Ultrasound of Superficial Lumps and Bumps

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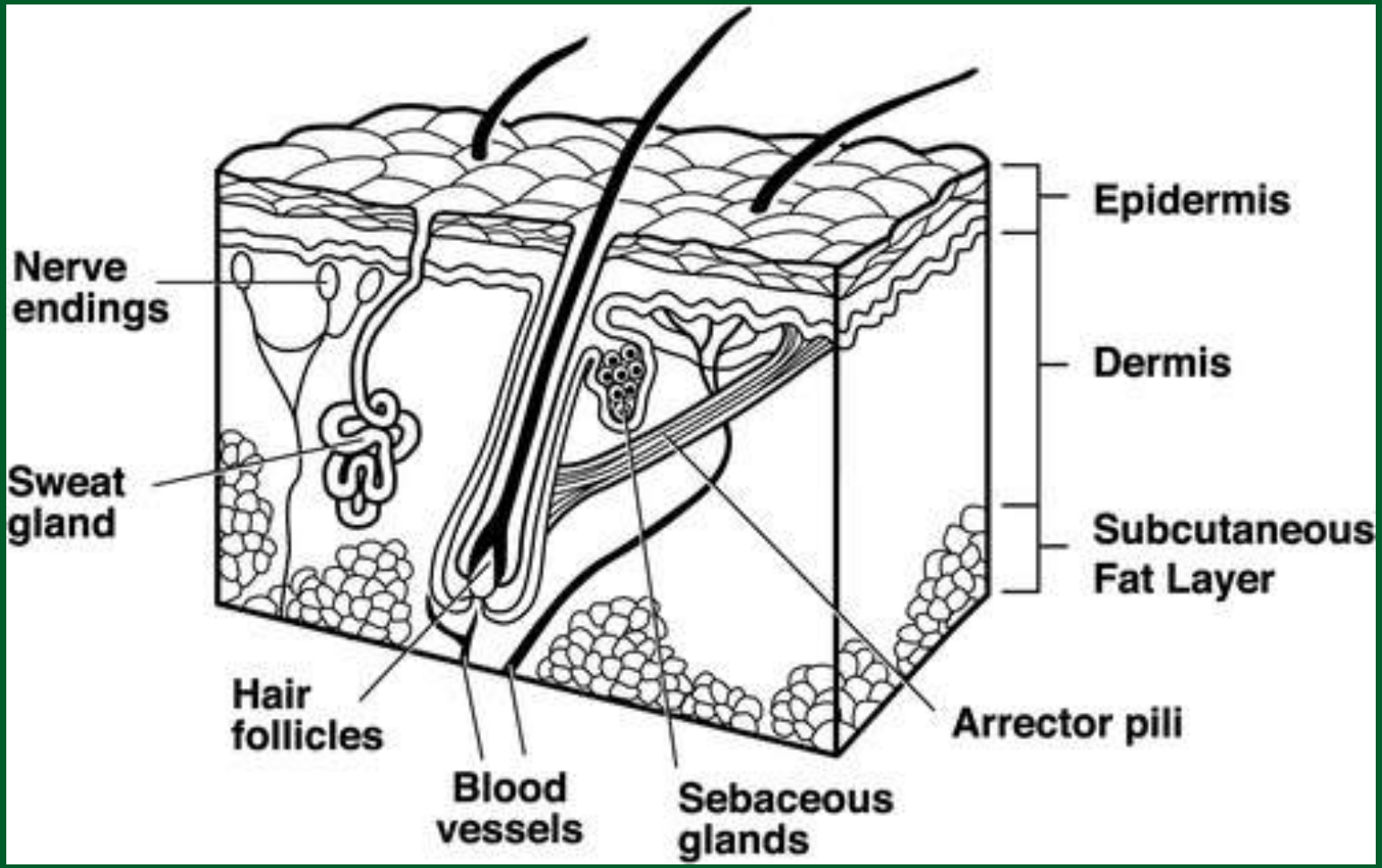
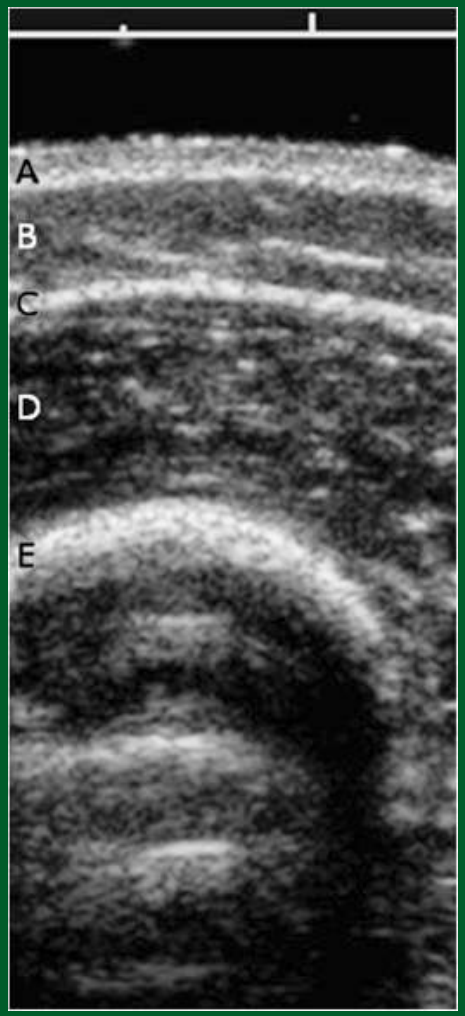
Layers of the Skin



Radiographics 2006; 26, 1289-1304

Superficial Anatomy



A — Epidermis and Dermis

B — Subcutaneous

C — Deep Fascia

D — Muscle

E — Bone

Shah and Callahan, Pediatric Radiology 2013; 43:S23-40

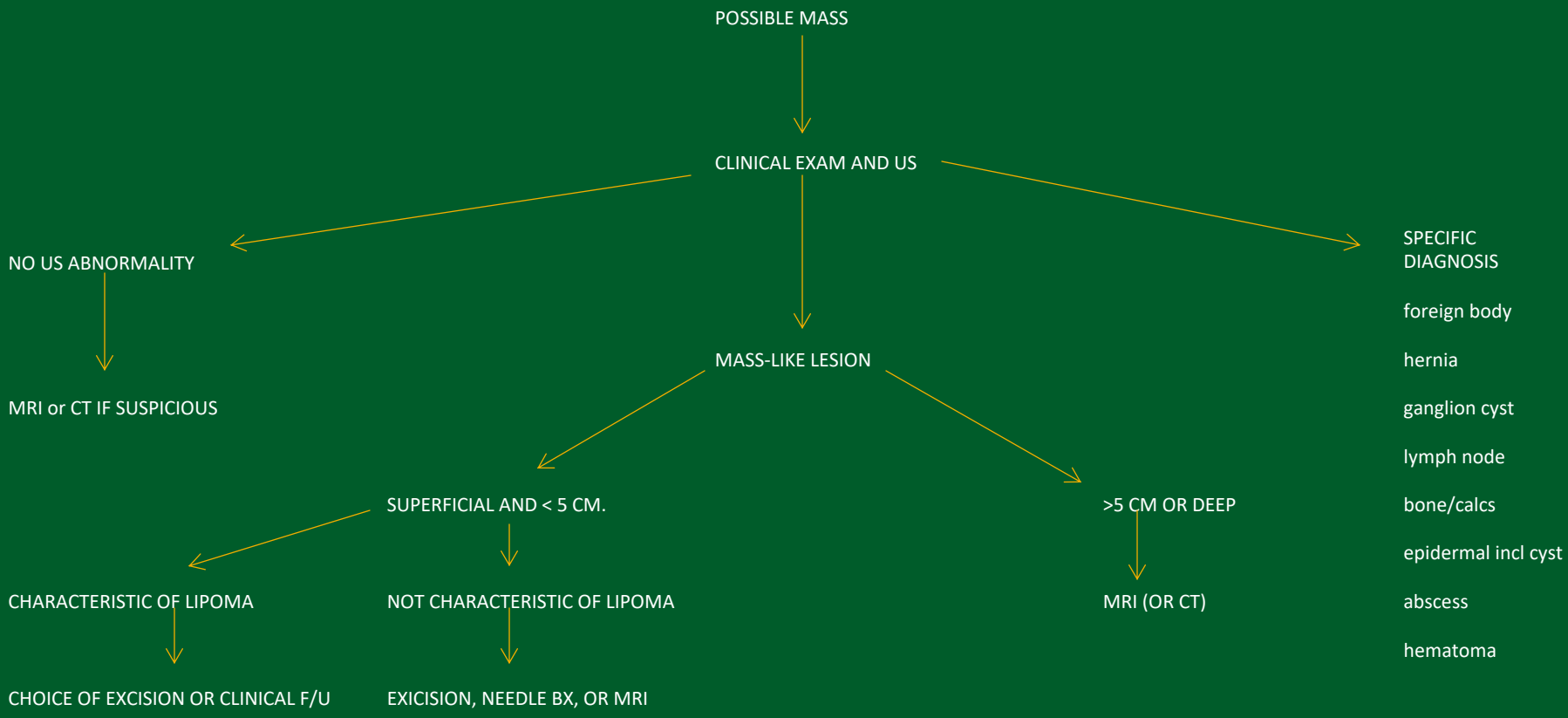
Skin Layers

- Epidermis
  - Thinnest layer
  - Keratinocytes
  - Merkel cells, melanocytes
- Dermis
  - Fibroblasts, endothelial and neural cells
  - Collagen
- Subcutaneous
  - Lipid cells, blood vessels, septa

General Principles

- History-especially for post-trauma pts.
- Physical exam is mandatory (MD)
- Scan with highest frequency transducer (≥ 8-12 MHz)
- Lots of gel/stand-off pad/light touch
- Color Doppler-optimized for slow flow
- ** ***Use contralateral side for comparison-Dual imaging mode*** **

Decision Tree for U/S of Superficial Lumps



from J. Wagner, Ultrasound Clinics, 2014

4 Criteria of a Simple Cyst by U/S

- Anechoic
- Imperceptible walls
- Smooth, round shape
- Increased through transmission

- Rarely, simple cysts in the skin or subQ tissue

US-All ages (1-90+)

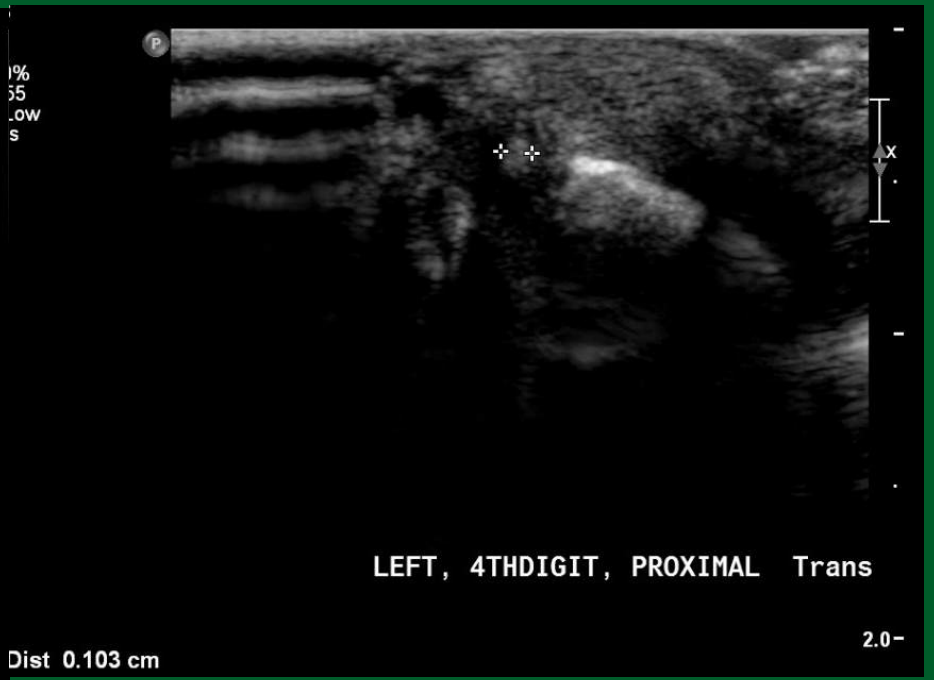
- Foreign Bodies
- Cellulitis/Abscess

Foreign bodies-US invaluable

- Sensitivity, PPV– both > 95%
- Wood, thorns, glass, plastic, metal: all well shown
- *Echogenic structures* +/- shadowing
- If Hyperechoic rim surrounding hypoechoic center, + compressibility, think = abscess

Foreign body- Ultrasound is best search method (before plain films)

Wooden splinter



Deep wood splinter causing partial tendon tear

Skin and ST infection

- Cellulitis/Phlegmon
  - infection of skin and soft tissues
- Ultrasound Findings
  - Skin thickening
  - Hyperemia (color Doppler)
  - Subcutaneous edema
- Classic cobblestoning
  - Fluid tracking between fatty lobules in SubQ
- Dirty shadowing
  - think gas from infection

"Cobblestoning" of Sub-Q fat

SubQ Edema

Sonosite 180 , Kigali, Rwanda

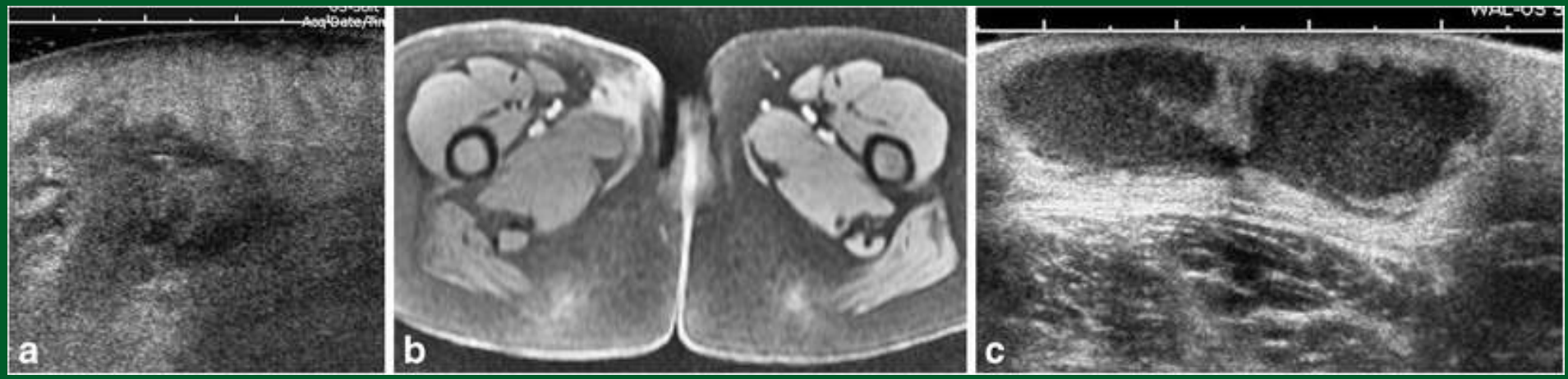
Cobblestoning-Sub Q edema++

Cellulitis

Skin/fat thickening

MRI with contrast

Frank abscess

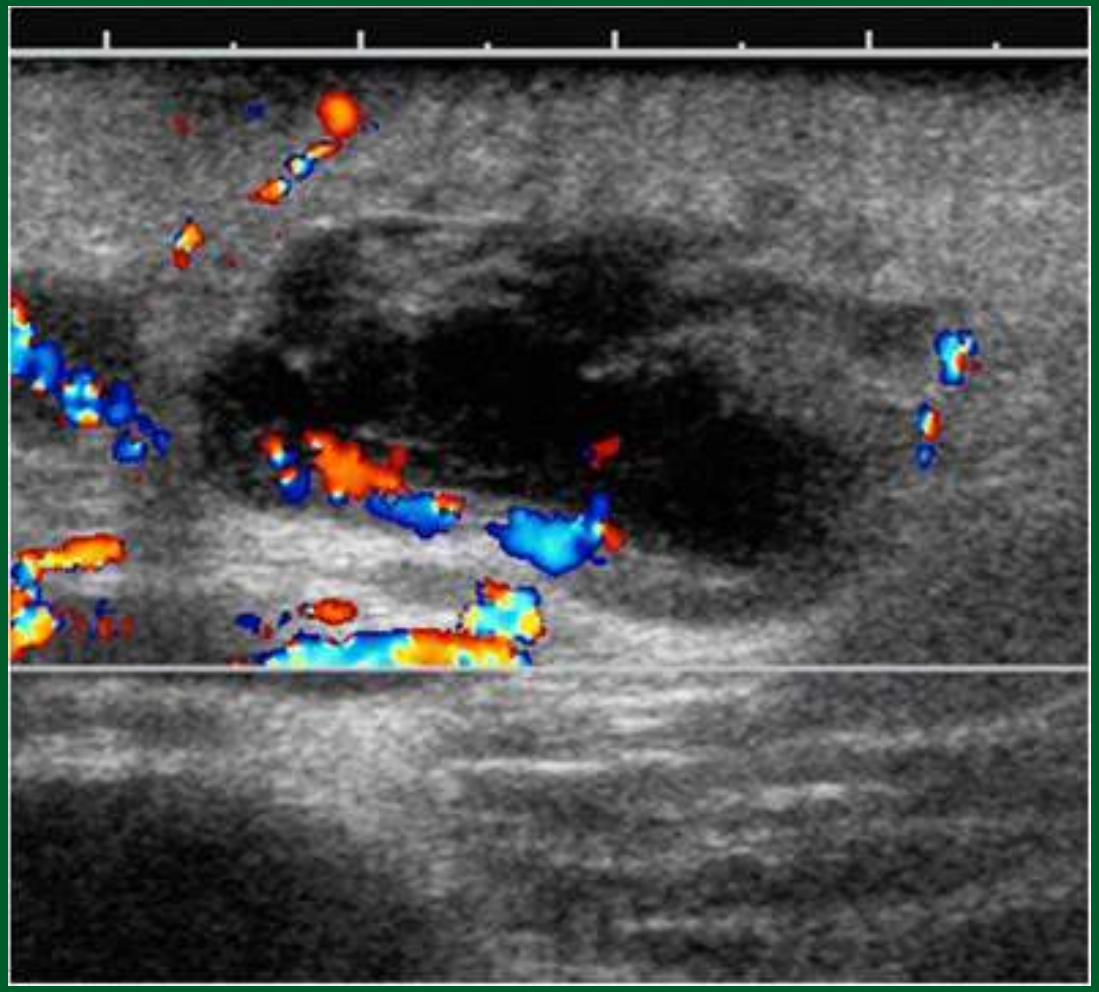


Shah and Callahan, 2013

Skin and ST Infection

- Abscess
  - Early-difficult clinically to distinguish from cellulitis
  - Complex (int. echoes) fluid collection with thick, irregular (+/ - hyperemic) wall
  - May be pockets of gas-echogenic foci
  - US allows for easy aspiration, drainage

