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Case Reports and Series

Focal plasma cell osteomyelitis: An unusual presentation on the foot

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ABSTRACT

Plasma cellular osteomyelitis is a chronic and recurrent non purulent bone inflammatory entity charactererized by abundance of plasma cells in the lesional bone. Is a recurrent, unifocal or multifocal disorder, which has an unknown etiology with clinical and radiographic features that may make it impossible to distinguish from other non-suppurative sclerosing osteomyelitis. This rare condition usually occurs in metaphysis of a long bone of children or young adults. We report a case of PCO in a 64-year-old woman with intermittent diffused pain in the hallux of the left foot after several nail avulsions and two surgical procedures on the distal phalanx. The histological study of the bone sample showed reactive sclerotic bone with plasma cells compatible with PCO. In spite of its infectious origin, as in the present case the causal agent is not always identified. Owing to rarity of entity, a clinical diagnosis is usually not considered and a histopathological examination is essential to establish of a definitive diagnosis.

Plasma cell osteomyelitis (PCO) is a histological variant of primary chronic non-suppurative osteomyelitis (PCNSO) characterized by a quiescent inflammation with abundance of plasma cells and a small number of lymphocytes in the lesional bone. The common characteristic of the pathology is low degree persistent bone irritation associated with sclerotic proliferation of fibrous bone tissue without suppuration. It is a rare pathology which has a cause that is not very well-known and a diagnosis which in the majority of cases is difficult to establish. Typical features of infection are not observed and in most cases the causal agent cannot be identified in the cultivation .The clinical and radiographic features may make it impossible to distinguish from other sclerotic bone lesions.[1-6]

Numerous cases of PCNSO, alone or related with autoimmune syndromes, have been reported in the literature. To date, PCNPO classifications are confusing due to a non-uniform terminology. Primarily, Garrè's osteomyelitis, periostitis ossificans and diffuse esclerosing osteomyelitis (DSO) terms have been indistinctly used, especially in dental literature, to describe multiple cases affecting the jaw and periodontal region. However, Garrè did not actually describe a singular and specific type of chronic osteomyelitis if not special forms and complications of the acute infectious osteomyelitis. On the other hand, DSO is a mere descriptive radiologic term that may refer to different entities. In PCNSO there are no gender predilection and usually occurs in long bone metaphysis of children or young adults. Some studies have revealed two peaks of incidence, one in adolescence and one after age 50 years.[7-11]

In lower limb, PCO has been especially described in femur and tibia metaphysis being the foot an unusual localization of this type of chronic osteomyelitis.[1-4,12,13] Although etiopathogenesis of PCO is not well known, it is assumed to be an infection due to bacteria of low-virulence or an auto-inflammatory bone disorder rarely associated with orthopaedic infection.[14] As the lesion represents a radiographic and clinical presentation common to a wide variety of osseous lesion, the histological study is essential to establish a definitive diagnosis. A conservative approach with antibiotics and non- steroidal anti-inflammatory drugs usually leads only to temporary pain relief. Currently, surgical treatment with local curettage or resection of the focus in association with antibiotic therapy is the best option.

In the foot only three cases have been published of PCO in the literature. The development of PCO has not been reported as a complication of, or associated with recurring subungual infectious processes or subungual bone resection. Although PCO is a rare presentation of osteomyelitis in the foot, physicians must include it in their differential diagnosis.

Case report

A 64-year-old woman farm worker with history of high blood pressure and fibrocystic mastopathy presented to family physician for diffuse persistent pain located in the first toe of the left foot, having evolved for at least three years, predominantly nocturnal, without clear mechanical characteristics and which eases with treatment by analgesics and

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non-steroidal anti-inflammatory. As antecedents she refers to having suffered between 2015 and 2017 at least three nail avulsions as a result of subungual bruising and abscesses caused by her work footwear. Due to the persistence of the symptoms, in September 2017 she went to a podiatrist where she lives and was diagnosed with subungual exostosis which was surgically removed and whose diagnosis was confirmed histopathologically. Six months later she was seen again by the same professional for the same reason. The need of a second operation was indicated, consisting in the resection of a third of the distal phalanx. For a year, the patient presented periodic pain episodes with varying intensity from a few days to several weeks and were intersected by periods of silence with absence of symptoms. A year after the last surgery, she was assessed in the Clinical Area of Podiatry of the University of Seville. When examined she revealed the existence of an itchy swelling with a slight increase of local temperature, and pain when probed and upon moving the interphalangeal joint of the hallux. The patient did not refer to having fever or febricula and her blood and biochemical test results were normal and without alterations in the erythrocyte sedimentation rate or C-reactive protein.

