Original Clinical Studies

Comparison of vestibular sulcus depth in vestibuloplasty using standard Clark's technique with and without amnion as graft material

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ABSTRACT

Introduction: A number of materials are used as grafts in vestibuloplasty like mucosal and skin grafts with several advantages and disadvantages. To circumvent the disadvantages of these grafts, biological membranes such as amnion membranes are often recommended. **Materials and Methods:** The objective of this study was to clinically assess the vestibular sulcus 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. Amnion was used as graft material in 10 patients (group I) and no grafts used in remaining 10 patients (group II). The vestibular depth was evaluated at time intervals of 1 week, 2 weeks, 1 month and 3 months, postoperatively. **Results:** Mean postoperative vestibular depth after 3 months in group I and II were 10.0 ± 3.13 mm and 7.8±0.63 mm, respectively. Mean of 2.2 ± 2.50 mm increase in depth was achieved after 3 months in Group I. **Conclusion:** Amnion graft is a viable and reliable option that promotes early healing and maintains postoperative vestibular depth.

Keywords: Amnion graft, clark's technique, vestibular depth, vestibuloplasty

INTRODUCTION

The oral rehabilitation of patients after loss of teeth has made much progress in recent times. Vestibuloplasty, ridge augmentation and different types of implants were used to overcome the problems of flat alveolar ridge.[1] Many different methods have been described for regenerating or replacing bone for secondary implant placement but until now no substantial progress has been made in soft tissue management.[2] The most common procedure in vestibuloplasty are submucosal vestibuloplasty, secondary epithelial vestibuloplasty, soft tissue graft vestibuloplasty and Edlanplasty.[3] The aim of all these techniques is to create adequate vestibular depth and limit the traction of fiber and muscle attachments.[2]

In secondary epithelial vestibuloplasty, there is a need to cover the exposed periosteum because a nearly complete relapse could be proven during secondary healing with contraction and epithelialization of the vestibular periosteum.[3] To date various autogenous soft tissue grafts from autogenous mucosal to allogeneic collagen membrane[4] have been used for vestibular extension. All grafts have the disadvantages of increased morbidity, postoperative pain and risk of surgical complications in the donor site.[5] This led to search for an alternate graft material.

Biological membrane obtained from placenta opens new perspectives. The human amnion membrane is a biological graft which has unique properties like antiadhesive effects, bacteriostatic properties, wound protection, pain reduction and epithelisation effects. Its easy availability, low cost makes it the best material.

The use of amnion in vestibuloplasty has been first reported by Guler *et al*.,[6] who concentrated on the blood flow to the graft. Lawson studied the use of amniotic membrane along with pectoralis major muscle for oral reconstruction.[7]

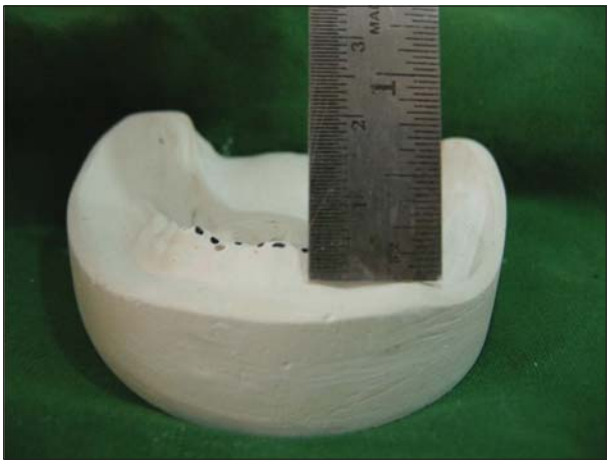


Figure 1: Preoperative cast

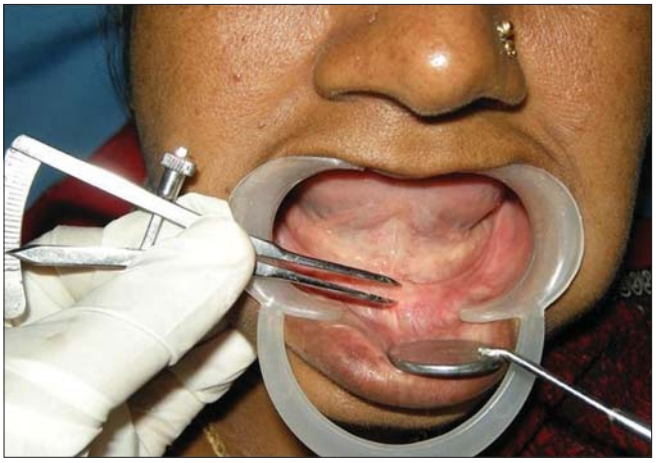


Figure 2: Preoperative depth

Figure 4: Separation of amnion from chorion

MATERIALS AND METHOD

Twenty patients who presented with insufficient vestibular depth but adequate mandibular bone heights were referred for the correction of vestibular depth. Bone height and mucosal quality and quantity were assessed using radiographic and clinical methods. The procedure to be performed was explained, followed by informed written consent. Ethical committee clearance was obtained and endorsed duly by the head of the institution.