Early abscess-discrete, anechoic collection with marginal hyperemia

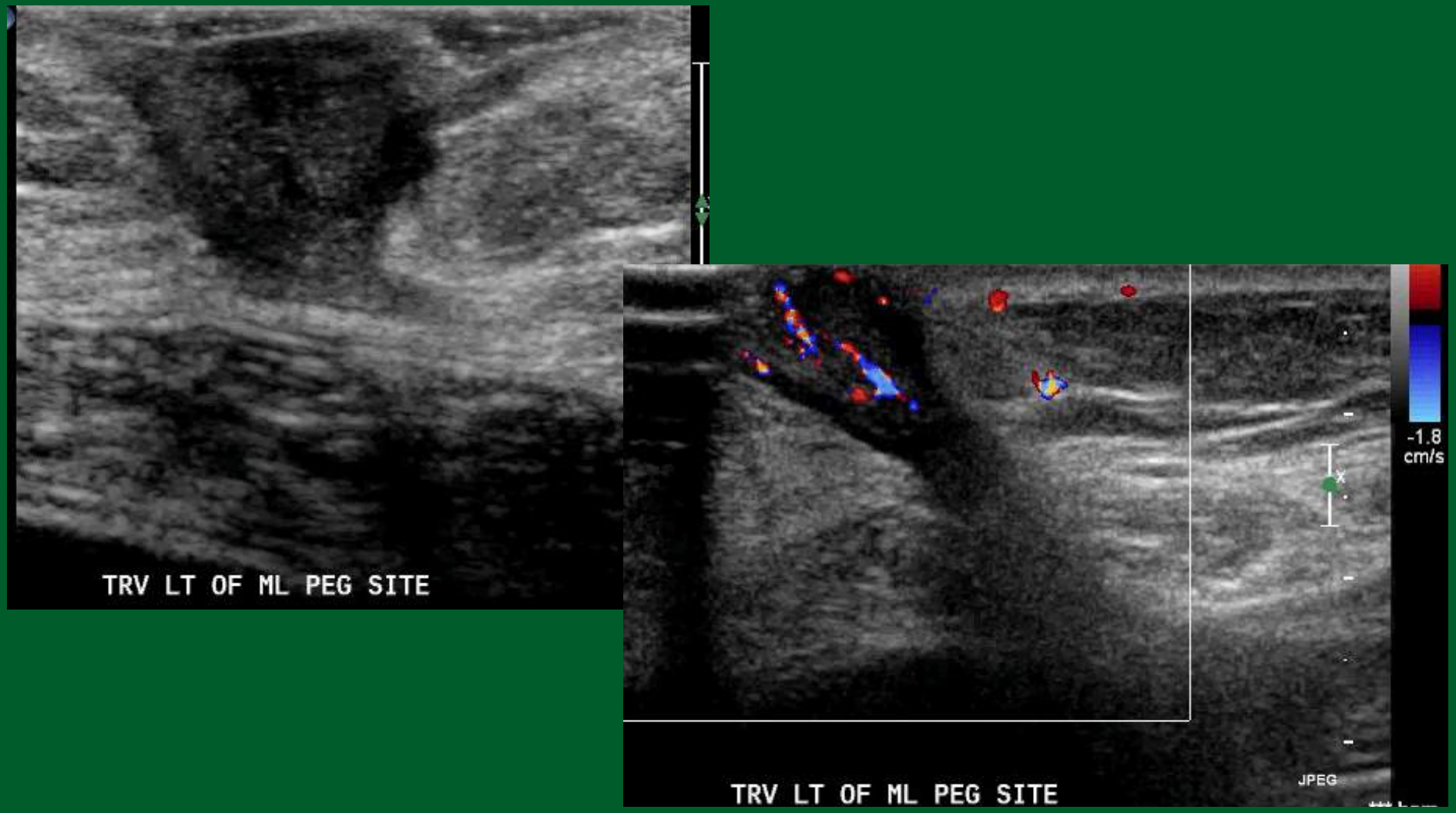


Late lymphadenitis/early abscess

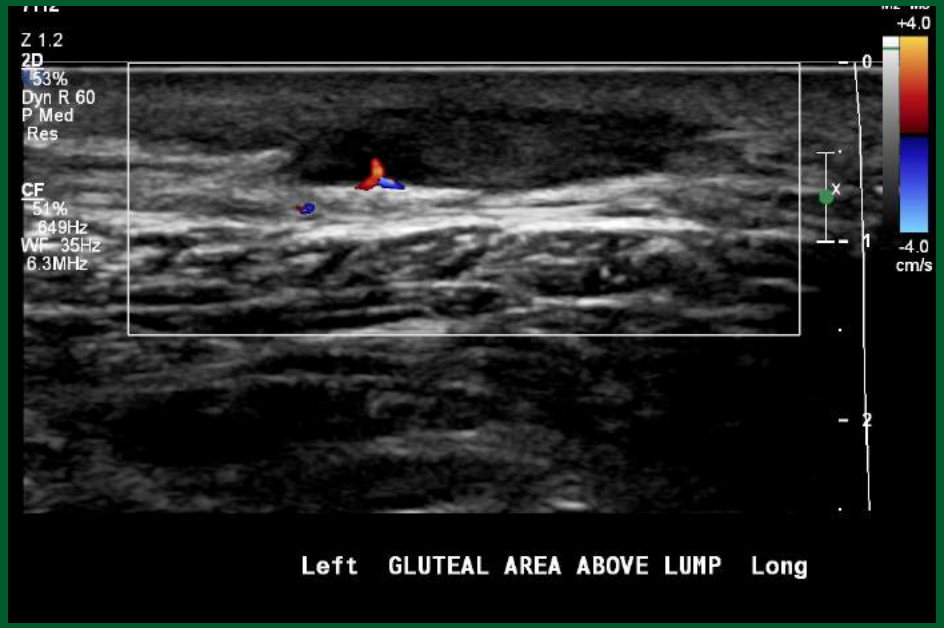
Early abscess

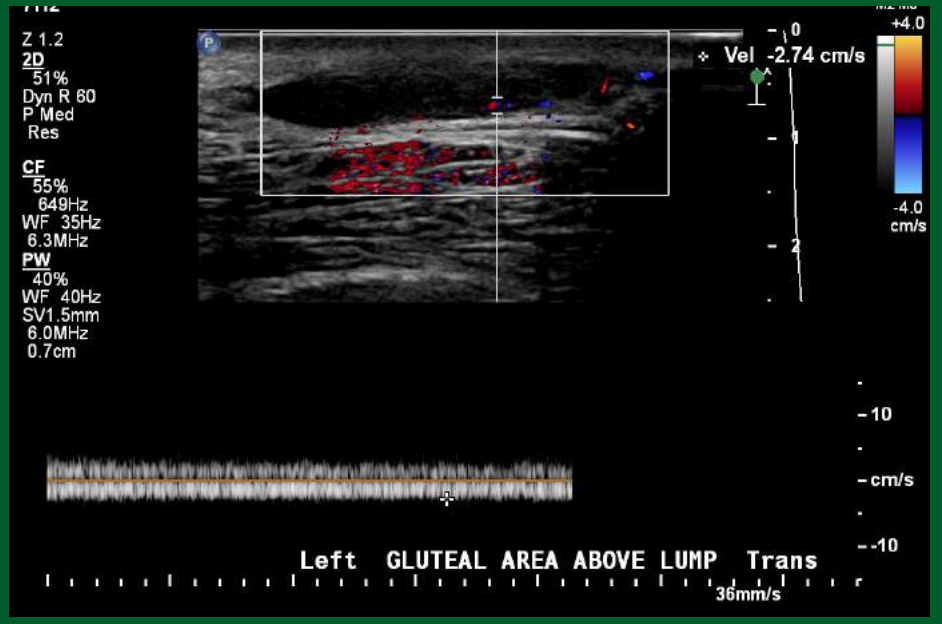
Early abscess in IV drug abuser

Granulation Tissue @ PEG site



77 yo with Gluteal area lump with + color Doppler-concern for sarcoma



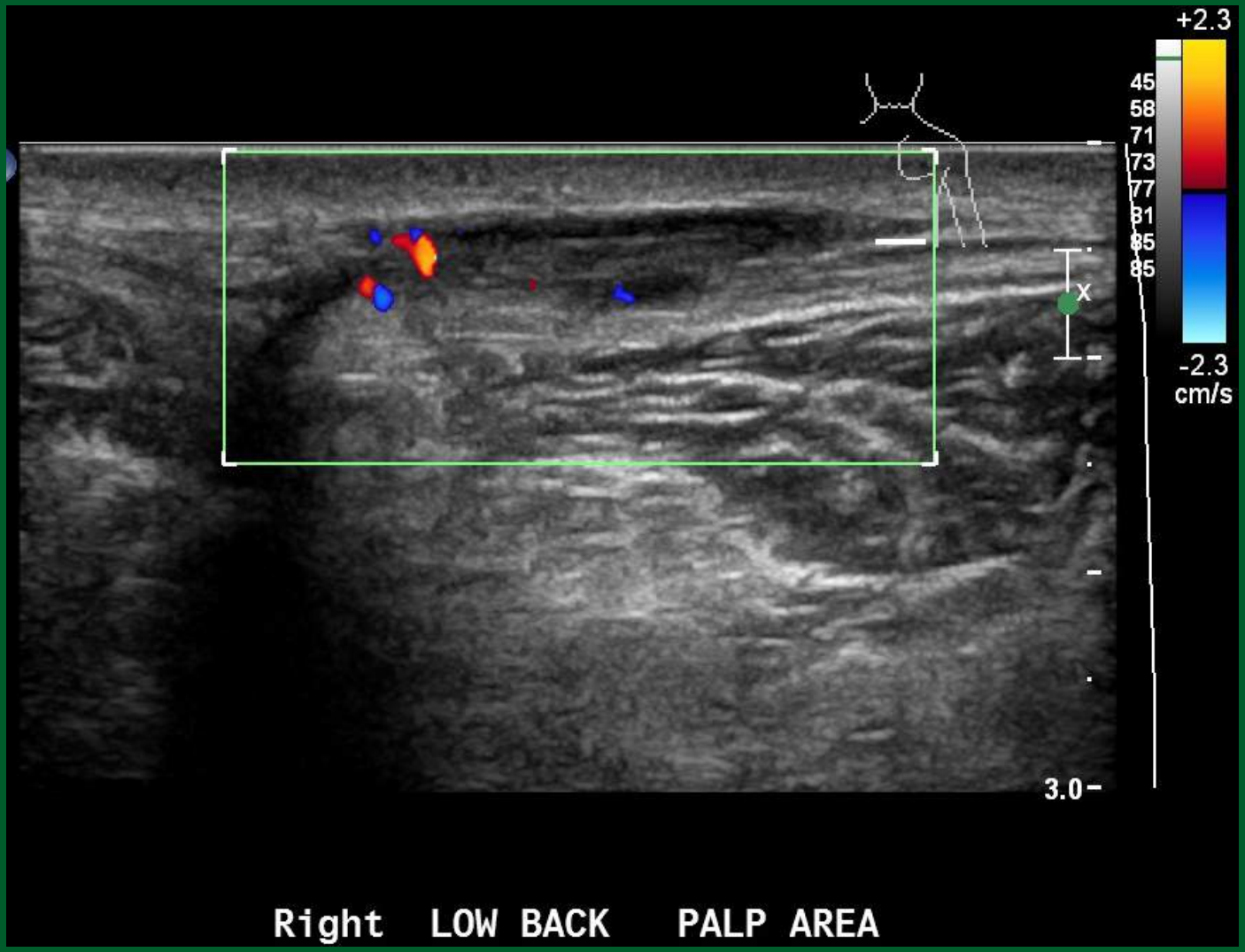


UW bx 5/18– granulation tissue

Non-painful lump in back-asymmetry

No biopsy or f/u imaging-presumed hematoma

Hematoma-no blood flow



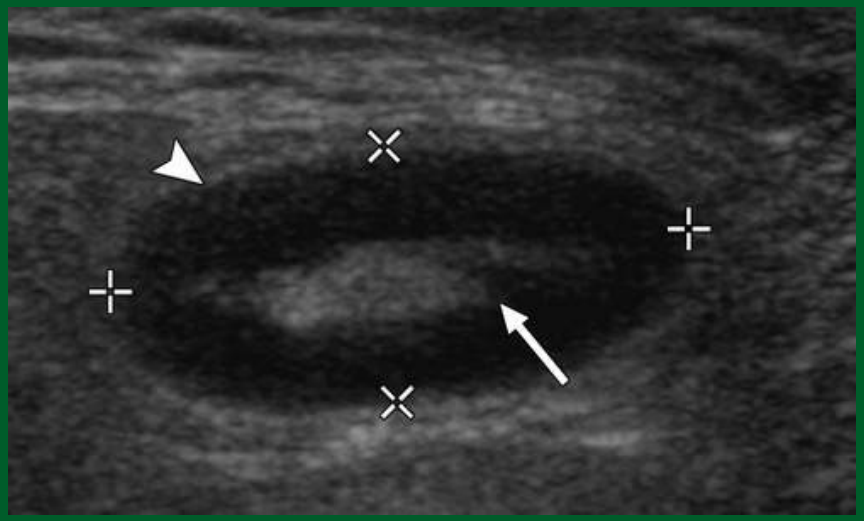
Hematoma clip

Lymph Node

- Among most common superficial nodules/lumps
- Children-95% are benign, reactive, hx infection/inflammation
- Lymphadenitis on U/S
  - Hypervascular cortex, loss of fatty hilum, adjacent cellulitis, indurated fat
  - +/- Necrosis and abscess*
  - *Hard to differentiate from cancer

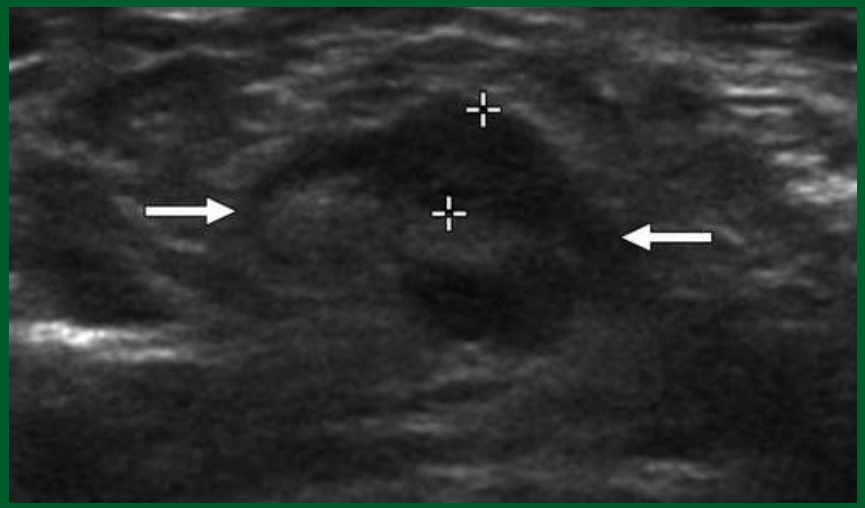
Lymph nodes

Benign in 8 yo male neck



Oval Shape, wider than high, uniform cortical thickness

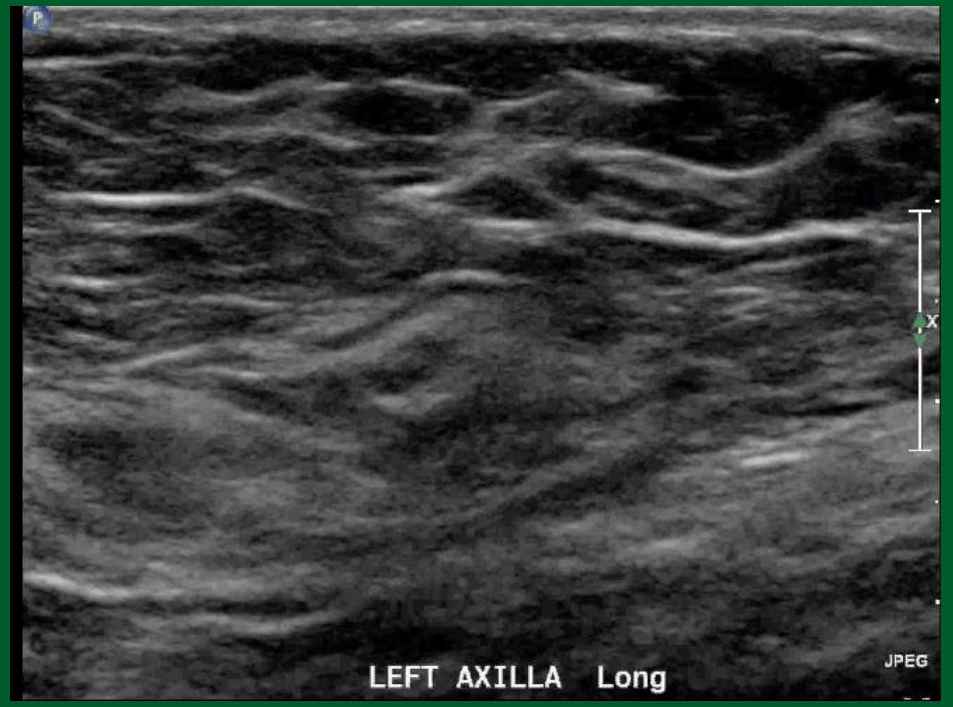
Malignant in 72 yo woman w/ breast CA



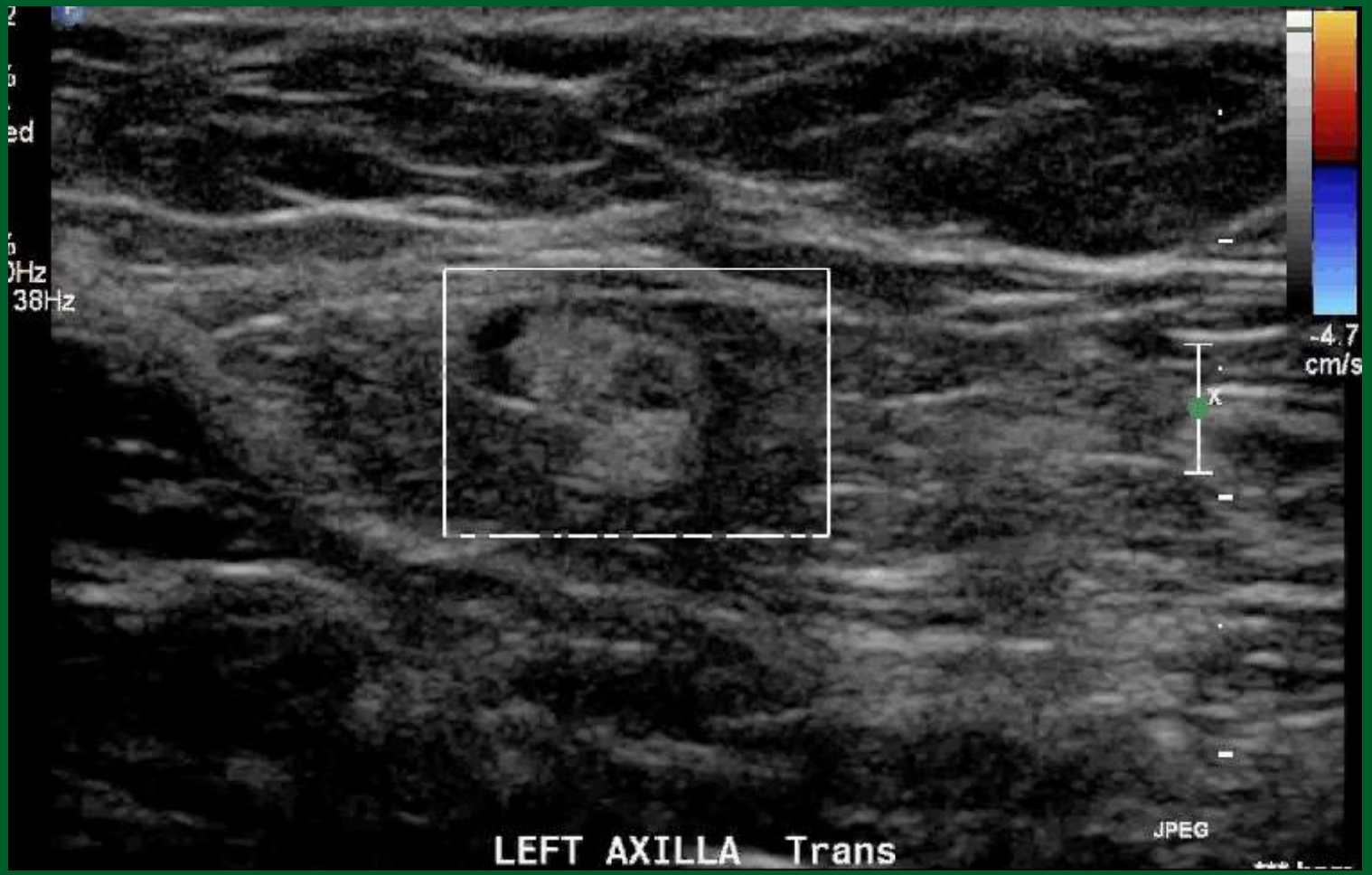
Focal cortical bulge, CA finding + FNA

Shah and Callahan, 2013

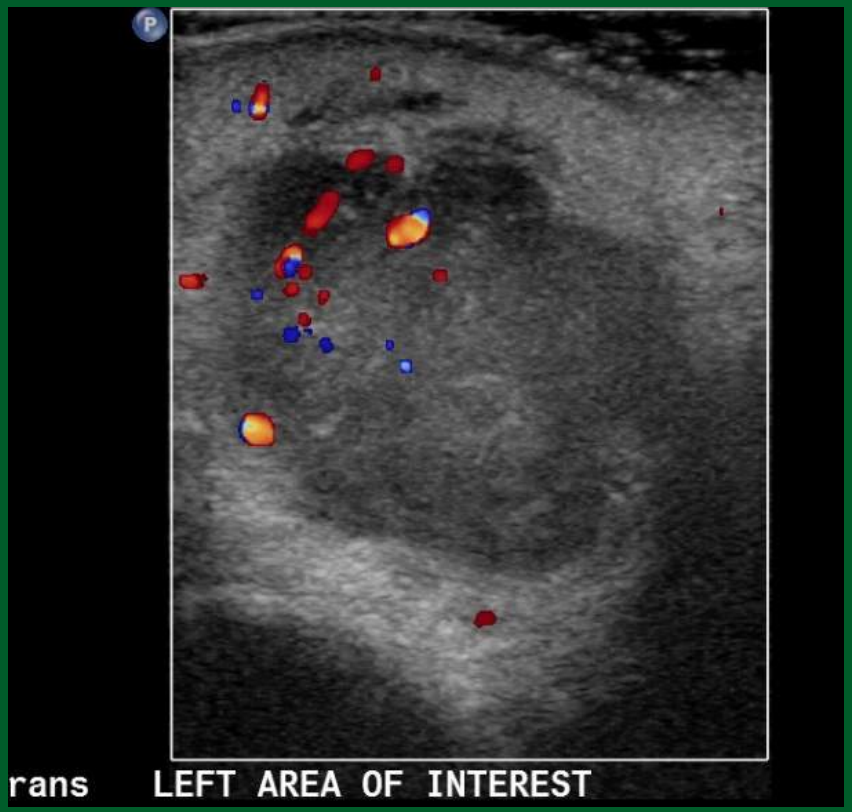
Axillary Lymph node-hypoechoic lesion in fatty hilus



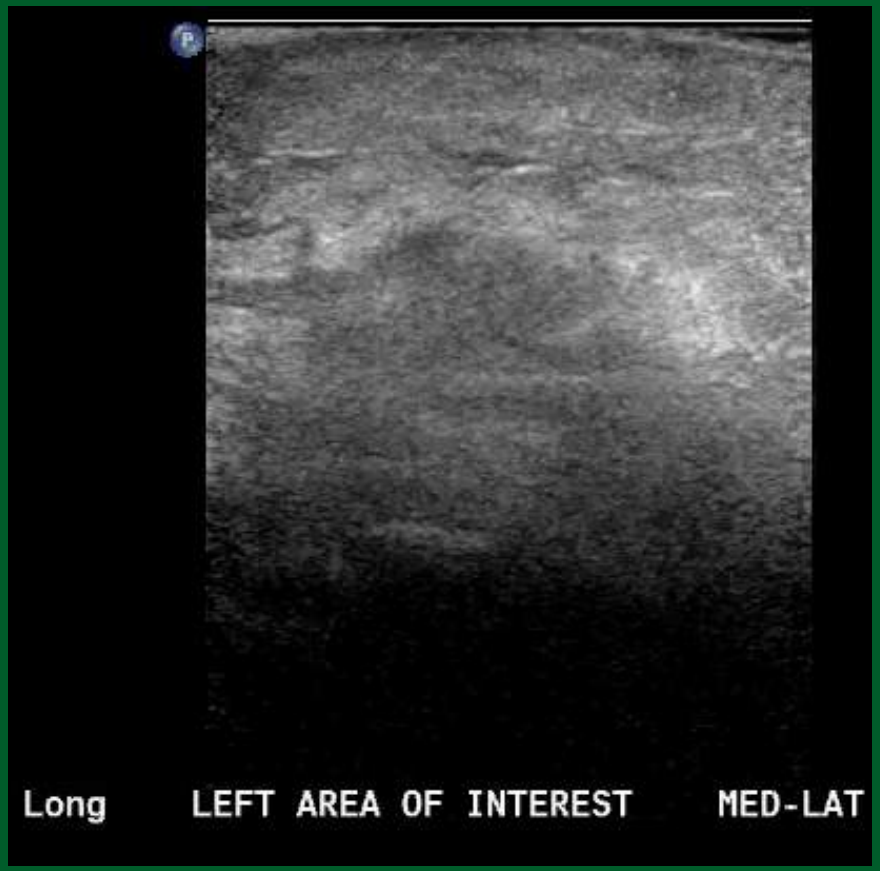
+ FNA of focal lesion in sinus

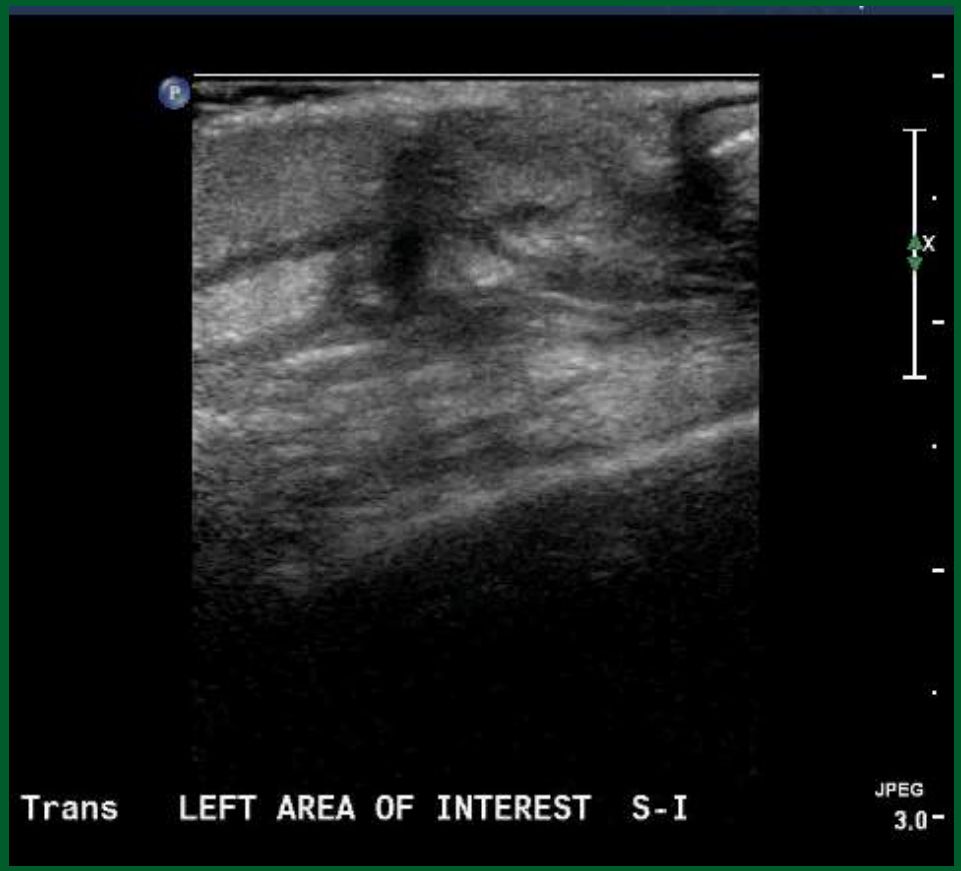


Lymphadenitis in 7 y.o. girl: left pre-auricular space

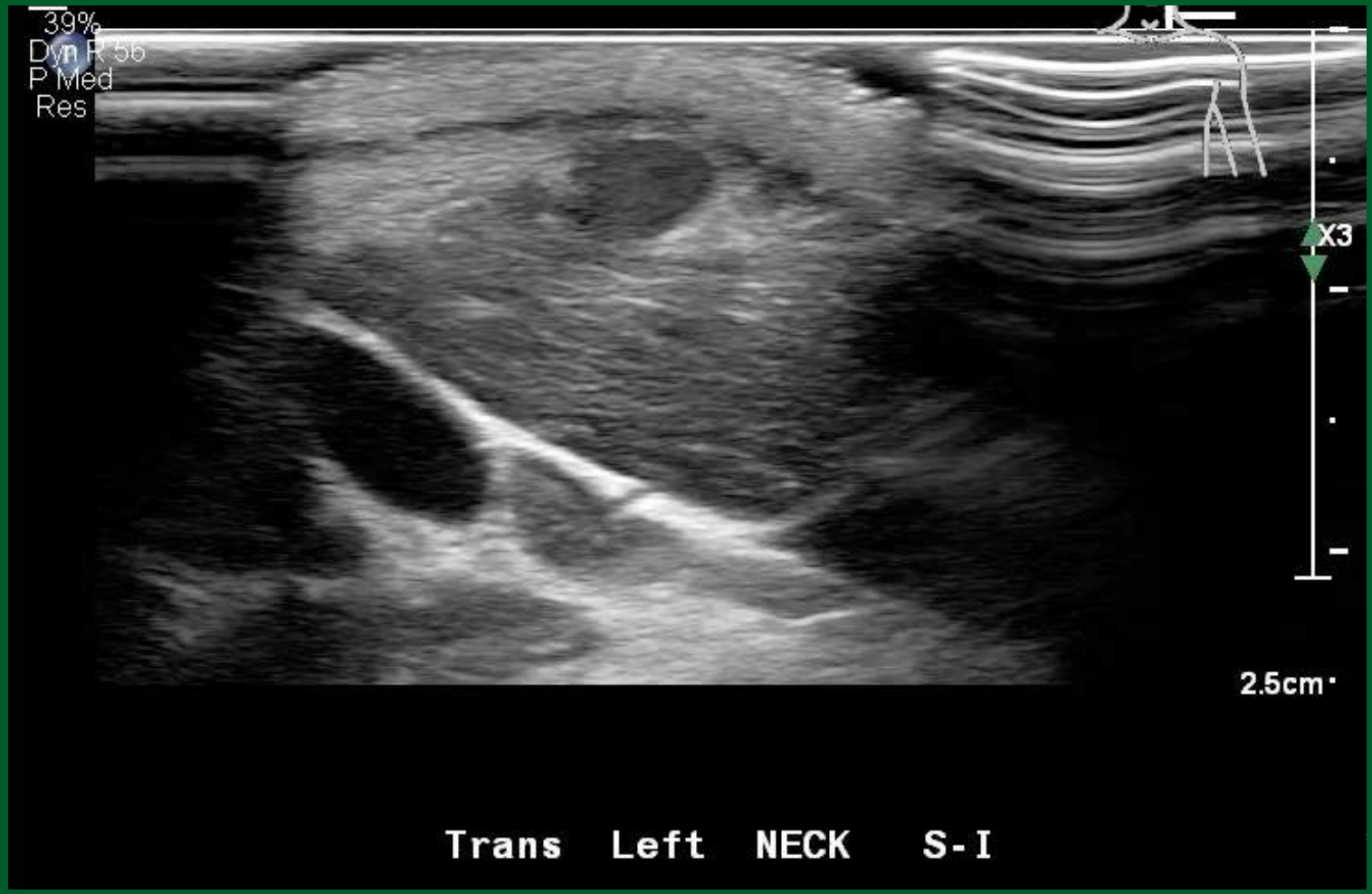


Lymphadenitis in 7 year old female

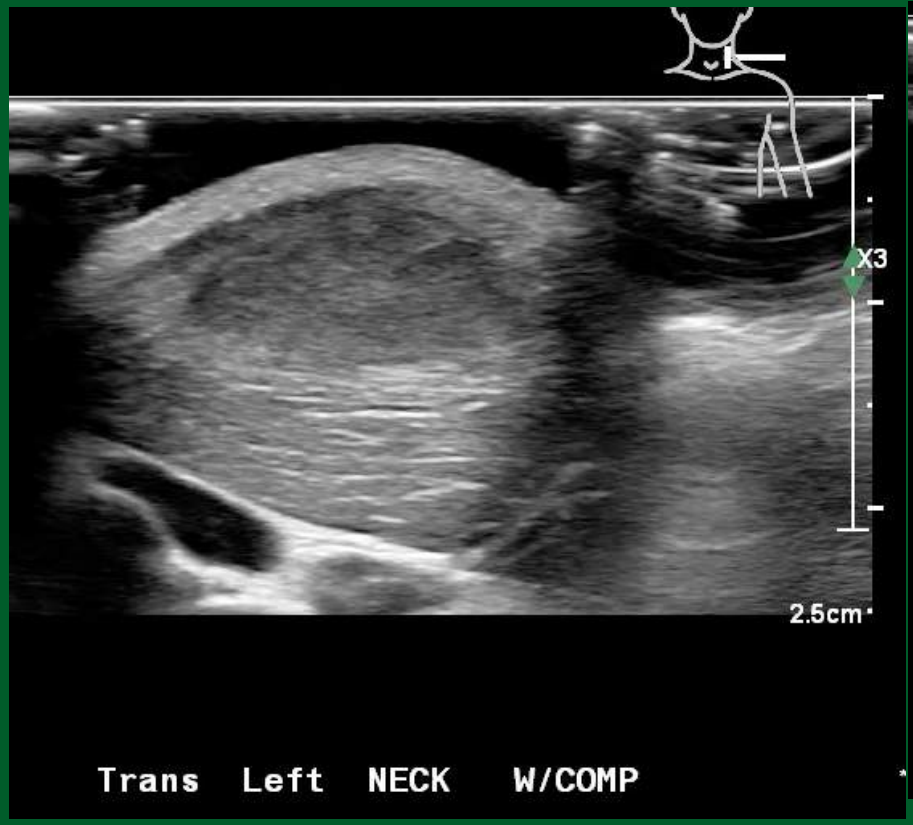




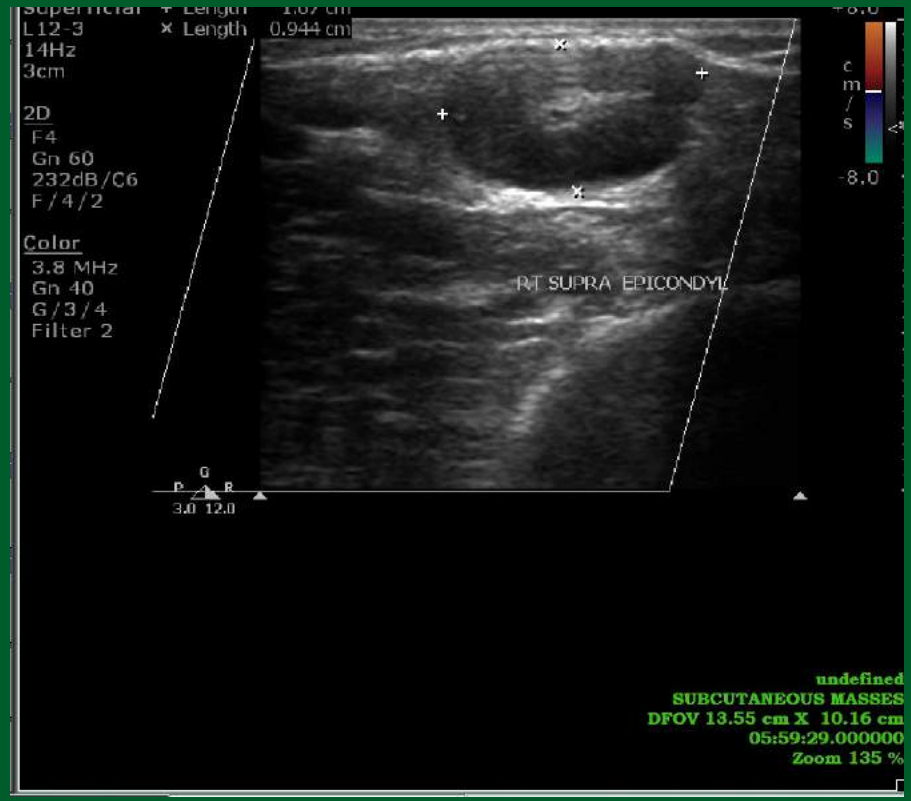
Neck lump in 33 yo pt.



