

EMERGENCY IMAGING

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FIGURE 1



FIGURE 2



A 40-year-old man presents to the ED with pain and inability to extend his right leg after a fall down several stairs. Radiographs are obtained (Figures 1 and 2).

What is your diagnosis?

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FIGURE 3

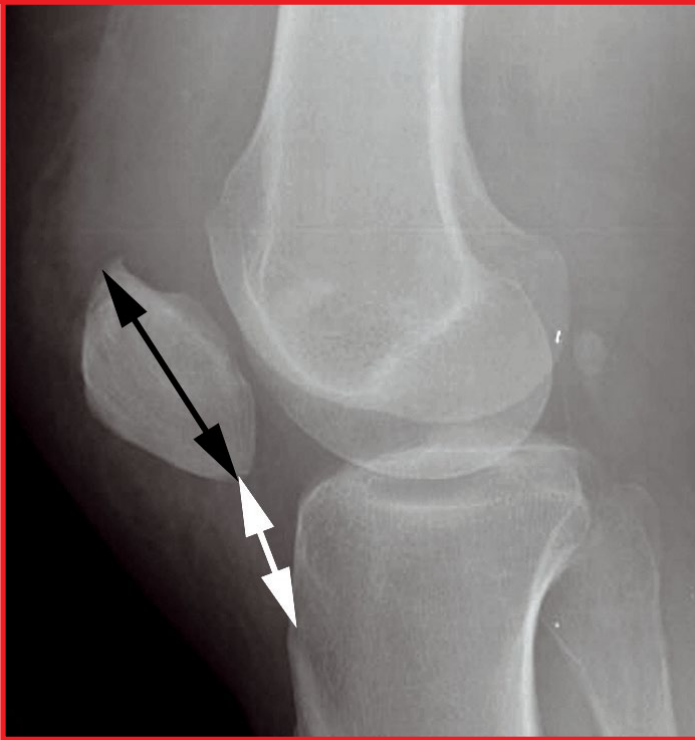


FIGURE 4



ANSWER

The AP and lateral views of the right knee demonstrate that the patella is low in position, a finding known as *patella baja* or *patella infera*. While several quantitative methods have been described for assessing the location of the patella, the Insall-Salvati ratio is one of the more commonly used and is relatively simple to remember. To calculate this ratio, one measures the length of the patellar tendon, defined on radiographs as the distance from the inferior pole of the patella to the tibial tubercle (white arrow, Figure 3). This value is then divided by the diagonal length of the patella (black arrow, Figure 3). With normal patellar location, the Insall-Salvati ratio is between 0.8 and 1.2. When the ratio is less than 0.8, the patella is low (*patella baja*). When the ratio is greater than 1.2, the patella is high riding; this is termed *patella alta*.¹

Patella baja in a patient with a history of traumatic injury suggests a tear of the quadriceps tendon. The quadriceps tendon is a component of the extensor mechanism of the knee, which also includes the osseous patella and the patellar tendon. The quadriceps tendon itself consists of 3 bundles: the rectus femoris (superficial), the vastus medialis and vastus lateralis (middle), and the vastus intermedius (deep). Tears of the quadriceps tendon may be partial or complete. Partial tears are more difficult to diagnose radiographically, as the patella will remain in anatomic position. Tears of the quadriceps tendon are the second most common injury to the extensor mechanism, following fractures of the patella.² Quadriceps tears most frequently occur at the insertion of the tendon on the patella.

Tears are uncommon in normal tendons, which are estimated to be able to withstand more than 17 times the normal body weight.³ This injury does occur in patients with chronic tendinosis or in association with several systemic diseases, including diabetes, renal failure, rheumatoid arthritis, and gout.² Quadriceps tears may also occur with chronic steroid use.

Although ultrasonography may be utilized to assess injury to the quadriceps tendon, skill and experience with musculoskeletal ultrasound are required. In most practices, the preferred diagnostic imaging examination to either exclude or characterize a quadriceps tear is MRI. MRI allows direct visualization of the three bundles of the quadriceps tendon, as well as the remainder of the extensor mechanism. A sagittal proton density image from the MRI examination obtained in this patient (Figure 4) demonstrates the torn and retracted quadriceps tendon (white arrow) and allows direct measurement of the gap (red arrow) between the tendon and the patella (red asterisk).

Timely diagnosis of quadriceps tears is essential. Failure to treat these injuries promptly may result in proximal tendon retraction and muscle atrophy, making repair difficult and often ineffective. **EM**

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