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Original Research

Use Of Synthetic Collagen Membrane For Use Of Mucosal Reconstruction After Oral Carcinoma Surgeries

[1]Dr.Rohan Deepak Gharpure, [2]Dr. Shailesh Kannur, [3]Dr. Ramakanth Baloorkar, [4]Dr.Shivangouda Patil,[5]Dr.Shrihari Venkatesh

[1]Final year post-graduate, Department of General Surgery, BLDEDU Shri B M Patil Medical College Hospital and Research Center, Vijayapura, Karnataka, India
[2] Assistant Professor, Department of General Surgery, BLDEDU Shri B M Patil Medical College Hospital and Research Center, Vijayapura, Karnataka, India
[3]Professor, Department of General Surgery, BLDEDU Shri B M Patil Medical College Hospital and Research Center, Vijayapura, Karnataka, India
[4]Associate Professor, Department of General Surgery, BLDEDU Shri B M Patil Medical College Hospital and Research Center, Vijayapura, Karnataka, India
[5]Final year post-graduate Department of General Surgery, BLDEDU Shri B M Patil Medical College Hospital and Research Center, Vijayapura, Karnataka, India

Corresponding author
Dr. Shailesh Kannur
Assistant Professor, Department of General Surgery, BLDEDU Shri B M Patil Medical College Hospital and Research Centre, Vijayapura, Karnataka, India
Email: shailesh.kannur@gmail.com

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ABSTRACT

Background-oral and maxillofacial surgical procedures often result in open wounds. A dressing material should cover these wounds to prevent microbial infection, foreign material contamination, wound contracture, and improved healing. The intentions were to make the technique as simple as possible and to determine whether a collagen graft was a suitable dressing material for reconstruction in oral malignancy surgeries.

Aim: to evaluate the efficacy of collagen membrane as a biological dressing material for coverage of intra-oral defects with control of bleeding, pain, re-epithelialization and contractures

Materials and methods: - all patients admitted under the Department of General Surgery at B.L.D.E.(DU) 's ShriB.M.Patil Medical College Hospital and Research Centre, Vijayapura.

A total of 32 diagnosed patients of carcinoma buccal mucosa who underwent surgical procedures where intra-op synthetic collagen was used for closure of defect were assessed on five parameters, which included

1)Haemostasis 2) Pain 3) Granulation tissue 4) Re-Epithelialization 5) Post-op contracture

At the end of pod 3,15, and 1 month and the final assessment at the 3rd month

Statistical analysis was done using (S.P.S.S) (version 20) software.

Results: Overall, the effectiveness of collagen membrane after three months was found in 29 patients, who had a score of between 8-10, which is very effective, and the remaining three patients had a score between 6-8, which was influential in the remaining cases.

Conclusion: The collagen membrane is a specific activator of platelets and causes platelet aggregation over the biomaterial. Thus, it strengthens the clot. Collagen causes chemotaxis, cell aggregation, and adhesion, as well as a release reaction of platelets. Collagen has a chemotactic effect on endothelial cells and fibroblasts; inflammation and pain are significantly reduced. Collagen causes early migration of fibroblasts, leading to good granulation tissue formation.

Our results showed good granulation tissue and hameostasis and also ease of using it as a graft and cover material during intra operative procedure.

Keywords: Carcinoma Buccal mucosa , Oral reconstruction , collagen sheets ,

INTRODUCTION-

The oral mucosa is subject to many severe and chronic diseases such as leukoplakia, submucosal fibrosis of the mouth, squamous cell carcinoma, advanced malignant lesions and many surgical procedures that create in open and surface areas.

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According to Ashley's principles of plastic surgery, these surface areas should be covered with a dressing to prevent microbial infection, foreign body contamination, and wound debridement to promote healing. [1]

Various techniques have been used in the past, including full thickness skin grafting, free buccal mucosal grafting, oral grafting, and last, but not least, reproducible techniques. For larger defects, local and distal pedicled flaps, free micro-instruments have been tried with variable success rates. [2]

Collagen has many applications in oral surgery as an additional material in the area during palatoplasty, for bone regeneration during maxillary sinus lift, to stimulate or not to take medicine. , to strengthen the atrophic point in the lower jaw to place dental implants. It can also be used as a healing agent for orbital floor fractures, for treating regional gingivitis, as a scaffold in tissue engineering to produce dental pulp, and to cover minor tissue defects. . Easy on the mouth and more. Collagen is also used as a growth factor for cells such as osteoblasts. [3,4]

The aims and objectives of the study were based on clinical parameters. The goal is to simplify this process and determine if collagen is a good dressing material to cover raw surfaces post-carcinoma buccal surgeries. This study demonstrates the use of collagen membrane dressings on surgical defects of the oral mucosa, which may require another method of defect closure.

MATERIALS AND METHODS-

All patients are admitted under the Department of General Surgery at BLDE.(DU) 's ShriB.M.patil Medical College Hospital and Research Centre, Vijayapura,

A total of 32 diagnosed patients of carcinoma buccal mucosa who underwent surgical procedures where intra-op synthetic collagen was used for closure of defect were assessed on 5 parameters, which included

1) Haemostasis
2) Pain
3) Granulation Tissue
4) Re-Epithelialization
5) Post-Op Contracture

At the end of POD 3,15, and 1 month and the final assessment at the 3rd month.

