Case Report

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Computed tomography findings of periostitis ossificans

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Abstract

Periostitis ossificans (PO) is a type of chronic osteomyelitis, an inflammation of cortical and cancellous bone. In the maxillofacial region, the mandible is most frequently affected. The cause of inflammatory subperiosteal bone production in PO is spread of infection from a bacterial focus (e.g.: odontogenic disease, pulpal or periodontal infection, and extraction wounds). This pathology is most common in younger people (mean age of 13 years). Conventional radiographs are one of the most useful tools for diagnosis, but in some cases computed tomography (CT) has a key role in both diagnosis and identification of the tissues involved. This paper reports two cases of PO in which CT helped establishing the suspicious etiology: a 12-year-old boy with PO of pulpal origin and a 14-year-old boy with PO of periodontal origin.

Keywords: osteomyelitis, tomography.

Introduction

Periostitis ossificans (PO) is a type of chronic osteomyelitis that is more popularly known as Garrè's osteomyelitis. Osteomyelitis is defined as an inflammation of cortical and cancellous bone. In the maxillofacial region, the mandible is most frequently affected[1-4]. Most reported cases are unifocal and unilateral[3].

PO represents a periosteal reaction to the presence of inflammation. The affected periosteum forms several rows of reactive vital bone that are parallel to each other and expand to the surface of the altered bone[5-6]. The cause of inflammatory subperiosteal bone production in PO, affecting the mandible or maxilla, is spread of infection from a bacterial focus (e.g. odontogenic disease, pulpal and periodontal infection, extraction wounds, foreign bodies, and infected fractures), perforating the cortex and becoming attenuated, which in turn stimulates bone formation by the periosteum[1-2]. However, in some cases, the cause of osteomyelitis is not clear[1]. Inflammatory exudates spread subperiosteally, elevating the periosteum and stimulating formation of new bone.

High-quality radiographs reveal radiopaque bone laminations that are arranged roughly parallel to each other and to the underlying cortical surface. These laminations vary from 1 to 12 in number, and radiolucent separations are often present between the new bone and the original cortex. Periapical, occlusal and panoramic radiographs are often used for diagnosis of PO and have a high diagnostic

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value. However, at the initial osteomyelitis stage, there is no radiographic evidence and diffuse radiolucency begins to appear with time. Computed tomography (CT) may also be used and it is accurate for detecting not only typical alterations inside the bone, but also periosteal reactions and soft tissue involvement. CT is also helpful for determining the extension of bone involvement and the relationship with adjacent anatomic structures[7]. However, CT has been used for diagnosis in only a few cases reported in the literature[6,8-9].

PO is usually caused by a periapical infection secondary to caries or pulp infection, but it might be associated with a periodontal pocket occasionally. This paper reports two cases of PO, one of pulpal origin and another of periodontal origin, emphasizing the diagnostic role of CT.

Case Report

Case 1

A 12-year-old male patient was referred to our clinic with complaint of swelling on the posterior region of the left mandible. On the clinical examination, the patient referred diffuse pain on palpation in the affected area and lymphadenopathy, though without evidence of suppuration. Multislice CT (MSCT) scans showed an increase in the cortical bone and volume of the mandible and periosteal new bone formation. A hyperdense area surrounding the left premolar region up to the ascending ramus of the mandible on the same side was observed, leading to mandible cortical duplication on the buccal surface (Figure 1). A hypodense lesion related to the periapical region of the first molar was seen, indicating endodontic involvement (Figure 2). A three-dimensional volume rendering reconstruction showed facial asymmetry (Figure 3). The MSCT images also showed hyperplasic lymph node causing soft tissue distension and sensitive palpation (Figure 4).

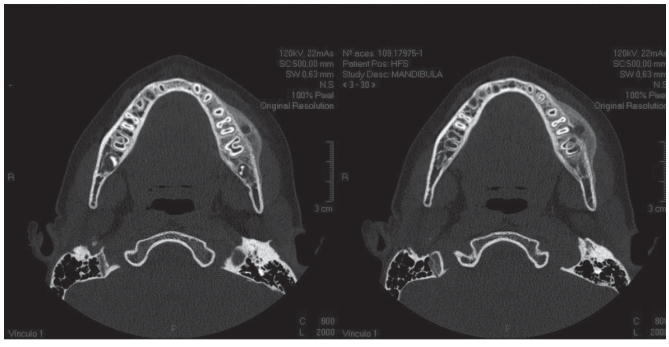

Fig. 1. MSCT axial images showing periosteal new bone formation.

