

## MSK Ultrasound Bites: Tips and Tricks

# Musculoskeletal Ultrasound: An Essential Tool in Diagnosing Patellar Tendon Injuries

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Musculoskeletal (MSK) ultrasound has emerged as a vital tool in diagnosing patellar tendon injuries. Traditional imaging techniques, such as X-rays and Magnetic Resonance Imaging, have certain limitations in assessing soft tissue structures or may not be easily accessible. MSK ultrasound, with its high-resolution, real-time imaging capabilities, offers a cost-effective, safe, and patient-friendly alternative. It allows for accurate visualization of the patellar tendon's structure and function, thereby facilitating the identification of pathological changes such as thickening, thinning, or disruption which aids in diagnosing conditions such as tendonitis, partial tears, and ruptures. Furthermore, MSK ultrasound serves as an invaluable tool for guiding interventions like injections, as it provides real-time imaging. This article explores the role and benefits of MSK ultrasound in diagnosing patellar tendon injuries, highlighting its cost-effectiveness, accessibility, real-time assessment capabilities, and reduced patient burden compared to other imaging modalities. Despite its numerous benefits, the need for ongoing research to enhance its utility is highlighted. As technology advances, MSK ultrasound is set to revolutionize the early detection and management of patellar tendon injuries.

## INTRODUCTION

Musculoskeletal (MSK) ultrasound is rapidly gaining recognition as a primary investigative tool for diagnosing a broad array of MSK disorders, particularly those affecting the tendons, ligaments, muscles, and joints. This advancement in medical technology provides a real-time, non-invasive, cost-effective, and dynamic approach to visualize soft tissue structures that might be challenging to investigate using traditional imaging modalities. A specific area where MSK ultrasound is making considerable strides is in the diagnosis of patellar tendon injuries. Patellar tendon injuries can be frustrating for both athletes and physicians to diagnose, as they often present with subtle signs and symptoms. Accurate diagnosis is important for proper treatment of the condition, as the symptoms associated with patellar tendinopathy are highly variable and easily missed. Because the signs and symptoms can be subtle, MSK ultrasound is a useful tool for helping to accurately assess patellar tendon injuries. MSK ultrasound allows for detailed visualization of the patellar tendon, providing clinicians with crucial information regarding the extent of the injury. In this article, we explore the role and benefits of this non-

invasive imaging technique in the detection and evaluation of patellar tendon injuries.

## UNDERSTANDING PATELLAR TENDON INJURIES

The patellar tendon, a crucial part of the extensor mechanism of the knee, plays a vital role in facilitating knee extension. Patellar tendon injuries, ranging from tendinopathies to partial or complete ruptures, can significantly impair knee function and quality of life. The successful management of these injuries hinges on an accurate and timely diagnosis. Traditional imaging modalities like plain radiographs (X-rays) can offer limited information, as they are primarily focused on evaluating bone structures. Magnetic Resonance Imaging (MRI), although excellent for soft tissues, might not always be accessible due to its cost, availability, and contraindications in some patients. One of the key advantages of MSK ultrasound in diagnosing patellar tendon injuries is its ability to offer high-resolution, real-time imaging of the patellar tendon. This non-invasive imaging technique makes it easier to detect changes in tendon tissue composition and smaller tears that may not be visible on other imaging modalities such as MRI or through the physical examination alone. Additionally, MSK ultra-

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sound can be performed quickly and conveniently, eliminating the need for patients to schedule separate appointments for imaging. The dynamic assessment allows clinicians to visualize the tendon's structure and function in both static and active states. It can readily identify changes in the structure of the patellar tendon, such as thickening, thinning, or disruption, which could suggest pathology.

## THE ROLE OF MSK ULTRASOUND IN DIAGNOSIS

When it comes to diagnosing injuries, accuracy is key. This is where MSK ultrasound comes in handy for patellar tendon injuries. This advanced imaging technique allows medical professionals to examine the internal structures of the body in real-time, producing detailed and accurate images of the patellar tendon. With its ability to identify pathologic changes over time and to help guide treatment, MSK ultrasound has become an integral part of the management of these types of injuries. By providing a detailed, real-time view of the anatomy and pathology within the tendon, the use of MSK ultrasound can help to ensure that patients receive timely and appropriate treatment in order to achieve the best possible outcomes.

