Chybicki Damian, Janas-Naze Anna, Osica Piotr, Gnatek Adrian. Removal of necrotic alveolar part of mandible with CGF (Concentrated Growth Factors) application into a post-operative bone defect – a case report. Journal of Education, Health and Sport. 2019;9(7):90-99. eISNN 2391-8306. DOI http://dx.doi.org/10.5281/zenodo.3266472
http://ojs.ukw.edu.pl/index.php/johs/article/view/7106

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part B item 1223 (26/01/2017).
1223 Journal of Education, Health and Sport eISSN 2391-8306 7

The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 20.06.2019. Revised: 25.06.2019. Accepted: 03.07.2019.

Removal of necrotic alveolar part of mandible with CGF (Concentrated Growth Factors) application into a post-operative bone defect – a case report

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The article was financed by Medical University of Lodz as a part of statutory activity nr 503/2-163-01/503/01

Abstract

Usage of platelet concentrate is an interesting clinical option for enhancement of healing tissue. One of them – Concentrated Growth Factors (CGF) is produced by processing blood samples with a special centrifuge device. It is proven that this material contains high concentration of growth factors and CD34+ cells which have anti-inflammatory properties and ability to stimulate proliferation and differentiation of connective tissue cells and angiogenesis. The following article presents a case of 70-year-old-patient who underwent the augmentation of the post-operative bone defect with CGF after removal of necrotic alveolar part of the mandible.

Key words: osteomyelitis, osteonecrosis, CGF, concentrated growth factors, oral surgery

Introduction

Osteomyelitis is an intraosseous inflammatory disease characterized by progressive inflammatory osteoclasia and ossification [1]. Due to complex craniofacial skeletal anatomy and aesthetic considerations, osteomyelitis of the craniofacial skeleton must be carefully treated and is much difficult to treat than of the other bones in the body. Despite the descreasing prevalence of osteomyelitis due to usage of advanced medications such as broad-spectrum antibiotics, it still remains a challenging disease in developing countries and poor areas [2].

Osteomyelitis is defined as a disease commences as an infection of the medullary cavity comprising Haversian systems and periosteum of infected area. Invasion of bacteria results in inflammation and edema of the medullary cavity and pressing of blood vessels. An acute ischemia results in a development of the necrotic bone. Stasis of blood areas is a critical factor for infection to progress. Etiology includes bacteremia, trauma, bone surgery and spread from contiguous infectious focus which is stimulated by diseases that affect vascularization of bone and general diseases with reduced immunity such as diabetes and anemia [2].

Medifuge MF 200 by Silfradent is used to produce CGF material. It uses a program with the following characteristics: 30 seconds acceleration, 2 minutes at 2700 rpm, 4 minutes at 2400 rpm, 4 minutes 2700 rpm, 3 minutes at 3000 rpm and 36 seconds deceleration and stopped. The CGF technology has an interesting property: easy and one-step obtainment of autologous material which derives to the defect site a large number of biological factors including Platelet Derived Growth Factor (PDGF), Vascular Endothelial Growth Factor (VEGF), Insulin-like Growth Factor (IGF), Transforming Growth Factor (TGF), Tumor Necrosis Factor (TNF), Brain Derived Growth Factor (BDGF) and Bone Morphogenetic Proteins (BMP). These growth factors are slowly released to surrounding tissues and stimulate healing [3,4]

Case report

63-year-old patient was referred to the Oral Surgery Department for treatment of chronic swelling and pain localized in the right corpus of mandible. The OPG examination was performed (Fig. 1). Patient’s medical history was irrelevant, and showed no drug allergies. No significant surgery procedures in the past. Also the patient denied taking any medications on a regular basis.

In the extra-oral examination no abnormalities were found. The Intra oral examination revealed edema and reddening of mucous membrane that covers the right alveolar part of the mandible with the presence of active fistula (Fig. 2). Also numerous missing teeth and unextracted roots were noticed. Taking into account severe ailments, sustainability of disease and aesthetic and functional considerations, it was decided to place CGF into a post-operative bone cavity.

The treatment plan was presented to the patient and all surgery permissions were collected. The laboratory blood tests were conducted and the surgery scheduled.

The patient was informed about the potential post-operation complaints and the necessity of follow-ups the day after surgery, one week, two weeks and one month after surgery.

At the beginning of the procedure, patient's venous blood was collected, by piercing a superficial vein, to a special plastic 9 mL tubes and immediately centrifuged in the Medifuge MF200, Silfradent machine (Fig. 3). Under local field block anesthesia, the necrotic bone was removed and the curretage of bone was performed (Fig. 4,5). The post-operative bone cavity was filled with the content of four tubes of the CGF material (Fig. 6,7). The wound was sutured and the post-operative instructions were given to the patient (Fig. 8).

The material that was removed during procedure was evaluated by pathologist. Histopathology confirmed our initial diagnosis.

