CASE REPORT

Patellar tendon rupture: an ultrasound case report

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creagh.boulger@osumc.edu**SUMMARY**

This article discusses a case in which ultrasound was the primary modality for diagnosis of traumatic patellar tendon rupture. Traditionally, this diagnosis has been made using MRI. This case highlights the growing need for emergency medicine physicians to become facile with bedside ultrasound and its indications as a supplement to traditional musculoskeletal examination. Normal and pathological patellar tendon examinations with ultrasound are discussed in detail. Furthermore, the advantages of ultrasound over the more traditional imaging modalities of x-ray and MRI in cases where tendon rupture is suspected are discussed.

BACKGROUND

Ultrasound is becoming increasingly prevalent in the emergency department. In 2008, ACEP (American College of Emergency Physicians) revised their guidelines to include 11 different indications for focused ultrasound in the emergency department. These include trauma, intrauterine pregnancy, abdominal aortic aneurysm, cardiac, hepatobiliary, urinary tract, deep vein thrombosis, musculoskeletal and soft tissue, thoracic, ocular and procedural guidance.¹ This case presents an instance where it was utilised during a musculoskeletal examination to diagnose a patellar tendon rupture. Unlike other imaging modalities commonly obtained in the emergency department, ultrasound has the advantages of speed of examination, dynamic imaging, no radiation exposure and in musculoskeletal examinations, straightforward comparison with the unaffected limb. Ultrasound is generally only useful for imaging musculoskeletal structures that are superficial to the bone, as the bone causes posterior acoustic shadowing. As such, the patellar tendon is an ideal target for ultrasound imaging given its anatomical location.²

In order to properly evaluate the patellar tendon, a linear probe is preferably given the superficial nature of the patellar tendon and the high frequency and resolution of a linear probe compared with other alternatives. The patient should be supine without any flexion or extension at the knees or hips. The patellar tendon should be evaluated in the sagittal plane initially, followed by the transverse plane.³ Visualisation in multiple planes is important, as with any ultrasound image, for thorough assessment of any potential injury.

x-Ray imaging is very limited in its evaluation of soft tissue or tendinous injuries (figure 1). MRI is expensive, time-consuming, much less readily available compared with ultrasound, and only provides static images. There is also some recent literature to

suggest that ultrasound imaging may be more sensitive for patellar tendon pathology than MRI (figure 2).⁴

CASE PRESENTATION

The patient in this case is a 34-year-old Caucasian man who presented to the emergency department after hitting his right knee directly against another player's leg during a basketball game (figure 3). He presented several hours after the injury occurred. His primary complaints were pain directly inferior to his right patella and decreased range of motion, particularly with extension. He was able to ambulate after the injury although pain was a limiting factor when he presented to the hospital for evaluation. He denied any other injuries or complaints. He is an otherwise healthy man who does not take any medications, has no allergies and does not smoke, drink or use any illicit substances. He has no significant medical or surgical history.

On examination, the patient was visibly uncomfortable but appeared non-toxic. He was supine and his legs were both in full extension. His vital signs were unremarkable with a blood pressure of 130/82 and pulse of 54. His right knee was notably swollen compared with the left, also with a relatively higher appearing patella. He was able to ambulate with assistance and a limp, but did bear weight on both knees. He had pain with patellar apprehension testing on the right. He had a negative Lachman test as well as a negative anterior and

Figure 1 Lateral x-ray of the patient's injured knee. Note the patella alta, or high-riding patella. There are no fractures or other bony injuries noted.

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Figure 2 The patient's uninjured left knee with patellar tendon measurements.

posterior drawer test on both knees. On further examination, he was unable to perform any straight leg raise on the right due to inability to extend his knee. He had normal 2+ dorsalis pedis, posterior tibial and popliteal pulses bilaterally and had full distal sensation intact to both feet and lower legs. He also had five of five plantarflexion and dorsiflexion strength bilaterally. His lower leg compartments were soft throughout.

