

PARTIAL EXTRACTION THERAPIES: A VIABLE ALTERNATIVE TO CONVENTIONAL AUGMENTATION TECHNIQUES

Dentistry

Dr Shreshtha Hegde PG Department of Prosthodontics, Yenepoya dental college

Prof, Dr Savita Dandekeri Department of Prosthodontics, Yenepoya dental college

Prof, Dr Sanath Shetty Department of Prosthodontics, Yenepoya dental college

Dr Mallikarjuna Ragher Reader, Department of Prosthodontics, Yenepoya dental college

ABSTRACT

Resorption of the alveolar ridge commences immediately post extraction, is more pronounced on the buccal aspect. The primary cause of alveolar bone loss has been identified as the loss of the periodontal ligament attachment to the buccal bone and the loss of the bundle bone owing to tooth/root extraction. Partial extraction treatments (PET) are a category of clinical procedures in which a portion of the tooth is left in the alveolar socket during extraction and the implant is either inserted at the same time or subsequently. Partial extraction therapy employs patient's own root structure to sustain blood flow that is generated from the periodontal ligament complex to retain the periodontium and peri-implant tissues. This review paper focuses on the partial extraction process, which are particularly useful for conserving soft and hard tissues.

KEYWORDS

Partial extraction therapy, socket shield, pontic shield, root submergence

INTRODUCTION

One of the sequelae of tooth loss is physiological changes that occurs to the bone structure. Tooth loss has always been a challenge in dentistry due to the physiological changes that occurs to the bone structure following extraction¹. The major changes after tooth extraction appear to be attributable to the loss of bundle bone-periodontal ligament complex and the consecutive trauma to the thin buccal bone plate that is mainly composed of bundle bone². For many years, immediate implant placement has been gaining lot of popularity, with excellent long term survival rates comparable to delayed implant placement approaches³.

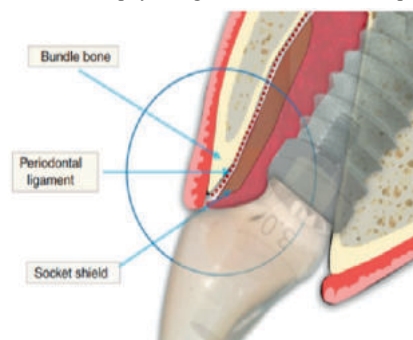
However, despite the benefits of a single surgical procedure, shorter treatment duration, and higher patient acceptance, immediate implant placement does not counteract the natural bone remodelling process, and thus cannot prevent buccal bone collapse^{4,5}. When it comes to implant therapy in the aesthetic zone, it is fundamental to maintain the buccal bone plate⁶. Buccal plate thickness, implant position, and gingival biotype can all influence the rate and extent of buccal bone resorption. Thus, the presence of buccal and interproximal bone support influences the depth, height, and width of peri-implant papillae^{7,8}. In the aesthetic zone, the successive soft and hard tissue deficiencies can interfere with optimal implant positioning and hamper the overall aesthetic outcome of implant-supported prostheses⁹. Restoration of healed ridge defect might require extensive surgical intervention involving guided bone regeneration techniques using bone or bone substitute material with a barrier membrane.

By retaining a part of the root on the facial side, attached to its periodontal ligament, the body is tricked into believing that the root still exists, while the bundle bone as well as the marginal gingiva continues to get its blood supply from the periodontal ligament, thereby maintaining the hard and soft tissue contours, a phenomenon which could be referred to as "Biologic cheating"¹⁰. This forms the basis for partial extraction therapy. Gluckman et al. coined the term "Partial Extraction Therapy" aims to preserve the natural contours of bone and soft tissue around implant-retained restorations. These include the root submergence technique, the socket-shield technique, and the pontic-shield technique.

The Socket- Shield Technique

First reported in 2010 by Hürzeler et al. the Socket Shield technique had progressed from concepts introduced in the 1950s that the retention of a tooth limits tissue alterations following extraction¹¹. To meet the demand of more predictability of the postoperative gingival conditions, an innovative and less invasive method without the use of bone substitute material was developed to avoid the resorption process

in horizontal and vertical dimensions. The idea was to leave a part of the root on the buccal side during immediate implant placement. The desired effect is to maintain the health of the periodontium, thereby maintaining the gingival tissues and keeping the crestal bone on its original level⁹. The principle is to prepare the root of a tooth indicated for extraction in such a manner that the buccal / facial root section remains in-situ with its physiologic relation to the buccal plate intact.



