

AMSER Case of the Month

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11-year-old female with left inner thigh trauma

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Patient Presentation

- **HPI:** 11-year-old female presenting with a traumatic left inner thigh injury after she fell off a moving boat and hit a propeller. She had bruising and a superficial abrasion to her left thigh among other injuries. She was followed-up 8 months later for subcutaneous lumps in her left inner thigh.
- **PMH:** None
- **PSH:** None
- **Vitals:** Temp 98.3°F (36.8°C), HR 144, RR 25, BP 107/67, SpO2 99%
- **Physical exam:** On initial presentation, she had pain with palpation of left thigh and left knee. Motor and sensation was intact to all extremities.

What Imaging Should We Order?

ACR Appropriateness Criteria

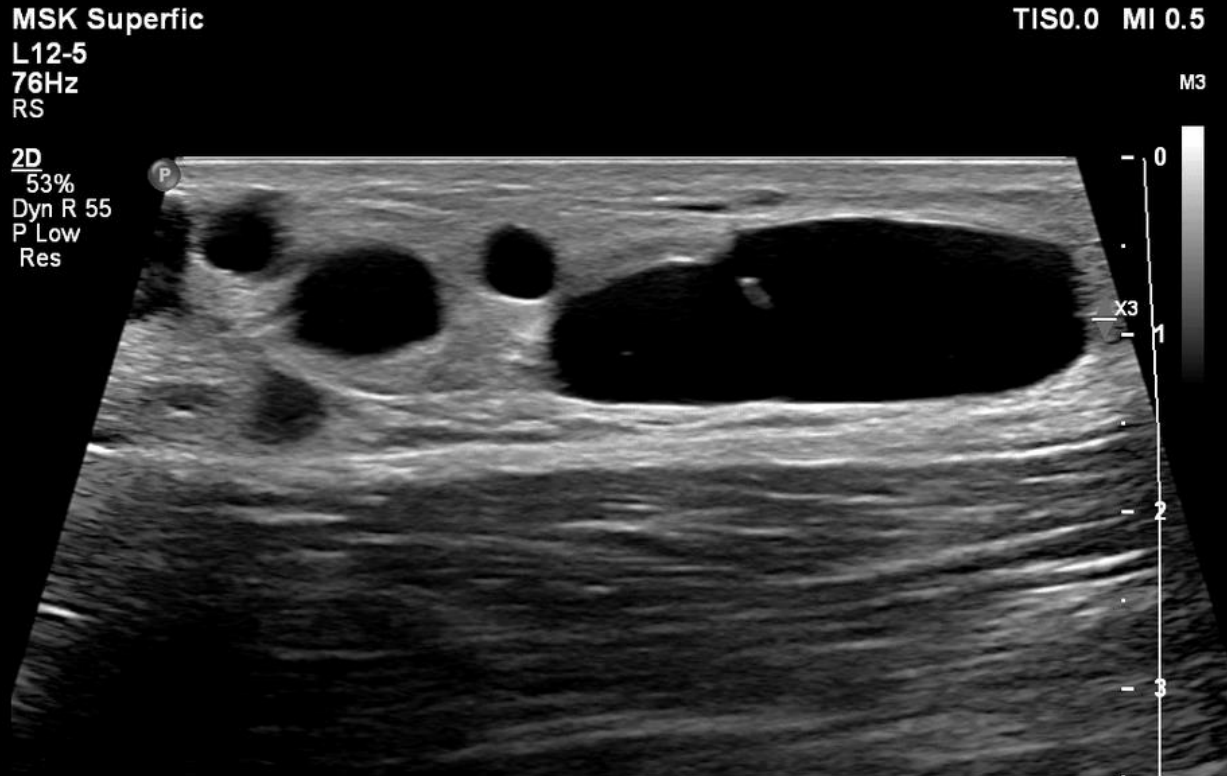
Variant: 1 Superficial soft tissue mass. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
US area of interest	Usually Appropriate	0
Radiography area of interest	Usually Appropriate	Varies
US area of interest with IV contrast	Usually Not Appropriate	0
Image-guided biopsy area of interest	Usually Not Appropriate	Varies
Image-guided fine needle aspiration area of interest	Usually Not Appropriate	Varies
MRI area of interest without and with IV contrast	Usually Not Appropriate	0
MRI area of interest without IV contrast	Usually Not Appropriate	0
FDG-PET/CT area of interest	Usually Not Appropriate	⚡⚡⚡⚡
CT area of interest with IV contrast	Usually Not Appropriate	Varies
CT area of interest without and with IV contrast	Usually Not Appropriate	Varies
CT area of interest without IV contrast	Usually Not Appropriate	Varies

