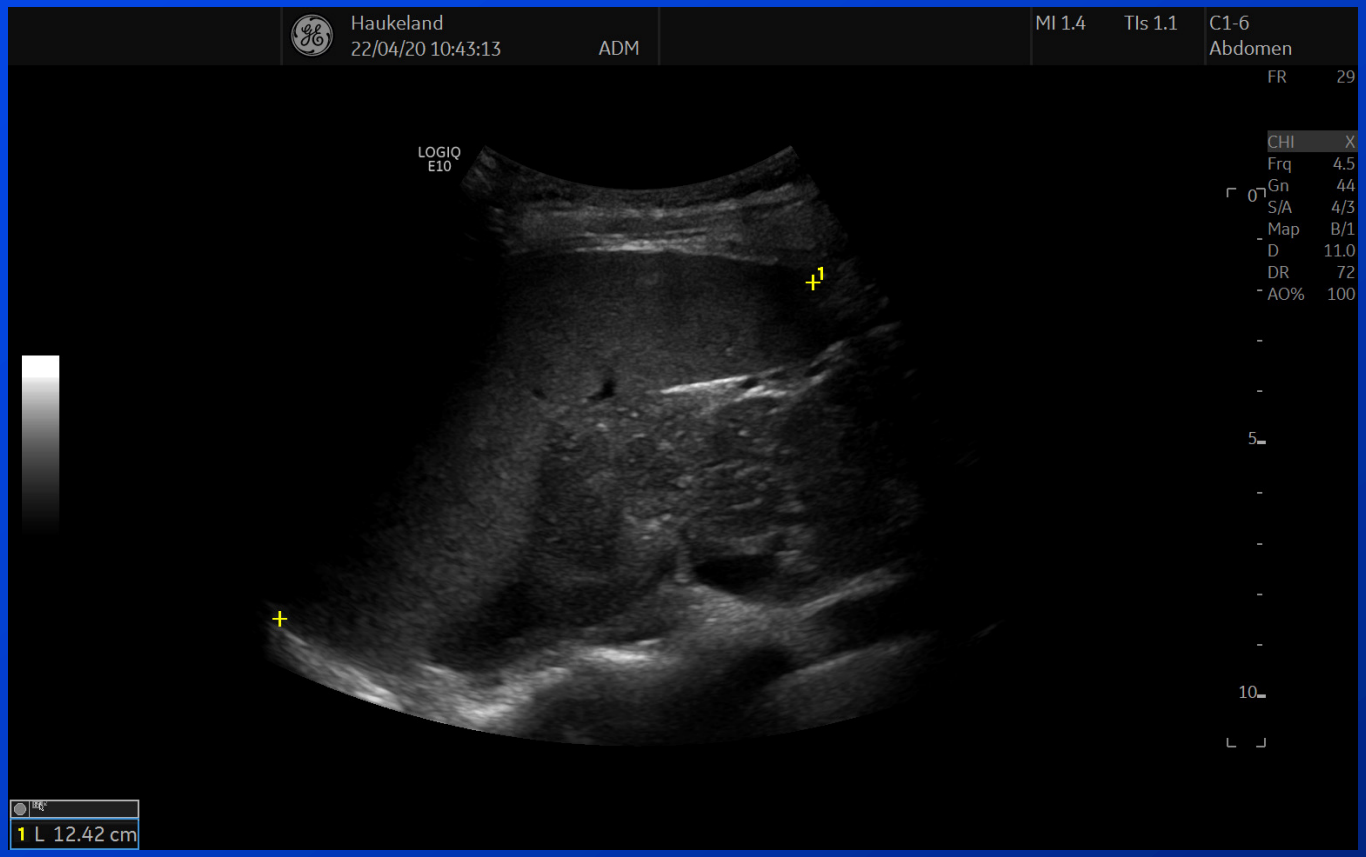


Look beyond the bladder !



