Case Report

Removal of Failed Dental Implant with Application of Concentrated Growth Factor (CGF): A Case Report

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Abstract

Introduction: High survival rates of dental implants were commonly reported even after 10 years of follow up. Nevertheless, complications and failure may occur and the implant would need to be removed. In recent years, the use of autogenous blood products in dental surgery has increased due to its ability to aid the healing of the soft and hard tissues.

Clinical case: The case demonstrated the utilisation of concentrated growth factor (CGF) from the patient's blood for healing following conservative removal of a failed dental implant. Subsequently, the patient showed satisfactory recovery without any infections and clinical complaints.

Conclusion: This explantation procedure, together with the use of CGF, may prevent the normal bone resorption and accelerate soft tissue healing. As it is biological in nature having originated from the patient's blood, it is more readily accepted by the tissues and the risk of infection is low.

Keywords: Concentrated growth factors (CGF); Dental implant removal; Explantation

Introduction

Dental implants have a high survival rate of over 95%, even after 10 years of follow up (Moraschini et al. 2015). However, technical, biological, and aesthetic complications do occur (Jung et al. 2012; Pjetursson et al. 2004; Roccuzzo et al. 2012; Romeo and Storelli 2012). In addition, the outcome of dental implants in patients who have underlying systemic diseases or other immunocompromised conditions can be less desirable (Beikler and Flemmig 2003; Bornstein, Cionca, and Mombelli 2009; Mombelli and Cionca 2006). While the majority of these complications can be managed (Lang et al. 2004), some of these problems cannot be rectified and the implant becomes non-functional and would require removal (Bowkett et al. 2016).

To prevent further bone loss during dental implant removal, treatment should be as conservative as possible, especially if the placement of a further implant fixture is planned (Bowkett et al. 2016). According to Bowkett et al., even when using a conservative and less invasive implant removal technique, there may still be excessive bone removal leading to inadequate bone volume. Thus, many studies have suggested a method of bone grafting (Esposito et al. 2006; Rocchietta, Fontana, and Simion 2008).

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Growth factors are bioactive proteins involved in the wound healing process. They can facilitate angiogenesis, chemotaxis, and cell proliferation (Pirpir et al. 2017). Various platelet concentrated such as platelet-rich plasma (PRP), platelet -rich fibrin (PRF), and concentrated growth factor (CGF) derived from human blood contain many growth factors and thus can be used to reconstruct bone defects (Bhanot and Alex 2002). Furthermore, growth factor-containing products have also been shown to accelerate the process of bone healing and osseointegration (Anitua et al. 2004; Öncü et al. 2016).

Concentrated growth factor (CGF) was first developed by Sacco in 2006 (Bernardi et al. 2017). In 2011, Sohn et al. demonstrated the higher regeneration capacity and multi-purpose functions of CGF (Sohn et al. 2011). As described in a recent review paper, there are several functions of CGF (Kshirsagar and Rubine 2017). Firstly, CGF can improve wound stability, which is essential in the establishment of a new connective tissue attachment to the root surface. CGF also provides a scaffold to support cytokine attachment and cellular migration, besides acting as a carrier for growth factors. Apart from that, CGF can be used as a barrier membrane to accelerate soft tissue healing (Sohn et al. 2011). This case report aims to suggest CGF as an alternative option for dental treatment.

Case Description

Patient information and diagnosis

A 59-year-old male patient was referred to the Periodontal Clinic, Universiti Teknologi MARA (UiTM) for the uncovering of a dental implant (unknown brand/system) in the upper left central incisor region (#21). The implant had been put in place for two years. Initially, two dental implants were placed for the replacement of the upper left central (#21) and lateral incisor (#22) teeth. However, the upper left lateral incisor experienced a loss of osseointegration and the crown of the upper left central incisor's was dislodged during brushing.

Furthermore, this patient was on medication for underlying hypertension, diabetes mellitus, and hyperlipidemia for the last five years.

When the implant was uncovered, it was evident that the implant was in an unfavorable position and could not be restored. Upon examination (Figure 1), there were dental biofilms which had accumulated around the dental implant.