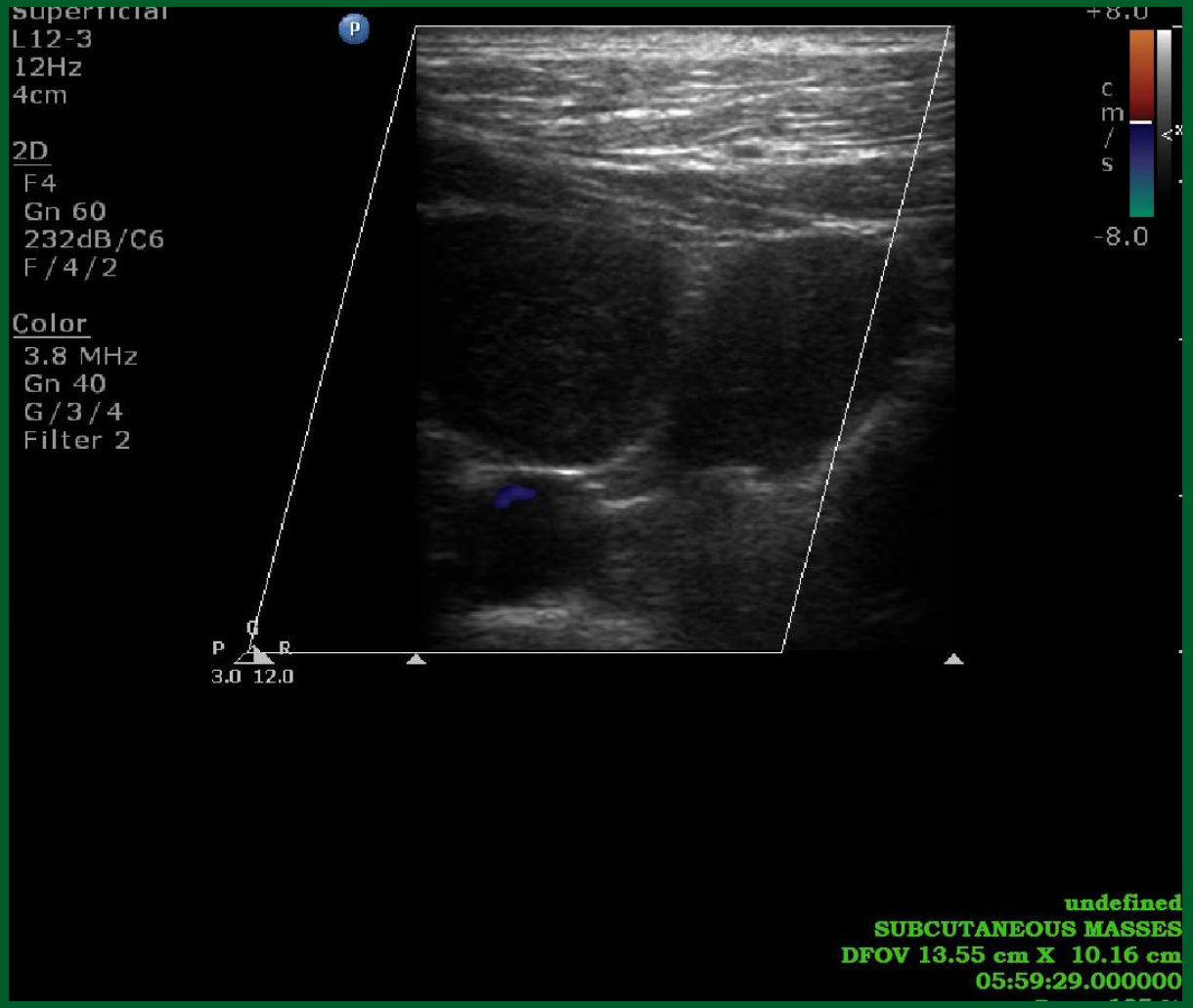
Neck lump



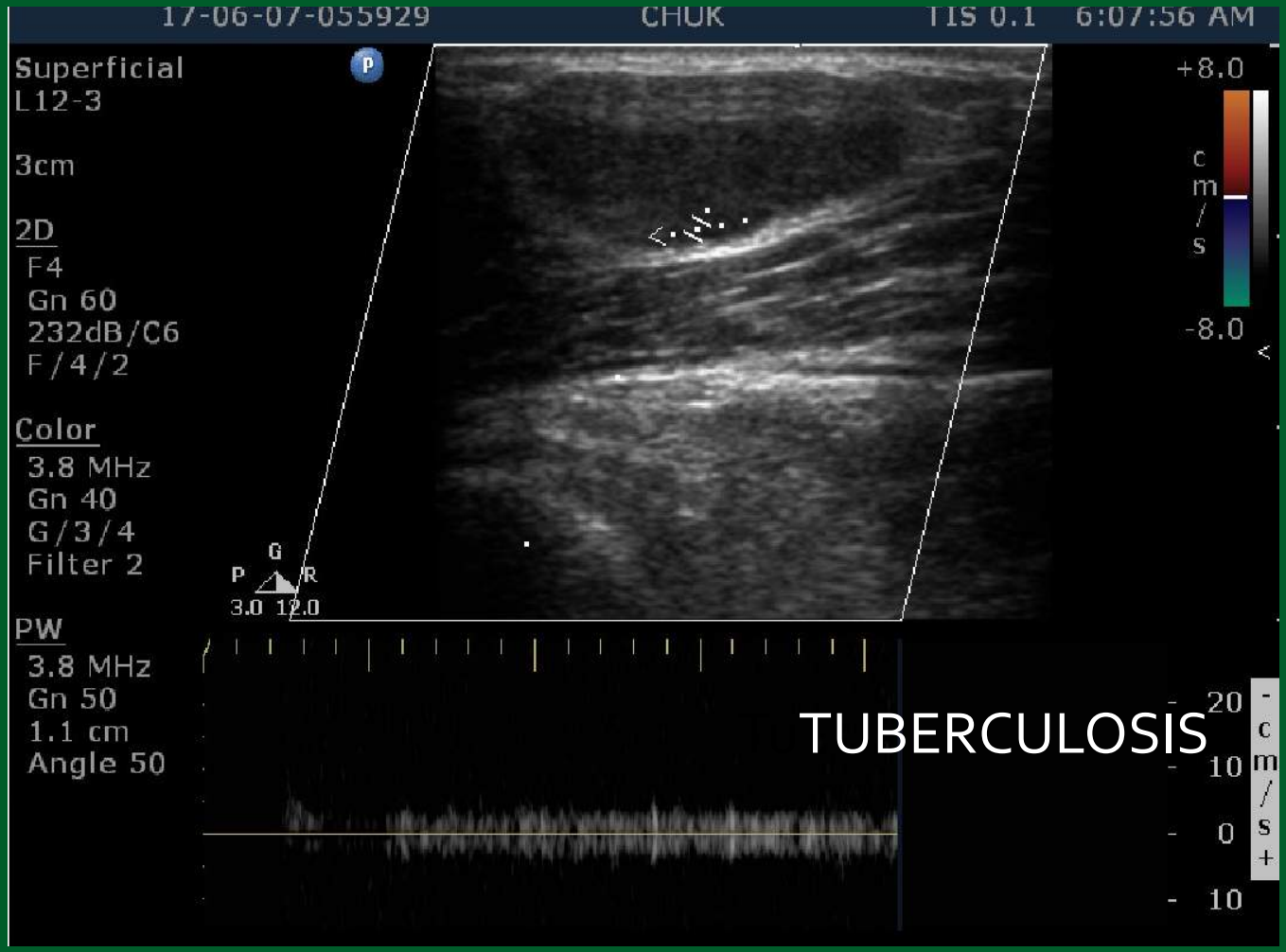
Multiple superficial lymph nodes in elderly African female



Superficial lymphadenopathy



Use Spectral Doppler to confirm color Doppler



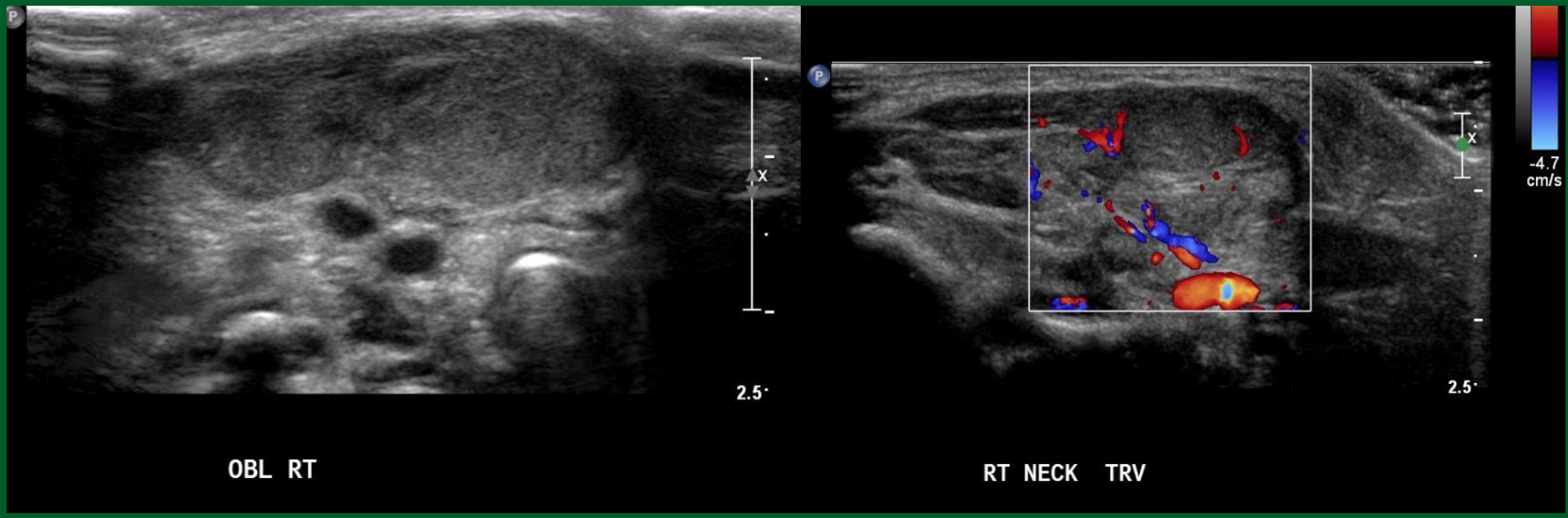
Lumps/Bumps in Pediatrics

- Infantile hemangiomas (IH) / Vascular lesions
  - Hemangioma, vascular malformation (low or high flow), lymphangioma, or AVM
- fibromatosis colli
- ectopic breast tissue

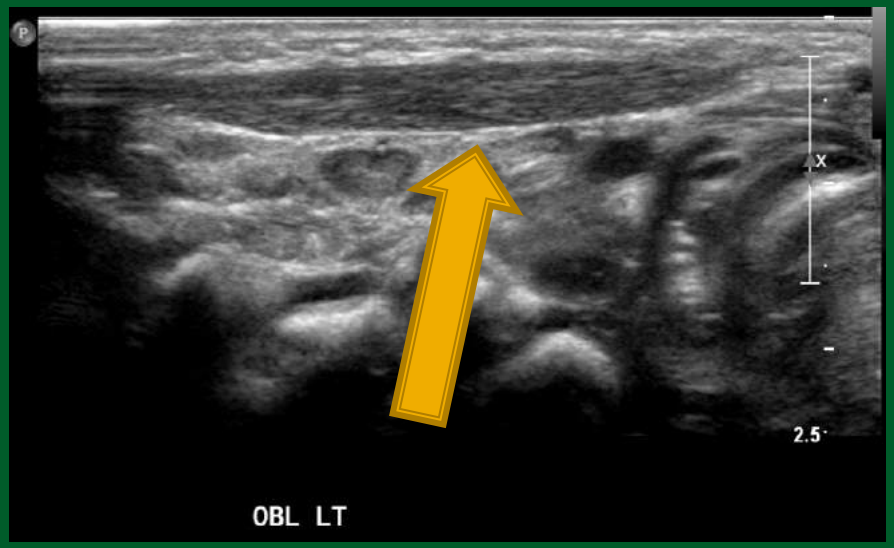
Fibromatosis Colli

- Contracture of SCM
- Head tilt to ipsilateral side
- Chin rotates to contralateral side
- Right side 75%
- Frequent traumatic breech or forceps delivery HX
- Occurs ~ age 4-6 weeks, regresses over 4-8 months
- Treat conservatively
- US-fusiform swelling of SCM

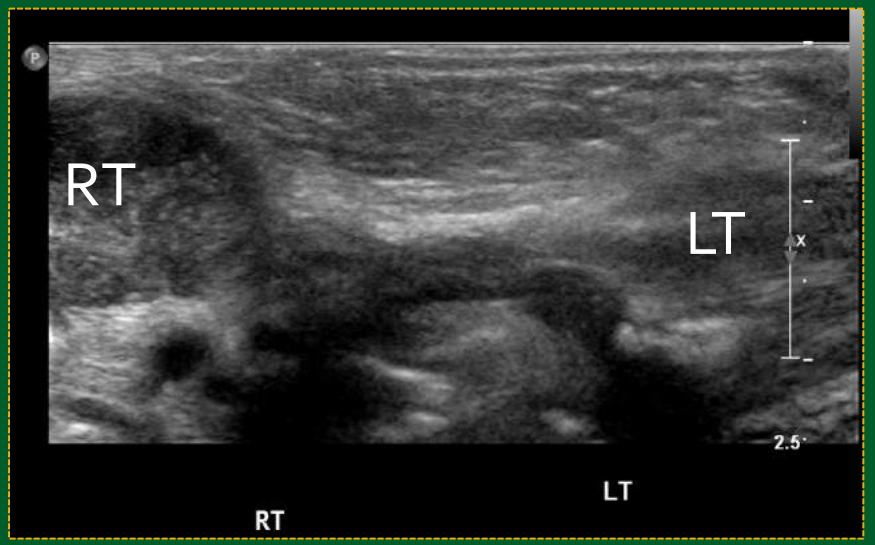
Fibromatosis Colli



Fibromatosis Colli

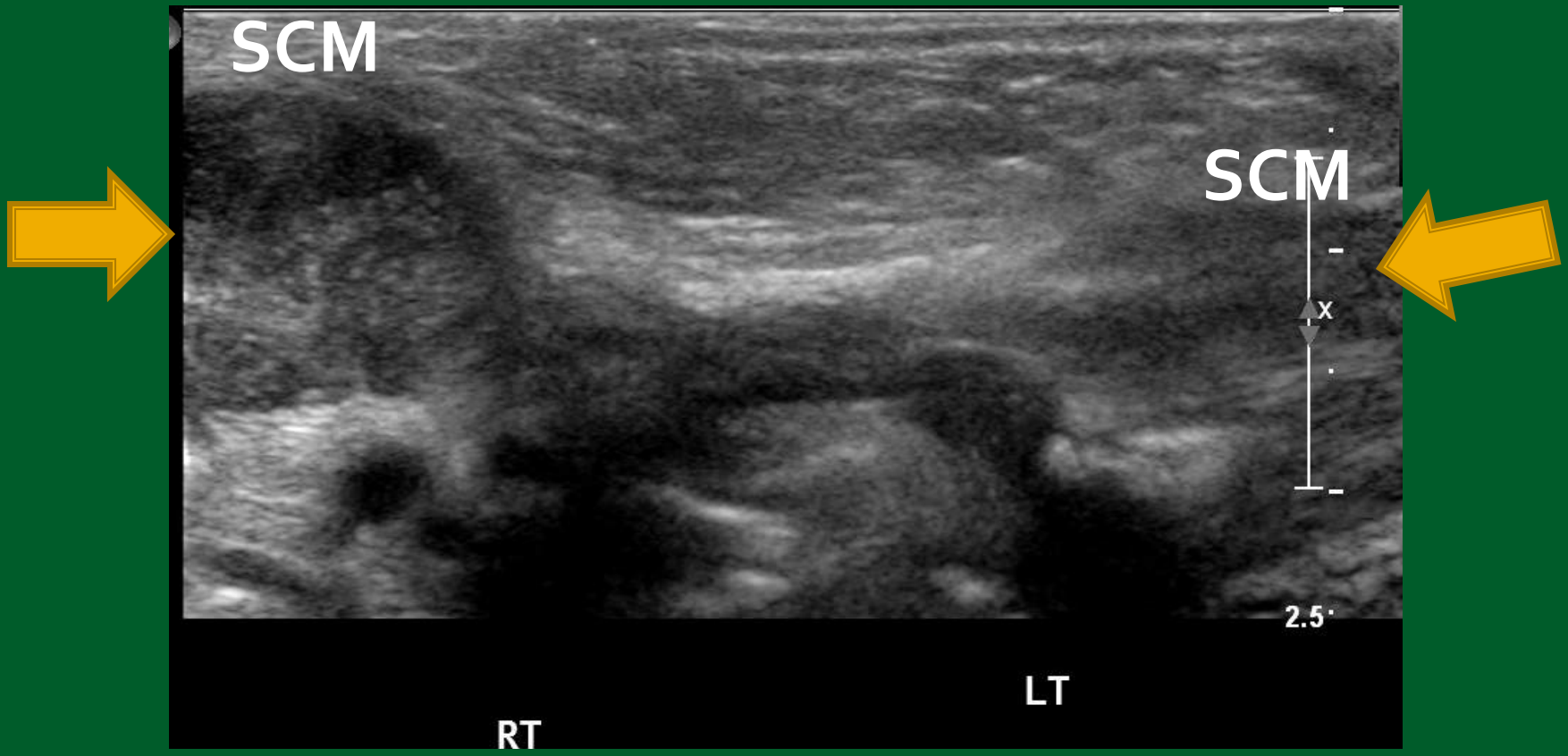


Contralateral SCM



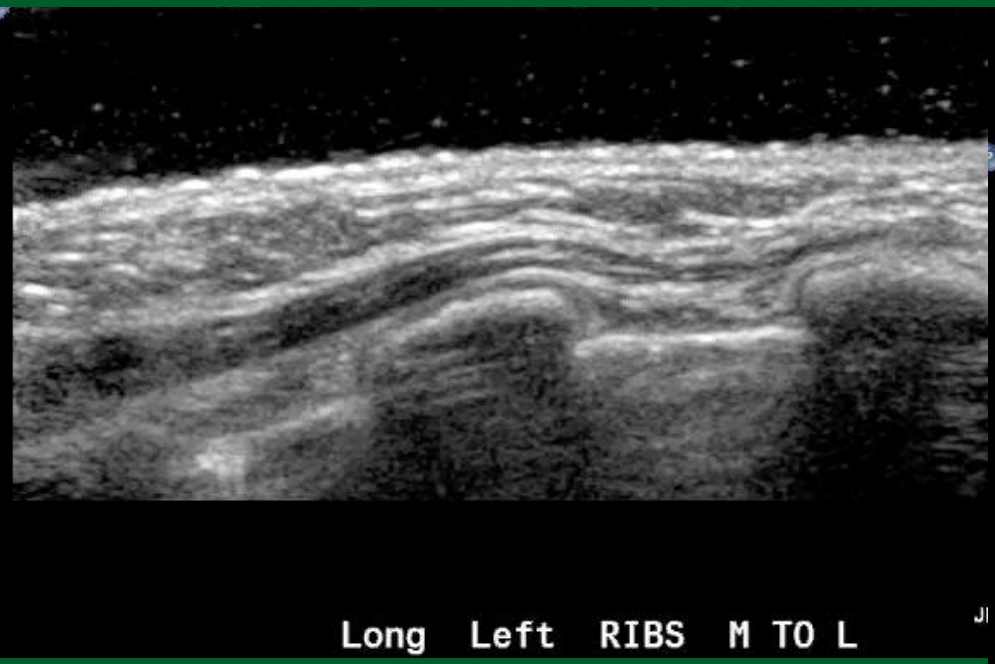
Trans neck view

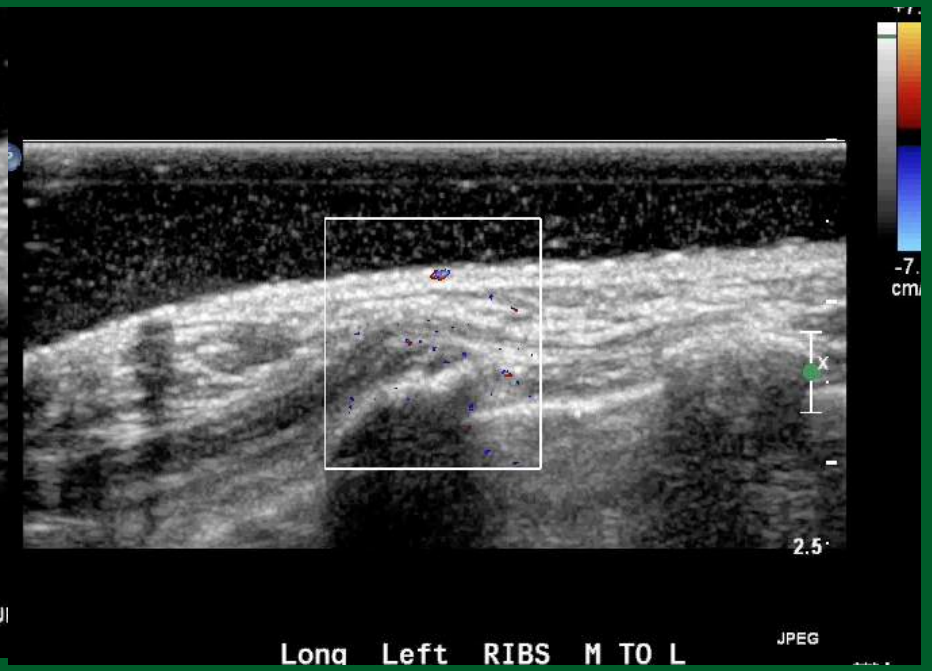
Fibromatosis Colli



Transverse view of the neck anteriorly

Rib chondroma in 2 year old girl



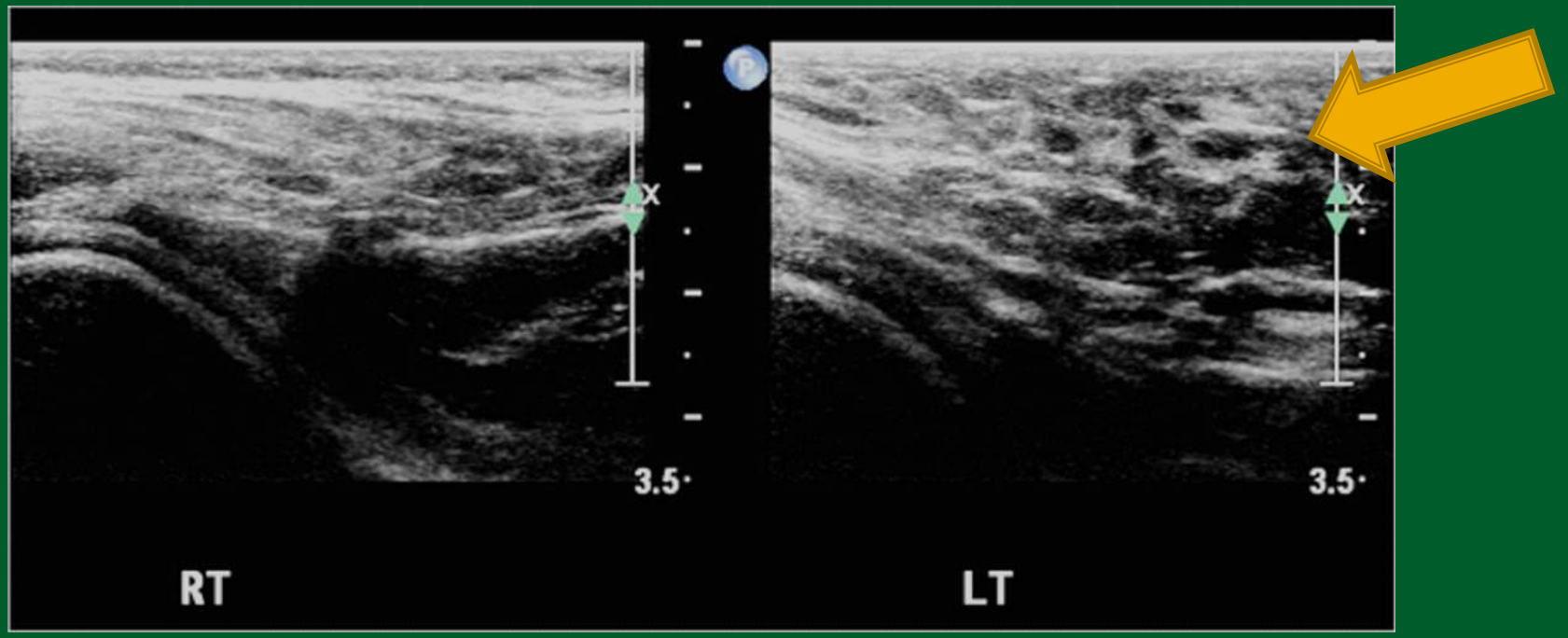


Ectopic Breast tissue

- Failure of regression of embryologic tissue
- Puberty-becomes more prominent
- Palpable, tender lesion(s) in axilla
- Echogenic tissue similar to breast tissue

