

RESTORING ESTHETICS - MANAGEMENT OF TISSUE LOSS IN IMPLANT SUPPORTED FIXED PARTIAL DENTURES: A LITERATURE REVIEW

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ABSTRACT:

Implant treatment is widely known by patients, who nowadays have increasing aesthetic expectations. Sometimes the aesthetic outcome of implant therapy is not ideal. Compromised aesthetics are usually caused by lack of sufficient bone after tooth loss. Several techniques have been proposed to augment bone prior to or at implant placement, however, there are situations in which it might be possible to obtain good aesthetic results solely through manipulating or augmenting soft tissues. Patients unwilling or unable to tolerate adjunctive surgeries may require alternative prosthetic replacements for the lost tissue in the form of gingival prostheses. Thus, this paper gives a review of aesthetic treatment options for tissue loss in implant supported fixed partial dentures.

Keywords: Implant, augment, gingival prostheses.



INTRODUCTION:

In recent years, the esthetic demands of the patients and dentists have increased because of an increasing awareness of appearance. The absolute goal in modern dentistry is to attain a balance between the “white” and “pink” esthetics in the zones which are esthetically important, white referring to the natural dentition or the restored dental hard tissues and pink referring to the surrounding tissues. The surrounding hard and soft tissues may add to or reduce the esthetic result.

Ridge deformities: The way the gingival tissues appear plays an important role in the overall esthetic framework. Many a

times ridge deformities may be encountered due to developmental defects, advanced periodontal disease, post-extraction bone resorption, traumatic extraction or other surgical causes. Siebert classified residual ridge deformities into three classes. ^[1] Class I is characterized by the loss of faciolingual tissue width with normal ridge height. Class II is characterized by the loss of height with normal ridge width. Class III is marked by a combination of loss of both height and width. ^[2]

Class I deformities are not very frequent and can be managed esthetically without much difficulty. Whereas, treatment of Class II and III ridge deformities require

some sort of surgical augmentation.^[2] There are two basic approaches to treat gingival defects: surgical and prosthetic. The surgical treatment consists of minor procedures of rebuilding the papillae and grafting which may not only augment the soft tissue, but also the bone to support this tissue. If the treatment is successful, the result may simulate the original contours of the tissue. However, this approach is not always predictable when a large volume of tissue is to be augmented. In such cases, prosthetic replacement is useful. Thus this paper gives a review of esthetic treatment options for tissue loss in cases of implant supported fixed partial dentures.

SOFT TISSUE AUGMENTATION

The key determinant for obtaining a successful implant in the esthetic zone is the ability to create a stable gingival architecture at gingival margin and interproximal papilla. Once the satisfactory outline of the gingival margins has been achieved, the prosthetic work can be finalized. Soft tissue augmentation can be done before implant placement, at the time of placement or at second stage surgery. The modification can be done by two basic approaches: versatile soft tissue closure techniques and connective tissue graft.^[1]

Versatile soft tissue closure techniques

These can be used for augmenting minor edentulous ridge defects.

Tunnel technique^[3]

The design for the original tunnel technique comprises the preparation of a

supraperiosteal mucosa flap with intrasulcular incisions. This allows the mobilisation of the cervical gingiva and, therefore, the creation of a “pouch”. By undermining the interdental papillae a mucogingival tunnel between all adjacent pouches can be developed. The subepithelial connective tissue graft (CTG) is then inserted into the tunnel, partly exposed over the recessions and sutured in this position. Since the amount of root coverage is depending on the size of the graft which survives over the root surface, necrosis of the exposed parts of the CTG is one of the problems which limit the predictability of this original technique. To overcome this problem, a better coverage of the CTG should be achieved. Therefore, it has been suggested to coronally advance the pouch and the tunnel. This modification has been described by Azzi and Etienne.^[4]