Intra- and postoperative process was uneventful. The follow-up examinations were performed. The day after procedure, patient did not claim any negative effects of operation (no pain, no edema). Sutures removing was scheduled in two weeks after procedure (Fig. 9). One month after procedure, the wound was completely healed and the OPG was performed to evaluate the condition of the bone after surgery and the application of CGF material (Fig. 10,11). It was stated that the bone was mainly reconstructed.

Discussion

Osteomyelitis in dental practise always provides difficulties in proper and effective treatment. The usage of broad-spectrum antibiotics reduced life-threatening complications, especially in patients who are immunodeficient, but the problem with sufficient local operation is still a obstacle to desirable results. In the presented case report the new approach to tissues regeneration by usage of CGF is described.

Successful regeneration of bone requires the consolidated endeavor of cells and growth factors in a time, concentration and site specific fashion. Continuous efforts in understanding the complex biological aspects of the wound healing process provide new knowledge for hitherto unavailable ways of treatment [5].

CGF enhances cell proliferation in all the three different cell lines (fibroblasts, endothelial cells and osteoblasts) involved in angiogenesis, tissue remodeling and regeneration [3]. Thoroughly understanding of these phenomena gives us wide possibilities for much better usage of regenerative abilities of human organisms which is vital if we want to be aware of all the processes that take place during tissues regeneration.

In the presented case the application of Concentrated Growth Factors into the post-operative bone defect resulted in alleviation of inflammatory symptoms that occurred during the development of osteonecrosis and enhancement of proliferation of epithelial and osseous cells. These properties have applied in the following clinical situations: sinus and alveolar ridge augmentation [6], pre-implant augmentation procedures [7], promotion of in vitro periodontal ligament stem cells proliferation [8], management of chronic venous ulcers [9]. It is therefore clear that the CGF material applies to many branches of medicine what confirms its unique properties and legitimacy of further studies for more advanced knowledge of its usage.

Potential using of Concentrated Growth Factors in oral surgery seems to bring encouraging effects. Not only does it reduce post-operative complaints, but also accelerates healing process and at the same time CGF is easy accessible and free from side effects. These properties are exceptional among all of the medicines that are currently available in dental office according to patient's allergies and adverse reactions. In our opinion this most recent and easy available material (CGF) and its wide range of possible applications gives us

unprecedented opportunity to treat wounds and other post-operative site defects that oral surgeons and general dental practitioners deal with everyday.

All above informations are strong reasons to consider more common usage of CGF material in treatment of osteomyelitis.

Conclusions

Application of Concentrated Growth Factor material reduces the post-operative patient complaints such as pain, malaise, edema. Owing to the fact that the CGF accelerates bone and epithelial tissues regeneration, prospective prosthetic treatment may be performed earlier up till now.

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Fig. 1. OPG taken before treatment.

Fig. 2. Intraoral view on operative region.

Fig. 3. Blood collecting.

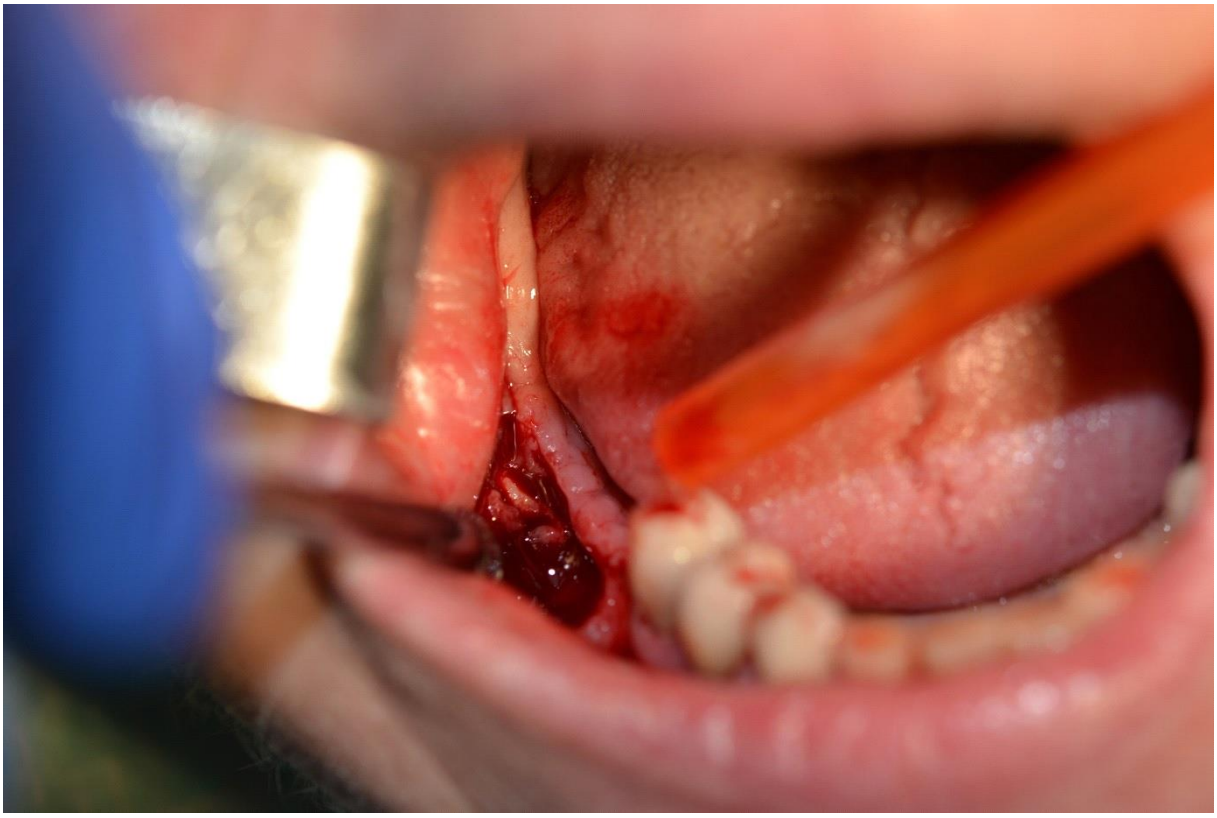
Fig. 4. Intraoperative view on necrotic bone.

