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CLINICAL REPORT

Management of peripheral giant cell granuloma around complete-arch fixed implant-supported prosthesis: A case series

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ABSTRACT

Abnormal peri-implant tissue response in the form of benign reactive lesions, such as peripheral giant cell granuloma and pyogenic granuloma, is a less frequent biologic complication associated with dental implant therapy. However, these lesions can cause gingival pain, swelling, and discomfort, as well as peri-implant bone loss and possible implant failure. Few reports in the dental literature have described these lesions around complete-arch fixed implant-supported prostheses. The purpose of this clinical report was to describe 3 distinct scenarios in patients with complete-arch fixed implant-supported prostheses presenting with benign reactive lesions that were histologically diagnosed as peripheral giant cell granulomas. Each of these 3 patients had acrylic resin as one of the materials in their prosthesis. The distinctive management of each of these 3 patients encompassed surgical, prosthodontic, and pharmacologic means. (J Prosthet Dent 2019;122:181-8)

Granulomas are typically manifested clinically as a benign exophytic growth formed during inflammation.[1-3] In the oral cavity, the term "granuloma" is associated with lesions such as pyogenic granuloma and peripheral giant cell granuloma and refers to an exuberant reactive hyperplasia of granulation tissue[1-3]; this misnomer should not be confused with a true immune-mediated delayed hypersensitivity-related granulomatous process such as tuberculosis or sarcoidosis. Reactive "granulomas" form in response to any irritation from local foreign elements that trigger an immune-mediated repair cascade that recruits a number of growth factors that promote fibrovascular tissue proliferation.[1-3] Common examples of foreign elements encountered in the oral cavity are plaque, bacteria, calculus, gutta percha, root remnants in gingiva, bone graft particles in gingiva, and nonresorbable suture fragments.[3-6] Granulomas found on the gingiva are typically identified as 1 of the 3 lesions—pyogenic granuloma (PG), peripheral giant cell granuloma (PGCG), or peripheral ossifying fibroma (POF)—due to their similar clinical appearance and characteristics.[7] A definitive diagnosis is obtained after an excisional biopsy and histological diagnosis. Pyogenic granulomas can occur in any region of the oral cavity, whereas PGCG and POF occur only on gingiva or alveolar mucosa owing to the presence of osteoclast-like multinucleated giant cells within the periosteal tissues of the attached mucosa.[3-7]

PGCG is a benign reactive exophytic lesion of granulation tissue and multinucleated giant cells of the gingiva arising in response to local irritating factors or chronic trauma.[3,8] It presents clinically as a reddish-purple pedunculated or sessile mass with a soft consistency ulcerated or smooth topography. PGCGs are usually asymptomatic and discovered by clinicians during routine examination. Patients often report these lesions when large and noticeable or traumatizing during function. They may also be accompanied by bone resorption in the area of the lesion or involvement of the supporting tissues of the adjacent teeth.[5] Prevalence of PGCG is higher in women (60%) and, although it can occur at any age, has a peak incidence between 40 and 60 years.[5] It also has a higher prevalence in the mandibular arch (64%) in the premolars region (43%).[5] The treatment is

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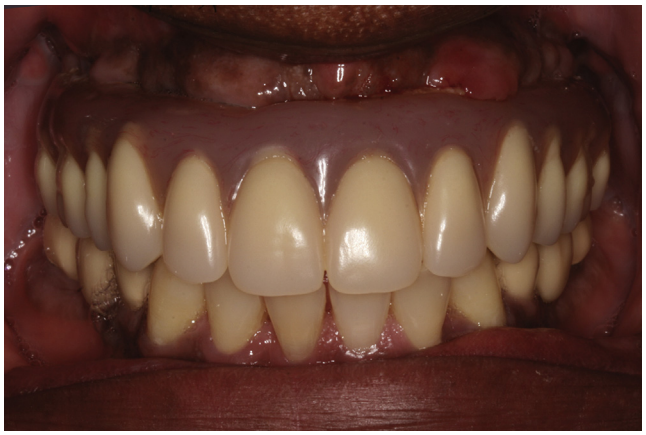

Figure 1. Frontal view of patient at time of presentation. Note exophytic lesion around left maxillary anterior region of his maxillary complete-arch fixed implant-supported prosthesis.

usually surgical excision and curettage, and the recurrence rate is about 9.5%.[2] Histological examination is characterized by a well-demarcated mass of fibrovascular granulation tissue that contains numerous osteoclast-type multinucleated giant cells, interstitial hemorrhage, chronic inflammation, hemosiderin deposition, and occasional elements of reactive trabecular bone.[3-8]