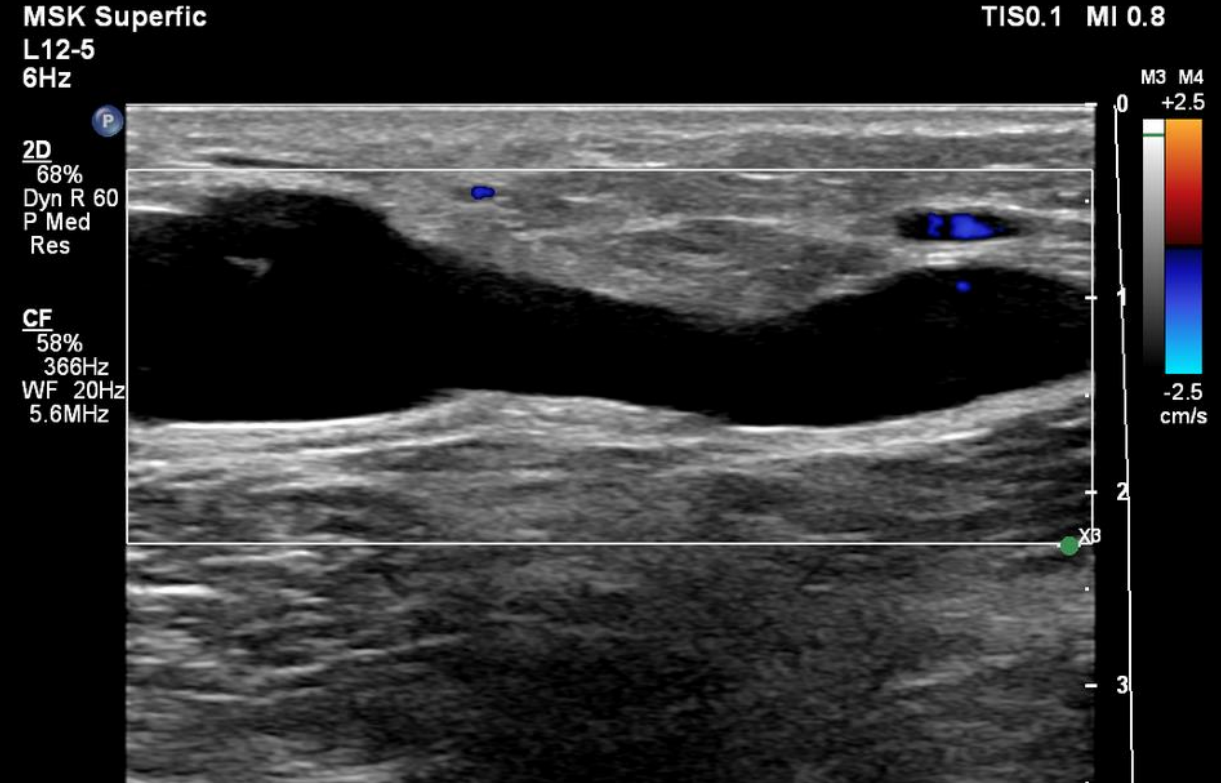
This imaging modality was ordered by the orthopedic physician

Findings (unlabeled)

