

# *Sonography of Pediatric Superficial Lumps and Bumps: Illustrative Examples from Head to Toe*

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# *Introduction*

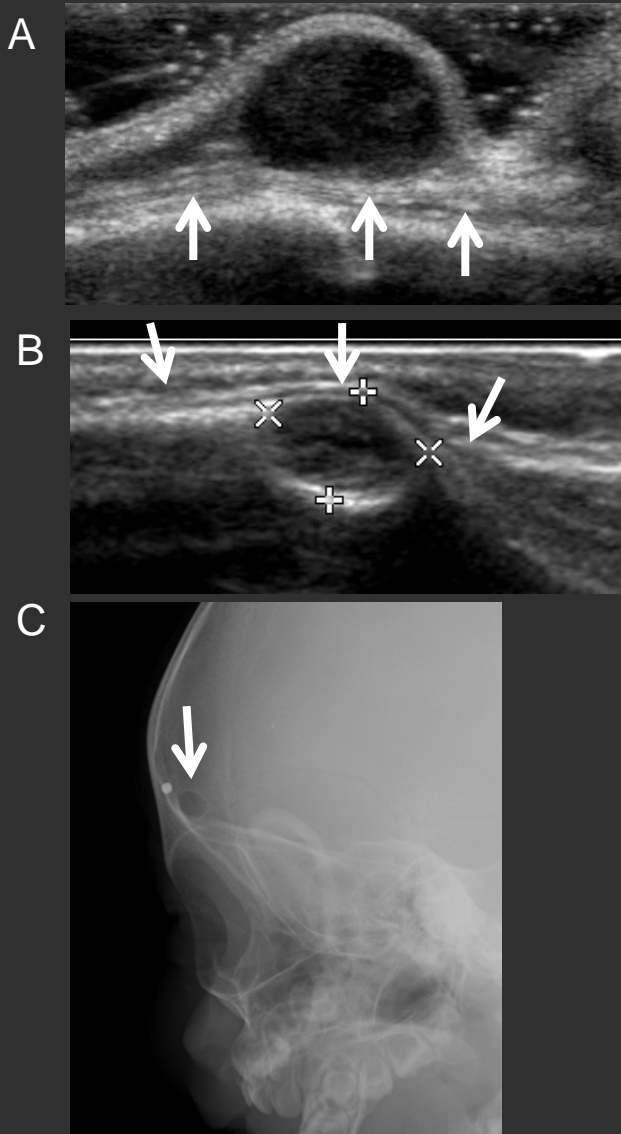
- ✓ Superficial lumps and bumps are extremely common in children with the majority of the masses ultimately proven to be benign.
- ✓ Duplex/color Doppler ultrasound (US) has emerged as the first line imaging modality for the evaluation of superficial pediatric masses as it provides a means for rapid acquisition of information including size, shape, location, internal content, and vascularity without utilizing radiation, iodinated contrast material, or sedation/anesthesia.
- ✓ In this pictorial review, we present a variety of cases ranging from head to toe that are either uncommonly seen (due to low incidence) or that were diagnosed in an atypical fashion (i.e. by ultrasound).

# Approach



- ✓ When presented with a pediatric superficial mass, it is imperative to first construct a differential diagnosis derived from relevant clinical history and physical examination.
- ✓ The sonographic scanning technique employed depends on the specific body part in question. Typically, a high-frequency (12-5, 17-5, 9-3 MHz) linear transducer is used to maximize resolution.
- ✓ For larger lesions, a curvilinear transducer or an extended field of view is helpful.
- ✓ Alternatively, for very small lesions, the “hockey stick” (17-5io MHz) linear probe may be required for characterization.
- ✓ The goal of sonography is often to determine the best next step, which might include watchful waiting (clinical observation or follow-up ultrasound), radiography, CT, MRI, biopsy or in some cases surgical resection.

