



Review Article

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Partial extraction therapies- A review

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Abstract

The rehabilitation of missing anterior teeth is a big challenge to the prosthodontist. Ridge augmentation procedures are often needed to maintain a good emergence profile for a natural appearance. However the results of such procedures are often unpredictable in nature. Root submergence therapy has been implemented for many years and is found to be effective in preserving the alveolar bone-periodontal ligament complex, thus preventing alveolar bone loss. The socket shield technique has been gaining popularity and is extensively practiced in the field of dental implantology. Modifications of this technique known as the proximal shield technique and pontic shield technique have been introduced in recent years and have provided promising results. These methods are used to maintain ridge contour by preserving tooth fragments to prevent bucco-palatal collapse of the alveolar ridge. This article is a review on these latest treatment modalities which are collectively known as The Partial Extraction Therapies.

Keywords: Partial extraction therapy, socket shield, pontic shield.

1. INTRODUCTION

The maxillary anterior teeth play a major role in defining beautiful smiles. These teeth provide lip support and maintain the facial profile by preserving the maxillary arch form [1]. The preservation of the grossly destructed anterior teeth which are indicated for extraction therefore can prove beneficial in order to maintain the bone width. Once the teeth are extracted, socket preservation needs to be carried out by guided bone regeneration (GBR) techniques using bone and/or bone substitute materials with a barrier membrane, bone block GBR procedures, ridge split techniques, and so forth. All of these may provide hard tissue gains, though with limitations along with the drawbacks of increased morbidity, technique sensitivity, increased costs, and difficulty of access to materials [2]. In addition, there are chances of crestal bone loss, reduction in width of edentulous ridge and reduction in height of interdental papillae [3].

With advancements in dentistry, extraction of any teeth has become the last resort in any treatment plan. This brings us to a very popular concept known as 'Partial Extraction Therapy' (PET). These techniques were first described under a collective term and classified by Gluckman *et al.* in 2016 [3].

Partial extraction therapy is a method of ridge preservation by retaining tooth roots to prevent ridge collapse. When a tooth is extracted, the bundle bone- periodontal ligament complex is lost and reduction in alveolar bone is inevitable. This alters ridge contour and providing aesthetic outcomes in area of pontics becomes a challenge to the prosthodontist. PET is a promising solution to this problem.

2. Indications

1. An unrestorable tooth indicated for extraction.
2. Absence of periapical pathology.
3. Teeth with healthy amputated pulp or root canal treated teeth.

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3. Contraindications

1. Teeth with external root resorption.
2. Root caries
3. Existing endodontic-periodontal lesions due to unhealthy roots [1].

4. There are 4 major treatment modalities

1. Root submergence
2. Socket-shield technique
3. Proximal socket-shield technique
4. Pontic shield technique [4]

5. Root submergence technique

This technique was first reported by Bjorn in 1961 in a study conducted on dogs and was later extended by him in 1965 on humans [5]. It is primarily indicated in situations where there are no distinct occlusal forces on the gingiva [6]. It may be carried out in vital or non vital teeth. The literature supports the use of non vital root submergence to reduce the risk of failure related to pulpal infection after submergence [3].



Figure 1: Root submergence Technique [7]

Technique

The teeth are first decoronated. The decoronation could be 2 mm below the crestal bone for overdentures [8, 9], at the crestal bone level [3], or 1 to 2 mm above the crestal bone to maintain epithelial and connective tissue attachment and papilla form.

- An irrigated surgical motor with a contrangled surgical fast handpiece and extra large round diamond bur is used to reduce coronal aspect of root into concavity.
- The roots are trimmed to a level slightly lower than the bone edge and then beveled to avoid exposed sharp edges [2].
- An SM 69(Swann-Morton Ltd.) blade or other suitable microblade is mandatory for split thickness dissection of facial and palatal pouches to tuck Connective Tissue Graft (CTG) into and the roots are covered by a flap. 6/0 nylon sutures are placed [10].
- The site is left to heal for a minimum of 3 months and thereafter pontic pressure may gradually be applied to develop the site [4].

