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Case Report

Traction apophysitis of the knee: A case report

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ABSTRACT

We report a case of a 12-year-old boy who presented with infrapatellar pain, with subsequent diagnosis of traction apophysitis of the knee (Sinding-Larsen-Johansson disease). Conventional radiographs are frequently reported with no significant findings in the acute setting, leading to ultrasound as the modality of choice for diagnostic efficacy of apophysal traction injuries in young athletes. Sinding-Larsen-Johansson disease has a 2%-5% incidence in children aged 10-15 years, with the most common cause related to sporting activities related to jumping.

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Introduction

Overuse injuries of the knee in young athletes is a known factor influencing tendon laxity as well as the process of skeletal maturity.

Chronic overuse and traction of the knee produces tearing and widening of the apophysis with subsequent rupture. This produces osteochondral fragments consisting of cartilage and the secondary ossification center [1].

The patella is the largest sesamoid bone of the skeleton and starts as a cartilage model with which mineralizes through multiple ossification centers between 18 months and 6 years. During initial ossification, the patella presents as an oval disc of bone and as growth progresses it develops a triangular shape. Inferior to the articular surfaces of the patella, there is a small triangular nonarticular surface known as the apex which extends inferiorly. The patella develops its adult morphology just prior and during adolescence. Unlike other epiphysis of long bones such as the femoral head, the patella

does not have a metaphyseal surface. Instead it presents a smooth articular as well as a tough porous surface. When the patella develops to its mature morphology, it is clearly distinct from other skeletal bones of the knee [2].

Apophyses are the normal bony outgrowths that arise from separate ossification centers which later fuse. The apophysis is a site of tendon or ligament attachment, as opposed to the epiphysis which relates to the end part of a long bone, separates from the shaft. Apophysitis relates to inflammation of an apophysis usually secondary to bony trauma. It is most commonly found in the immature skeleton where contraction force at the point of tendon insertion causes detachment of the ossification center from the parent bone as seen with Sinding-Larsen-Johansson disease. The inferior apex of the patella, a nonarticulating surface undergoes traction apophysitis where traction of the tendon insertion distracts a secondary ossification center from the body of the patella. This relates to the effect on the disease bone due to local forces acting on the bone [3].

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One of the less common sites of traction injuries is the inferior apex of the patella (Sinding-Larsen-Johansson). The most frequently reported cases are of children aged 10-15 years [4].

Sinding-Larsen-Johansson disease is characterized clinically by local pain and tenderness on palpation and radiographically by separation and fragmentation of the lower patellar apex associated with soft tissue swelling. On occasion, calcifications are noted at the site of the patellar ligament [5].

Ultrasound is an excellent tool to distinguish bony irregularity as well as focal swelling of the apophysis. Ultrasound is also effective in the assessment of tendon involvement with Power Doppler imaging [6,7].

Four stages of the disease process have previously been reported as follows:

Stage 1: Normal findings.

Stage 2: Irregular calcifications at the inferior patellar pole.

Stage 3: Coalescence of calcifications.

Stage 4A: Incorporation of calcifications into patella.

Stage 4B: Coalesced calcified mass separate from the patella [8].

Several pathogeneses have been prescribed to the disease process such as apophysitis, periostitis, tendinitis, calcifications associated with avascular necrosis as well as osteochondritis.

Case report

A 12-year-old boy was referred to our ultrasound department for persistent infrapatellar knee pain during longstanding seated positions and sporting activities. Patellar traction apophysitis (Sinding-Larsen-Johansson disease) was diagnosed by means of ultrasound assessment, and the patient was referred to sports physician for further treatment.

Ultrasound image evaluation

Ultrasound at the level of the inferior patella apex proved widening of the apophysis with bony irregularity at the tendon insertion site, presenting as apophysitis.

Focal thickening of the proximal insertion of the infrapatellar tendon insertion was noted in comparison to the contralateral side (see Fig. 1).

Power Doppler showed subtle increased hyperemia within the tendon fibers of the infrapatellar tendon (see Fig. 2).

Conventional radiograph evaluation

Conventional x-rays of the symptomatic right knee were reported as normal with no visible evidence of bony irregularity at the point of maximum tenderness. Incidental observation was made of cortical irregularity of the left asymptomatic knee, with loose bony fragment present (see Figs. 3 and 4).

Ultrasound proved superior in diagnosis of the disease process in its acute phase.

Discussion and conclusion

Anterior knee pain is a common point of referral to musculoskeletal clinics (25%), and is present in 14% of elite athletes.



Fig. 1 – Lateral right knee radiograph. (arrow indicates intact patellar apex with no evidence of apophysitis in the symptomatic right knee.)



