Extreme maxillary bone reconstruction with CERASORB Bioactive—a case report

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Ossifying fibroma is classified as, and behaves like, a benign bone neoplasm. It is often considered to be a type of fibroosseous lesion. This bone tumour consists of highly cellular, fibrous tissue that contains varying amounts of calcified tissue resembling bone, cementum or both.[1] Owing to the presence of both bone and cementum-like tissue in ossifying fibromas, these lesions are described using the terms "ossifying fibroma", "cementoossifying fibroma" and "cementifying fibroma".[2] Nonetheless, the consensus is that these three terms describe the same underlying type of lesion.[3,4]

In most cases, ossifying fibroma is slow-growing, but it is occasionally aggressive, particularly its juvenile subtypes. Additionally, its growth is usually concentric, and it is well demarcated from the adjacent bone. Some lesions may grow to become massive, causing considerable aesthetic and functional deformities. Clinically, ossifying fibroma is usually asymptomatic and is often found accidentally in routine dental examinations.

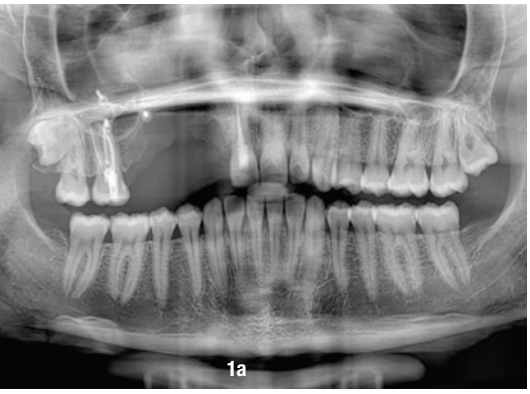
Ossifying fibroma predominantly affects the facial bone, most commonly in the mandible, where it arises apical to the premolars and molars and superior to the mandibular canal.[2] Among the other cranial and facial bones, the periorbital, frontal, ethmoid, sphenoid and temporal bones are also relatively common sites of this tumour.[4,5]

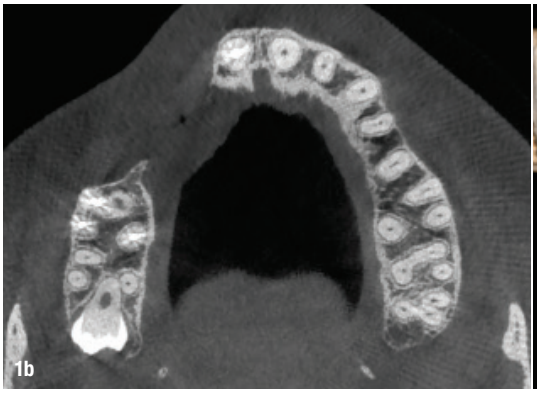
Ossifying fibroma most commonly occurs in patients in the second to fourth decades of life, although it may arise in children and adolescents, as well as in older adults.[2] It shows a predominance among females.[6]

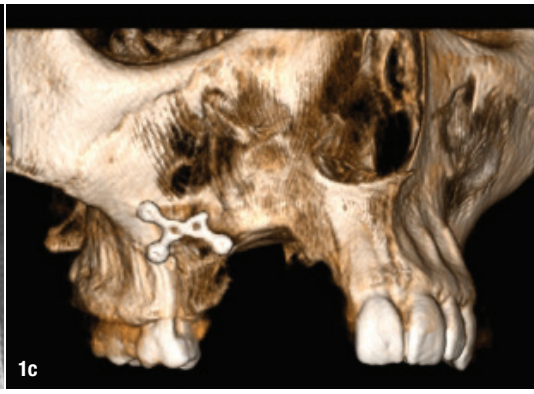
Classification

In 1968, Hamner et al. analysed 249 cases of fibroosseous jaw lesions of periodontal membrane origin and classified them.[7] In 1973, Waldron and Giansanti reported 65 cases (of which 43 had adequate clinical histories and radiographs) and concluded that this group of lesions was best considered a spectrum of processes arising from cells in the periodontal ligament.[6] In 1985, Eversole et al. described the radiographic characteristics of central ossifying fibroma, and two major patterns were noted, expansile unilocular radiolucencies and multilocular configuration.[8,1]