6. Socket-shield technique

This technique was first described by Hurzeler in 2010. A tooth indicated for extraction with apical pathology may be selected for the socket-shield technique. An absolute contraindication, however is mobility of the tooth root as a result of previously diseased periodontium, traumatic occlusion, or the like. The prepared tooth root section must be checked

for immobility. The authors also submit that active periodontitis at the tooth is an absolute contraindication to preparing a socket-shield [9].

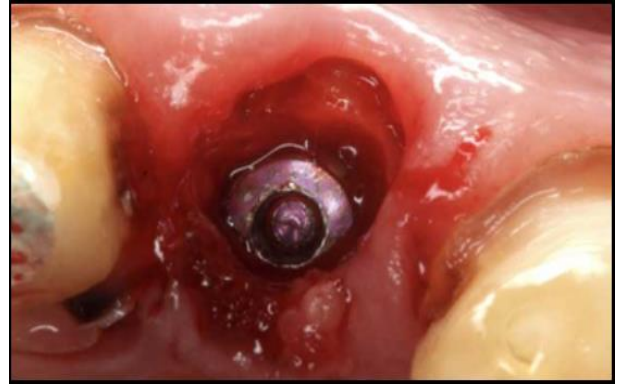


Figure 2: Socket shield Technique [11]

Technique

- An end cutting diamond bur is used to reduce coronal aspect of the endodontically treated tooth.
- The tooth root is sectioned mesiodistally using a long shank root resection bur which divides the root into labial and palatal halves.
- Microperiostomes are used to separate these root sections and the palatal half is removed with microforceps.
- A gingival protector is used and the inner aspect of this labial shield is reduced into a concavity with the help of an extra large round diamond bur [6].
- An implant is then placed lingual to this retained root fragment.

Gluckman and associates originally described preparing the shield to 1 mm above bone crest [12], the rationale being the maintenance of the periodontal fibers. The possibility of this occurring, as well as the need is overstated. As a result of the experience gained since the technique's inception these authors now reduce the socket-shield to bone crest level, and observed best results when a chamfer is created in the crestal 2 mm of the shield, thinning it slightly and providing additional and critical prosthetic space of 2–3 mm between the subgingival crown contour and the shield for soft tissue infill [13].

7. Pontic shield technique

This is a modification of the socket shield technique [9]. In cases of multiple implant placements, the pontic sites lose alveolar bone contour if the teeth are extracted in these sites.

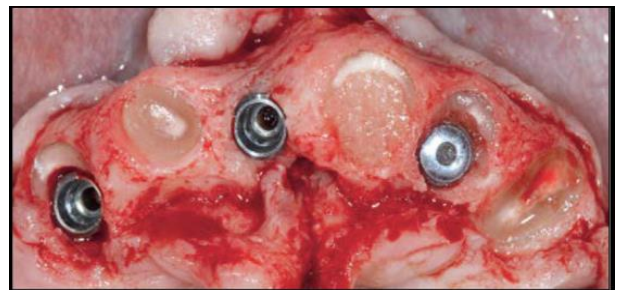


Figure 3: Pontic shield Technique [10]

Technique

- A labial shield is maintained in the pontic area similar to the socket shield technique and the remaining socket area is grafted with a bone graft using a plugger, particulate graft spoon and crucible.

- An SM 69 blade or other suitable microblade is mandatory for split thickness dissection of facial and palatal pouches to tuck CTG into followed by placement of 6/0 nylon sutures.

8. Proximal socket shield technique:

It was first introduced by Kan and Rungcharassaeng in 2013 [14]. It is similar to the socket shield technique except that the tooth is sectioned labiopalatally and a proximal half is preserved. This is followed by implant placement in the remaining socket area. This technique is primarily useful in preserving the interdental papilla and preventing formation of black triangles between adjacent crowns.