An x-ray was performed and is visible in the attached images. No fracture or osseous abnormality was noted except for patella alta, or a high-riding patella. Given the clinical concern for tendon injury based on his examination, an ultrasound was performed due to the advantages of availability, cost and convenience compared to MRI. Also attached are demonstrations of both the patient's uninjured, normal-appearing left patellar tendon and the injured right patellar tendon.

In evaluating the normal, uninjured patellar tendon, note its fibrillar nature. There is no swelling joint effusion noted, and the patella is also well-visualised. The injured tendon image demonstrates a classic patellar tendon rupture. Note how much larger the width of the tendon is compared with the uninjured

Figure 3 The patient's injured right knee. Note the tendon stump as well as the increased wavy appearance compared with the uninjured knee.

example in the same patient. This is indicative of a retracted tendon stump, a common ultrasound finding in full thickness patellar tendon tears. Other findings frequently include a more wavy appearance to the tendon and diffraction shadowing (edge artefact) at the torn tendon stump.³

DIFFERENTIAL DIAGNOSIS

Patellar tendon rupture, patellar subluxation, patellar fracture, knee contusion and ligamentous injury of the knee.

TREATMENT

Treatment is almost universally surgical repair of the injured patellar ligament.

OUTCOME AND FOLLOW-UP

Orthopaedic surgery admitted this patient, who had operative intervention the next day without incident. He was discharged on postoperative day 1. No MRI was required.

DISCUSSION

Musculoskeletal examinations in the emergency department can be largely supplemented with ultrasound in the hands of a competent physician. Examination technique is fairly simple for superficial tendons such as the patellar and quadriceps tendons. Visualisation in multiple planes is critical for full evaluation of the injury. Also, ultrasound offers the benefit of convenience at the bedside, dynamic evaluation and easy comparison between an injured area and an uninjured area. Disadvantages of ultrasound imaging include operator dependence and limitation to imaging only structures superficial to bone.

Tendons exhibit a property known as *anisotropy*. This is a term used to describe the unique property of tendons to appear differently depending on the direction of the ultrasound beam going through it. As such, tendons tend to have a fibrillar appearance, but their echogenicity is partially dependent on the angle of insonation and the axis that the structure is viewed in (ie, transverse compared with sagittal).

Generally speaking, the patellar tendon will present with hypoechoic swelling and continuous tendon fibres if tendinosis is present. This condition is also referred to as 'Jumper's Knee'.⁵ A partial thickness tendon tear will appear with visibly defined anechoic and hypoechoic clefts. In addition, significant hyperaemia can be present on Doppler imaging. If complete tendon fibre disruption is present, as in this case, a full-thickness patellar tendon tear has occurred. This appears as a retracted tendon stump with swelling, increased waviness and edge artefact at the tendon stump.³

Patellar tendon rupture can be evaluated with radiographs, including evaluation for infrapatellar fat pad disruption as a sign of patellar tendon rupture.⁶ In addition, MRI can be used to diagnose patellar tendon pathology. However, ultrasound can also be used as an effective diagnostic tool, with one study even finding that ultrasound was more accurate than MRI in diagnosing patellar tendon pathology.⁴ In addition, Girith *et al* proposed that, due to the strengths of ultrasound in examining the extensor tendon mechanism, it could be considered the imaging modality of choice in patellar tendon evaluation.⁷

Ultrasound has been used successfully by the USA military to diagnose patellar tendon rupture in a deployed theatre, which allowed proper treatment to be initiated for the patient. This experience demonstrates the utility of ultrasound in diagnosis of patellar tendon ruptures and the ease with which it can improve patient care.²

Learning points

- ▶ Ultrasound can be used conveniently, quickly and effectively to expedite the diagnosis and treatment of patients with musculoskeletal injuries. This is particularly true when tendinous injuries are suspected, given the limitations of x-ray imaging and MRI.
- ▶ Emergency medicine physicians should familiarise themselves with ultrasound as a part of their practice, and realise that musculoskeletal examinations can be supplemented by the use of bedside ultrasound.
- ▶ When imaging a superficial tendon to evaluate for injury, it is important to remember the concept of anisotropy and to view the desired structure in multiple planes for complete evaluation.

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