

Objective

Muscle biopsy plays an important role in the diagnosis of patients with **suspected myopathy**. Currently, the procedure is often performed by orthopedic surgeons using an open approach with muscle selection guided by physical examination, electromyography or imaging. Since the disease distribution in myopathies can be patchy and affected muscles can be partially involved, **targeted biopsy of region involved by the disease process** is important. However, **myopathic changes may not be well seen on ultrasound**. We describe our initial experience of using ultrasound-MRI fusion system to guide targeted muscle biopsy in patients with suspected myopathy.

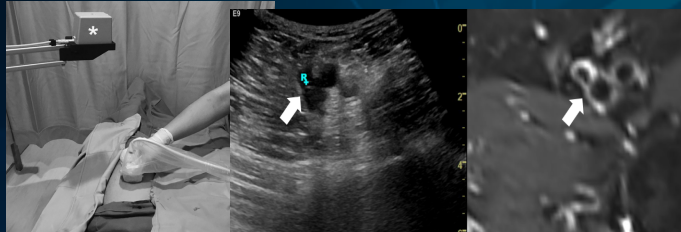
Materials and Methods

Ultrasound-MRI fusion guided muscle biopsy performed in three patients with suspected myopathy and MRI evidence of active muscle edema between June 2017 and May 2018. Turbo-spin echo T2-weighted images obtained in axial plane from pelvis to both thighs in 1.5T/3T MR system. Clinical information, procedural data and quality of the biopsied cores were recorded.

How it is done:

Step 1: Upload T2W Dixon water-only MR image to US system for fusion

Step 2: Coregistration: Plane and point registration



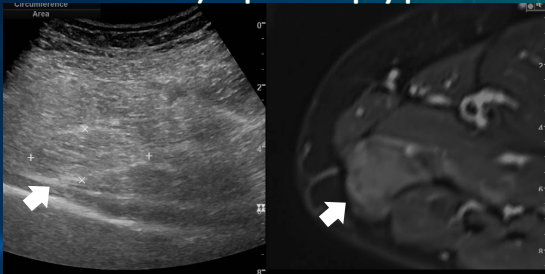
Plane registration

Align US probe along the same axial plane as MRI.

Point registration

Mark the same anatomic points, e.g. the saphenofemoral junction (white arrows), on both US (left) and MRI (right).

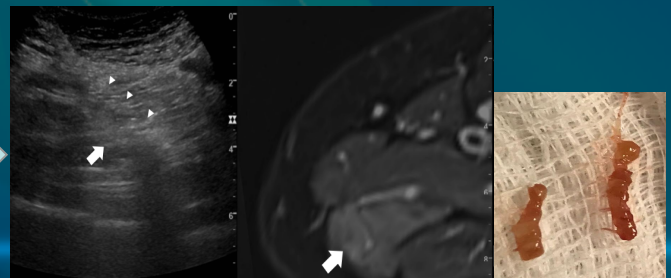
Step 3: Identify target (area of muscle edema on MR) & plan biopsy path



Coregistered image

Left semimembranosus (arrows) appears hyperintense on T2-weighted MRI (right) but normal on US (left).

Step 4: US-MRI fusion guided biopsy



Left semimembranosus (arrows) was sampled with a 14-gauge Trucut biopsy needle (arrowheads) under US-MRI fusion imaging guidance. Muscle cores were obtained.

Results

Four muscle biopsies performed in three in anterior, medial and posterior compartments of the thigh.

- Technical success rate: 100%.
- Median fusion time: 7 mins (range, 6 – 10)
- Median procedural time: 53 mins (range, 31 – 58)
- No complications occurred.
- All patients were discharged on the same day.
- All specimens were considered of optimal diagnostic quality by the pathologists.

Age	Sex	Muscle biopsied	Fusion time	Total Procedure time	Final diagnosis
64	F	Left semimembranosus	10 mins	53 mins	Necrotizing myopathy
22	M	Right adductor magnus	6 mins	31 mins	Muscular dystrophy
70	M	Left semimembranosus Left vastus lateralis	7 mins	58 mins	Necrotizing myopathy

Conclusions

Ultrasound-MRI fusion guided muscle biopsy is a useful procedure facilitating diagnosis of myopathy. Our approach may represent a step towards precision medicine in image-guided diagnosis in myopathies.