

SOCKET SHIELD TECHNIQUE: A REVIEW

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ABSTRACT : In order for an implant to be successful , osseointegration of the implant with the bone is required, which is possible only if there is adequate bone .After a tooth has been extracted several changes occur during the healing of the extraction socket followed by the continuous resorption of the bone due to loss of the periodontal apparatus and the blood supply. In an aesthetic zone , the resorption of the buccal bone followed by shrinkage of the soft tissues made it difficult for clinicians to restore the aesthetics.A novel technique was described in 2010 by Hurzeler et al who proposed a Partial Extraction Therapy , wherein only the lingual section of the root was to be extracted and the buccal bone was to be kept intact with the periodontium , this technique allowed clinicians to improve the esthetics and prevent the shrinkage of the hard and soft tissues. This review article aims to explain the socket shield technique and the rationale for it.

Key words: immediate implant, socket shield, buccal bone.

Introduction:

A technique of preserving the root fragment while extracting a tooth, especially the vestibular portion of the coronal 2/3r third of the root was first introduced by Hurzeler et al and it was referred to as the ‘socket shield technique’¹

This technique is a part of the classification of partial extraction therapy

Socket shield technique (SST) can be defined as part of the root is left attached to the labial bone, which aids in maintenance of the labial bone and soft tissue architecture. The labial root fragment is referred to as the ‘shield’ through all the chapters. An implant is placed in the palatal part of the socket in the same surgical appointment to support a restoration”²

The main aim of this technique is to preserve the blood supply and prevent the

loss of the periodontium, thereby keeping the buccal bone and bundle bone intact in order to prevent resorption

The buccal bone has bilateral blood supply from the gingiva above and the periodontium below. Once a tooth is extracted, buccal bone is deprived of the blood supply from socket side and this result in the loss of some buccal bone. The root section preserves the periodontium which consists of periodontal ligament (PDL)and its fibers, blood vessels, root cementum, bundle bone, and alveolar bone. The root fragment provides support to the buccal tissues and prevents the contraction as it is vital and will prevent any further remodelling to occur.

A modern technique was introduced by Baumer et al for preserving the hard and soft tissues and avoiding their shrinkage after loss of a tooth , without using any

regenerating materials with the use of an implant being placed immediately whilst retaining the buccal segment of the root.³

Only the sectioned buccal root is used to preserve the tissues along with an immediate implant being placed. The gap between the buccal section of the root and the implant may be filled with materials that resorb slowly. Teeth with relatively poor prognosis and may be considered for this procedure.

One of the major goals of prosthetic rehabilitation is to achieve and maintain the harmony between the pink and white zones especially in the aesthetic areas. Atraumatic extraction of a tooth with immediate implant placement was found to result in the loss of buccal bone, both vertically and horizontally as well as flattening of the interproximal bony scallop resulting in a complicated rehabilitation

The loss of supporting bone followed by the apical migration of soft tissue results in unesthetic black triangles between teeth. This creates a very challenging situation to a clinician in restoring the missing tooth with restoration having an acceptable esthetics, especially in the maxillary anterior region

Many preventive procedures such as ridge preservation procedures, and post collapse of the ridge procedures, such as bone augmentation, soft-tissue augmentation, or a mix of both, have been used in the past to compensate for this loss of bone and soft tissue.

After the extraction of a tooth immediate implant placement has been proven to be a viable and successful method. By comparing the success rate of both the immediate implants and delayed implants

, studies show that at least 1mm of recession will be seen in the the facial gingiva after an immediate implant is placed.

The recession was observed to be far greater with gingival biotypes that were thin.

The recession of the facial gingiva and the subsequent collapse of the ridge can present itself as a disaster for restoring aesthetics in the anterior maxillary region.

Aesthetics that have been compromised can be camouflaged to a certain degree in cases with gingival biotypes are thick and also patient with lip line that is relatively lower. However a failure of restoring the aesthetic demands of the patient can be seen in cases where several implants are to be placed and tissue available is insufficient and also in patients that have a high lip line and the gingival biotypes are thin.

The ‘socket shield technique’ has proven to be a good treatment alternative in order to manage the risks that are involved while restoring the aesthetics and prevent the shrinkage of the tissue after the tooth has been extracted

PRINCIPLE OF THE SOCKET SHIELD TECHNIQUE :

If a section of the buccal part of the root is preserved along with its entire periodontal apparatus then the body is misled into thinking that the root is still present and the gingiva and the bundle bone continue to receive their blood supply. This phenomenon is often known as “biological cheating”⁴

This biological cheating is the basic principle of the “Socket Shield Technique” and its variations.

