

Anterior Cruciate Ligament Calcification

L. Cardoso Fava Ferreira dos Santos^{1,2}, M.L. Duarte^{1,2}.

1. Universidade de Ribeirão Preto (UNAERP) Campus Guarujá, Guarujá – São Paulo, Brazil.
2. Department of Radiology, Hospital Beneficência Portuguesa de Santos. Avenida Bernardino de Campos, 47, Santos-SP, Brazil.

Abstract

Presentation

A 79-year-old woman reports left knee weakness and pain for five months. She denies any improving or worsening factors. Sports practice, refers to walks and exercises with an ergometric bicycle at home. Affirms have difficulties climbing stairs and getting up, needing support. However, she does daily activities normally, without limitations. The physical examination shows a normal anterior drawer test. Gait evaluation, inspection, and mobility tests were ordinary. Normal blood test, with 9,1 mg/dL calcium and 4,63 mg/dL potassium.

Diagnosis

The computed tomography (CT) scan of the left knee presents anterior cruciate ligament calcification with arthrosis and chondrocalcinosis of the lateral and medial menisci.

Treatment

The patient underwent symptomatic treatment of analgesics and physiotherapy, improving the pain in 10 days. Also, she started bodybuilding and improved her weakness.

Discussion

Incidental findings of calcification in asymptomatic patients raise the possibility that it represents a benign chronic condition of less or no clinical significance. Conservative treatment with oral anti-inflammatory drugs and intra-articular corticosteroids is often chosen because it tends to decrease the intensity of the symptoms. In this case was also chosen symptomatic treatment with analgesics, physiotherapy, and bodybuilding. In the study demonstrated by Tsujii et al, arthroscopy was chosen to remove the calcification because of the severe pain demonstrated by the patient, who had its symptoms relieved after the procedure. Corroborating, Hayashi & Fischer affirmed that surgical removal of the calcification results in patient relief in pain cases.

Introduction

Ligaments are composed of collagen fibers and parallel fibroblasts. The fibroblasts are extracellular matrix producers' cells (collagen), while the collagen fibers aren't much elastic, but very resistant to

traction forces. Histologically, the deposition of calcium near the ACL showed insignificant degenerative changes.¹

The anterior cruciate ligament (ACL) in the knee originates from the anterior tibial plateau region, while its insertion is located in the posterolateral femoral notch. ACL doesn't allow knee hyperextension and limits the scrolling of the femur on the tibia; this is the main limiting factor of tibial translation around the femur. ACL has two functional branches:²

1. Anteromedial: promotes knee flexion.
2. Posterolateral: is responsible for knee extension.

ACL is the knee ligament that is more likely to be injured.³ Its rupture is common in young and active individuals, resulting in psychological and physical negative impacts, being associated with pain, articular instability, and secondary osteoarthritis development. ACL vascularization is scarce and is the weakest of the cruciate ligaments.⁴

According to Hayashi and Fischer,⁵ ACL calcification is a finding only present in case reports. Herein, we report the case of a 79-year-old woman with ACL calcification and a clinical history of knee weakness over five years.

Case Report

A 79-year-old woman reports left knee weakness and pain for five months. She denies any improving or worsening factors. Sports practice, refers to walks and exercises with an ergometric bicycle at home. She takes ezetimibe and simvastatin to treat cholesterolemia, besides acetylsalicylic acid, vitamin compounds that include A and C vitamins, collagen, and hyaluronic acid. Affirms have difficulties climbing stairs and getting up, needing support. However, she does daily activities normally, without limitations. She denies previous surgeries and, at the moment, is treating renal and biliary lithiasis.

The physical examination shows a normal anterior drawer test. Gait evaluation, inspection, and mobility tests were ordinary. Normal blood test, with 9,1 mg/dL calcium and 4,63 mg/dL potassium. The computed tomography (CT) scan of the left knee presents ACL calcification (Figure) with arthrosis and chondrocalcinosis of the lateral and medial menisci. The patient refused to undergo MRI.