The tooth root section's periodontal attachment apparatus (periodontal ligament (PDL), attachment fibers, vascularization, root cementum, bundle bone, alveolar bone) is intended to remain vital and undamaged to prevent the expected post-extraction socket remodeling and to support the buccal / facial tissues. Preserving the periodontal ligament and the supra-crestal attachment of the tooth on the buccal aspect in conjunction with immediate implant placement have the potential to avoid buccal bone remodelling⁹.

Advantages:

Blood supply derived from the buccal aspect of periodontal apparatus is maintained.

In Patients with a high smile line and when two implants must be placed next to each other in the aesthetic zone.

Aside from the aesthetic benefits, the procedure is also more cost effective because no grafting or membrane material is required.

The comorbidity is reduced because a second surgery site to gain a connective tissue graft is not necessary, which results in less post operational pain.

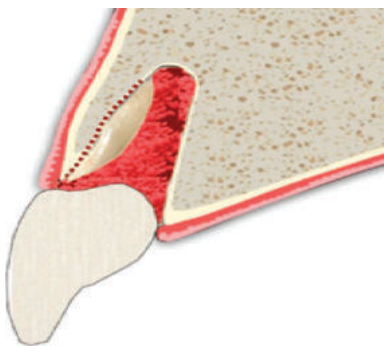
For patients with contraindications for major surgery due to their medical history⁶.

Technique:

1. Sectioning of the coronal part of the tooth.
2. Sectioning the root in the coronal plane to separate the labial part of the root from the palatal part.
3. The mobilized palatal fragment is extracted.
4. The ideal thickness of buccal shield should be approximately 1.5 mm. The shield should extend from mesio-labial to disto-labial line angle and follow the curvature of the labial bone contour. S-shaped preparation to bevel the shield on its internal aspect to accommodate the abutment.
5. The diameter of the implant should be chosen to ideally leave a space of 1 to 1.5 mm between the shield and the labial part of the implant in the coronal aspect.

The Pontic-shield

An infection-free tooth root, whether endodontically treated or with a vital pulp, may when submerged support the ridge architecture to develop a pontic site¹⁰. Preservation of supracrestal fibers can better develop pontic sites by papillae preservation¹². The procedure entails preparing the root exactly like the socket shield procedure and leaving it under a pontic. The advantage of this is to maintain the soft tissue contours which will allow excellent emergence profile for the pontic. It will also maintain the alveolar ridge dimension and prevents its potential collapse overtime. The pontic-shield should not be overprepared, since overthinning of the root may leave it unstable and flexure could lead to failure.

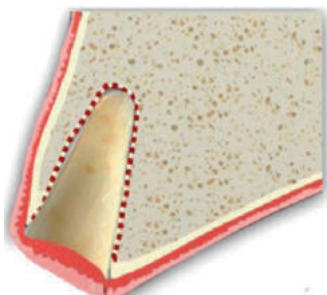
**Advantages:**

Roots with a small periapical lesion can be chosen for pontic shield technique. Preservation of supracrestal fibers can better develop pontic sites by papillae preservation.

Technique:

The tooth root sectioned along long axis in mesio distal direction with a long shank root resection bur.

Periotomes inserted between the palatal root section and alveolar socket wall to sever the PDL. Palatal section of the root to be removed. The remaining root section then shaped and reduced coronally to 1 mm above the alveolar crest. The tooth socket apex then curetted to remove any remnant of infection. facial root section checked for immobility by applying a sharp probe to its surface.

Root Submergence Technique

Overtime, increasing bone loss behind the pontic sites can provide an aesthetic compromise in restorations. It also raises difficulties with hygienic upkeep. Salama et al.⁸ and Gluckman et al.¹³ proposed retention of the root or its part for maintenance of hard and soft tissue during extraction. Retaining the tooth root, or a portion of it, aided in the retention of the periodontal ligament attachment to the alveolar bone, hence maintaining the bundle bone's vascular supply. Root

submergence was originally introduced as a technique to preserve alveolar ridge volume beneath removable full prostheses¹⁴. It is a technique of retaining the radicular portion of the root within the confines of the alveolar housing to prevent alveolar bone loss, thereby preserving the ridge contours.

Advantages:

Maintains the height and width of the residual ridge crest.
Soft tissue augmentation procedure is not required.
Improves the predictability of the interdental papillae height.

Technique:

1. The tooth is decoronated at the buccal gingival level.
2. The root is trimmed to the level of the alveolar bone crest.
3. The center of the root is further hollowed out to create additional space for soft tissue below the future pontic site.
4. A minimum of 2 mm of soft tissue should be present above the submerged root to prevent it from future migration and exposure.