Roll flap

Abrams (1980) introduced a method for minor edentulous alveolar defects augmentation. It involves a palatal connective tissue pedicle from which the epithelium is tripped and rolling it under the buccal mucosa.^[1, 5]

Modified roll flap

Scharf & Tarnow (1992) proposed a modification of the roll technique (Abrams 1980) for managing soft tissues around implants in the aesthetically important zones. At the time of the second surgical procedure, a “trap-door approach” on the alveolar ridge over the palatal connective tissue was recommended to preserve the epithelium. This allowed the mobilization of

a pedicle connective tissue flap which was then rotated buccally to increase soft tissue thickness. [1, 5, 6]

A subsequent modification of this technique was given by Barone et al. (1999) in which buccal releasing incisions were avoided, suggesting the use of an intrasulcular incision on the adjacent teeth to improve the aesthetic outcomes. [7]

Connective tissue graft

Inlay tissue grafting: In this method, a donor graft is placed under the soft tissue. It is one of the basic and most predictable methods. This can be used for minor- to moderate-size edentulous ridge defects. It assists in flap closure, improves the height of the tissue and its topography, and helps to mask metallic discolorations around the collars of abutment. These grafts may be either pedicled or nonpedicled. A pedicled graft has more blood supply, but its use is limited to the area which is adjacent to the donor site. The nonpedicled graft can be used for an area which is away from the donor site. [1]

Connective tissue grafts are used in two forms: (1) a graft which is entirely composed of connective tissue; it is used for esthetic ridge augmentation procedures. (2) a connective tissue graft with an epithelial surface; used for treating denuded root surfaces and gingival discoloration around dental implants. [8, 9]

Two main clinical steps are involved in this procedure: (1) recipient site preparation and (2) harvesting the connective tissue graft. Its advantage is that it preserves the

original characteristics of the overlying mucosa, therefore it blends better esthetically. Ridges augmented with connective tissue have shown stability during the first three years. But in cases of apicocoronal ridge defects, it alone may not be able to the augment the defect completely. The only disadvantage of these grafts is that a second surgical site is required.

Thoma, Beni et al. in 2009 stated in their systematic review of surgical procedures for soft tissue augmentation, that the use of subepithelial connective tissue grafts (SCTGs) resulted in statistically significantly more soft tissue volume gain compared with free gingival grafts (FGGs). [8] Thoma et al in 2014 stated in their systematic review that for soft tissue volume augmentation, autogenous tissue (SCTG) has to be considered treatment of choice resulting in an increase in soft tissue thickness at implant sites and in partially edentulous sites. [9]

Onlay tissue grafting [1]

In this technique the connective tissue grafts are sutured over the soft tissue. Onlay grafts are thick, free gingival graft which are obtained from partial or total thickness palatal grafts. They are used to gain ridge height, and can also be used to eliminate gingival amalgam tattoos as well as to treat weakened gingival tissues because of previous trauma. When the graft is thin, it can be used to increase the zone of attached gingiva, whereas a thick one is recommended in cases of ridge augmentation procedures.

HARD TISSUE AUGMENTATION

The procedure involves preparation of two surgical sites: the recipient and the donor site. After the preparation of the sites, the graft is adapted and fitted to the underlying periosteum and sutured. A fibrin clot formation is promoted by five minutes of pressure applied with a saline-wetted gauze. The grafted area is covered by rubber dam followed by a surgical dressing, and the raw area is covered by a fabricated acrylic template. A waiting period of at least 4 weeks should be observed before any gingivoplasty procedure and at least 6 weeks for any provisional prosthesis or reflecting a flap for implant placement if the grafting was done before the implant placement.

The drawbacks with this procedure are that the texture and colour may not match with the surrounding tissues, difficulty of adaptation of the graft to the recipient site, hematoma formation causing mobility of the graft, graft shrinkage, and failure to achieve a good adherence of the graft to the titanium abutments.