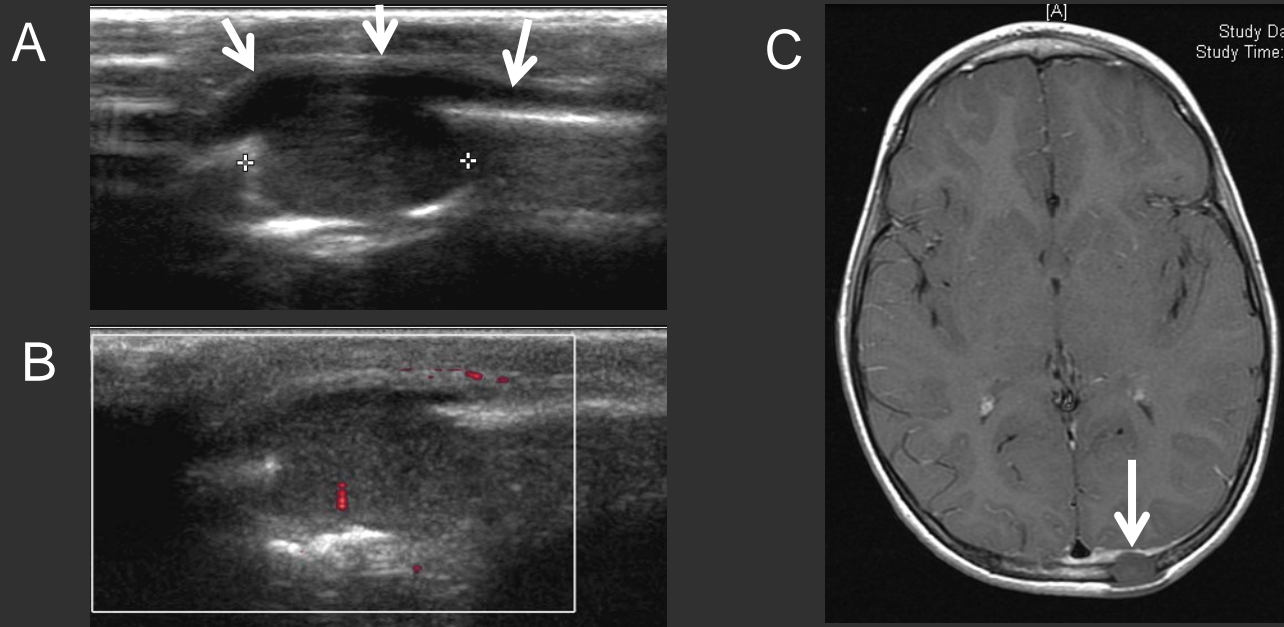
# Dermoids and epidermoid cysts



**A.** 1 month old female with a right postauricular compressible lump present since birth. Transverse US image demonstrated a well defined subcutaneous avascular compressible cystic mass superficial to the periosteum (arrows). The underlying skull was unremarkable.

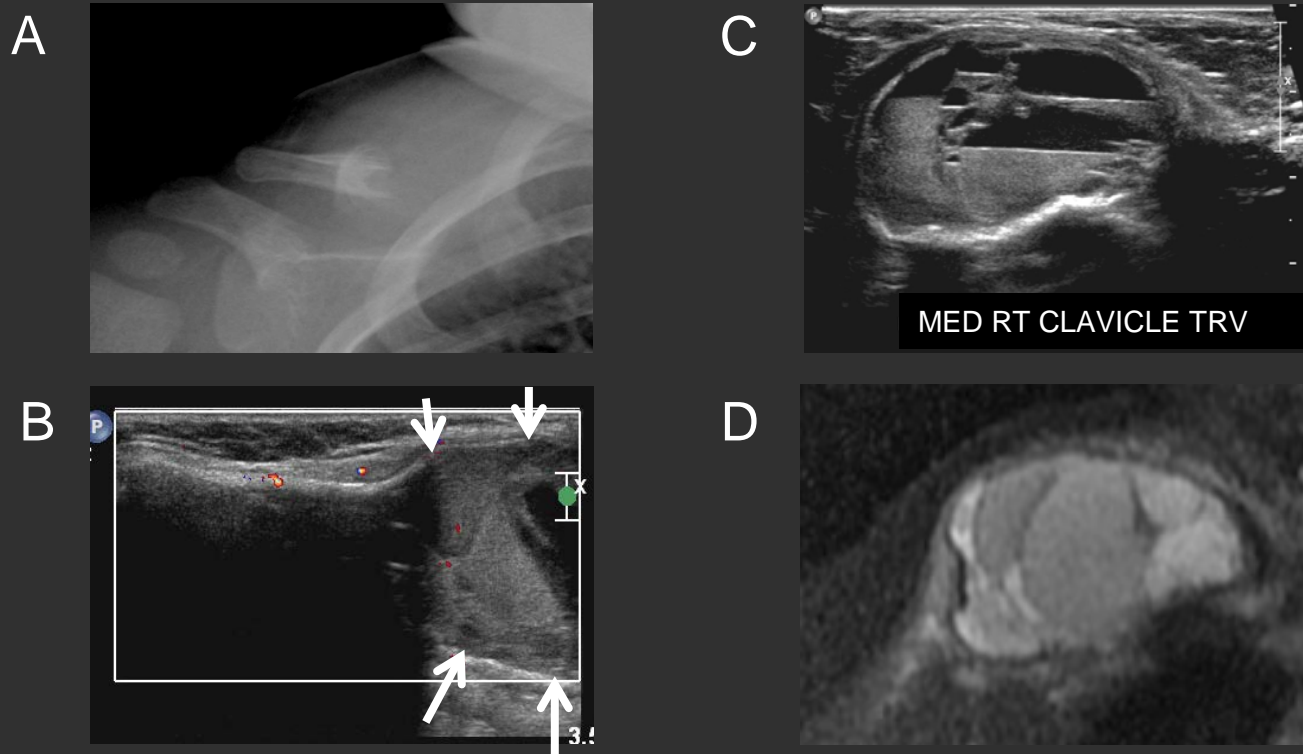
**B,C.** Epidermoid cyst in a 9 month old female with a small hard immobile right frontal mass. Transverse US image demonstrates a subcentimeter hypoechoic avascular well defined cystic mass with extension through the right frontal bone. There is periosteal draping over the mass (arrows). Corresponding lateral cranial radiograph (C) demonstrated a lucent lesion with well-defined sclerotic margins in the corresponding part of the skull (arrow).

