ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 4, Issue – 4, July - 2021, Page No. : 417 - 422

A new edge to ridge preservation by partial extraction therapy – A Case Report

[1]Dr. Swetha A, Post graduate, Department of Periodontics, M R Ambedkar Dental College, Bangalore, Karnataka.

[2]Dr. Nikhila Chandramohan, Post graduate, Department of Periodontics, M R Ambedkar Dental College, Bangalore, Karnataka.

Corresponding Author: Dr. Swetha A, Post graduate, Department of Periodontics, M R Ambedkar Dental College, Bangalore , Karnataka.

Citation of this Article: Dr. Swetha A, Dr. Nikhila Chandramohan, "A new edge to ridge preservation by partial extraction therapy – A Case Report", IJDSIR- July - 2021, Vol. – 4, Issue - 4, P. No. 417 – 422.

Type of Publication: Case Report

Conflicts of Interest: Nil

Abstract

After tooth extraction, the alveolar bone undergoes a remodeling process, which leads to horizontal and vertical bone loss. These restorative processes complicate dental rehabilitation and esthetic outcomes particularly when dealing with dental implants. Various methods like socket preservation, guided bone regeneration (GBR), etc have been described to retain the original dimension of the bone after extraction. Most procedures use filler materials and membranes to support the buccal plate and overlying soft tissue, to stabilize the coagulum and to prevent epithelial ingrowth. It has also been suggested that resorption of the buccal bundle bone can be avoided by leaving a buccal root segment (socket shield technique) in place, because the biological integrity of the buccal periodontium (bundle bone) remains untouched. This method has also been described in connection with immediate implant placement. It was concluded that this technique indisputably satisfies the criteria of minimal invasion, soft & hard tissue preservation and minimal use of bone substitutes.

Keywords: Alveolar bone preservation, dental implant, Immediate implant placement, esthetics, GBR , root retention.

Introduction

Sufficient alveolar bone volume and favourable architecture of the alveolar ridge is essential to obtain ideal functional and aesthetic prosthetic reconstruction following implant therapy. But the healing process at extraction sites is characterized by contour changes caused by bone resorption and remodelling which may compromise the restoration-oriented three-dimensional positioning of the implant which requires optimal support and stability of surrounding hard and soft tissues[1].

Various histological studies have shown that resorption of the alveolar process after tooth extraction in the maxilla or mandible is significantly larger at the buccal aspect than at the lingual/palatal aspect. The loss of a tooth triggers a remodelling reaction as a part of the healing process, involving various degrees of alveolar bone resorption, especially affecting the buccal lamella attributable to the loss of periodontal ligament and the consecutive trauma in particular, at the buccal bone plate thereby leading to its resorption[2].Different techniques such as immediate implant placement, socket preservation and the targeted use of guided bone regeneration have been proposed to maintain the ridge dimension to a certain amount. However, applying these methods to extraction sockets could not completely preserve the coronal part of facial bone walls which were composed of bundle bone almost

entirely. One of the most simple & physiological approach to the prevention of alveolar ridge resorption is to naturally preserve the inflammation-free dental root[3].Retaining a root for alveolar ridge preservation has been tested in several clinical studies. In a case report by Filippi A et al in 2001, decoronation of an ankylosed tooth demonstrated complete maintenance of the height and width of the alveolar ridge prior to implant placement[4]. Davarpanah et al in 2009, reported a case series of implant osteotomy preparation and placement through ankylosed roots. The root fragments were deliberately left and did not seem to interfere with osseointegration[5].In 2010, Hürzeler et al. introduced a new method, the SOCKET SHIELD TECHNIQUE (SS technique), in which instead of bone grafts materials, a partial root fragment (shield) was intentionally retained around an immediately placed implant with the aim of avoiding tissue alterations after tooth extraction. The principle is to prepare the root of a tooth indicated for extraction in such a manner that the buccal root section remains in-situ with its physiologic relation to the buccal plate intact. The root section's periodontal attachment apparatus- PDL, attachment fibres, vascularisation, root cementum, bundle & alveolar bone is intended to remain vital and undamaged so as to prevent the expected post-extraction socket remodelling and to support the buccal tissues.[6] Keeping this in mind, we present a case here wherein a young healthy male patient presented with a crown-root fracture on the upper right central incisor. The root fragment was sectioned into two with the aim of preserving the buccal fragment thereby acting as a socket-shield during immediate implant placement. The results from the case followed up at 1 year post-op demonstrating the degree of facial ridge tissue preservation achieved.

