International Journal of Chemical and Biochemical Sciences
(ISSN 2226-9614)

Journal Home page: www.iscientific.org/Journal.html

Layered Bone Grafting Approaches for Socket Preservation in Mandibular Molar Site: A case Report

Nourhan Alaa El Din Akl [(1) *], ***Hala Ahmed Abuel-Ela*** [(2)], ***Doaa Adel-Khattab*** [(3)], ***Tarek Mahmoud El Tayeb*** [(4)]

[(1) *] *Assistant lecturer of Periodontology, department of oral medicine, faculty of oral and dental medicine, Misr international university (MIU)*[*], *Egypt*

[(2)] *Professor of oral medicine, periodontology and diagnosis, faculty of dentistry, Ain Shams University (ASU), 20 Organization of African Union St., Cairo, 1156, Egypt*

[(3)] *Associate Professor of oral medicine, periodontology and diagnosis, faculty of dentistry, Ain Shams University (ASU), 20 Organization of African Union St., Cairo, 1156, Egypt*

[(4)] *Associate Professor of oral medicine, periodontology and diagnosis, faculty of oral and dental medicine, Misr international university (MIU), Egypt*

Abstract

A 35-year-old woman presented to the dental clinic complaining of pain in lower right quadrant. Clinical and radiographic (CBCT) examination revealed badly decayed 46 with periapical pathosis. Atraumatic tooth extraction was performed using a periotome, followed by thorough curettage to remove periapical pathosis. Augmentation of the extraction socket done through placement of deep collagen layer, xenograft then sealing of the socket using collagen membrane. Bone width was assessed clinically by using bone caliper and radiographically through CBCT at the time of extraction and 4 months after the procedures. Alveolar ridge preservation using layering technique results in less bone resorption maintaining the tissues for implant placement.

Keywords: infected socket, alveolar ridge preservation, xenograft

Short communication *Corresponding Author, e-mail: Nourhan.Akl@miuegypt.edu.eg, Doi # https://doi.org/10.62877/2-IJCBS-26-29-23-2,
Submitted: 02-01-2026; Accepted: 29-01-2026; Published: 01-03-2026

1. Introduction

One of the dilemmas that we face in dentistry is replacing an extracted tooth. Following tooth extraction, the alveolar process becomes atrophied creating a prosthetic challenge to restore such area in an attempt for it to resemble the natural dentition [1]. The healing of the extraction socket is uneven; bone resorption occurs in the horizontal dimension of the alveolar ridge in addition to vertical ridge height which is more pronounced in the buccal aspect. The result of such resorption is the formation of a narrower and shorter alveolar ridge, which will lead to a change in the location of the ridge to become more lingually/palatally positioned [1]. The amount of the bone collapse in the alveolar ridge after 6 months following tooth extraction is 3.79 ± 0.23 mm in the horizontal dimension and 1.24 ± 0.11 mm in the vertical height. The percentage of horizontal dimension change at 3 months is 32% and at 6 months is 29-63% while the percentage of the vertical dimension change is 11-22%. Such findings emphasize the importance of ridge preservation [2]. Different materials were used in ridge preservation following tooth extraction.

Xenografts are one of the materials used in ridge preservation; an animal study stated that after 3 months of its placement 30% of it was still present in the defect [3]. Fresh extraction sockets filled with xenograft showed better results in terms of buccal plate resorption than non-grafted sockets. Also, the use of collagen membranes has been shown to enhance wound healing compared to spontaneous healing [4].

The histologic examination revealed that the central portion of the augmented bone was occupied by xenograft particles. respectively [5]. A systematic review stated that posterior sites exhibit major ridge reduction and may jeopardize implant placement afterwards [6]. A simplified technique called Biologically oriented Alveolar Ridge Preservation (BARP) was presented in a case report that confined socket grafting to the coronal portion of the socket [7]. The rationale of BARP is based on enhancing wound maturation in the middle and apical parts of socket by avoiding any potential interference of bone graft with spontaneous bone deposition. They also stated that such technique improved provision for clot and graft stabilization at socket entrance [8].