CASE SELECTION :

Proper clinical assessment and a study of the radiograph must be done correctly in order to select a case for the SST procedure.

The parameter involved in the clinical assessment are⁴:

- ✓ Lip line
- ✓ Free gingival margin and Position of the tooth
- ✓ Gingival Biotype
- ✓ Interproximal height of the bone
- ✓ Space that is available for the restoration
- ✓ Infection at the site of the implant

A.LIP LINE

The lip line has been classified as:

- ✓ High
- ✓ Average
- ✓ Low

It is more difficult to achieve good esthetics in patients with higher lip lines as there is more display of the tooth and gingiva , thus posing as an obstacle for the dentist while providing the restoration. ⁶



- ✓ A low lip line is more preferable as the interface between the soft tissue and teeth wont be seen when the patient smiles.



B) Free gingival margin(FGM) and position of the tooth :

- ✓ There is a lower chance of the esthetics being compromised if the FGM is more coronal as any minor recession wont be seen as evidently. ⁶⁻⁸

C) Gingival Biotype

- ✓ A Thick gingival biotype is preferred over a thin one as recession post extraction is seen more evidently in thinner biotypes of the gingiva. ⁶⁻⁷

D Interproximal Height of Bone :

- ✓ In order to maintain an intact interdental papilla the height of the bone available interproximal plays a crucial role.
- ✓ A reduced height will cause the formation of a triangular dark space in between the tooth and the implant and thereby compromising the esthetics. ⁹⁻¹¹

E)Infection at Site of implant:

- ✓ Any periapical infection at the site of the implant can be risk and lead to complications after the surgery such as mobility in the shield . ¹²

F)Space available for the restoration :

In order to provide a good definitive prosthesis the space required for :

- ✓ Screw-retained prosthesis: 5mm
- ✓ Cement retained prosthesis:8mm



Sufficient space for restoration



Insufficient space for restoration

Classification of the Socket Shield

Technique:²

Based upon the location of the shield in socket.

TYPE		LOCATION
TYPE I	Buccal shield	In buccal part of the socket, between proximal line angles of tooth.
TYPE II	Full C buccal shield	In buccal part and the interproximal part on both sides of the socket.
TYPE III	Half C buccal shield	Lies in buccal part and one of the interproximal part
TYPE IV	Interproximal shield	Lies only in mesial or distal part of the socket.
TYPE V	Lingual-palatal shield	Lies on the lingual or palatal side of the socket.
TYPE VI	Multiple buccal shields	Two or more shield in the socket.

Indications

1. To support and preserve buccofacial bone plate of extraction socket in cases of immediate implants.

2. Socket shield technique is indicated in vertical fracture of teeth without pulpal pathologies, where preservation of the tissue and aesthetics is a priority.

3. To preserve papilla between the dental implants.

Contraindication

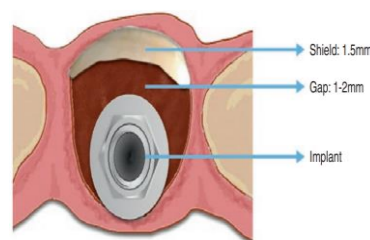
- Loss of buccal bone due to vertical fracture
- Loss of buccal bone due to periodontitis
- Caries on root fragment to be retained.
 - Teeth that are mobile.
 - Teeth that are present outside the arch

Diagnostic Tools for SST :

- ✓ IOPA
- ✓ CBCT

Guidelines for Preparation of the shield :

- ✓ Preparation of the shield requires extensive planning, any errors that occur due to improper planning of the shield can lead to failure in the long term.



Occlusal view of the dimensions of the shield, and the gap that must exist between the shield and the implant. ²