PGCG around dental implants has been rarely described in the literature.[4,7] The first clinical report was described in 1984, and presently, only 16 clinical reports have been reported.[5,7] The treatment of PGCG around dental implants is similar to that of PGCG around natural teeth and soft tissues and includes complete surgical excision to the bony level and thorough curettage, as well as elimination of the causative agent. Examples of foreign bodies around dental implants include food impaction, calculus, bone graft particles in gingiva, titanium debris from previously prepared or amputated dental implants or abutments, acrylic resin debris, nonresorbable suture fragments, residual cement, fragments of toothbrush bristles, dental floss, and other oral hygiene aids.[9-11]

In most situations of PGCG around dental implants, there is an accompanying bone loss indicating the potential destructive nature of this benign lesion. Pennarocha et al[4] in 2012 reviewed 11 clinical reports and found that dental implants failed in 5 of these. In a recent systematic review of benign reactive lesions around dental implants, Atarbashi-Moghadam et al[7] reviewed 16 clinical reports on PGCG and identified an additional 9 clinical reports on pyogenic granuloma. They reported a recurrence rate of 33.33% for these lesions and reported that the chance of implant removal was 29.62%.[7] Patients with PGCG around dental implants supporting complete-arch fixed implant-supported prostheses (CAFIPs) present with a unique set of risks and challenges. This is because of patient oral hygiene challenges,

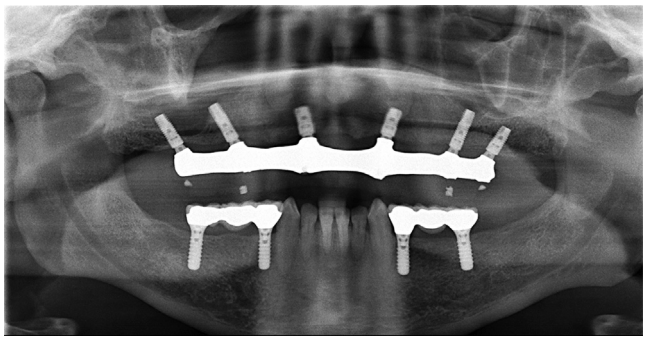

Figure 2. Panoramic radiograph showing stable bone levels around affected implant similar to remaining implants. Implants placed 10 years earlier.

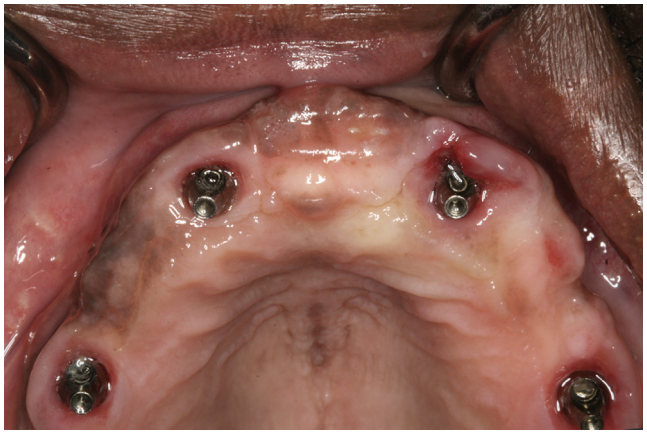

Figure 3. Occlusal view shows exophytic lesion with inflammation around affected dental implant. Peri-implant condition around remaining implants was healthy.

exposure to various types of biomaterials, potential debris during treatment, especially in immediately loaded protocols, and when regular professional maintenance is absent.

The purpose of this clinical report was to describe 3 distinct scenarios in patients with a CAFIP presenting with peripheral giant cell granuloma. The management of each of these 3 patients and their outcomes are described.

CLINICAL REPORT

Patient 1

A 49-year-old African-American man presented to the prosthodontist with benign reactive growth around his left anterior maxillary implant (Fig. 1). The patient's dental history revealed that he had had 6 maxillary implants placed along with bone grafting procedures 10 years before. He had been functioning with a maxillary metal-resin CAFIP with no mechanical or biological complications and had been under routine professional maintenance during the 10-year period. The patient

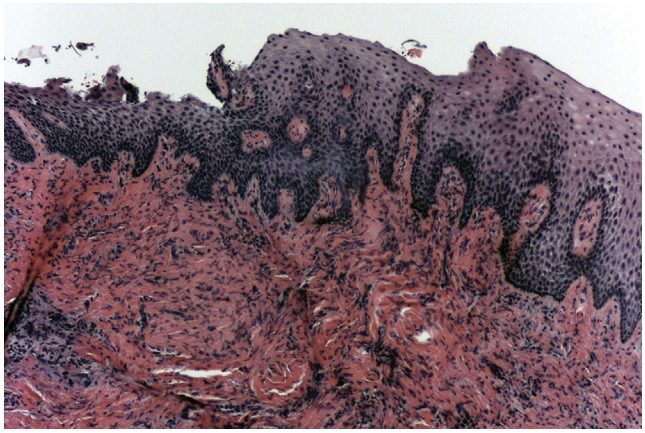

Figure 4. Photomicrograph from histopathological evaluation of biopsied specimen showing hyperplastic fibrovascular tissue, scattered multinucleated giant cells, interstitial hemorrhage, inflammation, reactive elongated rete pegs, and hemosiderin deposition.