# Langerhans cell histiocytosis



7 year old male with a painful occipital mass. Transverse greyscale (A) and Doppler (B) US images of the left occiput demonstrated a 1.5 cm minimally vascular solid mass that extends from the diploic surface through the inner and outer tables of skull with local subperiosteal (arrows) spread. C. Axial T1 MRI revealed a hypointense oval lesion in the corresponding location and confirmed sonographic findings.

# Aneurysmal bone cyst



15 month old male with enlarging hard immobile mass in the medial right clavicle which developed following right clavicular trauma 2 months prior to presentation. **A.** Radiograph of the right clavicle demonstrates that the medial aspect of the right clavicle is not visualized and that there is expansion and splaying of the most medial portion of the clavicle. **B.** Transverse Doppler US image of the right medial clavicular region demonstrates marked expansion of the medial end of the clavicle (arrows). **C.** There were multiple fluid/fluid levels within a multiseptated mass replacing the medial end of the right clavicle. **D.** Findings were confirmed by axial STIR MRI.

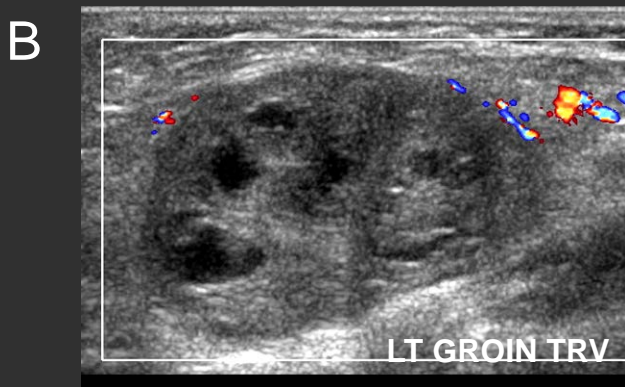
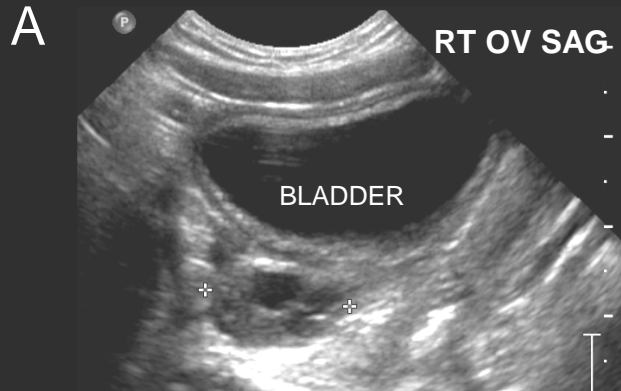
# Infected urachal cyst



6 month old male with erythematous and painful soft tissue swelling of the umbilicus and mid abdomen wall. Greyscale sagittal US image of the urachal tract (A) and transverse US image of the umbilicus (B) demonstrate heterogeneity within the urachal tract and cyst. C. Transverse Doppler US image of the umbilicus demonstrates significant hypervascularity consistent with acute infection.



