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Case Report

Socket preservation using gelatin hydrogel: A case report with radiographic analysis

Bhukya Vanitha^{1,*}, Mahith Vangala², Akshay Kumar K³, Dibakar Sutradhar⁴,
Chalamala Naga Sai Sahithi⁵, Vinayaka Ambujakshi Manjunatha⁶

¹Dept. of Dental Surgery, MGM Hospital Kakatiya Medical College, Warangal, Telangana, India

²Dept. of Public Health, Cape Breton University, Sydney, Nova Scotia, Canada

³University of Agricultural Science, Raichur, Karnataka, India

⁴Dept. of Oral Surgery, Srinivas Institute of Dental Sciences, Mangalore, Karnataka, India

⁵Bapuji Dental College and Hospital, Davanagere, Karnataka, India

⁶Dept. of Periodontology, PMNM Dental College & Hospital, Bagalkot, Karnataka, India



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ABSTRACT

The case report aims to evaluate radiographically a new bone formation in extraction sockets augmented with gelatin gel. 16 was extracted atraumatically and then gelatin gel was grafted in the extraction socket. The margins were closed with periosteal releasing incision (closed-membrane technique). The implant was placed after 4 months of healing. Wound healing was unremarkable. radiographically, the bone reformation was observed in relation to 16. Immediate graft after extraction using gelatin gel is recommended for socket preservation.

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1. Introduction

Post extraction Volumetric changes in the residual alveolar edge are constantly expected. Complex exodontic modalities might result in progressive alveolar bone loss.¹ Botticelli et al. attributed that there will be a rapid rate of bone resorption in the buccal plate of alveolar bone in comparison with the lingual plate.² Assuming that the conservation of the remaining alveolar ridge prevails at the hour of the tooth extraction helps unremarkable implant treatment.³ the long-term functional and esthetic stability of the implants necessitates vivacious sustenance of both hard & soft tissues.

Various grafting materials such as bovine bone matrix, hydroxyapatites (HAs), and bioglasses have been also introduced to forestall the breakdown of hard and delicate

tissues encompassing the alveolar socket and balance out the blood supply.⁴ Although the utilization of autogenous bone graft to repair bone deformities is referenced as a brilliant norm, its sources are restricted, with additional complications such as bleeding, pain, and infection.^{3,4}

Scientists are still researching for reasonable bone elective materials to overcome the hurdles such as the absence of autogenous bone, surgical instruments, and restricted accessible bone volume. 9 Gelatin is a characteristic, biocompatible, biodegradable, and multi functional biopolymer. In the medico pharmaceutical field, gelatin is right now utilized as a grid for Implants, medicinal gadget coatings, and as a stabilizer in immunizations.^{5,6}

Gelatin has also proven its osteoconductive efficacy with radiographic and histologic evidence. The goal of this clinic-radiographic experiment is to assess enhanced socket sites utilizing gelatin gel using the radiographic and

* Corresponding author.

E-mail address: drvanithamdsasstprof@gmail.com (B. Vanitha).

histological examination.

2. Case Report

2.1. Methods

2.1.1. Preparation of gelatin gel.⁵

Nippi, Inc. (MediGelatin®, HMG-BP, Tokyo, Japan) generously provided gelatin having an isoelectric point of 5.1. At 60°C, aqueous gelatin (5 wt%) was made by combining gelation granules and water. After the gelatin granules were completely dissolved in the water, glycerol (10 wt%) was added to the gelatin solution to promote gelation.

2.1.2. Surgical technique

Manual curettage was used to remove any soft tissue or inflammatory tissue in the extraction socket. Gentle compression was used to graft sticky gelatin gel into the socket. With a periosteal release incision, the wound was closed with a 3-0 silk suture (closed-membrane technique). After 4 months of healing, the full-thickness flap was raised to expose the augmented socket site and to prepare the osteotomy for implant placement. Following sequential drilling and wound closure using catgut 4-0 suture, the implant was inserted.