Collagen Matrices

It is a recent development in the onlay grafting procedure. Increasing and/or restoring the width of attached gingiva can be done by grafting with autogenous tissue or freeze-dried skin. It has many strong advantages over the traditional onlay grafting: there is a better colour and contour matching with the original surrounding tissues, there is no need for a donor site surgery, and an unlimited availability. [1, 9, 10]

A lot of patients present with tissue deficiencies in the maxillary anterior region, either after tooth loss after trauma, or periodontal and endodontic causes. The bone deficiency of the alveolar process may be either horizontal, or vertical, or a combination of both. The final prosthesis thus may be compromised functionally, structurally or esthetically. [11] Various classifications have been put forth in relation to treatment planning in dental and maxillofacial implantology for bone resorption and alveolar ridge configurations. [12-15]

A myriad of surgical techniques have been described in previous years for reconstruction of deficient alveolar bone for supporting dental implants, eg, particulate graft augmentation, block graft augmentation, ridge splitting or ridge expansion, and distraction osteogenesis. Materials that can be used for grafting include autogenous graft, allogeneic graft, Xenograft, alloplast, and recent advances like bone promoting proteins, and titanium meshes. [11, 17]

The augmentation can be done either simultaneously, that is with the implant placement, or it can be done in a staged manner wherein the alveolar bone reconstruction is done in the initial surgery, and implant placement is done after 2-6 months. [11]

If the defect is less than 2 mm, autogenous bone chips can correct it. However, if the defect is more than 2 mm a veneer or an onlay graft has to be used. [1]

Particulate graft augmentation ^[18, 19]

It is done in the following cases

- In defects with multiple osseous walls that will contain the graft
- Dehiscence or fenestration defects when implants are placed simultaneously.

Block graft augmentation ^[18, 19]

In this, a block of cortical bone is harvested from a remote site and is utilized to increase the bone width. It is done in the following cases:

- Horizontal augmentation
- Minimal vertical defects

The intraoral sites most commonly used for obtaining the graft are the mandibular symphysis and the ramus.

Ridge splitting/ ridge expansion ^[17, 20, 21]

Alveolar reconstruction or alveolar widening with osteotomes and chisels produces a greenstick fracture leaving the remaining periosteum attached to the bone. This periosteally pedicled buccal cortex is repositioned and a new implant bed is created without even drilling. Lateral widening completely exposing the labial cortex has been introduced.

Advantages

- Survival and success rates of implants placed in the expanded ridges are comparable with those of implants placed in native, non-reconstructed bone.

- Implants placed in ridges that have been expanded seem to withstand the biomechanical demands of loading.

Limitations:

- Can be applied only in cases where the buccal and palatal/lingual plates are separated by spongy bone.
- Buccal plate can fracture.
- Unfavourable inclination of the implants placed in the expanded bone.

Distraction osteogenesis ^[11, 17, 22, 23]

Distraction osteogenesis is defined as a biologic process of bone formation occurring between the surfaces of vital bone segments that are gradually separated by incremental traction

The distraction technique has also been adapted for limited augmentations of the alveolar crest prior implantation. It is mostly used in the anterior maxilla. Some of the systems use equipment, which are removed in conjunction with implant placement and some utilize the implant itself as the distraction device.

The daily rate of alveolar crest distraction is approximately 1 mm, which is considered optimal. It is initiated after 2-5 days after the primary osteotomy. Distraction is continued up to 30 days and the final gain will be between 4 and 7mm.

Advantage - Donor site problems of grafts and dehiscence of grafted bone are avoided.

Disadvantage - A second surgery is needed if implant-based distraction is not used.

