Osgood-Schlatter disease – ultrasonographic diagnostic

Florentin Vreju, Paulina Ciurea, Anca Roșu

Department of Rheumatology, University of Medicine and Pharmacy Craiova, Romania

Abstract

Osgood-Schlatter disease is a condition that is caused by traction of the muscle-tendon unit at tibial tuberosity, which affects adolescents who exercise. The predisposing factors include rapid growth and physical activity, particularly running and jumping. Osgood-Schlatter disease causes intermittent pain, which can be aggravated by running, cycling and climbing stairs. We present the case of a young boy, soccer player, which presented for pain at the level of the tibial tuberosity. Ultrasonography showed changes at the distal part of the patellar tendon and at the tibial tuberosity, consistent with Osgood-Schlatter disease.

Keywords: ultrasonography, Osgood-Schlatter disease, apophysitis, tibial tuberosity, patellar tendon.

Introduction

Osgood-Schlatter disease, named for the doctors that first described it [1,2], in 1903, is a traction apophysitis of the tibial tuberosity, due to repetitive strain from the quadriceps muscle, and chronic avulsion of the tibia, which may occur in the preossification phase or the ossified phase of the secondary ossification center. The maturation of tibial apophysis has four stages, as Ehrenborg and Engfeldt described it: cartilaginous stage between 0–11 years, apophyseal stage between 11–14 years, epi- physeal stage, when the tibial joins with tibial apophysis between 14–18 years and the bony stage, when the epiphysis is fully fused, after 18 years. It seems that most of the cases of Osgood-Schlatter disease occur in the apophyseal stage, the common age of presentation being between 12 and 15 years for boys and between 8 and 12 years for girls [3].

The symptoms range from aching and soreness, to swelling, severe pain and limping. The onset is gradual, with mild, intermittent pain, but in acute phases, the pain may become severe and continuous. Pain exacerbates after physical activity involving running or jumping or after kneeling. Physical examination usually finds tenderness directly over the area of the tibial tuberosity and local swelling. The pain can be reproduced with extension of the knee against resistance.

The diagnosis is mostly clinical, but imagistic methods are often used to confirm it. Abnormality of the secondary ossification center of the tibial tubercle is evident on conventional radiography and ranges from irregularity of the apophysis with separation from the tibial tu-
berosity to fragmentation in the later stages [4]. The same changes have been identified as characteristic for Osgood-Schlatter disease on ultrasound [3,5,6] and magnetic resonance images (MRI) [7].

The treatment is usually conservative, with medication and ice to relieve pain and stretching and strengthening exercises preceded by local warm packs. Surgery is rarely recommended in the growing patient, if conservative treatment has failed.

**Case presentation**

A 14-year-old boy was referred to our department for clinical examination and sonographic evaluation. The patient, a soccer player for 8 years, presented with pain and local tenderness at the level of the tibial tuberosity, accompanied by asymmetric, local swelling. The symptoms, more intense in the right knee, were exacerbated by training, especially straightening the leg against force (stair climbing, jumping, deep knee bends, or weightlifting) or following an extended period of vigorous exercise, and had led to limitation of the physical activity. We found the same symptoms in the left knee, but with a lower intensity. Previous biologic evaluation was uncharacteristic, except that the patient was HLA-B27 positive.

Musculoskeletal ultrasound, in gray scale and Doppler, was performed with a high-frequency linear array transducer, on a Siemens ACUSON X300 machine. The proximal head of the patellar tendon was normal in both knees, with a normal anterior surface of patella as a thin echogenic line. Longitudinal sonography of the distal head of the right patellar tendon showed swelling of the unossified cartilage and overlying soft tissues, with reduced internal echogenicity and thickening of the tendon (fig 1). Underneath, we were able to see fragmentation of the bone and irregularity of the ossification center (fig 2).

The anteroposterior thickness of the patellar tendon at the insertion on the tibial tuberosity was 5.7 mm on the right knee and 3.8 mm on the left one, with the increase in size due to a focal area of low echogenicity in posterior portion of tendon. Over the tibial tuberosity, the right patellar tendon decreases its size, however remaining thicker than the left one. Power Doppler ultrasonography showed a low signal along the distal right patellar tendon and posterior to the tendon, at the level of a bone irregularity.

These findings were consistent with the diagnosis of the Osgood-Schlatter disease and the patient was advised to stop the activities which had caused pain, to use topical NSAID and ice packs and was referred to the kineto-therapy department, to learn stretching and strengthening exercises.