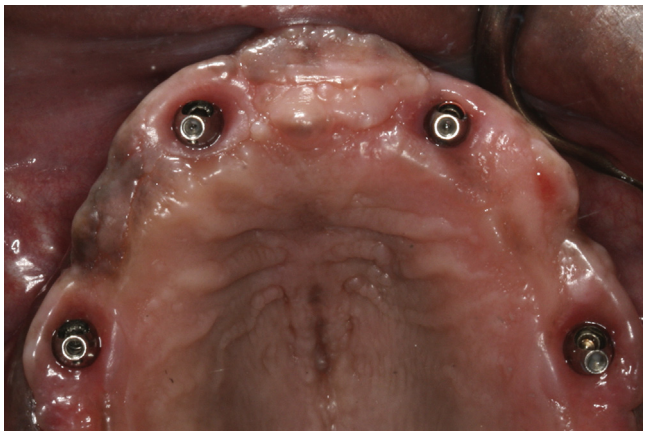

Figure 5. Occlusal view at 6-month follow-up showing absence of recurrence and healthy peri-implant status around affected implant as well as remaining implants. Patient was free of recurrence for 24 months thereafter.

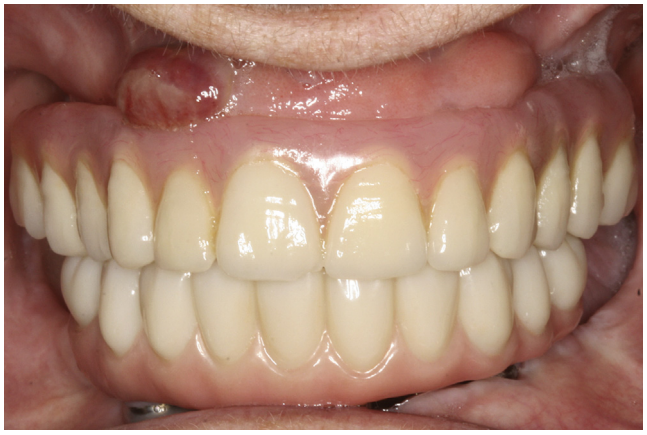

Figure 6. Frontal view of patient at time of presentation. Note large exophytic lesion around right maxillary anterior region of her maxillary complete-arch fixed implant-supported prosthesis.

experienced minor pain and discomfort and had noticed the growth for a few weeks before presentation.

On clinical examination, the patient had minor signs of discomfort from the lesion. The lesion was approximately 6 mm in length and 4 mm in width. It was red and homogenous in color, and the outline of the growth was discrete. The clinical texture of the lesion was smooth and dome shaped without any ulcerations. The radiograph revealed no bone loss (Fig. 2). The differential diagnoses included PG, POF, and PGCG. The patient was educated about the likelihood of the benign nature of the condition and the differential diagnoses. A decision was made to remove the maxillary CAFIP to evaluate the extent of the lesion in addition to excision and curettage. Removal of the maxillary CAFIP confirmed the extent of the lesion (Fig. 3). The implant and abutment were evaluated for mobility and a sharp sound was confirmed on auscultation confirming a clinically stable implant. No foreign body or signs of infection were found around the implant. The tissue surface of the prosthesis was smooth and convex, and the patient's oral hygiene around the prosthesis was good. The treatment plan was excisional biopsy followed by histopathological examination.

Accordingly, the patient's verbal and written consent were first obtained. and local anesthesia using 4% articaine containing 1:100 000 epinephrine was administered by buccal and palatal infiltration around the lesion for an excisional biopsy procedure. A round Siegel surgical scalpel with a size 15C blade was used to completely excise the exophytic lesion to the bony level. The specimen was fixed in 10% neutral buffered formalin and sent to the oral pathologist for review and to obtain a definitive diagnosis by histological examination. The region was completely curetted using a Lucas surgical curette. After copious irrigation with sterile saline, hemostasis was obtained using cotton gauze, and the patient's maxillary CAFIP was replaced in the mouth. The specimen was prepared in the oral pathology laboratory using standard procedures and studied under a microscope. The photomicrographs revealed the absence of any foreign body and showed the classic features of PGCG with hyperplastic granulation tissue, numerous multinucleated giant cells, interstitial hemorrhage, chronic inflammation, and hemosiderin deposition (Fig. 4). The patient's maxillary CAFIP was removed after 6 months for re-evaluation, which confirmed the absence of any recurrence and revealed the well-healed biopsy site (Fig. 5). The patient remained free of recurrence at subsequent recalls for 24 months.

