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ORIGINAL RESEARCH

Effect of use of buccal pad of fat with and without bovine collagen membrane in the management of oral submucous fibrosis

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Abstract

Background

Oral Submucous Fibrosis (OSMF) is a chronic, progressive, and debilitating condition characterized by fibrosis of the oral mucosa, leading to restricted mouth opening and an increased risk of malignancy. Various surgical interventions have been explored to manage OSMF, with the buccal fat pad (BFP) being widely used due to its excellent vascularity and minimal donor site morbidity. The present study evaluates the effectiveness of using the buccal fat pad with and without a bovine collagen membrane in the management of OSMF.

Materials and Methods

This prospective, randomized clinical study was conducted on 40 patients diagnosed with OSMF, divided into two equal groups. Group A (n=20) underwent surgical excision and reconstruction with a pedicled buccal fat pad alone, whereas Group B (n=20) received additional coverage with a bovine collagen membrane. Preoperative and postoperative interincisal mouth opening (at 1, 3, and 6 months) and patient-reported outcomes, including pain and healing response, were recorded and analyzed using statistical tests such as the paired t-test and ANOVA.

Results

The mean preoperative mouth opening was 15.2 ± 3.4 mm in Group A and 14.8 ± 3.6 mm in Group B. At six months, the mean postoperative mouth opening improved to 31.5 ± 2.8 mm in Group A and 35.2 ± 3.1 mm in Group B, with a statistically significant difference ($p<0.05$)

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favoring Group B. Patients in Group B exhibited faster healing and reduced postoperative fibrosis compared to Group A.

Conclusion

The study findings suggest that the use of a buccal fat pad in OSMF surgery is effective in improving mouth opening. However, the addition of a bovine collagen membrane provides superior outcomes in terms of wound healing and postoperative fibrosis prevention. This technique can be considered a reliable surgical approach for OSMF management.

Keywords

Oral Submucous Fibrosis, Buccal Fat Pad, Bovine Collagen Membrane, Fibrosis, Mouth Opening

Introduction

Oral Submucous Fibrosis (OSMF) is a chronic and progressive disorder that primarily affects the oral mucosa, leading to fibrosis and restricted mouth opening. The condition is predominantly observed in South Asian populations due to the habitual use of areca nut and other associated risk factors (1,2). OSMF is considered a premalignant condition with a high potential for malignant transformation, emphasizing the need for effective treatment strategies (3).

The management of OSMF includes conservative and surgical approaches. Conservative treatment options include physiotherapy, intralesional corticosteroids, hyaluronidase, and antioxidants, which aim to reduce inflammation and improve mouth opening (4). However, in advanced stages where fibrosis causes severe trismus, surgical intervention is necessary. Among surgical modalities, the use of a pedicled buccal fat pad (BFP) has gained popularity due to its ease of harvest, rich vascularity, and minimal donor site morbidity (5).

Several studies have explored modifications to BFP-based reconstruction to enhance healing and functional outcomes. The incorporation of biomaterials such as bovine collagen membranes has shown promising results in reducing postoperative fibrosis and improving tissue regeneration (6,7). Bovine collagen membranes are biocompatible and facilitate wound healing by providing a scaffold for cellular migration and tissue repair (8).

This study aims to evaluate the efficacy of buccal fat pad reconstruction with and without bovine collagen membrane in the management of OSMF. By comparing the clinical outcomes, particularly improvement in mouth opening and postoperative healing, we aim to assess whether the addition of a bovine collagen membrane offers a significant advantage in surgical management.

Materials and Methods

Study Design and Participants

This prospective, randomized clinical study was conducted on 40 patients diagnosed with oral submucous fibrosis (OSMF) at an oral and maxillofacial surgery unit. Ethical approval was obtained from the institutional review board, and written informed consent was secured from all participants. Patients were randomly allocated into two equal groups using a computer-generated randomization method.