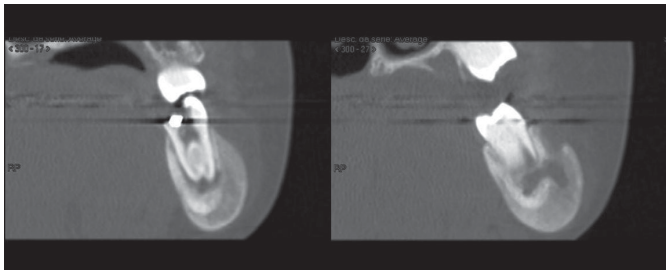

Fig. 2. Cross-sectional images showing pulpal involvement of the first molar.

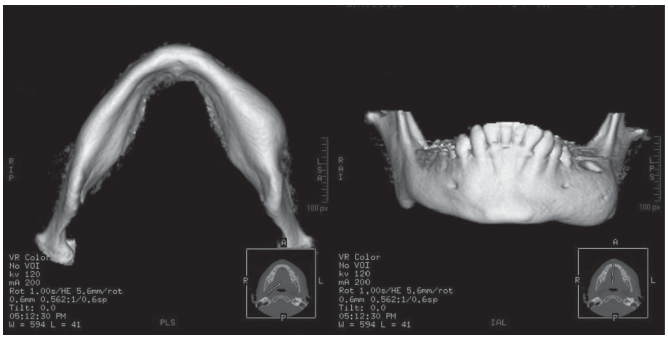

Fig. 3. MSCT three-dimensional volume rendering reconstruction showing an increase of volume due to new bone formation.

Fig. 4. MSCT axial image showing hyperplasic lymph node.

A bone biopsy was performed and the material was sent for histological evaluation, confirming the diagnosis of PO.

Case 2

A 14-year-old male patient was referred to our clinic with complaint of swelling on the posterior region of the left mandible. On clinical examination, the patient reported diffuse pain on palpation of the affected area.

MSCT scans revealed a slight increase in the cortical bone and periosteal new bone formation. There were distinct changes of periosteal bone on the left mandible (Figure 5), cortex duplication (Figure 6) associated with the sound second molar, which was partially erupted and exhibited local bone fenestration (Figure 7A and 7B).

Bone biopsy was performed and the material was sent for histological analysis, confirming the diagnosis of PO.

Discussion

Proliferative periostitis was first described by Karl Garrè in 1893. Since then, several terms have been used to describe

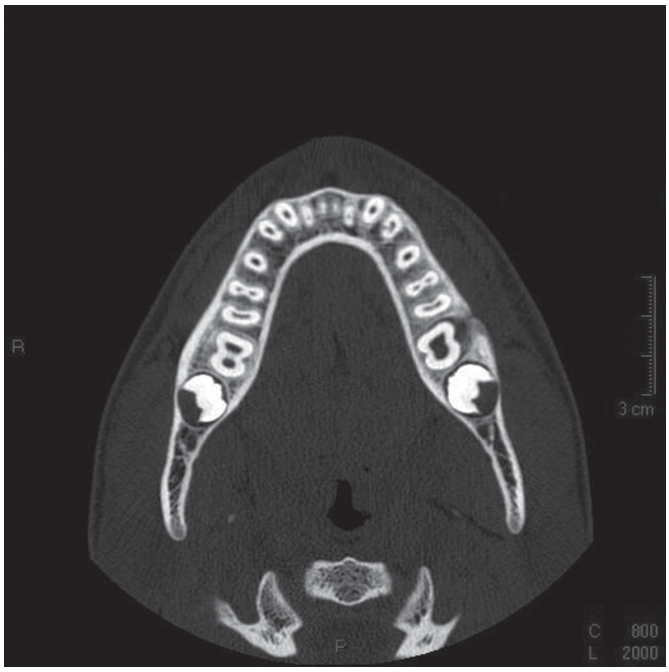

Fig. 5. Axial image showing distinct changes on the cortical bone of the left mandible.

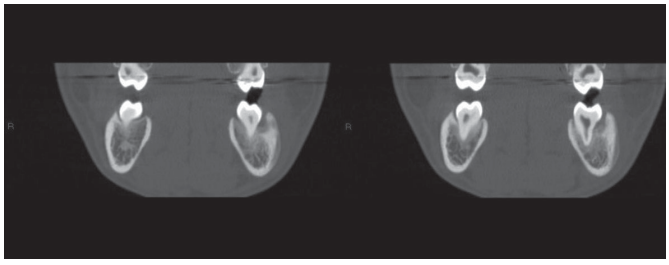

Fig. 6. Coronal slices showing a discrete increase in volume, with cortex duplication, on the left side of the mandible associated with the second molar showing periodontal involvement.