Patient 2

A 64-year-old white woman presented to the prosthodontist with a benign reactive lesion around her right anterior maxillary implant (Fig. 6). The patient's dental

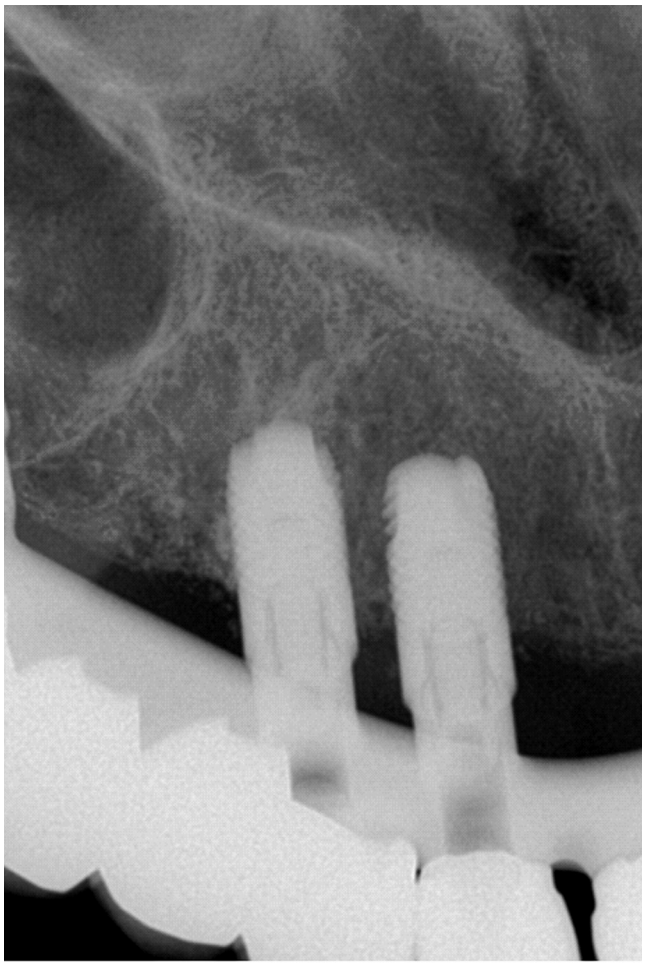

Figure 7. Periapical radiograph showing significant bone loss around affected implant as well as adjacent implant. Implants placed 10 years earlier.

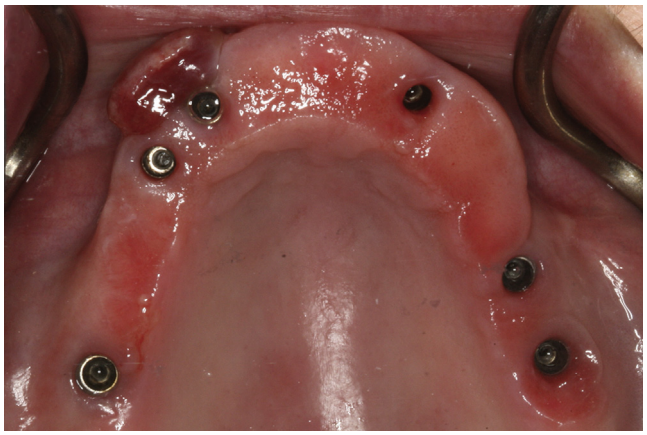

Figure 8. Occlusal view showing large exophytic lesion with severe inflammation around affected dental implant. Peri-implant condition around remaining posterior implants was healthy.

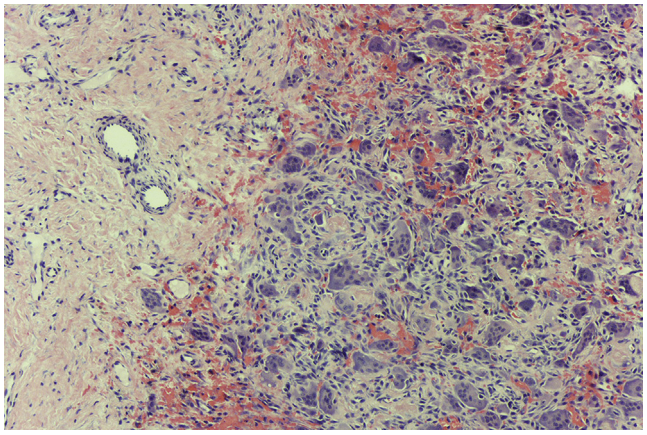

Figure 9. Photomicrograph from histopathological evaluation of biopsied specimen showing numerous multinucleated giant cells in background of hemorrhagic, hyperplastic granulation tissue.

history revealed that she had had 6 maxillary implants placed along with bone grafting procedures 10 years previously. She had been functioning with a maxillary metal-ceramic-resin CAFIP with no mechanical or biological complications, and she had been under routine professional maintenance during the 10-year period. The patient experienced severe pain, bleeding, and discomfort and had noticed the benign growth for a few weeks before presentation.