Left medial thigh longitudinal US

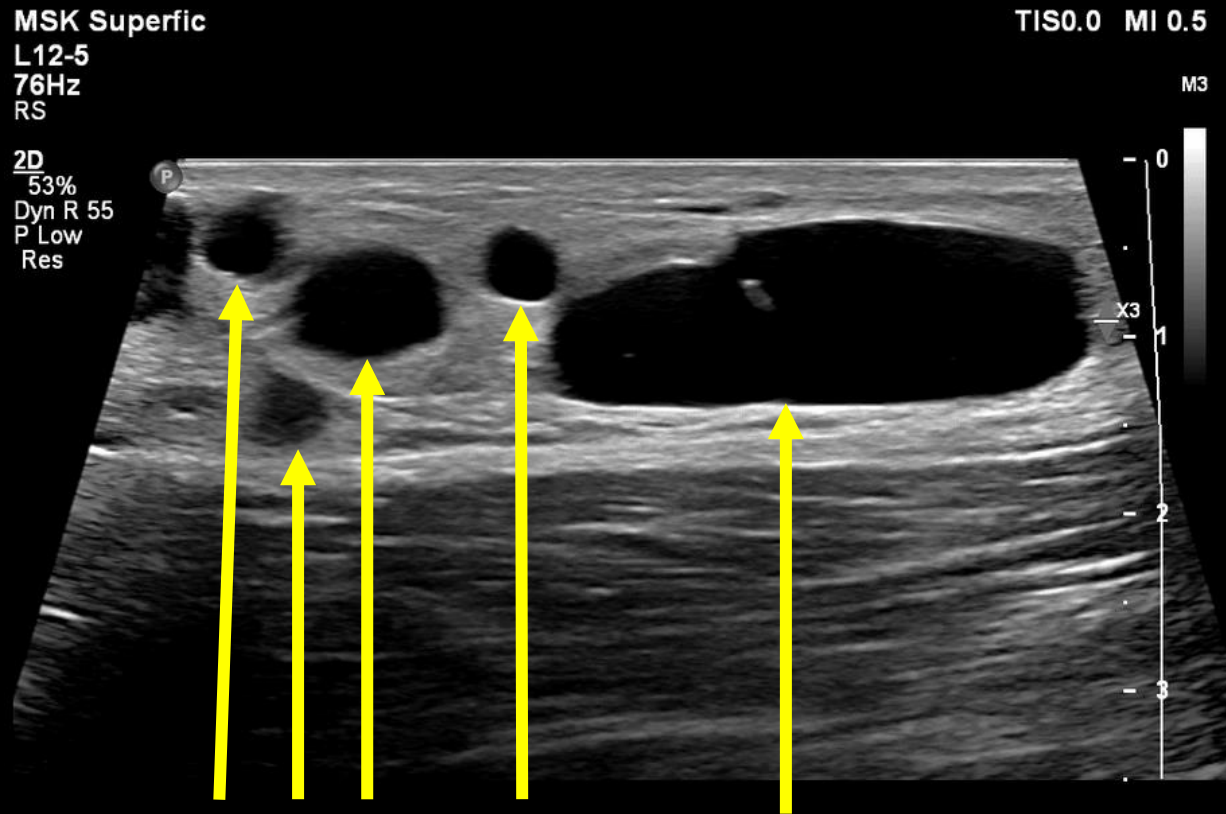


Left medial thigh transverse US

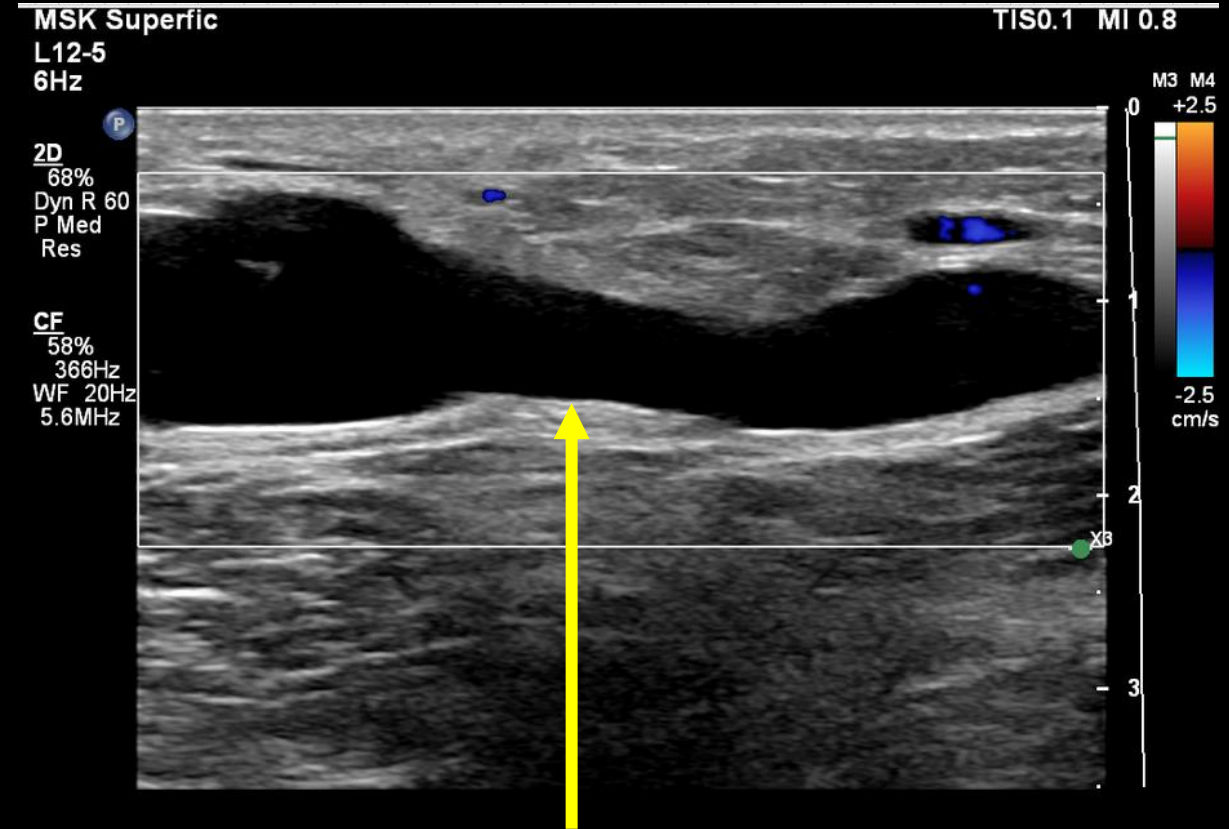


Findings (labeled)

Left medial thigh longitudinal US



Left medial thigh transverse US



Anechoic, rounded/tubular, avascular structures in the subcutaneous fat layer

What Imaging Should We Order Next?

ACR Appropriateness Criteria

Variant: 3 Soft tissue mass. Nondiagnostic radiograph and noncontrast enhanced ultrasound. Next imaging study.

Procedure	Appropriateness Category	Relative Radiation Level
MRI area of interest without and with IV contrast	Usually Appropriate	0