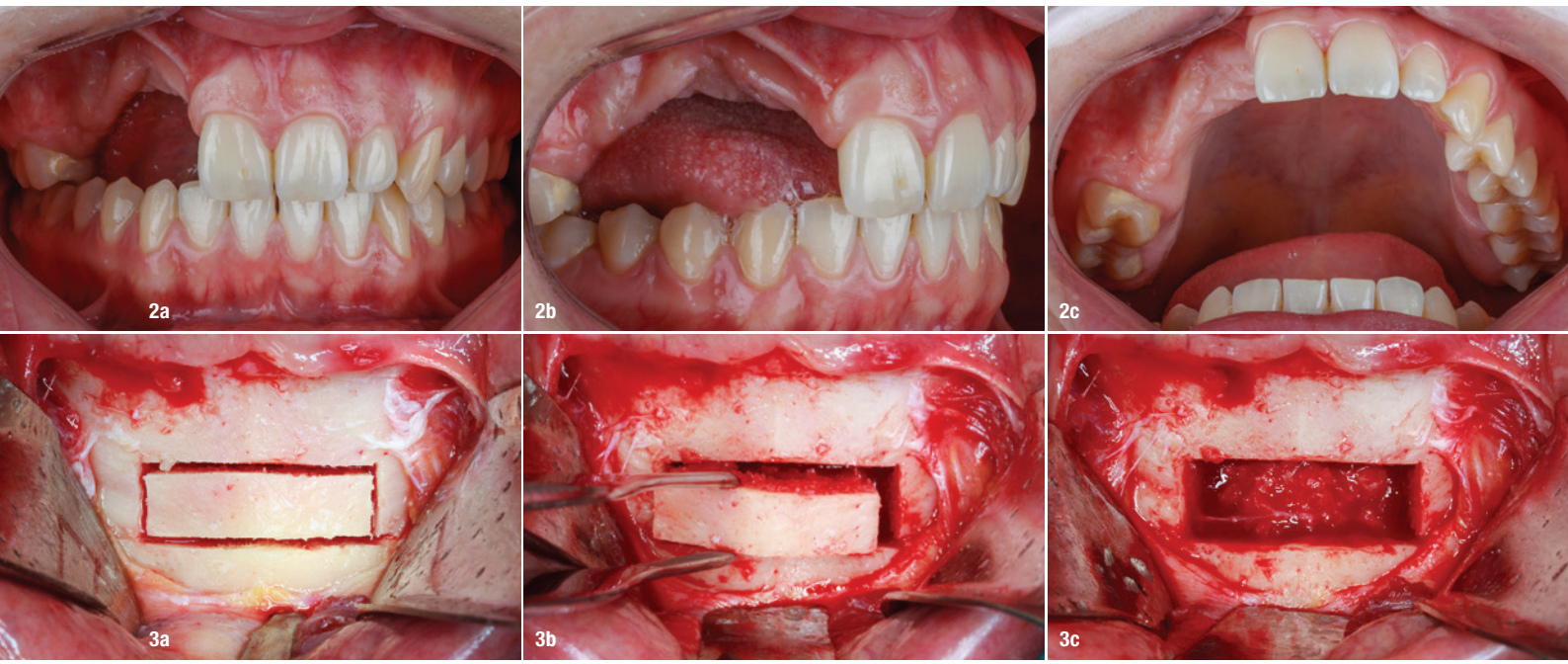
In 1971, the World Health Organization (WHO) suggested the classification of cementum-containing lesions into four types: fibrous dysplasia, ossifying fibroma, cementifying fibroma and cementoossifying fibroma.[2] In a subsequent WHO classification, benign fibroosseous lesions of the oral and maxillofacial regions were divided into osteogenic neoplasms or non-neoplastic bone lesions, the former category including cementifying ossifying fibroma.[2]







Figs. 1a–c: Initial orthopantomography and computed tomography.



Figs. 2a–c: Clinical aspect of first quadrant bone defect. **Figs. 3a–c:** Rectangular osteotomy in the chin area.

However, the term "cementifying ossifying fibroma" was simplified to "ossifying fibroma" in the 2005 WHO classification system.[9]

Radiographic features

In a study by Liu et al. the radiographic characteristics of the tumour showed two patterns: cystic lesions (either unicystic or multicystic) and mixed-density lesions. The predominant radiographic features of ossifying fibroma are a round or oval well-defined, expansile mass with a corticated border and a variable degree of internal radiopacity.[1]

The internal aspect of these lesions can be granular, resembling fibrous dysplasia, and they may have a thin, radiolucent periphery, representing a fibrous capsule. This can result in the expansion of the outer cortical plate of bone. The density of these lesions is mixed, and the internal structure may be a mixture of radiolucent and radiopaque tissue.[1] Radiographically, ossifying fibroma most frequently appears as a well-defined mixed radiolucent and radiopaque lesion.