**Discussion**

Osgood-Schlatter disease is quite frequent in adolescents, the occurrence being reported as greater in boys than girls [8,9] and frequently bilaterally (20–30%). Together with the Sinding-Larsen-Johansson disease, OSD is responsible for disability of the knee joint in adolescents practicing sports.
Histological studies performed on the tibial tuberosity growth plate have revealed three zones that gradually coalesce. The proximal zone, formed of short cell columns, is analogous to the upper tibial growth plate. The middle zone consists mostly of fibrocartilage that alternates with layers of hyaline cartilage. The distal zone is made mainly of fibrous tissue.

During the maturation of the tibial tuberosity through the apophyseal to epiphyseal stages, the most important change is distal migration of the short cell columns replacing fibrocartilage. Thus, OSD might be caused by the new developing ossification center’s inability to strive to the quadriceps forces, resulting in avulsion of the center and later new bone formation[10]. OSD occurs in the ossification centers, due to traction and not compression stress at the level of the patella or the tibial tuberosity, and for this reason, it has been called “non-articular osteochondrosis” [5].

The prognosis of the Osgood-Schlatter disease is good, with a self-limiting course and complete recovery with the closure of the tibial growth plate. About 80% of patients respond well to conservative treatment.

In more than 10% of the cases, complications can occur, such as pseudarthrosis or migration of a separate ossicle in the patellar tendon, with premature closure of the anterior tibial epiphysis resulting in genu recurvatum (hyper-extension). This may further result in a high-riding patella (patella alta), with increasing joint reactive forces at the patellofemoral articulation, and potentially leading to early osteoarthritis of that joint. Another complication is persistence of pain into late adolescence or adulthood usually due to the bony prominence at the tibial tubercle, which results from the small ossicle and forms from the fragmentation of the apophysis. This ossicle may impinge on the patellar tendon, causing pain and limiting activity. More than that, there are studies [11] which sustain an association of Osgood Schlatter’s disease and patellar instability. Patellar tendon avulsions are possible sequelae to Osgood-Schlatter disease. Thereby, an early diagnosis is important, to stop any activity that requires knee bending and jumping.

Unlike, in other cases, it is important to not overtreat these patients. Glucocorticoid injections, which might be necessary to treat other diseases, have a low beneficial effect in Osgood Schlatter disease and might lead to subcutaneous atrophy, striiae formation in the skin overlying the tibial tubercle and in rare cases, to a more severe complication—tendon rupture.

The diagnosis of OSD is clinical, but plain radiographs of the knee are recommended in all unilateral cases to rule out other conditions such as tibial apophyseal fracture, infection, or tumor. Conventional radiographs of the knee show, in the lateral view, an irregularity of the apophysis, with separation from the tibial tuberosity, in early stages and fragmentation, in the later stages [4]. However, radiography cannot give complete information about the involvement of the non-osseous tissues, which may provide a diagnostic hallmark in the early stages. In these cases, soft tissue swelling, especially of the infrapatellar fat pads may be the only evidence of this disease. More than that, considering that the disease occurs in children and pre-teenagers, Röntgen exposure should be avoided, MRI and ultrasound being the choice, with the emphasis on the latter. This should be the first-choice examination in both the diagnosis and the follow-up of Osgood-Schlatter disease due to its availability and lower costs.

Magnetic resonance imaging can identify five stages of the disease: normal, early, progressive, terminal and healing. The normal stage reveals no changes on the MRI scan, although the patient is symptomatic. The MRI scan shows signs of inflammation in the area of the secondary ossification centre. The progressive stage reveals partial cartilage avulsion at the level of the secondary ossification centre. The terminal stage shows separated ossicles and the healing stage can be defined as osseous healing without separated ossicles at the level of the tibial tuberosity [12].

Ultrasonography of the patellar tendon enthesis can differentiate three stages of the disease, based on the following criteria: presence or absence of a large anechoic region, presence or absence of ossicles and irregularity of the apophyseal surface. Stage 1 (cartilage attachment) is characterized by a large anechoic region (apophyseal cartilage), with or without ossicles. Stage 2 (insertional cartilage) shows the attachment of the collagen fibers onto the bone surface, with a thin anechoic layer of cartilage. Stage 3 represents the mature attachment of the collagen fibers onto the bone surface [13].

This case has confirmed the complexity of the relationship between pain and imaging and revealed the importance that sonography has in the assessment of the patellar tendon changes and of the adjacent anatomic structures. Furthermore, musculoskeletal ultrasonography was able to differentiate Osgood-Schlatter disease from a possible HLA-B27 related enthesopathy, allowing us to make the correct diagnosis and choose the conservative treatment.

References


