

## Review Article

# Root Membrane Technique-An Insight

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## Abstract

There are different treatment options in modern dentistry for the replacement of lost dentition. Of these the most upcoming and acceptable treatment option is Dental implants. The common problem usually with immediate implant placement in the anterior region is the post-operative soft tissue contour as a part of the bone modelling during healing. Hurzeler et al in 2010 introduced a new technique called the “socket shield technique”. This technique has been used as an alternative treatment modality for immediate implant placement in the aesthetic zone. This review articles provides a detailed information regarding the clinical concept of Root membrane technique.

Key words:- Socket shield, Dental Implants. Root membrane, Buccal shield, Aesthetic Zone

## Introduction

One of the main challenges in dentistry is replacing the missing tooth or teeth restoring its function and aesthetics. There are different treatment options in modern dentistry for the replacement of lost teeth. Of these the most upcoming and acceptable treatment option is Dental implants. Dental implants, made of titanium can be used for the replacement of both the anterior as well as the posterior dentition that will ultimately restore the aesthetics and function of the

missing teeth. These implants can be placed immediately after extraction of the teeth. The common problem usually associated with immediate implant placement in the anterior region is the post-operative soft tissue contour loss as a part of the bone modelling during healing. This may indirectly affect the aesthetics and long-term function of the implant.

To overcome these problems, Hurzeler et al in 2010 introduced a new technique called the “Socket shield technique”. This technique has been used as an alternative treatment modality for immediate implant placement in the aesthetic zone. It is also called as Root membrane technique as it utilizes the buccal two third of the tooth root which is kept inside the socket. The intentional retention of the root fragment serves to preserve or maintain the normal soft tissue contour throughout the entire period of implant function.

### Root membrane Technique

Following adequate anaesthesia of the site for immediate implant placement, the crown portion of the tooth is removed at the gingival level with utmost care not to damage the gingiva. Under copious irrigation, with the use of a long shank root resection surgical bur, the tooth root is carefully sectioned mesiodistally and longitudinally midway through the root with the canal as a reference point, such that labial and the palatal halves are separated from each other entirely from the coronal to apical aspect. Followed by this separation, a microperiosteome is used to displace the palatal halves and retrieved using microforceps (1). After this, the socket should be carefully evaluated to make sure that there is no mobility of the remaining buccal two third of the root. This prepared tooth root shields the buccal wall of the socket and prevents the recession of the tissues buccofacial to an immediately placed implant(2).

### Classification of Root membrane Technique

Depending on the position of the shield in the socket, root membrane technique can be classified as follows: (3)

Type	Description	Clinical scenario
Type I: buccal shield	Shield lies only in the buccal part	Single edentulous site
Type II: full C buccal shield	Shield lies in buccal part and the interproximal part on both sides of socket	Existing implant on either side of the missing area

		Missing tooth on either side without an implant
Type III: Half C buccal shield	Shield lies in buccal part and one of the interproximal parts	When there is tooth on one side and implant or a missing tooth on the other side
Type IV: Interproximal shield	Shield lies only in the mesial or distal part of the socket	When there is buccal resorption requiring grafting, and there is an adjacent side with missing tooth or an implant
Type V: Lingual-palatal shield	Shield lies on the lingual or palatal side of the socket	Maxillary molars
Type VI: Multiple buccal shields	When there are two or more shields in the socket	In cases with vertical root fracture

### Clinical concept

The most physiologic approach to prevent alveolar ridge resorption is to naturally preserve the root if possible (4). A very minor amount of inflammatory alteration or bone growth is observed around the root submerged for alveolar bone preservation (5). The root membrane concept intends to minimize volumetric alteration at the implant site by evenly maintaining the contour of soft and hard tissue around the immediately placed implant, throughout its function (6,7). Normally, tooth extraction results in loss of periodontal ligament along with its vascular supply which provides nutrition to the buccal bone (8, 9, 10, 11, 12). In the absence of this nourishment, there will be physiologic bone resorption of the buccal bone leading to contraction of the soft tissues ultimately results in aesthetic dilemma (13, 14, 15, 16). Studies put forward various techniques such as GBR, soft tissue grafting, socket preservation and also the use of various graft materials to limit this physiologic resorption (17, 18, 19, 20, 21). The clinical concept or the rationale behind the root membrane technique is that, maintenance of the buccal portion of the root helps in maintaining the PDL and the associated vessels which may in turn prevent the physiologic resorption of the buccal bone, preserving the esthetics of the ridge (22, 23). Also, the flapless approach allows for maintenance of vascular supply from the supraperiosteal artery (24). Earlier, this PDL-mediated ridge preservation technique was named as socket shield technique introduced by Hurzeler et al in the year 2010. Later Siormpas suggested the name