1. **Detection of Injuries:** MSK ultrasound can effectively identify structural changes in the patellar tendon, such as thickening, thinning, or disruption. Hypoechoic regions within the tendon, a classic sign of tendinopathy, can be easily visualized. In cases of complete or partial tears, MSK ultrasound can delineate the size and location of the tear.
2. **Assessment of Vascularity:** Using Doppler imaging, an essential component of modern ultrasound machines, MSK ultrasound can assess vascularity within and around the tendon. This capability can help differentiate normal from abnormal tendons, as neovascularity is often seen in tendinopathy and healing tendons.
3. **Dynamic Assessment:** Unlike other imaging modalities, MSK ultrasound can assess the patellar tendon while the patient is actively moving their knee. This feature is particularly useful in cases of fat pad impingement or patellar instability, where the pathology might only be evident during specific movements or positions.
4. **Guidance for Interventional Procedures:** In addition to diagnostic uses, MSK ultrasound can guide clinicians during interventional procedures such as injections or aspirations, increasing the accuracy and safety of these treatments.

MSK ultrasound is also helpful for monitoring post-treatment progress since it can be used to track changes in tendon structure and composition over time. This is important for ensuring that the treatment plan is having the desired effect and can aid in determining if a different course of action may be necessary. In addition, MSK ultrasound can also help to identify potential areas of re-injury or tendinopathy which may require further attention or inter-

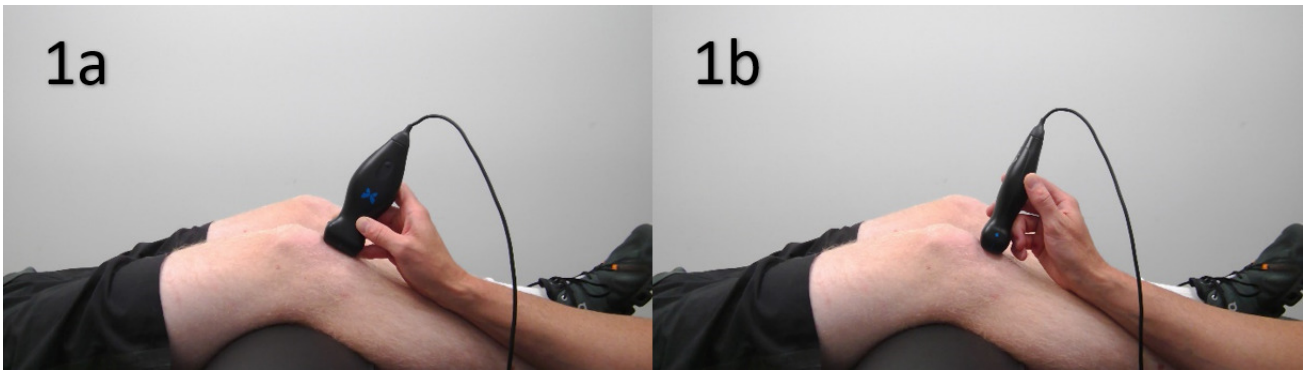
vention. MSK ultrasound can therefore be an essential part of post-treatment management for patellar tendon injuries.

## LIMITATIONS AND CONSIDERATIONS

Despite its numerous advantages, it is important to acknowledge that the efficacy of MSK ultrasound is highly operator-dependent, requiring significant expertise and training for accurate interpretation. Specifically, one should ensure that the transducer is positioned correctly, as an inaccurate positioning can lead to incorrect diagnosis. Additionally, it is important to be mindful of the ultrasound settings being used, as incorrect settings can result in poor image quality. Tendons are also susceptible to anisotropy, an imaging artifact that may lead to an incorrect diagnosis of a tear. Finally, interpretation of the ultrasound image can also pose a challenge, as patellar tendon injuries can sometimes appear similar to other injuries. With these considerations in mind, practitioners can ensure that they are making the most of MSK ultrasound in diagnosing patellar tendon injuries.