On clinical examination, the patient had severe pain and discomfort from the lesion. The lesion was approximately 20 mm in length and 12 mm in width. It was bright red with a whitish streak in color, but the outline of the growth was discrete. The clinical texture of the lesion was smooth and dome shaped without any obvious ulcerations and had a firm consistency. The radiograph revealed severe saucer-shaped bone loss of at least 60% around the implant. The bone loss also affected the adjacent implant (Fig. 7). The patient was educated about the possible benign nature of the condition and the differential diagnoses of PG, POF, and PGCG. A decision was made to remove the maxillary CAFIP to evaluate the extent of the lesion and bone loss around the dental implant in addition to excision and curettage. Removal of the maxillary CAFIP showed the true extent of the lesion with a horizontal extension of at least 10 mm (Fig. 8). The tissue surface of the prosthesis was smooth, and modified ridge lap contours were present; the patient's oral hygiene around the prosthesis was fair. The implant was evaluated for absence of mobility, and a sharp sound on auscultation confirmed a clinically stable implant. No foreign body or signs of infection were found around the implant. The treatment plan was excisional biopsy, followed by histopathological examination.

The lesion was surgically excised, and the specimen was prepared in the oral pathology laboratory in a similar manner as described for patient 1. Aggressive curettage was accomplished, and hemostasis was obtained using resorbable sutures. The patient's maxillary CAFIP was

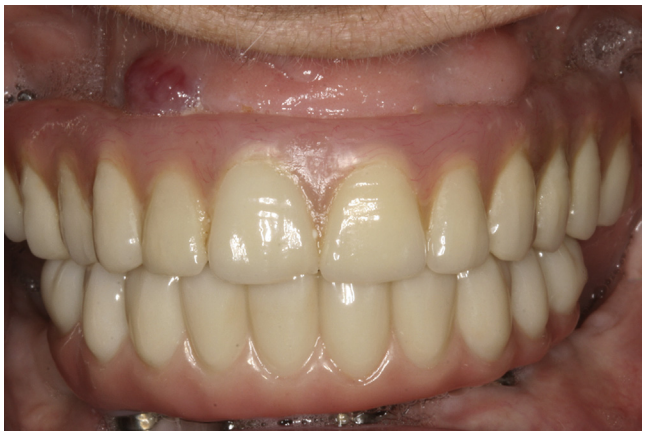

Figure 10. Frontal view at 2-month recall showing recurrence of lesion but slightly smaller than at time of initial presentation.

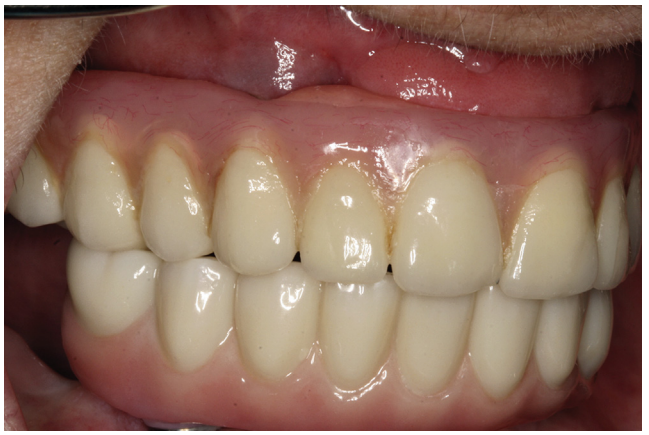

Figure 12. Lateral view showing well-healed site without recurrence 6 weeks after implant removal. Autopolymerizing resin added to tissue surface to fill deficient area after implant removal. Patient free of recurrence for 24 months thereafter.

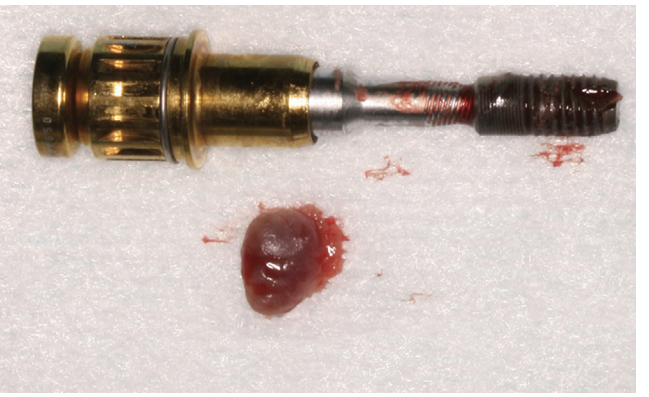

Figure 11. Image showing removal of affected implant using countertorque device. Specimen removed by surgical excision.