PROSTHETIC COMPENSATION

Even though surgical augmentation procedure may be a prerequisite to achieve improved esthetics, some patients may not be willing or are not able to tolerate these surgeries. Also, after performing these surgeries, the effect of correcting these deformities may not be as good as ideal and can leave dark areas between teeth, thus hampering the esthetics, phonetics and the lip support. [24]

Gingival replacement prostheses have historically been used to replace the tissue that has been lost when other surgical procedures were contraindicated or considered unpredictable. Large amount of tissue volumes can be easily replaced with this method. Alternative prosthetic replacements for lost tissue include [24-30]:-

1. A fixed partial denture with gingival porcelain
2. A detachable gingival flange
3. A removable gingival veneer
4. Prosthesis retained with precision attachments
5. Hybrid dentures

Materials used [24, 25, 27, 30]

REFERENCES:

1. Abd El Salam El Askary. Fundamentals of esthetic implant dentistry 2nd edition. Blackwell publishing.
2. Po-Yu Lai, Shing-Wai Yip. Alveolar Ridge Augmentation using Subepithelial Connective Tissue

The material used for these prostheses include heat-cured and autopolymerising acrylic resin, gingival coloured porcelain, flexible silicone material and thermoplastic copolyamides. Heat-polymerised acrylic resin has been used most commonly for the fabrication of removable gingival prostheses because of its low cost, durability and smooth surface. However, few of its disadvantages are that it is rigid, fractures easily and it difficult to adjust around teeth. Flexible silicone material has an improved comfort and more resistance to fracture. A new material, thermoplastic copolyamide has better toughness and flexibility properties. All of these materials have shown good colour stability.

CONCLUSION:

It is unusual for edentulous ridges to possess ideal dimensions and appearance, especially if they are the result of teeth extracted following loss of periodontal support or trauma. The bone ridges undergoes atrophic processes, in both apicocoronal and buccolingual directions, with inevitable repercussions for the esthetic appearance for the restoration. Creation of the inconspicuous restoration in the esthetic zone is a goal of implant therapy today. It is now possible to fulfil this goal with innovations in the use of bone grafting, soft tissue augmentation, and diligent prosthetic management.

- Grafts: A Case report. Journal of Prosthodontics and Implantology 2012 ; Volume 1(2): 60-65.
3. Andrew L. Allen. Use of the Supraperiosteal Envelope in Soft Tissue Grafting for Root Coverage. I. Rationale and Technique. Int J Periodont Rest Dent 1994;14:217-22.
 4. Azzi R, Etienne D, Carranza F. Surgical reconstruction of the interdental papilla. Int J Periodontics Restorative Dent. 1998; Oct 18(5):466-73.
 5. K. Barakat, A. Ali, A. Abdel Meguid , M. Abdel Moniem. Modified roll flap a handy technique to augment the peri-implant soft tissue in the esthetic zone: A randomized controlled clinical trial. Tanta Dental Journal 2013; 10: 123e128.
 6. Scharf DR, Tarnow DP. Modified roll technique for localized alveolar ridge augmentation. Int J Periodontics Restorative Dent 1992;12:415e25.
 7. Barone R, Clauser C, Prato GP. Localized soft tissue ridge augmentation at phase 2 implant surgery: a case report. Int J Periodontics Restorative Dent 1999; 19:2: 141-145.
 8. Thoma DS, Beni GI, Zwahlen M, Hammerle CHF, Jung RE. A systematic review assessing soft tissue augmentation techniques. Clin. Oral Impl. Res. 2009; 20 (Suppl. 4): 146–165.
 9. Thoma DS, Buranawat B, Hammerle CHF, Held U, Jung RE. Efficacy of soft tissue augmentation around dental implants and in partially edentulous areas: A systematic review. J Clin Periodontol 2014; 41 (Suppl. 15): S77–S91.
 10. Silc, Jennifer T.; Petrungaro, Paul S. Acellular Dermal Matrix Grafts for Root Coverage Procedures: Review of Products and Introduction of a New Technique. Compendium of Continuing Education in Dentistry. Jun2013, Vol. 34 Issue 6, p408-416.
 11. Ulrike Kuchler, Thomas von Arx. Horizontal Ridge Augmentation in Conjunction with or Prior to Implant Placement in the Anterior Maxilla: A Systematic Review. Int J Oral Maxillofac Implants 2014;29(suppl):14–24.
 12. Wang HL, Al-Shammari K. HVC ridge deficiency classification: A therapeutically oriented classification. Int J Periodontics Restorative Dent 2002;22:335–343.
 13. Misch CE, Judy KW. Classification of partially edentulous arches for implant dentistry. Int J Oral Implantol 1987;4:7–13.
 14. Cawood JI, Howell RA. A classification of the edentulous jaws. Int J Oral Maxillofac Surg 1988;17:232–236.
 15. Tinti C, Parma-Benfenati S. Clinical classification of bone defects concerning the placement of dental implants. Int J Periodontics Restorative Dent 2003;23:147–155.
 16. Simon Storgård Jensen, Hendrik Terheyden. Bone Augmentation Procedures in Localized Defects in the Alveolar Ridge: Clinical Results with Different Bone Grafts and Bone-Substitute Materials Int J Oral Maxillofac Implants 2009;24(SUPPL):218–236.
 17. Matteo Chiapasco, Paolo Casentini, Marco Zaniboni. Bone Augmentation Procedures in Implant Dentistry