MRI area of interest without IV contrast	May Be Appropriate	0
CT area of interest with IV contrast	May Be Appropriate (Disagreement)	Varies
CT area of interest without and with IV contrast	May Be Appropriate	Varies
US area of interest with IV contrast	Usually Not Appropriate	0
Image-guided biopsy area of interest	Usually Not Appropriate	Varies
Image-guided fine needle aspiration area of interest	Usually Not Appropriate	Varies
FDG-PET/CT area of interest	Usually Not Appropriate	☢☢☢☢☢
CT area of interest without IV contrast	Usually Not Appropriate	Varies

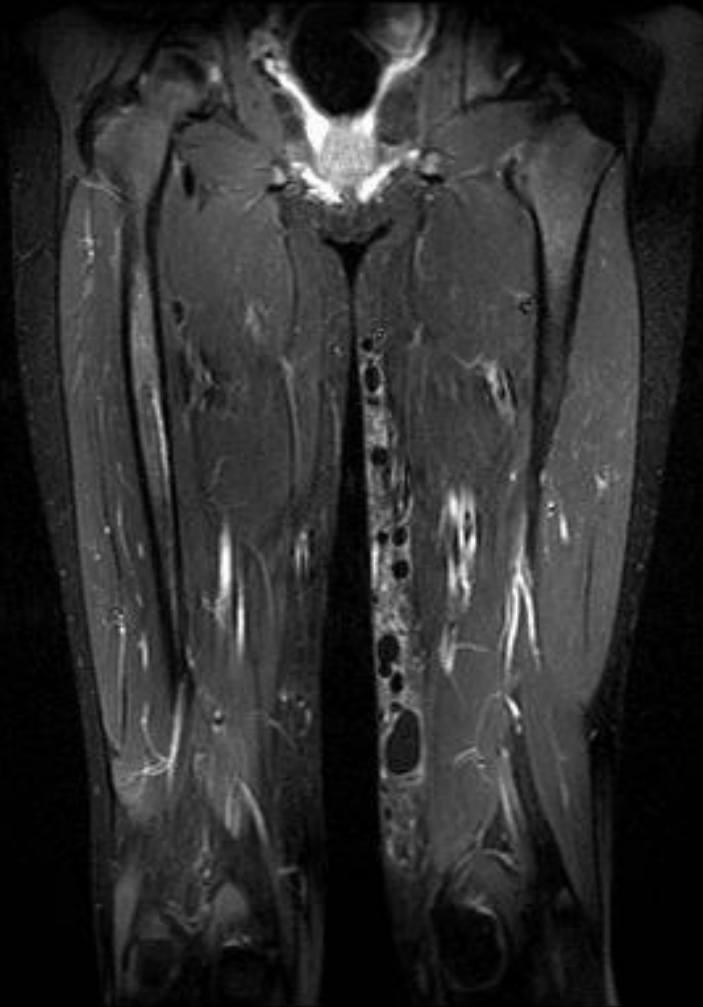
This imaging modality was ordered by the orthopedic physician