## CONCLUSION

In conclusion, MSK ultrasound is an important and invaluable tool in the assessment of patellar tendon injuries. With its advantages of high-resolution visualization, cost-effectiveness, accessibility, real-time assessment, and dynamic images of the patellar tendon, it is becoming a first-line imaging tool for many clinicians in the assessment of soft tissue structures. It can provide detailed information regarding the structure and composition of tendons that other imaging modalities cannot, as well as guide treatment decisions and monitor response to therapy over time. As such, MSK ultrasound should be considered as part of any comprehensive evaluation and management plan for patellar tendon injuries. By providing a real-time view of the anatomy and pathology within the tendon, MSK ultrasound can help to ensure that patients receive timely and appropriate treatment to achieve the best possible outcomes. While MSK ultrasound has become an essential tool in the diagnosis and management of patellar tendon injuries, continual research is necessary to further refine its use. Advancements in technology and imaging techniques may provide even greater resolution and clarity, aiding in our ability to diagnose and manage patellar tendon injuries effectively.



## Patellar Tendon

### Patient Position

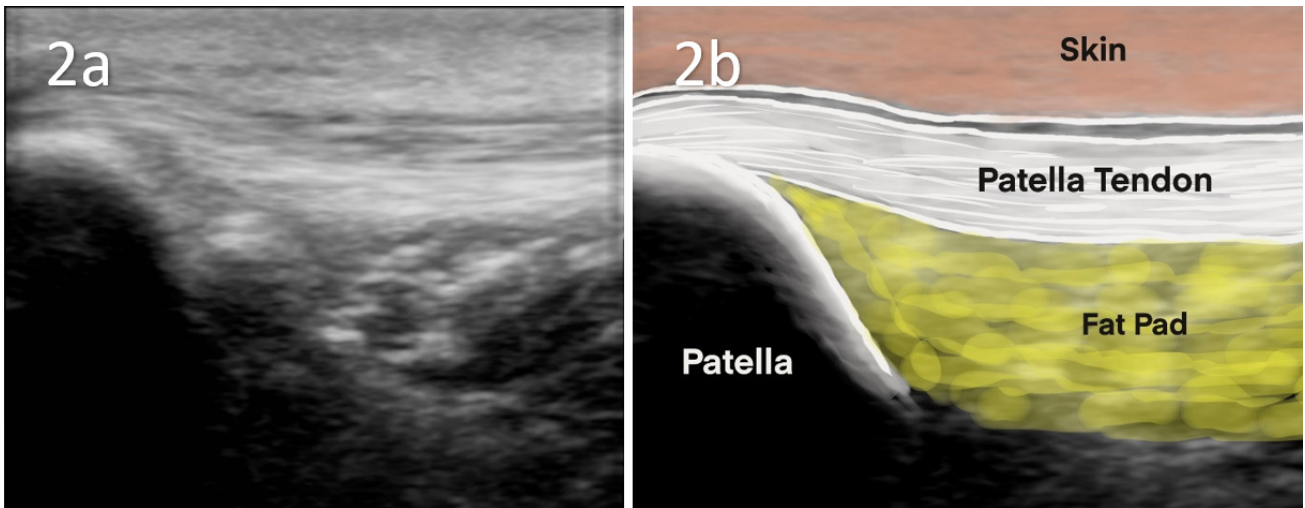
The patient is supine with a bolster placed under the knee for 30 degrees of knee flexion, reducing the patella “locking” on the femur as in full extension.

### Figure 1a: Transducer Placement

Long Axis (LAX) View: The probe is placed on the inferior portion of the patella in a LAX orientation.

