

Relocation of Muscle Attachments to Improve Denture Retention Utilizing Free Gingival Graft - A Case Report

Dr. Akhil S.¹, Dr. Jose Paul², Dr. Johnson Prakash D'Lima³,
Dr. Senny Thomas Parackal⁴, Dr. Deepak Thomas⁵, Dr. Ria Susan George⁶,
Dr. Jenny Susan Roy⁷, Dr. Syed Mohammed Jiffry C. A.⁸

¹Post Graduate Student, ² Professor and Head, ^{3,4} Professor,

⁵ Reader, ^{6,7} Senior Lecturer, ⁸ Lecturer

Department of Periodontics,

Annoor Dental College and Hospital, Muvattupuzha.

Corresponding author:

Dr. Akhil S., Email: akhilsurendran89@gmail.com

Abstract

Preprosthetic surgery aims to improve denture wearing by either preserving the existing ridge or remodelling it surgically to ensure a comfortable and stable prosthesis. This article reports a preprosthetic surgery of 60 year old male patient. Clark's technique along with free gingival graft and labial frenectomy was performed to relocate the muscle attachments. Three months post operatively a gain of 17mm of vestibular depth was achieved with uneventful healing and no signs of relapse.

Keywords: Clark's technique, free gingival graft, vestibuloplasty, frenectomy.

INTRODUCTION

The objective of prosthodontic treatment includes both functional and aesthetic appearance along with prosthesis longevity. Important requisites for a successful prosthetic rehabilitation includes sufficient amount of bone, keratinized tissue and adequate vestibular depth. But progressive resorption of bone in edentulous region leads to difficulties in stability and placement of conventional dentures. Consequently, the patients also suffer from non retentional complete prosthetic denture with functional and esthetic limitations, including difficulties with eating and speaking problems, pain, loss of soft-tissue support and less desirable facial appearance. There are three possible strategies in order to overcome these drawbacks: construction of new dentures, performing preprosthetic surgery in order to enlarge the denture-bearing area and construction of implant-retained mandibular overdenture.¹ Although implant-supported overdentures reveal a success rate of over 95% and offer improved esthetics, stability, and better quality of life, still most of the prefer conventional dentures, mainly due to financial reasons.

The surgical preparation of the mouth before the insertion of prosthesis is referred as preprosthetic surgery. It involves procedures aimed at removing abnormalities of hard and soft tissues of the jaws so that the prosthesis can be successfully placed. For many years preprosthetic surgery consisted of extraction of teeth and reduction of bony prominences. There has been renewed interest in preprosthetic surgery over the last 15 years that results in the development of many new techniques. In 1853 Willard was the first American dentist to perform the reduction of interdental gingival papillae and alveolar margin after extraction.² Beers in 1876 proposed "alveolus excisions following teeth extraction."³ In 1924, Kazanjian recommended prototype labiobuccal vestibuloplasty procedures to provide an additional denture-bearing surface for increased stability of denture.⁴

Objectives of preprosthetic surgery

- ↳ Improvement of masticatory function
- ↳ Reconstruction of acceptable facial and dental esthetics

- ↳ Creation of broad ridge form for denture and implant
- ↳ Adequate fixed soft tissue over denture bearing area
- ↳ Adequate vestibular depth
- ↳ Proper inter arch relationship
- ↳ Protection of neuro vascular bundle

Preprosthetic surgical procedures

Preprosthetic surgical procedures include:⁵

1. Procedures for alveolar ridge preservation
 - Supramucosal vital root retention
 - Submucosal vital root retention
2. Procedures for alveolar ridge correction
 - Alveoloplasty
 - Tuberosity reduction
 - Tori correction
 - Exostoses reduction
 - Mylohyoid ridge reduction
3. Procedures for Alveolar ridge extension
 - Vestibuloplasty
4. Procedures for Alveolar ridge augmentation
 - Bone grafts
 - Pedicled bone flap procedures
5. Horizontal osteotomy
6. Vertical (visor) osteotomy
 - Hydroxyapatite augmentation

VESTIBULOPLASTY

Vestibuloplasty is a mucogingival procedure aimed at the surgical alterations of the gingiva-mucous membrane relationships including deepening of the vestibule, altering the position of the frenum and widening of the zone of attached gingiva. Synonyms of vestibuloplasty includes Sulculoplasty, Sulcus deepening procedure, Vestibular extension procedure, & Sulcus extension technique. Vestibuloplasty is indicated for restricting the progression of gingival recession, regaining the width of attached gingiva, for effective plaque control measures, improving esthetics, improving retention and stability of denture, and preventing inflammatory alterations and tissue recession around implants.

