

MSK Ultrasound Bites: Tips and Tricks

Diagnostic Musculoskeletal Ultrasound in the Evaluation of the Teres Minor

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Rotator cuff injuries are one of the more common injuries that occur in the shoulder. Four muscles and tendons make up the rotator cuff. These include the supraspinatus, infraspinatus, subscapularis, and the teres minor. The teres minor is the smallest of the rotator cuff muscles. It originates from the middle third of the lateral border of the scapula, just below the insertion of the teres major. It inserts onto the inferior facet of the greater tubercle of the humerus. The teres minor is innervated by the axillary nerve, and its muscular action is that of external rotation, and it can be a weak abductor of the shoulder. It is part of a larger force couple between the rotator cuff group and the deltoid, which stabilizes the humeral head during humeral elevation.

Although the teres minor can be torn in massive rotator cuff tears, it is also commonly overused during repetitive activities requiring overhead lifting or external rotation. An accurate diagnosis of teres minor overuse, partial tears, or ruptures is essential for appropriate treatment planning and optimizing patient outcomes. Diagnostic musculoskeletal ultrasound (MSKUS) offers a portable, real-time, and cost-effective alternative that is gaining traction in rehabilitation and sports medicine settings. MSKUS has emerged as a valuable, non-invasive imaging modality for evaluating rotator cuff injuries, including tendinopathy, muscle strains (partial tears), and ruptures. MSKUS is excellent at detecting changes in tendon and muscle composition and continuity. This manuscript will review the utility of MSKUS in evaluating teres minor tendon and muscle injuries, including anatomy, common injury mechanisms, sonographic techniques, and clinical implications for those in the rehabilitation profession. By integrating MSKUS into clinical practice, providers can improve diagnostic accuracy, enhance diagnostic confidence, monitor healing progression, and guide rehabilitation strategies to achieve optimal patient outcomes for those with teres minor injuries.

INTRODUCTION

Diagnostic musculoskeletal ultrasound (MSKUS) has become an essential tool for evaluating musculoskeletal structures. Rotator cuff injuries are one of the more common injuries that occur in the shoulder. Four muscles and tendons make up the rotator cuff. These include the supraspinatus, infraspinatus, subscapularis, and the teres minor. While much attention has historically focused on the supraspinatus and infraspinatus tendons, the teres minor remains comparatively underexamined. This paper aims to provide a comprehensive review of diagnostic MSKUS of the teres minor, including relevant anatomy, scanning technique, normal and abnormal imaging characteristics, and common pathological findings.

ANATOMY OF THE TERES MINOR MUSCLE OF THE ROTATOR CUFF COMPLEX

The teres minor is the smallest of the rotator cuff muscles. It originates from the middle third of the lateral border of the scapula, just below the insertion of the teres major. It inserts onto the inferior facet of the greater tubercle of the humerus. The teres minor is innervated by the axillary nerve, and its muscular action is that of external rotation, and it can be a weak abductor of the shoulder. It is part of a larger force couple between the rotator cuff group and the deltoid, which stabilizes the humeral head during humeral elevation. An intact teres minor makes a huge contribution to overall shoulder function in a patient with a large or massive rotator cuff tear, providing at least a minimal

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degree of external rotation force^{1,2} that allows patients to perform important activities of daily living that would be absent without a teres minor.

THE ROLE OF MSKUS IN TENDON AND MUSCLE EVALUATION OF THE TERES MINOR

ADVANTAGES

- **Real-Time Imaging:** MSKUS allows dynamic evaluation of the teres minor muscle and tendon while the shoulder can be moved through internal and external rotation, with an available range of motion.
- **High-Resolution Visualization:** MSKUS provides detailed images of the teres minor tendon and its proximal enthesis at the posterior portion of the greater tuberosity.
- **Accessibility and Cost-Effectiveness:** MSKUS is portable, widely available, and less expensive than magnetic resonance imaging (MRI).