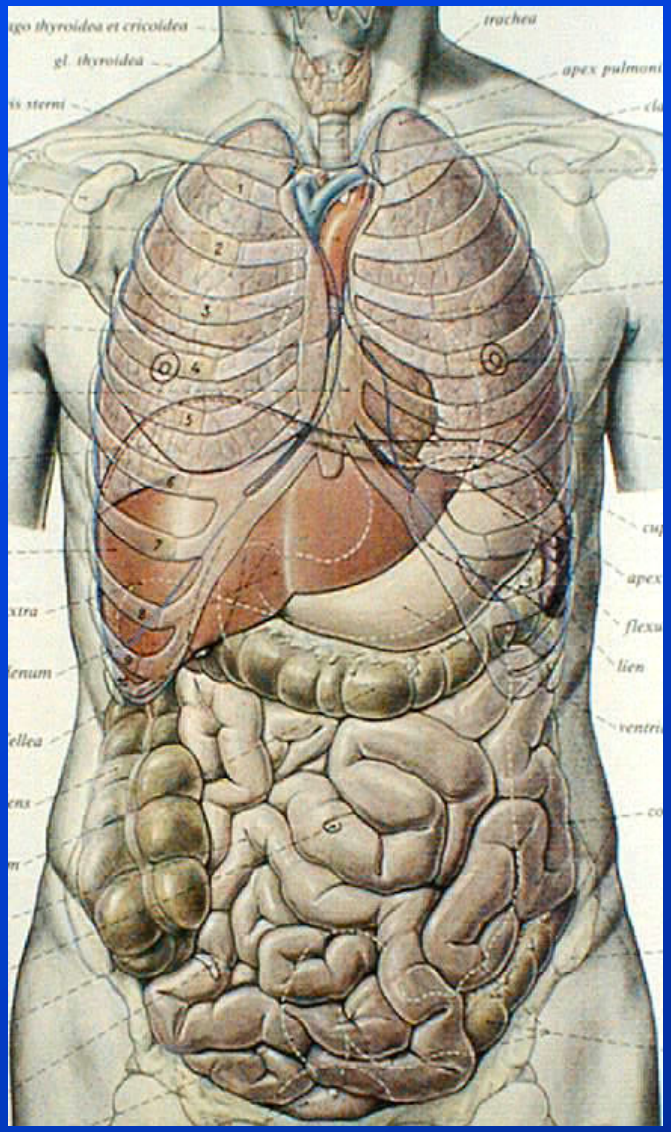


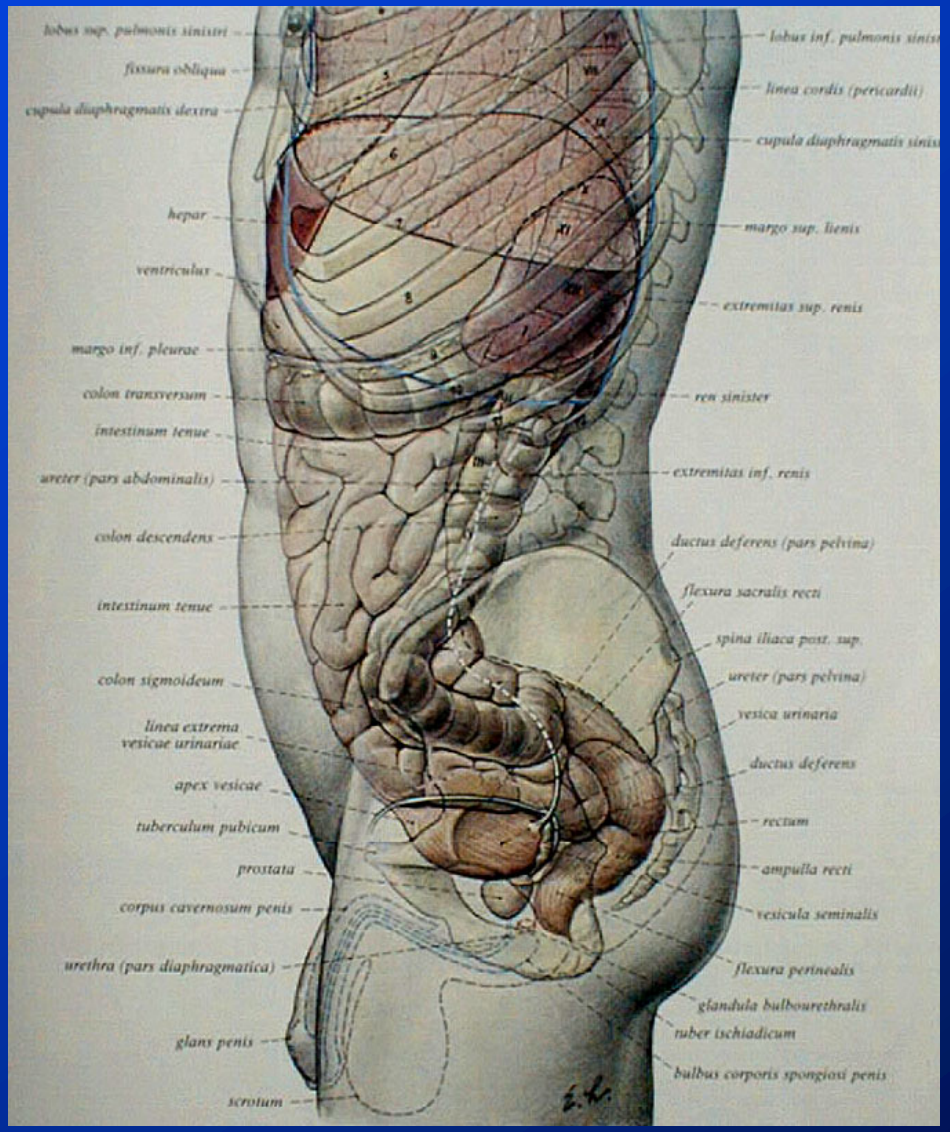
The spleen



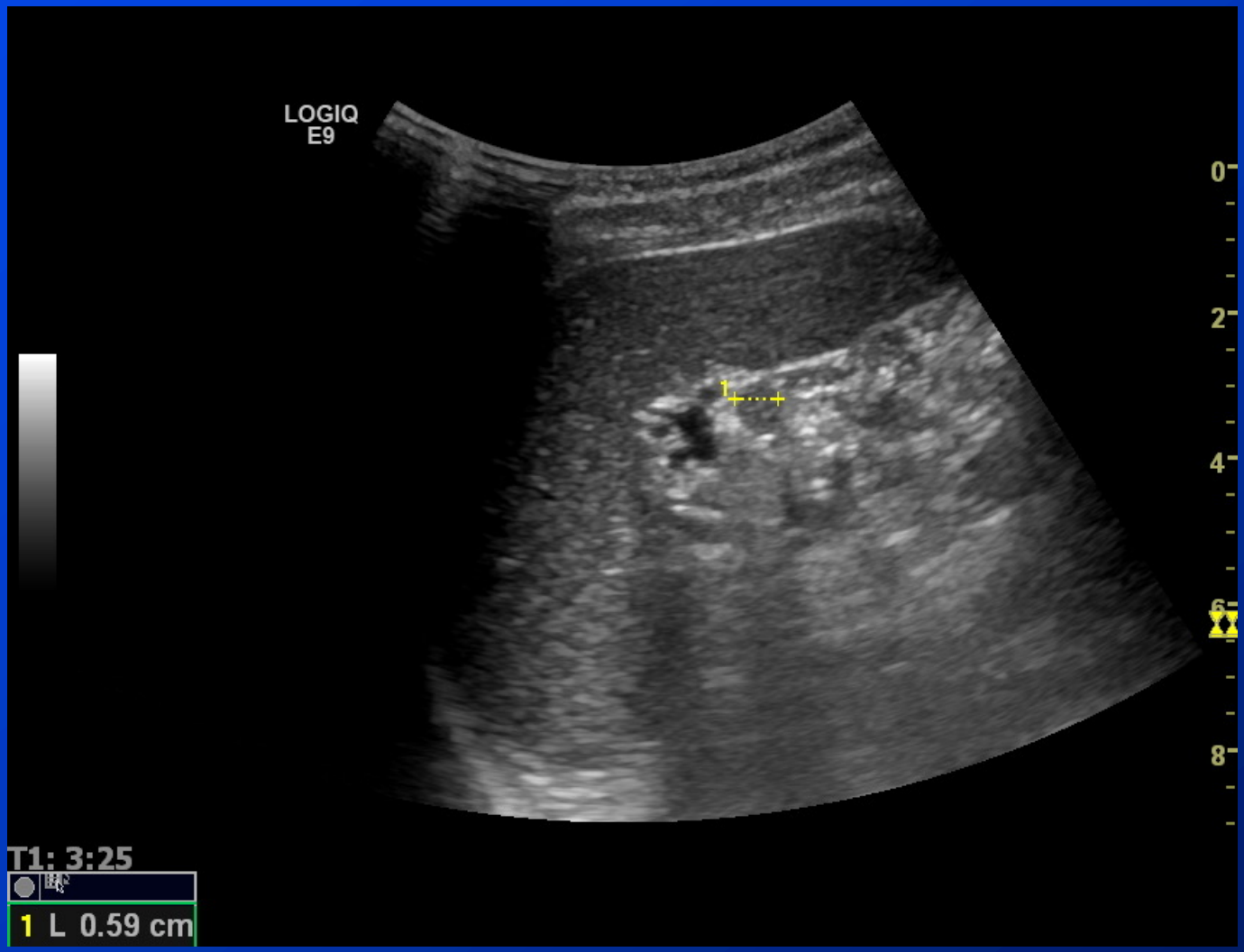
- Maximal ultrasonographic size: 12 x 8 x 4 cm
- The size tend to decrease in high ages
- 2-3 % of normals have accessory spleen

