Case Report

An Innovative Application of Pre-Medicated Collagen Sponges with Regenerative Biomaterials for Management of an Infected Extraction Socket: A Case Report

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Abstract

Localized infection of the extraction socket can compromise bone quality and quantity within the socket and bone support for the adjacent dentition. These events can preclude immediate rehabilitative interventions, such as implant placement, and increase the technical sensitivity of guided bone regeneration procedures for successful tissue and bone gain. The use of local scaffolds containing effective antimicrobial agents may suppress local infection and facilitate the regenerative process related to the introduced bone graft particles and barrier collagen membrane. In this case report, pre-medicated collagen sponges containing chlorhexidine and metronidazole were used in conjunction with a bone graft and collagen membrane for guided tissue and bone regeneration, which was followed by delayed implant placement with 2 years of follow-up evaluations.

Keywords: *Chlorhexidine, extraction socket, guided bone regeneration, infection, metronidazole*

Introduction

Implant-supported restorations have been considered as a viable treatment modality for the rehabilitation of partially edentulous patients.[1-3] Local application of chlorhexidine chips[4,5] and metronidazole gel[6] showed promising results in guided tissue regeneration of periodontal defects. Nonetheless, the application of these two agents for guided bone regeneration of compromised extraction sockets as a preparatory step for future implant therapy has yet to be evaluated. This report presented a case in which pre-medicated collagen sponges containing both chlorhexidine and metronidazole were applied strategically in conjunction with a particulate bone graft and collagen membrane for guided tissue and bone regeneration following extraction of a split mandibular first molar with purulent infection, fistula opening, and severe vertical bony defect of the adjacent second premolar. The quality and quantity of peri-implant bone 2 years after the prosthetic treatment phase was also discussed.

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Case Presentation

A 36-year-old female patient presented to a dental clinic with a chief complaint of tooth mobility and pain in the lower left region of the mouth. A consent was obtained from the patient prior to data collection and treatment. Medical and drug history were non-significant. Tooth #19 presented with a vertical fracture that extended deep below the gingival margin with noticeable mobility of the broken proximal halves. A fistula opening with purulent discharge on pressure palpation was also detected on the buccal gingival tissue. Grade II mobility was noted in tooth #20 and the vitality test revealed a vital pulpal response. Radiographic examination revealed that tooth #19 had a deep fracture line that extended halfway between the cementoenamel junction and the mesial root apex. A large peri-apical/periodontal

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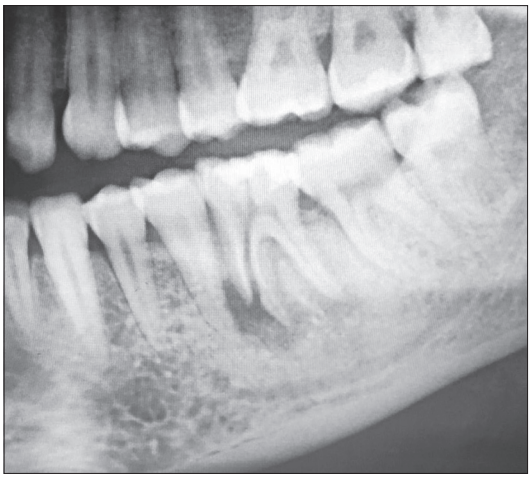

Figure 1: Pre-treatment radiograph indicating split tooth #19 and significant infection around its mesial root and distal root surface of tooth #20

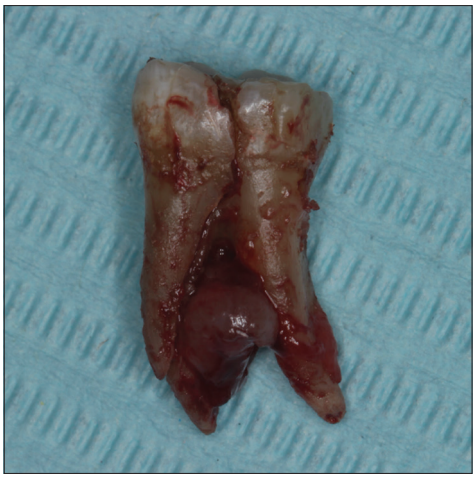

Figure 2: Extracted tooth #19 showing an extension of the fracture line and the size of the radicular granuloma