LIMITATIONS

- **Operator Dependency:** MSKUS requires skill and experience for accurate interpretation of findings. The ability to sonograph tendons and their respective muscles is to a large extent influenced by the operator and the availability and technical considerations of state-of-the-art equipment.
- **Depth Limitations:** Visualization is usually not a problem as the tendon and muscle of the teres minor are superficial.
- **Artifacts and Shadows:** Bone shadowing from the humeral head may create image artifacts, requiring adjustments in probe positioning and frequency. Calcifications are uncommon in the teres minor and typically occur in the supraspinatus tendon; however, several case studies have shown that this can occur.³⁻⁵

SONOGRAPHIC TECHNIQUE FOR EVALUATING THE TERES MINOR

EQUIPMENT SETUP

- **Probe Type:** Because of the superficial depth of the teres minor muscle and tendon, a standard high-frequency, linear array probe is utilized.
- **Patient Position:** The patient is seated with the shoulder in neutral or holding the opposite arm to put a slight stretch on the teres minor muscle and tendon for better visualization.
- **Dynamic Assessment:** A passive or active movement of shoulder internal or external rotation can create lengthening or shortening of the muscle and tendon to better evaluate its excursion properties.

EXAMINATION PROTOCOL

NORMAL SONOGRAPHIC APPEARANCE

The starting point for examining the posterior rotator cuff tendons, including the teres minor, is to find the posterior greater tuberosity and humeral head. The greater tuberosity and humeral head will be easily seen by their hyperechoic cortical outline, with a large acoustic shadow beneath. The proximal portion of the teres minor tendon can be scanned in both the long axis (LAX) and the short axis (SAX). In the LAX view, depending on the probe width and size, one should start proximally to visualize the hyperechoic reflection of the bony cortex of the greater tuberosity. When viewed in LAX, the tendon will appear as a smaller tendon superficial to the larger proximal tendon of the infraspinatus. In the SAX, the ultrasound transducer can be rotated 90 degrees just below the scapular spine. Visualized from superior to inferior, the first tendon seen is the infraspinatus, while the deeper tendon will be that of the teres minor. As with many tendon locations, both views may require some toggling or heel-to-toe movements to reduce anisotropy.

PATHOLOGIC FINDINGS IN TERES MINOR TENDON AND MUSCLE INJURY

- Isolated teres minor tears are rare.⁶⁻¹⁰ Disruption of fibrillar pattern is seen in partial tears and ruptures. Proximally, it is important to determine whether the injury is a free-tendon injury or a purely myotendinous injury. When there is a tear present, it will appear as either an anechoic or hypoechoic defect that disrupts the continuity of the insertion¹¹ onto the greater tuberosity.
- Atrophy of the tendon can be measured using volume estimations embedded into the ultrasound calculations. Atrophic changes are seen in up to 5% of patients presenting for routine shoulder imaging.¹² Quadrilateral space syndrome is caused by compression of the humeral artery and axillary nerve within the quadrilateral space.^{13,14} The teres minor can contribute to this problem as it is the superior border of the space, while the teres major is inferior, the humerus laterally, and the long head of the triceps medially.¹⁵
- Calcifications or retraction of the tendon may be visualized near the enthesis sites.

CLINICAL IMPLICATIONS FOR REHABILITATION PROVIDERS

MSKUS provides real-time feedback for rehabilitation professionals, facilitating early diagnosis and intervention. Key applications include:

- **Early Detection of Injury / Accurate Injury Grading:** MSKUS can quickly differentiate between a tendinopathy versus a strain, or more severe tendon

rupture or muscle tear, to help guide treatment planning.

- **Dynamic Functional Testing:** Rehabilitation professionals can use MSKUS during physical therapy sessions to monitor recovery and assess tendon and muscle function dynamically. Serial MSKUS imaging aids in assessing muscle healing and remodeling, helping determine readiness for rehabilitation progression.
- **Guided Interventions:** Ultrasound imaging assists in precision-guided dry needling or injections, such as corticosteroids for inflammation.
- **Patient Education:** Real-time imaging serves as a visual aid to explain the nature of the injury and set realistic expectations for recovery.

LIMITATIONS AND CHALLENGES

Despite its advantages, MSKUS cannot entirely replace MRI for complex cases of rotator cuff and teres minor injury imaging. Additionally, the expertise required for optimal imaging techniques limits its immediate adoption across all rehabilitation settings.

CONCLUSION

In summary, diagnostic MSKUS offers rehabilitation professionals a powerful, clinically relevant extension of the physical examination when evaluating the teres minor. Its ability to provide high-resolution, real-time, and dynamic visualization of the teres minor tendon and muscle architecture enhances diagnostic precision, supports early clinical decision-making, and allows serial monitoring of tissue healing and load tolerance. When integrated with a thorough understanding of teres minor anatomy, injury mechanisms, and functional biomechanics, MSKUS becomes more than an imaging modality—it becomes a performance-informed clinical tool. While operator skill and certain anatomic limitations must be acknowledged, the thoughtful incorporation of MSKUS into sports and orthopedic practice has the potential to elevate assessment accuracy, refine rehabilitation progression, and ultimately improve return-to-play outcomes for athletes with rotator cuff injury, particularly involving the teres minor muscle and tendon.



