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PRGF and Calcium Sulphate Graft as an Alternative Treatment for Odontogenic Keratocyst: Case Report

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1. Abstract

Odontogenic Keratocyst (OK) derives from remnants of dental-lamina, aggressive behaviour and recur tendency, mandibular mainly located, ascending angle/branch. Ideal one block surgical resection or physical decompression. Alternative therapies: thermal (cryotherapy); chemical (Carnoy's solution); conservative (enucleation, marsupialisation and curettage) and combined (enucleation-curettage/enucleation- cryotherapy). Calcium Sulphate (CS) combined with PRGF used for Bone Regeneration (BR) accelerates healing, promotes bone growth and reduces inflammation. Case report: 35-years-old female from Oral Surgery Clinic, Dentistry Faculty, Universidad Autónoma de Yucatán (UADY) showing increased volume in premaxillary region with OK preoperative imaging diagnosis associated to an impacted left superior canine. Excisional biopsy and PRGF+CS graft placement was performed. Histopathologically confirmed an Odontogenic Keratocyst. Postoperative imaging controls without recurrence after one year follow.

2. Introduction

Odontogenic Keratocyst (OK) derives from remains of dental lamina, with a higher incidence between the second and third decade of life, with a second period around the fifth decade, affecting more men 2:1. Aggressive behaviour and relapsing tendency (the first 5 years post-treatment) [1-3]. The presence of multiple OK is a feature of the basal cell nevus syndrome described by Gorlin and Goltz in 1960, based on a genetic alteration of autosomal dominant hereditary character; other features of the syndrome include: bifid ribs and basal cell carcinoma, calcification of brain sickle, multiple small epidermoid cysts, frontal bossing, shortened metacarpals and medulloblastoma [2,4]. OK is mainly located in the angle and ascending mandibular ramus, other unusual locations are the premaxilla and maxillary sinus. Clinically it causes pain, enlargement of adjacent soft tissues and bone expansion exhibiting facial asymmetry [1-3, 5, 6].

First described by Mikulicz in 1876 [7] then by Phillipsen in 1956 [1-3]. Subsequently Pindborg, Philipsen and Herriksen in 1963, established histological criteria and characterised a specific clinical behaviour [5]. In 2005, OMS reclassified it as a benign neoplasm of odontogenic nature, calling it Keratochatocytic Odontogenic Tumour (KOT) due to its aggressiveness and highly recurrent nature [6,8,9] however, in 2017, KOT was reclassified as Developmental Odontogenic Cyst (DOK) and renamed as OK [10, 11].

Histopathologically characteristic shows thin lining epithelial, of uniform thickness, varying between 8-10 cell layers thick and a basal layer of palisade cells together with a wavy parakeratinised surface [1-3,12]. Contents of the OK is a clear liquid, sometimes found to be occupied by keratin [4].

Imaging shows a well-circumscribed radiolucent image with thin, regular radiopaque borders. Multilocularity can be observed in large lesions and up to 40% adjacent to the crown of an impacted tooth. Rarely it presents as interradicular or periradicular radiolucency, although adjacent tooth retain vitality [1-3, 12, 13].

Treatments can be classified as physicals: decompression; thermal: cryotherapy or chemical: application of Carnoy's solution, prevents recurrence by penetrating 1.54 mm of bone margin with an exposure time of less than 5 minutes to avoid neurotoxicity. Conservative: enucleation, marsupialisation or curettage. Combined: enucleation- curettage or enucleation-cryotherapy, radical procedure by a bloc resection, which is still the ideal therapy. Depending on size and location, can be marginal, preserving basal bone, or segmental in large OKs, in which the small amount of healthy bone margin does not allow the preservation of maxillary or mandibular bone continuity. Segmental resection should be complemented with reconstruction of the bone defect [1-4,14].

Dentigerous cyst, ameloblastoma, adenomatoid odontogenic tumour, ameloblastic fibroma, traumatic bone cyst, central giant cell granuloma, lateral periodontal cyst or aneurysmal bone cyst should be considered in the differential diagnosis [1-3, 7].

