



Visual Case Discussion

Walking on eggshells: Point of care ultrasound for patellar fractures

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A 48-year-old otherwise healthy female was brought in by ambulance after falling onto her left knee while preparing breakfast. On physical examination, she had significant tenderness to palpation, edema, and deformity of the soft tissue over her left knee. There were no abrasions or lacerations. A bedside ultrasound was performed using a high-frequency linear transducer (10-5 MHz, Sonosite, Bothell, WA). Using point of care ultrasound, the patella was visualized in long axis with notable disruption in proximal and distal aspects. A moderate effusion was noted between the two hyperechoic structures (Fig. 1). The patella, like other bony structures on MSK exams, appears hyperechoic on ultrasound because of its higher density (impedance), whereas hematomas and edema appear hypoechoic due to the relatively decreased density. This finding correlated with physical exam findings of retraction of the quadriceps tendon proximally and patellar tendon distally. In this circumstance, ultrasound allowed for the rapid detection and treatment of a patellar fracture. The fracture was later confirmed on plain knee films (Fig. 2a). This case demonstrates the rapid diagnosis of a displaced transverse patellar fracture. The authors propose the 'broken egg sign,' where the proximal and distal hyperechoic structures represent the broken egg shell (°) and the hypoechoic hematoma and effusion consist of the yolk(*) (Fig. 1). Displaced patellar fractures precipitate significant morbidity requiring orthopedic intervention with prolonged recovery. Disruption of the patella causes complete discontinuity of the extensor mechanism: the quadriceps and the patellar tendons. A surgical approach is often necessary, including tension band wiring, Kirschner wires, or screw fixation.³ This patient underwent

open reduction internal fixation three days after her injury (Fig. 2b). The use of point of care ultrasound is well established for the detection of organ pathology; however, it has become more common for the rapid detection of muscular and skeletal injuries. Several case reports have demonstrated the use of ultrasonography for displaced and non-displaced patellar fractures.^{1,2} In conclusion, point of care ultrasonography offers a rapid evaluation for suspected patellar pathology.

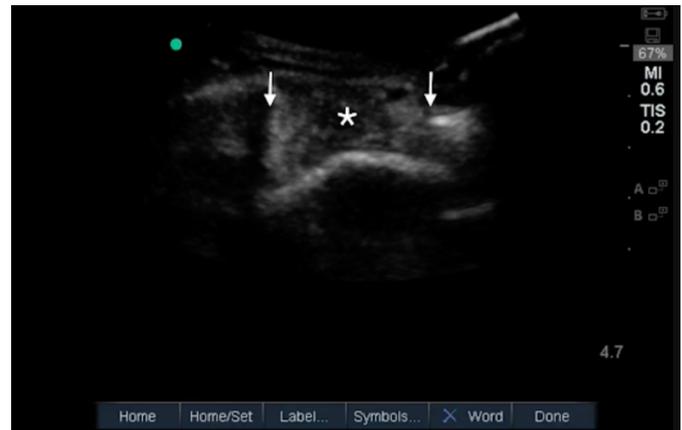


Figure 1. POCUS broken egg sign.

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Figure 2. (a) Day of injury. (b) Postsurgical fixation.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.visj.2018.12.010](https://doi.org/10.1016/j.visj.2018.12.010).

References

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Questions

1. Which physical exam tests the knee extensor mechanism?
 - a. The posterior drawer
 - b. The straight leg raise
 - c. The McMurray test
 - d. The Lachman
 - e. Patellar Apprehension Test

2. Most patellar fractures occur from a direct impact to the anterior surface of the knee?
 - a. True
 - b. False

Answers

1. The straight leg raise. Explanation: The straight leg raise requires knee extension. This complex movement, essential to bipedal ambulation, is the fine coordination between nerve, muscle, tendon and bone. The patient activates the quadriceps muscle which is attached to the patella by the quadriceps tendon. The patella is attached to the tibial tuberosity by the patellar tendon. These tendons are extremely strong. Unfortunately when high mechanical forces are applied to the anterior knee the patella often fractures before these large tendons rupture.
2. True. Explanation: Most patellar fractures are a result of a direct impact to the knee. This is most commonly seen by a direct fall on the knee or a lateral force, ie. a dashboard injury in a motor vehicle accident. Reference: Gwinner, C., Märdian, S., Schwabe, P., Schaser, K. D., Krapohl, B. D., & Jung, T. M. (2016). Current concepts review: Fractures of the patella. *GMS Interdisciplinary plastic and reconstructive surgery DGPW*, 5, Doc01. doi:[10.3205/iprs000080](https://doi.org/10.3205/iprs000080).