In literature a variety of vestibuloplasty techniques have been advocated. It includes:⁶

1. Mucosal advancement vestibuloplasty
 - Open sub mucosal vestibuloplasty
 - Closed sub mucosal vestibuloplasty
2. Secondary epithelisation vestibuloplasty
 - Kazanjian's Technique
 - Clark's Technique
 - Lipswitch Technique
3. Grafting vestibuloplasty

Open Sub Mucosal Vestibuloplasty

In open sub mucosal vestibuloplasty a horizontal incision is made at the mucogingival junction through the mucosa only. Then the mucosa is separated from the submucosa towards the lip and supraperiosteal dissection is done to the desired depth of vestibular deepening. Sutures are given in the flap to fix it to the underlying periosteum deep in the vestibule. The free margins of the flap are returned to their original position and then sutured.

Closed Sub Mucosal Vestibuloplasty

In closed sub mucosal vestibuloplasty the incision is extended from mucogingival junction into the labial mucosa and it is made through mucosa only. Then blunt dissection is done to separate mucosa from submucosa. The vertical incision is then deepened to reach the periosteum. Blunt dissection is then made in a subperiosteal plane and tunnels are created. A wedge shaped strip of connective tissue that exists between the submucosal tunnel and subperiosteal tunnel is removed. The freely movable mucosa is now adapted to the deepened sulcus and a stent is placed to hold the mucosa in that position.

Kazanjian Technique

Kazanjian technique is the oldest technique (1924).⁴ In this technique, a submucosal dissection is performed from the inner aspect of the lower lip to the mucogingival junction, near the labial side of alveolar crest. A supraperiosteal dissection is directed inferiorly to detach muscle and connective tissue attachments up to the desired vestibular depth. The raised mucosal flap is adapted to the new vestibular depth and secured with sutures or stent. The raw area on the lip

remains exposed. The main disadvantage of this technique is that severe scarring of the mucosa of lip that may decrease lower lip flexibility.

Clark's Technique

Clark's technique was proposed in the year 1953.⁷ In this procedure, the incision is given slightly labial to the crest along the alveolar ridge. In order to ensure adequate mobility and over correction, mucosal flap based on the inner aspect of lip is undermined till vermilion border. Supraperiosteal dissection is performed through the labial surface of alveolar bone to the desired vestibular depth. The edge of the mobilized flap is pushed into new vestibular depth and kept in position by sutures. It heals quickly as the alveolar bone is covered by periosteal layer. This technique has a better success rate than Kazanjian technique.

Lipswitch Technique

Lipswitch technique was introduced in the year 1963 by Edlan and B Mejchar.⁸ It is a modification of Kazanjian technique. In Lipswitch technique, a labial incision is made and the mucosal flap is reflected from the labial surface. In the anterior part of the mandible supraperiosteal dissection is done. The periosteum is incised on the crest of alveolar ridge and reflected away from the bone. The free end of the periosteum is sutured into the denuded labial submucosal surface. The mucosal flap is sutured to the inferior attachment of the periosteum at the depth of the vestibule.

Grafting vestibuloplasty

Grafting vestibuloplasty is done when there is inadequate labial vestibular mucosa. In this case a Clark's vestibuloplasty can be done followed by covering the raw periosteal surface with a graft to hasten the healing process. The different types of grafts that can be used are skin graft, dermal graft, mucosal graft from palatal or buccal mucosa and xenografts.

CASE REPORT

A 60 year old male patient referred from Department of Prosthodontics to Department of Periodontics, Annoor Dental

College and Hospital, Muvattupuzha, Kerala, India for preprosthetic surgery in relation to upper right antero-posterior region. On clinical examination, the maxilla was completely edentulous and he had given the history that all the teeth were extracted two years back due to mobility. There was no relevant medical and family history. Examination of intraoral soft tissue revealed inadequate vestibular depth due to high insertion of muscle fibres [Figure 1] and aberrant frenum in the maxillary anterior region [Figure 2]. Since the patient was systemically healthy, we planned to relocate the muscle fibres by Clark's technique along with free gingival graft and labial frenectomy. Routine blood investigations were carried out. The patient was informed about the treatment and signed consent form was obtained.



