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Case Study

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MANAGEMENT OF EXTRACTION SOCKET USING STICKY BONE MADE USING DEMINERALISED DENTIN MATRIX AND A-PRF MEMBRANE: A CASE REPORT

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INTRODUCTION

One of the goals of periodontal treatment is to maintain the teeth in good condition to provide health, function and aesthetics to the patients.[1] There are several options to give to the patients as an alternative to replace the extracted teeth, from removal to fixed dental prosthesis, from implant to adhesive fixed prosthesis, each of them with good results in terms of survival rates with long term follow-ups according to the literature, when well indicated.[2,3,4]

Socket preservation is born as a procedure to prevent or more properly, limit the alteration of the post extraction bone crest as a function of an optimal implant prosthetic rehabilitation (Jung 2009, Arauho and Lindhe 2005, Fickl et el 2008). Socket preservation is necessary for the functional and aesthetic prosthesis maintenance.

Proper bone volume or osseo-integration is required for the primary stability of the implant which can be obtained by maintaining the bone volume after the extraction of tooth. If there are severe bone defects near the socket, it will hamper the primary stability of implant which will further affect the osseo-integration.[5]

In a systematic review of 2009 by Darby et al, nine different methods of ridge preservation were evaluated. Among these, the most common was the grafting of biomaterial with membrane and the flap of advancement to partially or totally cover the alveolus. The second provided for the biomaterial grafting only. The third is a membrane with a first intention closure with a flap. The other method includes different combinations of graft materials.

We know that healing process of the alveolar bone after an extraction is divided into two phases, in the first the bundle bone is quickly reabsorbed and replaced by woven bone with a consequent volumetric reduction in vertical direction, in the second phase the external surface of the alveolar bone is reabsorbed causing a horizontal contraction.[6]

Socket preservation aims to limit this contraction as much as possible, as a function of implant-prosthetic rehabilitation that would otherwise be difficult or less effective.[7] For this, autologous graft possessing the properties of osteogenesis, osteoinduction, and osteoconduction is considered gold standard.[8]

Recently, it has been demonstrated that dentin has both osteo-conductive and osteo-inductive potential.[9,10] Investigators have used dentin as bone fillers or volume maintainers in sinus augmentation as well as guided bone regeneration.[11, 12]

There are several benefits to using autologous dentin for socket preservation. Firstly, it is a natural and biocompatible material, reducing the risk of rejection or infection. It also has the potential to stimulate bone growth, leading to better preservation of the socket and surrounding bone. Additionally, using autologous dentin eliminates the need for a separate bone graft procedure, making the process more efficient and cost-effective.

CASE REPORT

A 45 years old male patient with non-contributory medical history reported to the department of Periodontics of Pandit Deendayal Upadhyay Dental College and Hospital, Solapur with a chief complaint of pain in lower right back region of jaw since 2 months.

A pre- operative radiograph was taken which showed the irregular radiolucency involving distal root of second molar and mesial root of third molar suggestive of peri-apical infection and alveolar bone resorption.

Different treatment options were given to the patient and accordingly the patient opted for extraction and later consented for the implant.

Informed consent was procured from the patient and required blood investigations were conducted. After obtaining all the reports of blood investigation a thorough scaling and root planning procedure was done

two weeks prior to the surgery proceeded by antibiotic therapy.

On the day of the surgery local anaesthesia was administered to the patient. The tooth was luxated with the help of periosteal elevator followed by its extraction with the help of an extraction forcep. Surgical site curettage was performed. It was then irrigated with povidone- Iodine I.P.5% w/v (Betadine) and saline.

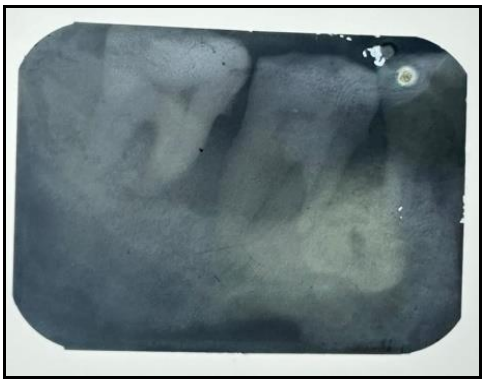
The extracted tooth was washed thoroughly. All the calculus over the tooth was removed and cleaned up properly.