Organ Projection

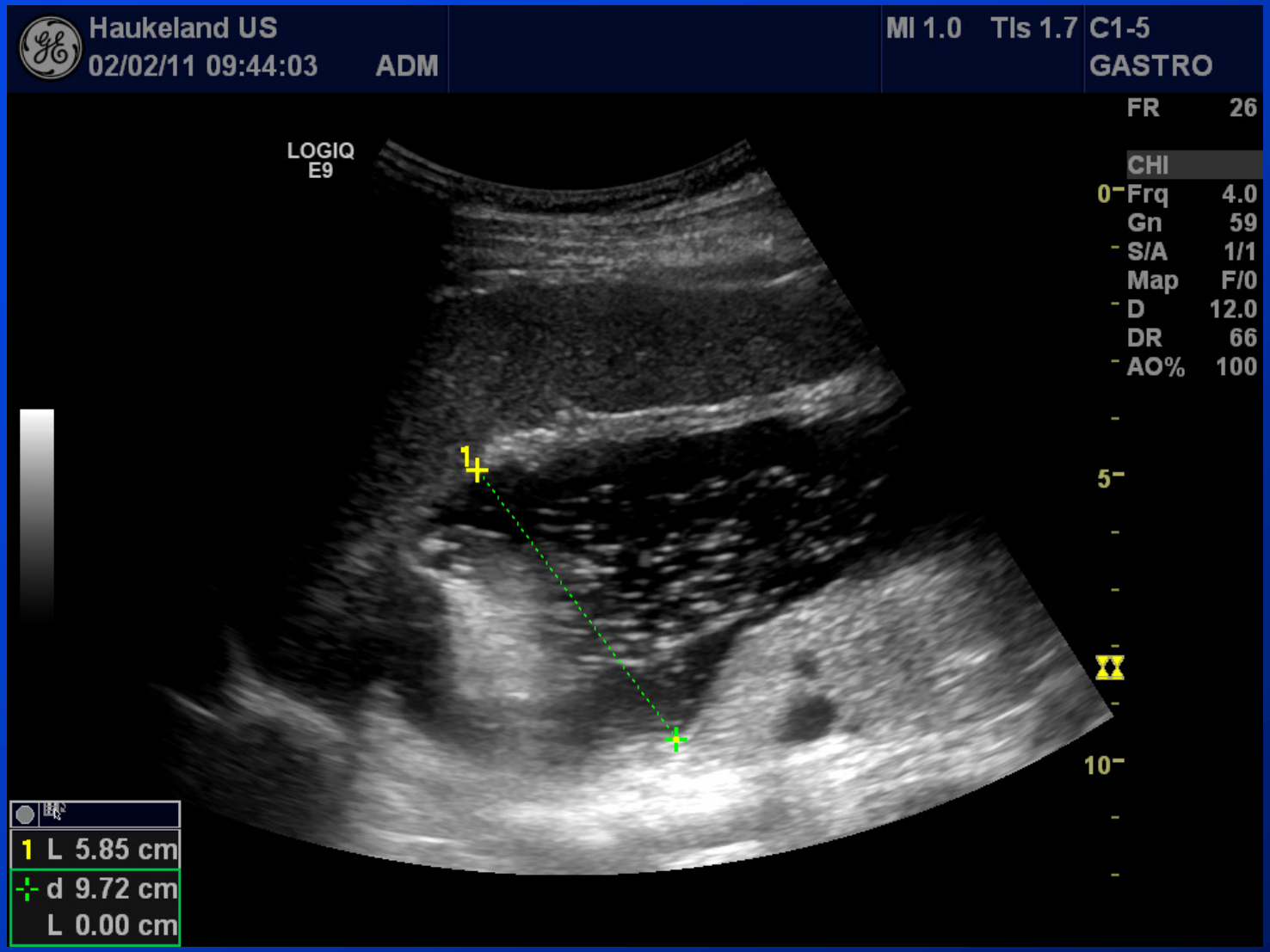




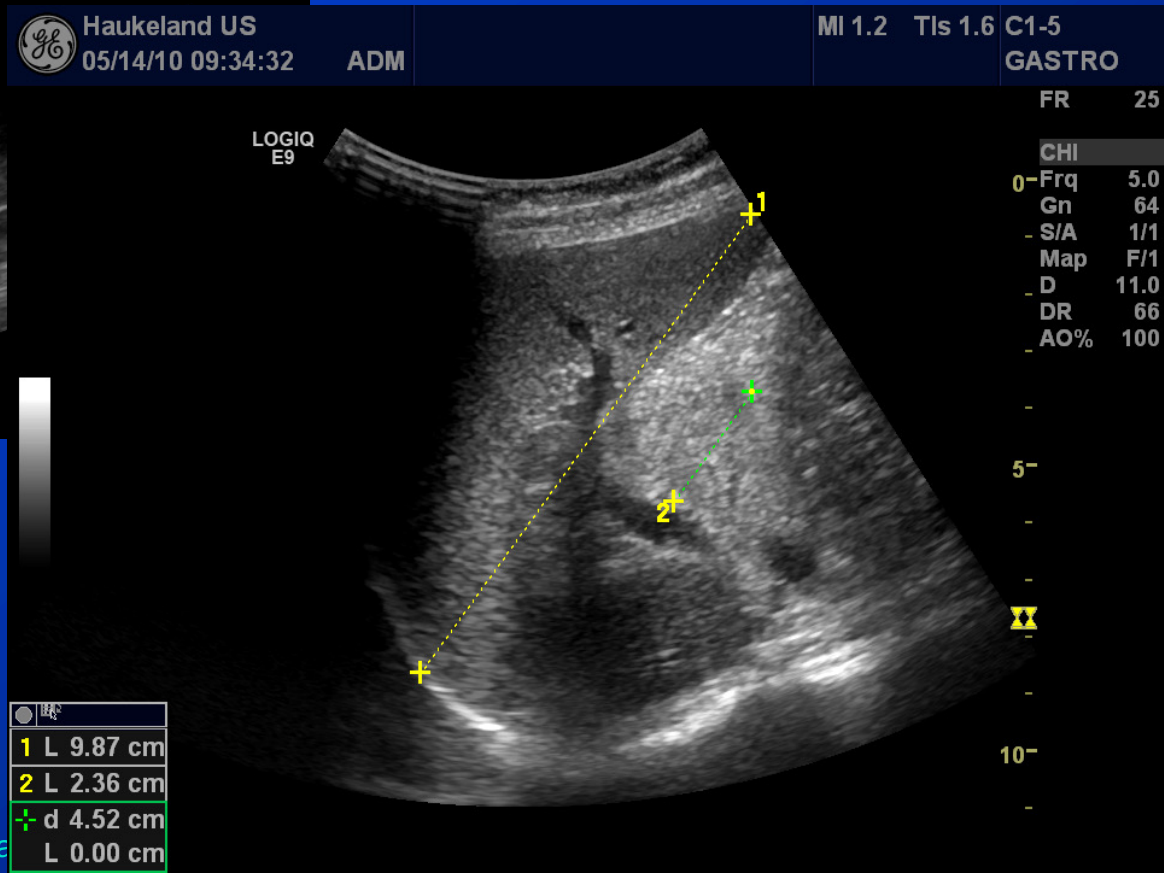
Accessory Spleen



Spleen as acoustic window



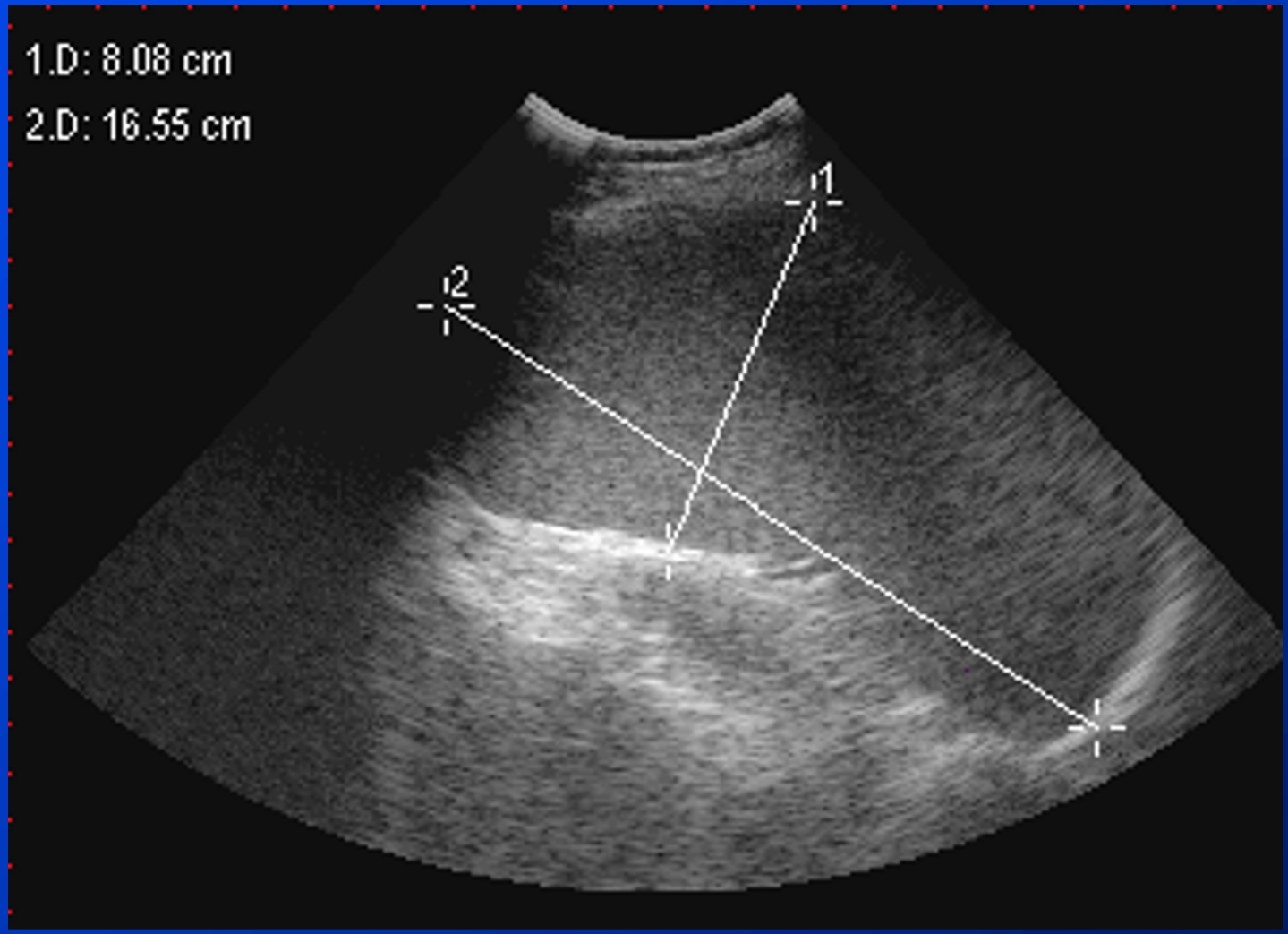
Pancreas viewed through the spleen



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 splenomagaly
  - Cirrhosis, portal or splenic vein thrombosis
- Metabolic diseases
  - Gaucher, Niemann-Pick, Amyloidosis