2.1.3. Class I extraction socket preservation with gelatin gel⁶

A 37-year-old male patient presented with a grade III mobility of about 16. The patient asked for a fixed implant-supported repair. The patient was healthy with the American Society of Anesthesiologists 1 and 2 (healthy patients or patients with controlled systematic diseases). All patients were informed and documented consent was obtained for a treatment procedure, radiographic analysis, and technique for restoration. Atraumatic extraction was conducted under local anesthetic with 2% lidocaine (1:100,000 epinephrine). Class, I extraction socket was found irt 16 (4-wall defect, intact bony housing, no wall involvement)(Figure 1) Gelatin gel was grafted and sutured on the defect (Figures 2 and 3). After 4 months of the healing period(Figure 4), the patient returned with an uneventful healing site.

3. Results

3.1. Clinical findings

From a clinical perspective, the present case was healed uneventfully. The socket location resulted in satisfactory bone growth for implant implantation four months following the first graft using gelatin gel. With initial stability of more than 25 Ncm, favorable ridge augmentation was obtained for implant engagement.

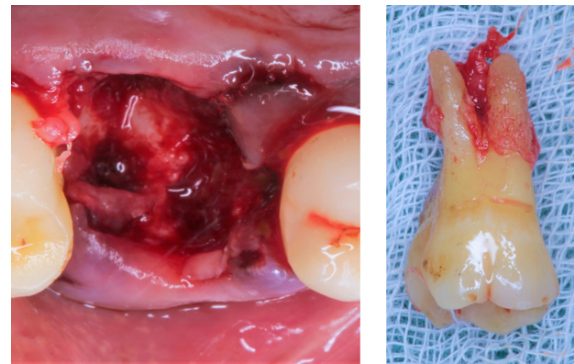


Fig. 1: Class I extraction socket irt 16 (4-wall defect, intact bony housing, no wall involvement)

