

## Partial Extraction Techniques: A Literature Review

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### ABSTRACT

**Background:** A subset of clinical approaches known as partial extraction therapies (PET) uses the tooth as a whole to compensate for lack of alveolar bone. It is possible to preserve the bundle bone and-periodontal ligament complex as well as its vascular supply by preserving the root of tooth and their bonding with the alveolar bone. The establishment of pontic locations and the conservation alveolar ridge after extraction have been successfully illustrated by root submergence therapy. Presence of pathological lesion at the root apex and endodontic intervention impose limitations on the approach of root submergence. It is adequately documented in the literature that loss of tooth can cause resorption of root. This alteration in morphology and degradation of alveolar ridge are caused by the loss of BB-PDL assembly after a tooth is extracted.

**Aim:** To review the available literature on partial extraction techniques

**Review results:** The part of facial or buccal segment of root is maintained after immediate implant implantation using the socket-shield approach developed. The buccal along with palatal root of a tooth that is scheduled for urgent extraction is divided by cutting the tooth in two halves in mesiodistal direction. The buccal root component is left in place while the root portion in palatal portion is eliminated. The root section's adhesion to the socket is not disturbed and it is further processed and enhanced. This constructed socket-shield preserves the relationship to bundle bone along with their vascularity in the presence of an implant that is placed palatal to root section in facial direction. It preserves support of the alveolar ridge buccal to the dental implant and the restoration. The pontic shield is another PET that draws features from both of the methods discussed just before. By conserving the buccal root or facial root component, treating the area with ridge conservation materials, and filling the tooth socket, this procedure creates a pontic site and thus protects the alveolar ridge. The establishment of pontic sites using the root submergence approach is only permitted at locations with a sound tooth pulp or locations where the endodontic therapy of root is accomplished.

**Conclusion:** For teeth that are about to be extracted, PET might be thought of as a more conservative alveolar ridge preservation method. Promising outcomes have been seen when retaining all or part of a tooth after implant implantation in order to improve a pontic site or preserve papillae or labial tissues. The authors of this literature review believe that additional comprehensive histologic data and evidence of clinical success for longer duration must be provided before the socket-shield technique and other partial extraction techniques are further promoted in routine clinical practice.

**Key words:** Partial extraction technique, Implants.

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## INTRODUCTION

A subset of clinical approaches known as partial extraction therapies (PET) uses the tooth as a whole to compensate for lack of alveolar bone. It is possible to preserve the bundle bone and-periodontal ligament complex as well as its vascular supply by preserving the root of tooth and their bonding with the alveolar bone. The establishment of pontic locations and the conservation alveolar ridge after extraction have been successfully illustrated by root submergence therapy. Presence of pathological lesion at the root apex and endodontic intervention impose limitations on the approach of root submergence. It is adequately documented in the literature that loss of tooth can cause resorption of root. This alteration in morphology and degradation of alveolar ridge are caused by the loss of BB-PDL assembly after a tooth is extracted [1,2].

In many cases, managing such resorbed alveolar ridge sites with cautious surgical treatment is needed to maintain completely edentulous or partially edentulous ridge. Recommendations to prevent loss of alveolar tissue (ridge conservation procedures) or reconstruct the ridge morphology (bone augmentation as well as soft tissue augmentation) are widely available in the literature. Unfortunately, neither of these procedures avoid the main reason for resorption, leading to incomplete or complete collapse of alveolar ridge in the end. The part of facial or buccal segment of root is the only tissue maintained after immediate implant implantation using the socket-shield approach developed. The buccal along with palatal root of a tooth that is scheduled for urgent extraction are divided by cutting the tooth in two halves in mesiodistal direction. The buccal root component is left in place while the root portion in palatal portion is eliminated [3,4].

The root section's adhesion to the socket is not disturbed and it is further processed and enhanced. This constructed socket-shield preserves the relationship to bundle bone alongwith their vascularity in the presence of an implant that is placed palatal to root section in facial direction. It preserve support of the alveolar ridge buccal to the dental implant and the restoration [5,6].

The pontic shield is another PET that draws features from both of the methods discussed just before. By conserving the buccal root or facial root component, treating the area with ridge conservation materials, and filling the tooth socket, this procedure creates a pontic site and thus protects the alveolar ridge. The establishment of pontic sites using the root submergence approach is only permitted at locations with a sound tooth pulp or locations where the endodontic therapy of root is accomplished [7,8].

