Radiology Case Reports 15 (2020) 1773–1776

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

Calcium pyrophosphate deposition disease: The role of imaging in their detection and in differential diagnosis of crystal arthropathies ☆

Antonio Catelli, MD[a,*], *Pietro Venetucci, MD*[a], *Anna Castaldo, MD*[a], *Giovanni loiudice, MD*[a], *Filippo Rosati Tarulli, MD*[b], *Mariapaola Carpiniello, MD*[c], *Mariateresa De Angelis, MD*[c], *Antonio Corvino, MD*[d]

[a] *Advanced Biomedical Sciences Department, University Federico II of Naples (UNINA), via S. Pansini 5, I-80131 Naples, Italy*
[b] *University of Salerno - Via Giovanni Paolo II, Fisciano (SA), Italy*
[c] *University of Campania "Luigi Vanvitelli", Caserta, Italy*
[d] *Motor Science and Wellness Department, University of Naples "Parthenope", Naples, Italy*

ARTICLE INFO

Article history:
Received 6 June 2020
Revised 2 July 2020
Accepted 3 July 2020

Keywords:
CT
US
Chondrocalcinosis
Pseudogout
Imaging arthropathy
CPPD

ABSTRACT

Calcium pyrophosphate deposition disease is characterized by the deposition of pyrophosphate crystals in various joint structures. Calcium pyrophosphate deposition disease can be linked to underlying metabolic disorders such as hemochromatosis, hyperparathyroidism, hypophosphatemia, hypomagnesaemia, and hypothyroidism, all of which increase the risk of calcium pyrophosphate deposition. We present the case of a 55-year-old male who underwent diagnostic examination for the onset of recurrent joint pain in the right knee.

Introduction

Calcium pyrophosphate deposition disease (CPPD) is characterized by the deposition of pyrophosphate crystals in various joint structures. It can be associated with high serum calcium and changes in the cartialginal matrix [1,2]. Both the cause of the CPPD and the mechanism of onset of crystal deposition remain largely unknown and vastly debated throughout the literature [1–4]. The causes of CPPD can be classified into the following categories: idiopathic, metabolic, hereditary, and post-traumatic [4]. CPPD can be linked to underlying metabolic dis-

☆ Declaration of Competing Interest: The authors have declared that no competing interests exist.

* Correspondence author.
E-mail address: catelliantonio89@gmail.com (A. Catelli).

https://doi.org/10.1016/j.radcr.2020.07.012

orders such as hemochromatosis, hyperparathyroidism, hypophosphatemia, hypomagnesaemia, and hypothyroidism, all of which increase the risk of calcium pyrophosphate deposition. Despite attempts to determine etiology, most cases of CPPD remain idiopathic [1–4]. This condition has not yet shown an association with gender, obesity or lifestyle, although it is slightly more common in Caucasian individuals [1–4]. The pathogenic role of calcium contains crystals, including CPPD and basic calcium phosphate are not yet clear and controversial [5,6]. However, clinical growth and experimental evidence indicate that these crystals can induce microcrystalline stress on synoviocytes and chondrocytes, leading to exacerbation of osteoarthritis [7,8]. CPPD has been most commonly documented in the knees, wrists, pubic symphysis [1]. CPPD has been found to appear in 1 of 3 forms: asymptomatic, acute, or chronic [1,2]. Strategies for the treatment and management of CPPD varies based on the severity of symptoms, the stage and clinical manifestation of CPPD. We present the case of a 55-year-old patient who underwent diagnostic examination for the onset of recurrent joint pain in the right knee.