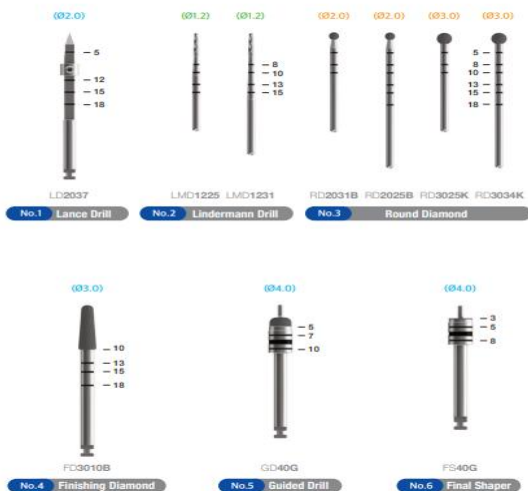
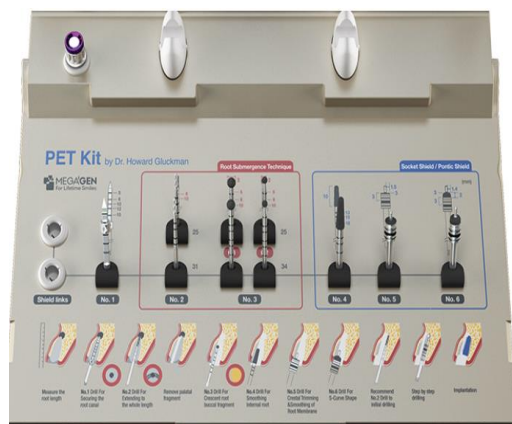
- ✓ While preparing the shield ,complete debridement of the shield must be done.
- ✓ The shield has to be stable through the procedure as any mobilization of the shield will lead to resorption or extrusion of the shield
- ✓ There should be no contact between the shield and the implant.
- ✓ The thickness of the shield plays a crucial role and it must not be made too thin as that would cause it to easily detach from the bone and must also not be extremely

thick as it would present as a hindrance while placing the implant

Instruments



Long shank carbide drill Round diamond Football shaped diamond



Clinical Steps of Surgical Technique

Under local anaesthesia, following procedure is carried out:

- Sectioning of the root (partial extraction).
- Shield preparation.
- Implant placement.
- Management of the gap.
- Suturing

First step is the sectioning of the root wherein a flap is raised, however research has shown that by doing so, it would cause the periosteum to separate from the bone and then cause resorption due to the lack of blood supply, thus a flapless approach is preferred.¹³⁻¹⁴

The choice of raising the flap would not affect the SST as a section of the root is left intact with its periodontal attachments.¹⁵

This procedure is done using a carbide bur with a short shank to first section the tooth and then a long shank carbide bur is used to section the buccal and palatal part of the root.

This sectioning can be done using the root canal space as a guide and an apex locator may be used to prevent damage to the bone.

The drill is made in a labial direction in order to achieve a clean section mesiodistally.

The palatal section is then extracted by placing an elevator between the palatal bone and the palatal section. The elevator must never be placed between the buccal section and the palatal section as it can cause fracture of the shield.

At no point, should the labial bone be perforated.

2) Preparation of the shield

After the palatal section of the root is extracted a gingival retractor should be placed in order to protect the soft tissues and preventing the tattooing of the soft tissue due to debris that is left behind.

A diamond round bur is first used to reduce the shield to level of crest of the bone. The thickness of the shield is reduced till it is 1.5mm.

While placing an implant in the mandibular anterior region the thickness of the shield should be less than 1.5mm to allow an implant that is narrow in its diameter to be placed.

The shield length must follow the contour of the labial bone and extend from the mesial to the distal line angle. The thickness of the shield in the middle must be thin in order to prevent any contact with the implant and also avoid any unnecessary pressure on the shield.¹⁵⁻¹⁶

A bevel or S-shaped profile on the inner side of the shield is given to accommodate the restorative components and give a good emergence profile when the crown is placed.

There should be no contact in between the temporary crown and the abutment with the prepared shield.



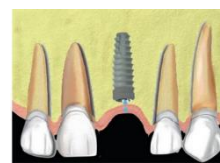
Trajectory for placing an implant based on the radial position of the tooth⁴

After the shield is prepared, any residue of the tooth must be removed by flushing the socket with saline and an IOPA can be taken to ensure all the remnants are removed.

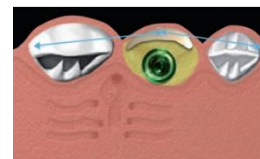
3) Placement of the implant:

In order to achieve optimum emergence in the final prosthesis it is important to place a 3-D implant in the:

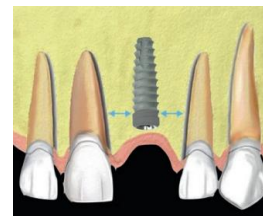
Coronoapical position⁴



Buccal-lingual position⁴



Mesial-distal position⁴



When an adequate amount of palatal bone is available then the osteotomy is 3-4mm apical to the crest of palatal bone.¹⁷ Gluckman et al. have suggested guidelines for selecting point of entry in the socket for immediate implant being placed¹⁸

Based on their classification for radial plane position of the tooth, the implant trajectory can be planned

