

Regeneration of new periodontal attachment following surgical removal of a Peripheral Giant Cell Granuloma in a young patient: an 8-year follow-up



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Abstract

Background Peripheral Giant Cell Granuloma (PGCG) is a rare benign lesion of the oral cavity originating from periosteum and gingival connective tissue, associated to local irritant and/or traumatic factors. Clinically PGCG appears as a painless swelling lesion with a smooth surface, brown red or purple in colour, ranging from few millimeters to 3-4 centimeters. The aim of this case report is to demonstrate the complete periodontal and bone regeneration after elimination of traumatic factors and surgical therapy.

Case Report A 12-year-old female patient complained a gingival swelling in region 2.1, following an orthodontic therapy. Following a careful evaluation of data collected by anamnesis and clinical and radiograph exams, the surgical excision of the lesion was scheduled. PGCG was confirmed by histological analysis. Finally, a series of follow up at one-, two-, three-, and eight-year were scheduled.

Conclusion The long-term follow-ups seem to demonstrate that the surgical removal of a PGCG associated with bone resorption and deep periodontal pockets caused by development of the lesion may lead to the regeneration of new periodontal attachment for both the infrabony and the suprabony component of the periodontal pocket.

Introduction

Peripheral Giant Cell Granuloma (PGCG) is a relatively uncommon benign lesion of the oral cavity [Mirza et al., 2021] originating from periosteum and gingival connective tissue differently to Central Giant Cell Granuloma (CGCG). It probably represents a reparative connective tissue response to a trauma or local irritative factors and the lesion development is often associated with scarce level of oral hygiene [Ekici et al., 2022]. In the World Health Organization classification of odontogenic and maxillofacial bone tumours it is defined as a giant cell lesion and is classified as a reactive osteoclast-containing gingival/alveolar lesion [Vered and Wright, 2022]. A genetic base cannot be excluded, in fact both PGCG and CGCG present a mutation in the KRAS gene in 70% of cases [Gomes et al., 2018]. PGCG is mainly associated with a low recurrence and only in a limited number of cases causes bone surface resorption, while CGCG shows often a more aggressive behaviour with a tendency to rapid growth, bone and root resorption and high recurrence [Mohtasham et al., 2019]. The observed activity of parathyroid hormone (PTH) on giant cells leads to hypothesis that neoplastic onset and growth may be supported by high level of calcium and PTH in serum. In fact, different studies associate the development of a GCG (Giant

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Cell Granuloma) either with hormonally based systemic pathologies such as parathyroid neoplasms or with kidney diseases that may alter calcium balance [Borges et al., 2012]. Anyhow the aetiology of PGCG is actually not clearly understood. [Ekici et al., 2022]. PGCG generally occurs in female with a peak at 40–60 years, while in the paediatric population is detected only in 9% of cases. Mandibula is the most frequent location [Akerzoul and Touré, 2023]. Clinically PGCG appears as a painless swelling lesion with a smooth surface, brown, red or purple in colour, ranging from few millimeters to 3–4 centimeters. It may show a sessile or pedunculate implantation base and the consistency may range from soft to hard [Wu et al., 2022; Akerzoul and Touré, 2023]. PGCG may lead to periodontal attachment loss and periodontal bone resorption [Moreno Rodríguez, 2019]. At histological examination fibroblastic mesenchymal cells and multi-nuclear giant cells are observed. Furthermore hemosiderin deposits, dystrophic calcification and ossified tissue could also be found within the lesion with both acute and chronic inflammatory cells.

The pathognomonic sign of PGCG are the multi-nuclear giant cells although the nature of these cells has not yet been specified. Several studies reported osteoclast-like characteristics while others suggested an endothelial and phagocytic origin. Mononuclear stromal cells seem to play a key role in the development of giant cells [Mohtasham et al., 2019]. Therapy is based on complete surgical removal of the lesion with curettage of surrounding bone tissue. The risk of recurrence is approximately 10% [Mighell et al., 1995]. The aim of this case report is to demonstrate the complete reconstruction of lost periodontal tissues with gain of clinical attachment level and periodontal bone regeneration after surgical removal of a PGCG deeply involving an upper central incisor in a young girl followed-up for eight years.