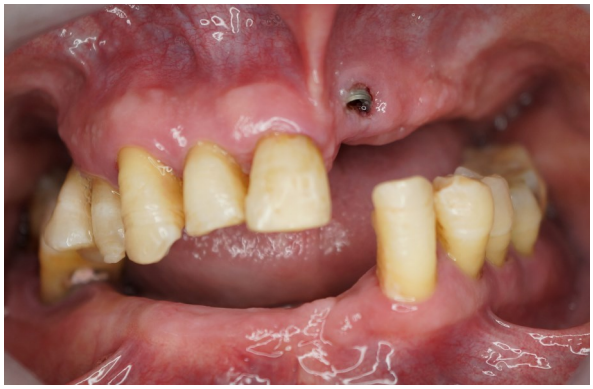


Figure 1

Even though the dental implant was not mobile, the implant was found to be placed too coronally with a probing pocket depth of 6 mm at the distobuccal site. Pus discharge was also present. Besides that, it was impossible to identify the implant system used as the patient was unable to retrieve the dental records from the previous clinic. The intraoral periapical radiograph revealed as high as 50% bone loss at the crestal bone around the dental implant (Figure 2). The diagnosis was peri-implantitis of #21. This patient was also diagnosed as having Generalised Periodontitis Stage IV Grade C (Tonetti, Greenwell, and Kornman 2018).

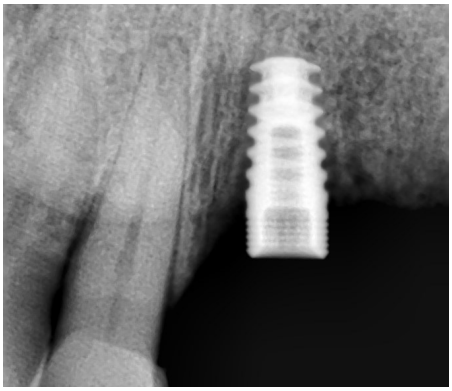


Figure 2

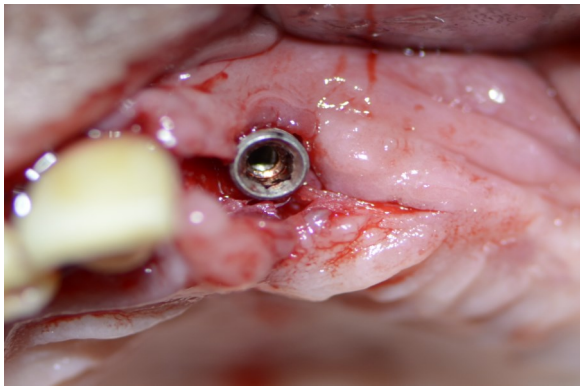


Figure 3

Treatment

For periodontal management, the initial phase therapy included oral hygiene instruction, scaling and root debridement, and extraction of hopeless teeth. The surgical procedure and possible alternatives regarding the management of peri-implantitis were discussed with the patient. Consequently, the patient opted for a conservative removal method of the dental implant (explantation) followed by CGF placement. The patient was informed about the treatment procedure and asked to fill up a consent form.

Before explantation of the dental implant surgery was performed, CGF was prepared by using the patient's blood. A total of 20 ml blood was collected and allocated into two red sterilised 10 ml Vacutainer tubes. These two tubes were instantly centrifuged with specific centrifuge with a rotor turning at alternated and controlled speed for 13 minutes to separate the cells in the blood. This resulted in fibrin-rich blocks that were larger, denser, and richer in a growth factor. After spinning, sedimentation of the Vacutainer's content was allowed to rest for 20 minutes until further processing.

Implant site was exposed under local anaesthesia through nasopalatine block anaesthesia by using 2% lidocaine (1:100,000 epinephrine). Full-thickness mucoperiosteal flap was elevated to expose the implant site (Figure 3). Explantation was performed using a piezoelectric device with copious irrigation of normal saline to minimise surgical trauma (Figure 4-6). Then, the CGF clot was detached from the blood portion using scissors (Figure 7) and placed into the implant removal socket (Figure 8). The primary closure was obtained using 4-0 resorbable suture. Lastly, the periodontal dressing was placed (Figure 9). The patient was prescribed with analgesic and advised to use 0.12% chlorhexidine mouth rinse for a week.