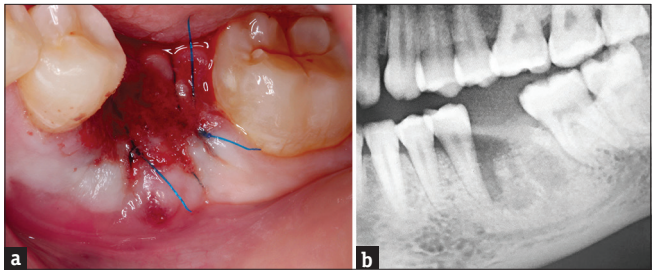

Figure 3: A composite image illustrating (a) surgical closure using the socket seal technique after extraction of tooth #19 and (b) socket fill following extraction with a radiolucent gap on the distal root surface of tooth #20, which represents pre-medicated collagen sponges

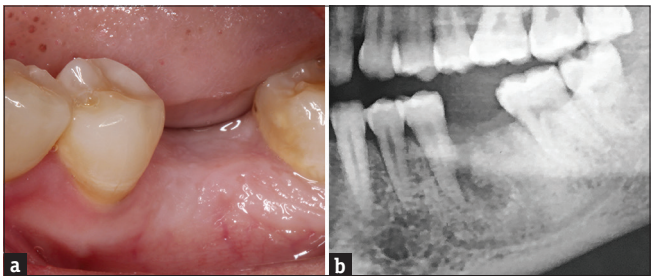

Figure 4: A composite figure illustrating (a) clinical view of site #19 6 months following extraction and GBR procedures and (b) radiographic evaluation of site #19 showing progressive healing and bone fill

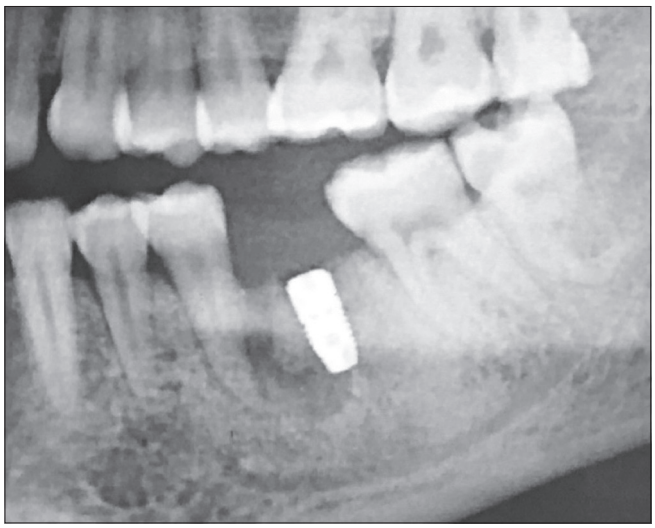

Figure 5: Post-operative view of the implant following placement in a two-stage surgical approach

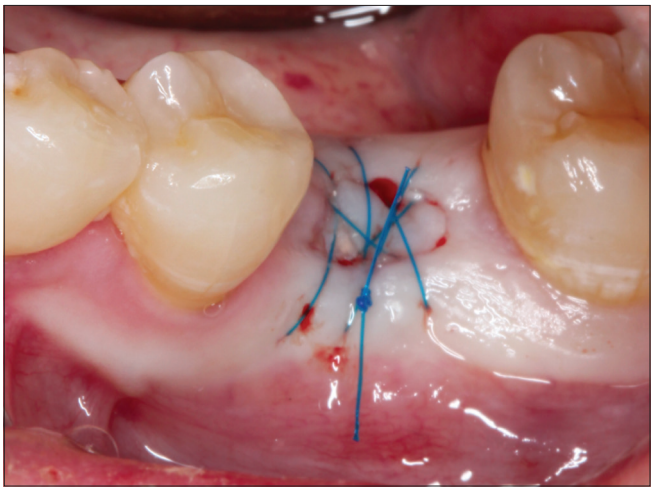

Figure 6: Post-operative clinical view of the implant site following closure of the surgical hole using the excised native soft-tissue

infection was also observed around the fracture area and the distal root surface of tooth #20 [Figure 1].