Fig. 2 – Lateral left knee radiograph (arrow indicates loose bony fragments of the patellar apex in the asymptomatic left knee).

Multiple conditions are prescribed to anterior knee pain due to close proximity of various anatomic structures, such as infrapatellar bursitis, Hoffa's fat pad inflammation, patellofemoral joint pain, and the synovial plica. Differentiating between various pathologic processes can be difficult in the clinical setting.

Traction apophyseal injuries in young athletes are commonly found in the 10-15-year-age group. Sporting activities

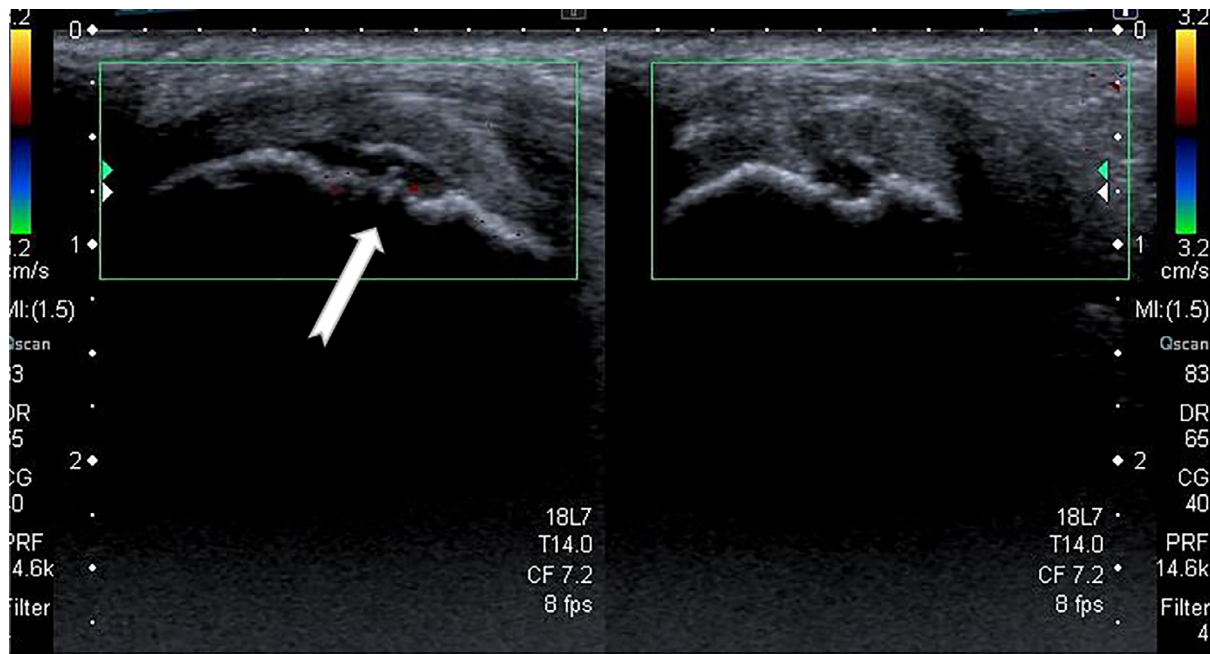


Fig. 3 – Subtle increased hyperemia (neovascularity) with Power Doppler imaging of the right knee (left image of split screen in comparison to asymptomatic left knee).

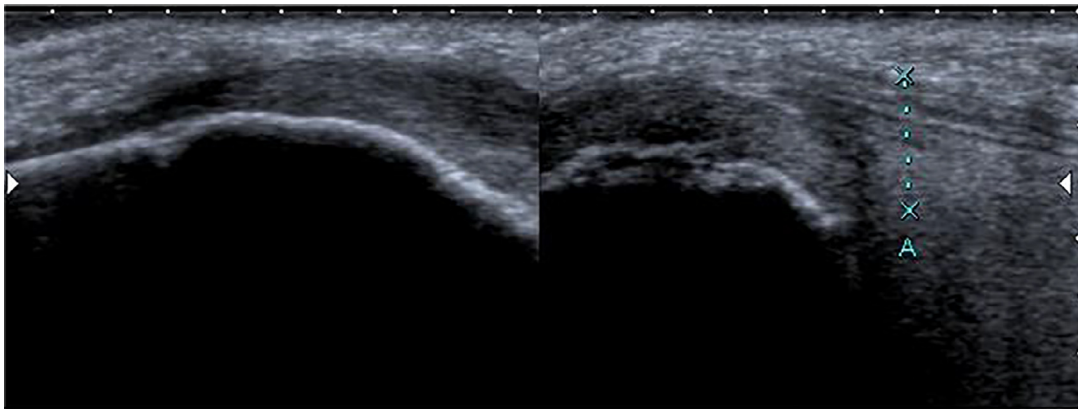


Fig. 4 – Prepatellar and infrapatellar aspect of the right knee.

such as long jump, karate, football have all been reported to be associated with apophyseal type injuries.