Figure 1: Inadequate vestibular depth due to high insertion of muscle fibres



Figure 2: Aberrant Maxillary labial frenum

Surgical procedure

The surgery was performed under local anesthesia with 2% lignocaine and 1:80000 adrenaline. After adequate local anesthesia was achieved, a horizontal incision was given with a no.15 Bard Parker blade just buccal to the crest of alveolar ridge [Figure 3]. Labial and vestibular mucosa was reflected. Supraperiosteal dissection was done up to the desired depth [Figure 4].

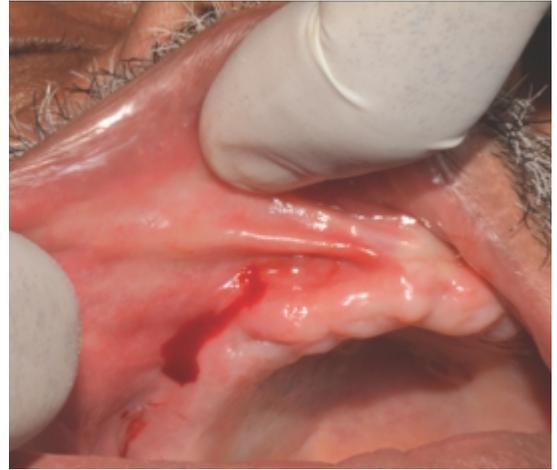


Figure 3: Horizontal incision given

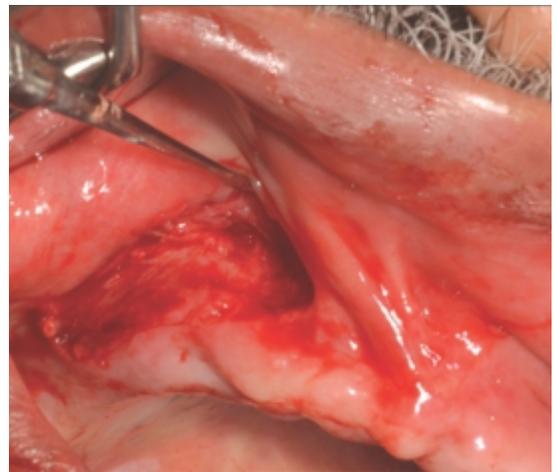


Figure 4: Supraperiosteal dissection done

To obtain pattern for the free gingival graft, aluminium foil template was placed on the recipient site [Figure 5]. Free gingival graft of appropriate size was harvested from the right palatal mucosa [Figure 6]. The procured graft was placed on recipient site and suturing done by using 5-0 vicryl sutures [Figure 7] and periodontal dressing was placed. The donor site was also sutured using silk suture.

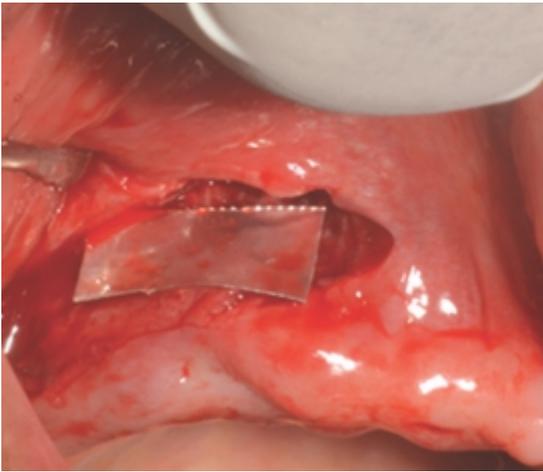


Figure 5:
Aluminium foil template placed on donor site



Figure 8: Classical frenectomy

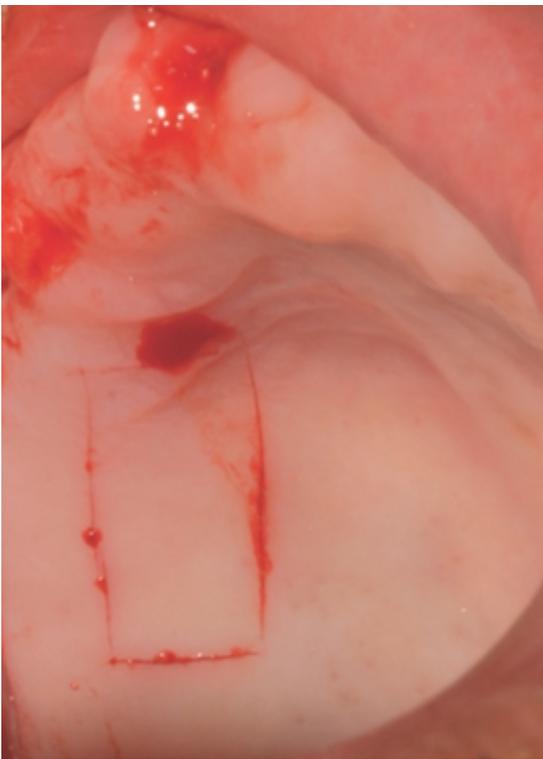


Figure 6: Harvesting of free gingival graft



Figure 9: Suturing done

Classical frenectomy was done in maxillary anterior region [Figure 8] and suturing was performed [Figure 9].