Differential diagnosis

The differential diagnosis includes benign mixed radiolucent and radiopaque neoplasms, and the diagnosis is determined by the clinical and radiographic behaviour.[2] The differential diagnosis depends on the degree and pattern of internal radiopacity. In many cases, CBCT images are helpful for diagnosing these lesions.[2] A diagnosis of fibrous dysplasia or periapical osseous dysplasia may be considered, and occasionally, a diagnosis of cementoblastoma.

Fibrous dysplasia refers to the replacement of normal bone with fibrous tissue containing foci of immature woven bone. Although fibrous dysplasia shows poorly defined expansion, the general shape of the involved bone is maintained. In contrast, ossifying fibroma displays tumour-like, concentric expansion.[2]

However, periapical osseous dysplasia is often multifocal, whereas ossifying fibroma is not. A wide sclerotic border, as well as a more undulating expansion, is more characteristic of the slow-growing periapical osseous dysplasia. The epicentre of periapical osseous dysplasia is located at the apex of the tooth, within the alveolar process.

Bone reconstruction

The treatment of choice for an ossifying fibroma is resection, requiring subsequent bone reconstruction. CERASORB Bioactive (curasan) is a bioactive synthetic, porous, biocompatible ceramic material made for filling, bridging and reconstruction of bone defects and augmentation of the atrophied alveolar ridge. This fully resorbable material provides the potential to increase bioactivity.[10] This new material with phase-pure beta-tricalcium phosphate technology is doped with silicate to enhance its mechanical stability and offers high open-celled porosity of approximately 75% for immediate start of osseointegration and is completely resorbed after four to six months.

Platelet-rich fibrin is a therapeutic blood matrix obtained by selective centrifugation and acts as an adjuvant in tissue repair. In order to obtain these fibrin matrices for the case presented in this article, six samples of autologous blood were collected in 10 mL pure glass dry tubes (Montserrat) and two blood samples in polystyrene dry tubes (Greiner Bio-One). These were centrifuged in the Fibrin System centrifuge (Ortoalresa) according to the methodological proposal of Duarte de Almeida and de Oliveira, which uses relative centrifugal force of 200 ×g for ten minutes to obtain two physical forms of fibrin, a polymeric or solid gel form and a monomeric or temporary liquid phase form, in a single centrifugation step.[11]

Clinical case

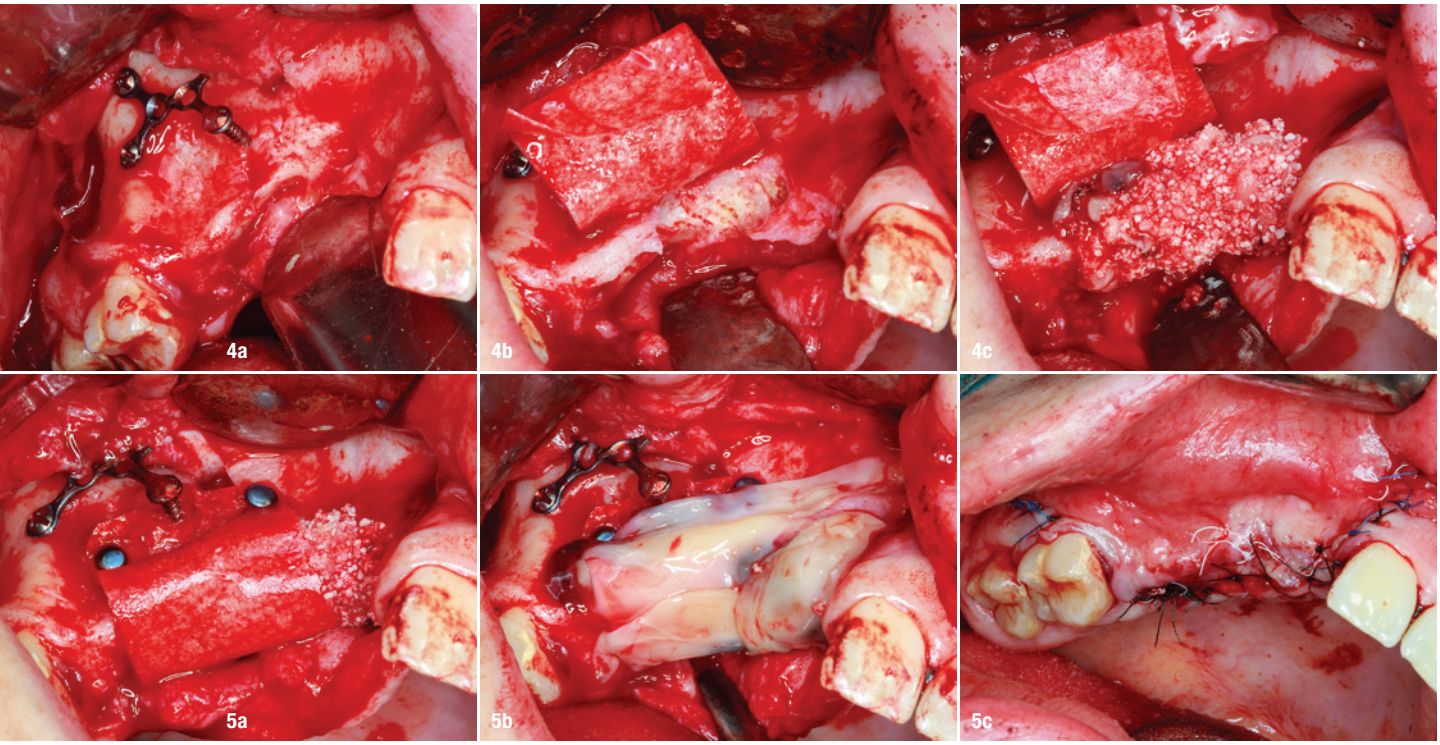
A 26-year-old female patient attended an oral and maxillofacial surgery consultation at the Clitrofa medical, dental and surgical centre in Trofa in Portugal for bone reconstruction of the maxillary right quadrant. The patient had been diagnosed with ossifying fibroma. It had been excised with a safe bone margin, and the bone defect was reconstructed with an autogenous fibula graft in the same surgery. This had failed after a month owing to bone exposure. The osteosynthesis plate used in graft fixation was present.

