Bone marrow oedema in acute Osgood-Schlatter disease: a possible cause of knee pain

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Section: Paediatric radiology
Area of Interest: Musculoskeletal system Paediatric
Procedure: Diagnostic procedure
Imaging Technique: MR
Special Focus: Oedema Case Type: Clinical Cases
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Patient: 15 years, male

Clinical History:

Right knee pain localised at the tibial tubercle, of a few weeks duration, in a 15-year-old soccer player. It was exacerbated by movement, prolonged knee flexion or pressure on the tibial tubercle, and relieved by rest. No recent traumas or prior knee pain.
Local swelling and tenderness evident upon physical examination.

Imaging Findings:

Although age and symptoms were suggestive of Osgood-Schlatter disease (OS), for the importance of the young athlete to the team, the sports physician decided to perform the MRI.

The examination was performed with a 0.26-T unit (Esaote E-scan, Genoa, Italy). Image acquisition included T1-weighted and proton-density-weighted fat-suppressed (PDFS) sequences. Both T1-weighted and PDFS sequences showed a widespread bone marrow oedema as low and high signal, respectively (Figs. 1, 2, 3). The patellar tendon appeared, on T1-weighted images, inhomogeneous and thickened at its distal insertion (Fig.1); inhomogeneous, thickened and hyperintense on the PDFS image (Fig.2). The deep infrapatellar bursa was distended by fluid and hyperintense on PDFS sequences. MRI confirmed the diagnosis of acute OS (Fig.3).
Within four weeks of rest and occasional non-steroidal anti-inflammatory therapy, the patient was asymptomatic and sports were resumed with exercises aimed to restore muscle strength and flexibility of the extensor mechanism of the knee. MRI confirmed the return to his pre-injury state with no complications.

Discussion:

The tibial tubercle develops as an anterior extension of the proximal tibial growth plate during early gestation and closes at 13–15 years of age in girls, and 15–19 in boys [1]. In adolescent athletes, repetitive traumatic traction by the patellar tendon on the immature tibial tubercle may result in microfractures and local inflammation of the cartilage, swelling of the patellar tendon, effusion in the deep infrapatellar bursa and, subsequently, abnormalities of the tibial tubercle. This knee overuse disorder is named OS, as it was firstly described by Robert Osgood and Carl Schlatter in 1903 [2].

OS overall prevalence is up to 20% in athletic adolescents, with frequent bilaterality, and 4–5% of an age-matched non-athletic population [3]. Patients typically present with gradual onset of pain, swelling and tenderness over the tibial tubercle. The common age of presentation is 12–15 years in boys, and 8–12 in girls. Risk factors include male sex, rapid skeletal growth and sports activities that require jumping such as soccer, running, basketball, volleyball,
skiing and gymnastics [2, 4].

OS is usually self-limiting, as symptoms disappear with complete ossification of the tibial tubercle. However, symptoms may continue to wax and wane for 12–24 months before complete resolution. In addition, the avulsed portion may continue to grow, ossify and enlarge, thus determining a heterotopic bone formation at the distal insertion site of the patellar tendon, and may require surgical treatment [2].

The recognised diagnostic criteria of OS include local pain, swelling, and tenderness upon clinical examination; swelling of the cartilage and the patellar tendon and effusion in the deep infrapatellar bursa upon sonography; and associated abnormalities of the tibial tubercle in advanced stages upon radiographic examination [4, 5]. MRI is not usually required for diagnosis. Nonetheless, it may reveal the early lesions of OS and assess their progression from primary stages to healing [5-7]. Regarding radiology and ultrasonography, MRI provides additional information as signal changes within the bones (bone marrow oedema). Bone marrow oedema is a recognised cause of pain mainly due to increased interosseous pressure with sensory nerve irritation, venous hypertension, and irritation of periosteum [8]. In our patient, an extensive oedema was demonstrated within the tibial tubercle and proximal epiphysis, and may be considered a concomitant cause of knee pain.

When evaluating patients affected with acute OS, paediatricians and radiologists should be aware that bone marrow oedema may be present and it is detectable only through MRI.

**Differential Diagnosis List:** Acute Osgood-Schlatter disease with an associated bone marrow oedema, Patellar tendinitis, Deep and superficial infrapatellar bursitis

**Final Diagnosis:** Acute Osgood-Schlatter disease with an associated bone marrow oedema

**References:**


**Description:** The patellar tendon (white arrow) is inhomogeneous and thickened at its distal insertion. Bone marrow oedema (blank arrow) appears as a hypointense area spreading within the tibial tubercle and proximal epiphysis, incompletely fused. **Origin:** Draghi F., Radiology Institute, IRCCS Policlinico San Matteo Foundation, University of Pavia, Pavia, Italy
Description: The patellar tendon (white arrow) is inhomogeneous, thickened and hyperintense at its distal insertion. Bone marrow oedema (blank arrow) appears as a hyperintense area spreading within the tibial tubercle and proximal epiphysis, incompletely fused. Origin: Draghi F., Radiology Institute, IRCCS Policlinico San Matteo Foundation, University of Pavia, Pavia, Italy
Description: The deep infrapatellar bursa (curved arrow) is distended by inflammatory fluid and shows increased signal. Bone marrow oedema (blank arrow) appears as a hyperintense area spreading within the tibial tubercle and proximal epiphysis, incompletely fused. Origin: Draghi F., Radiology Institute, IRCCS Policlinico San Matteo Foundation, University of Pavia, Pavia, Italy