A treatment plan was formulated that included extraction of tooth #19 with simultaneous guided bone regeneration followed by implant-supported crown replacement. The treatment plan also addressed the infected post-extraction socket and the distal root surface of tooth #20. The treatment plan and consent forms for the publication of this case report were documented and signed by the patient. Tooth #19 was extracted using atraumatic extraction forceps [Figure 2].

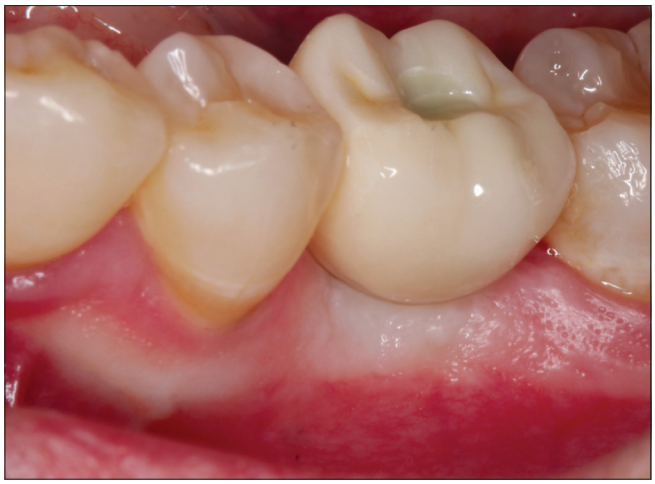

Figure 7: Post-operative clinical view of the screw-retained implant crown following insertion

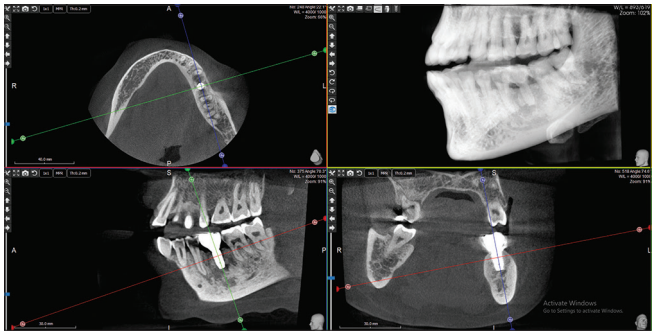

Figure 9: CBCT radiograph obtained the year following completion of treatment, indicating progressive bone gain around the implant and the distal root surface of tooth #20

The extraction socket was thoroughly debrided to remove all granulation tissue and obtain freshly bleeding bone surfaces. The distal root surface of tooth #20 was curetted carefully.

Guided bone regeneration (GDR) was planned for future implant placement. Three pieces of resorbable pre-medicated collagen sponge containing lidocaine, chlorhexidine, and metronidazole (Alvanes, Vladmiva, Belgorod, Russia) were adapted to the distal root surface of tooth #20 to facilitate hemostasis and antimicrobial control of the infected area for proper tissue/bone regeneration of the defect side. A resorbable collagen membrane (T-Barrier Membrane, B&B Dental Implant Co., Italy) was modified according to the size of the socket and was tacked under the buccal flap to ensure stability upon socket management.

An equal-part mixture of small-sized particulate allograft and xenograft bone materials (ACE Surgical Supply, Brockton, MA, USA) was used to fill the rest of the socket. The collagen membrane was then wrapped around to cover the socket and tacked under

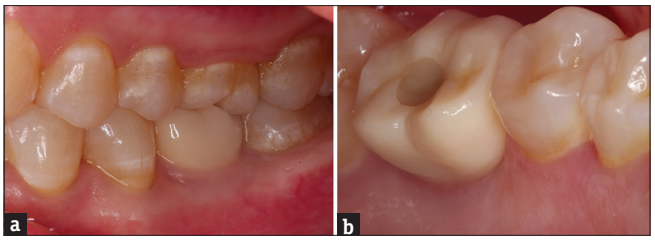

Figure 8: A composite figure illustrating clinical views of the implant-supported crown from the (a) buccal and (b) lingual aspects 2 years after treatment completion