Haemostasis

- 2—Good—no bleeding or bleeding stops within 5 min
- 1—Fair—slight bleeding, no intervention required, haemostasis took longer period, i.e. > 5 min
- 0—Poor—intense bleeding that required intervention for achieving haemostasis

Pain being subjective, assessed on the 3rd post-operative day, based on patients own words:

- 2—Good (none to mild)
- 1—Fair (moderate)
- 0—Poor (severe)
-

Presence of granulation tissue noted at the end of one month:

- 2—Good (entire wound)
- 1—Fair (nearly the entire wound)
- 0—Poor (inadequate)

Epithelialisation noted at the end of the month:

- 2—Good (entire wound)
- 1—Fair (nearly the entire wound)
- 0—Poor (inadequate)

Contracture of the wound at the end of 1 month:

- 2—Good (none)
- 1—Fair (< 50%)
- 0—Poor (severe, i.e. > 50%)

Effectiveness of the membrane after 3 months

- 8–10—very effective
- 5–7—effective
- 0–4—ineffective

Methods of using collagen sheet over the raw area:

Surgical procedure and placement of collagen-

Appropriate surgical resections were performed for malignant oral cavity lesions, with haemostasis achieved in the surgical sites. Surgicell-Mesh (a collagen membrane) was soaked in normal saline for at least five minutes to absorb water, making it soft, flexible, and similar to a native skin graft.

The membrane was then shaped to fit the mucosal defect as shown in Image -1 and 2 ,and trimmed as needed. No particular stent was necessary, as the graft could be easily cut with scissors. The collagen membrane was secured at the wound edges using 3-0 Vicryl sutures. To further anchor the membrane, quilting sutures were applied at the centre and periphery of the graft, allowing for secure fixation and wound drainage management.

For more significant defects, particularly in oral cancer surgeries, patients were fed through a nasogastric tube for three days before transitioning to oral feeding on the third postoperative day. Gargling with saline and betadine was recommended starting from the second postoperative day. The membrane typically resorbs or disintegrates by the seventh post-operative day, with healthy epithelial tissue forming underneath.

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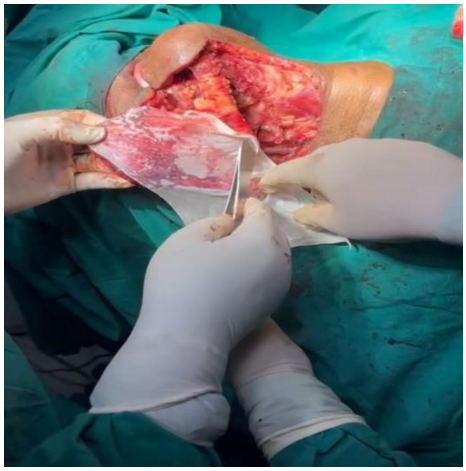


Image 1 : Placement of collagen membrane over a raw area.

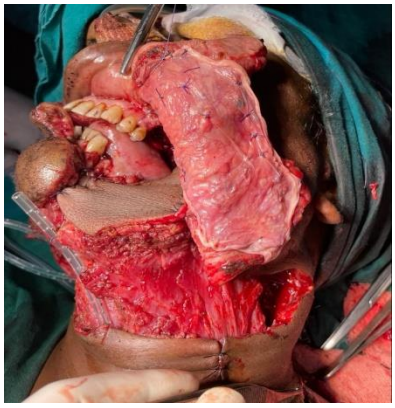


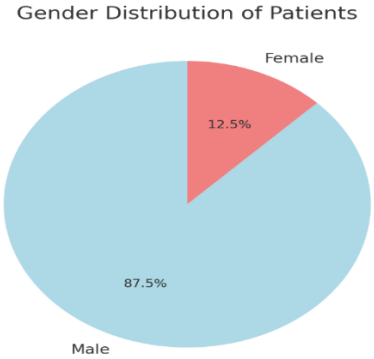
Image: 2- Fixation of collagen membrane over a raw area

RESULTS-

In total operated cases for carcinoma buccal mucosa 28 patients were male and 4 were female.(Figure-1)

Out of 32 patients included, 28 patients had good haemostasis, and the remaining 4 had fair haemostasis POD 3,7 and 30.

Figure-1- Gender Distribution of patients



Pain was assessed on POD 3, 7, and 30 Day,26 patients had mild pain over the defects, and the remaining 6 had moderate pain.

Epithelisation which was noted at the one month was 30 patients had entire epithelisation over the defect, and the remaining 2 had an epithelisation of more than 75 %

Around 27 patients had no contracture over the wound, and five patients had healthy contracture of < 50% at the end of one month.(Figure-3)

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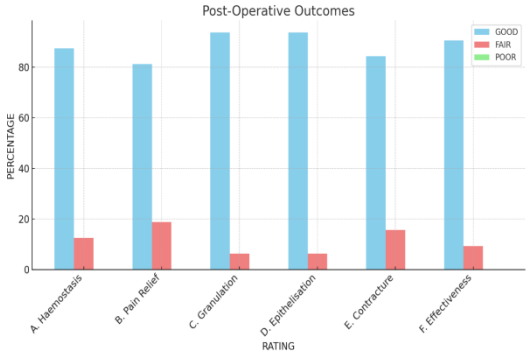

Figure 2- Post operative outcomes.