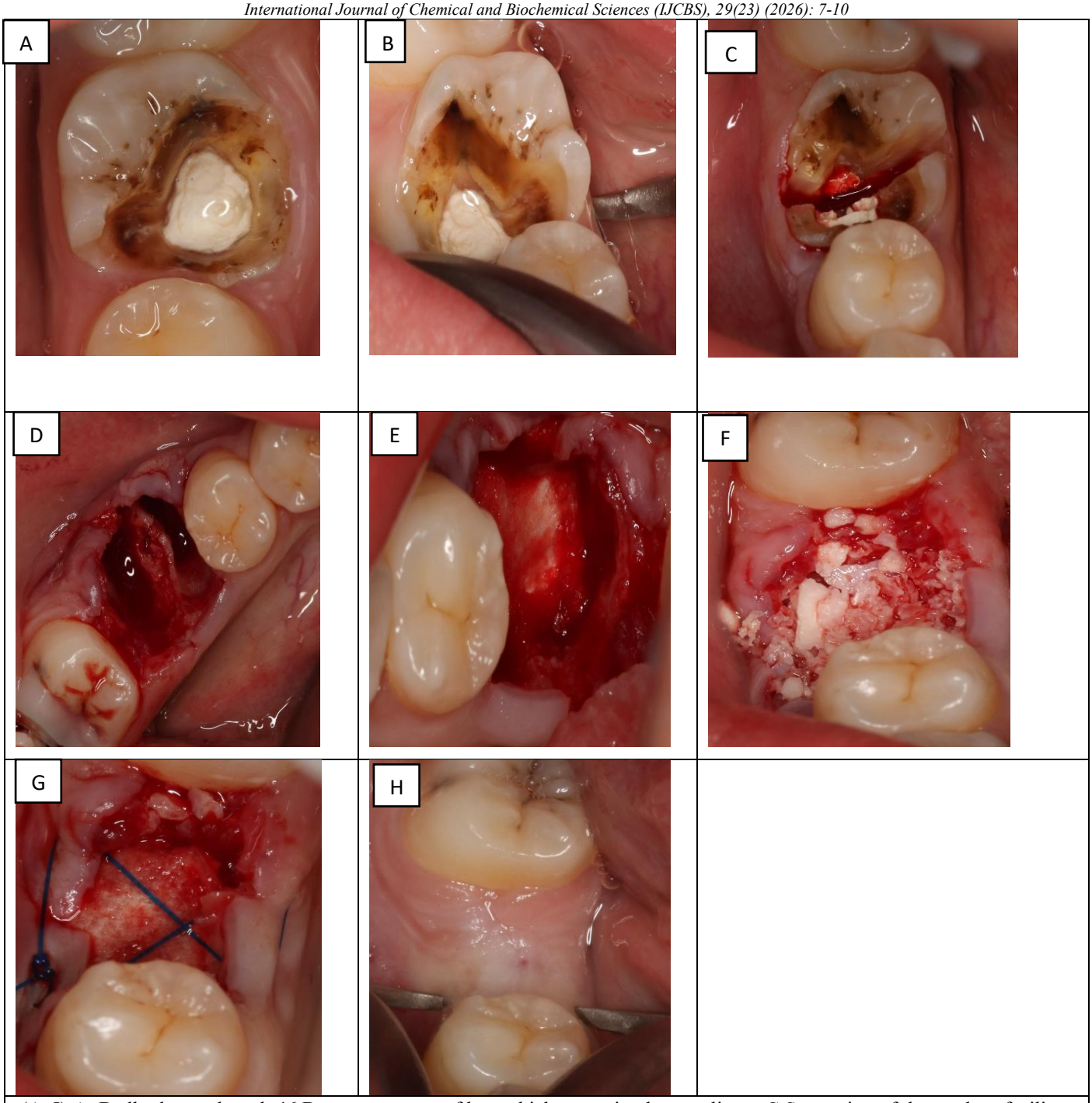
2. Materials and Methods

A 35-year-old woman presented with pain in lower right quadrant. Clinical and radiographic (cone beam computed tomography) examination revealed a badly decayed 46 with periapical pathosis. Written informed consent was obtained for all surgical procedures. The patient was prescribed amoxicillin 500 mg, three times daily for 7 days, starting 1 day before surgery. The use of antibiotics is supported by systematic reviews showing a reduction in postoperative complications (16). Local anaesthesia (Articaine HCL 4% with epinephrine 1:100,000) was administered. Assessment of the bone width was done using bone caliper prior to extraction. Atraumatic extraction was performed using a periotome, followed by thorough curettage of the socket to remove all periapical pathology. Collagen sponge was then placed at the apical third of the socket followed by xenograft in the middle third. At the coronal part of the socket tissue release was done to enable the tucking of the collagen membrane for proper seal of the socket. X suture was done to fix the collagen membrane using (5,0) resorbable polypropylene suture.