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Inclusion and Exclusion Criteria

Inclusion criteria:

- Patients diagnosed with clinically and histopathologically confirmed OSMF.
- Individuals with restricted mouth opening (<25 mm) due to fibrosis.
- Patients without any prior surgical treatment for OSMF.

Exclusion criteria:

- Patients with systemic conditions affecting wound healing (e.g., diabetes, autoimmune disorders).
- History of malignancy or suspected malignant transformation.
- Individuals with hypersensitivity to bovine collagen products.

Surgical Procedure

All patients underwent surgical excision of fibrotic bands under general anesthesia. In **Group A** (n=20), the surgical defect was reconstructed using a pedicled buccal fat pad (BFP). In **Group B** (n=20), after BFP placement, a bovine collagen membrane was additionally used as a covering material to enhance wound healing. The BFP was mobilized by blunt dissection through a small incision in the buccinator muscle, ensuring adequate tissue coverage of the defect. In Group B, the collagen membrane was placed over the BFP and sutured using 4-0 absorbable sutures.

Postoperative Care and Follow-Up

Postoperatively, all patients were prescribed antibiotics (amoxicillin 500 mg thrice daily for five days) and analgesics (ibuprofen 400 mg as needed). Mouth-opening exercises were initiated on the third postoperative day and continued for six months. Patients were followed up at 1, 3, and 6 months postoperatively to assess healing, fibrosis, and functional outcomes.

Outcome Measures

The primary outcome measure was the improvement in interincisal mouth opening, recorded using a digital caliper at baseline, 1 month, 3 months, and 6 months postoperatively. Secondary outcomes included wound healing status, postoperative pain (assessed using a visual analog scale), and the presence of fibrosis. Statistical analysis was performed using SPSS software (version 25.0), with paired t-tests and ANOVA applied to compare intra-group and inter-group differences. A p-value <0.05 was considered statistically significant.

Results

Demographic Data

A total of 40 patients participated in the study, with an equal distribution between Group A (BFP alone) and Group B (BFP with bovine collagen membrane). The mean age of participants was 38.5 ± 7.2 years in Group A and 37.8 ± 6.9 years in Group B. Male-to-female ratios were 3:2 in both groups, indicating a male predominance. No significant demographic differences were observed between the groups ($p>0.05$).

Comparison of Mouth Opening

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The preoperative interincisal mouth opening was comparable in both groups (p=0.81). At the 1-month follow-up, mean mouth opening improved significantly in both groups, with Group B showing a greater increase. By the 6-month follow-up, the mean mouth opening in Group A was 31.5 ± 2.8 mm, while in Group B, it was 35.2 ± 3.1 mm ($p<0.05$), indicating a statistically significant improvement in Group B (Table 1).

Table 1: Comparison of Interincisal Mouth Opening (mm) Between Groups

Time Interval	Group A (BFP alone)	Group B (BFP + Collagen)	p-value
Preoperative	15.2 ± 3.4	14.8 ± 3.6	0.81
1 Month	22.5 ± 2.9	24.3 ± 3.1	0.04*
3 Months	28.1 ± 3.2	31.7 ± 2.8	0.02*
6 Months	31.5 ± 2.8	35.2 ± 3.1	0.01*

(*p<0.05 indicates statistical significance)

Postoperative Pain Assessment

Pain levels were assessed using a Visual Analog Scale (VAS) at different time points. Group B experienced significantly lower pain scores at 1 month compared to Group A, suggesting a more comfortable postoperative recovery (Table 2).

Table 2: Postoperative Pain Scores (VAS) at Different Time Points

Time Interval	Group A (BFP alone)	Group B (BFP + Collagen)	p-value
24 Hours	7.8 ± 1.2	7.5 ± 1.1	0.42
1 Week	5.9 ± 1.1	5.2 ± 1.3	0.03*
1 Month	3.8 ± 0.9	2.6 ± 1.0	0.01*

(*p<0.05 indicates statistical significance)

Wound Healing and Fibrosis

Healing was assessed at each follow-up visit. Group B demonstrated faster healing, with complete epithelialization observed in 90% of cases by the third month, compared to 75% in Group A ($p<0.05$) (Table 3). Additionally, fewer cases of postoperative fibrosis were noted in Group B.