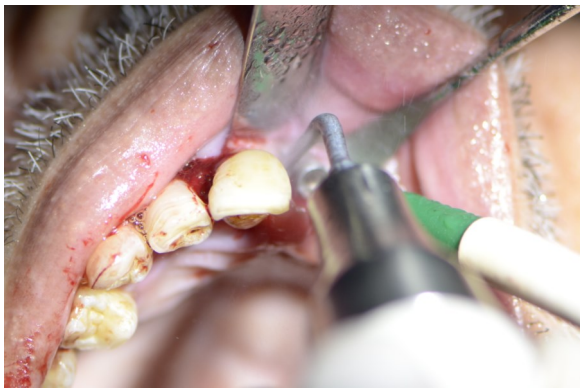
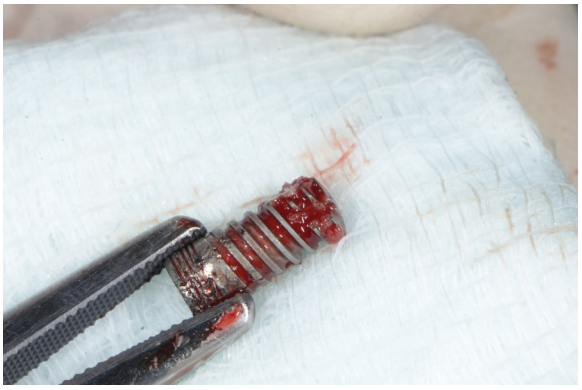


Figure 4



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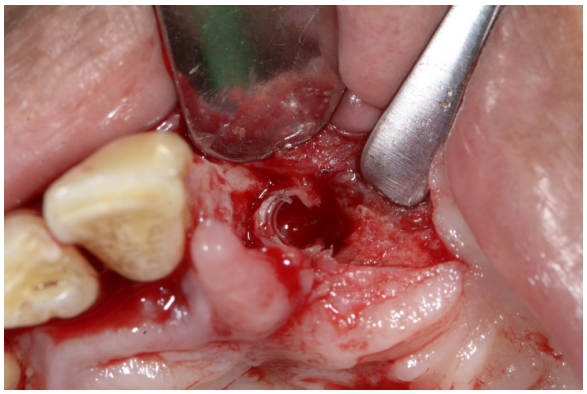

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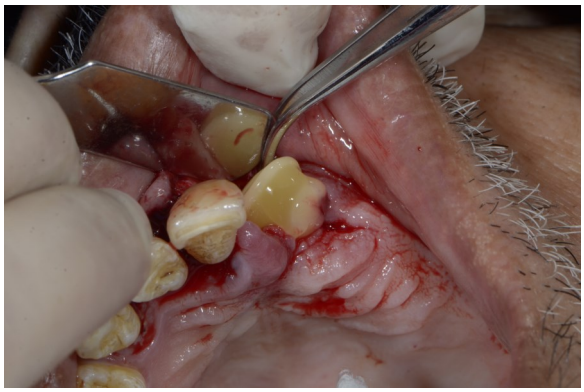

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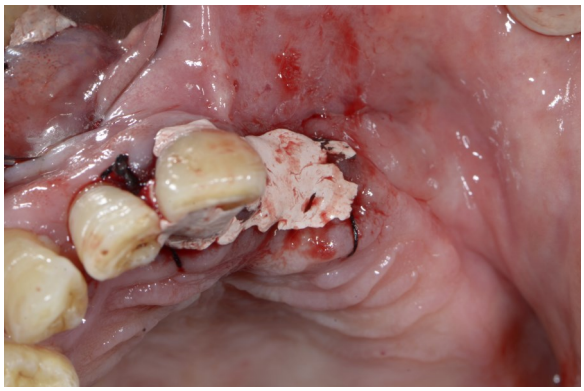

Figure 9

Follow-up and result

Upon discharge, the patient was asked to report on any post-operative pain, swelling, bleeding, speech impairment, analgesic use, trismus, and wound healing. The patient was reviewed at two days, one week (Figure 10), and six weeks. No side effects or adverse reactions were reported. There were no significant complications such as bleeding or delayed wound healing. Clinical healing was uneventful with no infection of other untoward clinical symptoms.

Follow up of the patient at three months showed satisfactory healing of the bony defects with excellent soft tissue healing in the area. The patient was also satisfied with the outcomes of the treatment. At the moment, the patient was fitted with a provisional denture for easier mastication and aesthetic purpose.