3. Results and discussion

Assessment of the bone width following the layered technique was done clinically using bone caliper and radiographically using CBCT. Assessment of the bone width was done at 3 points vertically. The present case demonstrated the use of atraumatic tooth extraction with a peristome, thorough curettage of periapical pathology, and alveolar ridge preservation using guided bone regeneration In this study, the proportions of newly formed bone and connective tissue were 16.02%±7.06% and 50.67%±8.42%, with a collagen layer, xenograft, and collagen membrane. This sequence aimed to minimize alveolar bone loss and optimize bone volume for future implant placement. Atraumatic extraction using a periotome is beneficial in preserving the buccal cortical plate and the alveolar ridge dimensions by severing periodontal ligament fibers instead of exerting excessive mechanical forces on the bone. Clinical trials have shown that periotome extractions preserve more alveolar bone and cause less postoperative pain compared to conventional forceps extraction [9]. The preservation of alveolar bone is critical in the molar region to maintain ridge anatomy suitable for prosthetic rehabilitation [10]. Complete removal of granulation tissue and infected material following curettage is essential to reduce bacterial contamination and to create a healthy environment conducive to new bone formation [11]. Such strict infection control improves the success of bone regeneration in compromised sockets with periapical pathology.

Filling the extraction socket with xenograft provides an osteoconductive scaffold to support new bone growth while simultaneously limiting postoperative resorption and alveolar ridge collapse [12]. Collagen membranes act as barriers that prevent soft tissue invasion into the graft site, preserving space for osteogenesis. Studies consistently report that the combined use of xenografts and resorbable collagen membranes leads to enhanced dimensional preservation of the alveolar ridge [13] [14]. The use of bone calipers clinically and CBCT radiographically at baseline and 4 months post-extraction is an effective method to quantitatively assess horizontal bone changes. Studies have demonstrated that grafting and membrane coverage can maintain alveolar ridge width with minimal reduction after 3 to 6 months, supporting the timing of implant placement [10-15]. Preservation of alveolar ridge dimensions after extraction is critical for successful implant osseointegration and esthetic outcomes, especially in the posterior mandible where anatomy and bone density pose challenges [16]. Atraumatic socket management combined with guided bone regeneration enhances bone quality and quantity, facilitating implant placement without additional augmentation procedures [17-18].



(A–I) A: Badly decayed tooth 46,B: measurement of bone thickness using bone caliper , C:Separation of the tooth to facilitate extraction ,D: extraction socket of tooth 46 with intact interseptal bone, E: placement of collagen sponge (Col cone) at the apex of each root, F: xenograft bone placement above the collagen sponge, G: coverage of the xenograft using collagen membrane and suturing of the socket, H: 4 months post operative measurement of the bone thickness.

Table 1: Assessment of the bone width

Measurement on CBCT	Baseline	4 Months Post-op
At the crest	11.61	9.4
At the middle (5 mm from the crest)	13.6	11.6
Apically (5 mm from the middle)	12.6	12

Measurement using bone calliper	Baseline	4 Months Post-op
At the crest	8	6
At the middle (5 mm from the crest)	10	8
Apically (5 mm from the middle)	12	10

4. Conclusions

This case supports that the biologically oriented technique can result in decreased bone width loss which will help in alveolar ridge preservation for future implant placement.

Author Contributions

The authors confirm their contribution to the paper as follows: contributed to the study conception, design and practical work; Nourhan Alaa Akl & Doaa Adel-Khattab; data collection was performed by Tarek Mahmoud El Tayeb; manuscript preparation was performed by Nourhan Alaa El Din and Hala Ahmed Abuel-Ela. All authors reviewed the results and approved the final version of the case report.

Conflict Of Interest Statement

The author declares no conflicts of interest.

References

[1] F. Van der Weijden, F. Dell'Acqua, D.E. Slot. (2009). Alveolar bone dimensional changes of post-extraction sockets in humans: a systematic review. Journal of clinical periodontology. 36(12): 1048-1058.

[2] B. de Brito Bezerra, M.A. Mendes Brazão, M.L.G. de Campos, M.Z. Casati, E.A. Sallum, A.W. Sallum. (2012). Association of hyaluronic acid with a collagen scaffold may improve bone healing in critical-size bone defects. Clinical Oral Implants Research. 23(8): 938-942.

[3] G. Kotsakis, V. Chrepa, N. Marcou, H. Prasad, J. Hinrichs. (2014). Flapless alveolar ridge preservation utilizing the “socket-plug” technique: Clinical technique and review of the literature. Journal of Oral Implantology. 40(6): 690-698.