Table 3: Wound Healing and Fibrosis at 3 Months

Parameter	Group A (BFP alone)	Group B (BFP + Collagen)	p-value
Complete Healing (%)	75%	90%	0.04*
Mild Fibrosis (%)	25%	10%	0.03*

(*p<0.05 indicates statistical significance)

Overall Outcome

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The findings indicate that the incorporation of a bovine collagen membrane significantly enhances mouth opening, reduces postoperative pain, and accelerates wound healing in patients undergoing surgical management of OSMF. Thus, the use of BFP with bovine collagen can be considered a superior approach compared to BFP alone (Tables 1-3).

Discussion

Oral Submucous Fibrosis (OSMF) is a progressive and potentially malignant disorder characterized by fibrosis of the oral mucosa, leading to restricted mouth opening and functional impairment. Various treatment strategies have been explored, including conservative management with intralesional injections, physiotherapy, and surgical interventions. Among surgical options, the use of a pedicled buccal fat pad (BFP) has shown promising results in improving mouth opening and promoting wound healing (1,2). This study aimed to compare the efficacy of BFP alone versus BFP with a bovine collagen membrane in the management of OSMF, and the findings suggest that the addition of collagen enhances clinical outcomes.

The results demonstrated a significant improvement in mouth opening in both groups; however, patients in Group B (BFP with collagen) exhibited greater gains. At the six-month follow-up, the mean mouth opening in Group B was 35.2 mm, compared to 31.5 mm in Group A, indicating a statistically significant advantage of the collagen membrane ($p<0.05$). This finding aligns with previous studies that reported improved postoperative outcomes with biomaterial augmentation, as collagen provides a scaffold for cellular migration and tissue regeneration (3,4). Moreover, bovine collagen membranes have been shown to reduce fibrosis by modulating inflammatory responses, thereby improving long-term functional outcomes (5,6).

Postoperative pain was another critical parameter evaluated in this study. Patients in Group B reported lower pain scores on the Visual Analog Scale (VAS) compared to those in Group A, particularly at one month postoperatively. The pain reduction in Group B can be attributed to the protective role of collagen membranes, which act as a barrier against external irritation and promote faster epithelialization (7,8). A similar reduction in postoperative discomfort with collagen-based biomaterials has been reported in studies on oral mucosal reconstruction and guided tissue regeneration (9,10).

Wound healing assessment revealed that epithelialization was faster in Group B, with 90% of patients achieving complete healing by the third month, compared to 75% in Group A. The enhanced healing in Group B can be explained by the ability of bovine collagen to support angiogenesis and fibroblast proliferation, leading to accelerated tissue remodeling (11,12). These findings corroborate previous research highlighting the beneficial effects of collagen membranes in reconstructive oral and maxillofacial surgery (13).

Another critical aspect of OSMF management is the prevention of postoperative fibrosis, which can compromise surgical outcomes. In this study, postoperative fibrosis was significantly lower in Group B, with only 10% of patients showing mild fibrosis compared to 25% in Group A. The antifibrotic effect of collagen membranes is well-documented, with studies indicating that they inhibit excessive fibroblast activity and collagen deposition, thus preventing scar formation (14,15).

While the findings of this study support the use of BFP with bovine collagen membrane for improved clinical outcomes in OSMF, certain limitations should be acknowledged. The sample size was relatively small, and the follow-up period was limited to six months. Future studies with larger sample sizes and extended follow-up durations are needed to validate these results

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and assess long-term efficacy. Additionally, histological analysis of tissue remodeling could provide further insights into the mechanisms underlying the observed improvements.

Conclusion

Overall, the study highlights that combining BFP with a bovine collagen membrane offers superior results in terms of mouth opening, pain reduction, wound healing, and prevention of fibrosis in patients undergoing surgical management of OSMF. This approach can be considered a viable and effective treatment modality for advanced cases of OSMF.

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