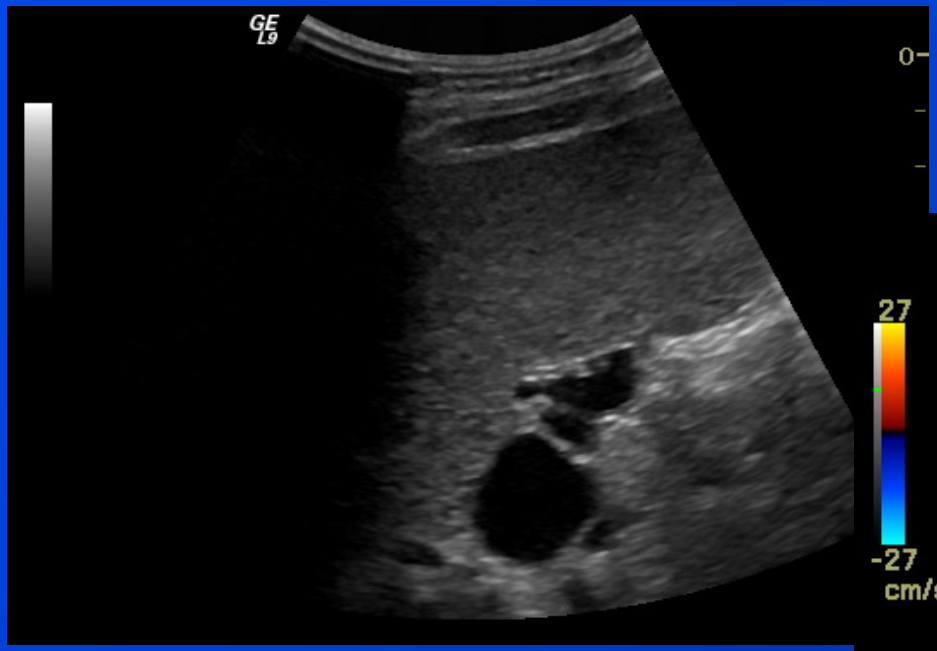
Splenomegaly

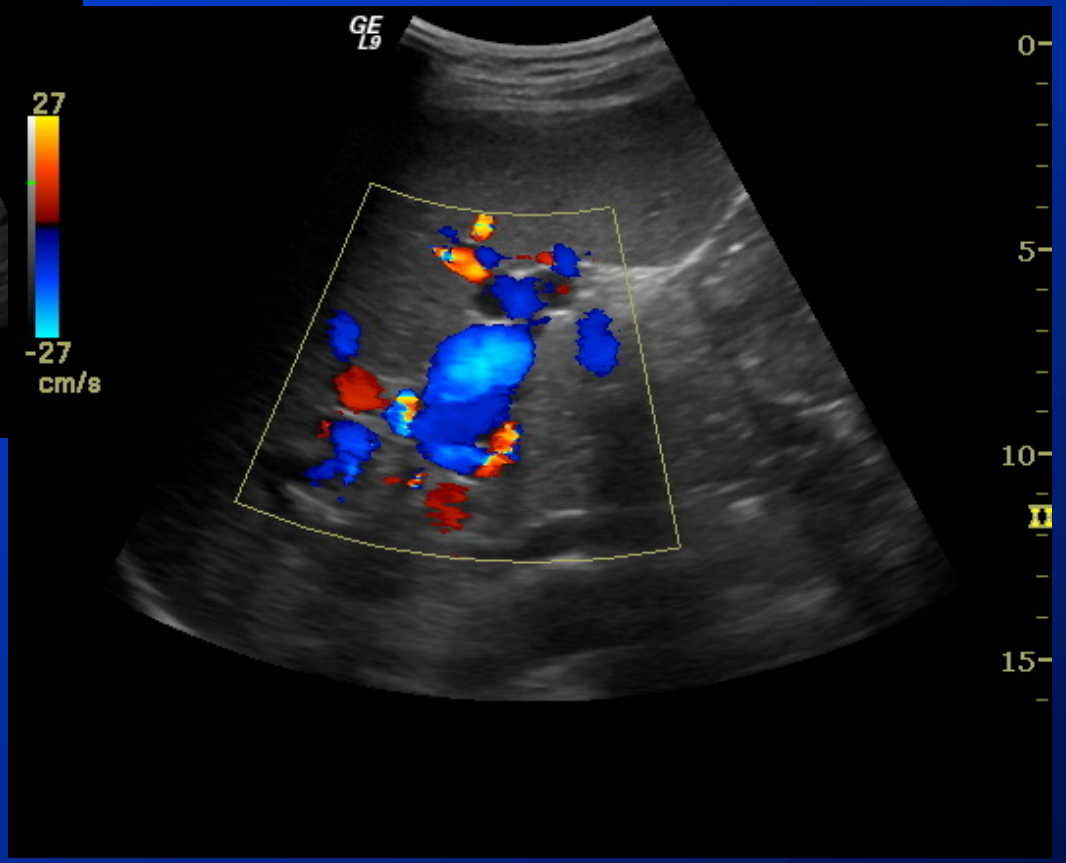


DX: Mononucleosis

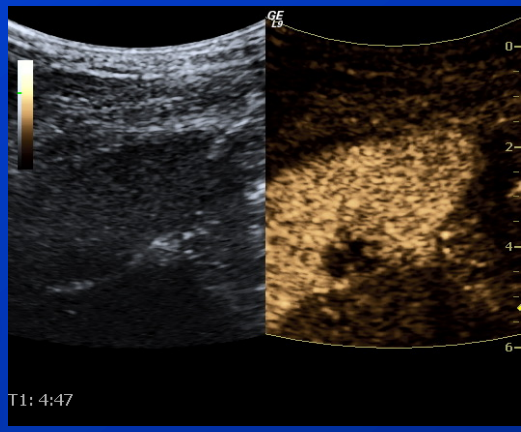
Massive splenomagali

If in doubt, sound it out !



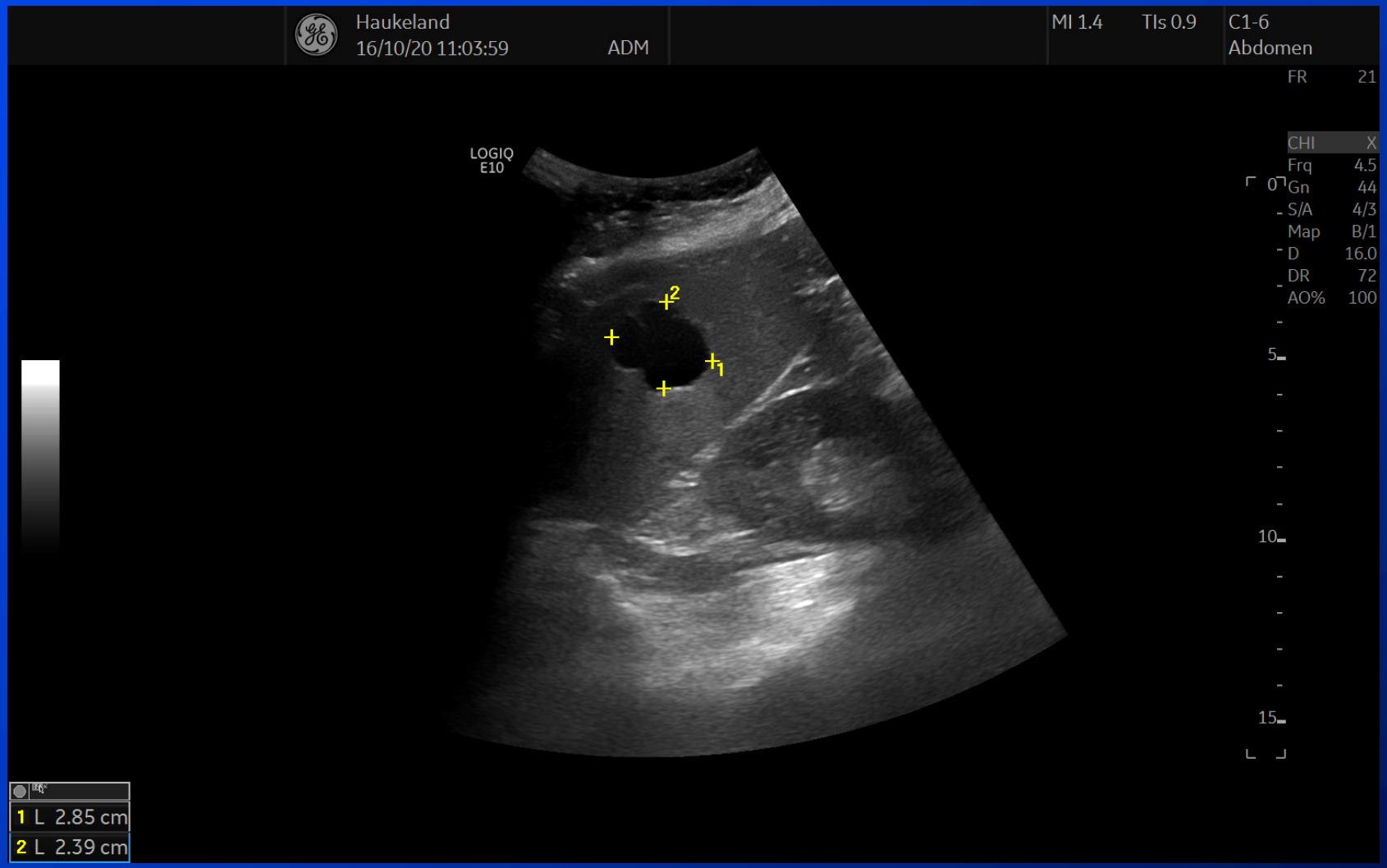


Neoplasms of the Spleen



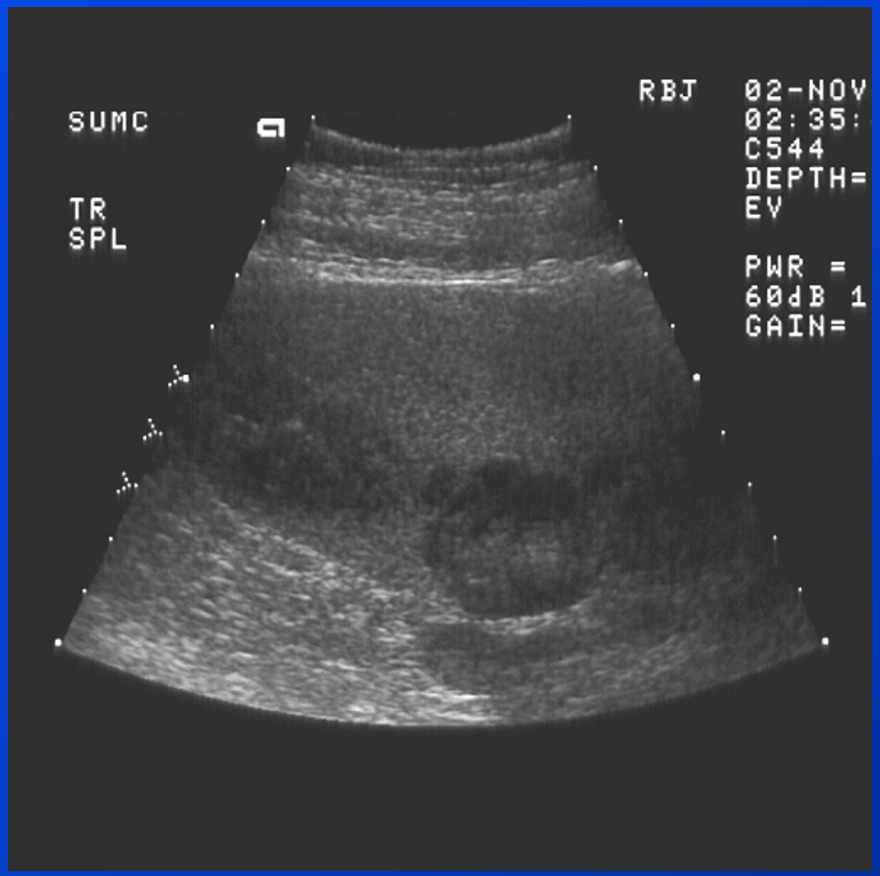
- Hemangiomas
  - Most frequent benign lesion
- Cystic lesions
  - Congenital (may contain cholesterol debris)
  - Post-traumatic lesions (residual hematoma)
    - 4 times more common than true cysts
  - Pancreatic pseudocysts
  - Ecchinococcus-cyst (usually multilocular)
- Lympoma
- Primary angiosarcoma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