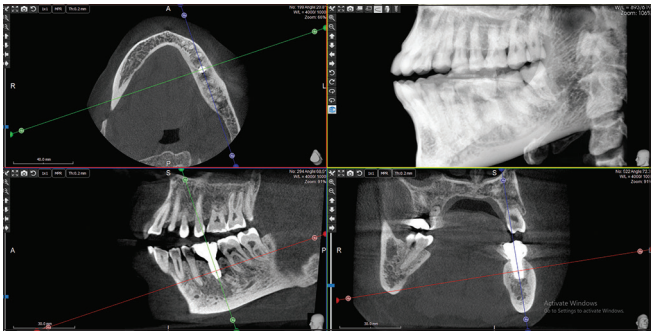

Figure 10: CBCT radiograph obtained 2 years following completion of treatment indicating adequate bone fill and maturation around the implant and distal root surface of tooth #20

the minimally reflected lingual flap. A modified piece of wound dressing collagen tape (HeliTape; Miltex Integra, Princeton, NJ, USA) was used to cover the collagen membrane and tacked under the edges of the buccal and lingual flaps. The site was sutured and cyanoacrylate coating was applied to achieve socket seal [Figure 3a and b]. Antibiotics, anti-inflammatory drugs, and antibacterial mouthwash were prescribed. The patient was recalled for 1, 4, and 6 months for site evaluation. A clinical and radiographic evaluation of the site was performed at the 6-month recall visit to plan for implant surgery [Figure 4a and b].

A flapless and free-hand approach was used to place a 4.2 × 9 implant (Astra Tech Implant EV; Dentsply Sirona, Mannheim, Germany) [Figures 5 and 6]. Healing abutment was placed after 3 months of implant placement, which was followed by impression making and placement of screw-retained implant-supported zirconia crown [Figure 7]. The patient was followed up every 3 months in the first year and every 6 months thereafter. The periodontal condition of tooth #20 improved, and no mobility was noted on recall visits. Post-treatment clinical photographs showed favorable soft-tissue health and level on the buccal and lingual aspects of the implant crown [Figure 8a and b]. Cone-beam Computed Tomography (CBCT) radiographs were taken 1 and 2 years post-treatment and revealed optimum bone quantity and quality around the implant and on the distal root surface of tooth #20 [Figures 9 and 10].

Discussion

This report presents a clinical approach for the application of local pharmaceutical agents in conjunction with standard biomaterials for guided bone regeneration.

Immediate implant placements are contraindicated in cases with purulent socket infection and poor bone configuration following extraction.[7] Subsequently, a more careful approach involving proper implant site preparation before placement is feasible to render favorable implant positioning and angulation as described in this clinical report.

Several biological agents have been reported to supplement the standard biomaterials in expediting healing and improving post-operative results following guided tissue and bone regeneration procedures.[8-10] Despite the clinical efficacy of these agents for regeneration, they are associated with increased treatment costs, and their implementation in clinical practice requires administrative approvals. The application of readily available agents such as pre-medicated collagen sponges may overcome these obstacles to supplement readily successful biomaterials for regenerative therapies.

Clinical studies reported that local application of chlorhexidine chips[4,5] and metronidazole gel[6] separately corrected the bony defects when used along with other biomaterials used for guided tissue regeneration. However, the current literature lacks a study outlining the effects of the combined application of these agents in tissue and bone regeneration procedures. The present report utilized a pre-medicated collagen sponge that contained both active agents in a scaffold form, which facilitated convenient manipulation and adaptation during the surgical procedure and ensures the local release of these agents during the healing process of tissue and bone regeneration.

Conclusion

Within the limitations of this clinical report, the findings of this report suggest that the application of pre-medicated collagen sponges containing chlorhexidine and metronidazole can help control local infection and facilitate significant tissue and bone regeneration in a compromised socket.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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