Anamnesis found no allergies or use of medications. On extra-oral clinical examination, a normal appearance was observed. On intra-oral clinical and radiographic examination (dental panoramic tomogram and CBCT), a massive bone defect was noted in the anatomical areas of teeth #15–12 (Figs. 1a–2c).

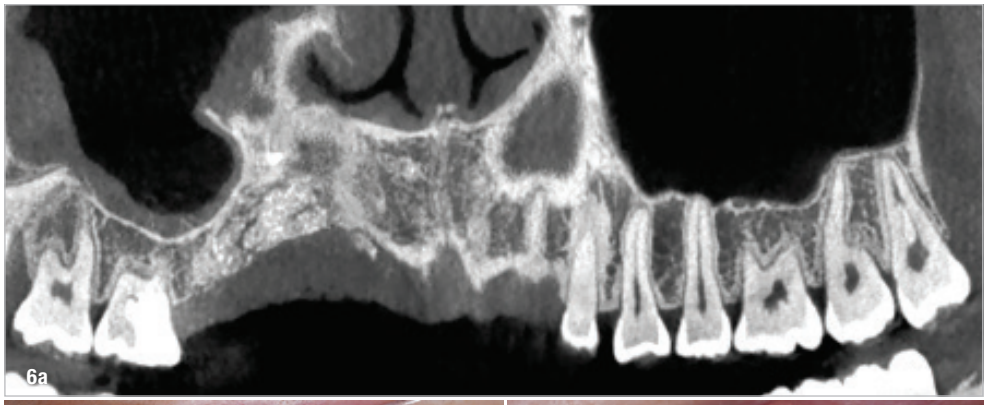
Two vertical and two horizontal osteotomies were performed in the symphyseal and parasymphyseal region to delimit the bone area to be grafted. This rectangular osteotomy was performed according to the bone availability evident in the CBCT scan (Figs. 3a–c).

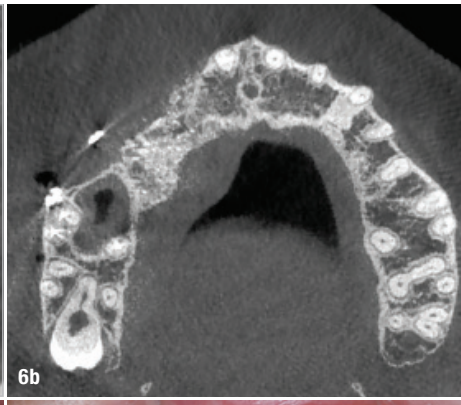
Bone reconstruction was performed by combining this autogenous bone and CERASORB Bioactive in a 50:50 ratio. The bone grafting material was mixed with the platelet-rich fibrin to create sticky bone, facilitating handling and application and allowing immediate adhesion to the defect site. The use of platelet-rich fibrin in the grafting process allows one to exploit its properties, especially in supporting the inflammatory response, immune response, tissue repair, tissue reorganisation and angiogenesis.