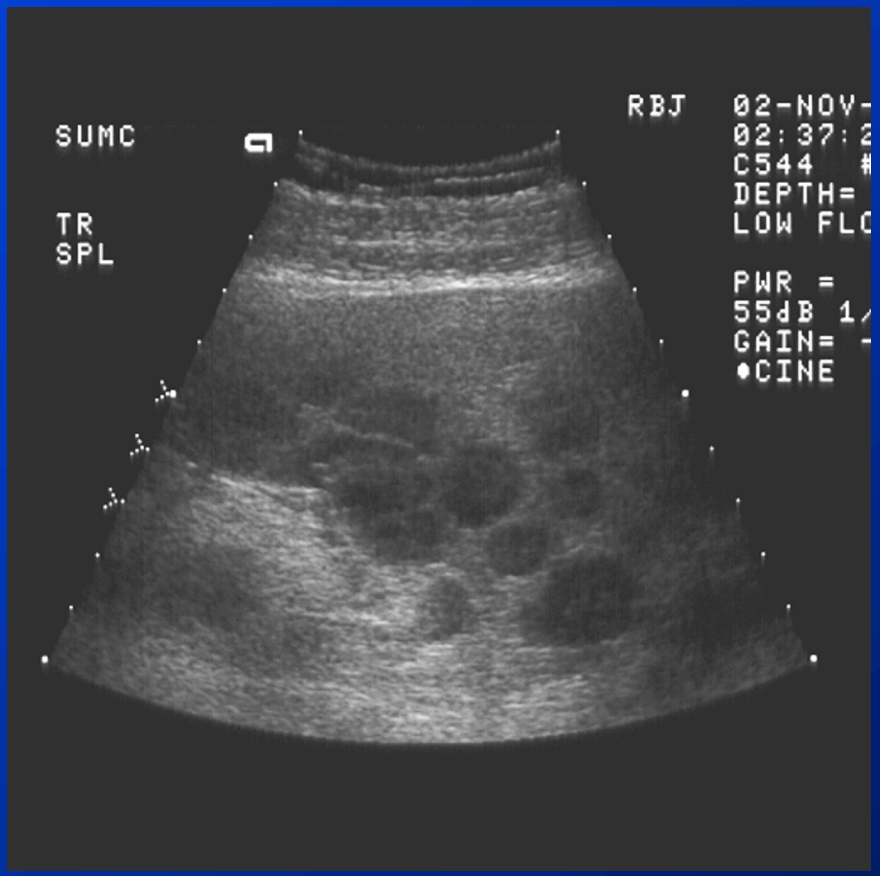
Simple cyst


Haukeland
16/10/20 11:03:59
ADM
MI 1.4
TIs 0.9
C1-6
Abdomen
FR 21
LOGIQ
E10
CHI X
Frq 4.5
Gn 44
S/A 4/3
Map B/1
D 16.0
DR 72
AO% 100
1 L 2.85 cm
2 L 2.39 cm

Lymphoma of the spleen

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

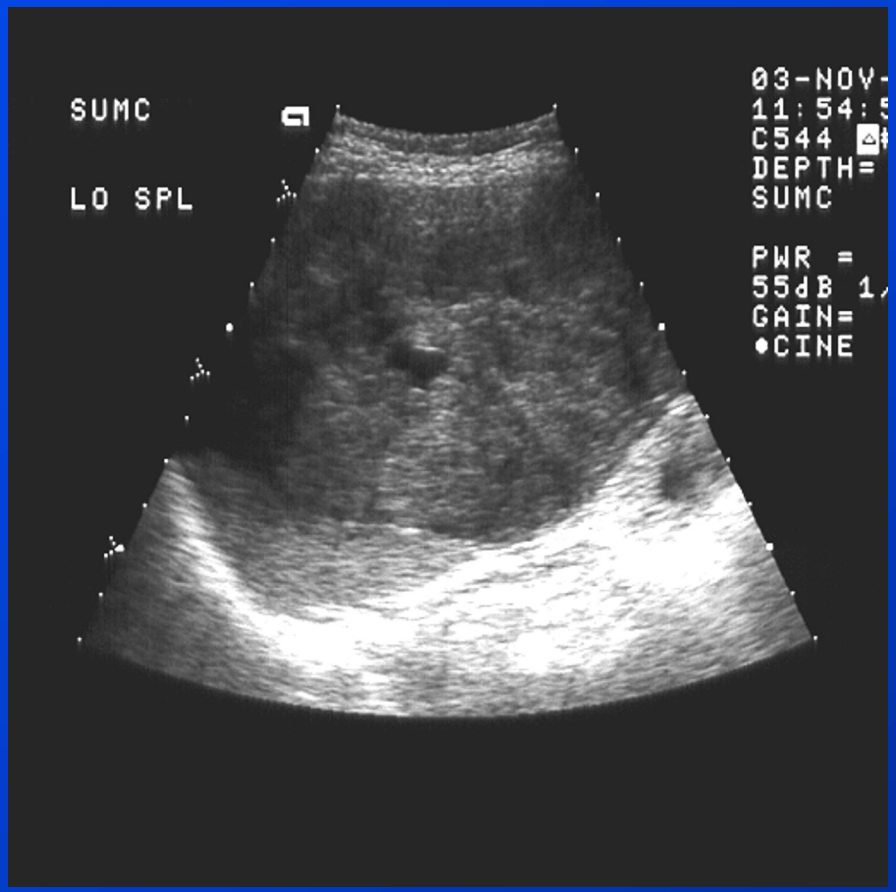




Transverse sonograms of the spleen demonstrating multiple rounded hypoechoic lesions with little enhanced sound transmission.

Metastasis to the Spleen

HISTORY: 47-year-old female with known ovarian carcinoma.