Case Report

A 25-year old male patient, systemically healthy and a non-smoker presented with an Ellis class 8 fracture on the upper right central incisor post road traffic accident. Periapical radiograph revealed no alveolar bone resorption and no apical radiolucency. The patient had high functional demands and moderate aesthetic expectations. Treatment options were discussed subsequently and immediate implant-supported single crown was the preferred choice for replacing the tooth. Preoperative Cone-beam computed tomography (CBCT) demonstrated thin buccal plate and sufficient residual bone apico-palatal to the root. To offset the expected post-extraction ridge resorption, the SS technique was planned simultaneous to immediate implant placement. CBCT indicated sufficient width palatal to the planned facial root section to accommodate a 4.3 x 11 mm implant.

Procedure

Prophylactic procedures included intake of antibiotic (Augmentin 625mg) one hour before surgery and mouth rinsing with 0.2% chlorhexidine solution. Once anesthetised, mid-crestal incision was placed in order to raise a full thickness mucoperiosteal flap. On exposure of the root fragment (shield), it was segmented in a mesio-distal direction along its long axis as far apical as possible using a coarse-grained long shank diamond bur coupled to a hydrated high-speed handpiece. Sectioning divided the tooth root into facial and palatal halves, with the intention of preserving the facial root section unmanipulated and attached to the tooth socket. Periotomes were then inserted between the palatal root fragment and the alveolar socket wall to sever the PDL fibres and this section of the root was then carefully extracted so as to not disturb the facial root fragment. The remaining buccal root section was then reduced coronally to a height of 1 mm above the alveolar crest, and thinned slightly (to a width of 1mm) to a concave contour by the careful application of diamond bur in an apico-coronal and mesio-distal direction. The socket was debrided gently and irrigated with normal saline. The tooth socket's palatal wall and apex were then curetted to remove any tissue or infective remnants and SS was checked for immobility with a probe. Implant bed preparation at the palatal wall of the socket was performed sequentially and a root form implant (Tapered Effect implant 4.3 X 11mm, Nobel biocare), was inserted palatal to the SS and adequate primary stability was achieved (>50 Ncm) primarily from apical and palatal bone. The apico-coronal position of the implant platform was situated 1mm apical to the palatal marginal gingiva. The gap between the shield and implant surface was left to enable blood clot formation. Cover screw was placed and covered by PRF (platelet rich fibrin) membrane. Primary closure was performed using silk sutures

Healing was uneventful with no signs of infection or other complication at 1 week and 1 month follow up visits.

After 4 months, the submerged implant was exposed and the abutment was fixed. After which, impressions and master casts were obtained and was then sent to the laboratory for fabrication of the fixed prosthesis. The implant was then restored by a cement-retained metal-

porcelain crown restoration. The patient was satisfied with the aesthetic and functional outcomes achieved.At the 1 year follow up visit, the soft tissue contours at the implant restoration remained comparable to the adjacent teeth and neither noticeable tissue recession nor any other complication was be observed. The intraoral periapical radiograph illustrated the bone height interproximal to the implant and tooth 11, and the relationship between the SS and the implant. The postoperative CBCT scan clearly shows the tissue bulk facial to the implant.