TERES MINOR TENDON

Figure 1A. Patient Position

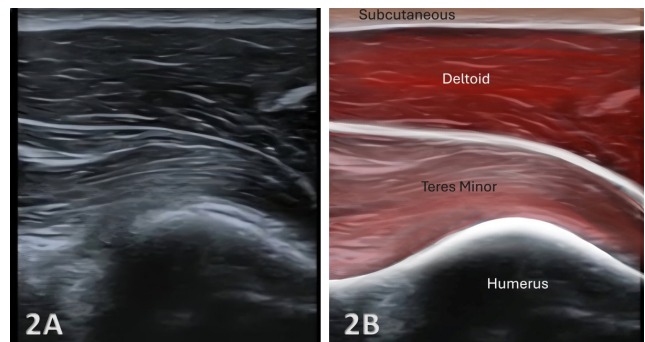
The patient is seated with the ipsilateral hand resting on the contralateral shoulder. This places the arm in slight internal rotation and adduction, applying a gentle stretch to the teres minor muscle and tendon for improved visualization. Because the teres minor lies inferior to the infraspinatus along the posterior shoulder, this position is equally effective in exposing the tendon and providing the ability to identify abnormalities at and near the insertion.

Figure 1B. Short Axis Transducer Placement

Short Axis (SAX) view is achieved by rotating the transducer 90 degrees from the LAX position, placing it perpendicular to the teres minor tendon fibers for a cross-sectional view. This position allows the examiner to assess the tendon's cross-sectional shape, thickness, and internal echogenicity at any point along its course. In the SAX view, with the transducer positioned just below the scapular spine, the infraspinatus tendon will appear as the more proximal structure, while the teres minor will be visible as a smaller, deeper tendon immediately inferior to it.

Figure 1C. Long Axis Transducer Placement

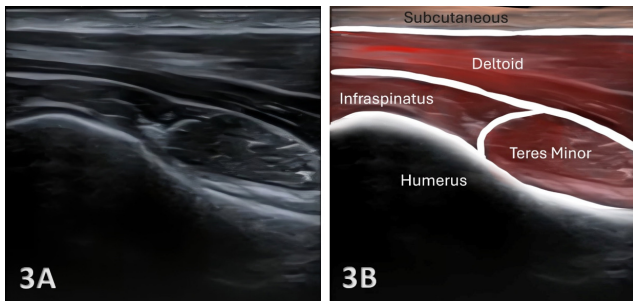
Long Axis (LAX) view places the transducer in-line with the teres minor tendon fibers, oriented parallel to their longitudinal course as they travel from the lateral border of the scapula to the inferior facet of the greater tuberosity. Begin by identifying the posterior humeral head and greater tuberosity as your primary bony landmarks. Position the transducer inferior to the scapular spine, angling it to follow the fiber direction of the teres minor as it courses toward its insertion. This view allows visualization of the tendon's length, fibrillar architecture, and continuity along its longitudinal axis. The LAX view is typically the initial approach to confirm transducer orientation before transitioning to the SAX view.



NORMAL VIEW IN LONG AXIS (LAX)

Figures 2A and 2B. Long Axis View

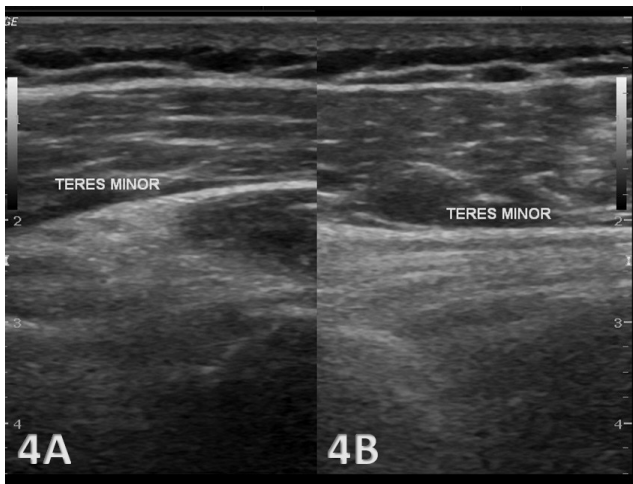
In the Long Axis view, the teres minor tendon is visualized in-line with its fiber orientation as it courses toward the inferior facet of the greater tuberosity. The hyperechoic cortical reflection of the greater tuberosity and humeral head serves as the primary bony landmark. The teres minor tendon should display a consistent, uniform hyperechoic fibrillar pattern along its longitudinal axis. It will appear as a smaller tendon just inferior to the infraspinatus, and the two tendons share a similar echogenic appearance. A critical differentiating feature is that the teres minor lies directly on bone, while the infraspinatus lies on articular cartilage identifiable as an anechoic layer above the cortex. Additionally, the teres minor has a primarily muscular rather than tendinous insertion. Superior to the tendon lie the bursa, deltoid muscle, and subcutaneous fat tissue. As with many tendon locations, some heel-to-toe probe adjustment may be required to reduce anisotropy and optimize the echogenicity of the tendon fibers.