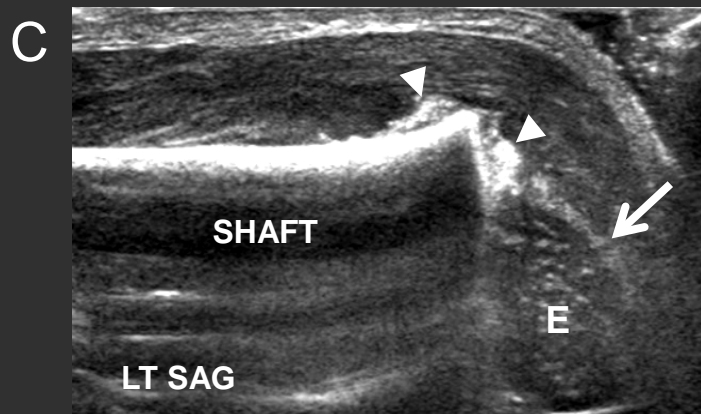
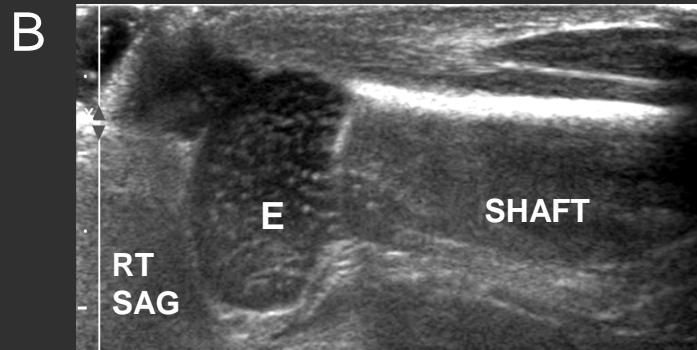
# Ovarian torsion



4 month old female with left groin mass and vomiting. **A.** Sagittal greyscale US image of the right adnexa demonstrates a normal right ovary (volume 2 mL) in the right adnexal region. **B.** The left ovary was not seen in the expected left adnexal region. Instead transverse Doppler US image of the left groin demonstrated a large oval avascular structure (volume 8.4 mL), containing multiple follicles, consistent with a torsed herniated left ovary.