Ectopic breast tissue

- Generally ill- defined
- Multiple small, hypoechoic areas
- May mimic lymph nodes
- Comparison to contralateral breast or area helpful



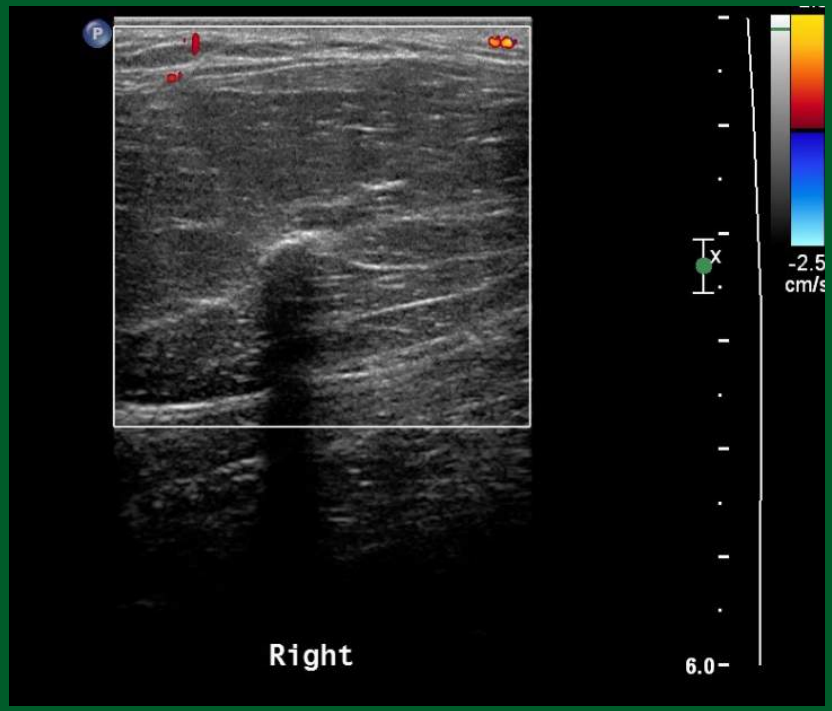
Common Lumps/Bumps in Adults

- Lipoma
- Hernia
- Epidermal inclusion cyst
- Ganglion cyst
- Popliteal cyst
- Morton's "neuroma"
- Fat necrosis
- Neurofibroma
- Uncommon-Sarcoma/malignancy

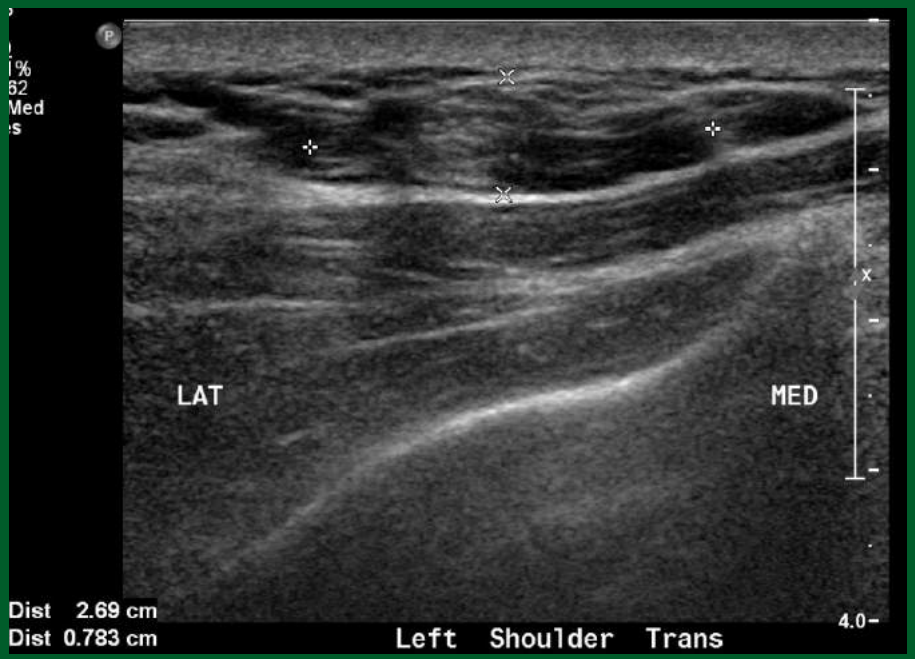
Lipoma

- Common in adults
  - > 50% or more of superficial lesions on U/S
  - 2-4% prevalence overall
- Rarer in children
  - 10% of all lesions
- Variable in appearance
  -Hypo- to hyperechoic, well-defined to vague borders
- Difficult to separate from surrounding fat
- Asymmetry of soft tissues
- Hard to see--***Look at contralateral body part***
- Ultrasound usually pathognomonic

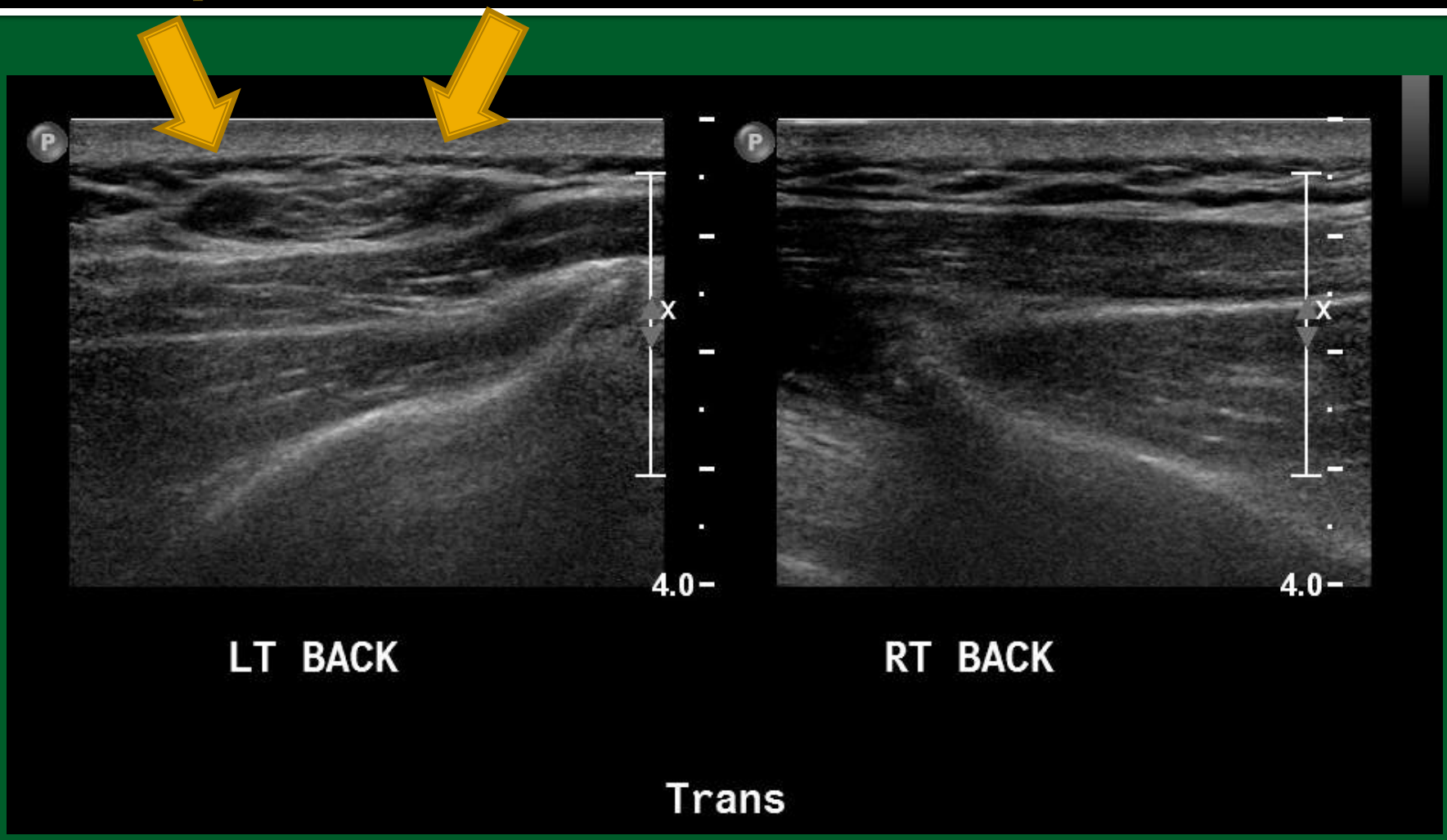
Lipoma-typical and atypical



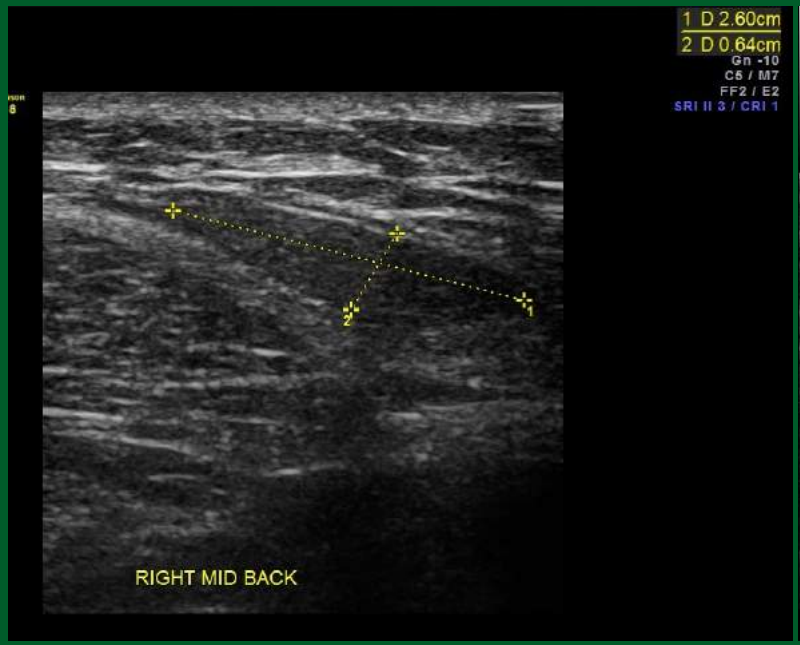
Ill-defined upper back mass in 62 yo male

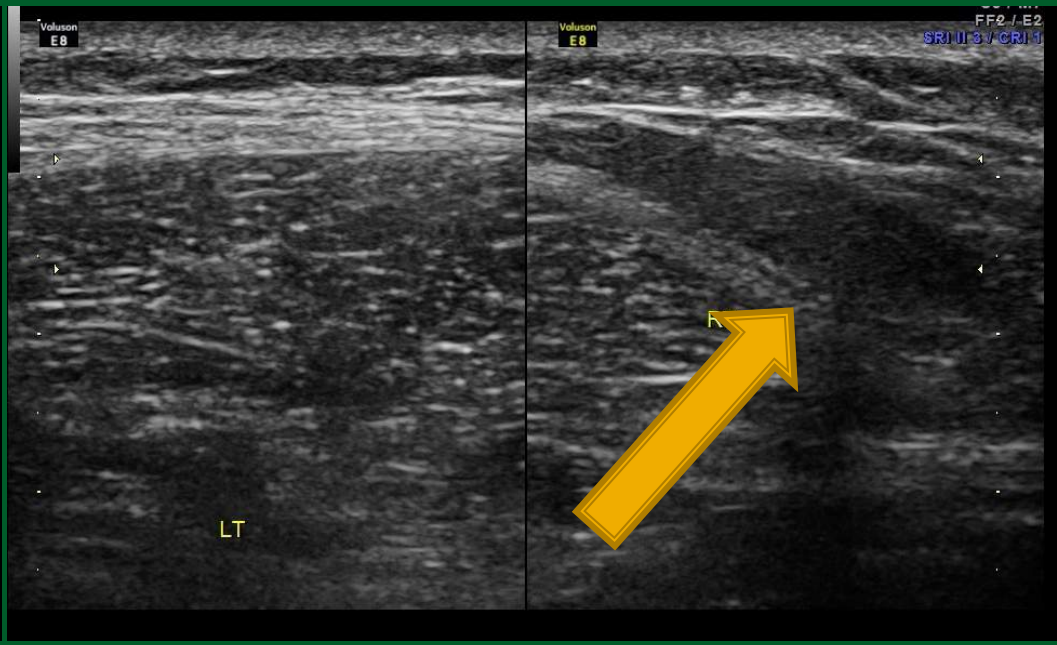


Lipoma –use contralateral side comparison!!

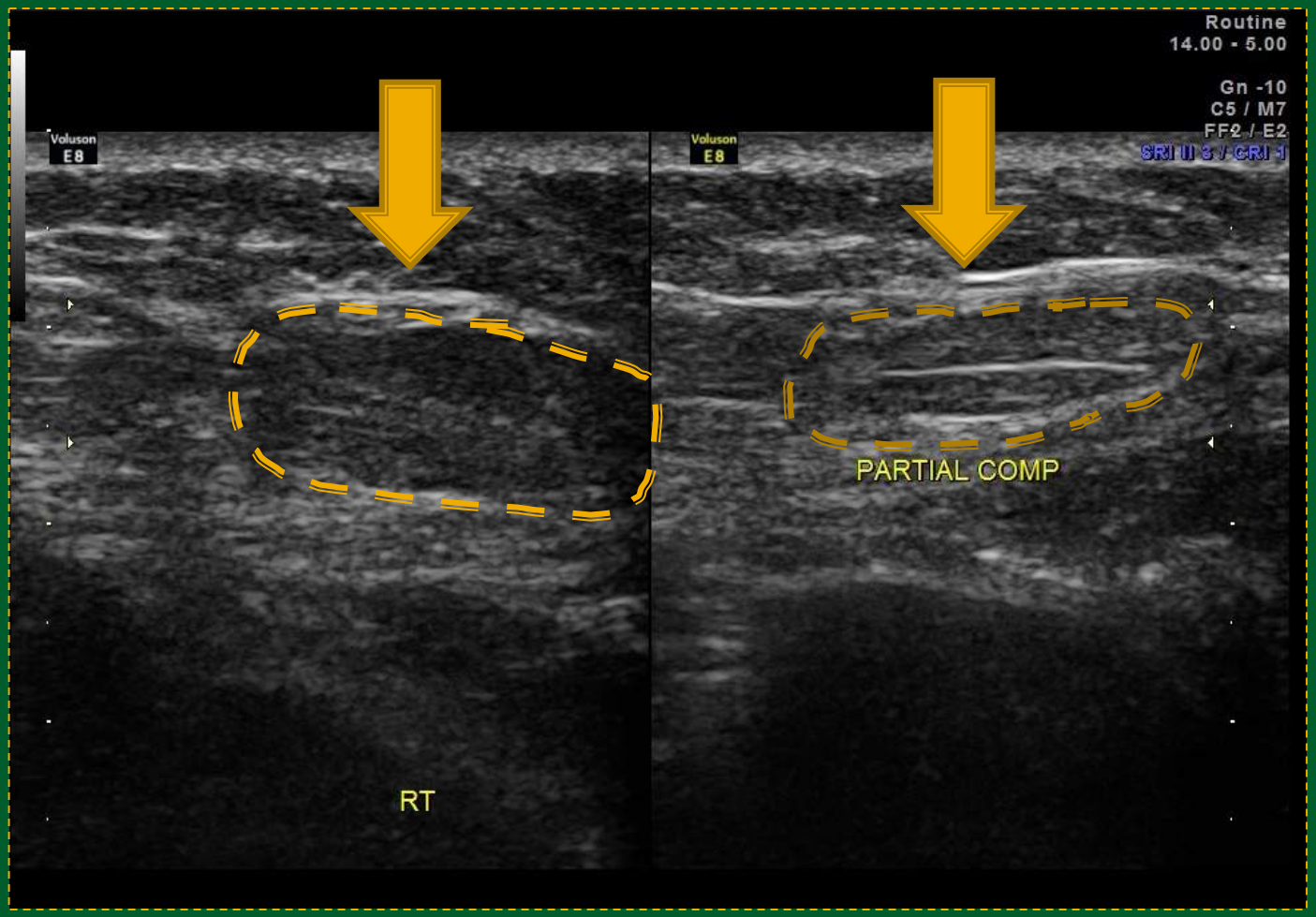


Lipoma in 57 yo woman-back





Lipoma –usually compressible



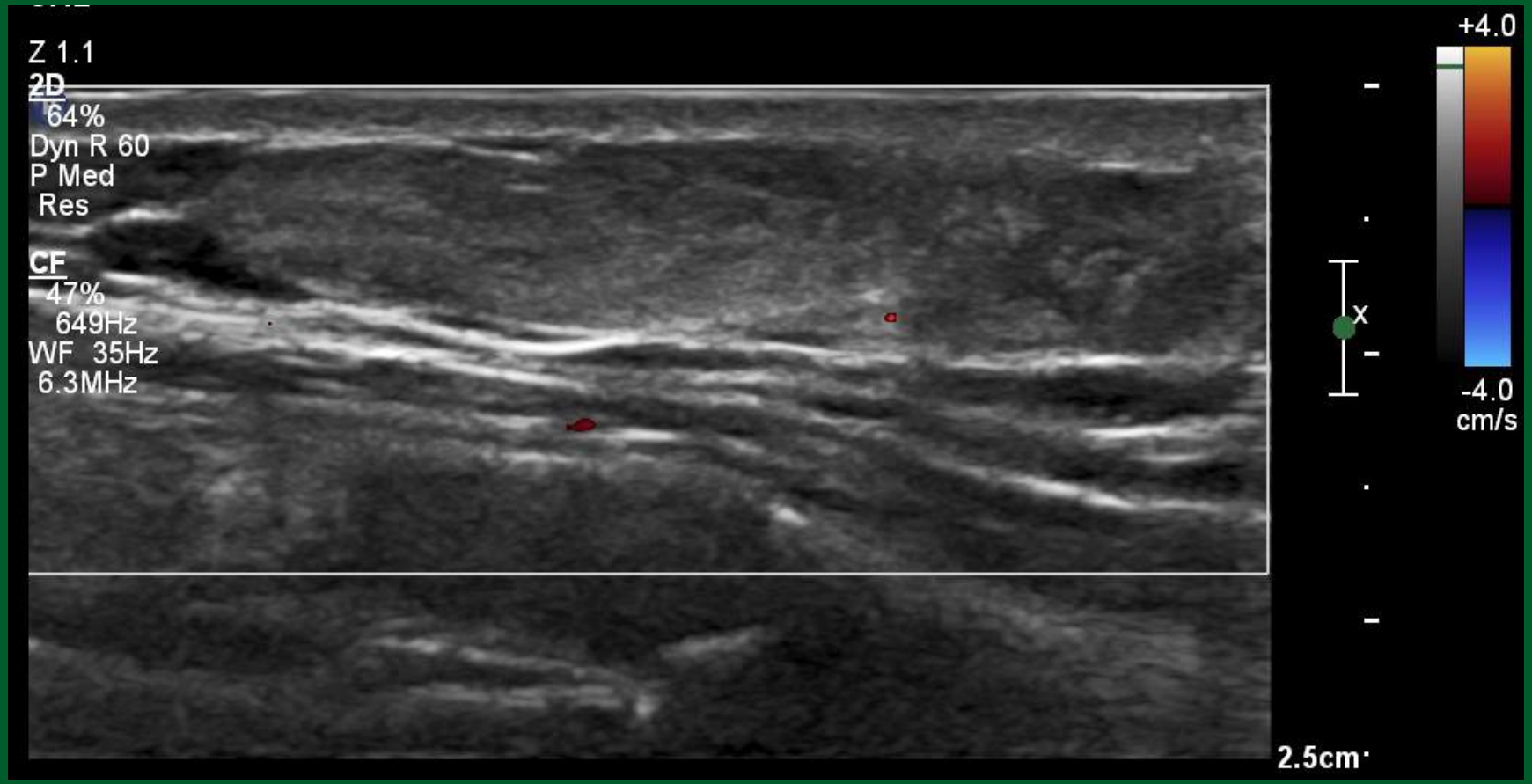
Lipomas and Blood flow (Color Doppler)

- 7 of 31 (23%) echogenic masses (lipoma or lipoma- like) in subQ fat had blood flow on color Doppler US
- Most were in upper arm, mean size 1.7 cm.
- Second most common site: trunk and chest
- Well-circumscribed
- Half homogeneous, half heterogeneous echogenicity

Skeletal Radiol (2012) 41:1055–1059

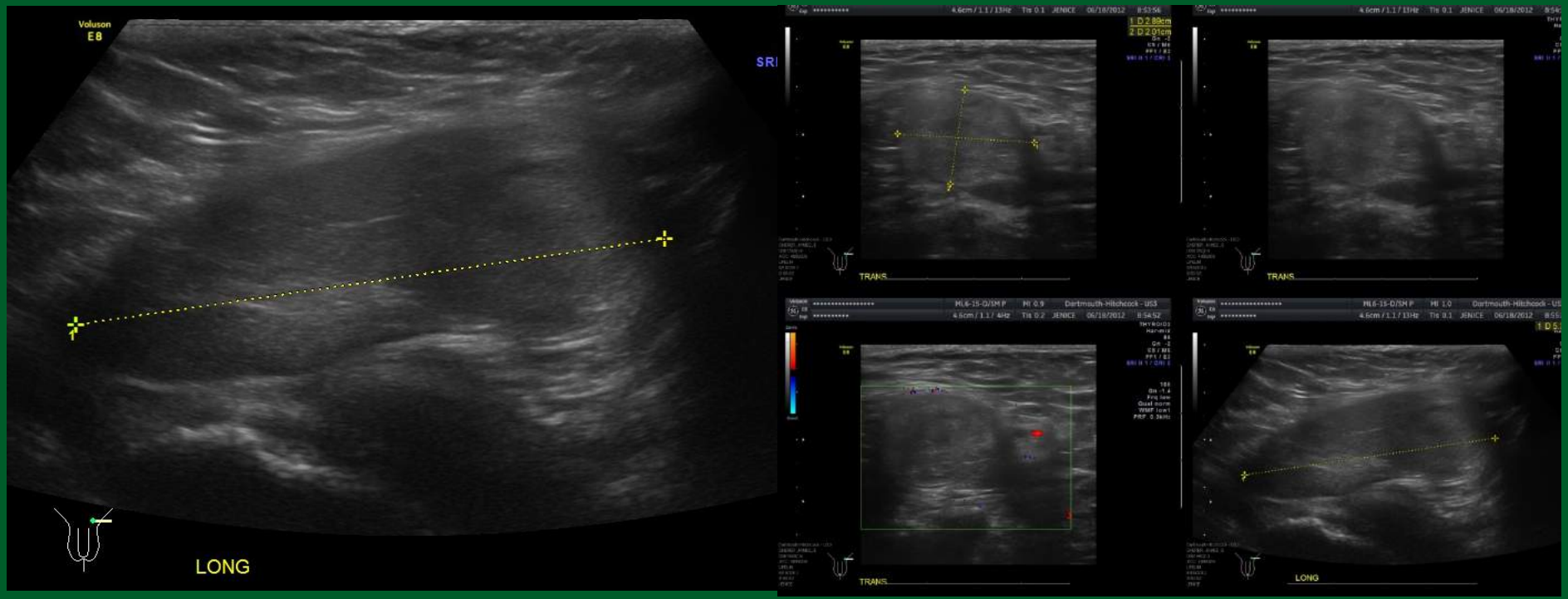
Superficial lesion in 25 yo male with hx of Burkitt's lymphoma

