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Cortical desmoids in adolescent top-level athletes

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Abstract

Two adolescent, highly active athletes are presented with unspecific symptoms of anterior knee pain. Conventional radiographs and magnetic resonance imaging (MRI) showed a suspicious but pathognomonic cortical irregularity of the dorsal, medial femoral condyle. Cortical desmoid is one of the most common incidental osseous findings on conventional radiographs and MRI of the knee. It often needs no follow-up examination in asymptomatic patients. Malignancy needs however to be ruled out.

Keywords

Knee, avulsive cortical irregularity, benign lytic lesion, don't touch lesion

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Introduction

Cortical desmoid represents a benign cortical irregularity (1), typically located at the posterior-medial condyle of the femur (2). Although it is rarely described in the orthopedic and sports-medicine literature (3), knowledge is of high clinical relevance (4). It has been used as synonym with distal femoral cortical irregularity (DFCI) (5), avulsive cortical irregularity, cortical abrasion, periosteal and subperiosteal desmoid (6), and as a variant of periostitis ossificans (1).

Usually, patients do not complain about any symptoms related to cortical desmoid, and no palpable mass, swelling, nor pain is present in physical examination (3). Hence, it usually is found as an incidental radiological finding.

Case reports

Case 1

An 11-year-old female gymnast presented to our sports-medical consultation due to anterior-medial pain of the left knee after her daily physical exercise. She remembers a hyperextension-trauma 2 years before, which may have caused these symptoms. Reducing her intense weekly training schedule of 20 h did not lead to significant relief of complaints especially when swimming (breaststroke more than crawl). No fever, no loss of weight, and no night sweat was present. The physical examination of both knees showed bilateral physiological status, except a palpable and painful soft tissue structure in the medial side of the left knee. The clinical suspicion of symptomatic mediopatellar plica was confirmed by magnetic resonance imaging (MRI). A hyperintense signal was detected on the posterior aspect of medial femoral condyle in axial T2-weighted (T2W) MR images (Fig. 1), surrounded by a rim of low signal representing sclerosis. For improved diagnostic purposes, conventional X-rays were performed (Fig. 2), demonstrating an irregular cortical thickening.

Treatment consisted of physical therapy to improve centering of the patella. Four months later, all symptoms had decreased significantly and conventional radiological follow-up of the cortical irregularity did not show any alteration. MRI follow-up showed

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Fig. 1. Patient 1: (a) PD TSE FS axial and (b) coronal view, (c) T2 TSE sagittal view – posteromedial cortical irregularity, high signal focus surrounded by a rim of low signal representing sclerosis.

Fig. 2. Patient 1: Conventional X-rays in lateral (a) and oblique (b) projection. Note its proximity to the epiphyseal growth zone.

significant reduction of the cortical desmoid in size and signal intensity (Fig. 3).

Case 2

A 15-year-old female judoka presented to our sports-medical consultation with load-dependent, bilateral, anterior knee pain, mainly in the flexed position, especially during cycling, judo, or climbing. Immediately after exercise, pain was declining. Neither effusion nor general symptoms such as fever, loss of weight, or night sweat were present at any time. Previously, our patient had been treated unsuccessfully by a physical therapist to improve centering of the patella. In physical examination, leg axis, knee stability, and mobility were equal for both sides and normal. Initial MRI of the knee showed a slightly indurated mediopatellar plica corresponding to our patient's symptoms. Additionally, a cortical irregularity at the medio-posterior border of the femur was found (Fig. 4). Plain radiographs at

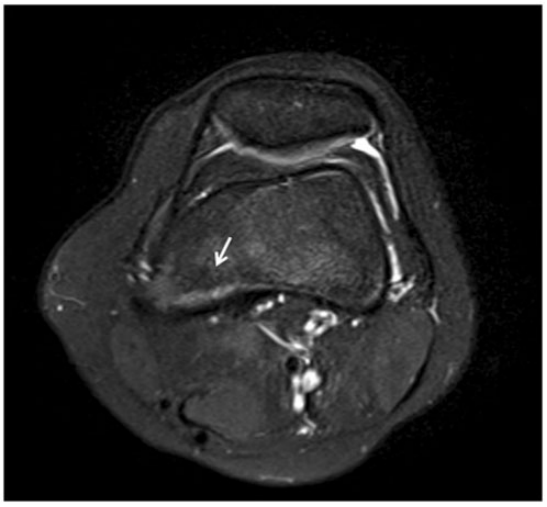

Fig. 3. Patient 1: 2-year follow-up on MRI image (PD TSE FS axial).