Dorso-plantar radiography showed a bone cortex defined with certain heterogeneity in the density of the remaining portion of the operated distal phalanx (Fig.1). Lytic lesions compatible with the active process of acute osteomyelitis were not observed and upon suspicion of a tumor lesion, an MRI was requested. This informed of edema of the soft parts around the bone stump of the distal phalanx in T1-weighted (Fig.2) and that of a heterogeneous intensity image in T2-weighted with active cortical erosion and lytic image in the remainder of the distal phalanx without affecting the interline (Fig.3). The three-phase bone scintigraphy showed hyperemia and vascular expansion with late bone hypercaptation at the level of the inter-phalangeal joint of the hallux of the left foot, suggesting an increase of the bone metabolic activity in the zone (Fig.4). Suspecting an infectious or active pseudotumor process, surgery aimed at carrying out a biopsy excision of the distal fragment of the phalanx was proposed. Under local anesthesia with supramalleolar tourniquet control, two transversal incisions were made close to the eponychium and distal to the hyponychium along with two linear incisions

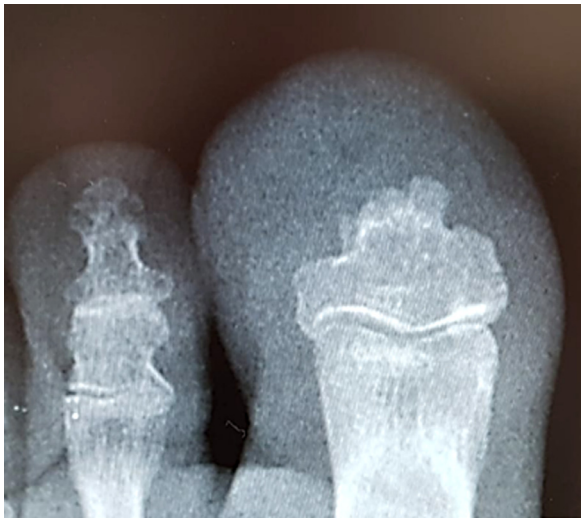

Fig. 1. Dorso-plantar radiography show heterogeneity in the density of the remaining portion of the distal phalanx of hallux.

from the medial and lateral margins, joining both transverse incisions to remove the nail bed and ungual plate as a block. The inter-phalangeal disarticulation was done, observing in the up of articular surface of the distal phalanx an incipient joint degeneration. The remaining distal phalanx was completely removed and the articular surface of the proximal phalanx head was suitably eliminated (Figs.5 and 6). Flexor hallucis longus and extensor halluces longus tendons were sutured to each other and the plantar flap was used to dorsally cover the defect. The bone sample removed was submitted for histological and microbiological study and postoperative radiography was done (Fig.7). Later, when removing the ischemia, an antibiotic prophylaxis of 2gr. of cefazolin was intravenously administered and repeated after 12 and 24 hours. The microbiological cultivation turned out to be negative with an absence of bacterial growth. The histopathological study revealed reactive and sclerotic