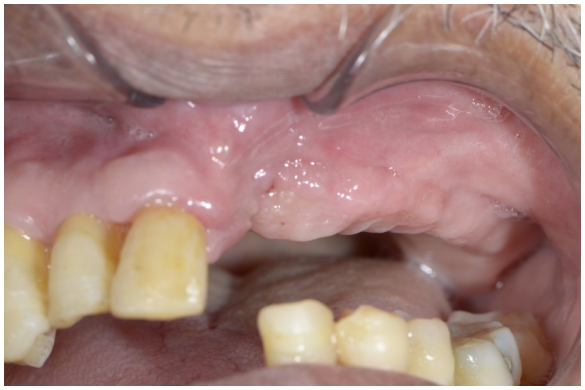

Figure 10

Discussion

In order to perform successful implant-treatment planning, it is important to understand the influence of peri-implant health on an individual's susceptibility to periodontitis. Studies have shown that poor oral hygiene, history of periodontitis, and cigarette smoking are the strongest risk factors of peri-implantitis (Heitz-Mayfield 2008; Lindquist 1997). Therefore, an implant treatment plan must recognise the past, present, and future risk factors of peri-implantitis.

In this case study, the initial poor implant-treatment plan had led to dental implant complications. After a detailed discussion between specialists from various departments and the patient, it was finally decided that the dental implant must be removed. It was not an easy decision as it depended heavily on several factors including the unknown implant system, the poor position of the dental implant, the low success rate of the implant, and that the patient also found great difficulty in getting information regarding the implant system from the previous dental clinic. Therefore, a prudent approach is needed to ensure accurate diagnosis and treatment plan before finalising the decision to remove a dental implant.

There is a variety of techniques that may be applied in cases of implant removal (Bowkett et al. 2016; Kshirsagar and Rubine 2017). The techniques included trephine bur, thin bur at low speed under saline irrigation, piezosurgery, electrosurgery (i.e. thermal explants), fixture removal kit, and laser. In this case, the piezosurgery technique was used due to the unknown implant system. Furthermore, this device has the extra advantage of cutting shallow bone well and preventing damage to the soft tissue at the same time (Bowkett et al. 2016; Vercellotti 2000; Wallace et al. 2007). Piezosurgery has shown better bone healing improvement post-operatively compared to high-speed burs (Froum S. 2011).

Knowledge about growth factors and wound healing has been enhanced by the development of CGF. CGF can accelerate bone healing and the healing of the extraction socket for conditions such as impacted tooth, implantology, ulcer management, and osteonecrosis of the jaw (Pal et al. 2012). In particular, CGF was also reported to have a good regenerative capacity and a high versatility on sinus and alveolar ridge augmentation. Thus, it is often considered as an interesting clinical alternative to optimise the healing of hard and soft tissue (Sohn et al. 2011).

Our aim in this present case is mainly to suggest the use of CGF as an alternative option in dental treatment. The limitation lies within the fact that the successful management with CGF in this patient may not be truly illustrated by the clinical and/or radiographic parameters such as the width of keratinised tissue, gingival phenotype, and radiographic imaging. However, based on a previous study, when growth factors within the CGF function effectively, they are able to accelerate tissue healing (Pirpir et al. 2017). In addition, the thrombocyte-secreting growth factors from α-granules can promote collagen synthesis (He et al. 2009; Hsu, Yuan, and Tseng 2009). When the CGF coexists with other thrombocytes, the fibrin network can be kept stable (Lam et al. 2011). Within this network, fibrin clot formation acts as chemical attractants of the surrounding cells such as cell adhesion proteins, thrombocytes, and plasma growth factor. Some of these mitogens are directly related to osteogenic cell function (Gruber et al. 2004).

Conclusion

The explantation procedure, together with the use of CGF, may prevent the resorption of normal bone and accelerate the soft tissue healing. As CGF originates from the patient's blood, it is biological in nature. Thus, it is more readily accepted by the tissues and associated with a lower risk of infection. Further studies such case control study or randomised clinical trials are needed to gather more comprehensive evidence about the use of CGF, whether CGF alone or the combination with other

regenerative products can be safely incorporated into clinical practice.

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