Findings (unlabeled)

Coronal T1



Coronal STIR

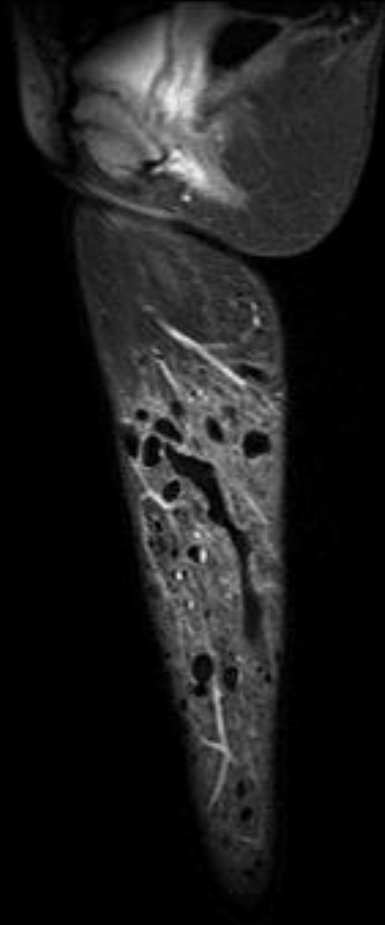


Findings (unlabeled)

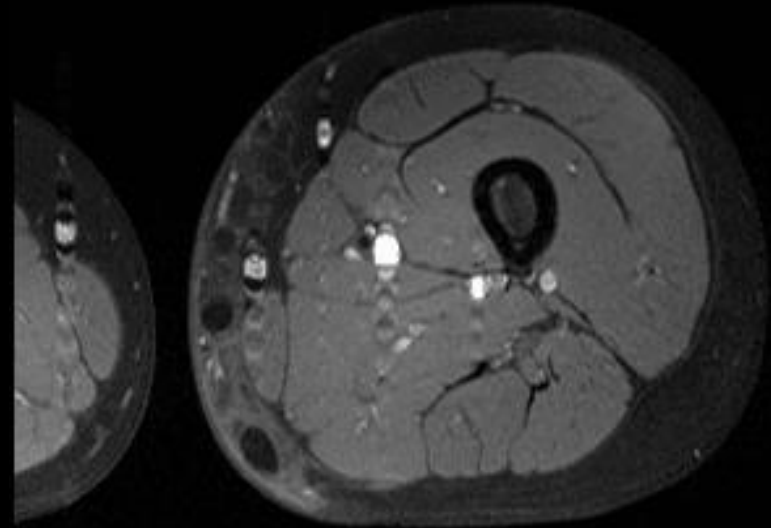
Sagittal T1



Sagittal STIR



Axial T2 fat-sat



Findings (labeled)

Coronal T1



Coronal STIR



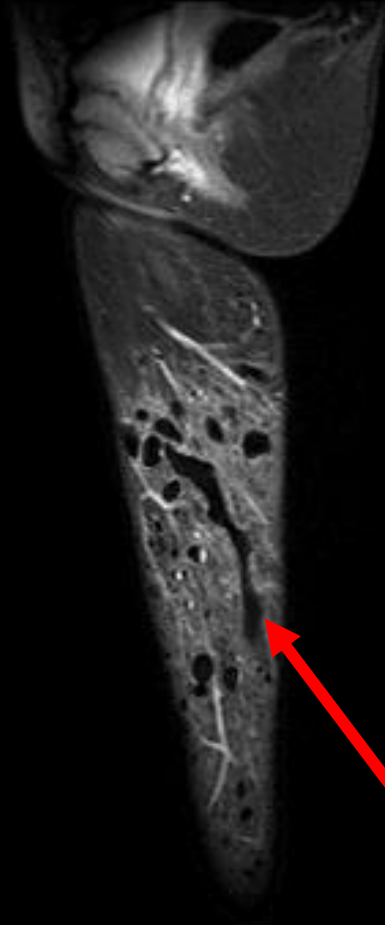
Lesions show **high fat signal intensity on T1** and **low signal on fat-saturated** sequences than the background uninvolved subcutaneous fat

Findings (labeled)

