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# Bone Scintigraphic Findings in Patellar Tendonitis

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Three patients with the signs and symptoms of patellar tendonitis were studied with technetium-99m utilizing the triple phase technique. The scans demonstrated characteristic abnormal radiotracer localization at the inferior pole of the patella or tibial tuberosity on early and delayed images. The regional patellar anatomy likely explains the bone scintigraphic findings in patellar tendonitis.

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**P**atellar tendonitis ("jumper's knee") is an inflammation of the patellar tendon or the quadriceps tendon with involvement at the inferior or superior aspect of the patella. Typically it is seen in athletes who engage in activities requiring vigorous and repetitive knee flexion and extension (1). In the usual case, the patient presents with insidious onset of pain after athletic participation. It is described as an aching knee localized to the upper or lower pole of the patella. The pain may disappear with rest, but as the inflammation worsens, the duration of pain may increase (2). Examination reveals tenderness over the superior or inferior pole of the patella. Radiographic findings range from normal to a variety of nonspecific abnormalities, including periosteal reaction at the anterior surface of the patella, fractures of the patella, tendonous calcification, and patellar deformities. We recently studied three patients with the signs and symptoms of patellar tendonitis, and present the bone scintigraphic findings in this group of patients.

## IMAGING TECHNIQUE

Images were obtained with a large field-of-view scintillation camera with a low-energy, high-resolution parallel hole collimator using a 20% window set on the 140-keV technetium-99m (<sup>99m</sup>Tc) photopeak. Patients were injected intravenously with 20 mCi of <sup>99m</sup>Tc-methylene diphosphonate (MDP). Using a bolus technique, serial 5-sec "flow" images were obtained followed immediately with a 2-min blood-pool image. De-

layed images (600,000 counts or 5 min) were done at 4-8 hr postinjection. All flow images were obtained in the anterior view with both knees centered on the camera face; postflow views were obtained in the anterior or lateral view.

## CASE REPORTS

### Case 1

A 44-yr-old male runner had a 7-mo history of pain in the lower part of his left knee while running. The pain worsened to the point that he ceased running and sought advice from an orthopedic surgeon. On examination, the patient had full range of motion of his knee joints, but there was tenderness in the infrapatellar region. Radiographs of the knee in four views were normal.

The patient underwent 2 mo of physical therapy and treatment with nonsteroidal antiinflammatory drugs without improvement. One month later bone scintigraphy was obtained. Flow images were normal. Early and delayed views revealed increased tracer localization to the inferior pole of the left patella and tibial tuberosity (Figs. 1a-c).

The patient was treated conservatively for the next four months, and though he remained symptomatic, he was able to start bike riding. No further therapy was planned.

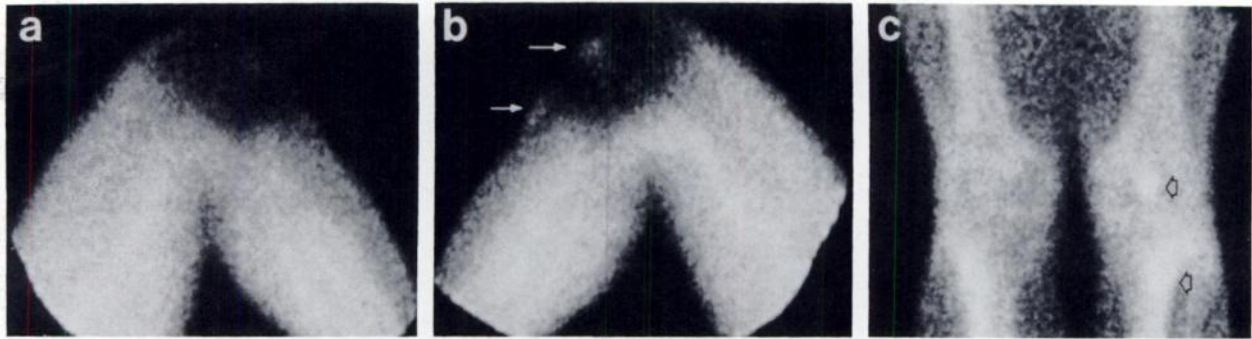
### Case 2

A 17-yr-old female athlete presented with a 1.5-yr history of left knee pain. The pain, which had been increasing, was located at the inferior aspect of her left patella. Examination revealed tenderness at the inferior border of the patella. No radiographs were obtained. Conservative therapy was prescribed. One month later the patient returned with worsening pain and a physical examination suggesting "necrosis tendonitis." Conservative therapy failed. Bone scintigraphy revealed abnormal localization of radiotracer at the inferior patellar border on blood pool and delayed images only (Figs. 2A-C).