Clinical Case

Case presentation

A 12-year-old female patient presented reporting a wide gingival swelling at tooth 2.1 occurred during orthodontic treatment that was suspended due to the progression of the lesion. The medical history was negative and the dental history did not reveal any previous traumatic event or pain. The lesion was asymptomatic but the patient complained a considerable limitation of upper lip



FIG. 1 Swelling in region 2.1.



FIG. 2 Swelling in region 2.1. Initial OPT and Buccal bone resorption on 2.1.

mobility and a significant aesthetic discomfort. Extraoral examination showed no skin discolorations, asymmetries or facial alterations. At intraoral examination a gingival swelling of approximately 2.5 cm in the apico-coronal direction and approximately 1 cm in the mesio-distal direction was observed on tooth 2.1 (Fig. 1).

The lesion presented a nodular appearance and a sessile base extending from marginal gingiva to alveolar mucosa. The reddish surface was smooth and intact and a hard-elastic consistency was detected. Patient showed good oral hygiene. Tooth 2.1 was positive to the vitality test and did not present any sign of carious lesion or other anomalies. A careful periodontal examination was performed and a pathological probing depth of 11 mm and 7 mm was detected on the mesial and vestibular aspect, respectively. Bleeding on probing (BoP) was positive on mesial, vestibular and distal aspect. There was no sign of suppuration. On the buccal side the gingival margin was coronally displaced of approximately 3 mm due to hypertrophic-hyperplastic marginal gingival tissue. Panoramic X-ray (OPT) showed absence bone lesions, periapical radiolucency or dento-alveolar fractures. A Cone-Beam Computed Tomography (CBCT) instead showed resorption of the buccal alveolar bone of tooth 2.1 (Fig. 2). Following a careful evaluation of the collected medical and dental data, patient's parents were correctly informed, and the therapeutic plan was presented. Surgical removal was scheduled in order to eliminate the lesion, restore the anatomical and functional integrity of the tooth 2.1. and proceed with a histological diagnosis. All clinical procedures were performed in accordance with the Declaration of Helsinki (2013).

Surgical Procedure

Following loco-regional anaesthesia by supra-periosteal submucosal infiltration, an access flap was designed. A 15c scalpel blade was used to perform an intrasulcular incision on the buccal side of teeth 1.1, 2.1, 2.2, splitting the interdental papilla and with a vertical incision distal to 2.2 reaching the alveolar mucosa. A full thickness mucoperiosteal flap was detached with a blunt

periosteal elevator starting from the vertical incision. The flap was separated from the underlying lesion with a partial thickness incision and the lesion was completely removed (Fig. 3a, b) showing an exposed root with a combined 3- to 1-wall periodontal intrabony defect. Careful debridement of periodontal bone defect and of exposed root surface was performed with adequate curettes (Fig. 3 c). The flap was repositioned and sutured with interrupted sutures slightly above the cemento-enamel

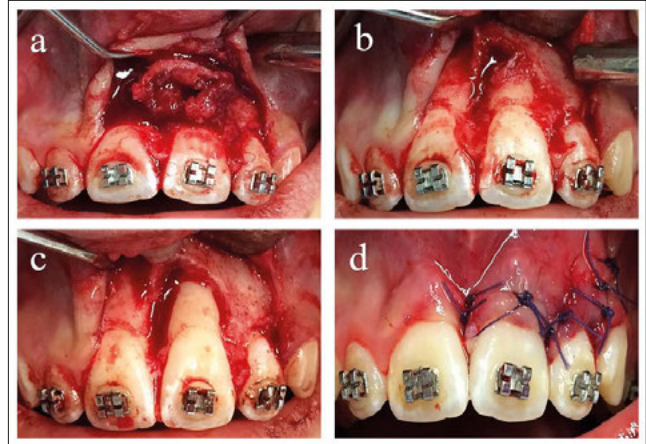


FIG. 3 Swelling in region 2.1. a) Enucleation; b) Conservative bone revision; c) Conservative root revision; d) Interrupted Sutures.