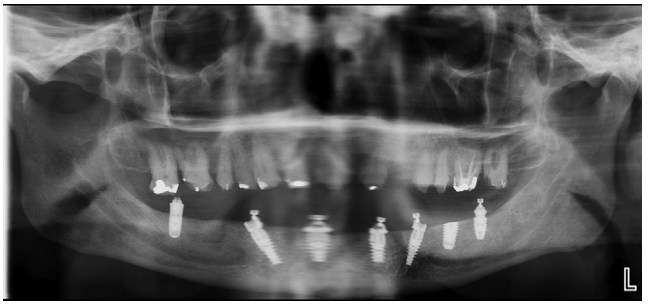

Figure 13. Panoramic radiograph of patient immediately after mandibular implant surgery showing 5 new implants. Previously placed implant at left mandibular first molar site sectioned to bone level and implant at right mandibular first molar site used for immediately loaded prosthesis. Maxillary teeth prepared and protected with acrylic resin interim restorations.

then replaced in the mouth. The specimen was prepared in the oral pathology laboratory by standard procedures and studied under a microscope. The photomicrographs revealed the absence of any foreign body and showed the classic features of PGCG (Fig. 9).

After a 2-month period, the patient presented to the prosthodontist once again complaining of pain and recurrence of the lesion (Fig. 10). At this stage, given the patient's history of inadequate oral hygiene around the 2 adjacent implants, significant bone loss around the offending implant, and the added issue of recurrent benign pathology, a decision was made to remove this implant. After obtaining the patient's consent, a countertorque device (Retrieval tool; Nobel Biocare) mounted on a ratchet was used, and the implant was removed from the maxilla (Fig. 11). The area was curetted thoroughly, and after copious irrigation with sterile saline, hemostasis was obtained using resorbable polyglactin sutures. The patient's maxillary CAFIP was trimmed at the implant region, and autopolymerizing acrylic resin (Truliner; Bosworth) was added to the deficient region and was trimmed and polished. The patient's maxillary CAFIP was removed after 6 weeks, confirming the absence of recurrence and revealing the well-healed biopsy site (Fig. 12). The patient remained free of any further recurrence at subsequent recalls for 24 months. The bone level around the adjacent implant had remained stable.

Patient 3

A 65-year-old white man presented to the prosthodontist with significant generalized exophytic lesions around 4 of his mandibular implants. Two weeks before presentation, this patient had had mandibular anterior teeth extracted and 5 mandibular implants placed by the prosthodontist, along with insertion of an immediately loaded acrylic resin CAFIP. The patient had also had 2 implants placed several years earlier by a general dentist at the left and right mandibular first molar sites. During the mandibular implant surgery, the implant at the left mandibular first molar site was amputated to the bony level as it was

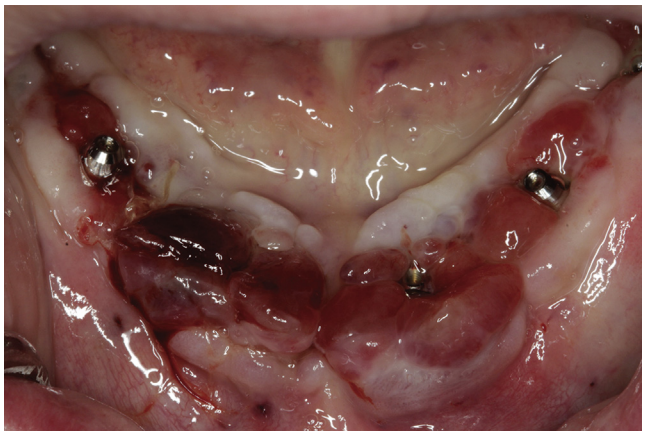

Figure 14. Occlusal view showing severe, large exophytic growths around 4 anterior implants that almost covered abutments.