Discussion

Apart from affecting the aesthetic outcome, alveolar ridge atrophy, has a negative impact on the subsequent prosthetic restoration as well. In recent years, several scientific studies on socket preservation have been published. True to the motto according to Ashman et al is that "when we take something out, we should put something back in" [7], studies have been carried out where fresh extraction sockets were filled and covered with various bone substitutes and membranes.Ideally, a method for the prevention of alveolar ridge resorption should be a cost-effective and minimally invasive, with minimal material requirements. However, these criteria are not entirely met by any of the methods available today. *Thus, the quest for simple concepts with predictable results is still on today's research agenda.*It has been known for quiet sometime that to retain root fragments *in situ* covered by mucosa represents an alternative technique for alveolar ridge preservation. With the root submergence technique (RST), submucosal root retention can virtually eliminate bone resorption[8]. Preserving the periodontal ligament and the supra-crestal attachment of the tooth on the buccal aspect in conjunction with immediate implant placement appears to have the potential to avoid buccal bone remodelling. The technique of retaining roots to avoid alveolar bone remodelling was adopted from dental traumatology, where Malmgren et al.(1984) suggested the decoronation technique of ankylosed teeth. Decoronation may be considered a type of guided bone regeneration due to the fact that the remaining residual root will undergo a resorptive process by osteoclasts from the adjacent bone marrow and gradually be replaced by bone[10]. Studies by Malmgren et al. (1984[10],1994[11]) and Andersson et al. (2003)[18] have shown that preservation of decoronated roots in the alveolar process not only helps in maintaining the existing bone volume but also enables vertical bone growth, which can be observed coronal to the root. Thus, it can be assumed that retaining a root may alter the occurrence of facial bone resorption.First reported in 2010, THE SOCKET SHIELD (SS) TECHNIQUE has progressed from concepts introduced in the 1950s that the retention of a tooth limits tissue alterations following extraction[6]. Salama et al.in 2007 recommended a Root Submergence Technique (RST) in which a natural tooth root was maintained and the surrounding tissue could be preserved at the pontic site[8]. Periodontal regeneration including new attachment apparatus, cementum, connective tissue, and bone could be formed around a submerged root whose surface was pathologically exposed. This technique typically decoronates the tooth at the bone crest or preferably 1 mm above it so as to preserve the supracrestal fibers with epithelial and connective tissue attachment, which in turn can preserve the papillae aswell. It was postulated by Gluckman et al[12] aswell that retention of part of the tooth contiguous with the PDL, its fibers and its reticulate vascularity interconnected with bundle bone as a socket shield prevents the body from realizing the tooth has been extracted and eludes the physiological remodeling of an extraction socket and the alveolar crest. To achieve a most ideal appearance of the gingival tissues at the esthetic zone, it is fundamental to maintain the buccal bone plate and a high soft tissue volume. The results of the case reported here are consistent with the original report by Hürzeler et al (2010) where he confirmed that the retention of the buccal root section at immediate implant placement achieved osseointegration without any inflammatory or resorptive response of the ridge buccofacial to the implant and a restoration with aesthetics indistinguishable from the adjacent maxillary central incisor[6]. The histological analysis in beagle dogs suggested preservation of buccal bone plate, no resorption of root fragment and new cementum formation on the implant surface [6]. Whilst the authors reported preservation of the buccal tissues, it should be noted that absolute preservation has not yet been established. Few authors later reported a mean of 1 mm horizontal bone loss after final restoration, Chen and coworkers reported 0.72 mm of buccal resorption[13].

PRF is a nontoxic and nonimmunoreactive concentrated suspension of the growth factors found in platelets, which are involved in wound healing and postulated as promoters of tissue regeneration. Combining the growth factors has been shown to accelerate bone repair and

promote fibroblast proliferation, and increase tissue vascularity, rate of collagen formation, mitosis of mesenchymal stem cells and endothelial cells, as well as osteoblasts, playing key roles in the rate and extent of bone formation. This activity, together with increased vessel in-growth, is mediated by PDGF and TGF.[20] Hence keeping these benefits in mind, we have incorporated PRF in our case aiming at achieving uneventful healing and superior soft tissue quality.

Kan JY et al and Cherel F et al reported an alternative approach in a case utilizing a retained proximal root fragment to maintain the inter-implant papilla [16,17] .Bäumer et al.(2015) conducted a pilot study concentrated on the histological, clinical, and volumetrical observation of the alveolar ridge and implant after applying this technique [15]. Other than these, various versions of SS technique was studied by Siormpas et al. (2014)[14], Holbrook SE (2016)[19], Glocker et al. (2013)[3]. Hence, observation of healthy periodontal ligament of the tooth segment, lack of osteoclastic remodelling of the coronal part of the buccal plate, minor volumetric change of the ridge contour, and direct bone-to-implant contact manifests this technique as a feasible treatment option.However, this approach may be associated with certain risks, such as the development of peri-implant infections, root resorption , technique sensitivity and risk of displacement of the buccal root fragment or even lamellar bone. These occur especially in the presence of pre-exiting or developing periodontal or endodontic infections of the retained tooth fragments hence this technique can be avoided in such situations. The known alternatives are on one hand, common immediate implant placement, which in most cases leads to buccal resorption with only moderate aesthetic results, or on the other hand delayed implant placement with the need of subsequent reconstruction. Besides the aesthetic advantages, the SS technique is minimally invasive and more economical. Also the comorbidity is reduced because a second surgery site to gain a connective tissue graft is not necessary, which results in less postoperative morbidity.