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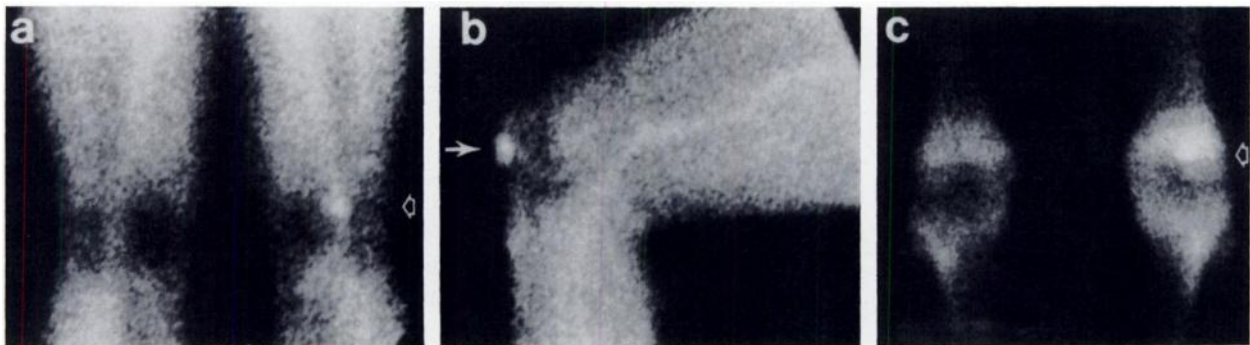
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**FIGURE 1**

a: Normal lateral blood-pool image of right knee. b: Lateral blood-pool image of the left knee with abnormalities (arrows) corresponding to the anterior image (c). c: Anterior delayed image with increased tracer localization at the inferior patellar border and tibial tuberosity (open arrows, left knee).



**FIGURE 2**

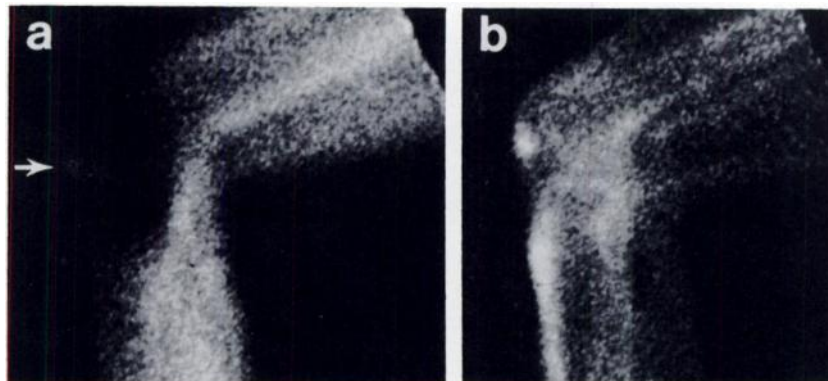
a: Anterior blood-pool image revealing increased localization of radiotracer at the left inferior patellar border (open arrow). b: Lateral blood-pool image of the left knee corresponding to the inferior patellar abnormality (arrow). c: Delayed anterior view highlighting abnormality at left inferior patella (open arrow).

Three weeks later the patient underwent surgical exploration where a necrotic piece of patellar tendon, located centrally and immediately inferior to the patella, was excised. Pathologically this tissue was characterized by chronic inflammation. The patient had an uneventful recovery.