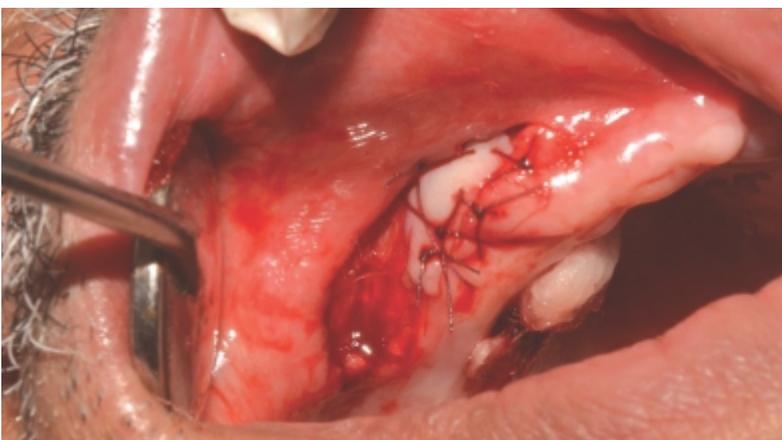


Figure 7: Graft placed in recipient site and suturing done

Postoperative Care

The patient was prescribed Amoxicillin (500mg) thrice a day for 5 days and Nonsteroidal anti-inflammatory drug tablet Mefenamic acid (500mg) + Paracetamol (325mg) thrice a day for 5 days to prevent post-operative infection and pain and reviewed after 1 week. Healing was uneventful [Figure 10]. Suture removal was done in the donor site and maxillary anterior region [Figure 11].

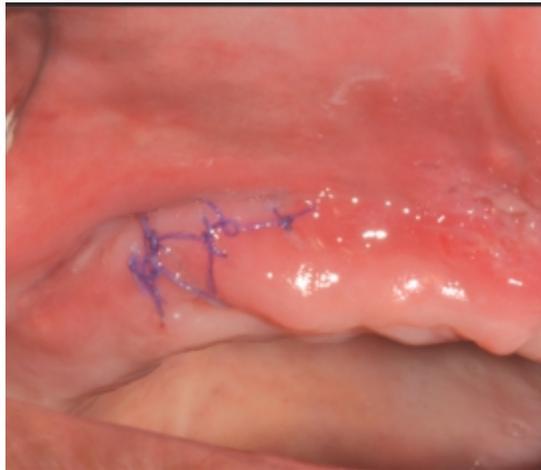


Figure 10: One week postoperative view



Figure 11: Suture removal

The patient was again reviewed on 14th day and suture removal in the grafted site was performed [Figure 12]. No complications were observed during that period of time. After three months patient was again reviewed, there were no signs of relapse and a gain of 17mm vestibular depth was achieved [Figure 13]. The patient was then referred back to Department of Prosthodontics and prosthetic phase was carried out [Figure 14].



Figure 12: Suture removal of grafted site

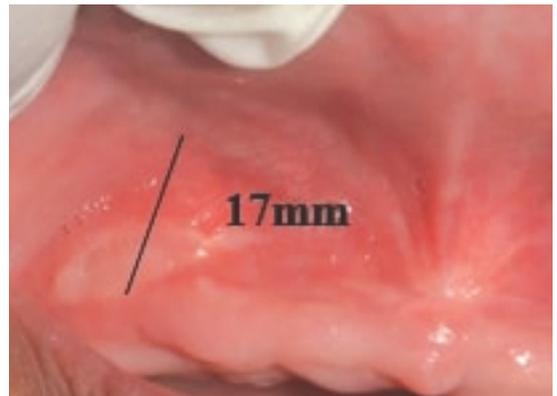


Figure 13: Three month postoperative view



Figure 14: Three month post operative view with prosthesis

DISCUSSION

Preprosthetic surgery involves bone and soft tissue augmentation procedures. Decreased residual alveolar ridge is a prerequisite for compromised esthetics and functional results when fabrication and inserting conventional dentures. The progressive bone resorption and the use of removable dentures have a negative effect on keratinized mucosa. The attachment of mucosa and muscles around the complete denture plays an important role in retention and stability of prosthesis. Considering the mucogingival problem posed by an inadequate depth of vestibule, a number of treatment options such as gingival augmentation with the use of grafts and vestibuloplasty through a secondary epithelization have been planned to increase the depth of vestibule. Clark's vestibuloplasty along with free gingival graft came into vogue and was more common in improving the vestibular depth and also quite successful in addressing the mucogingival problem associated with the dentition.⁶