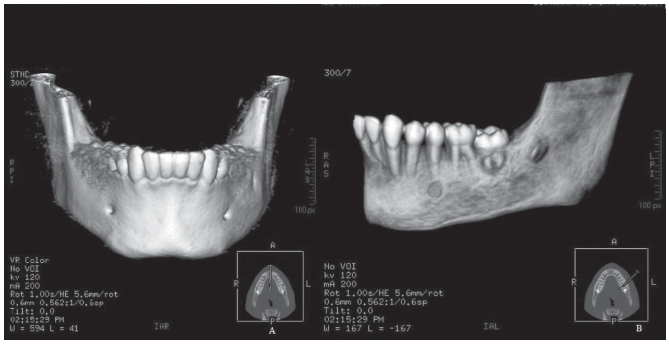

Fig. 7. (A) Three-dimensional volume rendering image showing a slight increase in volume on the posterior region of the left side of the mandible. (B) Opacity filter showing a slight destruction of the vestibular wall of the second molar.

this reactive proliferation of periosteum, including proliferative periostitis of Garrè, Garrè's osteomyelitis, non-suppurative ossifying periostitis, osteomyelitis sicca, osteomyelitis with proliferative periostitis, perimandibular ossification and PO, as referred to in this paper[3,10]. The most frequent cause of PO is dental caries with associated periapical inflammatory disease. Most cases arise in the mandibular premolar-molar area, but buccal cortex involvement is also common[6]. There are other causes, including recent dental extraction or mild periodontitis, but only a few reports have discussed an association between periodontal infection and PO in pediatric dental patients[4,11-12]. It is generally accepted that removal of the cause results in resolution of the infection and remodeling of the excessive bone[4].

Two cases of PO are described in this paper: the first associated with periapical infection of a permanent first molar, and a second case of periodontal origin. This association is not common, but cortical changes and bone perforation can be observed on CT images. Teeth close to PO usually seem sound, with no signs of pulpal involvement or apical periodontitis. Local bone loss can be observed, as reported herein. Bone loss was also reported by Van den Bossche *et al.*[12], who were the first to describe this association. During clinical examination, those authors found a probing pocket depth of 10 mm in the mandibular right first molar. Oulis *et al.*[11] also found bone loss on clinical examination and the associated tooth showed a probing pocket depth of 8 mm.

Both cases presented here affected the mandible. This can be expected because the distribution of blood vessels is poorer in the mandible than in the maxilla, and the mandibular cortical bone is thicker and more compact than the maxillary bone. The typical course of this disease is observed in the mandible rather than in the maxilla[9]. According to Ida *et al.*[13], 76% of cases of PO take place between the mandibular premolars and second molars, as seen in the cases reported here. It usually occurs in children and adolescents[11] (mean age of 13 years)[3-4] because in these individuals the periosteum is loosely attached to the bone surface and has greater osteogenic potential[6,14]. The patients of the present cases were two male adolescents aged 12 and 14 years, which is consistent with the cases reported in the literature.

The clinical appearance may vary widely, but the lesion is usually asymptomatic with no accompanying general or local signs of inflammation. However, both patients of this paper were referred for radiological examination because of pain. There are some case reports of patients who did not experience the acute phase of the disease, evolving directly to a chronic stage of PO[13]. This is why early diagnosis is one of the most important factors for a successful management of this pathology[13]. Modern diagnostic imaging techniques such as CT allow an earlier diagnosis when the bone infection is still in a more localized stage[15]. Case 1 was at a late stage and new bone formation could be observed. In Case 2, the diagnosis of PO was made at an earlier stage, in which only a discrete bone expansion could be observed.

CT examination is very important because of its contribution to the differential diagnosis of PO and other known pathologies that also cause bone expansion, such as fibrous dysplasia, Ewing sarcoma, osteogenic sarcoma, infantile cortical hyperostosis, callus, exostosis, calcifying hematoma, and osteotomas. CT is very important in the investigation of the possible causes of the disease as well as in determining the growing pattern and nature of the lesion. However, a final diagnosis can only be achieved by lesion biopsy[1,4,14]. CT scans also allow visualizing all involved and surrounding structures, which is essential for case follow-up[8].

The two cases of PO presented in this paper had different causes: pulpal infection (classic cause) and periodontal infection (unusual cause), and CT had a fundamental role in the diagnosis.

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