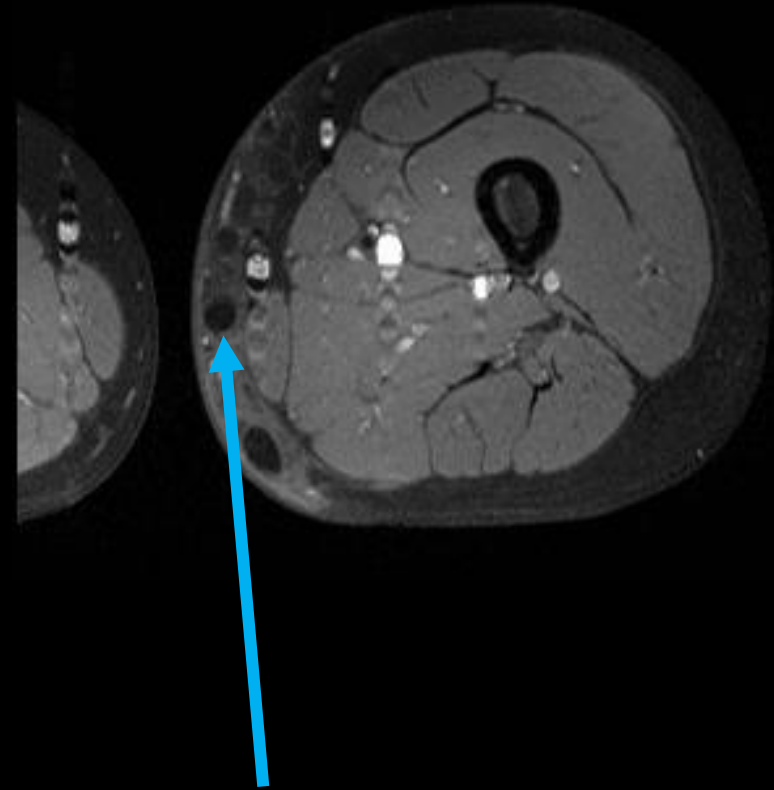
Sagittal T1



Sagittal STIR



Axial T2 fat-sat



Lesions show **high fat signal intensity on T1** and **low signal on fat-saturated** sequences than the background uninvolved subcutaneous fat

Final Dx:

Nodular cystic fat necrosis

Case Discussion

- **Background**

- Nodular cystic fat necrosis is unique form of fat necrosis, in which necrotic fat tissue becomes encapsulated by condensed fibrous tissue.
- These lesions primarily appear following an inciting traumatic event, surgical operation, or needle-based intervention. Initial onset may be significantly delayed, taking several months to years after the inciting event to manifest.
- Formation of the cysts may be due to traumatic disruption of lipocytes, leading to liquefactive fat necrosis and pooling of cellular debris/oil that is walled off by fibrotic tissue.

- **Epidemiology**

- The condition presents more commonly in middle-aged females and adolescent males. However, they may also present in adolescent females.
- Although most often found in breast tissue, NCFS may also present in the lower extremities as seen in this case.

Case Discussion (cont.)

- **Clinical presentation**

- Subcutaneous lumps at site of injury.
- Typically presents within months to years after initial traumatic event.

- **Imaging appearance**

- Nodular cystic fat necrosis can be readily visualized through ultrasound and MRI imaging.
- Ultrasound shows anechoic, rounded and tubular, avascular structures present in the subcutaneous fat.
- MRI shows fat signal intensity on all sequences. Homogenously high signal in lesions may be seen on T1 sequence, with a low signal on T1/T2 fat-saturated sequence as compared to the background subcutaneous fat.

Case Discussion (cont.)

- **Management**

- Treatment is dependent primarily on the size of the lesions. Smaller lesions may be managed conservatively, whilst moderate sized examples may be treated via aspiration, ultrasound-guided liposuction, or needle aeration. Calcified or large lesions may require direct surgical excision and debridement

- **Differential Diagnoses**

- Morell-Lavalee lesions: Fluid-filled cysts that develop after shearing injury along the myofascial planes.
- Lipomas: Benign subcutaneous growth of adipocytes enclosed in a fibrous capsule.
- Seromas: Serous fluid (plasma/lymphatic fluid) build-up, common after surgical procedures.
- Undiagnosed lymphatic malformation: Fluid-filled masses due to abnormally formed lymphatic vessels impairing lymph drainage.

References:

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4. Lee SJ, Lee WC, Jang YH, Kim DW, Chung SL, Bae HI. Two Cases of Nodular Cystic Fat Necrosis Possibly Related to Previous Trauma. *Ann Dermatol*. 2004 Jan;16(1):19-22. doi:10.5021/ad.2004.16.1.19
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