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RESEARCH ARTICLE

SOCKET PRESERVATION - A REVIEW

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Abstract

After tooth extraction, the jaw bone has a natural tendency to become narrow, and lose its original shape because the bone quickly resorbs, resulting in 30–60% loss in bone volume in the first six months.Socket preservation can reduce the need for later bone augmentation. By reducing bone resorption and accelerating bone formation it increases implant success and survival.[1]

Introduction:-

Socket preservation is a prophylactic procedure that aims to minimize alveolar ridge atrophy after tooth extraction.Alveolar bone uneventfully undergoes residual ridge resorption after tooth extraction.Socket preservation is a procedure which is done to reduce external ridge resorption following tooth extraction and enhances bone formation within the socket.[2]

This is particularly important for placement of dental implants allowing for more ideal placement for the final esthetics with improved emergence profile and gingivalarchitecture.

Goals Of Socket Preservation

1. The main goal is to maintain the original anatomy of the ridge.
2. Socket preservation procedure reduces the possibility of residual ridge resorption near the extraction site.
3. Dental implant placement becomes less difficult when the socket is well preserved.
4. This way maximum bone and soft tissue at the extraction site is retained.
5. In order to achieve a predictable esthetic and functional restoration, it is important to preserve the width and height of alveolar ridge after extraction of tooth.[3]
6. Following extraction of tooth various patterns of bone resorption, especially on buccal side,can occur therefore socket preservation plays a very crucial role.
7. Atraumatic extraction should be performed which preserves the maximum ridge

Atraumatic tooth extraction

Atraumatic extraction techniques should be used to minimize damage to the alveolar bone during tooth extraction. The initial incision can be made with a microsurgical blade to minimize elevation of the gingival tissues. The periodontal ligament can then be further separated from the root with the use of a periotome, avoiding the buccal plate.

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Frequently, single roots can be extracted with the periotome alone. If there is adequate tooth structure it can be extracted with tapered forceps, which better adapt to the root surface. For single-rooted teeth with inadequate tooth structure for forceps extraction, an alternative technique is to use the easy-x-tractor

Barrier membranes
The first barrier membrane used for extraction socket augmentation was expanded polytetrafluoroethylene (ptfe), which required primary closure and a second surgical procedure.

This technique is still used for large augmentations of deficient edentulous ridges. The key characteristics of an ideal barrier membrane are biocompatibility, suitable occlusive (barrier) qualities,and durability upon exposure. In badly damaged sockets, a combination of membranes can be used.[4]

For extraction sockets with complete loss of the buccal plate, a stiffer collagen membrane, such as biomend extend can be placed on the buccal to assist with space maintenance, and a more flexible and exposure-resistant collagen membrane [bio-gide] can be placed over the socket. Dense polytetrafluoroethylene(PTFE) can be used to protect any resorbable membrane from premature breakdown.[5]

Bone grafting materials
The various grafting materials can be combined to change the characteristics of the bone replacement graft. If demineralized freeze-dried bone allograft (dfdba) plus calcium sulfate (cas) is used as the basic graft, it can be made more substantial for badly damaged sockets by the addition of anorganic bovine hydroxyapatite(abh)or beta tricalcium phosphate (btcp).

Implant placement
The first reported case of an immediate implant placed in a fresh extraction socket was in 1976 by researchers w. Schulte and G. Heimke.In 1991, Barzilay et al. Suggested that immediate implant placement might reduce or eliminate alveolar ridge resorption during the initial healing of the alveolar extraction socket.[6]

The most important step in the postoperative management of augmented extraction sockets is the placement and shaping of the temporary tooth that is placed over the extraction area. If the socket is augmented and an immediate implant is not placed, a removable ovate pontic can be placed immediately.

Socket Shield Technique
As a result of the loss of the periodontal ligament and its vascular support, tooth extraction can lead to alveolar bone resorption Authors have discussed the preservation of dental roots as means to prevent alveolar resorption, reporting esthetic effects while maintaining soft tissues (Salama et al. 2007). Based on this idea,Hürzeler et al. (2010) introduced a technique known as socket shield .[7]

The goal of this technique is to maintain the bundle bone at its level on the buccal side by performing a partial root extraction.

Procedure:-

Step 1: cut the crown horizontally at the gingival level
Step 2: bisect the root vertically in such a manner that palatal half is removed along with the apex Thelength of the shield should be kept at two-third of the root length. This step requires lot of practice, patience, and time. The buccal part is then reshaped such that the shield width is about 1.5–2 mm.[8] The shield should be trimmed to the bone level. A bevel or s-shaped profile on the inner side of the shield is given to accommodate the restorative components.
Step 3: placement of implant in correct three-dimensional position.