The dentin grinding device (Smart Dentin Grinder, KometaBio) was used to process the tooth which was dried using a sterile gauze piece.

The graft particles in the range of 250 µm to 1200 µm were produced through the processing of the tooth in the dentin grinder. The cleanser (Dentin Cleanser, Kometabio) of sodium hydroxide in 20% ethanol with a high pH (very basic) was added into the graft particles. This helped to eliminate remaining organic material and any bacteria. The cleanser is removed after 5 minutes with the help of a sterile gauze piece. This step helped to eliminate the moisture. Now, to partially demineralize the graft particles ethylene di-amine tetra acetic acid (EDTA) was used which caused the revealing of more collagen and hence leading to a better site activation in the process of healing.

The mixture was followed by addition of dentin wash (Dentin Wash, Kometabio) containing phosphate-buffered saline. The mixture was then kept aside for a few seconds to set. A sterile gauze piece was used to remove the liquid wash after the second soaking process.[13]

The prepared dentin graft was mixed with blood and ringer lactate to make sticky bone. It was followed by the filling of the socket with the autologous dentin graft and to improve handling of the material, the autologous dentin graft particles were covered with A-PRF membrane (Duo Quattro PRF Centrifuge machine). 3-0 silk suture was used for primary closure of flap. Post-operative instructions were given to patients and immediate post-operative radiograph was recorded. The patient was then recalled for follow up after 7 days for the conclusive treatment.



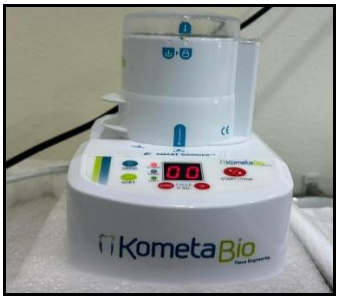
Pre-operative radiograph

Tooth #37

Extraction using forcep

Extracted Tooth

Thoroughly cleaned extracted tooth



Kometabio Dentin Grinder

Disinfection liquid solutions: unique basic alcohol dentin cleanser (red cap), EDTA (ethylene diamine tetra acetate, blue cap), and PBS (phosphate-buffered saline, green cap).

Dentin Graft sorted as per particle size

Graft Placement Done #37

PRF Membrane Prepared

PRF Membrane Placed

3-0 Silk Sutures Placed

Follow Up at Baseline

Follow Up after 3 Month

DISCUSSION

Exodontia is a traumatic procedure that often results in the destruction of soft tissue and alveolar bone. Alveolar ridge preservation is one of the most critical competencies in advanced dentistry after exodontia.[14]

Alveolar ridge preservation is a relatively new surgical procedure aimed at retaining maximum bone and soft tissue after a tooth has been removed. Socket preservation is necessary to maintain the bone volume for maintenance of aesthetic and functional requirement.

Selection of graft material should have the following properties: a) Osteo-conductive properties acting as a scaffold for bone regeneration, b) Osteo-inductive properties instigating accelerated bone regeneration and healing dynamics.[15]

Urist and co-workers carried out several studies to regenerate bone using tooth as a graft material. Due to the composition and the bone formation capacity, the tooth is ideal for reconstructing some defects, both vertical and horizontal.