Overall, the effectiveness of collagen membrane after 3 months was found in 29 patients, had a score of between 8-10, which is very effective, and the remaining 3 patients had a score between 6-8, which was influential in the remaining cases.(Figure-3)

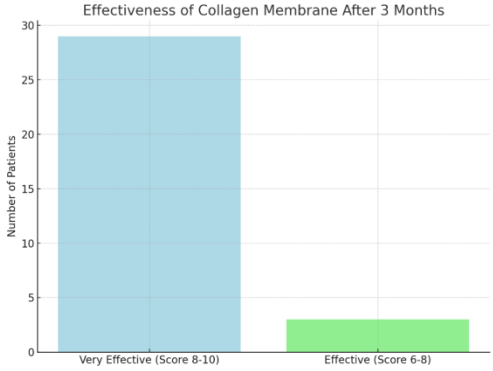

Figure-3 Effectiveness of collagen membrane

DISCUSSION-

Oral surface wounds, like other wounds, heal by epithelialization and granulation. But healing in the oral cavity presents unique challenges. This area is always moist due to saliva and food consumption, as well as factors such as poor oral hygiene, constant movement of the cheek and tongue, and chewing can prevent the attachment of food and successful recovery. [5].

Uncovered wounds are more prone to infection and scarring, leading to clinical complications. Studies show that the use of biological dressings significantly reduces the rate of wound infection and the reduction in leaving wounds exposed or using non-biological materials during healing. [6].

Mucosal grafts are promising since they closely resemble the ideal graft material. However, the amount of available oral mucosa is limited, and using thick mucosa from the cheek may lead to scarring. Thin, uniform grafts from the cheek, removed using a microtome, are effective but expensive and complex. Skin grafts provide another solution, but in the mouth, they retain their skin colour and lack the texture and flexibility of oral mucosa. Additionally, issues like hair and sweat gland growth can occur. Collagen offers an alternative to skin and mucosal grafts for covering intraoral surgical defects. [7]

In our study, collagen sheets proved to be an effective treatment process. Similar results were found in the studies of Singh et al., Thoma et al., and Sharma V et al. This can be explained by the formation of a gelatinous coagulum rich in fibrinogen and fibronectin, which contribute to the formation and organization of new fibers. The scar tissue also promotes the migration of fibroblasts into the wound bed to support the healing process. [8-10]

In our study, none of the cases showed an adverse or allergic reaction to collagen, which confirms its safety as an additional material for closing defects in the mouth. This finding is similar to the study results of Reddy et al. [11] .

The collagen membrane precisely activates platelets, leading to platelet aggregation on the biomaterial, which helps strengthen the clot. It promotes chemotaxis, cell aggregation, adhesion, and the release of platelets. Its chemotactic properties also attract endothelial cells and fibroblasts, significantly reducing inflammation and pain. In a study by Shanmugam et al., 22 patients had no mild pain compared to our research, and 26 patients had a pain-free post-operative period. [12]

In our study, 28 out of 32 patients (87.5%) experienced good haemostasis, and 4 patients (12.5%) had fair haemostasis compared to a

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survey done by Soujanya et al. [13].The study showed an excellent haemostatic effect in 28 cases out of 30 (93.3%) and fair in two cases (6.6%)

Our study's outcome was very effective (score 8-10): 29 patients (90.63%) rated the membrane's effectiveness as very high. Effective (score 6-8): 3 patients (9.37%) rated it as effective, whereas in the same study, six patients (20%) had a very practical outcome, 20 patients (66%) had an effective score, and four patients (13.3%) had ineffective score (0-4)

The collagen membrane is flexible and conforms well to the wound, regardless of its shape. It was noted that the membrane adhered effectively to both the mucosa and the wound bed. This initial adhesion is attributed to the interaction between fibrin and collagen and is later reinforced by fibrovascular ingrowth into the collagen membrane.[12,14]

LIMITATIONS-

1) Small sample size.
2) This study was done only to cover the raw areas of post-malignant resections.
3) Stabilization of the membrane to the surgical defect in this present study was done by suturing the membrane to the edges of the defect, which was a time-consuming and delicate procedure.

CONCLUSION-

The synthetic collagen membrane (0.5 mm thickness) was used as a temporary dressing material on oral mucosal defects. The membrane is proved to be effective in terms of adequate hemostasis, good epithelialization, and granulation tissue. Collagen membrane is a handy and reliable option that ensures predictable healing. Most of the patients reverted back to normal feeding habits in the first post-operative week, as the patients have not experienced any burning sensation on the oral wound, or any discharge or infection in the oral cavity. The collagen membrane is strongly recommended for all oral mucosal defects for a complaint-free post-operative period.

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