Clinical Significance

This case report of immediate placement simultaneous to the SS technique demonstrates with a 1 year of follow up, successful preservation of post-extraction tissues coinciding with successful restorative implant treatment. This highly promising technique holds significant potential in the field of aesthetic and restorative implant dentistry. The void in the literature reporting on the technique's long-term success requires more large scale randomized clinical trials and longitudinal studies, so that it can be introduced in everyday practice.

Conclusion

It is indisputable that the buccal shield protects the integrity of the buccal bundle bone and serves as a guiding structure when placing the implant in the optimum position. The SS technique offers a viable and promising solution when managing the inevitable post-extraction remodelling and its complications associated with immediately placed implants.

References

1. Schropp L, Wenzel A, Kostopoulos L, Karring T. Bone healing and soft tissue contour changes following single-tooth extraction: A clinical and radiographic12-month prospective. The Int J Perio Rest Dent 2003;23(4):313-322.
2. Araujo MG, Lindhe J. Dimensional ridge alterations following tooth extraction. An experimental study in the dog. J Clin Periodontol 2005; 32: 212-8
3. Glocker M, Attin T and Schmidlin P. Ridge Preservation with Modified "Socket-Shield" Technique: A Methodological Case Series. Dent. J. 2014, 2, 11-21.
4. Filippi A, Pohl Y, von Arx T. Decoronation of an ankylosed tooth for preservation of alveolar bone prior to implant placement. Dent Traumatol 2001; 17: 93-5.
5. Davarpanah M, Szmukler-Moncler S. Unconventional implant treatment: I. Implant placement in contact with ankylosed root fragments. A series of five case reports. Clin Oral Implants Res 2009; 20: 851
6. Hurzeler MB, Zuhr O, Schupbach P, Rebele SF, Emmanouilidis N, Fickl S. The socket-shield technique: a proof-of-principle report. J Clin Periodontol 2010; 37: 855-62.
7. Ashman, A. Ridge preservation-the future practice of dentistry. Dent. Econ. 1995, 85, 82–83.
8. Salama, M.; Ishikawa, T.; Salama, H.; Funato, A.; Garber, D. Advantages of the root submergence technique for pontic site development in esthetic implant therapy. Int J. Periodontics Restor. Dent.2007, 27, 521–527
9. Bäumer D, Zuhr O, Rebele S, Schneider D, Schupbach P, Hürzeler M. The socket-shield technique: first histological, clinical, and volumetrical observations after separation of the buccal tooth

segment - a pilot study. Clin Implant Dent Relat Res. 2015;17(1):71-82.
10. Malmgren B, Cvek M, Lundberg M, Frykholm A. Surgical treatment of ankylosed and infrapositioned reimplanted incisors in adolescents. Scand J Dent Res. 1984;92(5):391-9
11. Malmgren O, Malmgren B, Goldson L, Orthodontic management of the traumatized dentition. In, Andreasen JO, Andreasen FM, eds, Textbook and Color Atlas of Traumatic Injuries to the Teeth. Munksgaard, Copenhagen, 1994, pp 587-633.
12. Gluckman H, Du Toit J, Salama . The socket-shield technique to support the buccofacial tissues at immediate implant placement. Int Dent – African edition.2015;5(3):6-13
13. Chen CL, Pan YH. Socket Shield Technique for Ridge Preservation: A Case Report. J Prosthondontics Implantology. 2013;2(2):16-21.
14. Siormpas KD, Mitsias ME, Kontsiotou-Siormpa E, Garber D, Kotsakis GA. Immediate implant placement in the esthetic zone utilizing the "root-membrane" technique: clinical results up to 5 years postloading. Int J Oral Maxillofac Implants. 2014 Nov-Dec;29(6):1397-405. doi: 10.11607/jomi.3707. Epub 2014 Sep 26. PMID: 25265125.
15. Baumer D, Zuhr O, Rebele S, Schneider D, Schupbach P, Hurzeler M. The Socket-Shield Technique: First Histological, Clinical, and Volumetrical Observations after Separation of the Buccal Tooth Segment- A Pilot Study. Clin Implant Dent Relat Res 2013.
16. Kan JY, Rungcharassaeng K. Proximal socket shield for interimplant papilla preservation in the esthetic zone. Int J Periodontics Restorative Dent. 2013;33(1):e24-31.
17. Cherel F, Etienne D. Papilla preservation between two implants: a modified socket-shield technique to maintain the scalloped anatomy? A case report. Quintessence Int. 2014;45(1):23.
18. Andersson L, Emami-Kristiansen Z, Högström J. Single-tooth implant treatment in the anterior region of the maxilla for treatment of tooth loss after trauma: a retrospective clinical and interview study. Dent Traumatol. 2003 Jun;19(3):126-31.
19. Holbrook SE. Model-Guided Flapless Immediate Implant Placement and Provisionalization in the Esthetic Zone Utilizing a Nanostructured Titanium Implant: A Case Report. J Oral Implantol. 2016 Feb;42(1):98-103.
20. Lozada JL, Caplanis N, Proussaefs P, Willardsen J, Kammeyer G. Platelet-rich plasma application in sinus graft surgery: Part I -Background and processing techniques. J Oral Implantol 2001;27:38-42.