Bx x 3 => mature fibrous and fatty tissue

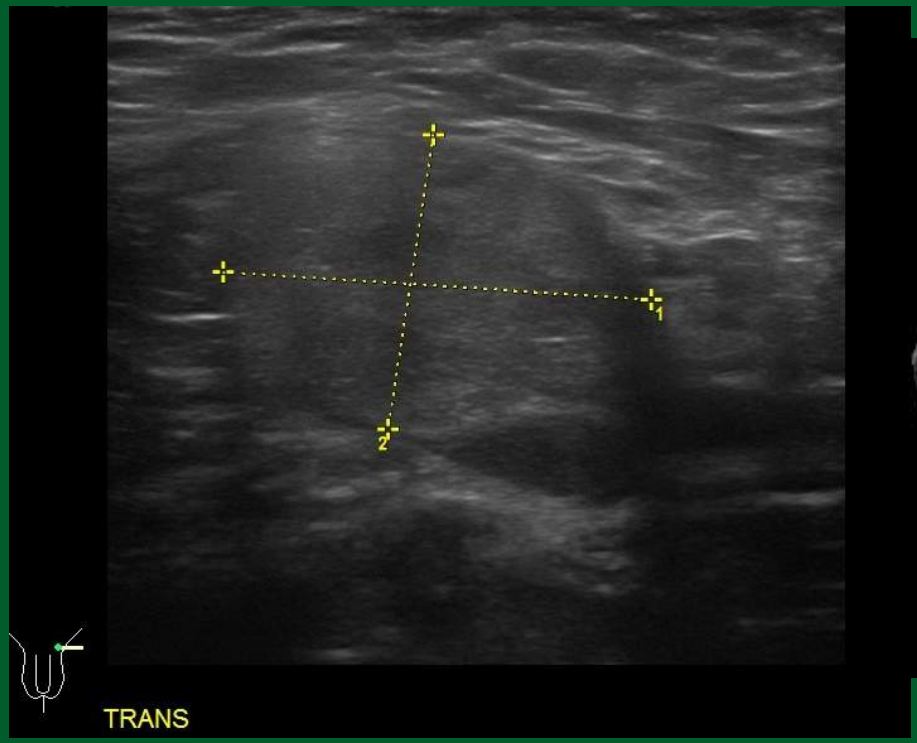


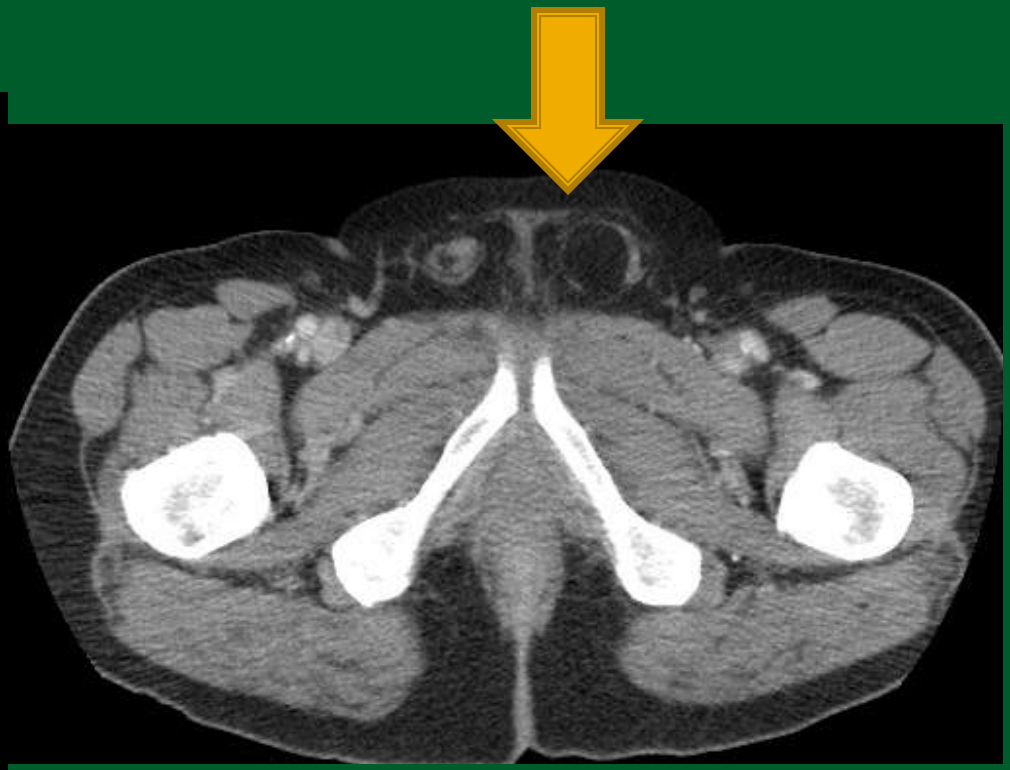
Cine clips of lipoma in axilla

Hernia-Inguinal

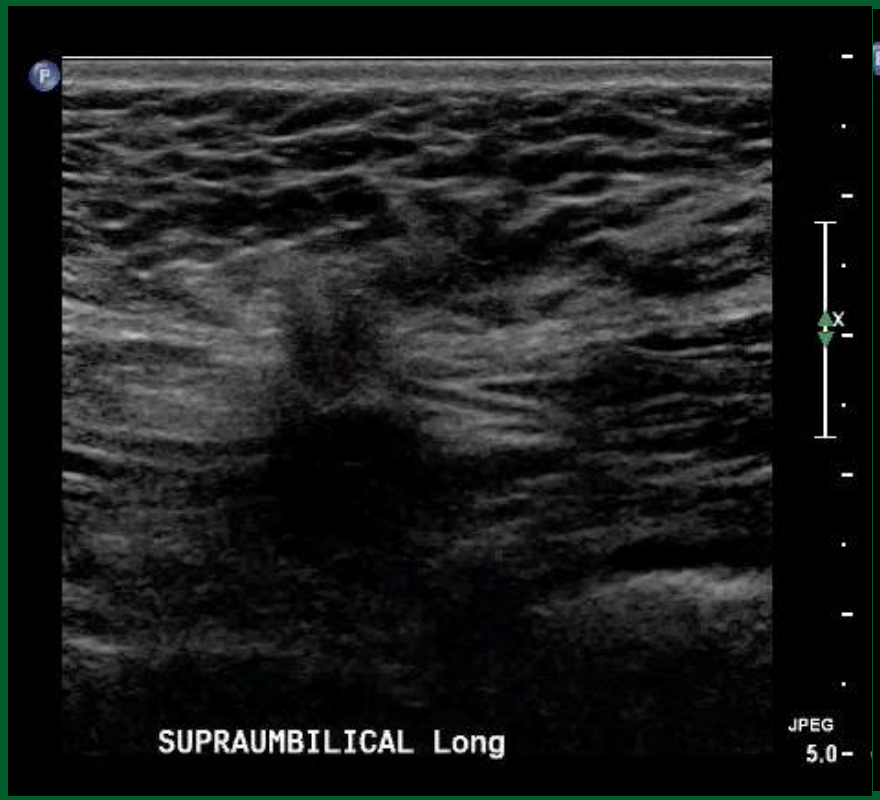


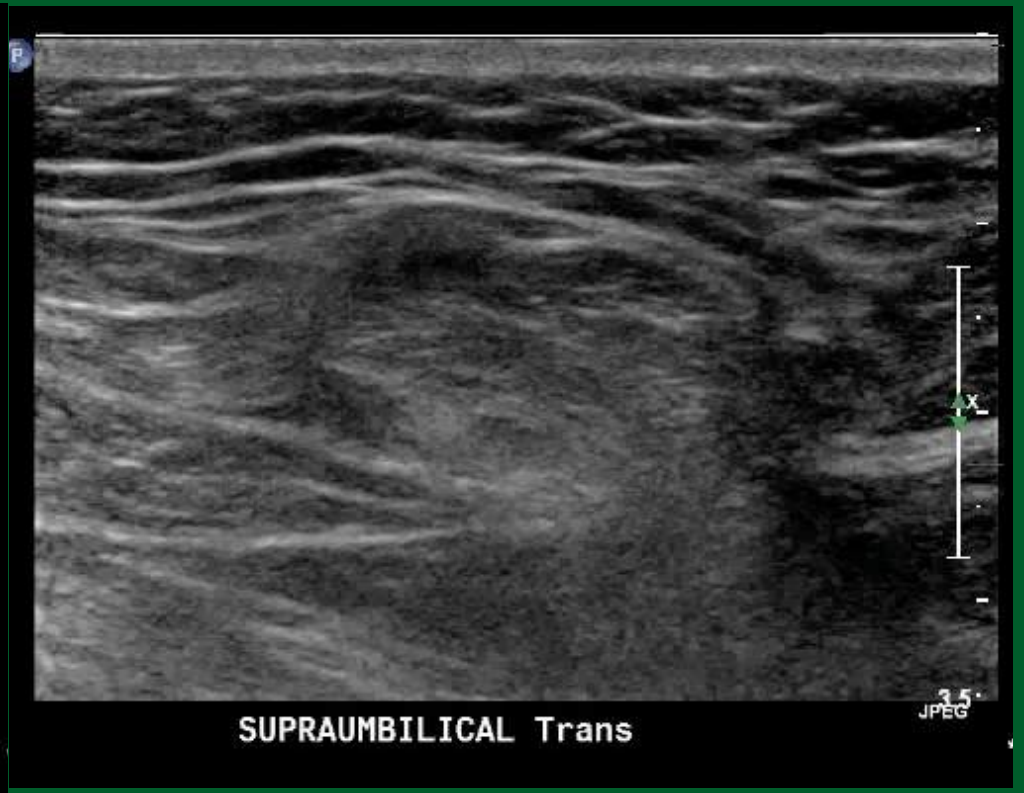
Hernia-Inguinal



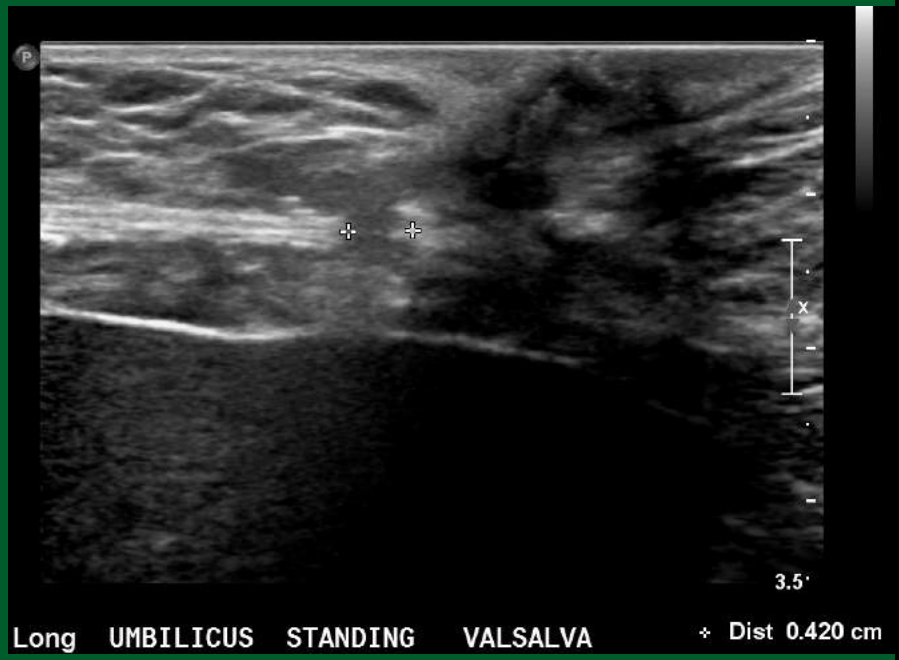


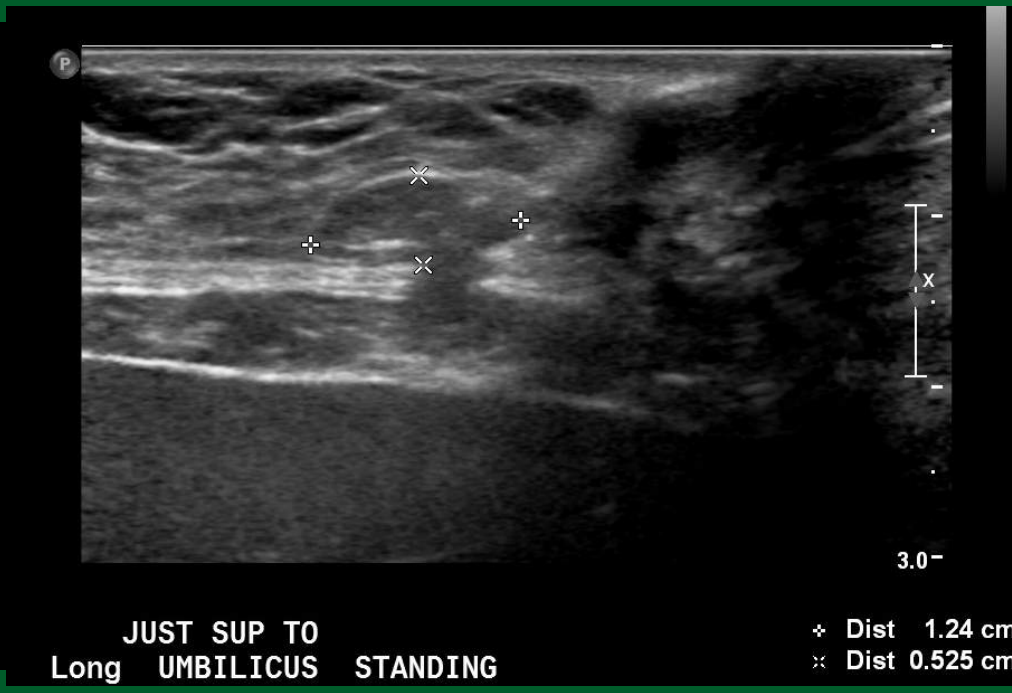
Abdominal hernia-mind the gap!





Hernia—only visible standing





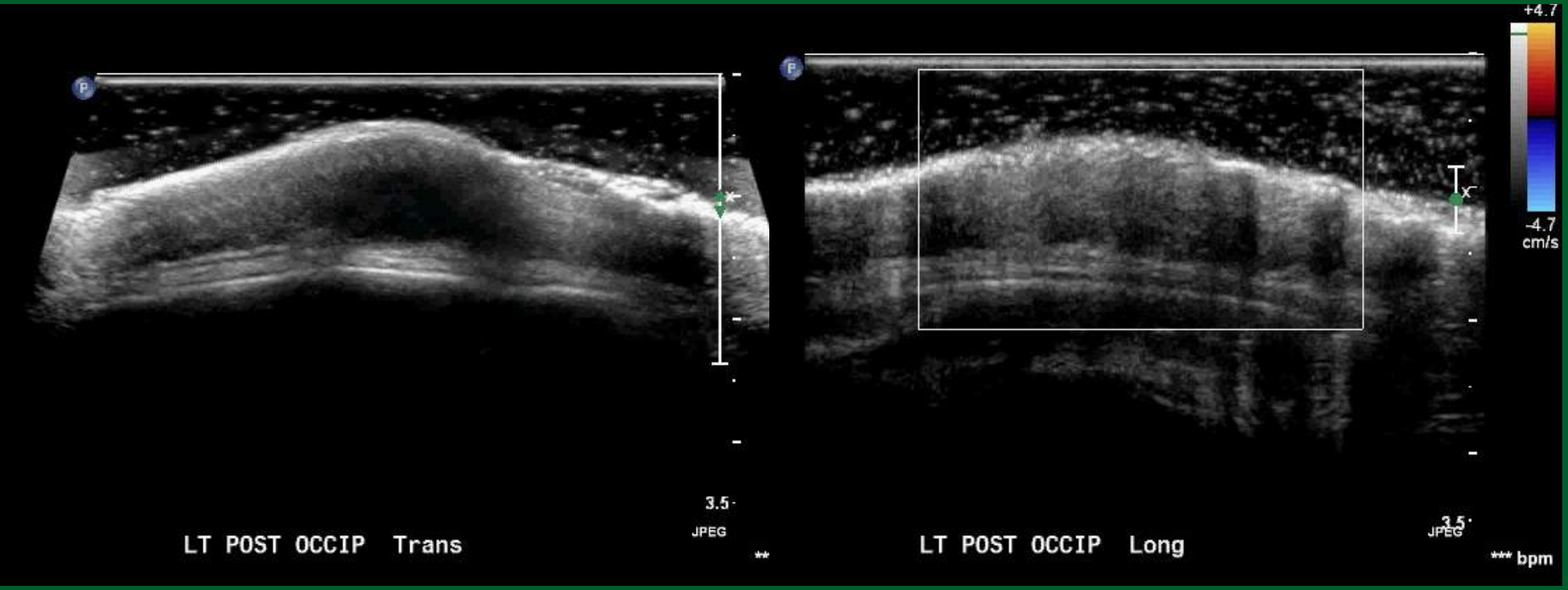
Ventral Hernias-large and small

Epidermal Inclusion Cyst (EIC)

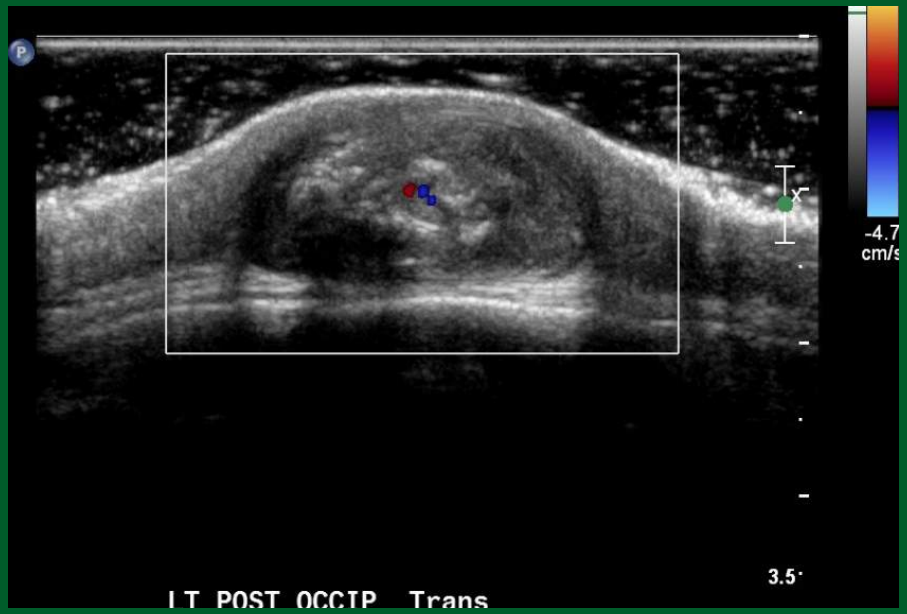
- Most common subcutaneous "cyst"
- Most common over trunk & scalp
- Rarely extremities
- Often clinical diagnosis
- Congenital or post-traumatic etiology
- Inclusion of squamous epithelium into dermis
- Hypoechoic rim
- Varying internal echoes
- No vascularity

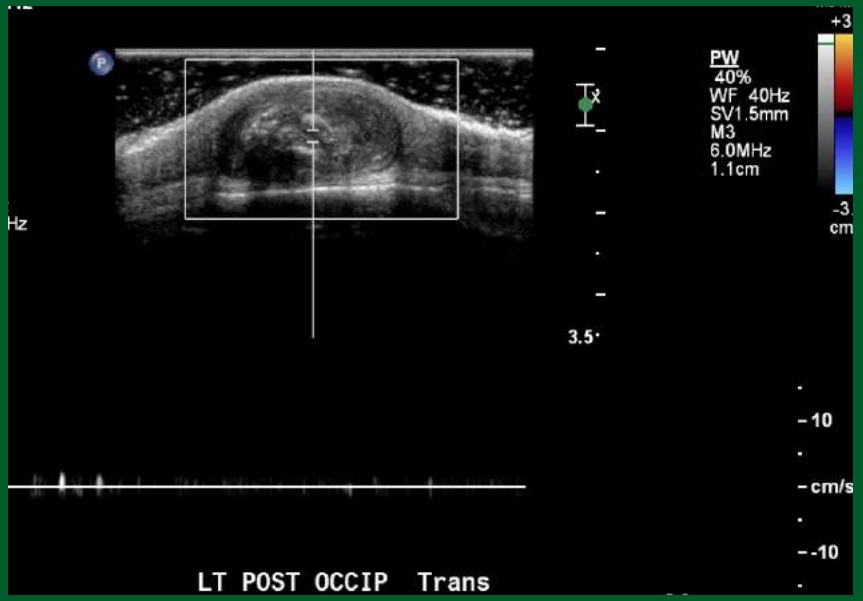
Epidermal Inclusion Cyst-Scalp

Epidermal Inclusion Cyst



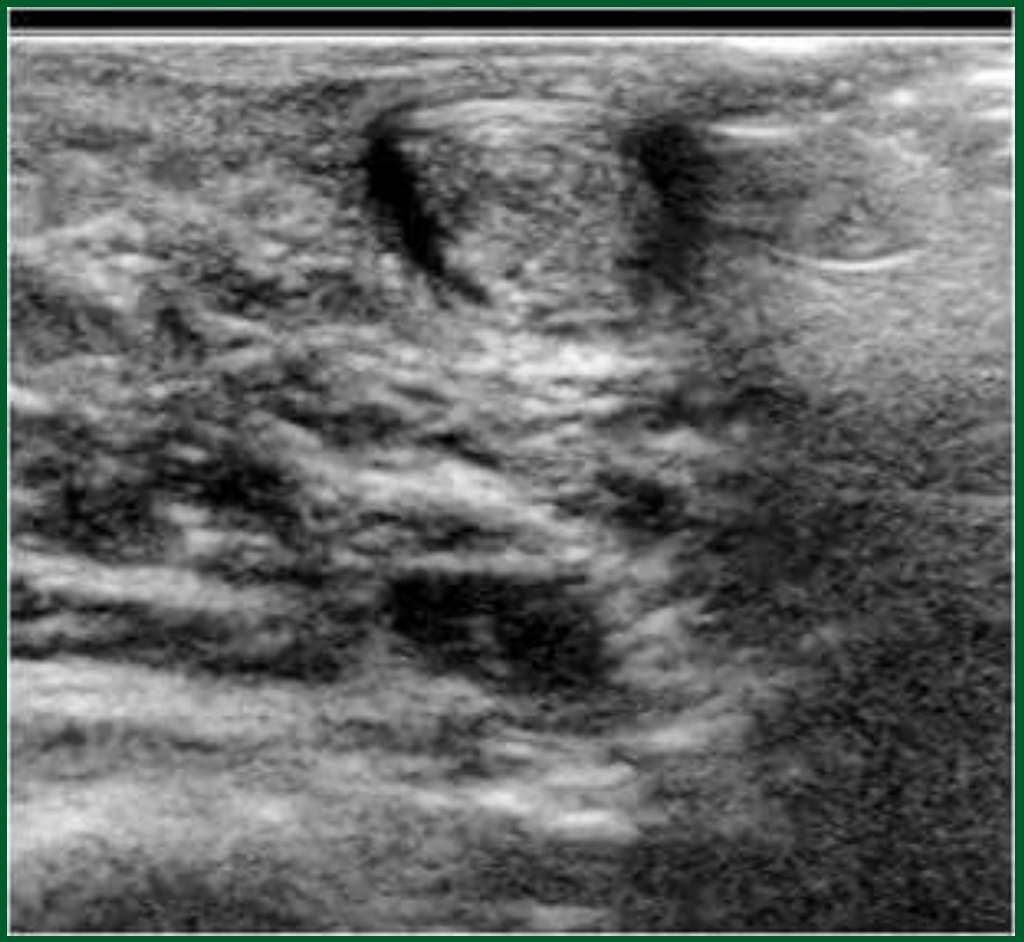
Epidermal Inclusion Cyst





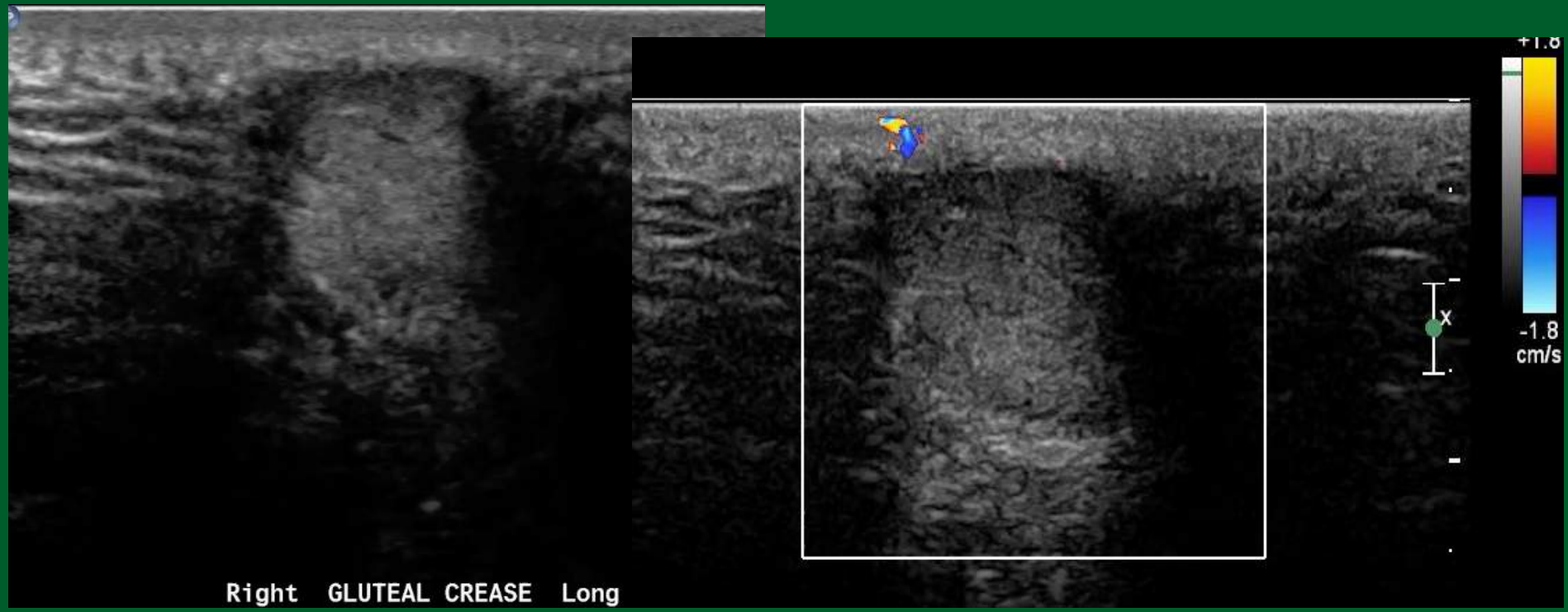
If in doubt, always exclude color Doppler twinkle artifact with **spectral Doppler**—if it is artifactual, only see noise