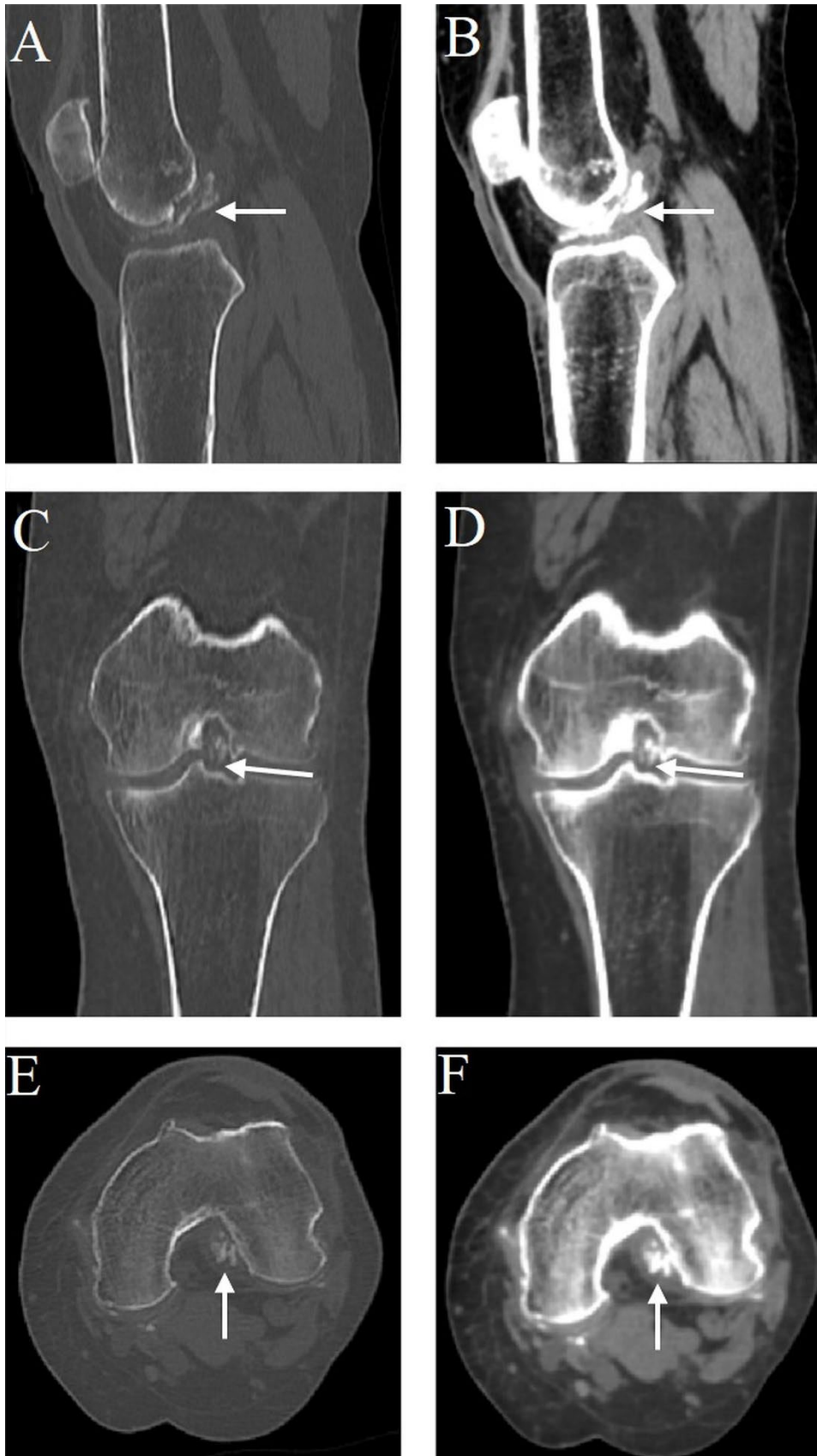


Figure: CT in the sagittal section in A (bone window) and in B (soft tissue window), in the coronal section in C (bone window) and in D (soft tissue window) and in the axial section in E (bone window)

and in F (soft tissue window) demonstrating calcification of the anterior cruciate ligament (white arrows).

The patient underwent symptomatic treatment of analgesics and physiotherapy, improving the pain in 10 days. Also, she started bodybuilding and improved her weakness.

Discussion

CT scan and magnetic resonance imaging (MRI) are essential to achieve the correct diagnosis of ACL calcification. In this case report, a CT scan was performed as a diagnosed method, which showed ACL calcification, arthrosis, and chondrocalcinosis of the lateral and medial menisci. Despite the rare condition, ACL calcification should be included in the differential diagnosis of acute knee pain.¹

Incidental findings of calcification in asymptomatic patients raise the possibility that it represents a benign chronic condition of less or no clinical significance.⁵ Conservative treatment with oral anti-inflammatory drugs and intra-articular corticosteroids is often chosen because it tends to decrease the intensity of the symptoms.¹ In this case was also chosen symptomatic treatment with analgesics, physiotherapy, and bodybuilding. In the study demonstrated by Tsujii et al, arthroscopy was chosen to remove the calcification because of the severe pain demonstrated by the patient, who had its symptoms relieved after the procedure.¹ Corroborating, Hayashi & Fischer affirmed that surgical removal of the calcification results in patient relief in pain cases.⁵