Preoperative impression, cast and measurements were made [Figures 1 and 2]. The cast was arbitrarily scraped till the desired depth as per the clinical requirements. A splint was fabricated with clear acrylic, finished and polished [Figure 3]. Fresh amniotic membrane was obtained from healthy seronegative mothers who underwent Cesarean section. The amnion was separated from the chorion [Figure 4] and was cleansed of blood by flushing with copious amounts of tap water.

The membranes were placed in a large glass bottle containing 85% glycerol, made by taking 85 ml of glycerol and making up to 100 ml with normal saline and stored at room temperature for 24 hours. They were then transferred to another bottle of 85% glycerol and stored at 4^0C for the time period till used.

Figure 3: Acrylic splint

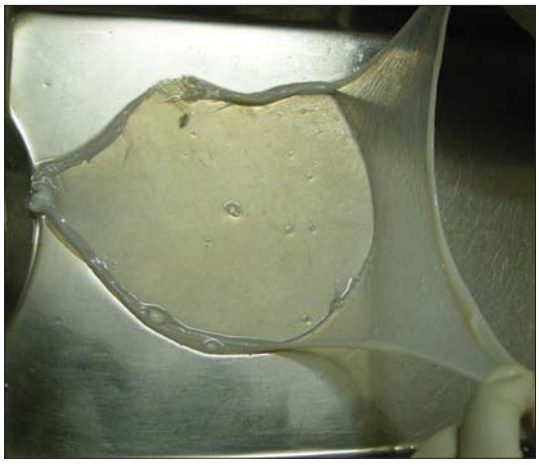


Figure 5: Harvested amnion graft

Immediately prior to their use, small clean sections (6 x 10 cm^2) of membrane were cut and kept in 400 ml of saline containing 10,00,000 IU penicillin at 48^{0}C up to 24 hours. The obtained graft material was then properly cleaned in saline solution [Figure 5].

Clark's technique of vestibuloplasty was done after reflection of flap [Figure 6] and suturing to desired depth [Figure 7] and the amniotic graft material so prepared is transferred over the surgical site with mesenchymal side against the wound and sutured in place with 5-0 absorbable sutures [Figure 8]. The surgical splint was placed after lining with soft liner[7] to prevent formation of dead space, and secured either with circum-mandibular suturing