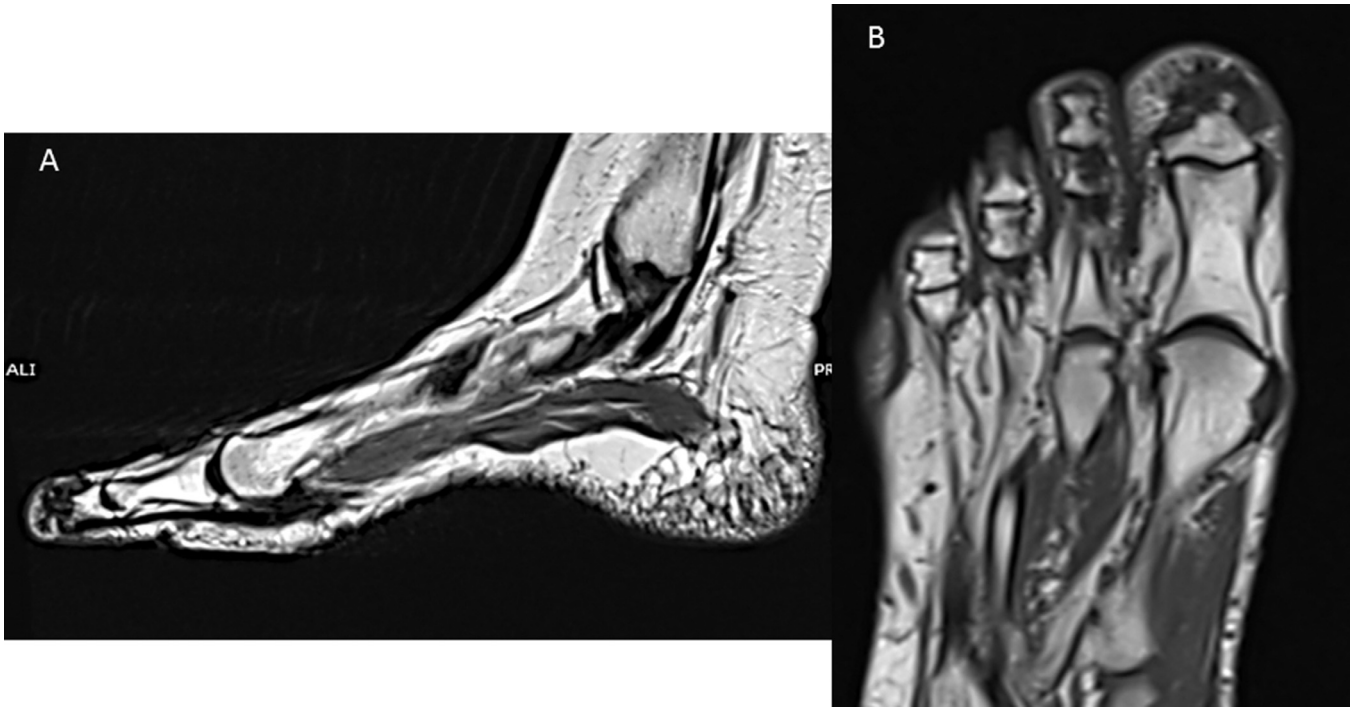

Fig. 2. Axial and coronal MRI images shows edema in the soft tissue around of the bone stump of the distal phalanx (T1-weighted).

Fig. 3. Coronal weighted MRI image show heterogeneous intensity with osteolytic focus in the bone marrow near of the interphalangeal joint (T2-weighted).

cortical and cancellous bone with remodeling activity and the existence of trabecular bone with thinning, fibrosis and an important presence of infiltrated plasma cells. The marrow of the bone specimen was replaced by a marked, chronic inflammatory infiltrate of numerous mononuclear and binucleated plasma cells and histiocytes intermixed with occasional lymphocytes. There were no visible microorganisms in the specimen (Fig. 6). These findings of reactive and sclerotic bone with heavy plasma cell infiltration were consistent with chronic inflammation as is caused