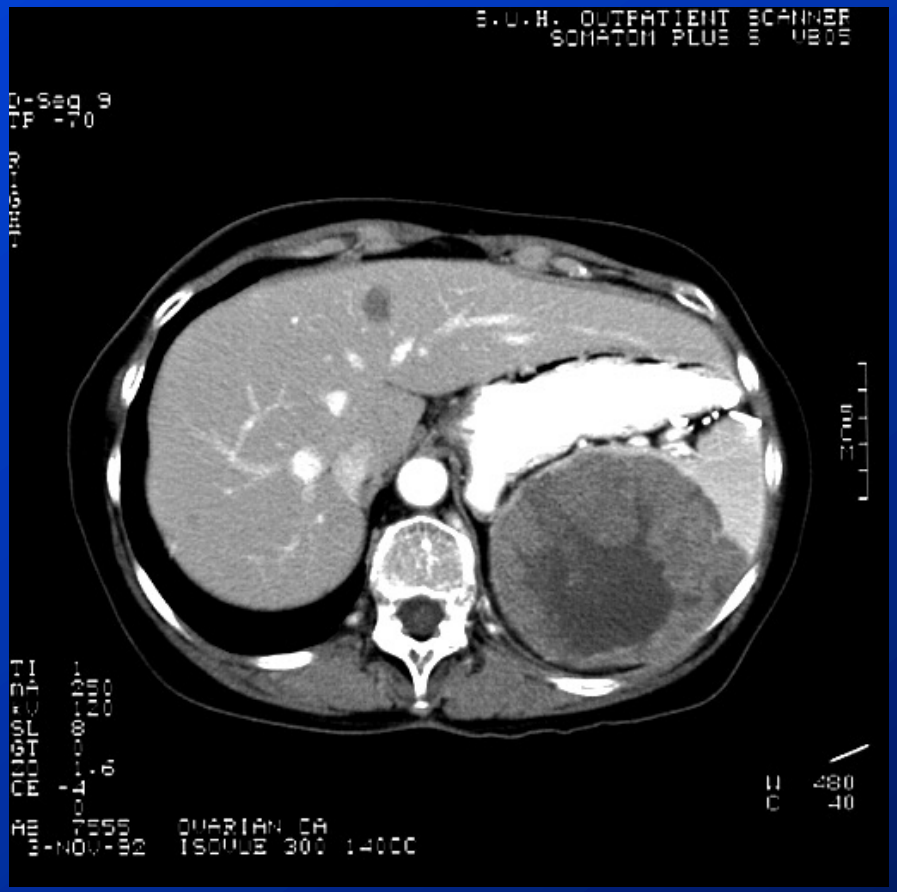
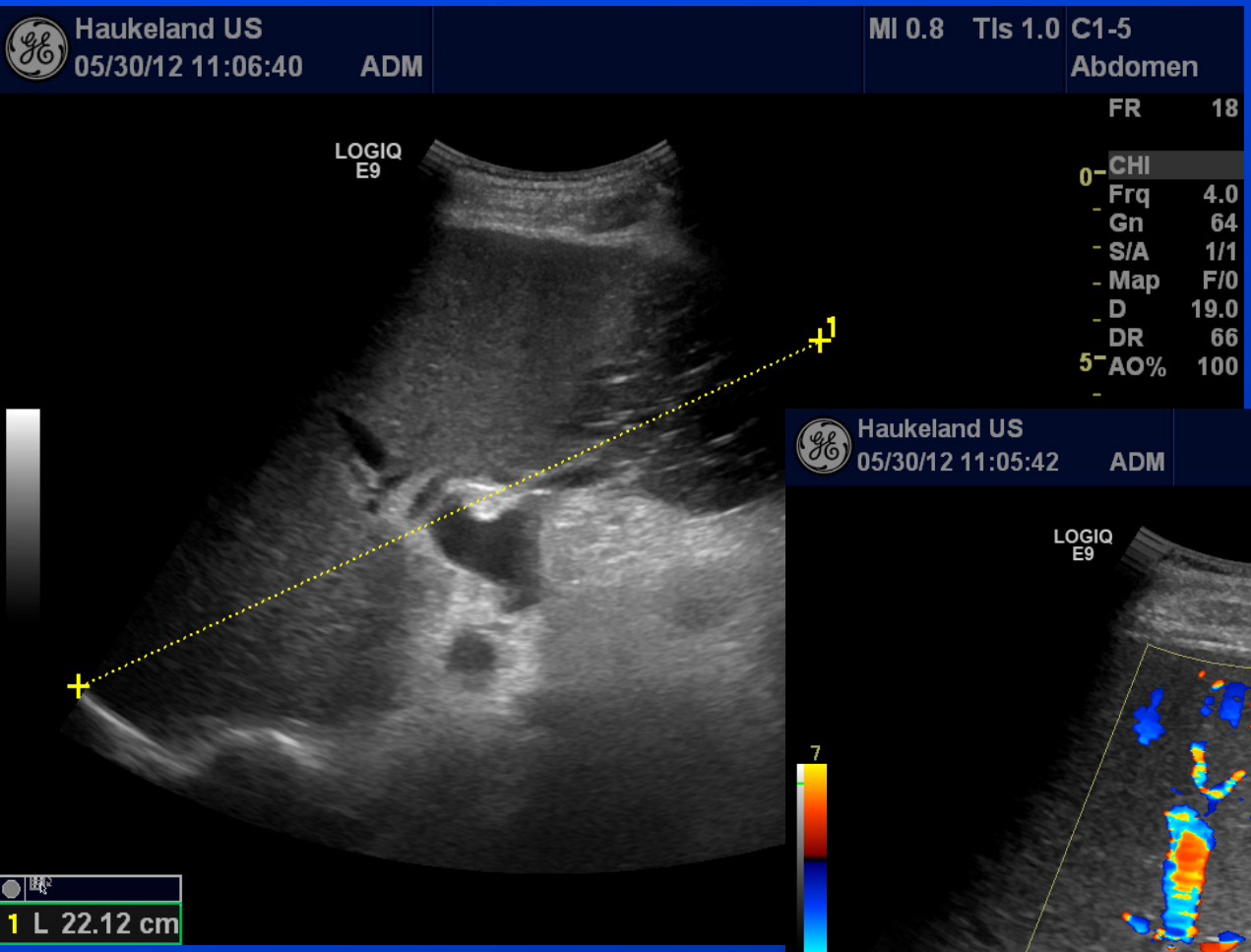


