



SOFT TISSUE EXPANDERS AND ITS APPLICATIONS IN PERIODONTOLOGY- A REVIEW

Periodontology

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ABSTRACT

The drawbacks associated with the traditional periodontal plastic surgical procedures such as compromise in tissue integrity and colour match and insufficient quantity leading to post-surgical graft exposure can be overcome by the use of recent advances such as soft tissue expanders. Soft tissue expansion can overcome these disadvantages and can be used for the effective generation of soft tissue thereby achieving predictable augmentation of deficient alveolar ridges.[1] This article discusses about the various soft tissue expanders and their applications in periodontology.

KEYWORDS

soft tissue expanders, tissue expansion , implant, soft tissue

INTRODUCTION

Placement of implants in resorbed ridges poses numerous difficulties to the clinician for successful aesthetic and functional rehabilitation. The reconstruction technique for resorbed ridges utilizes one or a combination of periodontal plastic surgical procedures in conjunction with autogenous bone grafting, allogenic bone block grafting, and ridge split techniques, distraction osteogenesis, or guided bone regeneration for most predictable outcomes.[1] Many of these techniques are limited in their efficacy due to inadequate regeneration of bone and soft tissue, which leads to implant failure. A technique to avoid such a scenario is soft tissue expansion.

WHAT IS SOFT TISSUE EXPANSION

Soft tissue expansion is a reconstructive surgical procedure that provides space for the development of additional skin, bone or other tissues due to resorption. [2,3,4] This space is provided by the insertion of tissue expanders in the defect site, which allows the enlargement of soft tissues to provide the adequate soft tissue closure. [5] A surplus of soft tissue will make tension-free closure of the augmented site easier or possible at all. Tissue expansion should therefore be considered in the treatment planning in all those cases where a lack of soft tissue of the appropriate quality and / or quantity is to be expected. The use of intraoral soft tissue expanders was first described in 2007 as small hydrogel expanders became available. (KOBUSETAL) [6]

NEED FOR SOFT TISSUE EXPANSION

In modern dental practice, placement of endosseous implants is constantly increasing, as many patients are seeking replacement of lost teeth with this modality of treatment. Since the overall success of dental implant therapy depends on the presence of adequate bone volume at implant sites. Soft tissue expanders have been introduced in implant therapy, as pre-augmentation devices, to avoid the complications associated with bone-grafting procedures

CHARACTERISTICS OF AN IDEAL TISSUE EXPANDER

1. It should be made of an inert material; hence not causing any toxicity to the surrounding tissues.
2. The expanding process should be as short as possible, thus decreasing the treatment time.
3. Maximum amount of tissue should be produced.
4. It should have the option of fixation hence helping to keep the expander in place during expansion.
5. A Rounded shape of the expander, thus reducing the risk of perforation during expansion.
6. The expander and the filling port should be easily identified in the operating field thus providing comfort and effectiveness for the surgeon.[6]

ADVANTAGES OF SOFT TISSUE EXPANSION

Tissue expansion:-

- Allows better wound closure without compromising the blood supply of the flap.[15]
- Eliminates the need for harvesting connective tissue graft and avoids the multiple phases of flap transfer when ridge augmentation is contemplated by using soft tissue onlay grafts. [12-15]
- Augments the keratinized tissue at the recipient sites and the color, texture and thickness of the tissue obtained is maintained.[14,15]
- Expanded flaps have increased vascularity; hence, their transfer may be safer.[34]

INDICATIONS

Tissue expansion is used in various surgical procedures that include:

1. bone regeneration procedures and onlay grafting procedures.
2. intraoperative procedures in cleft lip repair surgery[26]
3. treatment of decubitus ulcers with local flaps[27]
4. development of post-auricular skin for external ear reconstruction surgery[28]
5. extension of forehead skin for forehead flap total nasal reconstruction [29]

CONTRAINDICATIONS

Tissue expansion is contraindicated in patients with:

1. psychological disturbances
2. active infections in the body
3. poor vascularization of tissue in the implantation area
4. systemic diseases such as diabetes mellitus, bacterial pneumonia, chronic liver disease, renal failure and hypertension [17]

TYPES OF EXPANDERS

Several types of expander exist, varying in material, size, filling substitute, filling port and filling valve. Shapes may vary: round, rectangular, tubular or crescent-shaped. The expanded sizes vary from about 0.35 ml (cupola Dental Osmed® GmbH) to 1300 ml (Integra® breast expanders) Most of expanders consist mainly of a silicone balloon with an injection port. The latest generation of expanders consists of hydrogels, which compared to balloon expanders are self-inflating and therefore have no filling port In a review by Drury *et al.* hydrogel applications were classified for tissue engineering in three categories: space filling, bioactive molecule delivery and cell/ tissue delivery.

CHITOSAN TISSUE EXPANDER

Chitosan ascorbate, obtained by mixing chitosan with ascorbic acid and sodium ascorbate, was produced in a gel form suitable for the treatment of periodontal problems according to current dental surgery. Chitosan ascorbate plays an important biological role in the presence

of atmospheric oxygen and at pH of 6. Thus the proliferation and organization of the cells were favoured with the subsequent enhanced capability of reconstructing the soft tissue and reduces the occurrence of tooth mobility and pocket depths.[18]

COMPLICATIONS

Exposure of the tissue expander is a common clinical complication, reported in about 11.1% of the cases [19]. Expander exposure has been attributed to several factors: too rapid expansion, dehiscence of the incision, a fold in the expander that eroded through the skin, inadequate tissue coverage or manipulation of the expander by a noncompliant patient [21]. Infection of the expander pocket, the expander or the filling port is possible [21]. Therefore aseptic techniques are to be followed during surgery and during inflation in the office. Hematoma can lead to infection [22]. The disadvantage of the hydrogel expander if used without silicone envelope is its uncontrolled rapid swelling, which may lead to perforation [20]. To overcome this problem Anwender et al. introduced a silicone envelope with some holes in it in which the hydrogel is sealed.[24] The expanding process of a hydrogel expander stays uncontrolled. The hydrogel expander cannot be deflated. Varying with the area in which hydrogel expanders were extra-orally, 0-25% complications have been reported [25]

FUTURE OF TISSUE EXPANDERS

The use of a tissue expander is seen to be an effective method in developing the required amount of tissue after a surgical procedure as it provides adequate tissue coverage and aesthetics.[26] Tissue expansion involves a simple procedure, which can also be done by novice surgeons. The use of self-inflating or osmotic tissue expander has started to gain attention in various surgical procedures due to its numerous advantages that can overcome problems such as the loss of bone graft and disclosure of graft. Recent advances in tissue expander technology have made it easier for successful implantation of bone grafts or synthetic grafts and development of tissue with matching colour and texture to the area of defect. Based on the current responses of patients for the restoration of aesthetics, form and function, the tissue expander is expected to play an important role in intra oral tissue reconstruction in the future. [5]

CONCLUSION

Patients who lack part or all jaw bone and soft tissue and are in need of a tooth implant, run at a greater risk of unsuccessful operations. This is because there is not enough soft tissue to cover a bone transplant performed in anticipation of the tooth implant. The so called osmotic hydrogel expanders increases the amount of soft tissue, which increases the risk of likelihood of bone transplant. Advantages of the osmed tissue expanders are that the material is safe with low complication rate and low risk of infection due to small incision site and minimal trauma.[14]

At present alloplastic material such as titanium is often used for mandibular reconstruction as it is resistant to corrosion ,acceptable and biocompatible.[12] Controlled soft tissue expansion encourages the development of tissues which ideally match the color and texture to give a donor effect, which offers a new ,safe and widely applicable technique in reconstructive surgery. Synthetic implants or bone grafts have been successfully implanted beneath the expanded soft tissues.[13]

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