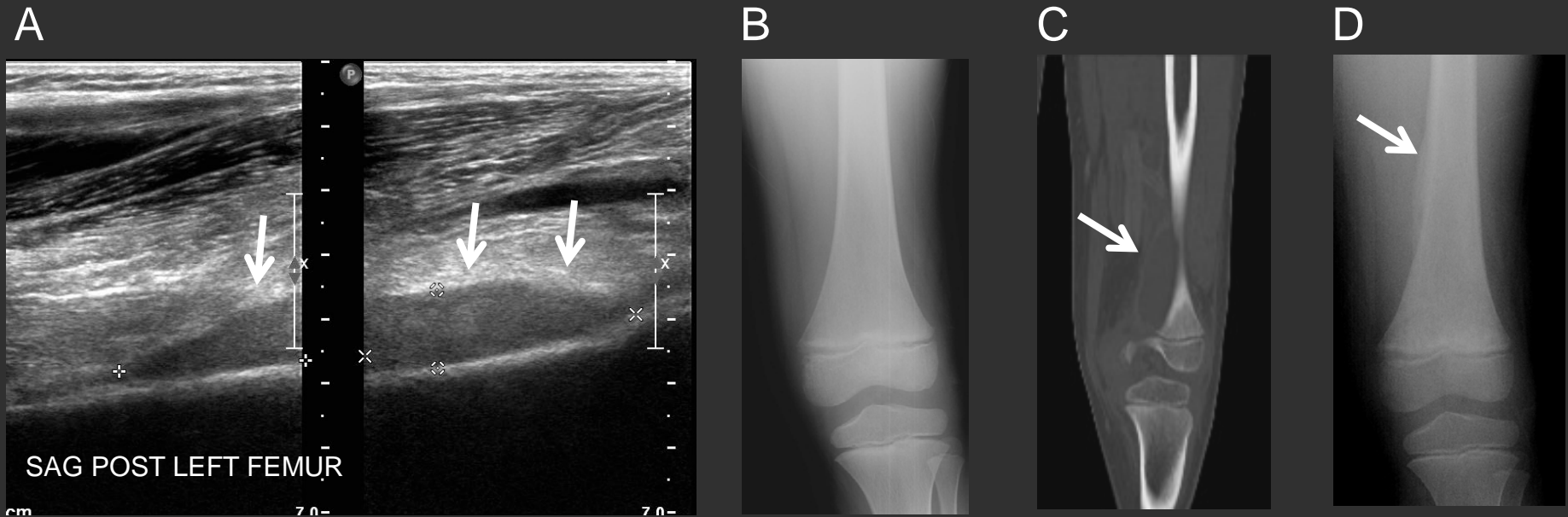


# Displaced Salter-Harris type II fracture



1 week old male with a hard "mass" at the left knee. **A**. Portable supine radiograph of the femurs demonstrates marked soft tissue swelling of the left knee. Two small bone fragments are identified adjacent to the metaphysis. Coincidental note is made of a left inguinal hernia. Sagittal greyscale US image of the right knee (**B**) demonstrates normal alignment of the cartilaginous distal femoral epiphysis (E) relative to the shaft. Sagittal greyscale US image of the left knee (**C**) demonstrates a Salter-Harris type II fracture with posterior displacement of the distal femoral epiphysis (arrow). Arrowheads indicate small metaphyseal bone fragments and periosteal reaction.

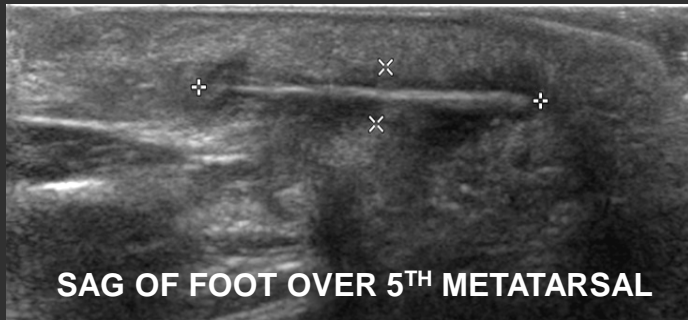
# Osteomyelitis



7 year old male with acute left thigh pain and swelling for 3 days, fever, and increased inflammatory markers. **A.** Sagittal dual screen US of the posterior femur demonstrates elevation of the periosteum (arrows), below which is moderately echoic fluid consistent with purulent material in this clinical setting. **B.** Corresponding frontal left femur radiograph performed several hours prior to the ultrasound was unremarkable. No periosteal reaction was seen. **C.** Coronal CT of the left femur performed several hours after the ultrasound demonstrates subperiosteal fluid in the distal medial left thigh (arrow). **D.** Radiograph of the left femur performed 4 weeks later demonstrated organizing periosteal reaction at the medial distal femoral diaphysis (arrow).

# Foreign body (splinter)

A



B



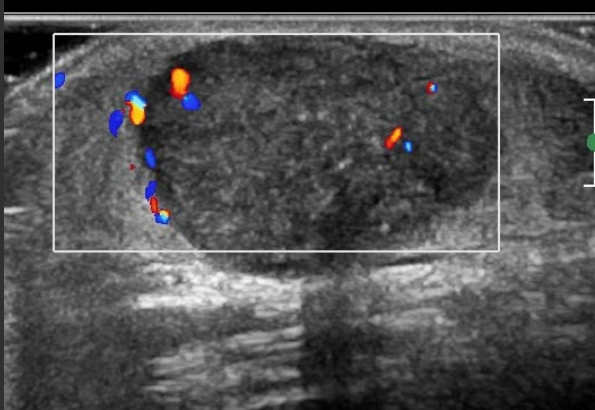
10 year old male with pain and soft tissue swelling on the sole of the foot after stepping on a sharp item. **A.** Sagittal US of the sole of the foot adjacent to the 5<sup>th</sup> ray demonstrated a 2.2 cm long brightly echogenic structure surrounded by hypoechoic edematous tissue. The underlying skeletal structures were normal. **B.** Corresponding surgical specimen.

# Pilomatricoma

A



B



6 year old female with bluish painless mass in the posterior midline neck. Transverse greyscale (A) and Doppler (B) US images of the posterior midline neck demonstrate a superficial oval heterogeneously hypoechoic, mildly hypervascular mass with a hypoechoic halo and multiple punctate echogenic foci.