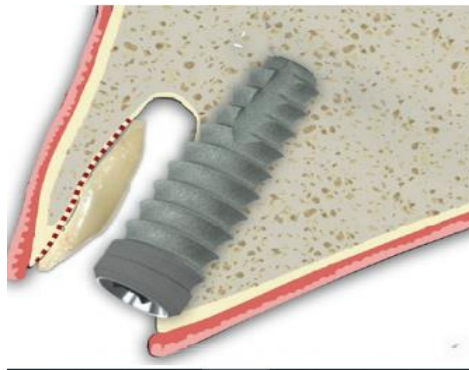
The osteotomy is always begun from the palatal wall of socket, it is never started

from the apex of the socket if the tooth is facially positioned and the labial bone is thin as this would lead to the implant being too close the shield.

The shield must not be perforated during the osteotomy with the drill.

A space of atleast 1-1.5mm must be present between the implant and shield.

In order to achieve proper primary stability from the periapical bone , the length of the implant should be 2-3 mm from the apex



Final position of the implant

4) Management of the space between the implant and the shield :

In order for new bone to form there should a blood clot in between the implant and shield.

A good seal must be crested with the temporary restoration or the healing abutment in order to prevent the soft tissue infill into the gap.¹⁹

In cases of the presence of a large gap in between the shield and the implant then a

alloplast may be used to enhance the bone formation as it provides itself as frame.

5) Closure :

In order to close the socket and protect the implant, the closure can be done in four ways :

- 1) Placing a healing abutment:
The easiest way to protect the impant is to use healing abutment when a temporary restoration is planned.²⁰⁻²²



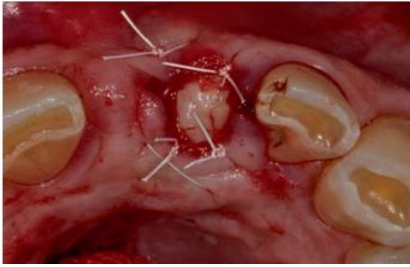
Healing abutment

2)Customized healing abutment :

This method can be used when a provisional restoration is not plannedand the customizing the healing abutment will lead to development of the soft tissue .²³



- 3). Placing a cover screw : if there is poor primary stability of the implant, the clinician can submerge the implant after which the seal can be achieved by taking a graft from the tuberosity or the palate. A seal is achieved with a piece of free gingival graft from the palate or tuberosity which is sutured around the periphery of the socket ²⁴



4.) Using a provisional crown that is screw retained :

If the occlusion is stable for providing a good fixed restoration then this method can be chosen provided there is primary stability of the implant. This method will also help in maintaining the contour of soft tissue for the final prosthesis .



Advantages

- a. Resorption of the lamellar bone can be avoided, if the implant is placed touch with the buccal root fragment and thereby preventing the shrinkage of the tissues and the bony structures
- b. Preservation of peri-implant tissues.
- c. buccal shield that is insitu will act a guide while placing the implant in correct position.
- d. Complete osseointegration can be achieved by this technique.
- e. Prevents formation of fibrous tissue around implant.

F. Minimally invasive

I . Reduces the need for graft materials

Disadvantages

- a. Due to developing or existing periodontal infections, resorption can be seen of the root fragment that has been retained
- b. Technique sensitive.
- c. If not handled with care, it can lead to the lamellar bone in the buccal area to be displaced.
- d. Long term presence of the buccal shield has not been found so far.

Complications:

1. Incomplete sectioning:
While sectioning of the root is being done sometimes the palatal root may get extracted without the apex.
This can be rectified by trimming the apex of the root with the help of a bur that has a long shank .
2. Mobility of the shield:
If the labial shield becomes mobile during sectioning of the tooth it is advised to completely extract the tooth and simply place an immediate implant .²⁵
3. Labial fenestration:
In case of a labial fenestration being created close to the apex ,an esthetic buccal flap can be made in order to access the fenestration and it can be grafted.
4. Inability to achieve stability of implant:

In case of poor stability of the implant , a provisional restoration can be made immediately so that the implant is

submerged inside and the socket can be sealed by using an free gingival graft.

5. Spinning implant:

A staged implant placement is done in case the stability of the implant is extremely poor and the implant is spinning and the osteotomy that was prepared can be filled using biomaterials.²⁵

CONCLUSION

The clinician should be specially trained and must have experienced clinical skills. The procedure requires a little more time and patience to avoid mobility in the shield.

The case selection is very important for the success of the procedure. The intactness of the shield has a crucial role in ensuring the success of the treatment.

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