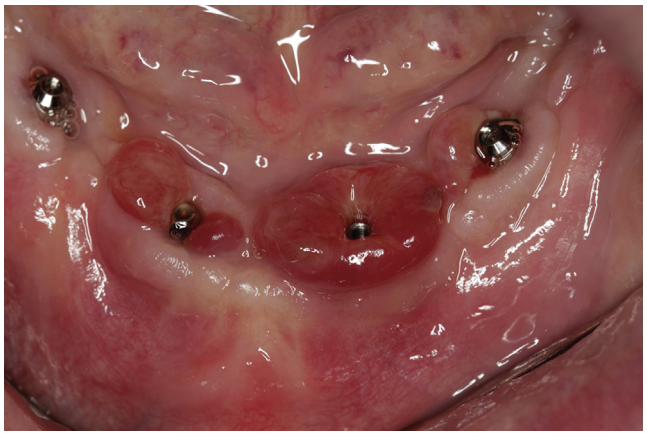

Figure 15. Occlusal view at 4-week follow-up after initial surgical excision showing recurrence around 2 anterior implants.

malpositioned superiorly-inferiorly and could not be removed. The implant at the right mandibular first molar site was used as the sixth implant to support the interim CAFIP (Fig. 13). The patient had been functioning with the interim acrylic resin CAFIP and complained of severe pain, bleeding, and discomfort; he had noticed the benign growth for a few days before presentation.

The patient's medical history was unremarkable. He was not taking antiepileptic or calcium channel blocker medications. His previous natural teeth had been extracted 2 weeks earlier, and he did not have a history of gingival enlargement. On clinical examination, the patient had severe pain and discomfort from the lesions. The lesions were pronounced in the anterior mandibular sites and measured to be approximately 20 mm in length and 15 mm in width (Fig. 14). They were bright red with a bluish tinge, and the outline of the growth was discrete. The clinical texture of the lesion was smooth and firm in consistency without obvious ulcerations. The lesions appeared exophytic, irregular in shape, and broad based and had no suppuration. The radiograph revealed no bony changes during the short follow-up period. The differential diagnoses included PG, POF, and PGCG, as well as medication-induced gingival enlargement. The patient was educated about the benign nature of the condition, the differential diagnoses, and a minor risk of removal of the implants due to the early healing period. However, as all 5 dental implants had achieved good primary stability ranging from 45 Ncm to 75 Ncm peak insertion torque, a decision was made to remove the immediately loaded CAFIP for excision and curettage of the lesion.

The mandibular interim CAFIP was removed, all abutments were retightened, and the implants were evaluated for the absence of mobility; a sharp sound on auscultation confirmed clinically stable implants. No foreign body or signs of infection were found around the implant. The treatment plan was surgical excision and curettage. Accordingly, the lesion was surgically excised, and the specimen was prepared in the oral pathology laboratory in a similar manner as described for patient 1. Aggressive curettage was also accomplished with Lucas and Molt surgical curettes around the implants, ensuring the instruments did not come in contact the implants and abutments. A copious amount of sterile saline was used for irrigation, especially to flush out any possible titanium debris from the amputated implant. Hemostasis was then obtained using resorbable polyglactin sutures. The patient's interim CAFIP was then relieved on the tissue surface and reinserted in the mouth, and its screws were tightened.

After a 4-week period, the patient presented to the prosthodontist once again complaining of pain and recurrence of the lesion but now localized to the 2 anterior implants (Fig. 15). At this stage, 3 interventions were performed. First, an additional surgical excision was performed to the bony level, followed by aggressive curettage; second, a new interim CAFIP was fabricated with significantly increased hygiene space underneath the tissue surface by using computer-aided technology by milling from a solid block of polymethylmethacrylate material. This was performed to rule out the differential diagnosis of allergic reaction to residual monomer from the previous interim CAFIP and to prevent the soft tissues from coming in contact with the interim prosthesis. Finally, a fluocinonide cream 0.5 mg/g (Lidex; Medics) was prescribed to the patient for topical application twice daily for a 1-week period to facilitate healing. The patient healed uneventfully this time and remained free of any further recurrence at subsequent recalls for 4 months; all 5 new implants successfully osseointegrated with stable bone levels (Fig. 16). Thereafter, standard procedures for fabricating a monolithic zirconia CAFIP were accomplished, and the definitive prosthesis was inserted after 4 months (Fig. 17). The patient was closely monitored for recurrence during completion of his tooth-borne fixed

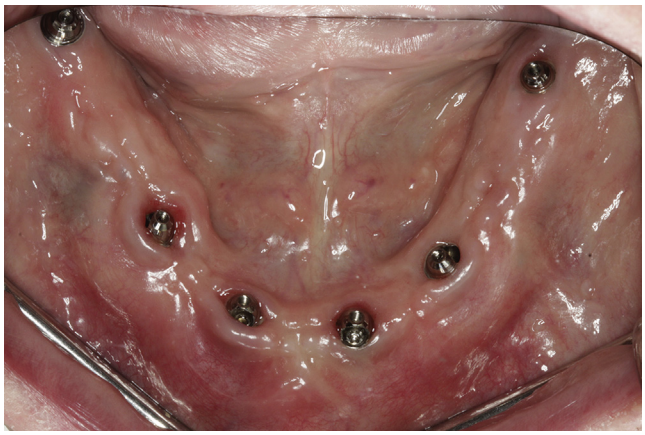

Figure 16. Occlusal view at 4-month follow-up showing absence of recurrence and healthy peri-implant status around affected implants as well as remaining implants. Patient free of recurrence for 12 months thereafter.

prosthodontics treatment in the maxilla and remained free of any recurrence for 12 months.