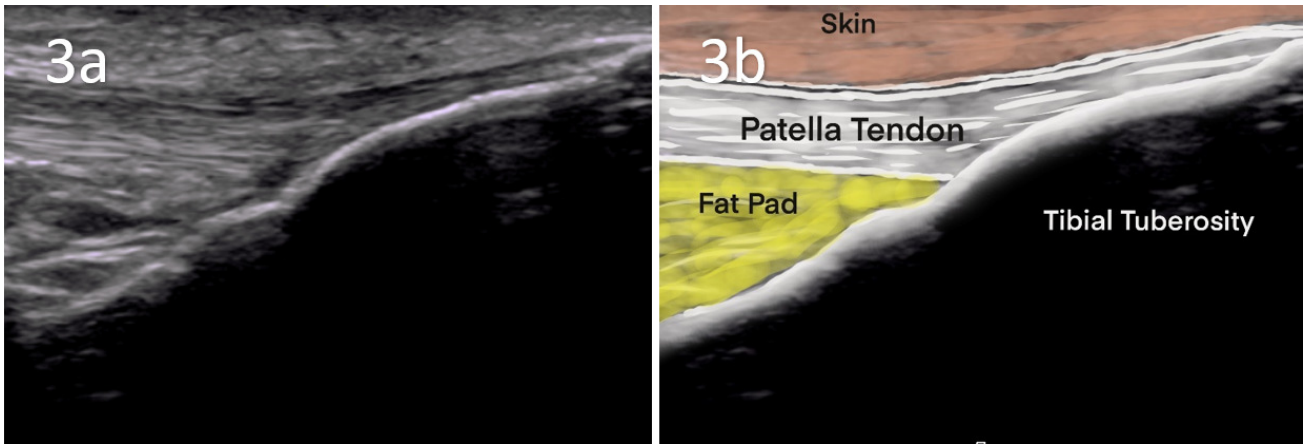
### Figure 1b: Transducer Placement

Short Axis (SAX) View: The probe is placed just inferior to the distal end of the patella in a transverse/SAX orientation.



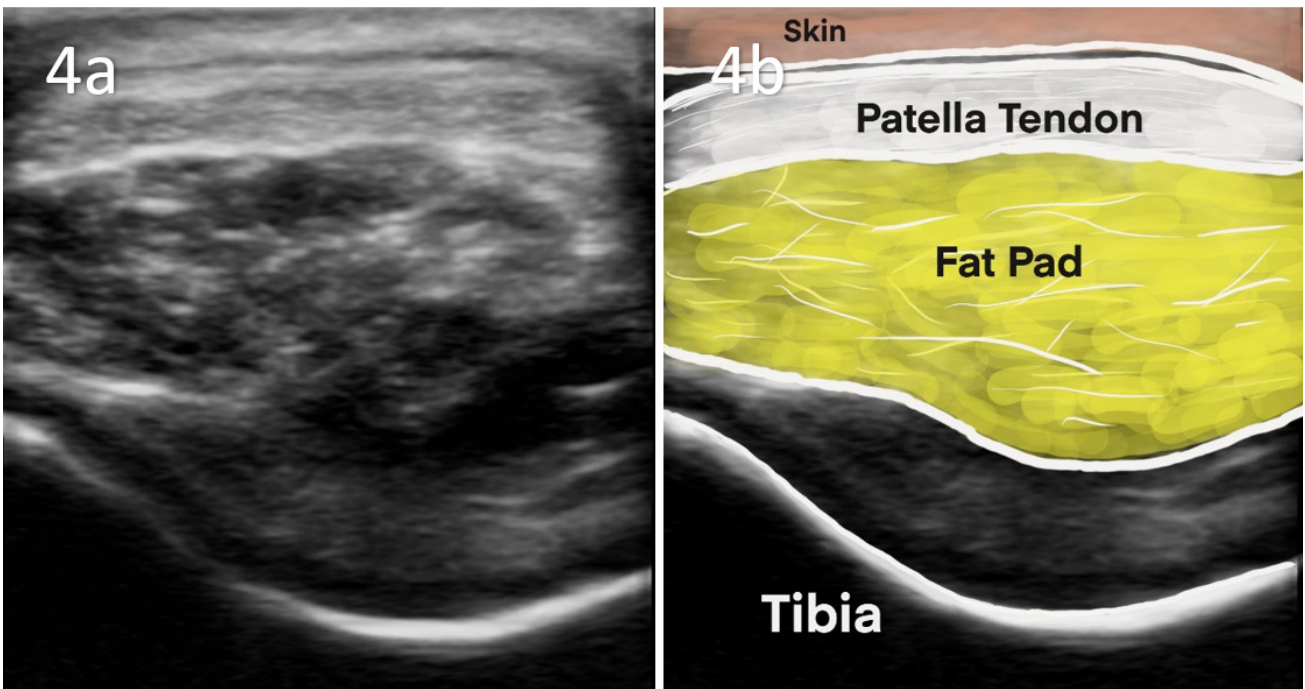
## NORMAL VIEW IN LONG AXIS (LAX)

**Figures 2a and 2b Proximal Patellar Tendon in Long Axis View:** The cortical reflection of the patella is to the left and is the proximal hyperechoic arc with shadowing deep to it. The hyperechoic, fibrous echotexture of the patellar tendon demonstrates a sharp “beak-like” origin from the patella, and the tendon thickens to display a uniform band of fibers. Deep to the tendon are mixed/marbled echoes of Hoffa’s Fat Pad.



