Case Report

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Socket Preservation: A Foregoing Approach for Future Implant Placement

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ABSTRACT

Background: Significant changes in bone volume and morphology following tooth extraction can make implant rehabilitation very difficult and these changes increase as the time from extraction to implant placement increases. The extraction socket preservation technique conserves the alveolar architecture and prevents hard and soft tissue collapse that minimizes the necessity for future augmentation procedures. Many techniques have been discovered for socket preservation which allows the dentist to place the implant in extraction sites that were thought to be compromised. Recently, to reinstate alveolar bone loss and to support efficient placement of dental implants many different bone substitute such as autografts, allografts, xenografts, synthetic biomaterials and osteoactive agents have been proposed. The aim of this case report was to evaluate the aptitude of bioactive glass with collagen membrane in the socket preservation for the development of ideal future implant site.

Keywords: Bioactive glass, Collagen, Dental implant.

INTRODUCTION

Soft tissue contour depends on the basic bone anatomy. Following tooth extraction, sockets undergo a remodeling process that influences the implant rehabilitation treatment of the edentulous areas[1]. Alveolar bone loss may occur due to a diversity of factors such as periodontitis, aggressive manipulation during extractions, endodontic pathology and facial trauma. Most extractions are done with no regard for maintaining the alveolar ridge. Extraction of tooth and succeeding healing of the socket frequently results in osseous abnormalities of the alveolar ridge, including decreased height and width of the residual ridge[2,3]. The severity of the healing form may pose a problem for the clinician in 2 ways: one it creates an esthetic problem in the fabrication of a restoration supported by implant or in the construction of a conventional prosthesis; and it may make the placement of an implant perplexing.[4] However, it is possible to minimize such glitches by simply carrying out ridge preservation procedures in extraction sockets using grafting materials with or without barrier membranes[5,6].

Prevention of alveolar bone loss post-extraction was first described by Greenstein (1985) and Ashman and Bruins (1985). Cohen (1988) was the first to coin the term socket preservation, a technique planned for prosthetic socket maintenance, ridge preservation, and ridge augmentation. Basic socket preservation, although similar in all cases, varies with the method of socket closure. As a result, there are a number of different socket preservation procedures namely:

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1. Connective tissue graft (Langer and Calangar, 1980)
2. Socket seal or free gingival graft (Landsberg and Bichacho, 1994)
3. Bio-Col or resorbable hemostatic plug technique (Sklar, 1999)
4. Guided bone regeneration
   a. Nonresorbable membrane
   b. Resorbable membrane
   c. Normal restorability (4–6 weeks)
   d. Extended restorability (4–6 months)
5. Alloderm or acellular dermal graft (Misch, 1998)
6. Prosthetic "pontic" socket plug
   a. Removable (Misch, 1998; Kois and Kan, 2001)
   b. Fixed (Kois, 1998; Spear, 1999; Sklar, 1999)
7. Combination epithelialized subepithelial connective tissue graft (Stimmelmayr 2010)
8. Modified socket seal surgery with composite graft approach (Misch and Misch, 1999)

To preserve bone at the future implant site socket preservation techniques have been employed, also known as *socket seal surgery*, which involve the placement of different bone graft materials in the socket[7,8]. The literature also confirms that socket grafting can considerably reduce early bone loss[9,10].

CASE REPORT

A 42 year-old female with a noncontributory medical history, presented to Department of Periodontics with a fractured tooth. Clinical examination showed tooth 47 with vertical fracture. The prognosis of this tooth was hopeless so extraction was advised, followed by socket preservation procedure keeping in mind future implant rehabilitation.

Patient's vital signs were determined and assessed before surgical treatment. To minimize vasoconstriction, a local anesthetic (lidocaine 2%), with minimal epinephrine concentration, i.e. a maximum of 1:100,000, was administered in the extraction site. A sharp #15 surgical blade was used to sever the dentogingival and dentoalveolar connective tissue fibers around 47.

To minimize the mechanical pressure and trauma to the alveolar bone, a slow and gentle rotating force was used while extracting the tooth.

Thumb support against the labial aspect of the alveolus and a check on the state of the soft tissue walls of the fresh extraction socket was done to ensure intactness. The fresh socket was debrided of granulation tissue and residual periodontal ligament fibers followed by a thorough evaluation of the remaining bony socket.

Fig 1: Bone graft placement.

Fig 2: Collagen membrane placed.

Fig 3: Bone formation after 6 months.

Fig 4: Six month post-operative radiograph.

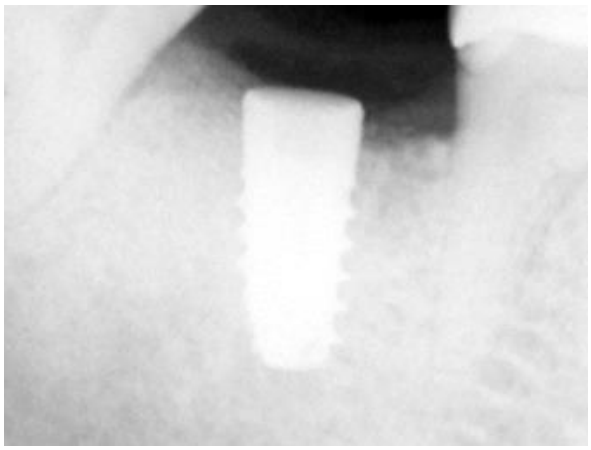

Fig 5: Implant placement done.