Arellano and González (2008) reported a 42-years-old male patient with a volume increase in the right mandibular region 1 year's evolution, with yellow-transparent non- foetid material coming out. Orthopantomography showed a mandibular body radiolucent lesion. Aspiration biopsy reported KOT. Combined therapy including enucleation-curettage and Carnoy's solution. Controls with orthopantomographies showed no recurrence after one year [15].

Rivera et al. (2017) reported a 19-years-old male patient, CT cone bean showing hypodense mass occupying most of the right sinus lumen enveloping another hyperdense mass corresponding to a third molar. Incisional biopsy reported KOT. Subsequently enucleation and peripheral curettage were performed. Ninety days later orthopantomography showed the right maxillary sinus free of lesion [14].

Forteza et al. (2019) reported on 415 patients who underwent surgery, 282 male and 133 females; ages 6-85 years. The 79.9% were located in the mandible. The most commonly applied treatment was enucleation, followed by enucleation and Carnoy's solution, enucleation with curettage, marsupialisation and finally resection [11].

The reconstruction of bone defect following enucleation of a tumour or cyst, as well as trauma, is an essential point in the treatment. Bone Regeneration (BR) uses different types of materials that can be: autografts (from the same individual) allografts (from another individual of the same species) xenografts (from other species) and alloplastics like synthetic materials β-tricalcium phosphate, calcium sulphate, bioactive vitreous ceramics or polymers [16-18].

Calcium Sulphate (plaster of Paris) when used as a BR material resorbs in 8 weeks depending on the size of the bone defect, does not cause inflammation, has ability to stabilise blood clot, promotes healing process and has the added value of being affordable. It has been combined with other materials to increase binding properties, volume and efficacy [19-21].

PRGF is 100% autologous and biocompatible, obtained from the patient's own blood, thus eliminating the possibility of disease transmission and consequently reducing procurement costs [22-24]. Promotes angiogenesis, stimulates cell migration and increases proliferation and stimulates paracrine and autocrine secretion also less postoperative inflammation, rapid soft tissue healing and increases bone repair [24-27].

Therefore, combination of PRGF+CS generates an exothermic reaction that activates the growth factors contained in the plasma. The mixture promotes healing acceleration process, bone growth and decreases inflammation [16, 28].

3. Case Presentation

Thirty-five-years-old female patient, from Chiapas and resident of Mérida, Yucatán, Mexico was attended in Surgery Clinic of Dentistry Faculty of the UADY for extraction of impacted left canine associated with a pathology in maxilla. Painful symptomatology in edentulous premaxillary region, starting approximately 6 years ago, reporting mobility and teeth loss trough years. No systemic diseases or drug allergies. Non submandibular and cervical ganglions, or other related systemic symptoms, hypotonic upper lip, nasal spine bulging, anterosuperior depression on the free edge lip because of teeth absence producing downward lip commissures (Figure 1).

Intra-oral examination, supragingival plaque was observed in both arches, absence of multiple teeth, reduced anterior vertical dimension, increased volume in premaxilla, predominantly left side, indurated consistency and pink soft tissues (Figure 2).

CT scan showed a hypodense area in the premaxilla region (16.81 mm long and 19.64 mm wide) showing loss of vestibular, interdental and palatal bone tables due to presence of pathology and a hyperdense area corresponding to impacted left canine in a horizontal position (Figure 3).

Prior to the surgical procedure, blood was collected from the patient using a bti Plasma Transfer Device (PTD)® kit according to manufacturer's protocol. Briefly, 4 tubes with the patient's blood were introduced into the bti Endoret® centrifuge at 2000 rpm for 8 min, the fractions of poor and plasma rich in growth factors (PRGF) were separated, the PRGF fraction was deposited in a puff mixed with 50 μL calcium chloride (PRGF activator) and added with CS spheres. Two to five minutes later, the graft (PRGF+CS) was formed with a rubbery consistency [21]. Under surgical protocol and infiltrative anaesthesia, a full-thickness trapezoidal flap, osteotomy, enucleation of the pathology, removal of impacted left canine, curettage, placement of PRGF+CS graft, repositioning of the flap and suture placement were performed (Figure 4).