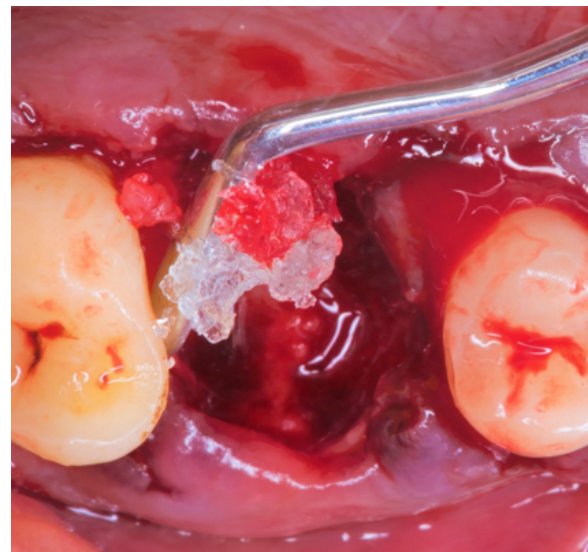


Fig. 2: Gelatin gel was grafted

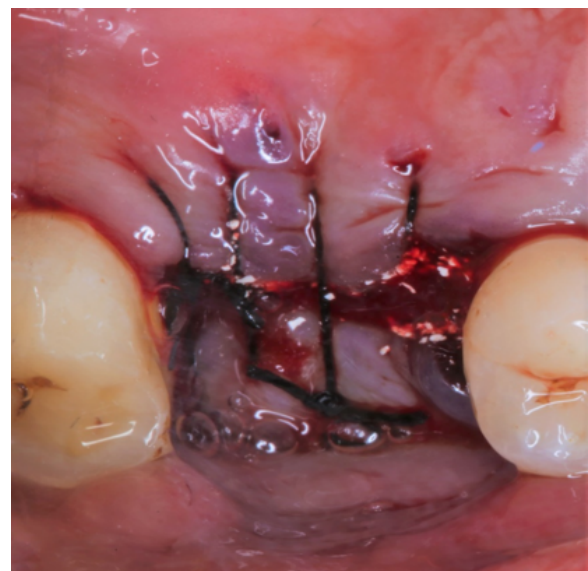


Fig. 3: 3-0 silk simple interrupted sutures placed



Fig. 4: After 4 months of the healing period

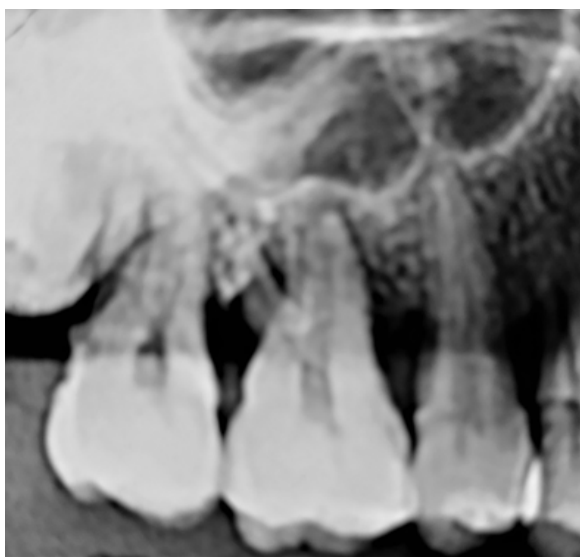


Fig. 5: Pre-op IOPA of 16



Fig. 6: 04 months post-op IOPA of 16

3.2. Radiographic findings(Figures 5 and 6)

Intraoral periapical radiograph of 16 reveals a radio-opacity, postoperatively 4 months suggestive of new bone formation.

4. Discussion

Significant hard and soft tissue changes occur in alveolar bone after extraction^{7,8} Overall resorption of the horizontal alveolar ridge has been reported by 50%.⁹ Preventing alveolar bone resorption after extraction is crucial to reduce the amount of bone augmentation that may be required during future implant therapy.

Socket preservation is a surgical treatment that aims to save alveolar bone following tooth extraction. To eliminate or minimize the need for bone augmentation during implant restorations.¹⁰ The alveolus preservation of the socket is a procedure that involves the usage of bone grafts or bone substitutes /with or without membranes.¹¹ Bone graft materials used in periodontal and Oro maxillofacial surgery can be classified into autografts, allografts, alloplastic and xenografts.¹²

Autografts are strongly favored due to their osteoinductivity, osteoconductivity and osteogenicity.¹³ However, there are factors to consider such as limited availability or the need for a secondary donor site, graft resorption, and high cost.¹⁴ Other graft materials such as bovine bone, allogeneic or synthetic bone have been used as an alternative to bone augmentation. However, the materials are only osteoconductive and act as an anatomic framework for osteoblasts to lay down and form bone.

Gelatin and its analogs, mainly the hydrogels are getting a lot of attention. Shuai Yuan et al. attributed the positive results from nano gelatin hydrogel (NGH) & NGH + injectable platelet-rich fibrin in Ridge preservation with early angiogenesis and osteogenesis in an animal study.¹⁵

A study conducted by A. Leucht et al., with an all-gelatin-based toolbox of methacrylate-modified gelatin (GM), non-modified gelatin (G), and acetylated GM (GMA) exhibited the deposition of bone matrices associated proteins like collagen type I, fibronectin, and alkaline phosphatase within the 30-day culture. Suggestive of osteoinductive and conductive property of gelatin.¹⁶

As our case report is the denovo trial involving gelatin hydrogel as a bone substitute in the socket preservation technique, there are a few limitations are there in terms of sample size and advanced parameters like cone beam computed tomography for a better radiological assessment. Even the histological analysis of the bone structure would have been a great asset.

5. Conclusion

With all the aforementioned limitations I would suggest the gelatin hydrogel to consider as a bone substitute with an added advantage of affordability, fewer chances of rejection,

and no secondary surgical site.

6. Source of Funding

None.

7. Conflict of Interest

None.

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Author biography

Bhukya Vanitha, Periodontist

Mahith Vangala, Dental Consultant

Akshay Kumar K, Ph.D Scholar

Dibakar Sutradhar, Senior Lecturer

Chalamala Naga Sai Sahithi, Internee

Vinayaka Ambujakshi Manjunatha, Assistant Professor

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