Sinding-Larsen-Johansson disease is a self-limiting condition and responds to modification of activity and Nonsteroidal anti-inflammatory drugs (NSAIDs). Exercises to improve flexibility of the hamstrings, quadriceps and heel cords can help reduce symptoms. The symptoms resolve within 10-12 months with incidence of the disease seldomly found after skeletal maturity of the affected bony occurs.

Ultrasound proves to aid in the clinical reasoning process. High-frequency ultrasound can visualize structural changes of the infrapatellar tendon such as increased echogenicity of the affected tendon fibers, thickening, calcification as well as neovascularity [9].

The case is considered worthy of reporting to prove the important role of ultrasound in the radiological setting for diagnosis of traction apophyseal injuries such as Sinding-Larsen-Johansson disease (Fig. 5).

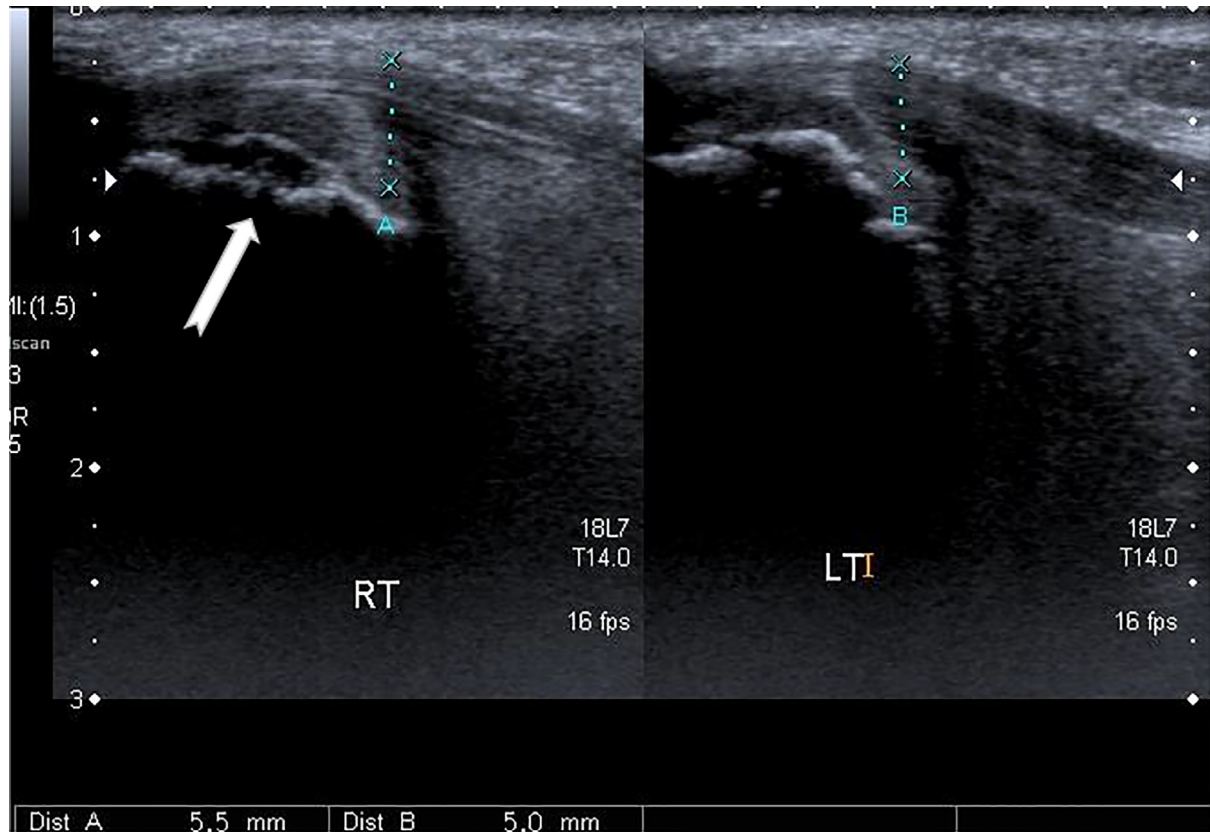


Fig. 5 – Focal thickening and increased echogenicity of the right infrapatellar tendon in comparison to the contralateral left side (arrow indicates significant widening and cortical irregularity associated with the apophysis of the patellar apex).

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