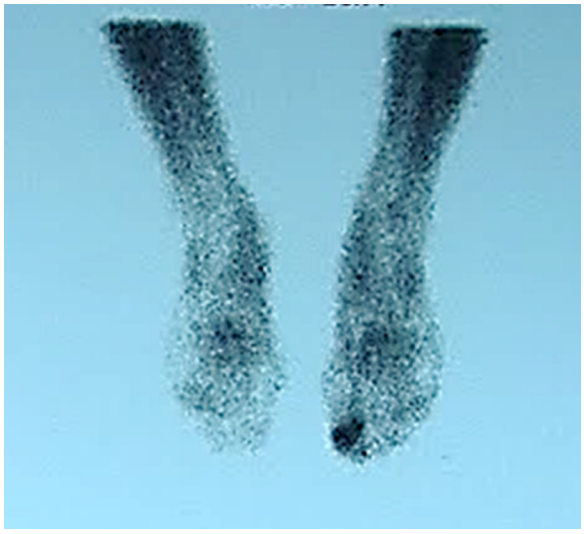

Fig. 4. Angiographic phase scintography (technetium-99m–labeled 3-phase) show hyperemia and vascular expansion with late bone hypercaptation at the level of the hallux in the left foot with increase of the bone metabolic activity in the zone.

by an infectious process compatible with PCO. The postoperative period coursed uneventful and a complete disappearance of the symptomatology took place. The radiological findings did not reveal signs of recurrence after a follow-up period of 21 months.

Discussion

The term primary chronic osteomyelitis covers a heterogeneous spectrum of clinical features that should be separated for therapeutic reasons. While bacteria can be found in unifocal presentation, bacteriological cultivations are usually negative in the multifocal manifestations of DSO and chronic recurrent multifocal osteomyelitis (CRMO).[6,14-16] In most reported cases of PCNSO, radiology demonstrated sclerosis, osteolysis and periosteal reaction in variable stages. Although sclerosis is an essential feature of primary chronic osteomyelitis, this may occur in a variety of metabolic and inflammatory diseases. In the same way, neoplasms such as osteoid osteoma, Ewing sarcoma, or

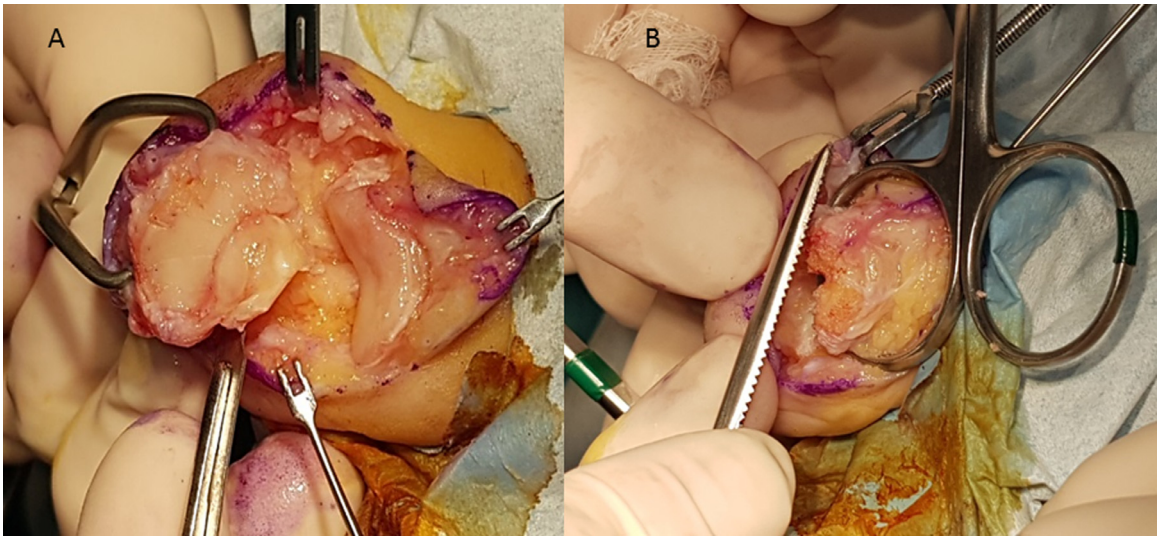

Fig. 5. Intraoperative images showing incipient joint deterioration in the distal phalanx with exposure of subchondral bone (A). View after removal of the articular surface of the head of the proximal phalanx (B).