Epidermal Inclusion Cyst



Shah and Callahan, Pediatric Radiology 2013; 43:S23-40

Gluteal Crease Mass in Man

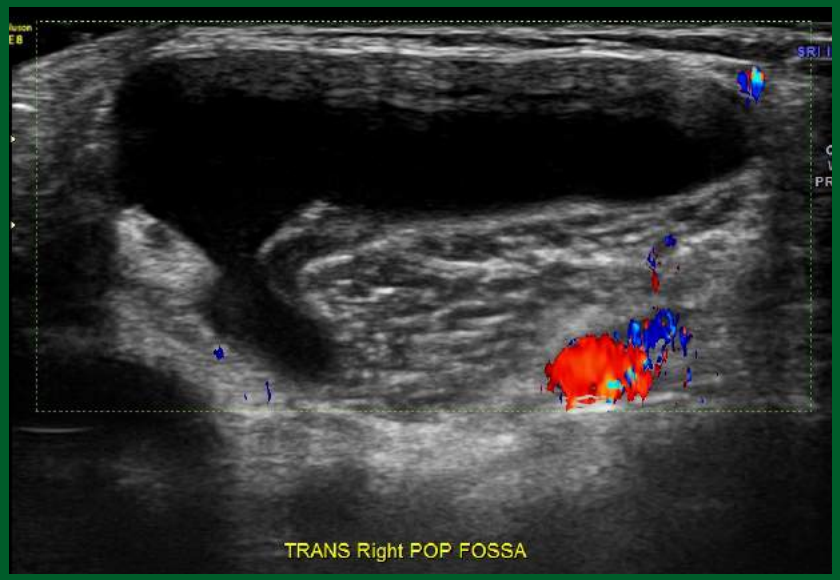


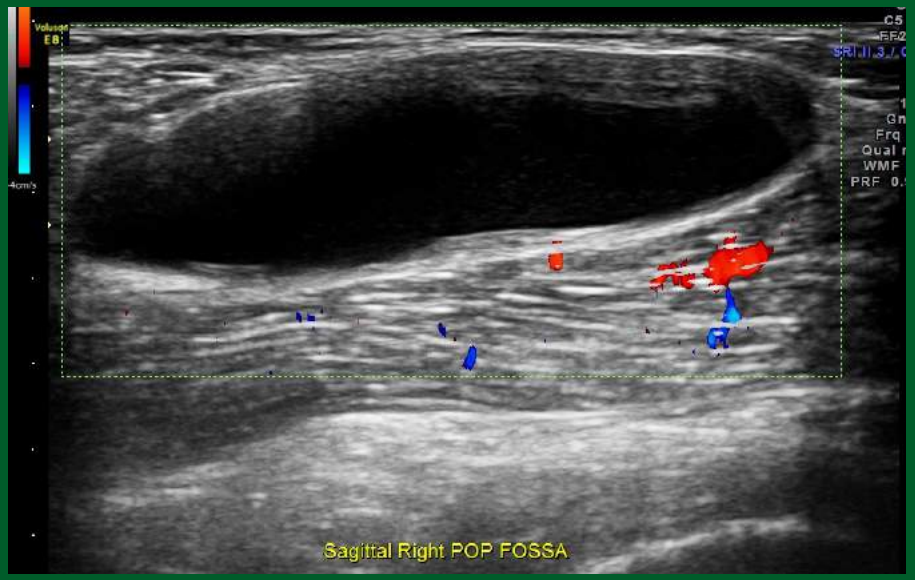
Pilonidal Cyst

Baker's or Popliteal Cyst

- 5 % of palpable masses
- Fluid in bursa behind knee
  - Postero-medial to the joint
  - Usually anechoic fluid, may contain debris or septa
  - Usually reflects knee joint pathology
  - May see septa in R.A., inflammatory processes

Popliteal (Baker's) Cyst



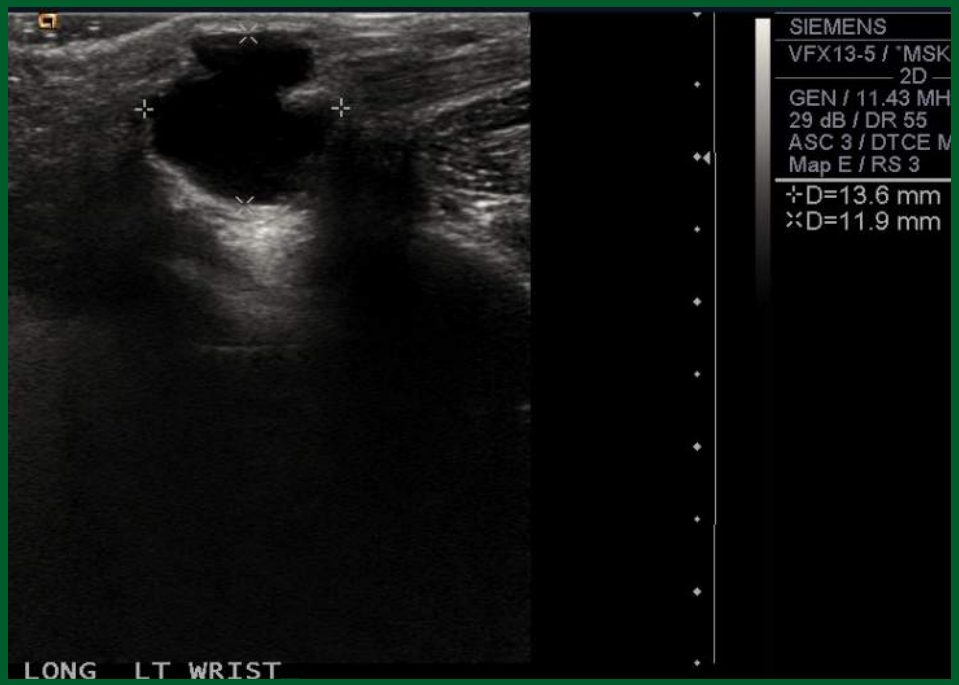


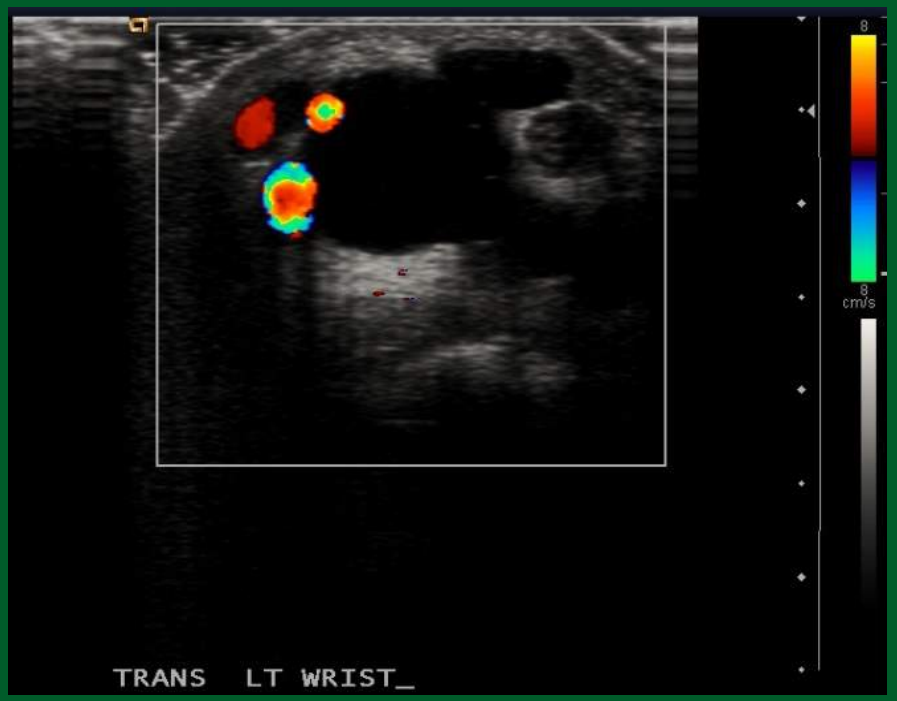
Ganglion Cyst

- Hand and wrist most common--near articular joints
- Pain and/or palpable abnl. -***often feel hard***
- 10-40 years of age
- 2nd most common soft tissue lesion after lipoma
- U/S appearance
  - Anechoic or mildly complex cystic
  - Generally round or oval
  - Often, lobulated or septated
  - No blood flow
  - Connection to tendon sheath or joint capsule

Ganglion Cyst

Wrist ganglion

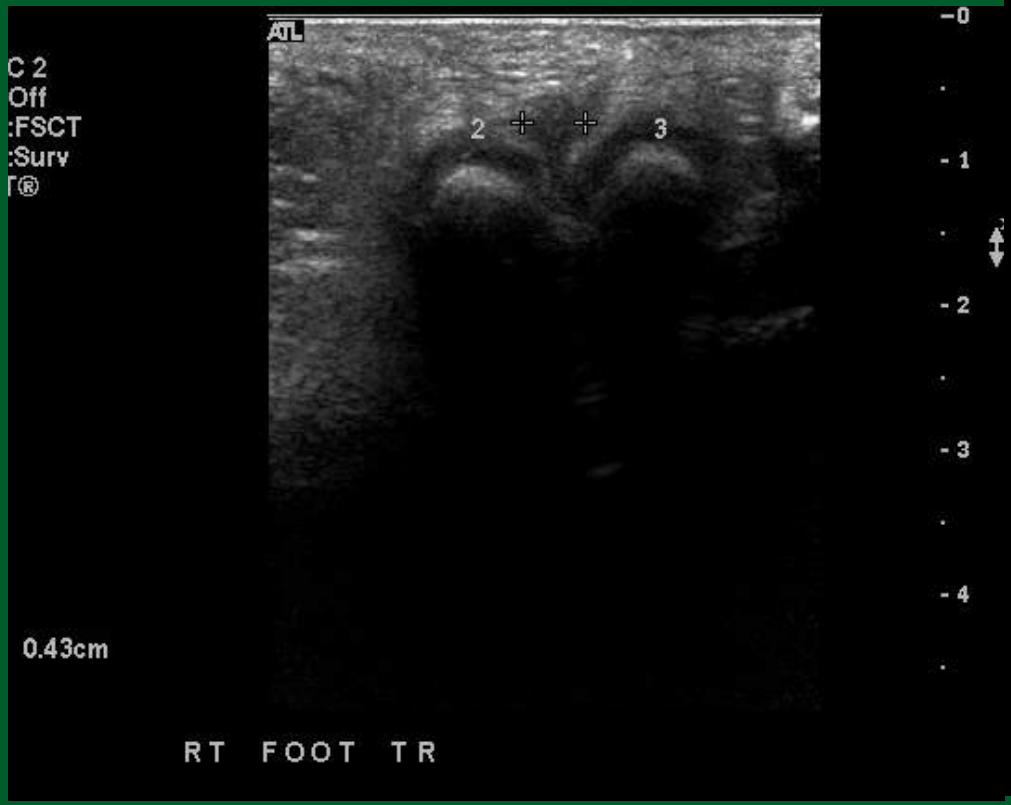


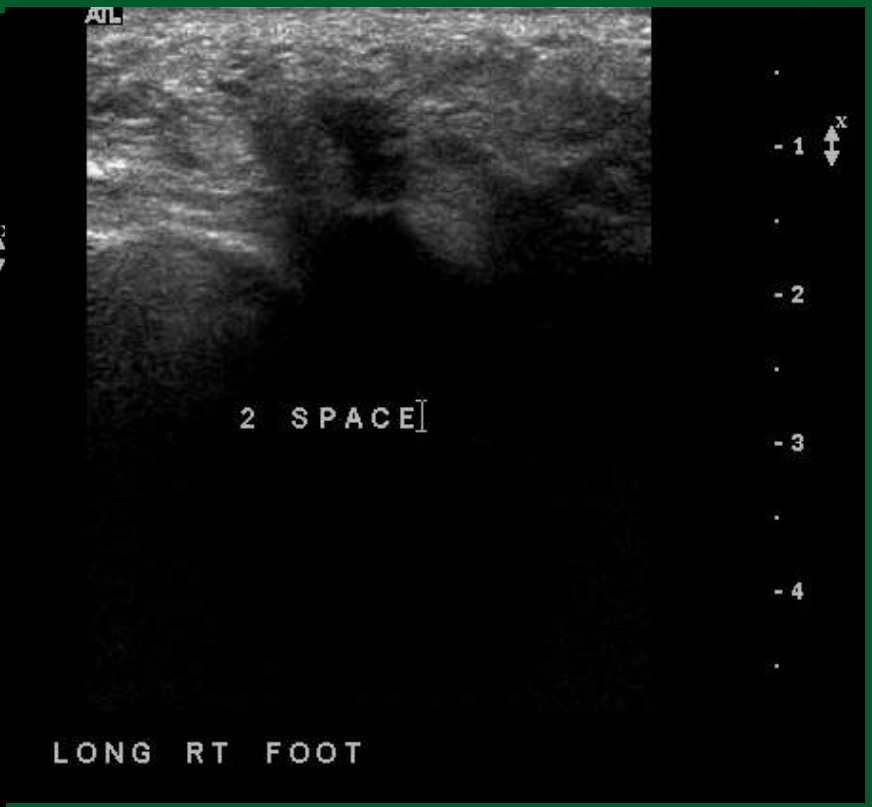


Morton's "Neuroma"-perineural fibrosis

- 2nd-3rd web space of foot -most common site
- Bilateral in 10%
- Multiple in up to 30% of pts
- Middle aged
- Female
- US appearance
  - Hypoechoic
  - Well-defined
  - Ovoid, ~ 5-7 mm. diameter

Morton's "Neuroma"-"pops" out

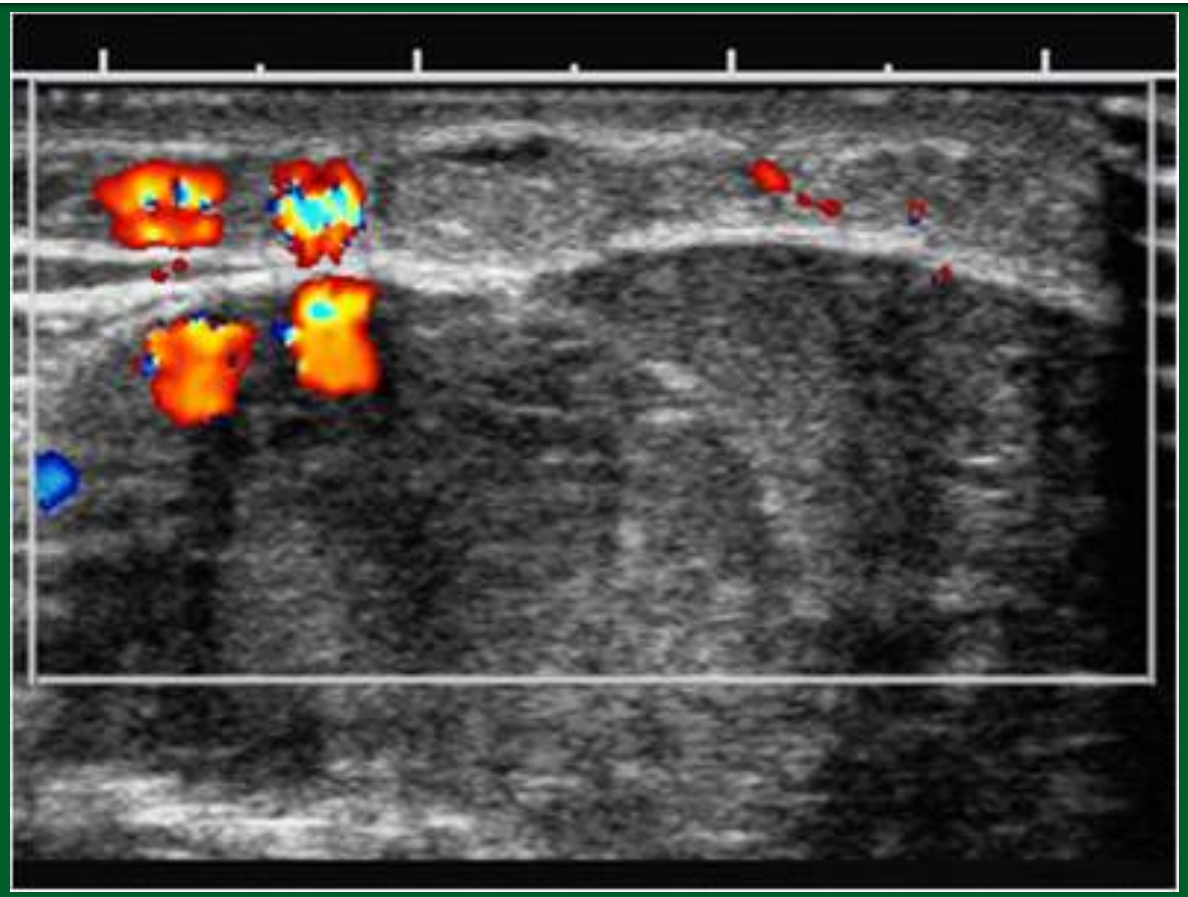




Fat (Dystrophic) Necrosis

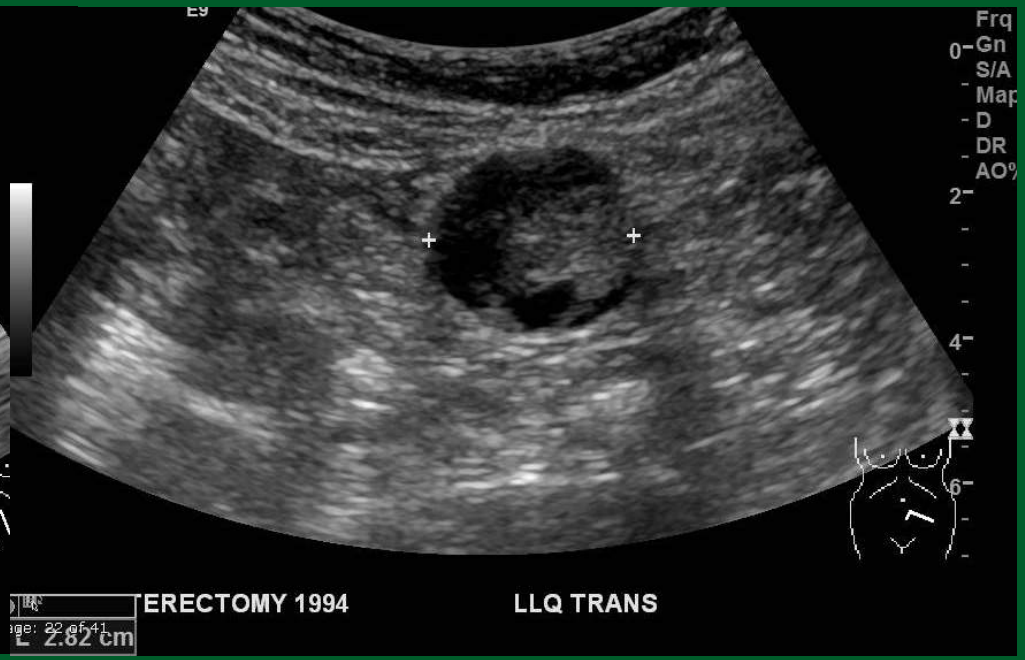
- Etiology
  - S/p blunt trauma (but pt may not recall, often minor)
  - Sickle cell dz, vasculitis
  - Autoimmune disease (SLE, Wegener's)
  - Hypothermia
  - Medication injection
- PE-Firm, non-tender
- US
  - Hyperechoic, in subcutaneous tissues
  - Indistinct, hypoechoic margins
  - Little vascularity

Fat necrosis

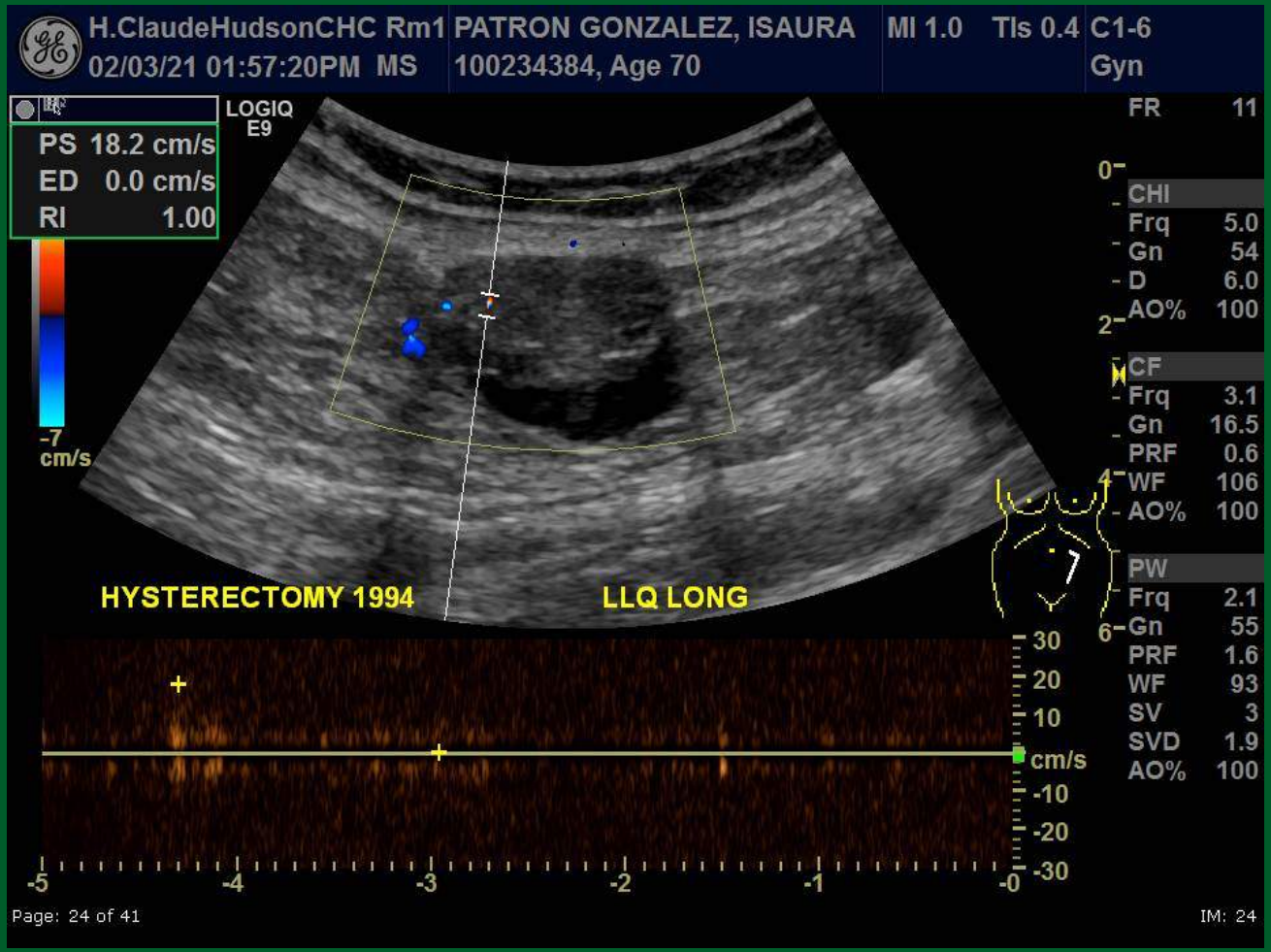


Shah and Callahan, Pedi Radiology, 2013

Fat necrosis in 70 yo female



Fat Necrosis

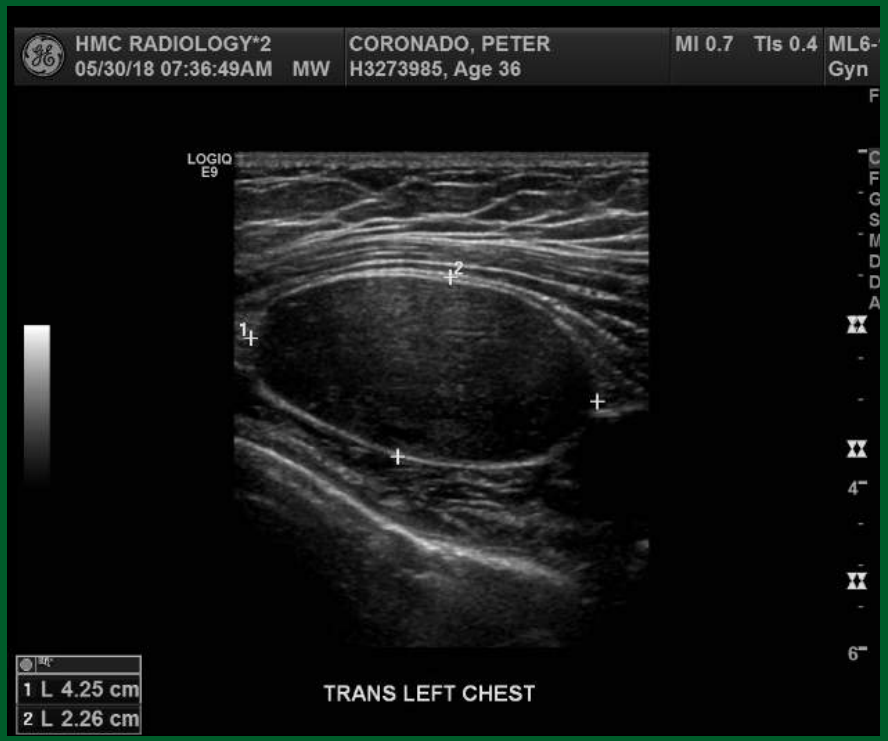


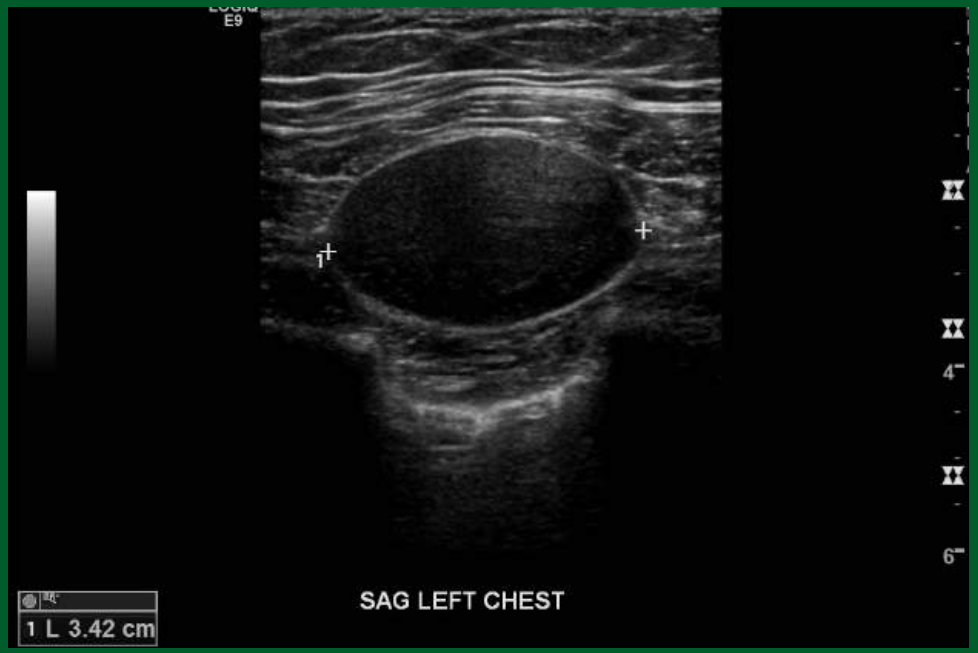
Fat necrosis s/p hysterectomy

Neurofibroma/Schwannoma

- Benign lesion of nerve /nerve sheath (Schwann cells)
- Age ~ 20-50
- Most in deep locations
- Rarely superficial-dermal
- Tenderness, numbness frequent symptoms
- Smooth, well-defined
- Optimally-see nerve at either end of lesion