Case

A 55-year-old man performed diagnostic tests at our clinic for recurrent right knee pain prevalent at rest for about 6 months. The patient did not report any other known conditions. Upon physical examination, the joint was swollen, erythematous and with a slight increase in temperature compared to the contralateral joint. The other axile and appendicular joints showed no signs of inflammation. The patient had no fever or other symptoms. Blood pressure was 120/70 mmHg. The blood count, liver, kidney, and thyroid function were normal. The inflammation indexes slightly increased. In the norm the values of uricemia, serum parathyroid hormone, calcemia, phosphate, magnesemia. ANA and Rheumatoid Factor were negative. The ultrasound examination with a high frequency (12 mHz) revealed the presence of intra-articular liquid, thickening and proliferation of the synovium, hyperechoic punctiform deposits in the synovial membrane. The scannable parts of the meniscal cartilaginous matrix had hyperechoic linear deposits. The P Doppler examination showed a significant increase in the vascular signal of the synovium (Fig. 1). The X-ray examination performed in AP and LL projection showed the presence of bilateral linear meniscal deposits. The computed tomography (CT) examination performed without contrast medium confirms the presence of pinpoint hyperdense deposits in the synovium and hyaline cartilages and linear deposits in the fibro-meniscal. CT and traditional radiology also allowed to highlight degenerative phenomena of the knee joint. The diagnosis was perfected with the withdrawal of the synovial fluid. It was subjected to polarized light which highlighted the presence of birefringent crystals in accordance with the suspicion of CPPD. The patient was subsequently treated with ice, functional rest and oral corticosteroids without success. Therefore it was subjected to 6 ultrasound-guided intra-articular aspiration and infiltrative therapy of corticosteroids and hyaluronic acid with excellent results on the symptoms. It is currently in good condition. Performs 6 monthly clinical and ultrasound follow-up.

Discussion

Epidemiology

The finding of crystal deposits in and around the joints is an incidental finding in asymptomatic patients. They can cause acute or chronic arthropathy. The main crystal arthropathies are monosodium urate, CPPD, and basic calcium phosphate. CPPD disease is the second leading cause of crystal arthropathy and appears to affect 4%-7% of the adult population in Europe and the United States [9–11]. CPPD disease is rare in patients under the age of 60 years [9].

Clinical presentation

It occurs mainly in the knee joint, wrist, and pubic symphysis and can manifest itself in 3 forms: asymptomatic, acute, or chronic [1,2]. In acute CPP (or pseudogout) crystal arthritis, patients typically present with the acute onset of monoarticular or oligoarticular arthritis which manifests itself as heat, erythema and swelling in and around the affected joint. Fever and chills may also occur. The arthritic episode can last even months compared to gout which lasts a maximum of 1 week [9–12].In chronic CPP crystal arthritis, most affected patients have an oligo-polyarticular form of arthritis-like arthritis. This osteoarthritis-like arthritis is typically distinguishable from typical arthrosis by flares of inflammatory signs and symptoms and unusually severe joint damage [9].

Diagnosis

The analysis of synovial fluid still constitutes the gold standard for diagnosis especially in the acute phase. The role of diagnostic imaging is very important for both diagnosis and percutaneous treatment [13–15]. Although in the acute phase there are no specific imaging signs, it is a valid tool in the detection and differential diagnosis of chronic crystal arthropathies. The radiological characteristics of CPPD usually have a mono or polyarticular distribution (knees, pubic symphysis, and wrist), the deposits are often articular (hyaline cartilage, fibrocartilage, synovium, capsules, and ligament) and have point or linear morphology; the monosodium urate has a mono or polyarticular distribution with involvement in the acute phase more frequently than the first metatarsal phalangeal, the deposits are more frequently para-articular (ligaments, bags, and tendons) and have intra- and extra-articular nodular morphology with expansive erosion and dysmorphism of the bone joint heads; the BCU has a mono-articular distribution (shoulder, hips, elbows, wrists, and knees), the deposits are more frequently para-articular (tendons, bursae, and ligaments) and have amorphous morphology [9]. Traditional radiology is still the main imaging modality today. It is widespread throughout the territory, has reduced costs and allows the assessment of the location, distribution and morphology of crystal deposits. It also allows to evaluate the bone