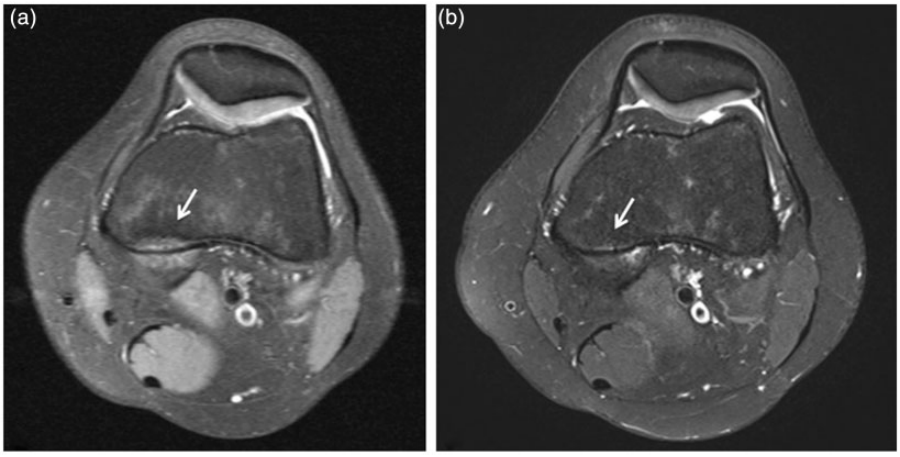

Fig. 4. Patient 2: PD TSE FS transversal view – posteromedial cortical irregularity, intermediate signal focus surrounded by a rim of low signal representing sclerosis (a) and 2-year follow-up (b).

the 6-month follow-up showed no significant alteration of the lesion, the MRI after 2 years showed small reduction of the cortical desmoid. All in all, the patient had no further complains.

Discussion

Cortical desmoid has been reported as one of the most frequent coincidental findings on plain radiographs and a common finding in MRI (7). It is found in 3.6–5.5% of girls and 9.1–11.5% of boys (8–10). Some investigations have found an incidence of up to 53% on plain radiographs (1,11) and 58% on MRI (1). Cortical desmoid is more often found on the left knee (12) and bilateral in up to 35% (13). Increased familiar recurrence has been discussed (14).

In our two high-level female athletes, plain radiographs showed cortical irregularity with marginal sclerosis (Fig. 2) without the typical lytic lesion reported in various publications (2,13,15). Some cases may even show ragged spiculation suggesting malignancy (15). The highest sensitivity is reported for the oblique anterior-posterior projection of plain radiographs in 20–40° external femoral rotation (Fig. 2) (3,6,12).

As etiopathologic cause of this lesion, avulsion of either the medial head of the gastrocnemius muscle (1,5,9,10), or the insertion of aponeurosis of the adductor magnus muscle (10,12,15) lateral to the medial supracondylar ridge of the femur have been discussed. Both of the two sports, judo and gymnastics are especially prone to muscular injuries to the lower extremities (16,17). Major mechanisms of cortical desmoid in these sports may represent hyperextension of the knee while landing causing injury to ischiocrural and adductor muscles in gymnasts and forced dorsiflexion of the foot putting stress on the gastrocnemius muscles in judo. As in our two cases, cortical desmoid is mainly found in 10–15-year-old adolescents (9,18) or before closure of the epiphysis of the knee (8,19), as avulsion of bony insertion occurs more frequently in children and adolescent than in adults (15), due to a stronger tendon to bone relationship and vulnerability of epiphyseal plate.

The posterior aspect of the medial femur condyle is not the only site of cortical irregularities. Similar lesions have been documented in other anatomical region of strong tendon insertions such as the pectoralis major muscle on the humerus in gymnasts (20), and other long bones (6).