Legend Figure

Fig 1: Preoperative measurement

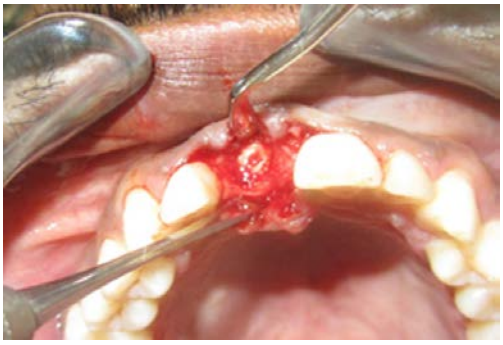

Fig 2: Flap reflection showing fractured tooth fragment within the alveolar socket

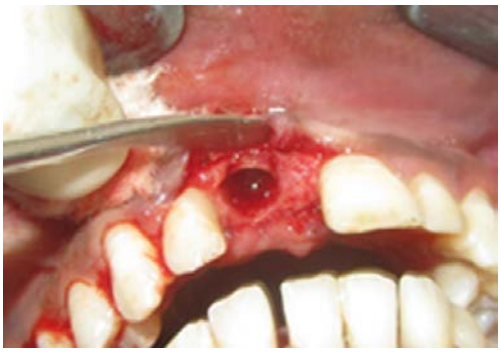

Fig 3: Partial extraction done leaving buccal fragment intact

Fig 4: Extracted palatal root fragment

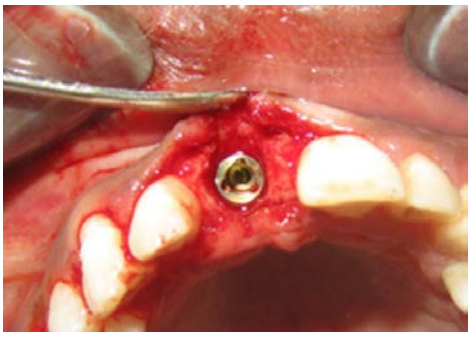

Fig 5: Implant placement

Fig 6: Sutures placed

Fig 7: PRF membrane prepared and placed over the implant cover screw

Fig 8: Evaluation at 1 year post crown delivery

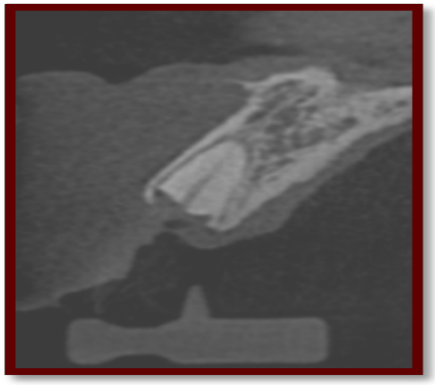

Fig 9: Preoperative CBCT

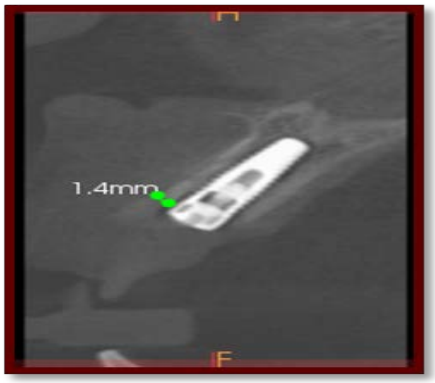

Fig 10 :1 year post-op CBCT showing maintenance of buccal tissue integrity