Figure 6: Reflection of flap

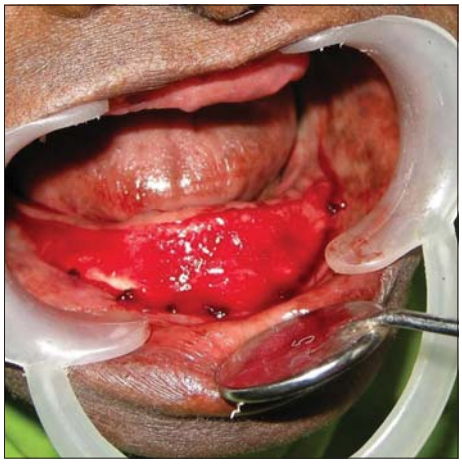


Figure 7: Flap sutured to desired depth

Figure 8: Suturing of amnion graft to denuded periosteum

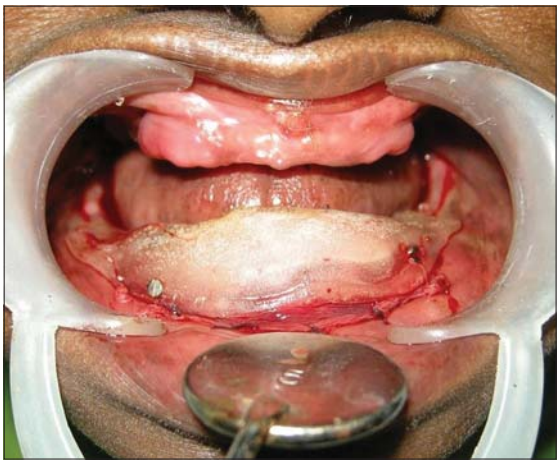


Figure 9: Splints secured by bone screw

Figure 10: Postoperative cast

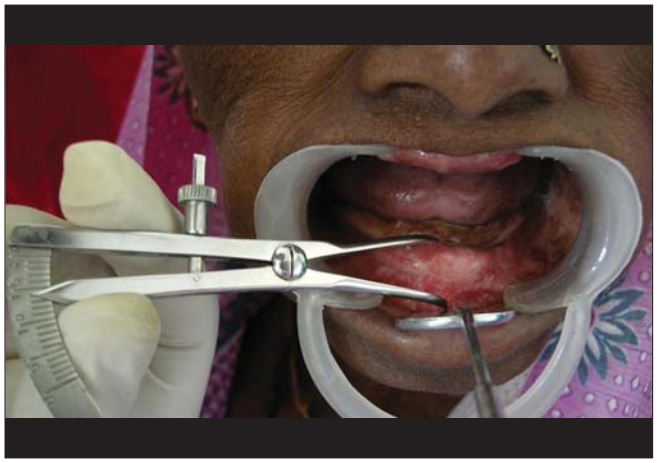


Figure 11: Postoperative vestibular depth

or with bone screws of 1.5 x 6 mm [Figure 9]. Postoperative impression, cast and measurements were made [Figures 10 and 11].

Out of 20 patients, randomly 10 patients (Group I) had the raw surface covered with amnion graft followed by splint placement and remaining 10 patients(Group II) underwent secondary epithelisation without any graft under local anaesthesia. Splints were secured to bone through the tranmucosal bone screws. The splint was removed after 7th day postoperatively and grafted site was thoroughly cleaned. Patients were followed up and their vestibular depths were measured at intervals of 1 week, 2 weeks, 1month and 3 months, postoperatively [Tables 1 and 2].

Descriptive statistics were presented. Paired t test was performed to find the difference between the percentages of reduction in depth of the buccal vestibule. *P* value ≤ 0.05 was taken as significant.

RESULTS

The reduction in the depth of the buccal vestibule in Group I was found to be 24.81% after 3 months follow-up and 42.22% reduction in the depth of the buccal vestibule was seen in group II [Table 3]. The difference in between the groups at various post-operative measurements was statistically significant.

Postoperatively there were no mental nerve paresthesias in both the groups. Vestibular depth was assessed in all patients. Group I patients had no postoperative edema, swelling and even pain was of bearable state which can effectively be controlled by using analgesics. No complications such as immunological rejection and infection occurred in study population, and the prosthetic treatment could be started as early as a month after the surgery. Although in one of our patient there was relapse of the vestibular depth to almost near to its preoperative value, mainly due to inability to maintain the oral hygiene. In Group II, one patient had postoperative edema and swelling which subsided on further course of antibiotics. Pain of higher scale chiefly on 1st and 2nd day were present in group II. The graft area could not be differentiated from nongrafted tissue after 3 months. Group I showed better results when compared to group II [Graph 1].

DISCUSSION

Lack of an adequate residual alveolar ridge and basal seat severely compromises the success of prosthodontic treatment. It has been suggested that expansion of the denture-bearing area by means of a vestibuloplasty would reduce denture load per square unit of supporting bone and thus reduce the bone resorption caused by transfer of occlusal forces.[8] Numerous graft materials are available but all suffer from certain limitations. In order to overcome the same there is a search for more appropriate graft material. Skin graft,[8] mucosal grafts,[8] palatal graft,[9] buccal graft,[10] cultured mucosal grafts, allogenic collagen membrane,[4] dural graft,[5] placental graft[6,7] were suggested.

Split skin graft is well-tolerated, but can be subjected to postoperative shrinkage,[2] and when compared with the

Table 1: Vestibular depth in vestibuloplasty cases with amnion graft

Case No.	Preoperative Vestibular depth (in mm)	Intraoperative Vestibular depth (in mm)	Postoperative Vestibular depth (1 week)	Postoperative Vestibular depth (2 week)	Postoperative Vestibular depth (1 month)	Postoperative Vestibular depth (3 months)
1	4	15	14	14	14	14
2	3	15	14	14	14	14
3	4	13	12	10	8	8
4	3	15	14	12	12	12
5	3	12	9	9	9	9
6	3	10	9	8	7	5
7	4	14	13	12	11	11
8	4	15	14	13	13	12
9	2	12	10	10	9	9
10	3	12	10	9	8	6
Mean	3.3	13.3	11.9	11.1	10.5	10.0

Table 2: Vestibular depth in vestibuloplasty cases without amnion graft

Case No.	Preoperative Vestibular depth (in mm)	Intraoperative Vestibular depth (in mm)	Postoperative Vestibular depth (1 week)	Postoperative Vestibular depth (2 week)	Postoperative Vestibular depth (1 month)	Postoperative Vestibular depth (3 months)
1	3	14	10	10	8	7
2	4	15	11	10	9	8
3	4	13	10	9	9	8
4	2	12	9	8	8	7
5	3	13	10	10	9	8
6	4	13	10	10	9	8
7	3	14	11	10	9	9
8	3	15	11	10	9	8
9	3	14	11	9	8	8
10	4	12	10	9	8	7
Mean	3.3	13.5	10.3	9.5	8.6	7.8