CONCLUSION

A significant problem in restorative and implant dentistry is buccopalatal collapse of the postextraction ridge. Partial extraction therapies (PET) represent a subgroup of precollapse interventions that collectively use the tooth itself to offset the loss of alveolar tissue. The preservation of the vascular architecture of the buccal bone and soft tissues due to the presence of an intact PDL between the root/fragment and the bone can be contributed to the great outcomes of the PET procedures. With careful treatment planning and case selection, PET procedures have produced good mechanical, biological, and aesthetic results.

REFERENCES

1. Trombelli L, Farina R, Marzola A, Bozzi L, Liljenberg B, Lindhe J. Modeling and remodeling of human extraction sockets. *J Clin Periodontol*. 2008 Jul;35(7):630-9.
2. Araújo MG, Sukekava F, Wennström JL, Lindhe J. Ridge alterations following implant placement in fresh extraction sockets: an experimental study in the dog. *J Clin Periodontol*. 2005 Jun;32(6):645-52.
3. Mangano C, Raes F, Lenzi C, Eccellente T, Ortolani M, Luongo G, Mangano F. Immediate Loading of Single Implants: A 2-Year Prospective Multicenter Study. *Int J Periodontics Restorative Dent*. 2017 Jan/Feb;37(1):69-78.
4. Tonetti MS, Cortellini P, Graziani F, Cairo F, Lang NP, Abundo R, Conforti GP, Marquardt S, Rasperi G, Silvestri M, Walkamm B, Wetzel A. Immediate versus delayed implant placement after anterior single tooth extraction: the timing randomized controlled clinical trial. *J Clin Periodontol*. 2017 Feb;44(2):215-224. doi: 10.1111/jcpe.12666. Epub 2017 Jan 31. PMID: 27978602.
5. Cosyn J, Eghbali A, Hermans A, Vervaeke S, De Bruyn H, Cleymaet R. A 5-year prospective study on single immediate implants in the aesthetic zone. *J Clin Periodontol*. 2016 Aug;43(8):702-9. doi: 10.1111/jcpe.12571. Epub 2016 Jun 13. PMID: 27120578.
6. Bäumer D, Zuh O, Rebele S, Schneider D, Schubach P, Hürzeler M. The socket-shield technique: first histological, clinical, and volumetric observations after separation of the buccal tooth segment – a pilot study. *Clin Implant Dent Relat Res*. 2015 Feb;17(1):71-82. doi: 10.1111/cid.12076. Epub 2013 Apr 30. PMID: 23631704.
7. Ferrus J, Cecchinato D, Pjetursson EB, Lang NP, Sanz M, Lindhe J. Factors influencing ridge alterations following immediate implant placement into extraction sockets. *Clin Oral Implants Res*. 2010 Jan;21(1):22-9. doi: 10.1111/j.1600-0501.2009.01825.x. Epub 2009 Nov 13. PMID: 19912273.
8. Salama H, Salama MA, Garber D, Adar P. The interproximal height of bone: a guidepost to predictable aesthetic strategies and soft tissue contours in anterior tooth replacement. *Pract Periodontics Aesthet Dent*. 1998 Nov-Dec;10(9):1131-41; quiz 1142. PMID: 10093558.
9. Hürzeler MB, Zuh O, Schubach P, Rebele SF, Emmanouilidis N, Fickl S. The socket-shield technique: a proof-of-principle report. *J Clin Periodontol*. 2010 Sep;37(9):855-62. doi: 10.1111/j.1600-051X.2010.01595.x. PMID: 20712701.
10. Gluckman H, Du Toit J, Salama M. The Pontic-Shield: Partial Extraction Therapy for Ridge Preservation and Pontic Site Development. *Int J Periodontics Restorative Dent*. 2016 May-Jun;36(3):417-23. doi: 10.11607/prd.2651. PMID: 27100812.
11. Gluckman H, Du Toit J, Salama M. The socket-shield technique to support the buccofacial tissues at immediate implant placement. *Int Dent Afr Ed*. 2015;5(3):6-14.
12. 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 Restorative Dent*. 2007 Dec;27(6):521-7. PMID: 18092446.
13. Gluckman H, Salama M, Du Toit J. Partial Extraction Therapies (PET) Part 1: Maintaining Alveolar Ridge Contour at Pontic and Immediate Implant Sites. *Int J Periodontics Restorative Dent*. 2016 Sep-Oct;36(5):681-7. doi: 10.11607/prd.2783. PMID: 27560672.
14. Miller pa. Complete dentures supported by natural teeth. *Tex Dent J*. 1965 Sep;83:4-8. PMID: 14319044.