Figure 4: Proximal Socket Shield Technique [14]

9. DISCUSSION

Numerous publications have verified that tooth extraction is followed by dimensional changes of the alveolar ridge contour [15]. The resorption of the alveolar ridge is more pronounced on the buccal than on the lingual aspect of the extraction socket [16]. The clinical and histologic evidence presented in the studies reviewed by Casey and Lauciello indicate that non infected vital roots completely submerged within the alveolus may be an expedient and inexpensive way of preserving alveolar bone for the support of complete or removable partial dentures [4]. When the roots are submerged to the level of the alveolar bone crest, there may be bony infill coronal to the root tip. This is advantageous in preserving the alveolar ridge height.

However, if no bone forms over the roots, the submerged root can still support the alveolar ridge width. Thus, bone grafting over the retained root site may not be necessary [6]. However there may be soft tissue perforation followed by root caries if roots are not totally covered [1]. Soft tissue perforation might occur when the technique is used under overdentures because pressure will be transferred through the denture base to the soft tissues covering the roots. Retrievability is important when the root submergence technique is used for pontic site development in fixed prosthodontics. Screw retained fixed implant prostheses are the ideal type of restoration with root submergence because of the ease of retrievability. If cement-retained fixed implant prostheses are fabricated, it is advantageous to cement the definitive restoration with an interim cement because retrievability of the roots under definitively cemented restorations is challenging [1].

Von Wowern and Winther [17] reported a 4-year clinical and radiographic follow up study of 20 nonvital submerged roots under the overdentures of 15 participants which revealed 11 failures due to exposure of the root surface. The authors stated that alveolar ridge resorption was not prevented by retained roots and claimed that bone resorption around the roots was the primary reason for coverage failure. In order to prevent this complication, the root should be completely submerged, and all sharp edges should be adjusted to avoid exposed sharp edges. This complication is not expected when used at a pontic site, as the soft tissue covering the roots will be protected from pressure. Some

complications associated with this technique involve root resorption, ankylosis, periapical pathology, and soft tissue perforation.

However, Bowers *et al.* examined 43 submerged vital roots in 9 patients at 6 months after submergence and reported that no complications such as root resorption, ankylosis, or pulp necrosis occurred in any vital roots [11]. Documented complications with the Root Submergence Technique involved gingival tissue perforation and cyst formation, but necrotic and infected dental pulps have seldom been reported [3]. Hurzeler *et al.* concluded that retaining the buccal aspect of the root in conjunction with immediate implant placement is a viable technique to achieve osseointegration without any inflammatory or resorptive response [18].

The most common complication seen in a study conducted by Gluckman and associates was internal exposure of the socket-shield [8] due to lack of adequate space between the coronal edge of the shield and the subgingival contour of the crown. Internal exposures are usually noted at the time of removing the provisional restoration. At that stage, a micro-flap is raised and the shield is reduced to the bone level and all sharp edges smoothed. It is advised to add a small connective tissue graft into the sulcus to assist soft tissue closure. The second most common complication is the external exposure. This also is likely due to an over extension of the shield's coronal aspect, or the sharp coronal aspect that perforates the overlying soft tissue, and more likely at sites inherently deficient in facial bone (lower anterior, cuspids, previous orthodontic treatment). The management is similar to that of internal exposure management. Similar complications may be seen with proximal socket shield technique and in some cases of pontic shield technique. However, partial extraction therapies provide a sustainable alternative for ridge preservation and help in achieving excellent aesthetic outcomes.

10. CONCLUSION

Partial extraction therapies open new prospects of treatment options in this era of high aesthetic demands and the ever growing field of implantology. They provide a conservative approach by preservation of root fragments and thus help in maintaining the ridge contour. The data available on these techniques is very limited and requires more histological studies and long term clinical follow up of cases treated using these methods.

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