18. Perry R. Klokkevold. Localized bone augmentation and implant site development. In Newman et al. Carranza's Clinical Periodontology, 10th edition. Elsevier publications. p. 1133-1146.
19. Craig Misch. Intraoral bone grafts for dental implants. In Michael Sonick and Debby Hwang. Implant site development 1st edition. Wiley-Blackwell publications. p. 232-249
20. Georg Enislidis et al. Preliminary Report on a Staged Ridge Splitting Technique for Implant Placement in the Mandible: A Technical Note. Int J Oral Maxillofac Implants 2006;21:445-449.
21. Agosiino Scipioni, Giovanni B. Bruschi, Gastano Calesini. The Edentulous Ridge Expansion Technique: A Five-Year Study. Int J Peridont Rest Dent 1994;14:451-459.
22. Hussam S. Batal, David A. Cottrell. Alveolar distraction osteogenesis for implant site development. Oral Maxillofacial Surg Clin N Am 2004; 16: 91- 109.
23. Tatiana Vargas Koudriavtsev, Rodrigo A. Jiménez, Alejandro Sáenz. Predictable prosthetic rehabilitation in the traumatized anterior maxilla through alveolar distraction osteogenesis and implant placement: A clinical report. Journal of Dental Implants: Jul - Dec 2014; Vol 4 Issue 2: 187-194.
24. Yu-lin Lai, MS,a Ho-fu Lui, and Shyh-yuan Lee. In vitro color stability, stain resistance, and water sorption of four removable gingival flange materials; J Prosthet Dent 2003;90:293-300.
25. A. Alani, A. Maglad and F. Nohl. The prosthetic management of gingival aesthetics. British Dental Journal 2011; 210: 63-69.
26. Steven M. Morgano; Marcus A. R. Lima Verde; Michael J. Haddad. A fixed-detachable implant-supported prosthesis retained with precision attachments. J Prosthet Dent 1993;70:438-442.
27. Trakol Mekayarajjananonth et al. The functional and esthetic deficit replaced with an acrylic resin gingival veneer. Quintessence int 2002;33:91-94
28. Robert M. Brygider. Precision attachment-retained gingival veneers for fixed implant prostheses. J Prosthet Dent 1991;65:118-22.
29. Onur Geckili, Hakan Bilhan, Gulsum Ceylan, Altug Cilingir. Edentulous Maxillary Arch Fixed Implant Rehabilitation Using a Hybrid Prosthesis Made of Micro-Ceramic-Composite: Case Report. Journal of Oral Implantology 2013; 39(1): 115-120
30. Izchak Barzilay, Irene Tamblyn. Gingival Prostheses — A Review. J Can Dent Assoc 2003; 69(2):74-78.