Chondrocalcinosis is a clinical condition caused by the deposit of calcium pyrophosphate crystals on cartilages mainly on large joints and frequently on the knee, leading to an arthritis case.⁶ Grassi suggests that ACL's involvement in chondrocalcinosis is frequent, and in these cases, the most commonly chosen exams, radiography and MR, aren't effective in its identification.⁷ Microtomography allows the detection of calcium crystals in deep intra-articular structures like ACL – it is a better method to investigate patients with chondrocalcinosis.⁷

According to Tsujii et al, calcifications present some histological similarities relating its degeneration when compared to calcifying tendinitis.¹ The most frequent clinical aspect of this pathology consists of pain, just as ACL calcification. Its physiopathology is divided into three phases:

1. vPrecalcification: occurs when the tenocytes are transformed into chondrocytes.
2. Calcification: production and deposition of calcium crystals.
3. Post calcification: consists of the development of granulation tissue around the lesion.

Despite the similarities found in both pathologies, it would be precocious to hypothesize the physiopathology of ACL calcification compared with calcifying tendinitis, first because they are different structures (ligament and tendon) and also due to the scarcity of studies on ACL calcification.

In the study carried out by Lee, joint puncture of hemarthroses associated with ACL injury was performed. The synovial fluid was sent to culture and was observed, after 28 days, a rise in the genes related to osteoblasts and in the action of alkaline phosphatase. The results of this study suggest that hemarthrosis induced by the ACL injury contains osteoprogenitor cells, raising the possibility that the chronic lesion of ACL can lead to a calcification process. Concrete information on ACL calcification is scarce, so further studies and research are needed to formulate hypotheses and provide a better understanding of its physiopathology.⁸

The ACL is the knee ligament that is more likely to be injured, but its calcification is extremely rare, having just case reports in the literature. Although it has some possible causes, none is, until now, the exact cause of ACL calcification. Incidental findings of calcification in asymptomatic patients can represent a benign chronic condition of less or no clinical significance. However, the physician, especially the radiologist, must keep in mind that the ACL's calcification should be included on the differential diagnosis to acute knee pain.

Declaration of Conflicts of Interest:

None to declare.

Corresponding author:

Louise Cardoso Fava Ferreira dos Santos,

References:

1. Tsujii A, Tanaka Y, Yonetani Y, Iuchi R, Shiozaki Y, Horibe S. (2012) Symptomatic calcification of the anterior cruciate ligament: A case report. *Knee*. Jun;19(3):223-5.
2. Alves TAFA, Braun MAA, Duarte ML, Santosc LRD. (2022) Anteromedial meniscofemoral ligament-A rare finding. *Morphologie*. Jun;106(353):124-127.
3. Duran S, Gunaydin E, Aksahin E, Dasar U, Bicimoglu A, Sakman B. (2019) Evaluation of the anterolateral ligament of the knee by magnetic resonance imaging in patients with chronic anterior cruciate ligament rupture. *J Clin Orthop Trauma*. Jul-Aug;10(4):706-709.
4. Filbay SR, Grindem H. (2019) Evidence-based recommendations for the management of anterior cruciate ligament (ACL) rupture. *Best Pract Res Clin Rheumatol*. Feb;33(1):33-47.
5. Hayashi H, Fischer H. (2016) Incidental Anterior Cruciate Ligament Calcification: Case Report. *J Radiol Case Rep*. Mar 31;10(3):20-7.
6. Santiago MB, Galvão L, Lima I, Prado, Moura M. (2004) Familial Articular Chondrocalcinosis. *Rev Bras Reumatol*. Jul/Ago 44(4):305-7.

7. Grassi A, Dal Fabbro G, Fini M, Zaffagnini S, Parrilli A. (2021) Case Report: Anterior Cruciate Ligament Calcification in a Patient With Chondrocalcinosis: Micro-Computed Tomography Presentation. *Front Surg*. Jul 29;8:680234.
8. Lee SY, Miwa M, Sakai Y, Kuroda R, Niikura T, Kurosaka M. (2006) Osteogenic potential of cells in vitro derived from haemarthrosis of the knee induced by injury to the anterior cruciate ligament. *J Bone Joint Surg Br*. Jan;88(1):129-33.

Images description:

Figure: CT in the sagittal section in A (bone window) and in B (soft tissue window), in the coronal section in C (bone window) and in D (soft tissue window) and in the axial section in E (bone window) and in F (soft tissue window) demonstrating calcification of the anterior cruciate ligament (white arrows).