[4] N. Elian, S. Cho, S. Froum, R.B. Smith, D.P. Tarnow. (2007). A simplified socket classification and repair technique. Practical Procedures and Aesthetic Dentistry. 19(2): 99.

[5] C. Maiorana, P.P. Poli, M. Deflorian, T. Testori, F. Mandelli, H. Nagursky, R. Vinci. (2017). Alveolar socket preservation with demineralised bovine bone mineral and a collagen matrix. Journal of periodontal & implant science. 47(4): 194.

[6] M.S. Tonetti, R.E. Jung, G. Avila-Ortiz, J. Blanco, J. Cosyn, S. Fickl, E. Figuero, M. Goldstein, F. Graziani, P. Madianos. (2019). Management of the extraction socket and timing of implant placement: Consensus report and clinical recommendations of group 3 of the XV European Workshop in Periodontology. Journal of clinical periodontology. 46: 183-194.

[7] G. Avila-Ortiz, L. Chambrone, F. Vignoletti. (2019). Effect of alveolar ridge preservation interventions following tooth extraction: a systematic review and meta-analysis. Journal of clinical periodontology. 46: 195-223.

[8] M. Pramstraller, R. Farina, A. Simonelli, W. Götz, L. Trombelli. (2021). A simplified procedure for biologically oriented alveolar ridge preservation: clinical and histological findings from a case report. Clinical Advances in Periodontics. 11(4): 189-194.

[9] M.M. CONTRACTOR, K. BHATE, U. LONDHE, S. AWATE, A. CHHATRIWALA, S. SAMUEL. (2023). Efficacy of Periotome Versus Conventional Forceps Extraction in Socket Preservation and Reduction of Postoperative Pain: A Randomised Clinical Trial. Journal of Clinical & Diagnostic Research. 17(11).

[10] A. Al Qabbani, S. Al Kawas, H. Enezei, N.H.A. Razak, S.W. Al Bayatti, A.R. Samsudin, S.A. Hamid. (2018). Biomechanical and radiological assessment of immediate implants for alveolar ridge preservation. Dental Research Journal. 15(6): 420-429.

[11] S.S. Salian, K.K. Durge, P.V. Dhadse, S.S. SALIAN, K. Durge. (2023). A Case Report of Atraumatic Tooth Extraction Followed by Ridge Preservation for Implant-Supported Prosthetic Rehabilitation Using an Alloplastic Bone Graft. Cureus. 15(12): eXXXX.

[12] R.V. Yotsova. (2024). Socket preservation using dense polytetrafluoroethylene membranes and platelet-rich plasma. Cureus. 16(10).

[13] C.P. Joshi, C.B. D'Lima, U.C. Samat, P.A. Karde, A.G. Patil, N.H. Dani. (2017). Comparative alveolar ridge preservation using allogenous tooth graft versus free-dried bone allograft: a randomized, controlled, prospective, clinical pilot study. Contemporary clinical dentistry. 8(2): 211-217.

[14] D.S. Thoma, G.I. Benic, M. Zwahlen, C.H.F. Hämmerle. (2019). The 2nd Baltic Osseointegration Academy and Lithuanian University of Health Sciences Consensus Conference 2019. Biological aspects of tooth extraction, socket healing and indications for socket preservation. European Journal of Oralimplantology. 12(Suppl 1): 97-104.

[15] A.A. Samad, J.M. Ahmed, H.M. Ali, O. Shihab, A. Haider, D. Karpavicius. (2024). Extraction Socket Seal Technique for Socket Preservation after Tooth Extraction: An Innovative Approach. Erbil Dental Journal (EDJ). 7(1): 101-110.

[16] Z.S. Natto, A. Parashis, B. Steffensen, R. Ganguly, M.D. Finkelman, Y.N. Jeong. (2017). Efficacy of collagen matrix seal and collagen sponge on ridge preservation in combination with bone allograft: a randomized controlled clinical trial. Journal of clinical periodontology. 44(6): 649-659.

[17] A. Ionescu, A. Dodi, L.C. Petcu, M.I. Nicolescu. (2022). Open healing: a minimally invasive protocol with flapless ridge preservation in implant patients. Biology. 11(1): 142.

[18] D. Moher, S. Hopewell, K.F. Schulz, V. Montori, P.C. Gøtzsche, P.J. Devereaux, D. Elbourne, M. Egger, D.G. Altman. (2010). CONSORT 2010 explanation and elaboration: updated guidelines for reporting parallel group randomised trials. Bmj. 340.