DISCUSSION

The purpose of this clinical case series was to describe the presentation and management of 3 distinct scenarios of PGCG, which is a benign reactive lesion with an unknown definitive etiology. Besides the 2 common benign differential diagnoses (PG and POF) related to PGCG, it is important to rule out peri-implant infections, drug-induced gingival enlargement, allergic reaction to any biomaterials, and oral malignancy presenting in this region.

Not all PGCGs can be managed successfully and simply with a single surgical excision as presented in patient 1. Recurrence of this lesion can be concerning to patients and clinicians and may even require removal of the implant as presented in patient 2. Should an implant in a strategic location (such as a distal implant in a 4-implant CAFIP scenario) be affected by PGCG, this can significantly impact the subsequent course of prosthodontic treatment, as well as retreatment and patient satisfaction. Additionally, PGCG not only presents in patients during long-term follow-up as presented in patient 1 and 2, but can also affect patients as early as 2 weeks after implant surgery, as presented in patient 3.

PGCG has been regarded as a poorly understood lesion because it is challenging to identify a definitive etiology for each situation.[5] In patient 1, the tissue surface comprised acrylic resin and metal (highly polished silver palladium alloy). The tissue surface of the prosthesis was smooth and convex, and the patient's oral hygiene was good. In patient 2, the tissue surface of the prosthesis was smooth and had a modified ridge lap contour, and the patient's oral hygiene was fair. The tissue surface of the prosthesis was made of acrylic resin

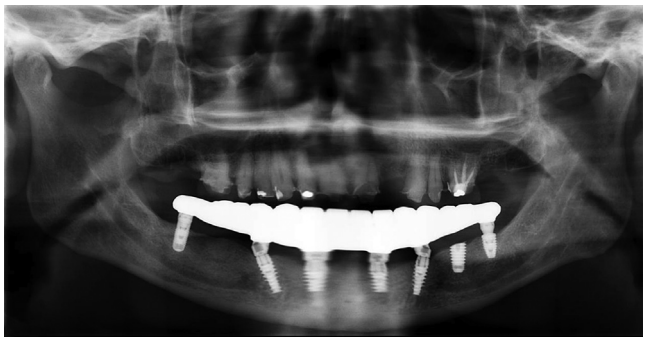

Figure 17. Panoramic radiograph showing definitive monolithic zirconia complete-arch fixed implant-supported prosthesis inserted over 6 implants. Bone levels stable around all dental implants 8 months after placement. Patient completed maxillary tooth-borne fixed prosthodontic treatment 2 months after mandibular treatment.

in a wrap-around design. In patient 3, the tissue surface of the immediately loaded prosthesis was made of acrylic resin as well. Although it is difficult to speculate on the etiology of PGCG in each of these patients, a common factor in all 3 patients was the acrylic resin in each of these prostheses. The biologic plausibility of acrylic resin as an etiologic agent for PGCG should be explored further as the current dental literature does not identify it as an agent.

Current knowledge about PGCG around dental implants indicates that it does not interfere with the process of osseointegration but rather causes crestal bone loss that can eventually lead to implant failure.[3] Surgical excision to the bony level and aggressive curettage can cause additional bone loss around the implant. If the affected implant is strategic to the support of the CAFIP, it should be maintained whenever possible by regenerative therapy. However, the patient should be cautioned about the guarded prognosis for such implants, and secondary (reserve) sites should be prepared and planned for subsequent implants for the future. All patients seeking or treated with CAFIP should be informed about the lifelong need for professional maintenance in addition to daily at-home maintenance.[12]

SUMMARY

This clinical report described a case series of 3 distinct scenarios in patients with a complete-arch fixed implant-supported prosthesis who presented with benign reactive lesions diagnosed as peripheral giant cell granuloma. One patient was managed by straightforward surgical excision without any subsequent recurrence, whereas the second patient with a recurrence was managed by implant removal and the third by surgical, prosthodontic, and pharmacologic means. To the authors' knowledge, this is the first clinical report in the prosthodontic literature describing the comprehensive management of patients with such lesions.

Benign reactive lesions such as peripheral giant cell granulomas are a less frequent biologic complication associated with implant therapy but can cause gingival pain, swelling, and discomfort, as well as peri-implant bone loss and possible implant failure.

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