When a pathology at the root apex prevent the root

submergence therapy, the pontic shield offers the doctor an alternative approach. It is possible to generate a pontic site with little to no buccopalatal dimension collapse by maintaining the important periodontal tissues buccofacial near the root. The literature on partial extraction procedures is somewhat scant. In order to assess the body of knowledge that is currently accessible on the partial extraction approach, this literature review is offered [9,10].

## PET classification

Currently, there is no notion of PET as a set of procedures to regulate the postextraction alveolar ridge as well as its resorption. Therefore, it can be challenging for a clinician to differentiate here between approved clinical indications for every procedures in order to choose a course of treatment. Root submergence has been an option since long time in implant dentistry as well as restorative dentistry. However, the other PET procedures are very recent. There is intersection of their indications, however each therapy is appropriate for the site's ultimate goal [11,12]. Due to the ability to manage each extraction site specifically for the intended restoration, pontic, or implant, two or more therapies can be successfully used at the same time on the same patient. When addressing an arch or an quadrant, combining multiple therapies gives the clinician more possibilities for alternative treatment protocols and placement tactics, design of restorations, locations for placement, and other things. The clinical circumstances appropriate for each therapy are identified, along with a proposed classification to help the doctor.

## Root submergence

When designing a pontic site below the conventional FPD or below an implant based FPD (or for any other reason), the root must be clear of any apical disease or have successfully undergone endodontic therapy. The tooth is reduced upto the alveolar crest and there is hollowing of the coronal root to resemble the ovate pontic of future. The next step is to accomplish soft tissue closing to promote healing through primary intention. It has been postulated that the attached gingiva can be moved forward and stitched, or, more ideally, a graft of soft tissue, connective tissue either alone or being epithelialized is stacked on top of the submerged root for closure of soft tissue and to provide a mass of tissue for the development of a pontic site later on. Prior to applying any pontic stress to the tissue above the tooth root, the region must recuperate atleast for a period of up to three months [13,14].

## Socket-shield

An extraction-recommended tooth is prepared at an urgent implant insertion site, often in the front maxilla, to serve as a socket-shield. Till 1 mm just above alveolar bone crest, the decoronation of tooth is carried out. The root is then divided lengthwise into the labial section and palatal section. The tooth apex is cleaned of any

pathology after removing the palatal root segment. After that, a dental bur with a longer shank is used to gently provide concave design to the labial root section. Immediately a dental implant is then put next to the socket shield in the palatal position. The buccal space is grafted preferably with a bone substitute material that resorbs slowly [15,16].

### **Pontic shield**

The extraction socket is filled with a slow-resorbing osseous replacement material after being similarly prepared as the socket shield. It is necessary to close the socket, ideally with a graft of soft tissue. After allowing the area to recuperate for a period of three months, gentle pontic pressure can be applied to site to develop that area [17].

### **Evolution of partial extraction techniques**

In order to be successful, implant therapy must fully integrate the peri-implant tissues that surround the prosthesis, rather than just achieving osseointegration. Similar to maintaining healthy periodontal tissues around a tooth, it is crucial to build healthy peri-implant tissues. For a while, the implant-restorative therapy conundrum has been focused on the condition of health, condition of stability, and condition of volume of the bone, despite the fact that the whole peri-implant tissue complex necessitates careful management. To construct the biologic width, which consists of connective tissue as well as the extended functional epithelium, healthy bone is kept at the coronal implant. These tissues do, however, begin to regress apically after tooth loss, as can be seen at the time of immediate implant implantation [18].

When a tooth is extracted, the abundant periodontal ligament (PDL) vascular system that nourishes the bundle bone of alveolus is severed. Demineralization of the socket post extraction is therefore unavoidable. If the anchoring tissues at the site of implant placed immediately after extraction resorb and are made worse by risk variables for recession of soft tissues, then there may be considerable aesthetic and as well as functional failure of implants. The partial extraction therapies (PET) recommend substantial preservation of root of tooth to keep the periodontium present buccal or labial to it in suitable condition

The theory has been that keeping the tooth root or a portion of it will conserve the PDL fibres that hold it to the alveolar bone and the PDL blood supply that feeds the bundle bone, which will keep every one of the periodontium's tissue constituents in suitable condition. In order to preserve the alveolar ridge, invention of root submergence therapy in year 1953 recommended keeping roots of decoronated tooth under complete removable dentures. The idea changed in 2007 to be used at pontic locations underneath affixed partial dentures. With longitudinal segmentation of a buried root at the site of immediate implant implantation, the socket-shield technique advanced, and histology of healed tissue was shown. The labial root segment remained in

place and supported the periodontal tissues [19].