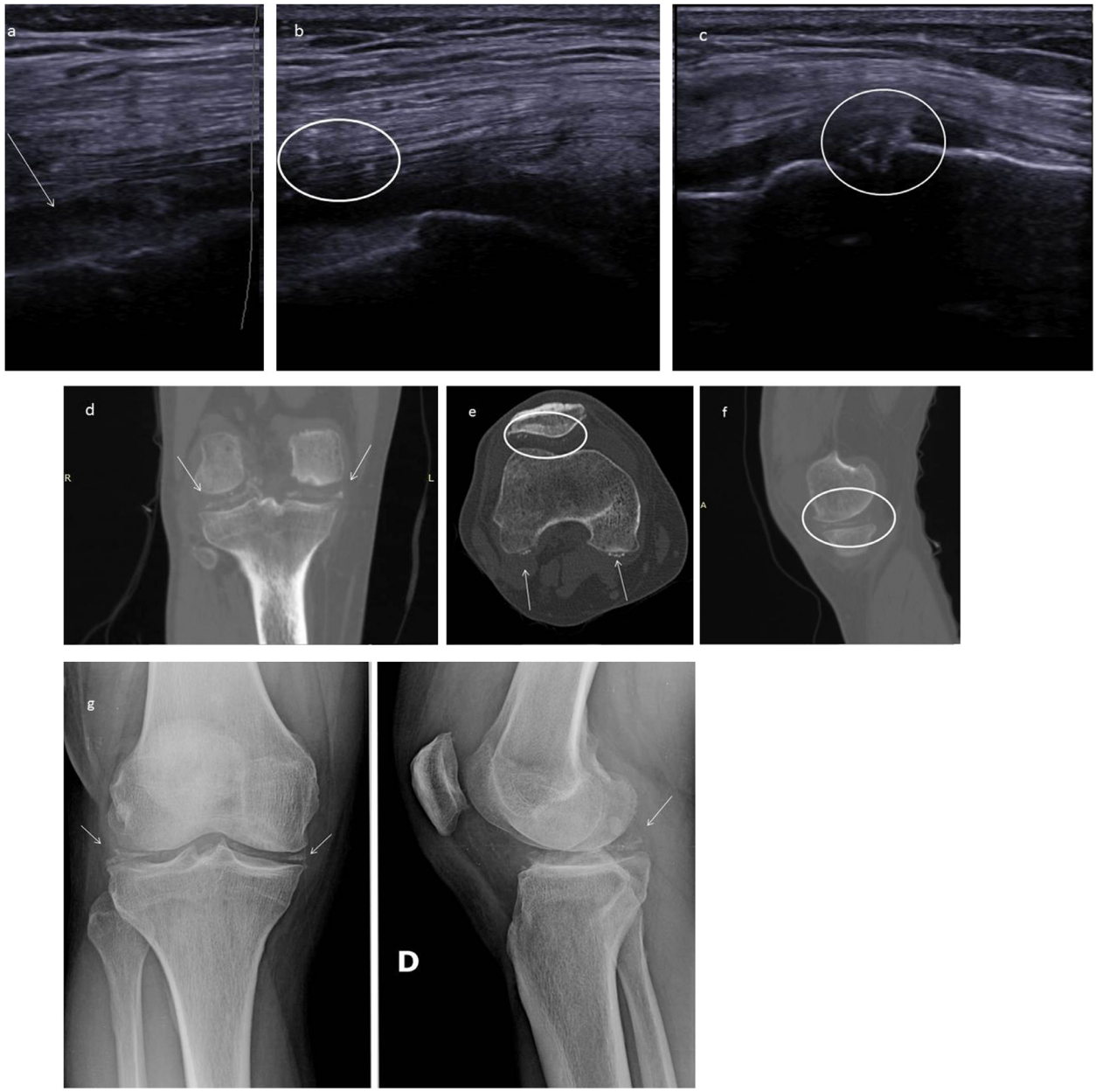

Fig. 1 – US exam. (a) Synovial hypertrophy (arrow), (b) point hypergenic deposits in the synovium (circle) and (c) hypergenic linear deposits in the meniscus (circle) CT exam. (d) Coronal plane hyperdense lineal deposits in fibrous meniscus (arrow), (e) axial plane hyperdense pinpoint deposits in hyaline cartilage (arrow and circle) and (f) sagittal plane hyperdense linear deposits in meniscus (circle). (g) RX exam AP-LL. (f) Linear deposits in the fibrous meniscus (arrow).

profile and any concomitant pathologies. In our case, we found the presence of linear deposits of both meniscal fibrocartilages. Despite this, the ultrasound (US) and CT have an increasing role in the detection and differential diagnosis of crystal arthropathies. The US is widespread in the area, has low costs and few counter-indications. With respect to traditional radiology, it allows to evaluate in detail the characteristics as well as the deposits, also the structural conditions of the tendons, ligaments, bags as well as some intra-articular components. Furthermore, it also allows to evaluate and quantify the intra-articular fluid. The P. Doppler study allows to identify the degree of hyperemia of the tissues involved. It allows to investigate the cortical profile. Although it has high contrast resolution, it has a poor overview of the exam as well as some regions of the joint cannot be explored. Unlike the previously described diagnostic tests, CT allows to identify the location, density and morphology of the crystal deposits by means of volumetric reconstructions. Especially if performed in the acute phase, magnetic resonance imaging can show serious inflammatory changes, this could be misleading and the correlation with radiographs or CT should help distinguish crystalline arthropathies. In our experience,

the integrated use of the traditional radiology, US and CT has allowed us the diagnosis of CPPD confirmed subsequently by the withdrawal of the synovial fluid. Currently the patient is in excellent condition and performs clinical and US follow-up every 6 month.