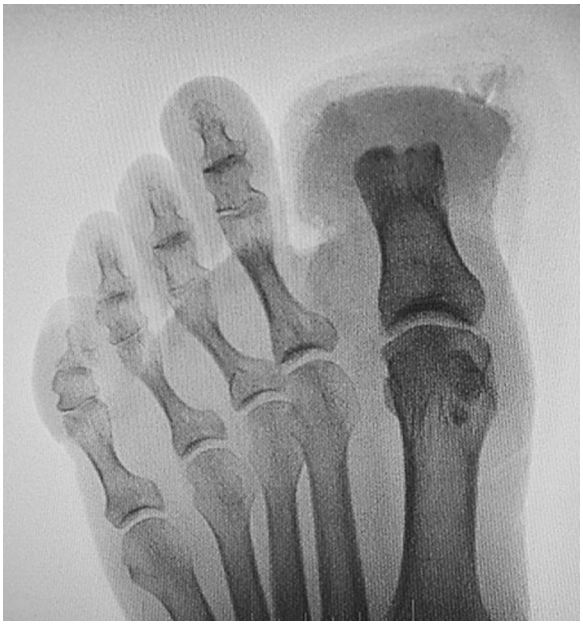

Fig. 6. Postoperative dorso-plantar radiography.

eosinophilic granuloma may simulate primary sclerosing osteomyelitis.[17-22] Based on differences histological variant of PCNSO known, it is characterized by a unifocal or multifocal inflammatory process of the bone accompanied by diffused pain which is present in outbreaks, followed by spontaneous remission. Clinically, PCNSO are characterized by low-degree infections the onset of symptoms with inconspicuous and clinical and radiological nonspecific signs without the typical features of infection.[1,6]

PCO is an uncommon histological variant of focal sclerosing osteomyelitis and must be differentiated of DSO and the CRMO. PCO is usually seen in long bone metaphysis while DSO affects the posterior body or ascending ramus of the mandible and the diaphysis of other long bones.[1,2,6,15-16] In histologic specimens of the PCO are characterized by presence of sclerotic bone reactive with an increased number of plasma cells characteristic of the immunological processes with unusual presence of granulocytes.[1, 23] On the contrary, granulocytes are significantly more present in multifocal non-recurrent osteomyelitis (DSO) and CRMO than in unifocal non-recurrent lesions. The same way, hyperostosis is present more often in CRMO than in unifocal non-recurrent lesions.[24] Currently chronic osteomyelitis is divided into active and inactive forms. Both are specifically defined by criteria-based histopathologic findings. Although not specifically, the histologic presence of aggregates of plasma cells in a background of dense marrow fibrosis with absence of neutrophils and without other clinical features can be considered diagnostic of chronic inactive osteomyelitis.[25]

In the present case, based on the evolution of the process and on medical patient`s history, we initially suspect an infectious or active pseudotumoral process. The histopathological study revealed reactive and sclerotic cortical and cancellous bone with remodeling activity and the existence of an important presence of infiltrated plasma cells. We consider that the pathological condition could be more related with the episodes of recurring subungual infectious processes than with the previous bone surgeries done. Although the causal agent was not identified, PCO tends to be associated with infections due to *staphylococcus aureus* characterized more by osteolysis, rather than sclerosis.[4,5] This would explain that, unlike other cases of PCO reported in long bones of the lower limb, the absence of cortical sclerosis with only certain heterogeneity in the density of the distal phalanx. As the present case, on histologic examination, chronic staphylococcal osteomyelitis often shows an abundance of plasma cell.[1,4]

The foot is unusual localization of PCNPO and most of the reported cases correspond to the CRMO type.[6,26] In the foot, as far as we know, only three cases have been published of PCO in the literature. Two patients had suffered accidental penetrating injury 10 and 22 years ago respectively.[12,13] To our knowledge, despite the frequency of infections and infections to the nail unit, the development of PCO has not been reported as a complication of nail avulsion or associated with subungual bone resection. It is postulated that to develop a PCO it is necessary for the causal agent to be inoculated under the periosteum. The hardness of the bone cortex protects the medullaris of the bone, making the process become chronic and causing an inflammation which ends up forming new bone. PCO can remain silent for years and not produce the characteristic clinical and radiological symptoms until it reaches a more evolved state.[1]