Postoperative indications and medication: clindamycin 300 mg c/8 hours for 5 days, nimesulide 100 mg c/12 hours for 5 days,

ketorolac 10 mg c/8 hours for 3 days and chlorhexidine gel applied 3 times a day for 2 weeks. One week later stitches were removed showing adequate evolution. The histopathological macroscopically report a single specimen of soft, irregular, reddish brown with haemorrhage areas, rough, opaque, firm and resilient tissue measuring approximately 1.9 x 1.7 x 0.9 cm. Microscopically reported stratified squamous epithelium 6-8 layers thick, parakeratinised, corrugated, with basal cells arranged in a palisade; the epithelial spikes flattened and on the luminal surface traces of keratin and a diffuse moderate chronic inflammatory infiltrate (Figure 5).

Six months Orthopantomography control, without signs of recurrence (Figure 6).

Figure 1: Extra-oral photographs A. Right side. B. Frontal. C. Left side. D. Left three- quarter. E. Right three-quarter.

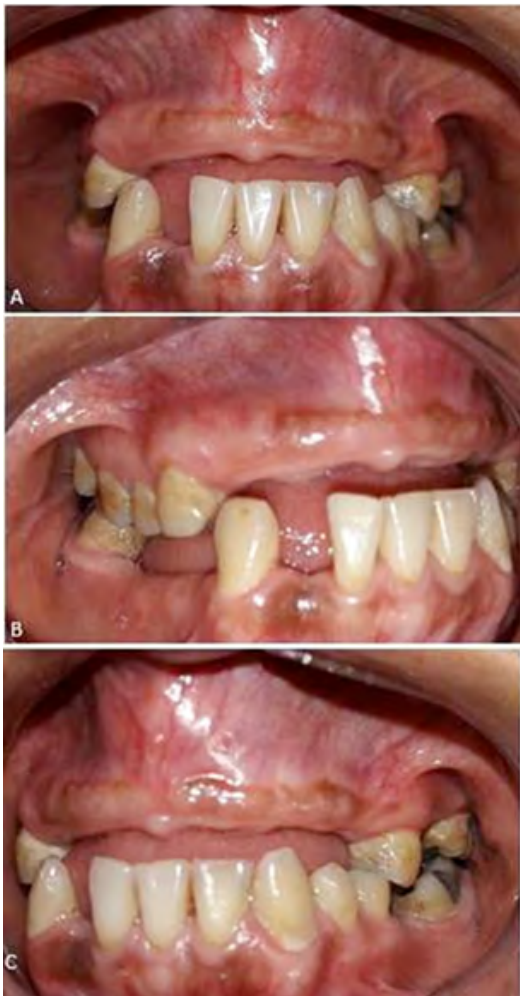

Figure 2: Intraoral photographs. A. Anterior. B. Right side. C. Left side.

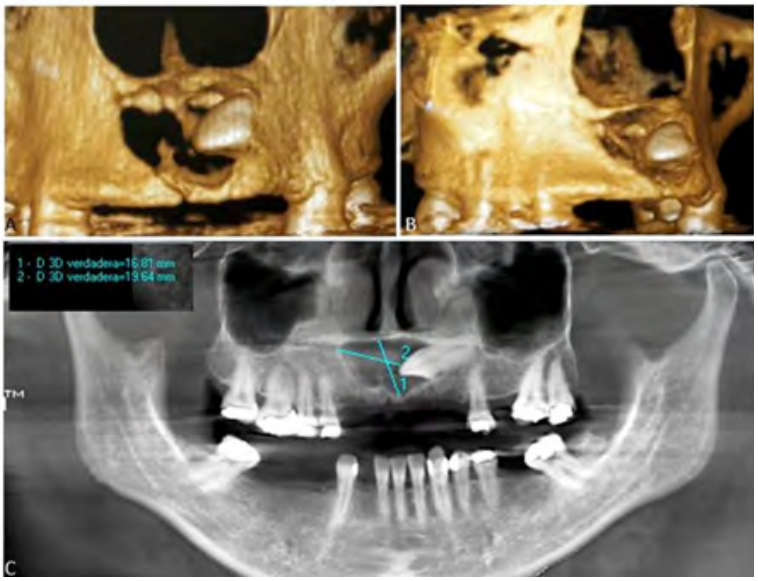

Figure 3: Tomography. A. Anterior view. B. Right lateral view. C. Tomographic measurements.