Vascularization and healing of free gingival graft occurs in a two-phase. The first phase is known as plasmatic imbibition. During the first 48 hours, a plasma-like fluid from the underlying recipient bed is drawn by capillary action. A fibrin network is formed between the graft and the recipient bed that helps to secure the graft in position. Then blood flow begins into the graft and excess fluid is carried into systemic circulation. The second phase is termed as inosculation of blood vessels. During the first 48 hours, vascular buds get proliferated and provide a mechanism for entry of blood to the graft. By 4-7 days true circulation is established and lymphatic channels are re-established. Therefore, survival of the graft depends on the presence of a vascular recipient bed and fixed contact of the graft with the tissues of the recipient bed. Poor adaptation of the graft, fluid collections under the graft, movement, pressure and infection may prevent proper contact and jeopardize the graft's survival.

Sikkerimath BC et al. conducted a study to clinically assess the vestibular depth in vestibuloplasty using Clark's technique with and without amnion as graft material. Twenty edentulous patients underwent mandibular

labial vestibuloplasty using Clark's technique. The graft material used was amnion. The study proved that the amniotic membrane which is used as a graft material promotes healing and prevent relapse.⁹

Although the surgical method involving epithelial graft is well known in clinical research, it has several drawbacks, including the need for a second surgical site, delayed phase of healing on the palate, swelling, pain and compromised esthetic results.

Singhal A. et al. done the vestibular extension with platelet rich fibrin. The main advantages of this technique are avoidance of second surgical site for harvesting the graft, thus improving the patient compliance and reducing the postoperative morbidity, PRF is easy to procure and can be prepared in few minutes. They achieved adequate depth of vestibule and width of attached gingiva by using PRF as an adjunct for vestibular extension¹⁰.

CONCLUSION

Preprosthetic surgery is a rapidly changing field of dentistry. Grafting vestibuloplasty has long been popularized in increasing the depth of the vestibule. It is a viable and effective treatment modality in relocation of muscle attachments to improve denture retention. However, proper case selection, knowledge about different techniques and its limitations is a must for the clinician treating a patient who will receive complete denture prosthesis.

REFERENCES

1. Raghoobar GM, Meijer HJ, Vant Hof M, Stegenga B, Vissink A. A randomized prospective clinical trial on the effectiveness of three treatment modalities for patients with lower denture problems: a 10 year follow-up study on patient satisfaction. *International journal of oral and maxillofacial surgery*. 2003 Jan 1; 32(5):498-503.
2. Willard AT. Preparing the mouth for full sets of artificial teeth. *Dent. News Letter*. 1853 Jul; 6:238.
3. Beers WG. Notes from practice. *Dent*

- Cosm. 1876; 18:118.
4. Kazanjian VH. Surgical operations as related to satisfactory dentures. Dent Cosmos. 1924 Apr; 66:387.
 5. ChitraChakravarthy. Text book of Oral & Maxillofacial Surgery, 2nd ed, Paras Medical Publishers.
 6. Froschl T, Kerscher A. The optimal vestibuloplasty in preprosthetic surgery of the mandible. Journal of Cranio-Maxillofacial Surgery. 1997 Apr 1; 25(2):85-90.
 7. Kazanjian VH. Surgical operations as related to satisfactory dentures. Dent Cosmos. 1924 Apr; 66:387.
 8. Edlan A. Plastic surgery of the vestibulum in periodontal therapy. Int. Dent. J. 1963; 13:593-6.
 9. Sikkerimath BC, Dandagi S, Gudi SS, Jayapalan D. Comparison of vestibular sulcus depth in vestibuloplasty using standard Clark's technique with and without amnion as graft material. Annals of maxillofacial surgery. 2012 Jan; 2(1):30.
 10. Singhal A, Deepa D. Novel surgical procedure for vestibular extension with platelet-rich fibrin. International Journal of Oral Health Sciences. 2015 Jan 1; 5(1):66.