The image diagnosis by MRI and scintigraphy seems fundamental. The acute activity of chronic osteomyelitis can almost certainly be excluded if the MRI findings are negative. MRI is key to distinguish acute

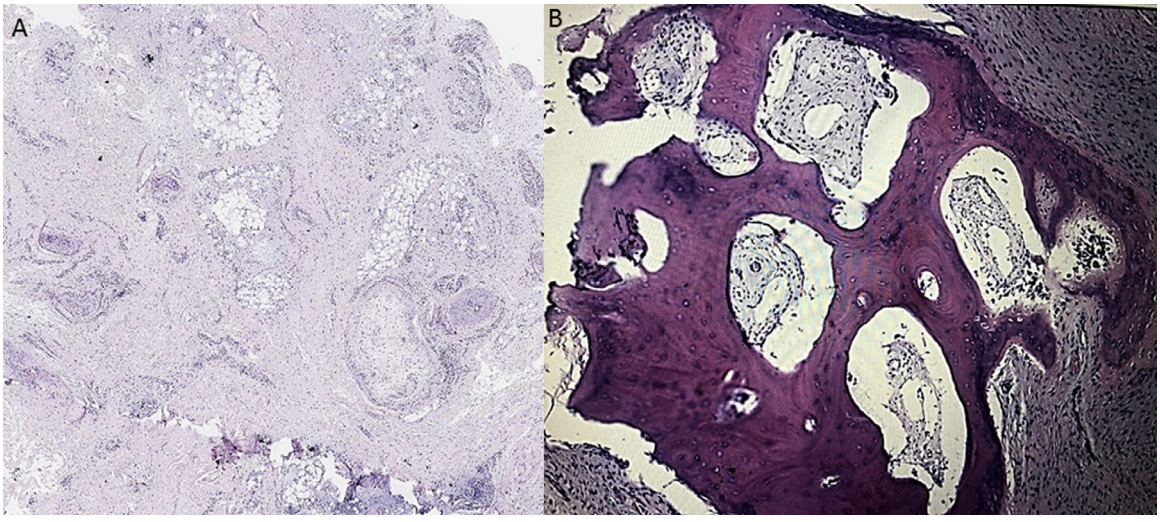

Fig. 7. (A) Panoramic view of the bone tissue. Subperiosteal new bone showing reactive bone formation with bony trabeculae (20 × magnification, hematoxylin-eosin stain). (B) Photomicrograph of the lesion showing sclerotic lamellar bone segments with signs of inflammation, fibrosis of marrow spaces and abundant infiltration of plasma cells (40 × magnification, hematoxylin-eosin stain).

from chronic infection by delineating the devascularized fibrotic areas (low signal on T1 and T2). In the present case the significant edema of the soft tissues around the bone stump of the distal phalanx was observed in T1-weighted with an important heterogeneous intensity image in T2-weighted and active osteolytic focus in the bone marrow and without cortical erosion. Though MRI is the most sensible test, the high sensitivity of scintigraphy enables improving the diagnostic precision, eliminating the potential mistakes associated with ectopic bone marrow.[27] In our case the bone scan showed a clear hyperemia and vascular expansion with bone hypercaptation in the zone.

In summary, PCO is a rare entity with distinctive histopatologic picture, with nonspecific findings, and an unclear cause. The clinical and radiographic features may make it impossible to distinguish it from other sclerotic bone lesions. This unusual case of PCO on the foot exemplifies the need for a thorough historical, physical, and careful image diagnosis with scintigraphy and MRI. A diligent histopathological examination and correlation with clinic-radiological features is essential to establish a correct diagnosis.

Declaration of Patient Consent

Before this report, an informed consent form was obtained from the patient and the protocol was approved by Área Clínica de Podología de la Universidad de Sevilla.

Declaration of Competing Interest

Complete informed consent was obtained from the patient for the publication of this study and accompanying images.

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