Treatment and prognosis

Common treatments that provide symptomatic relief include systemic or intra-articular therapy with non steroid anti-inflammatory drugs (NSAIDs) or corticosteroids, ice, temporary rest, and joint aspiration. Although the progression of this condition may vary between individuals, most will experience recurrent symptomatic episodes. Despite the incurable nature of this condition, the prognosis is good, as long as symptoms are controlled and patients are monitored for disposal conditions that can be treatable and preventable.

REFERENCES

[1] Stainsby BE, Ellul N, Dimopoulos A, Lubberdink C, Salerno V, Solomon M. Calcium pyrophosphate deposition disease in the ankle joint: a case report. J Can Chiropr Assoc. 2017;61(1):40–4.

[2] Lindenmeyer C, Sobel A, Nazarian L, Mandel S, Raikin S. A case study of pseudo-neuropathic pseudogout. Med Forum. 2013;14(26).

[3] Yochum T, Rowe L. Essentials of skeletal radiology. Baltimore: Williams & Wilkins; 1996.

[4] Abhishek A. Calcium pyrophosphate deposition. Br J Hosp Med 2014;75(4):C61–4.

[5] Gamon E, Mouterde G, Barnetche T, Combe B. Diagnostic value of ultrasound in calcium pyrophosphate deposition disease: a systematic review and meta-analysis. Ann Rheum Dis 2015;74(Suppl2) 774.2-774.

[6] Zhang W, Doherty M, Pascual E, Barskova V, Guerne P, Jansen T, et al. EULAR recommendations for calcium pyrophosphate deposition. Part II: Management. Ann Rheum Dis 2011;70(4):571–5.

[7] Tanikawa H, Ogawa R, Okuma K, Harato K, Niki Y, Kobayashi S, et al. Detection of calcium pyrophosphate dihydrate crystals in knee meniscus by dual energy computed tomography. Orthop Surg Res. 2018;13(1):73.

[8] Ea HK, Nguyen C, Bazin D, Bianchi A, Guicheux J, Reboul P, et al. Articular cartilage calcification in osteoarthritis: insights into crystal-induced stress. Arthritis Rheum. 2011;63:10–18.

[9] Omoumi P, Zufferey P, Malghem J, So A. Imaging in gout and other crystal-related arthropathies. Rheum Dis Clin North Am 2016;42(4):621–44. doi:10.1016/j.rdc.2016.07.005.

[10] Baysal T, Baysal O, Kutlu R. The crowned dens syndrome: a rare form of calcium pyrophosphate deposition disease. Eur Radiol 2000;6(10):1003–5.

[11] Ellman MH, Brown NL, Levin B. Prevalence of knee chondrocalcinosis in hospital and clinic patients aged 50 or older. J Am Geriatr Soc 1981;4(29):189–92.

[12] Gentili A. Advanced imaging of gout. Semin Musculoskelet Radiol 2003;3(7):165–74.

[13] Catelli A, Pane F, Liccardo A, Tafuri D. Giant Right-side inguinal hernia: anatomo-clinical and diagnostic considerations of a case. Acta Medica Mediterranea 2020;36:439.

[14] Corvino A, Pignata S, Campanino MR, Corvino F, Giurazza F, Tafuri D, et al. Thyroglossal duct cysts and site-specific differential diagnoses: imaging findings with emphasis on ultrasound assessment. O J Ultrasound 2020;23(2):139–49.

[15] Catelli A, Ponsiglione A, Capaldo I, Corvino A, Radice L, Venetucci P, et al. Giant endometrioid ovarian cancer: the role of diagnostic imaging and Figo staging. Euro Mediterranean Biomed J 2020;15(22):94–6.