The optimum space between shield and implant is 1.5 mm or more. A bone graft is suggested if the gap is more than 3 mm. A provisional crown or a customized healing abutment given immediately after the implant placement will help in maintaining the soft-tissue contours. The choice of prosthesis for the final restoration is a screw-retained crown or a cement-retained crown with restorative margin that can be easily accessed for cement clean up.

Socket Seal Surgery

A composite graft of connective tissue, periosteum and tuberosity bone is used to seal the socket. Technique applicable for non-infected tooth extraction and implant planned for replacement Not to be performed if infection present or mucoperiosteal flap is elevated [9]

Atraumatic extraction is performed. Following extraction, the socket may be sealed with either a soft tissue transplant or a collagen matrix, such as mucoderm, to stabilize the blood clot and protect it from bacterial contamination or physical damage.

In the conventional approach, the socket is sealed with an autologous gingival transplant, which is harvested with a punch from the palate. Collagen matrix mucoderm is a valid alternative to this approach that spares the patient the discomfort of the harvesting procedure. [10]Heterogenous and xenogenous matrices were developed as alternatives for free autogenous grafts. More recently, a collagen-based matrix was introduced in the market specifically for use sealing the alveolar socket.[11]To stabilize the collagen matrix on the surgical site, single interrupted sutures can be performed from the borders of the material to the soft tissues around the alveolar socket.

Socket Preservation With Platelet Rich Plasma(Prp) And Platelet Rich Fibrin (PRF)

Socket preservation using biomaterials has been proposed and autologous platelet concentrates including platelet rich plasma (PRP) with growth factors and platelet rich fibrin (PRF) are employed (rutherford and niekrash, 1992; zhang and wang, 2007).[12]

PRF is a second-generation of autologous growth factors,which encourages healing and is proposed to be associated with effective and early organization of bone substance and bone volume percentage (dohan and choukroun, 2006; kutkut and andreana, 2012). In addition, prf is a platelet concentrate with leukocytes in dense fibrin matrix, which can be conveniently prepared from autogenous non anti-coagulated blood when centrifuged (choukroun and diss, 2006).PRP is more applicable for cases that require easy coverage. [13]

Preparation method of PRP

The coagulation process to obtain a gel was initiated with 10% calcium chloride and bovine thrombin.

The introduction of an endogenous initiator of coagulation (usually bovine thrombin) in most of the commercially available methods of prp preparation has the effect of causing rapid degranulation of platelets and almost immediate liberation of growth factors into the surgical area at the time of preparation.[14] Since growth factors have a limited time of effectiveness, immediate release of growth factors can only affect the immediate stages of wound healing and not the extended period of time needed for bone and soft tissue regeneration.

A PRP blood clot, on the other hand, contains 4% rbcs, 95% platelets, and 1% wbcs.The prp preparation protocol requires collection of blood with anticoagulant, centrifugation in two steps, and induced polymerization of the platelet concentrate using calcium chloride and bovine thrombin. A platelet-rich fibrin material, which does not use bovine thrombin as an activator, has been described as a **platelet-rich fibrin matrix (prfm).**

Preparation method of Platelet rich fibrin (PRF)

PRF is harvested from venous blood and does not lead to immune rejection in clinical application. Unlike other platelet concentrates, this technique does not require any gelifying agent.[15]

Choukroun et al. developed the PRF in 2001 and the production protocol of PRF attempts to accumulate platelets and released cytokines in a fibrin clot. It includes collection of whole venous blood (around 5 ml) in each of the two sterile vacutainer tubes (6 ml) without anticoagulant and the vacutainer tubes are then placed in a centrifugal machine at 3,000 revolutions per minute (rpm) for 10 min, after which it settles into the following three layers:

1. Upper straw-coloured acellular plasma,
2. Red-colored lower fraction containing red blood cells (rbcs), and
3. The middle fraction containing the fibrin clot .

The upper straw-coloured layer is then removed and middle fraction is collected, 2 mm below to the lower dividing line, which is the PRF .

Conclusion:-

Socket preservation is important for achieving optimum esthetics with implant restorations. The data, however, were limited, and clinical significance could not be inferred. Good bone level alone does not imply improved esthetics. socket preservation helps to maintain the alveolar architecture. Socket preservation significantly reduces the loss of ridge width and height following tooth removal.

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