junction. A sling suture was also placed on the buccal aspect to adapt the gingival margin of raised flap to the emergency profile of the tooth to obtain a firm wound closure (Figure 3d). The young age of the patient and the highly aesthetic site required a surgical procedure aimed to preserve as much as possible of gingival tissue avoiding any occurrence of gingival recession. Both systemic antibiotic therapy (amoxicillin + clavulanic acid 1g twice a day for 4 days) and local antiseptic therapy (0.12% chlorhexidine-based mouthwash 2 times a day for 10 days) were prescribed. Anatomical samples were properly oriented and sent to histological examination.

Histological examination and diagnosis

Two anatomical samples were collected during the surgical procedure:

- Sample A (coronal): 1.5 cm brownish-white sample;
- Sample B (apical): 1.4 cm brownish-white sample.

Sample A showed at histological analysis a stromal cellular proliferation, partly spindle and immersed in a background of collagen fibres, partly round-oval with a pale nucleus and eosinophilic cytoplasm. Furthermore, an irregular distribution of osteoclast-like multinucleated giant cells was observed with bone residues at the periphery. In sample B, fibro-adipose and fibromuscular tissues were identified with features similar to sample A in the peripheral region (Fig. 4). Histological diagnosis of peripheral giant cell granuloma was made.

Clinical and Radiographic Follow-ups

At 7 days clinical examination showed a good healing of surgical wound with absence of complications and of tissue inflammation. Sutures were removed after 10 days. At one month the surgical wound seemed almost completely healed and no complications or gingival recession were observed. The patient showed a good oral health. However, she was further motivated to correct oral hygiene procedures. A regular follow-up was scheduled on a monthly basis for the first 3 months and then every 3 months up to 1 year. At the 1-year follow-up, clinical examination showed

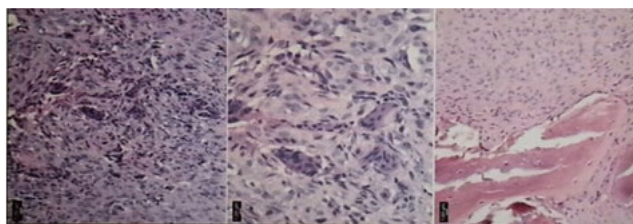


FIG. 4 Histological exam.



FIG. 5 a) Persistence of the dehiscence of the buccal bone at one year; b) Partial periodontal regeneration at two years; c) Complete regeneration of the buccal bone at three years, the nasopalatine duct is very well evidenced; d) Buccal wall is preserved at eight years and no lesion is evidenced.

complete gingival healing with absence of tissue inflammation and of tooth mobility. No pathological probing depths (PD) were detected on all periodontal sites of teeth 2.1 and 2.2. CBCT examination highlighted the persistence, although reduced, of loss of the buccal alveolar bone of tooth 2.1 (Fig. 5a). After two years no clinical sign of swelling, tooth mobility, redness or pain were reported. Tooth 2.1 showed a PD of 2 mm on all periodontal sites. CBCT examination showed a partial regeneration of buccal alveolar bone in region 2.1 (Fig. 5b). At three years patient still showed good sign of oral health and maintenance of healthy periodontal conditions of tooth 2.1 associated to CBCT evidence of complete reconstruction of buccal alveolar bone (Fig. 5c). These clinical and X-ray results were confirmed after 8 years of follow-up (Fig. 5d - 6).