Fig. 5. Postoperative bone defect.

Fig. 6. CGF material (blood after centrifugation).

Fig. 7. Bone defect filled with CGF.

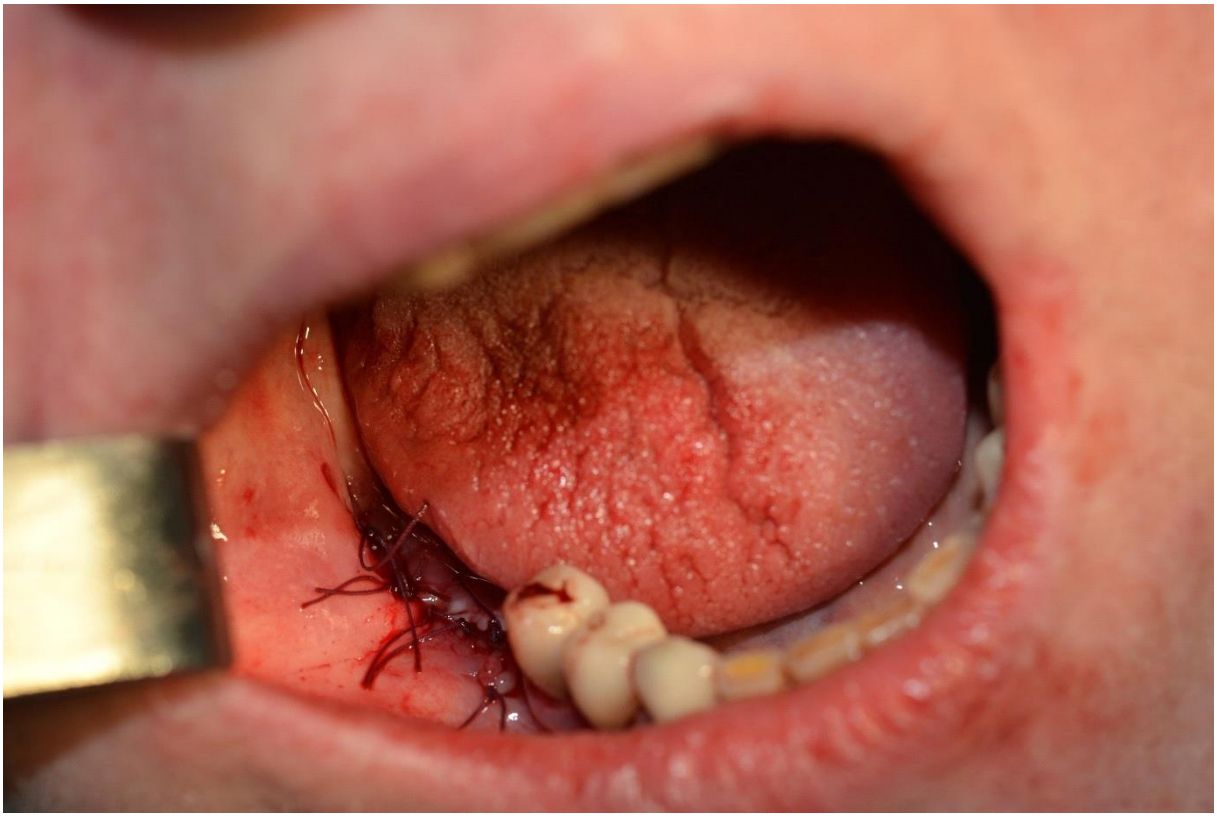

Fig. 8. Post-operative view.

Fig. 9. Follow-up two weeks after surgery.

Fig. 10. One month after surgery.

Fig. 11. OPG taken one month after surgery.