In different hard tissue deficiencies, because of their properties of osteo-genesis, osteo-induction, and osteo-conduction, autogenous grafts are considered as gold standard.[16]

The shape of the alveolar ridge may be affected by both internal and external changes during the healing of an extraction socket.[17]

Since 100% socket fill does not occur as implied by many studies, the regeneration of the bone to the level of the neighbouring teeth or to the level of bone crest does not happen during healing.[18]

Based on finding reported in both experimental and clinical literature as well as outcome observed in various studies involving the use of different types of hard tissue derivatives for packing bone defects, both viable and nonviable. it seems that fresh autologous bone containing viable osteogenic cells remain unparelled in terms of superiority.[19]

The use of autogenous dentin grafts, prepared using the Smart Dentin Grinder (SDG) procedure, offers several advantages over other types of bone graft materials. Kim et al. introduced the concept of using extracted teeth as a source of bone graft material to overcome the limitations of allografts, xenografts, and synthetic grafts.[20]

In a study conducted by Young-Kyun Kim et al. (2010), a groundbreaking bone grafting material was developed by incorporating autogenous teeth. This innovative approach laid the foundation for its clinical application. The study concluded that the autogenous teeth experienced gradual resorption and were subsequently replaced by new bone of exceptional quality through the processes of osteoinduction and osteoconduction.[20]

In 2013, Young-Kyun Kim, Junho Lee et al. conducted a study to develop an ideal bone substitute that meets the gold standard. They choose tooth as a donor site for evaluating its potential as a bone substitute due to its similar chemical composition to alveolar bone. Previous studies had already evaluated the inorganic components of the autogenous tooth bone graft material (AutoBT) and its osteo-conductivity. Building on these studies, the researchers analyzed the organic components and evaluated the osteo-inductivity of AutoBT. They concluded that AutoBT induced new bone formation through the action of non-collagenous proteins (NCP) embedded in dentin.[20]

Autogenous dentin grafts are biocompatible, osteo-inductive, and osteo-conductive due to the presence of hydroxyapatite, and have osteogenic properties. Additionally, they do not elicit an immunological response and are cost-effective. However, there are limitations to consider, such as the requirement for a physiologically non-functional or root canal treated tooth, technique sensitivity during preparation, and the need for special armamentarium. Overall, the benefits of using autogenous dentin grafts outweigh the limitations, making them a valuable option for socket preservation procedures.

CONCLUSION

Socket preservation using dentin graft seems to have yielded positive results in the present case series. It is important to continue monitoring and conducting further research to validate these findings. The results encourage the use of autologous dentin graft plug with PRF membrane as a suitable alternative for extraction socket preservation. This could potentially provide a more effective and natural option for preserving socket integrity after tooth extraction. Further research and clinical studies will be important to confirm its efficacy and safety in broader context. While the present case report only utilizes a radiovisiography for all the measurements, incorporating direct clinical measurements and cone beam computed tomography would indeed provide a more comprehensive and accurate assessment of the outcome. This approach can offer a more complete picture of the socket preservation technique's effectiveness and help confirming the radiographic findings.

REFERENCES

1. Chapple IL, Wilson NH. Manifesto for a paradigm shift: periodontal health for a better life. Br Dent J., 2014 Feb; 216(4): 159-62. [Medline: 24557384] [doi:10.1038/sj.bdj.2014.97]
2. Ricardo Faria-Almeida, Inesa Astramskaite-Januseviciene, Algirdas Puisys, Francisco Correia Extraction Socket Preservation with or without Membranes, Soft Tissue Influence on Post