“root membrane technique” because the attached PDL on the is retained root fragment is the prime reason why blood supply and nutrition is maintained and thus ridge resorption is prevented. (24)

### Indications (25, 26)

1. Vertical fracture of the tooth without any pulpal pathology
2. Tooth with adequate periodontal support
3. Decoronated tooth at the level of the gingiva without any injury to the existing soft tissue
4. For delayed or late implantation approach or optimization of the pontic support in the crown and bridge reconstruction so as to improve the prosthesis base for removable dentures

### Contraindications (4, 25)

General contraindications:

- Patients under bisphosphonate therapy
- Immunocompromised patients
- Radiation therapy
- Anticoagulation

Local contraindications:

- Absence of buccal lamina which may be due vertical root fractures or periodontal disease
- Absence of adequate periodontal support
- Tooth with pulpal infections

### Histology

Although the clinical results obtained through the root membrane technique can be considered encouraging till now, there is only one human histologic evidence put forward by Mitsias et al in 2017 that supports the above-mentioned technique. They published evidence of histological analysis of a human sample which was retrieved 5 years after they performed the root

membrane technique in the anterior maxilla. The histologic and histomorphometric evaluation showed the presence of well-maintained buccal bone and PDL with high percentage of bone to implant contact (76.2%) (26). Also, most of the space between the implant and root towards the apical and middle third was filled with compact and mature bone and coronal third showed presence of noninfiltrated connective tissue. The root showed no signs of resorption. Other histologic studies on the root membrane technique are on animals. (27, 28)

## Modifications

- Proximal socket shielding introduced by Joseph and Kitachai in 2013 made use of an alternative approach in a case, utilizing a retained proximal root portion to preserve the peri- implant papilla (29).
- Modified socket shield technique by Glocker et al, 2014 which is mainly indicated in delayed implant placement cases. the root is separated vertically and the buccal root fragment is retained. The gingiva overlying the root fragment is tunnelled by 2mm so as to allow insertion of a collagen cone. It is then secured using criss-cross sutures. (4)
- Technique proposed by Cherel and Etienne in 2014 which involved the sectioning of the root in a vestibular-lingual manner, preserving the proximal portion of the root to preserve the papilla (30)
- Root-t-belt technique introduced by Guirado et al, 2016 (31) is a modification of the technique put forward by Cherel and Etienne. The implant placed is surrounded by root remnants, creating a belt- like structure preventing displacement of the papilla.

## Advantages (2)

1. Minimally invasive technique
2. Buccal shield serves as a guiding structure while implant placement
3. Minimizes tissue alteration at the implant site
4. Tissue preservation which helps in preserving a healthy peri-implant tissue

## Complications and limitations (2)

1. As the technique is sensitive, inexperienced surgeon may cause injury of the soft tissues while sectioning the root
2. Nicking of adjacent tooth root
3. Fracture of the buccal plate while removing the sectioned root fragment
4. Tooth with pre- existing periodontal or endodontic infection may lead to failure of the implant

5. Resorption of the root fragment
6. Mobilization of the root fragment
7. Peri implant mucositis

## Conclusion

Root membrane technique seems to be one of the predictable treatment options for the preservation of both the hard and soft tissue contour after extraction of teeth. Retaining the buccal root portion followed by immediate implant placement has been reported as a viable technique to obtain osseointegration in the absence of an inflammatory response. The histologic evidence that root membrane technique can preserve the buccal bone plate can validate the clinical use of this minimally invasive procedure that will ultimately yield the optimum esthetics. Further human studies both clinical and histologic are required to confirm the stability of this technique.

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