Table 3: Reduction rate in group 1 and group 2 from intraoperative to 3 months by t-test

Time	% of Reduction in group 1	% of Reduction in group 2	*P*-value
Intraoperative to 1 week	10.53	23.7	0.0000*
Intraoperative to 2 weeks	16.54	29.63	0.0001*
Intraoperative to 1 month	21.05	36.3	0.0005*
Intraoperative to 3 months	24.81	42.22	0.0008*

*$P<0.05$

surrounding mucosa, the grafted area displays a marked clinical difference in consistency and color. Common complications of the donor site include susceptibility to *Candida* infection, pain, discomfort, delayed healing, hypertrophic or discolored scars and dysethesia. The problem with mucosal (buccal and palatal grafts) is the limited amount of mucosa available for grafting. Possibility of nerve damages and an increased rate of ulceration altogether prevent its use for prosthetic purposes.[4] Palatal mucosal wounds leave an open wound with a healing course of 4-6 and half weeks and possible complications of soreness, ulcers, and difficulty in wearing an upper denture.[10]

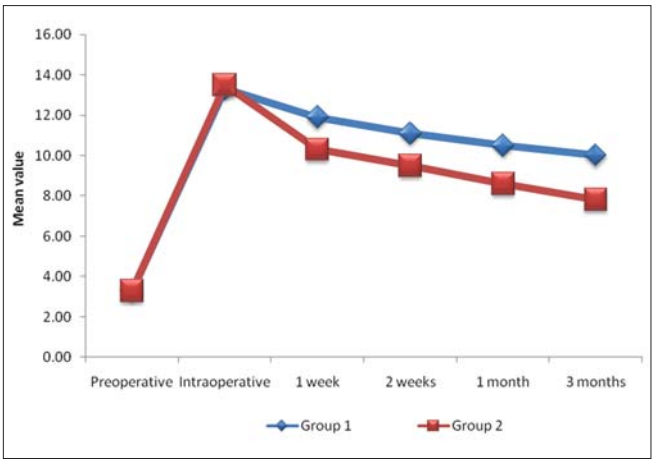
To circumvent these disadvantages biological membranes have been suggested as options including fetal membranes. The amniotic membrane is formed from the ectoderm of the fetus. It has a stromal matrix, a thick collagen layer, and an overlying basement membrane with a single layer of epithelium. It closely resembles the epidermis of the skin and has been used as a physiological wound dressing with great success.[6] The amnion has the following advantages: it promotes secondary epithelialization, vascularize healthy granulation tissue and stimulate the neovascularisation in neighbouring tissues and it is antibacterial. Another characteristic of amniotic membrane is the lack of immunogenicity as it did not express antigens of histocompatibility, the allograft was never rejected.[7]

They are inexpensive, readily available, used fresh or lyophilised, and stored at room temperature after sterilisation by γ-irradiation.

Human amnion has been known to be an effective dressing since John Staige Davis used it way back in 1910.[7] Since then extensive studies on amnion have been performed all over the world and it has been proved to be an excellent biological dressing with almost all the qualities of an ideal dressing. Chao *et al*., were the first who used it for the coverage of huge dural defects. Lawson placed amnion over the deep aspect of the pectoralis major muscle for oral cavity reconstruction.[7] A single layer of fresh amnion for surgical treatment of oral submucous fibrosis. Guler *et al*., used the grafts of amnion in mandibular vestibuloplasty.[6]

To evaluate the efficacy of human amniotic membrane as a graft material in vestibuloplasty, we conducted the present clinical study comparing vestibular depths between group I where the denuded surface of periosteum in mandibular labial surface was covered with glycerol-preserved amnion graft using Clark's technique and group II where standard Clark's technique was performed without graft.

In most patients problem with lower denture are more than with



Graph 1: Comparison of group 1 and group 2 with respect to vestibular depth (in mm) at different time intervals

the upper denture, as the alveolar ridge resorption is four times greater in the mandible than in the maxilla. So we included mandibular anterior region as the site for our study.

The main potential issue that one could expect to raise with use of processed amnion is of cross infections, especially with prion diseases. Adequate care need to be exercised while collecting the same from voluntary donors. Proper screening and sterilization modalities need to be instituted. The next issue would be of voluntary, informed consent of the patients owing to the ethical issues involved in such treatment.

The result of the present study indicates that reduction in postoperative vestibular depth is less when human amniotic membrane is used as a graft material to cover the denuded periosteum when compared to standard Clark's technique without amnion graft. The results of this study indicates that the amnion is an appropriate graft material for vestibuloplasty. The concept of using biodegradable amniotic membrane could lead to better results, shorter treatment time and less donor site morbidity. Also, the study proves the versatility of angiogenic biodegradable amniotic membrane as a favourable graft material for vestibuloplasty which promotes healing and prevent relapse.

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