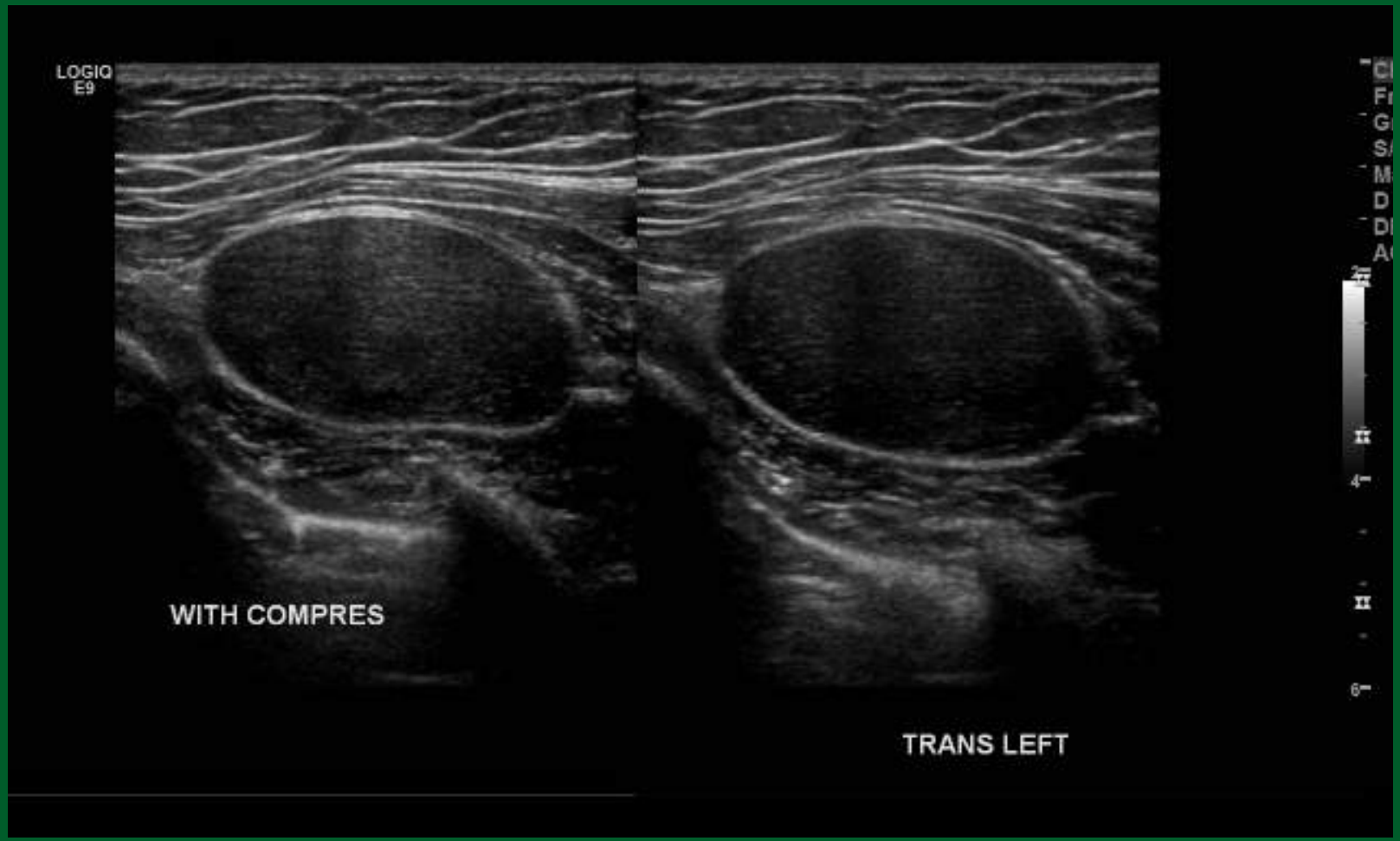
36 yo male with slow growing lump



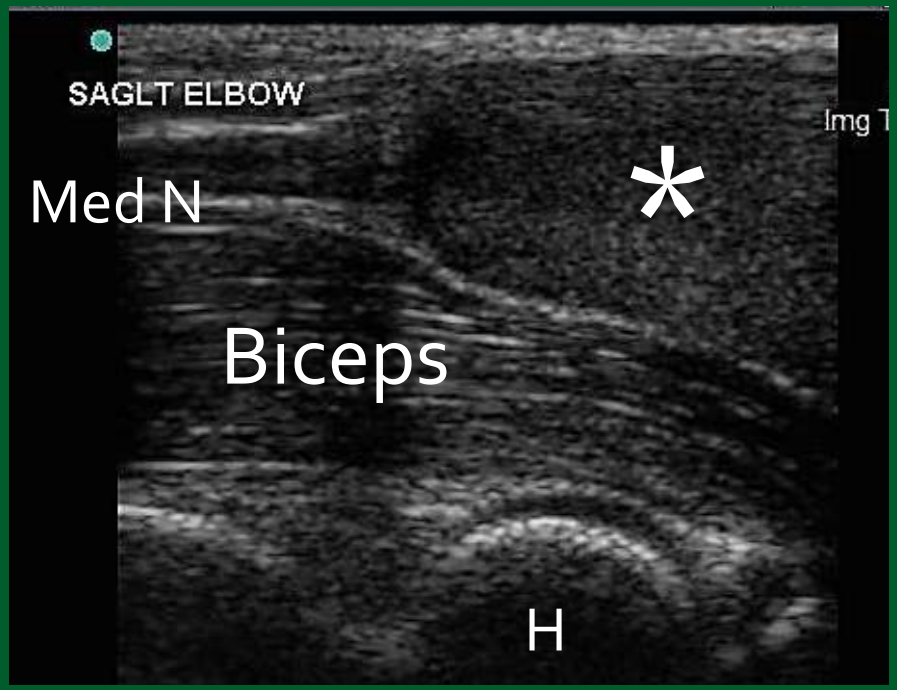


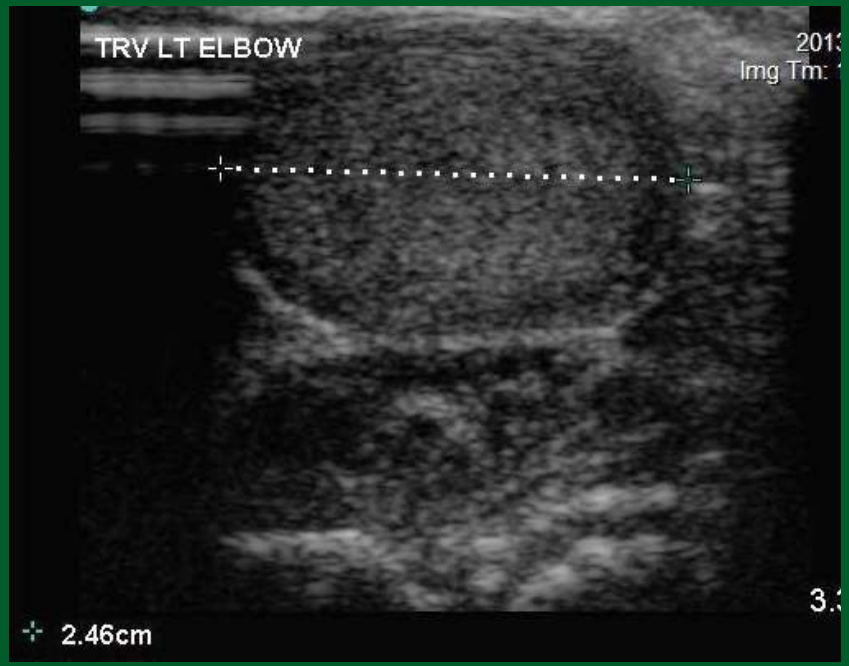
Vascularity??

Neurofibroma with degen. changes



Neurofibroma- Mercy Ships (West Africa) screening



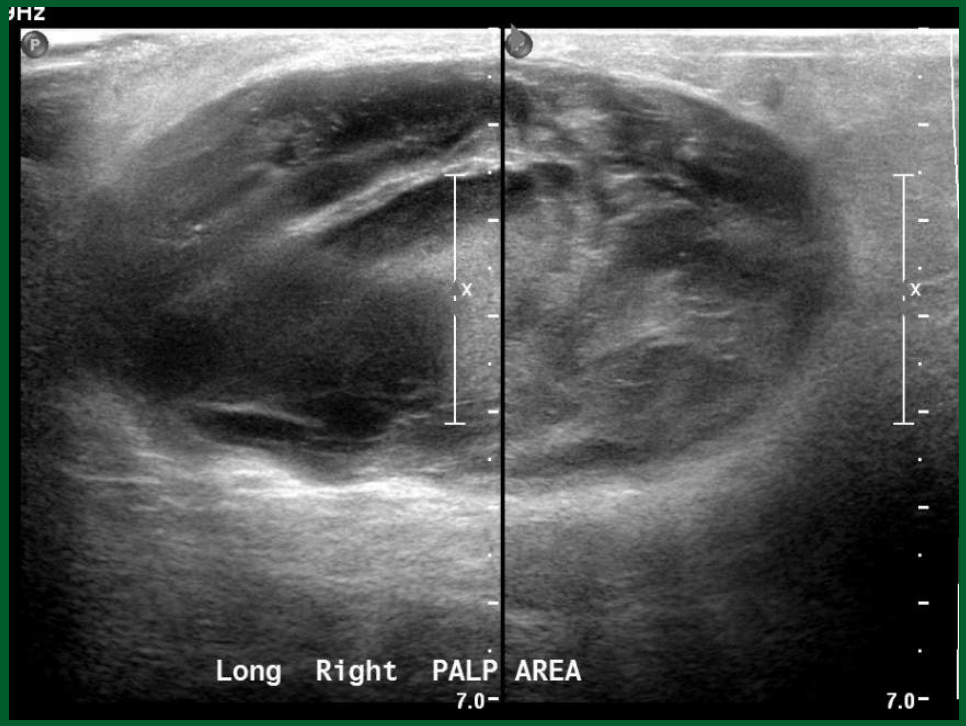


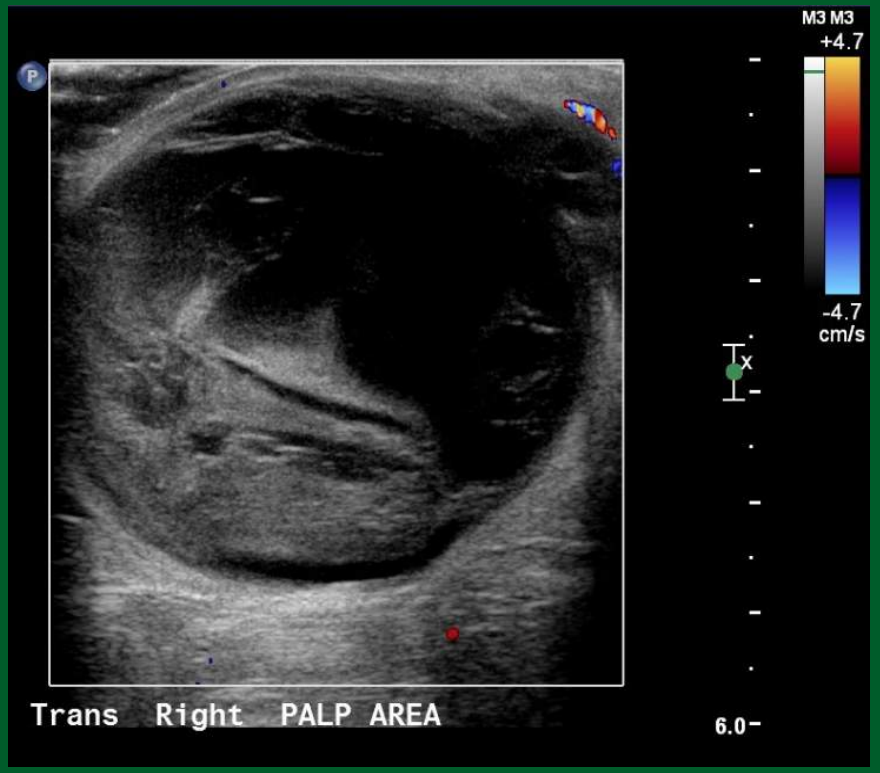
13 yo male, Congo-Brazzaville, 2013

88 yo s/p melanoma resection

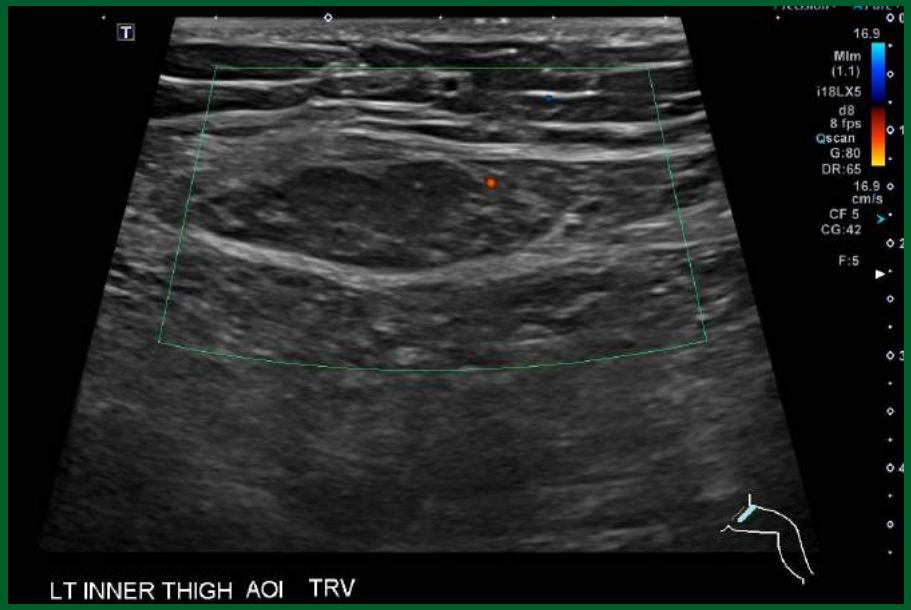
Large groin hematoma-
confirmed by MRI, no tumor

Hematoma (s/p melanoma resection) – color Doppler absence helpful



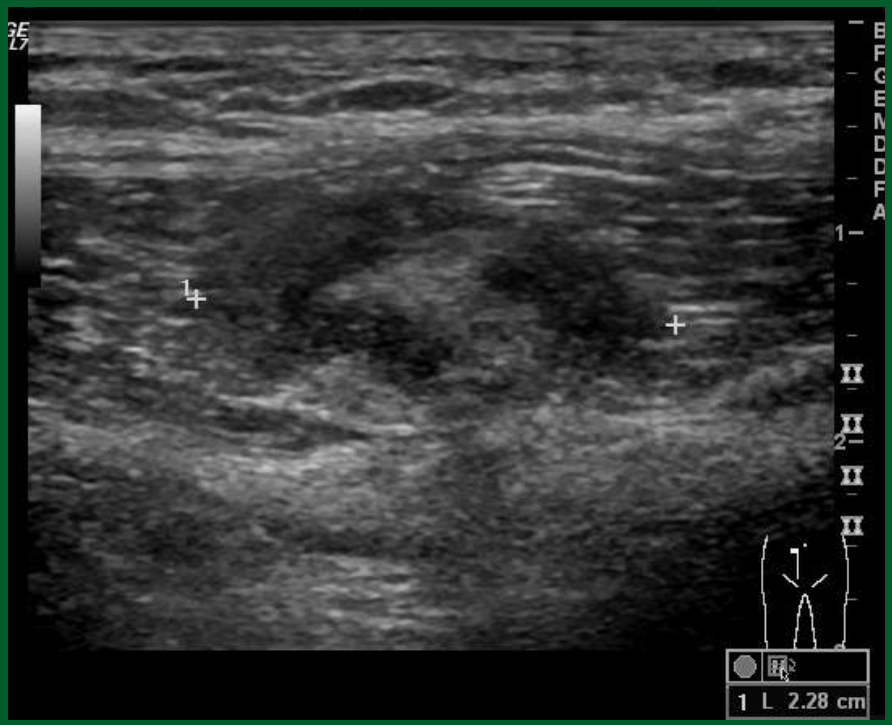


81 yo female with thigh pain, lump

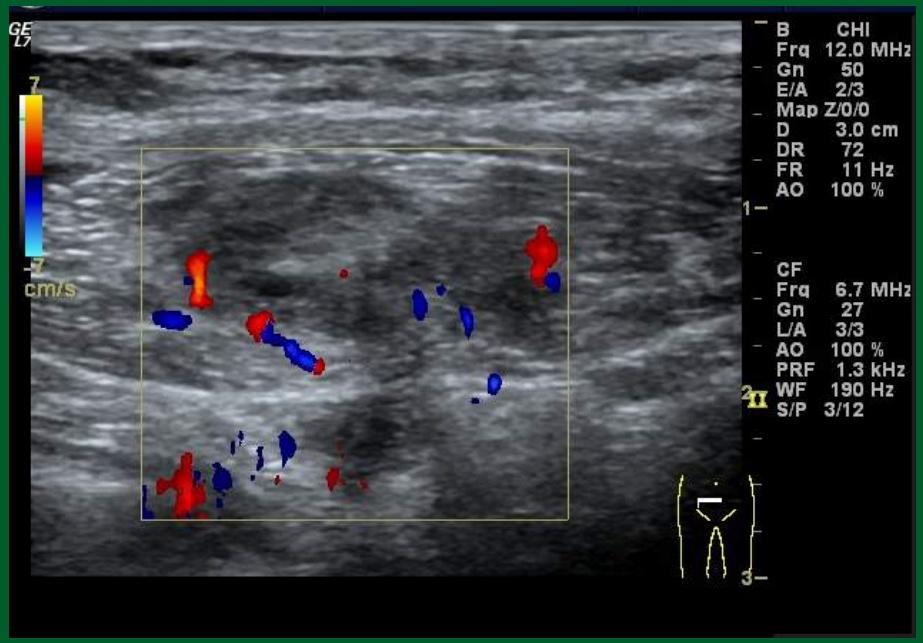


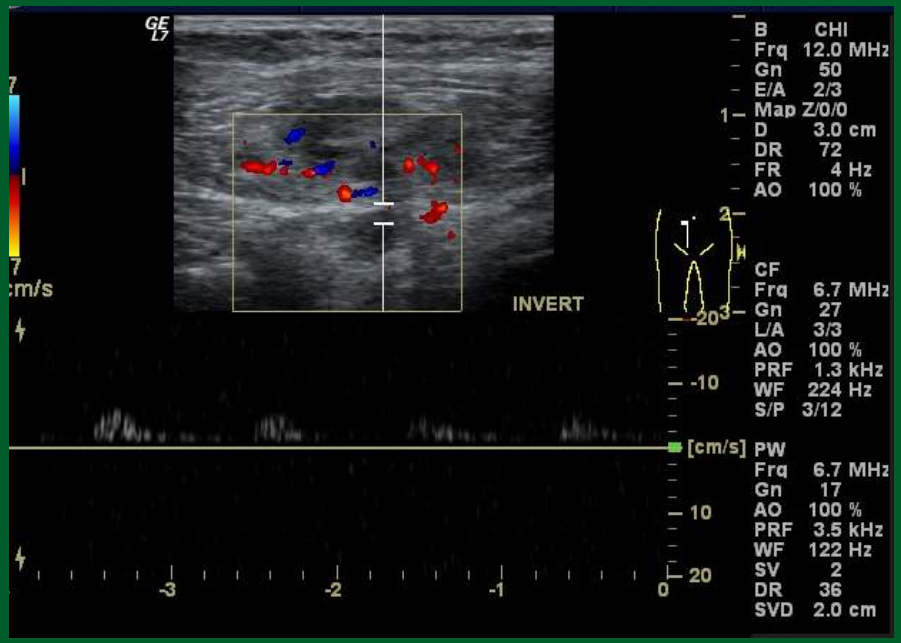
Probable hematoma, no therapy given

Abdominal wall mass in young woman, tender, near umbilicus

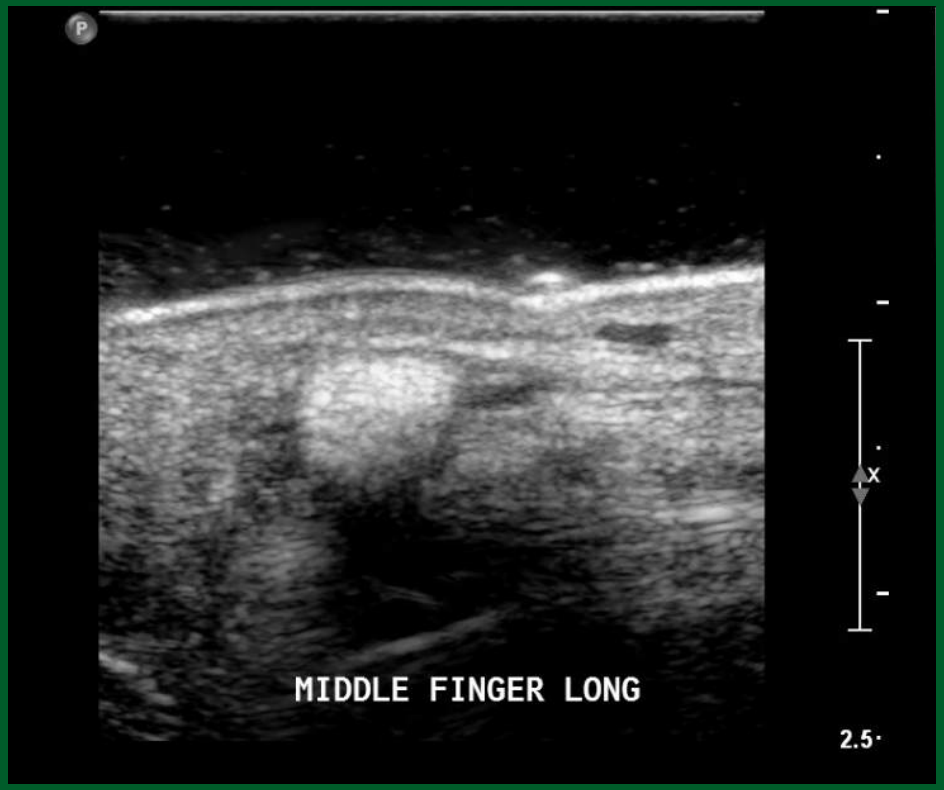


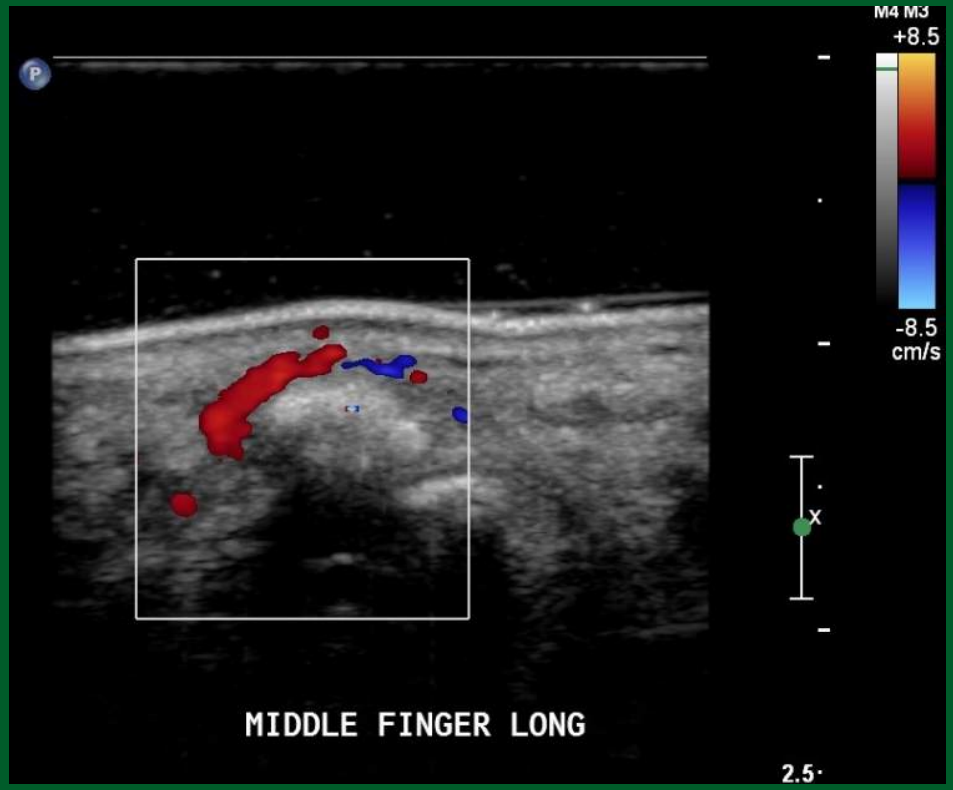
Abdominal wall mass at surgery: Endometrioma





62 yo cardiologist with painless lump 3rd DIP jt



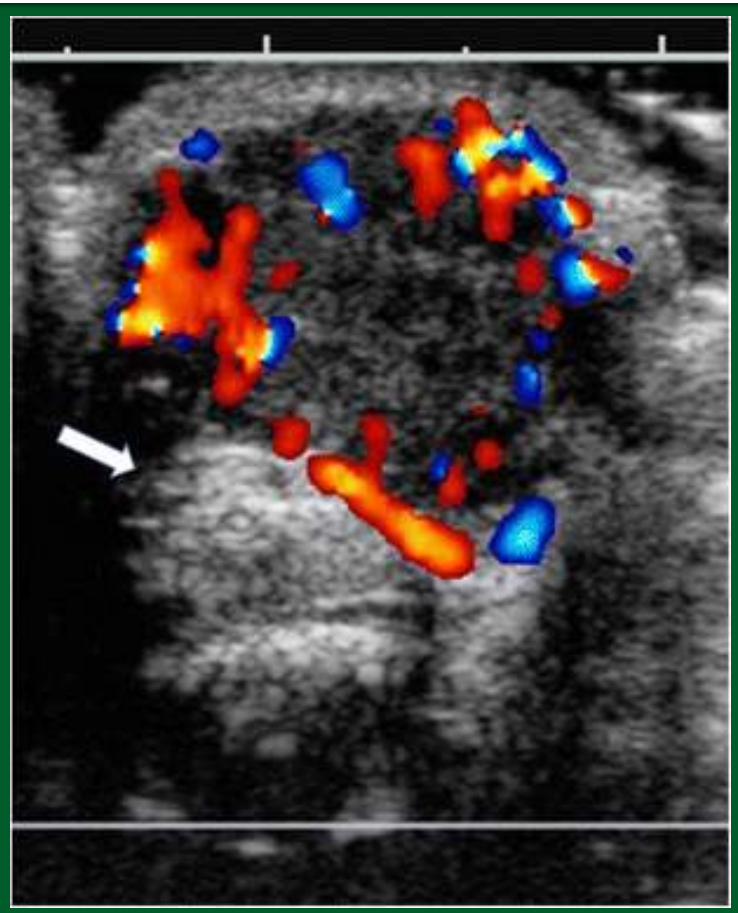


Lesson-use plain films – bony or Ca++

Benign vs. Malignant ST Masses

- Benign much more statistically common (~ 50:1)
- No single US predictor very accurate
- Margins & Vascularity "important"
- Clinical hx important
- PE-not so important (cysts or LN can feel fixed and solid & malignancy feel somewhat soft, mobile!)