NORMAL VIEW IN SHORT AXIS (SAX)

Figures 3A and 3B. Short Axis View

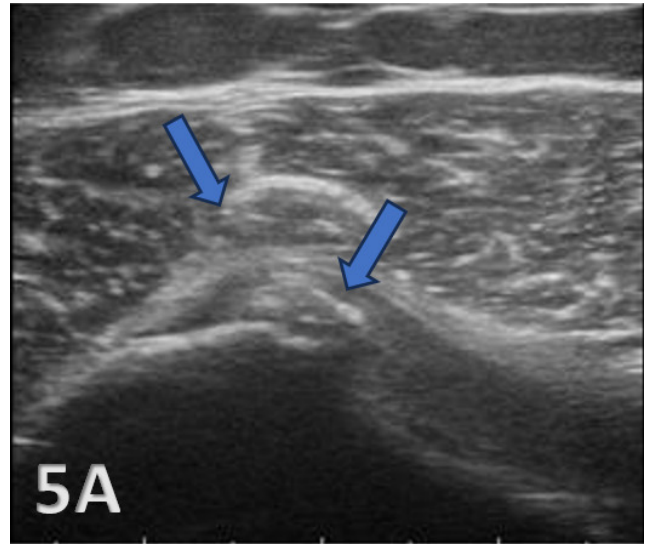
In the SAX view, the transducer is rotated 90 degrees to provide a cross-sectional image of the teres minor tendon. First identify the hyperechoic cortical outline of the humeral head and greater tuberosity. Viewed from superior to inferior, the infraspinatus tendon will appear as the first tendon encountered, with the teres minor visible as the smaller, deeper tendon immediately beneath it. Although the two tendons have a similar echogenic cross-sectional appearance, they can be reliably distinguished by what lies beneath each: the infraspinatus overlies articular cartilage (seen as an anechoic layer above the bony cortex), whereas the teres minor lies directly on bone with no intervening cartilage interface. The teres minor tendon should maintain a uniform, hyperechoic cross-sectional appearance at its insertion onto the inferior facet of the greater tuberosity. Above the tendons, the bursa, deltoid muscle, and subcutaneous fat tissue are identified in sequence toward the surface of the image.



TERES MINOR PATHOLOGY

Figures 4A and 4B. Isolated Fatty Infiltration of the Teres Minor Without Tendon Tear

Fatty infiltration of the teres minor muscle belly in the absence of a tendon tear is an uncommon but clinically significant sonographic finding. On MSKUS, fatty infiltration appears as increased echogenicity within the muscle belly, reflecting replacement of normal muscle fibers with hyperechoic fat and connective tissue, while the tendon itself remains intact with normal fibrillar continuity at its insertion. When the surrounding rotator cuff musculature appears normal, isolated teres minor fatty infiltration strongly implicates a neurogenic etiology. Because the teres minor receives its sole motor innervation from the axillary nerve as it passes through the quadrilateral space, compression or traction injury at that site can produce selective denervation and subsequent fatty atrophy of the teres minor while leaving the remainder of the rotator cuff unaffected. This pattern should prompt clinical correlation with electrodiagnostic testing and consideration of quadrilateral space syndrome.¹⁶



TERES MINOR CALCIFICATION IN SAX

Figure 5A. Teres Minor Tendon Calcification

Tendon calcification and degenerative tendon. Ultrasound image shows a well-defined linear calcific deposit (blue arrows) along the teres minor tendon fibers in a LAX view.

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