**Case 3**

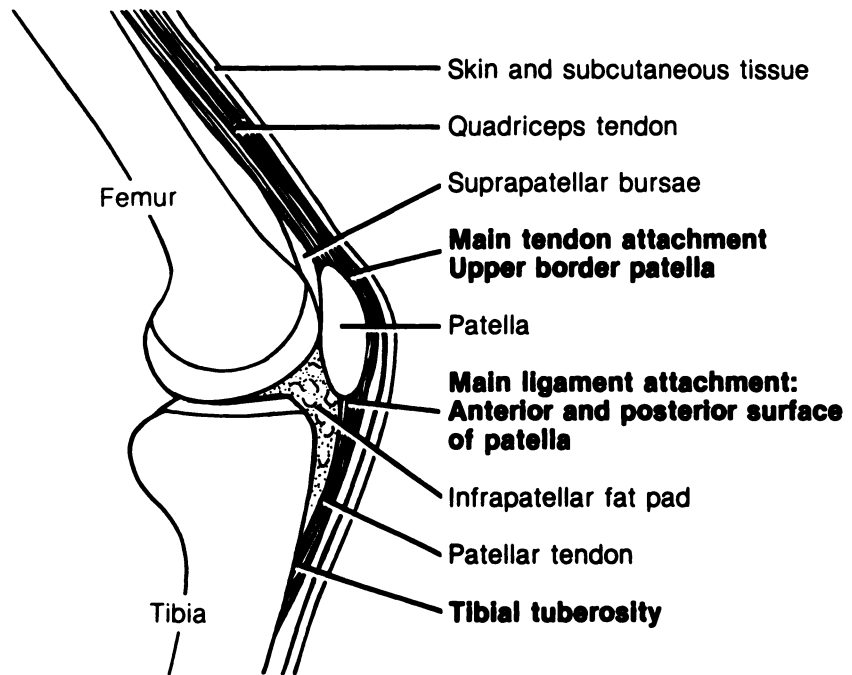
A 20-yr-old female volleyball player presented with a 2-yr history of left patellar tendonitis with pain at the inferior

patellar border. Exam revealed tenderness at the inferior patellar border. No knee effusion was present. Radiographs of the affected region were normal. Bone scintigraphy was performed and revealed an abnormality of the left inferior patellar border on blood-pool and delayed images only (Figs. 3A-B). Two weeks later the patient underwent knee surgery revealing nodularity of the patellar tendon just inferior to the patellar border and extending 2 cm distally. Histopathology of the excised tendonous region demonstrated chronic inflammatory changes. Postoperative recovery was uneventful.



**FIGURE 3**

a: Early lateral image of left knee with radiotracer localized to the inferior patella (arrow). b: Delayed image demonstrating abnormality at the inferior aspect of the left patella, corresponding to the early image.



**FIGURE 4**  
Regional patellar anatomy demonstrating the inferior patellar attachment and tibial insertion of the patellar tendon.

## DISCUSSION

We present bone scintigrams of three patients with the classic signs and symptoms of patellar tendonitis. In our series the intensity of the abnormal uptake in the region of the inferior patellar pole was approximately equivalent when comparing the three patients. Radiographs obtained in two patients were normal.

The regional patellar anatomy largely explains the characteristic increased tracer localization to the inferior pole of the patella or tibial tuberosity (Fig. 4). The quadriceps tendon fibers insert variably, but the main attachment is on the upper border and sides of the patella. The patellar tendon attaches at both the anterior and posterior surfaces of the lower patellar border and to the tibial tuberosity (3). With disease there is inflammation of the tendon and secondary involvement of the adjacent bony attachments (Figs. 1-4). In two of our cases, documentation of patellar tendonitis adjacent to the inferior patellar border (but not the most distal aspect of the tendon) was clearly demonstrated intraoperatively and on pathologic examination, thus explaining the abnormal inferior patellar radiotracer uptake. Had case number one undergone surgery, we

expect that tendonitis at the site of tendinous insertion on the tibial tuberosity would have been demonstrated as well, thus, explaining the bone scan abnormalities.

If the tendinous inflammation goes undiagnosed and progresses, the condition is neither benign nor self limiting (1,2). With progression of the inflammation, surgical intervention may be needed. Early diagnosis, therefore, is very important if strict conservative treatment is to succeed. It is our experience that plain radiographs are an insensitive modality and that bone scintigraphy can detect this condition earlier. The specific scan features should direct the referring physician to introduce strict conservative measures.

## REFERENCES

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