Extraction Alveolar Ridge Preservation: a Systematic Review J Oral Maxillofac Res, 2019; 10(3): e5. doi:10.5037/jomr.2019.10305.
3. Ali Z, Baker SR, Shahrbaf S, Martin N, Vettore MV. Oral health-related quality of life after prosthodontic treatment for patients with partial edentulism: A systematic review and meta-analysis. J Prosthet Dent, 2019 Jan; 121(1): 59-68.e3. [Medline: 30006220] [doi:10.1016/j.prosdent.2018.03.003].
4. Wolleb K, Sailer I, Thoma A, Menghini G, Hammerle CH. Clinical and radiographic evaluation of patients receiving both tooth- and implant-supported prosthodontic treatment after 5 years of function. Int J Prosthodont, 2012 May-Jun; 25(3): 252-9.[Medline: 22545254].
5. Heinemann F, Hasan I, Bourauel C, Biffar R, Mundt T. Bone stability around dental implants: Treatment related factors. Ann Anat, 2015; 199: 3-8.
6. Ivan Darby, BDS, PhD, FRACDS (Perio)1/Stephen T. Chen, BDS, MDSc, PhD2/Daniel Buser, DMD, Dr Med Dent: Ridge Preservation Techniques for Implant Therapy The International Journal of Oral & Maxillofacial Implants, 2009; 24(SUPPL): 260–271.
7. Barone A., Ricci M., Tonelli P., Santini S., Covani U. Tissue changes of extraction sockets in humans: A comparison of spontaneous healing vs. ridge preservation with secondary soft tissue healing. Clin. Oral Implant. Res, 2013; 24: 1231–1237. doi:10.1111/j.1600-0501.2012.02535. x.
8. Dimitriou R, Jones E, McGonagle D, Giannoudis PV. Bone regeneration: current concepts and future directions. BMC Med, 2011; 9: 66.
9. Iasella JM, Greenwell H, Miller RL et al. Ridge preservation with freeze-dried bone allograft and a collagen membrane compared to extraction alone for implant site development: a clinical and histologic study in humans. *J Periodontol*, 2003; 74(7): 990–999.
10. Barone A, Aldini NN, Fini M, Giardino R, CalvoGuirado JL, Covani U. Xenograft versus extraction alone for ridge preservation after tooth removal: a clinical and histomorphometric study. J Periodontol, 2008; 79(8): 1370–1377.
11. Jeong KI, Kim SG, Kim YK, Oh JS, Jeong MA, Park JJ. Clinical study of graft materials using autogenous teeth in maxillary sinus augmentation. Implant Dent, 2011; 20(6): 471–475.
12. Kim YK, Lee HJ, Kim KW, Kim SG, Um IW. Guide bone regeneration using autogenous teeth: case reports. J Korean Assoc Oral Maxillofac Surg, 2011; 37(2): 142–127.
13. Binderman I, Hallel G, Nardy C, et al. A novel procedure to process extracted teeth for immediate grafting of autogenous dentin. J Interdisciplinary Medicine and Dental Science, 2014; 2: 1-5.
14. Elayah SA, Younis H, Cui H, Liang X, Sakran KA, Alkadasi B, Al-Moraissi EA, Albadani M, Al-Okad W, Tu J and Na S (2023) Alveolar ridge preservation in post-extraction sockets using concentrated growth factors: a split-mouth, randomized, controlled clinical trial. Front. Endocrinol, 14: 1163696. doi:10.3389/fendo.2023.1163696.
15. Robert A. Horowitz, DDS; Gregori M. Kurtzman, DDS, MAGD; and José Luis Calvo-Guirado, DDS, PhD, Eu PhD, MS utilization of bioactive dentin for guided bone regeneration as a part of implant treatment: Compendium, June 2022; 43(6).
16. Chiapasco M, Zaniboni M, Boisco M. Augmentation proce-dures for the rehabilitation of deficient edentulous ridges with oral implants. Clin Oral Implants Res, 2006; 17(2): 136-159.
17. Darby ST, Chen and Buser D. Ridge preservation techniques for implant therapy. The International Journal of Oral & Maxillofacial Implants, 2009; 24: 260-27.
18. D M.G.Ara´ ujo, Lindhe J. Ridge alterations following tooth extraction with and without flap elevation: an experimental study in the dog. Clinical Oral Implants Research, 2009; 20: 545-549.
19. J. D. Yeomans and M. R. Urist induction by decalcified dentine implanted xnto oral, osseous and muscle tissues. Archs 04 Biol. Vol.12, pp.YYY-1008, 1967. Pcrgamon Press Ltd. Printed in Cit. Britain.
20. Alejandra del Canto-Díaz, Joaquín de Elío-Oliveros, Mariano del Canto-Díaz, Miguel-Angel Alobera-Gracia, Mariano del Canto-Pingarrón, Jose-María Martínez-González: Use of autologous tooth-derived graft material in the post-extraction dental socket. Pilot study. Med Oral Patol Oral Cir Bucal, 2019 Jan 1; 24(1): e53-60.