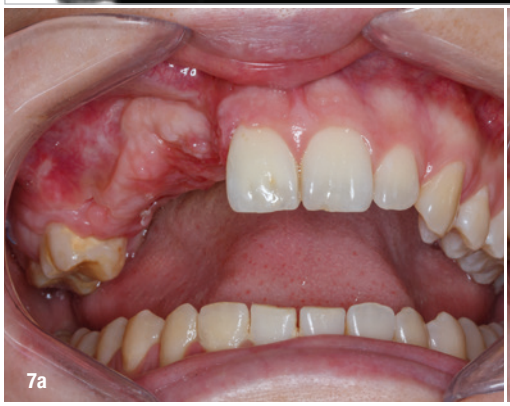
An EPI-GUIDE membrane (curasan) was used to cover the grafted site. This is a non-biological, resorbable hydrophilic membrane containing a 3D structure important for barrier function. Its 3D constructed density gradient is designed to attract and stabilise fibroblasts and epithelial cells while allowing permeable nutrients through the membrane. To ensure reliable positioning and fixation of the membrane, 5 mm Ti-SYSTEM pins (curasan) were used (Figs. 4a–c).

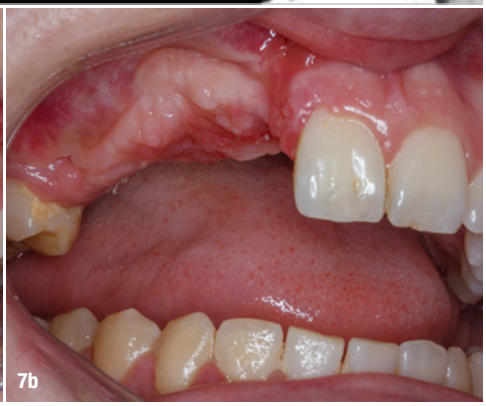


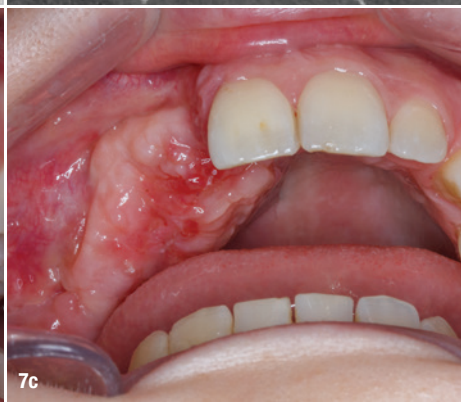
Figs. 4a–c: Sticky bone and EPI-GUIDE membrane fixed with Ti-SYSTEM 5 mm pins. **Figs. 5a–c:** Suture with undyed monofilament non-absorbable PTFE 4/0 and non-absorbable nylon 5/0.











Figs. 6a & b: Final computed tomography. **Figs. 7a–c:** Final clinical aspect of first quadrant bone reconstruction.

The autologous platelet-rich fibrin membranes were placed over the site to provide an extra-protected environment for bone regeneration in the defect area and to support new bone growth by presenting a barrier to the infiltration of soft tissue and promoting the growth of osteogenic cells in the bony defect (Figs. 5a–c). Suturing was performed with simple sutures using undyed non-resorbable (#4/0 PTFE) and non-resorbable monofilament suture material (#5/0 nylon; Figs. 6a & b).

The patient underwent systemic antibiotic, analgesic and anti-inflammatory therapy for eight days. Regarding post-operative care, she was instructed to maintain strict oral hygiene. The CBCT scan and clinical examination during the postoperative period of six months showed evidence of new bone formation (Figs. 7a–c).

Conclusion

This new biomaterial was developed for resorption and new bone formation to mimic autologous bone. It shows superior handling with rapid hydration with the surgeon's preferred fluids, including autologous fluids, growth factors and antibiotics for various surgical indications. In this case report, bioactive silicate coupled with high-porosity beta-tricalcium phosphate appears to have led to enhanced bone formation. A longer follow-up and case series will be needed to corroborate the encouraging preliminary results of this new biomaterial.

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Literature

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