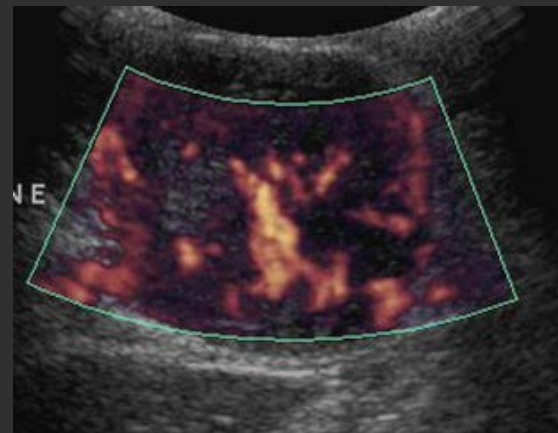
# Alveolar soft parts sarcoma

12 year old female with steadily growing painless anterior midline abdominal wall mass. Transverse greyscale (A) and sagittal Doppler (B) US images of the anterior abdominal wall demonstrated a solid well defined hypervascular mass. The patient underwent subsequent MRI and surgical excision.

A



B



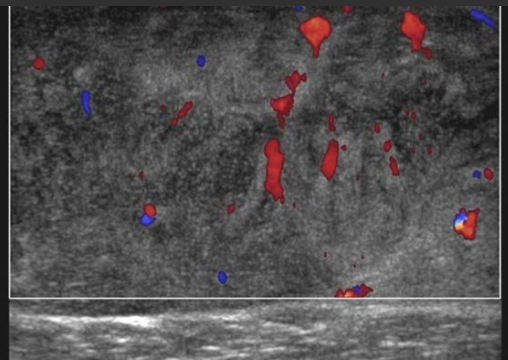


# Myxoid liposarcoma

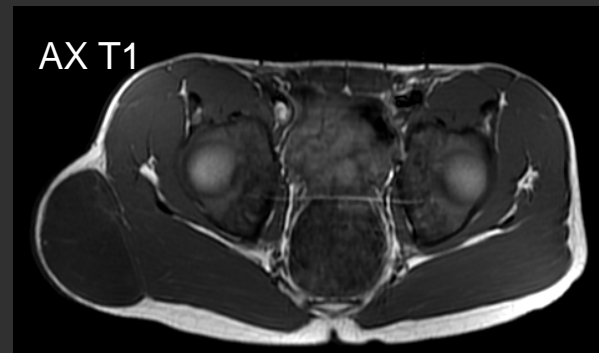
A



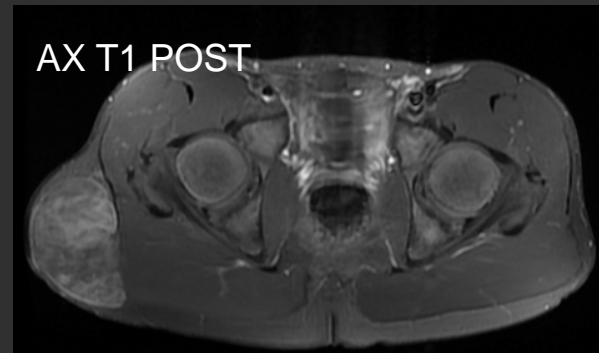
B



C



D



13 year old male with rapidly growing hard mass in the right lateral hip. Sagittal greyscale (A) and transverse Doppler (B) US images of the right hip demonstrate a large well-defined heterogeneously hypoechoic hypervascular non-compressible hard mass. Axial T1 pre-contrast (C) and (D) postcontrast MRI demonstrates an enhancing well circumscribed T1-hypointense lesion in the right hip. As the fat content is often less than 10-25% of the tumor volume, MRI does not show typical features of a lipomatous tumor (ie T1 hyperintensity). The mass was surgically resected.

# Conclusion

- In this pictorial review, we sought to present the sonographic findings of a variety of cases ranging from head to toe that are either uncommonly seen or were diagnosed in an atypical fashion (i.e. ultrasound) in our practice.
- In most cases, sufficient information can be obtained sonographically, and therefore CT and MRI are reserved for lesions that are too large or too deep to be completely imaged with US, or for planning resection when malignancy is suspected.
- If thorough investigation with sonography does not confirm the presence of a superficial lump or bump, no further imaging is recommended.

## References

Bansal AG, Rosenberg HK (2017) Sonography of pediatric superficial lumps and bumps: Illustrative examples from head to toe. *Pediatr Radiol*. 2017 Aug; 47(9): 1171-1183.

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