Fig 6: Prosthesis placement done.

Following the extraction, an osteoconductive bone graft (PerioGlas®) was placed in extraction site (Figure 1). A resorbable collagen membrane was positioned on the buccal aspect of the extraction socket, with an exposed membrane left at the occlusal aspect of the grafted site (Figure 2). Periodontal dressing was placed over the surgical area and antibiotics and oral analgesics were prescribed. A 0.2% chlorhexidine mouthwash was prescribed every 12 hours for 2-week duration post-surgically. Patient was instructed not to use a toothbrush or mechanical cleansing at the surgical area and only a soft diet was advised for the first 2 weeks of the healing process. Sutures were removed after 14 days of surgery and healing was found to be satisfactory with no bone graft exposed in the oral cavity. The patient did not report any untoward consequences. The patient was assessed after 3 months and 6 months.

After six months a good bony healing was noticed both clinically (Figure 3) and radiographically (Figure 4) that allowed the placement of a regular platform implant (Figure 5) within the bony envelope, and a good primary stability was achieved. A period of 4 months passed to permit osseointegration, afterwards the patient present for final impression. The final restoration showed healthy surrounding soft tissues (Figure 6).

DISCUSSION

The failure to preserve the anatomy of hard and soft tissues usually results in esthetic failures and compromises the final results. Socket preservation provides greater control and predictability in preventing site collapse and esthetic compromise. It is a simplified, minimally invasive regenerative approach for optimizing the preservation of the hard and soft tissue components of the alveolar ridge immediately following tooth extraction[11].

Various grafting materials have been used to preserve the socket before implant placement like autograft, allograft, xenografts, alloplasts.

PerioGlas® which is a synthetic absorbable osteoconductive bone graft substitute composed of a calcium phosphosilicate bioactive glass was used in this study. The particles of the graft are irregular in form, measuring from 90-170µm.

Bioactive glass composes of 46.1 mol% SiO_2, 26.9 mol% CaO, 24.4 mol% Na_2O, and 2.5 mol% P_2O_5[12]. Bioactive glass forms a carbonated hydroxyapatite layer on their surfaces once exposed to simulated body fluids or implanted in vivo. It has been theorized that these bioactive properties guide

and promote osteogenesis, allowing rapid formation of bone.

In histologic study, Froum et al compared bioactive glass and demineralized freeze dried bone allograft (DFDBA) in extraction sockets. More vital bone (59.5%) in bioactive glass grafted socket at 6-8 months than DFDBA treated sockets was observed (34.7%)[13].

Schepers et al in 1998 conducted a study to analyze the efficacy of narrow size range bioactive glass particles for the treatment of bone defects prior to implant placement. Partial edentulous areas were created on both sides of the mandible of six beagle dogs. Bioactive glass particles were immediately packed on one side and other side was left vacant as a control. Analysis revealed that more bone tissue and increased remodeling activity at the interface was seen in the implants placed in bioactive glass treated areas which was statistically more significant as compared to implants placed in untreated regions[14].

Antonietta M. Gatti et al investigated the ability of PerioGlas® in the socket preservation.. Granules of the PerioGlas® exhibited a biodegradation involving precipitation of calcium phosphate which works as a scaffold for osteoblasts colonization. All cases studied revealed the bioactivity of these granules resulting in formation of new bone and biodegradation of the glass. After 2 years of clinical follow-up, all the implants were efficaciously loaded and seemed stable[15].

Arthur et al evaluated the effectiveness of an acellular dermal matrix material as a membrane to cover the implant and a bioactive glass as a grafting material in case of immediate implant placement in the extraction socket. After 6 months, they found that the mineralized tissue had completely occupied the defect around the implant[16].

Resorbable barriers were used to cover the graft material which are biocompatible, exhibit multidirectional strength and tear resistance, easy to use and possess adequate cell occlusiveness to promote osteoblasts proliferation while excluding gingival cell invasion. The use of an occlusive membrane eliminates the problem of particle migration while simultaneously preventing epithelial and soft tissue migration into the socket. It also prevents external ridge resorption in the early healing period[17].

Collagen membrane was used in this study as a resorbable barrier. According to Cardaropoli et al socket preservation using bovine bone mineral and porcine collagen membrane improved ridge height and width dimensions when compared to extraction alone[17].

In another study, socket preservation with FDBA and a collagen membrane results in less amount of vertical and horizontal bone loss than extraction alone[18].

CONCLUSION

Loss of teeth often result in hard and soft tissue collapse, therefore the preservation of bone volume is of major importance in order to ensure the proper implant and esthetic rehabilitations. Today the commonly used method for ridge preservation procedure is a bone graft material placed in the extraction socket and covered by a cross or non-cross linked membrane followed by complete or partial flap closure. The decision to use socket preservation technique should be made on a case-by-case basis. Surgeons should be familiarized with the wide array of techniques and materials used in order to optimize and preserve the anatomy of bone and soft tissues.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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