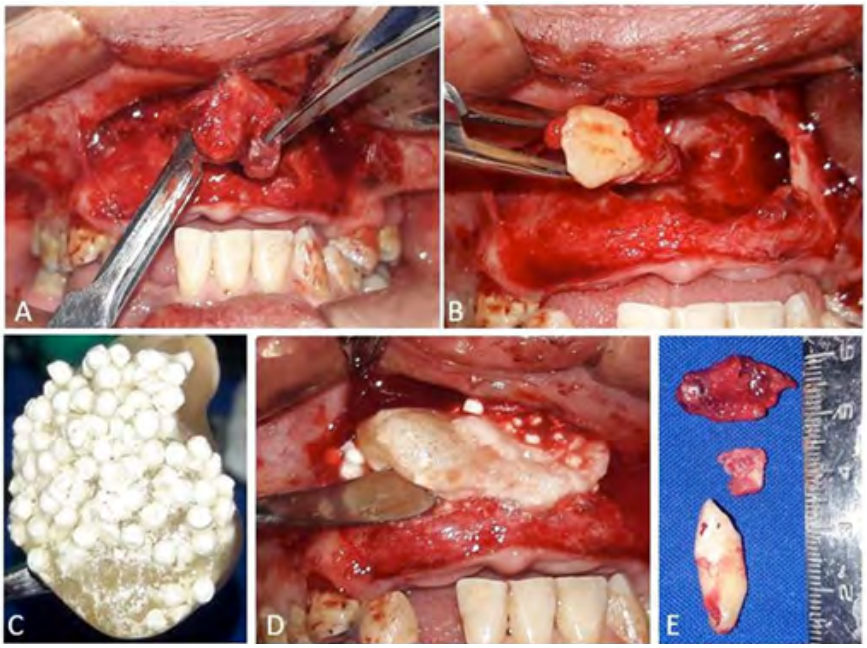

Figure 4: Surgical procedure A. Enucleation of pathology. B. Removal of impacted left canine. C. PRGF+CS graft. D. Placement of the graft in the bone defect. E. Impacted left canine and pathological tissue.

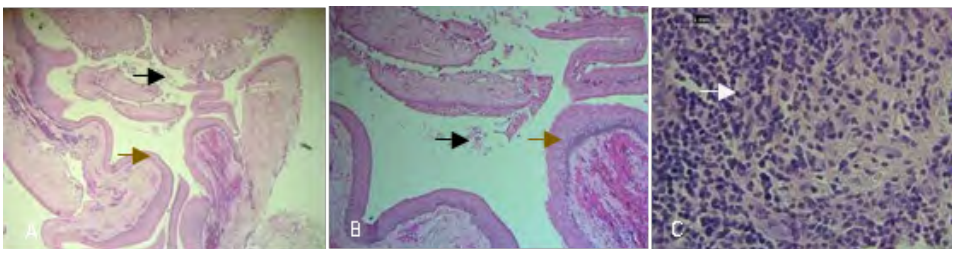

Figure 5: A and B. Arrows show the stratified squamous epithelium and traces of keratin. C. Inflammatory infiltrate.