Giant Cell Tumor of Tendon Sheath



Looks malignant, path: benign!

Shah and Callahan, Pediatric Radiology 2013; 43:S23-40

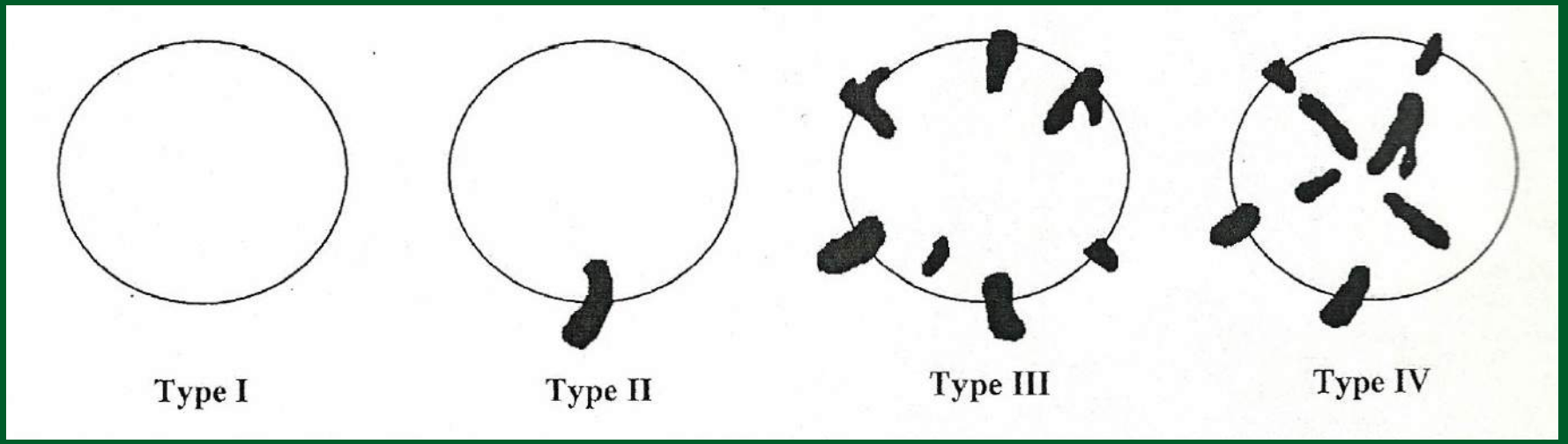
ST tumors: Malignant trending…

- Size > 5 cm., or intramuscular location
- Involvement of the deep fascial layers
- Lesion heterogeneity
- Poorly defined margins
- Increased vascularity +/-

Supporting Malignant Lesions:

- rapid growth
- clinical predisposition
- syndromes
- family history

Color Doppler grading scheme



Journal of Ultrasound in Medicine, 1999, 18: 89-93

Color Doppler Discrimination: Benign vs. Malignant

N = 71 lesions
(39 benign, 32 malignant)

Type	Benign (total 100 %)	Malignant (total 100 %)
I	86	9
II	14	0
III	0	50
IV	0	41

Giovagnorio, JUM 1999, 18:89

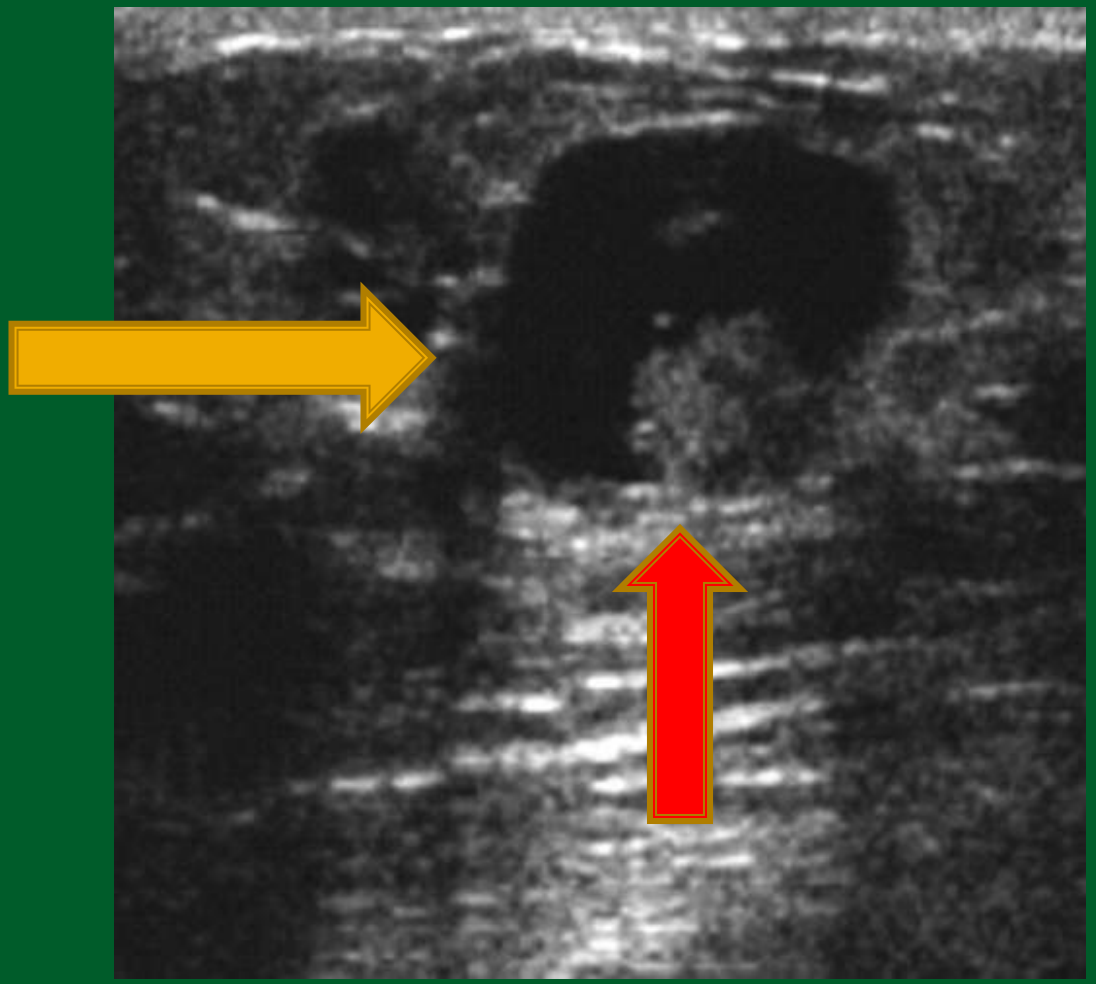
Malignant Soft tissue tumors

- Incidence - 1: 100 palpable soft tissue tumors in adults
- Uncommon in pediatrics

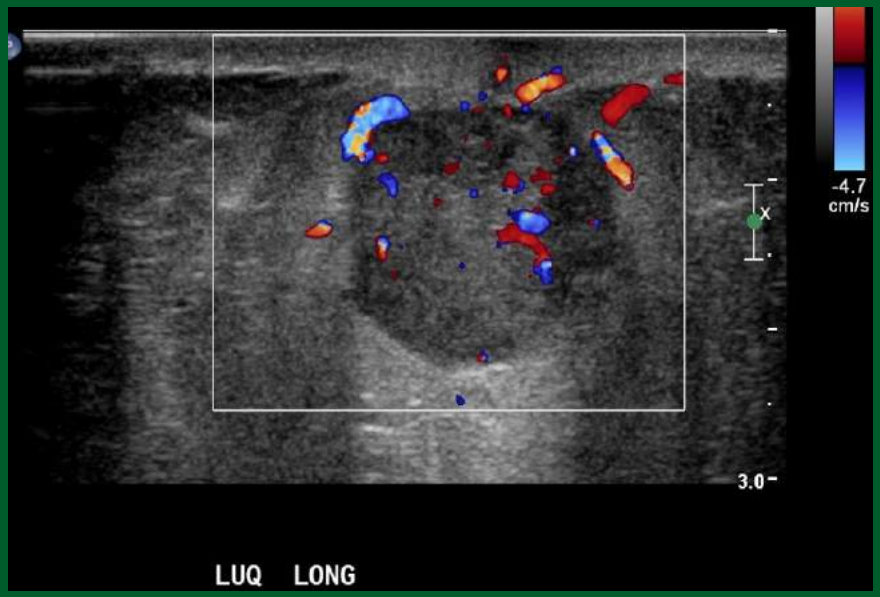
Malignant lymph node

- Height : Length > 0.5
- Loss of hilar fat sign
- Cortical thickening
- Hypervascularity

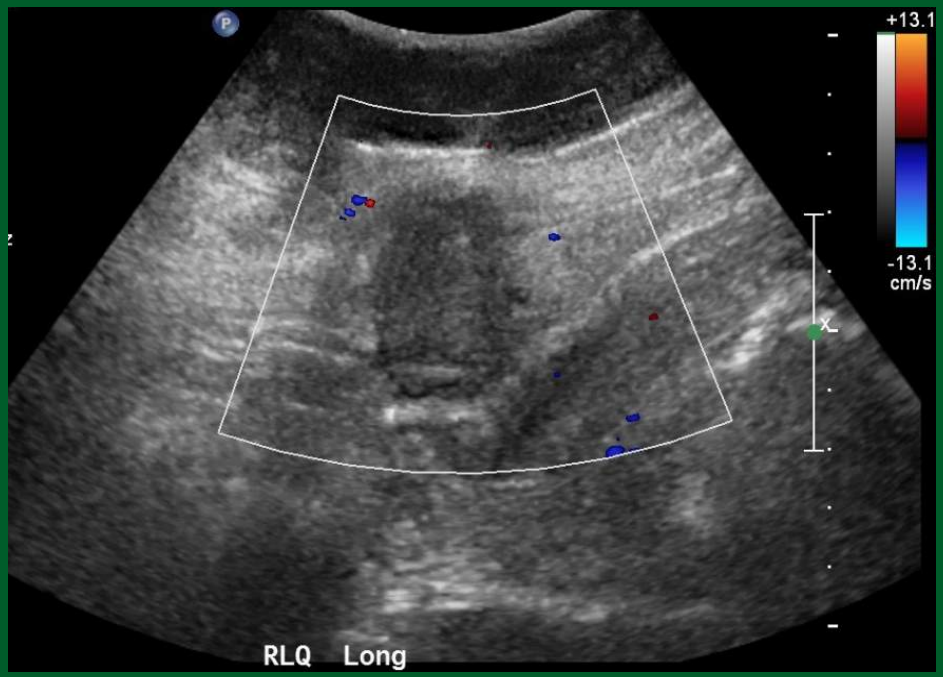
Metastases to axillary lymph node- male breast cancer



Subcutaneous carcinosarcoma metastasis upper abdomen



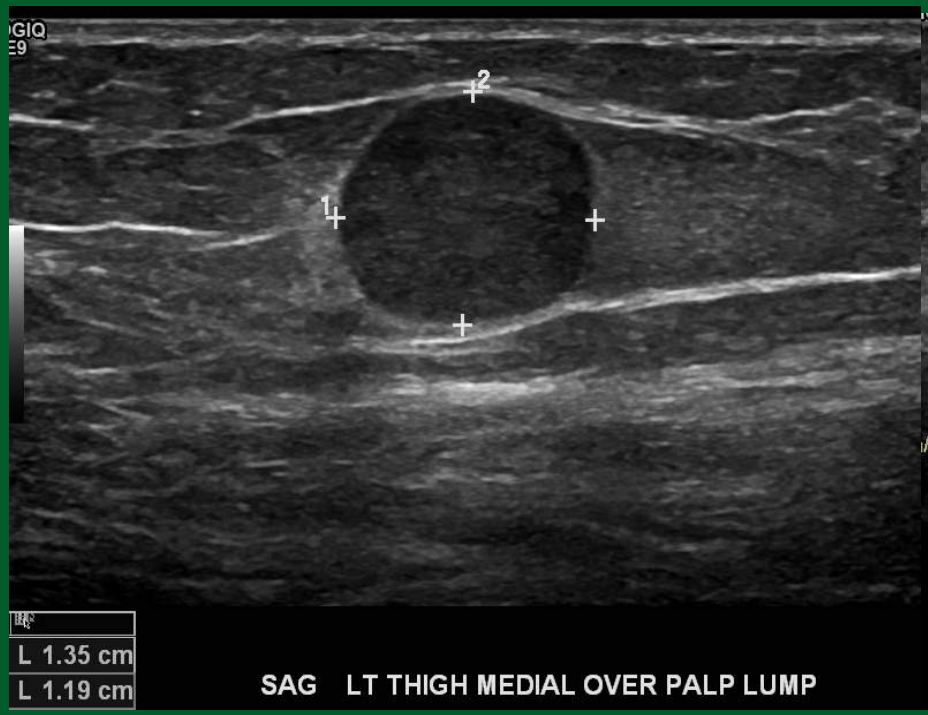
Carcinosarcoma pt-rectus hematoma—probably benign?

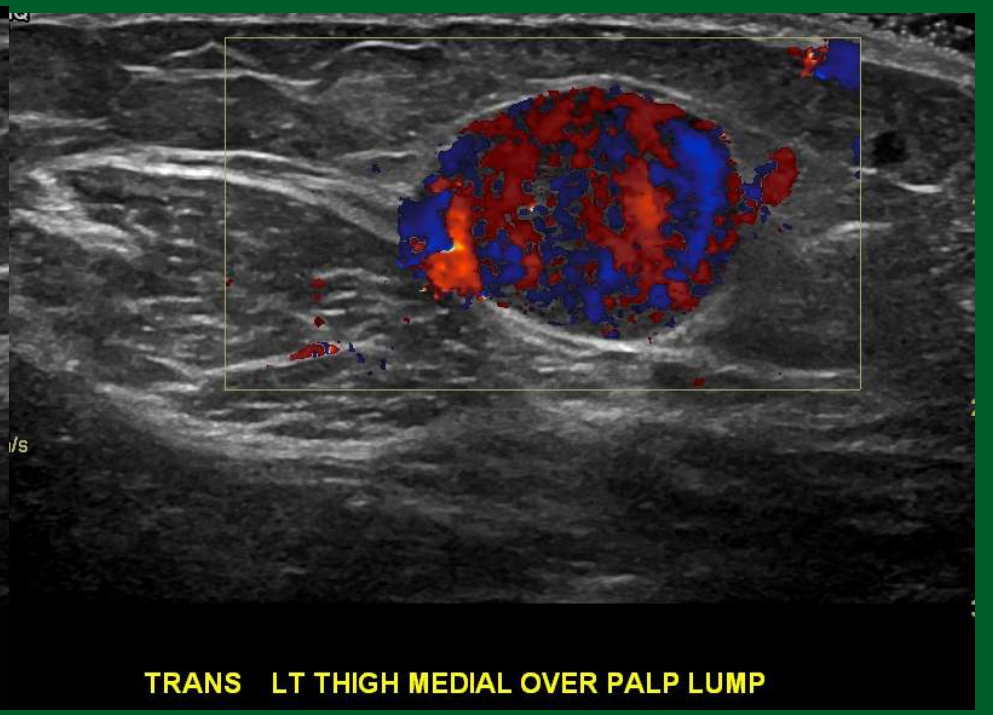


Sarcoma

- 1 percent of all adult malignancies and 12 percent of pediatric cancers
- 80 percent of sarcomas originate from soft tissue, and the rest from bone
- ~12,000 new cases of soft tissue sarcoma diagnosed each year in the United States, with 4,740 deaths
- Thigh, buttock, groin- ~ 50% cases

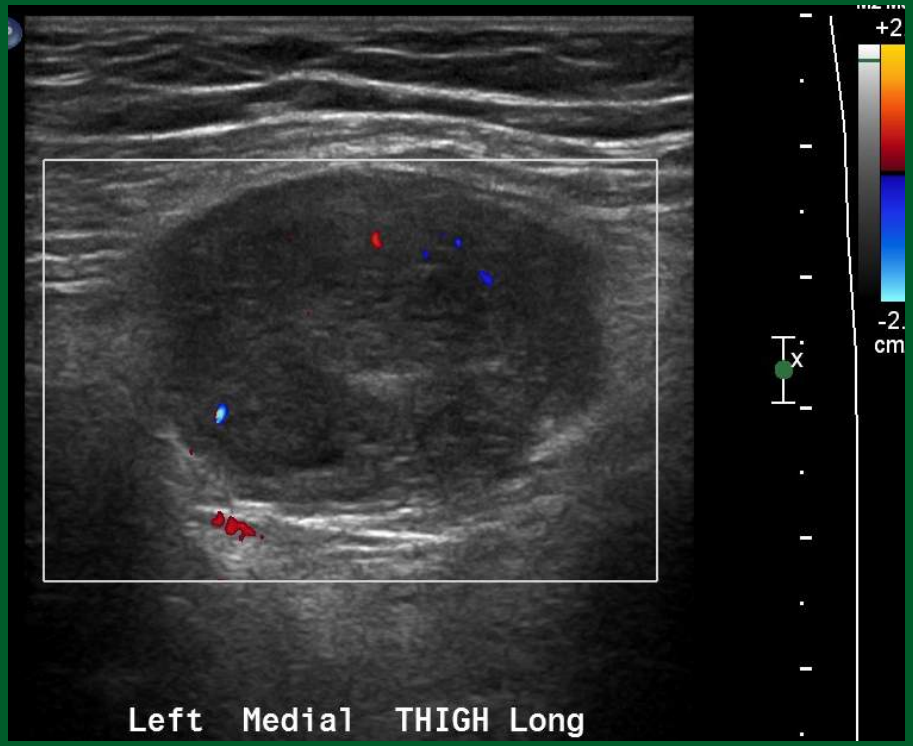
Sarcoma vs. dermatofibroma vs. desmoid tumor-57 yo man

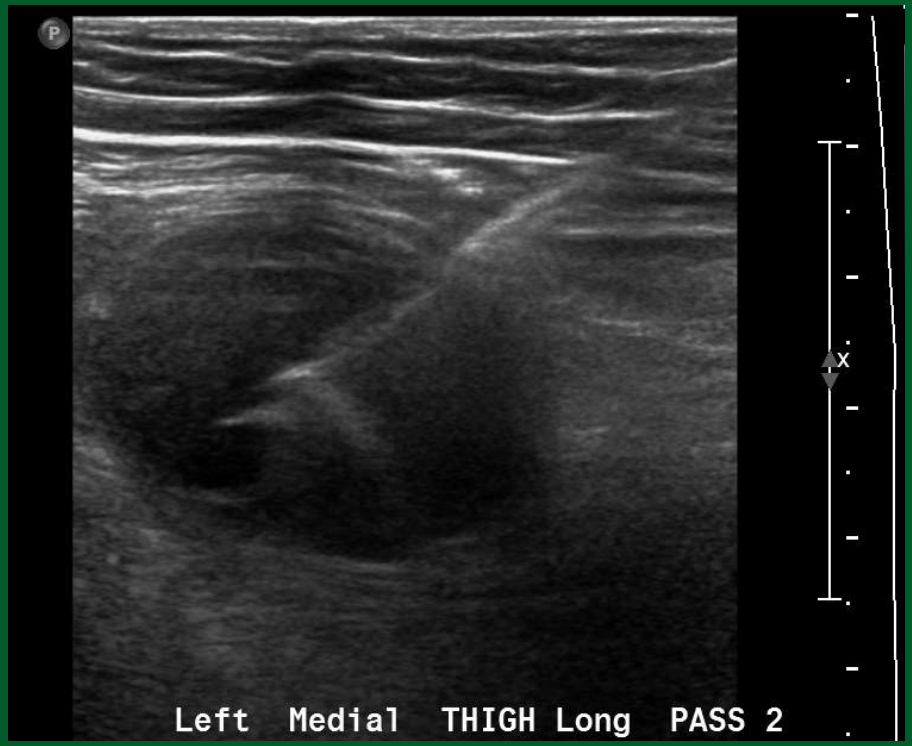




Sarcoma or Desmoid tumor?

72 m–myxoid spindle cell tumor



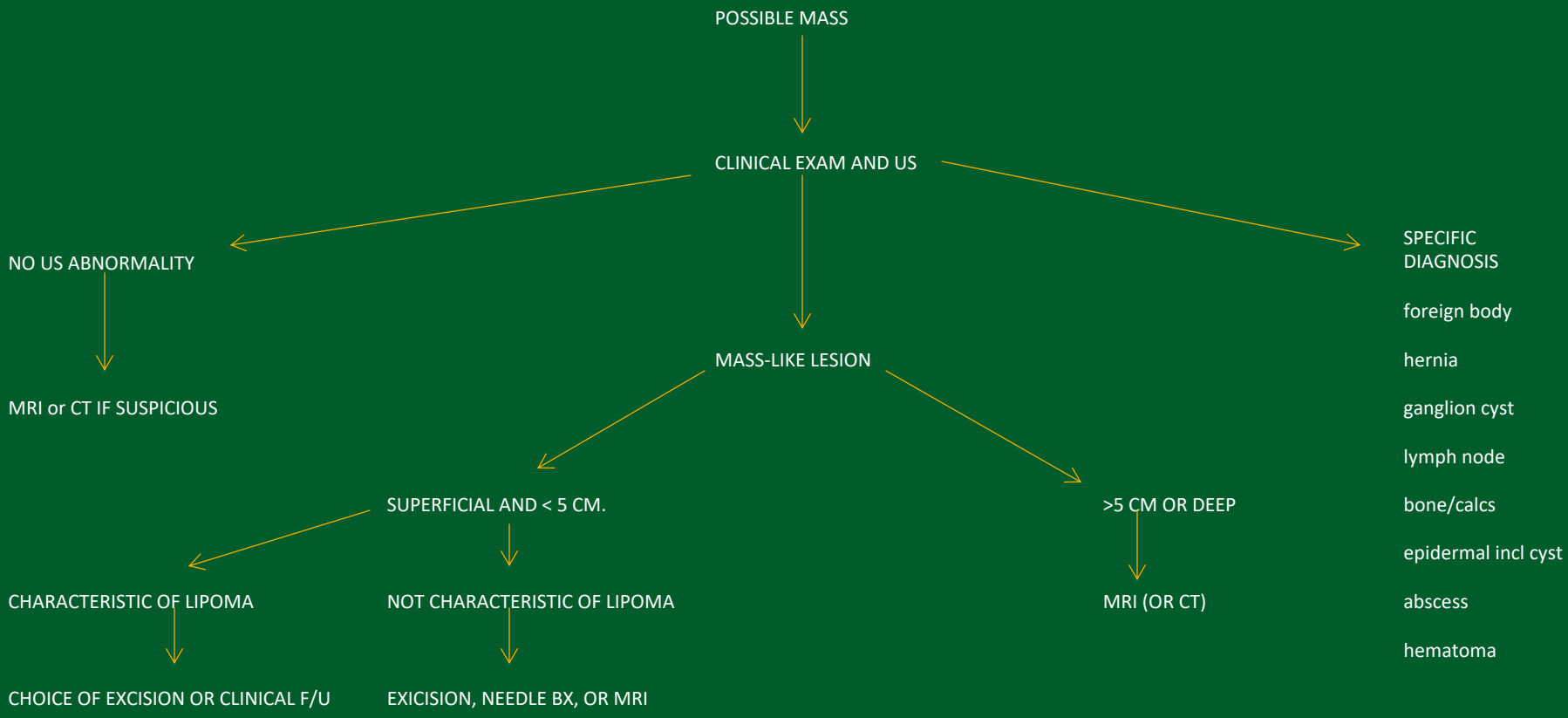


Surgery- intramuscular myxoma

Summary

- Superficial soft tissue bumps are common, malignancy rare (1-2%)
- Diff Dx based upon age, clinical hx, US appearance-get good history
- Know "leave-alone" lesions-fibromatosis coli, lipomas, cysts, hematomas
- Color Doppler very helpful- ~25% of lipomas may show Color Doppler flow
- Size > 5 cm. or deep location suggests malignancy (needs MRI or CT)
- If heavy Ca++ or bone, get plain films

Decision Tree for Lumps/ Bumps



from J. Wagner, Ultrasound Clinics, 2014

The End-Questions?

Thank you for your attention….