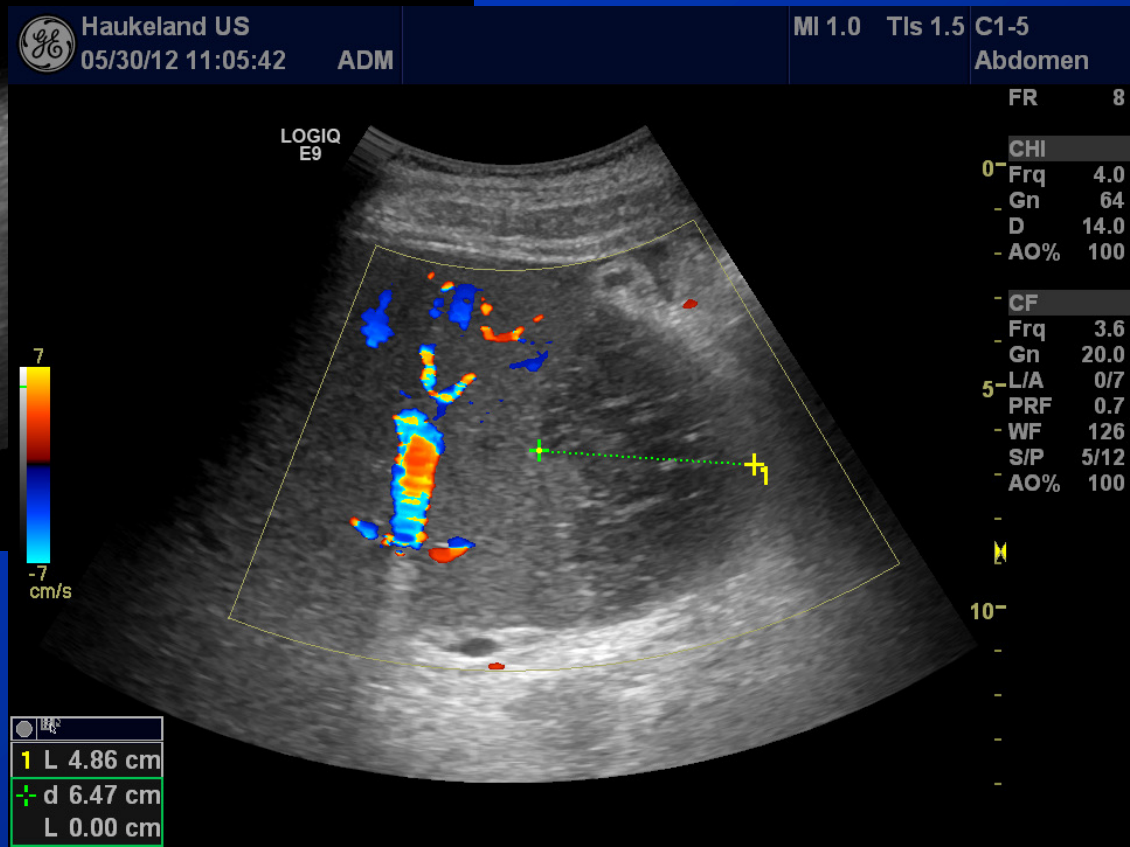
Image 1: A large lesion of mixed echogenicity occupying most of the spleen.
Image 2: Contrast-enhanced CT scan demonstrating a large low attenuating splenic lesion with areas of decreased attenuation centrally, probably related to necrosis.

Vascular Lesions of the Spleen

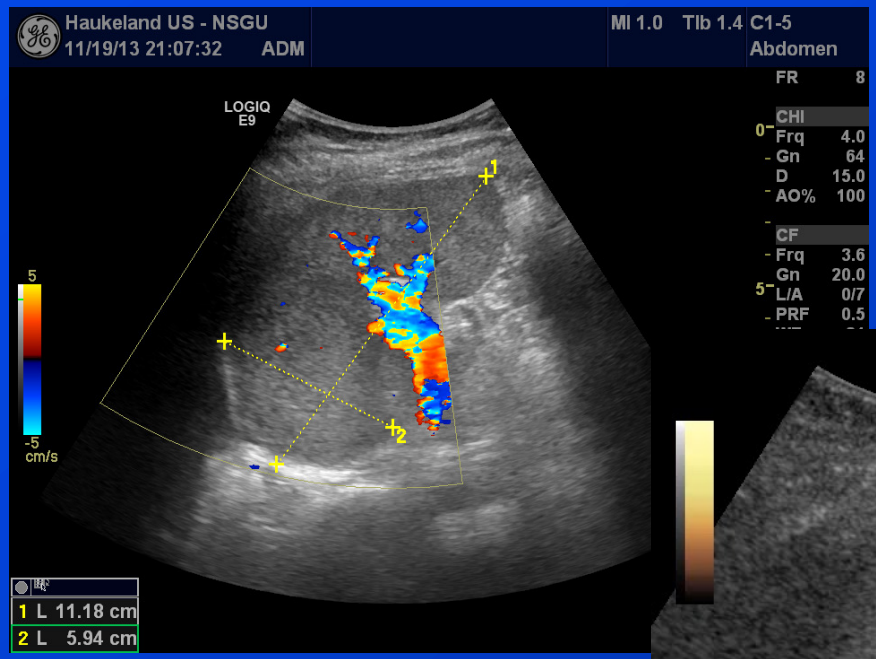
- Infarction
  - Wedge-shaped, often peripheral
  - Usually hypo-echoic
  - Septic infarcts may turn into a rounded lesion
- Aneurysm
  - Often related to atherosclerotic disease
  - Lesions larger than 1 cm should be followed
- Subcapsular hematoma
  - Often following trauma or massive splenomagaly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

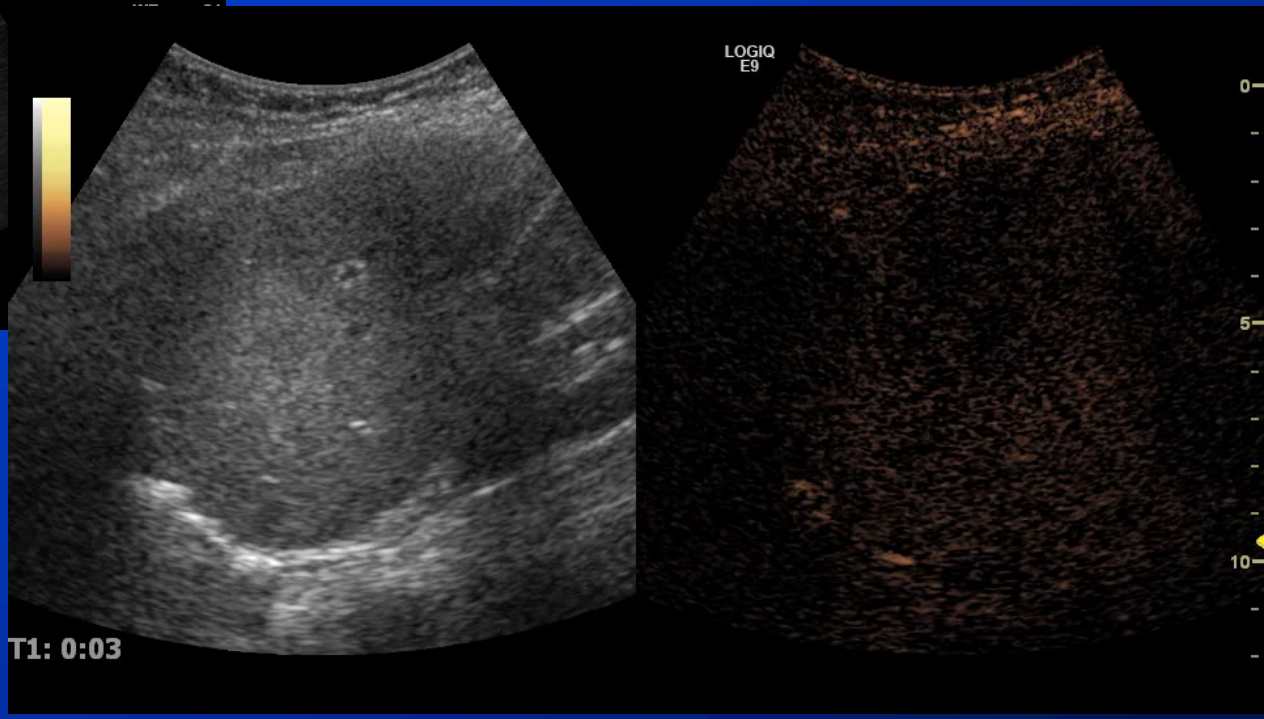
Splenic infarction





Splenic lesion – Previous trauma





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