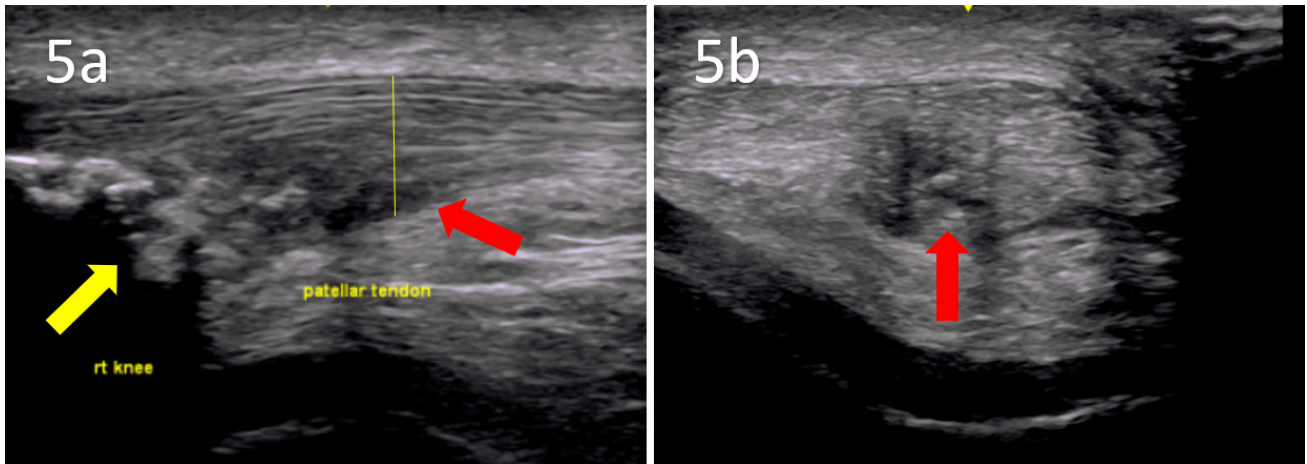
#### NORMAL VIEW IN LONG AXIS (LAX)

**Figures 3a and 3b Distal Patellar Tendon in Long Axis View:** The cortical reflection of tibial tuberosity is seen to the right and is the hyperechoic arc with shadowing deep to it. The hyperechoic, fibrous echotexture of the patellar tendon can be seen running in parallel fibers to insert on the tibial tuberosity. Deep to the tendon are mixed/marbled echoes of Hoffa's Fat Pad.



#### NORMAL VIEW IN SHORT AXIS (SAX)

**Figures 4a and 4b Patellar Tendon in Short Axis View:** The patella tendon is seen in cross section as well-defined, wide/broad, bristle-like structure superficial to Hoffa's Fat Pad. The tibia is deep to the fat pad, but is a variable landmark based on probe location along the 5 cm length of the patella tendon.



### PATELLAR TENDON TEAR IN LONG AXIS (LAX) AND SHORT AXIS (SAX)

**Figures 5a in Long Axis View and 5b in Short Axis View:** Figure 5a shows the cortical reflection of the patella to the left and the yellow arrow points to the cortical irregularities of the patella. These irregularities are secondary to insertional, chronic patella tendinosis. The patella tendon appears thickened as well (Yellow Line) compared to the normal view of a patella tendon. A moderate anechoic defect is seen in the proximal tendon indicating a patellar tendon tear (Red Arrow). Figure 5b shows a short axis view of the same patella tendon with the tear in the patella tendon (Red Arrow) viewed as an anechoic defect running perpendicular to the tendon fibers. (Photos courtesy of F. Clarke Holmes, MD.)



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