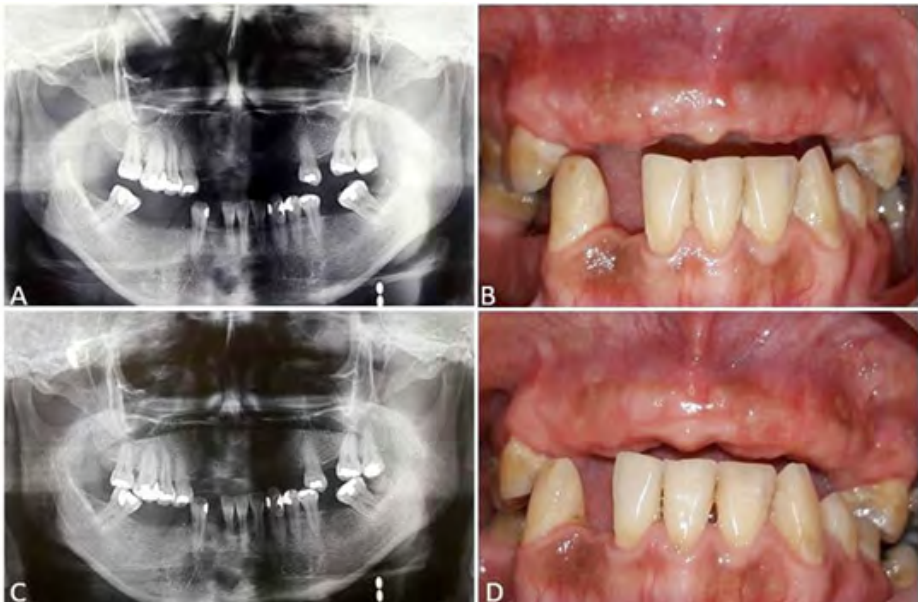

Figure 6: Postoperative radiographic control. A. Orthopantomography (2 weeks). B. Anterior intraoral photography (2 weeks). C. Orthopantomography (6 months). D. Anterior intraoral photograph (6 months).

4. Discussion

Odontogenic Keratocyst is considered an aggressive and recurrent entity due to presence of epithelial remnants remaining at the bone margin [14].

Vilcapoma et al. (2011) reported a 46-years-old male patient with right facial enlargement, orthopantomography showed an oval-shaped unilocular radiolucent image (5 x 3 cm) involving body and right mandibular ramus, with defined radiopaque borders and impacted tooth 4.8. Histopathology reported KOT. Enucleation of the lesion, curettage and reaming of the surgical site was performed, using autogenous iliac crest graft for BR, with radiographic controls after 6 months showing favourable evolution and adequate bone consolidation. The clinical management coincides with the current case by using a material for BR, differing in the type and graft (PRGF+CS) used and with favourable results [29].

Quintana et al. (2009) reported a 33-years-old female patient who had a radiolucent lesion circumscribed in mandibular body on the left side, histopathologically reported as OK. Enucleation, curettage and BR with Hydroxyapatite HAP-200 were performed with postoperative radiographic control without recurrence at one year. As reported in this paper they used an alloplastic material after curettage [5].

Martinovic et al. (2019) reported an 81 years old female patient, diagnosed with cleidocranial dysplasia, who on CT scan showed a tumour development with denticle- like content in the entire right maxillary sinus including nasal and orbital cavity floor. Total safety margins enucleation of the cystic mass (4cm) was performed, histopathology reported as OK. Two years' follow-up, reported asymptomatic and no recurrence. Franco et al. (2020) reported a 72 years old male with asymptomatic OK, tomographically showed a circular hypodense area (1.9 × 2.5 × 2.0 cm) with defined borders communicating with nasal cavity, osteolysis in the palatal region and the anterior wall of the left maxilla without teeth relation. Enucleation and peripheral osteotomy with a rotary instrument was performed without recurrence. Rancher et al. (2020) reported a 25-years-old female with OK in the left maxilla, associated with tooth 2.8, asymptomatic, with a slight increase in intraoral buccal volume. They performed surgical decompression by puncture, unlike the procedure we report, enucleation of the tumour by Le Fort I osteotomy and reconstruction with titanium mesh. Imaging showed bone repair and reduction of the lesion, without recurrence. These cases differ from the one presented as they did not use any type of graft for bone regeneration [30-32].

Figueroa et al. (2021) reported a 12-years-old male patient, with out systemic diseases or allergies. Imaging reported a maxilla resorption of cortices related to teeth 1.1 to 1.4, with including maxillary sinus and right nostril, and impacted 1.3 tooth. Histopathology reported orthokeratinised OK. Enucleation, curettage, application of Carnoy's solution and removal of tooth 1.3 was performed. Twelve years control without recurrence. This case shows a similar location but a differ age and the Carnoy's solution used [33].

5. Conclusion

Although en bloc resection is known to be the ideal treatment, most surgeons choose conservative treatments.

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