Discussion

Peripheral giant cell granuloma is a lesion which generally occurs between 40–60 years of age in female patients [Shadman et al., 2009; Ekici et al., 2022]. Nevertheless, in our study we reported a case in a 12-year-old patient occurred during orthodontic treatment, which was promptly interrupted. Several studies support that PGCG aetiology, differently from CGCG, which recognises a genetic component in the KRAS gene mutation and/or in PTH anomalies [Gomes et al., 2018], is mainly related to local irritative factors [Moreno Rodríguez, 2019]. The therapy is based on surgical excision of the lesion, although Chrcanovic et al. [2018] also recommend a careful osteoplasty with bone curettage to reduce the possibility of future recurrences. In the present case report the development of PGCG was clinically associated with periodontal loss of attachment and bone resorption leading to formation of a deep periodontal pocket involving both mesial and vestibular aspect of 2.1. The periodontal pocket showed a suprabony and infrabony component both on buccal and mesial surface with a probing depth of 7 mm and 11 mm, respectively. Although the patient did not present any other sign of periodontitis, it is likely that colonisation of the deep pocket 1 by a subgingival microflora occurred, thus contaminating the root surface cement. For this reason, during surgery a conservative root debridement was performed in order to renew the root surface biocompatibility creating the biological potential condition for a new periodontal attachment formation. [Heitz-Mayfield and Lang, 2013]. Furthermore, the flap was designed to preserve as much as possible of gingival tissue avoiding any occurrence of

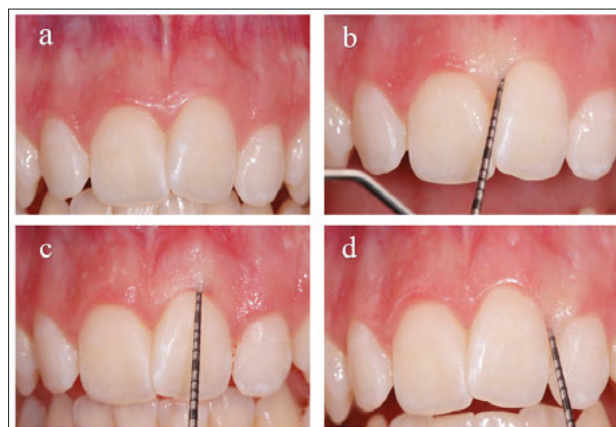


FIG. 6 a) 2.1. at eight years of follow up b) Mesial probing c) Buccal probing d) Distal probing.

gingival recession. The 1-year follow-up showed a healthy periodontal status of tooth 2.1 with clinical attachment (CAL) gain and no pathological probing depths but only a partial bone healing at CBCT examination. However, 3 years after surgery, the maintenance of clinically healthy periodontal tissues of tooth 2.1 combined with a complete reconstruction of the periodontal bony defects as shown by CBCT. These outcomes were also confirmed at the 8-year follow-up. Thus, it is reasonable to assume that CAL gain was associated with a complete periodontal regeneration with formation of a new periodontal attachment rather than a long junctional epithelium or connective tissue attachment [Heitz-Mayfield and Lang, 2013]. It is interesting to note that not only the intrabony component but also the suprabony defect completely healed with periodontal bone formation showing an unusual result even in periodontal regenerative therapy. Recent studies demonstrated that open flap debridement of suprabony defect leads only to a minimal CAL gain underlining that treatment of these defects is still challenging in periodontology [Graziani et al., 2014; Iorio-Siciliano et al., 2021]. Horizontal bone loss determines an unfavorable anatomy without bony walls to support the mucoperiosteal flap and to ensure wound stability along with the paucity of sources for cells capable to promote periodontal regeneration. For these reasons suprabony periodontal defects represent the least predictable defect type for periodontal regenerative therapy [Iorio-Siciliano et al., 2021].

On the other hand, resective periodontal surgery is clinically efficient and leads predictably to pocket reduction but it generally results in substantial increase in gingival recessions, dental hypersensitivity and impaired aesthetics. Therefore, this procedure was not considered due to the young age of the patient and the highly aesthetic site. Our results are confirmed by a similar report of Rodriguez J et al. [2016] even though referred to a 21-year-old woman with only a 1-year follow-up by means of periapical radiographs [Moreno Rodríguez, 2019; Grecchi et al., 2016]. The limit of these observations is that a histological analysis of the healed sites could not be performed in order to confirm the nature of CAL gain.

Conclusions

Considering the collected data during the long-term follow-up we may assume that in a young patient with no sign of periodontitis but with periodontal sites showing bone resorption and deep periodontal pockets caused by the development of a PGCG, the regeneration of new periodontal attachment is possible for both the infrabony as well as the suprabony component of

the periodontal pocket following surgical removal of PGCG.

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