Resnick and Greenway (10) were the first to classify cortical desmoid in cystic and proliferative lesions. The former is predominantly found in children laterally of the medial supracondylar ridge as cortical excavation and is due to stress over-loading on the insertion of medial gastrocnemius muscle. It also has been discussed as a residual lesion of fibro-cortical defect due to its anatomic location (10). Along the medial supracondylar ridge, a short segment of irregularity or spiculation can be identified in proliferative cortical lesion, and is found in slightly older patients. However, in their dissection study, Resnick and Greenway failed to prove a muscular insertion of the adductor magnus aponeurosis to this site and therefore, the lesion has been discussed as a physiological variant of metaphyseal growth (10).

Suh et al. (1) recently classified cortical desmoid in their radiological appearance: concave, convex, and divergent. Concave shaped lesions were the most frequent (82%) and found in younger subjects than convex and divergent shaped, which may be later stages of the same benign process (5). Hence,

radiographic appearance depends highly on the lesional stage (13).

CT and MRI are more sensitive in detecting cortical desmoid due to sectional representation (13) and illustrating soft tissue as demonstrated in our two cases. Diagnosis of cortical desmoid in the subsequent plain radiographs may have been missed, if previous imaging was not performed (Fig. 1). In our judoka, initial plain radiograph had been performed, without identifying the cortical irregularity; only additional MR and oblique conventional radiograph of the knee depicted this asymptomatic lesion. T2W MR images typically show intermediate to high signal surrounded by sclerosis which is seen as a rim of low signal intensity (Figs. 1 and 4). In T1-weighted images, the lesion has low signal (Fig. 1) (1,21). If 99m-Tc MDP bone scan is performed, it usually shows inactivity at the site of the lesion (22,23). The typical site of cortical desmoid is, however, masked frequently by the epiphyseal plate in growing children (24). Active lesions of cortical desmoids, such as during healing or involution, may have a slight uptake in delayed images (25). Nevertheless, some authors recommend biopsy in the case of a minimal increased uptake in the bone scan (3). Histology is strongly depending on the stage of evolution and on the pathologist experience (10). It has been described as reactive fibrous proliferation with mild inflammation originating from periosteal or subperiosteal tissue and bony spicules to dense fibrous scar tissue (3,6,10,26). Some even found them indistinguishable from osteochondroma (27).

Differential diagnosis always needs to include malignancy such as parosteal osteosarcoma (28), usually growing around cortical bone, with soft tissue involvement seen in MRI (5) and usually found in patients aged more than 60 years. In the young patient, also fibrous cortical defect could be considered, that might only be differentiated by its anatomic location but not on its appearance on MRI, and early stages of osteomyelitis (29). In painful conditions, not only malignant tumors but also stress fractures (30) have to be excluded.

Both our patients suffered from a symptomatic mediopatellar plica. Physiotherapy in both cases was sufficient to alleviate symptoms. Cortical desmoid was diagnosed in the course of radiological investigations as coincidental finding in both cases. Radiological follow-up did not show any progression of the lesion in our 6-month follow-up and a significant reduction of intensity and size in our 2-year MRI follow-up (Fig. 3). Two years after the first consultation, both of the two top athletes were clinically asymptomatic.

No recently published therapeutic guideline exists in literature. However, it seems a silent convention, that no further examination is required in conditions of asymptomatic clinical presentation and pathognomonic plain radiograph. In case of suspicious clinical presentation or atypical plain radiographs, MRI is a valuable tool to rule out malignancy. Plain radiological follow-up is indicated 4–6 months after the initial finding to re-evaluate the situation. Precipitate biopsy in asymptomatic patients with pathognomonic X-ray should be avoided (15,31,32) since false-positive malignant finding in biopsies (22) of this self-limiting lesion (10) may occur as a worst outcome and may lead to (sub-) total amputation of the limb (26).

In conclusion, the patient's age, clinical findings, anatomic localisation, appearance on plain radiographs, and clinical and radiological follow-up should be sufficient for diagnosis of cortical desmoid without additional histological analysis. According to the anatomical findings and radiological investigations, a traumatic pathogenesis of this lesion is the most probable cause due to higher traction forces at the insertion site; hence, athletes' populations may be more prone to this finding. Therefore, it is absolutely crucial that sports-physicians are aware and familiar with this self-limiting and absolutely benign radiological finding to appease the patient and to prevent potential detrimental consequences to the athlete's health.

Conflict of interest

None declared.

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