In order to protect the alveolar ridge at the site for pontic establishment through the pontic shield approach, partial root submergence approach and socket grafting were used in combination for the first time in 2015. These PET comprise root- and ridge-preservation methods used in implant dentistry and operative dentistry as a whole.

### **DISCUSSION**

The literature is well-researched on breakdown of alveolar ridge after extraction with different levels of resorption of alveolar bone. These abnormalities in the hard and soft tissues have the potential to compromise planned implant placement and result in cosmetic failure. For the optimum management of the resorbing ridge, the doctor must be cognizant of the physiological healing processes. The breakdown of combination of tooth, bundle bone and periodontal ligament after tooth extraction causes the tissues to resorb [20].

Following removal of tooth, bundle bone, which develops from a physiologically stressed PDL and is removed, causes the buccofacial tissues to almost certainly disintegrate. Prior to receiving permanent restorative care, a healed ridge defect caused by dental extraction may require substantial surgical intervention.

All of these methods may result in gains in hard tissue, but they all have drawbacks and restrictions, including increased morbidity, technique attentiveness, higher costs, and restricted access to materials [21].

The soft tissue changes, like as papillae loss and scarring after ridge augmentation surgery, are what stand out the most. The clinician should be aware that these procedures only offer modest benefits and will cause prolonged healing and shrinking, necessitating overcompensation. Both the patient and the therapist stand to gain from preventing ridge breakdown before it happens or minimizing collapse as much as feasible. The literature has suggested a large number of ridge preservation procedures using a wide range of materials and techniques, leaving the clinician unsure of which is most appropriate for ridge management. However, not all of treatments are able to address the tooth loss that is the root cause of the resorption. The idea behind root submergence was to protect the alveolar ridge volume underneath removable complete prosthesis [22].

More than 30 years ago, it was reported effective bone regeneration surrounding submerged tooth roots, the formation of coronal bone to such submerged teeth, and the potential for coronal formation of new cementum tissue and connective tissue. Later, it was revealed that a tooth root might be submerged to allow for the establishment of sites for pontics beneath FPDs. It has been proven that keeping the entire attachment apparatus intact will completely preserve the alveolar bone for pontic site development. With root submergence, the socket-shield approach and the pontic shield, commonly known as PET, are two variations on

**Table 1: Details of publications available focusing on the partial extraction techniques.**

Year of publication	Details of Study
2016	Series of ten case reports on the pontic shield
2016	Case report on the root membrane technique
2015	Animal histology of three cases of socket-shield with vertical fractures
2015	case report on Socket-shield at immediate placement, 1-year follow-up
2014	Series of forty six cases of the root-membrane technique with follow-up varying 2 to 5 years
2014	Publication of case report: Guided implant placement with socket-shield
2014	Publication of case report: Modified socket-shield for papillae preservation
2014	Publication of 3 case series: Modified socket-shield for ridge preservation, delayed placement
2013	Publication of case report: Proximal socket-shield for papillae preservation
2013	Publication of case report: Socket-shield with immediate implant placement
2010	Publication on animal histology of 1 case of socket-shield technique, and 1 human clinical case of implant restoration with socket-shield

this idea. There is relatively little current research to substantiate some of these methods [23].

The only ongoing studies are few case reports, few case series (one with a follow-up of 2 to 5 years), plus two animal histology reports (Table 1). It goes without saying that a randomised controlled trial is strongly advised to justify the usage of these methods. PET therapies are incredibly promising in the enhanced maintenance of the postextraction ridge, despite the paucity of research reporting on them. Histologically it is proved that these procedures sustain the supracrestal fibres and strengthen the peri-implant tissues. The BB-PDL-tooth complex is not altered, allowing for improved support of the soft tissue framework for a pontic site and implant placement site. The current PET procedures in no way supplant tried-and-true methods of ridge preservation. However, it is the goal of this working group to present the methods used and the findings and to encourage sensible exploratory research that might result in the long-term data necessary to support their validity [24,25].

### CONCLUSIONS

For teeth that are about to be extracted, PET might be thought of as a more conservative alveolar ridge preservation method. Promising outcomes have been seen when retaining all or part of a tooth after implant implantation in order to improve a pontic site or preserve papillae or labial tissues. The authors of this literature review believe that additional comprehensive histologic data and evidence of clinical success for longer duration must be provided before the socket-shield technique and other partial extraction techniques are further promoted in routine clinical practise. The word and classification for all of these strategies are being proposed for the first time in this article.

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