Collagen Membrane Over Buccal Fat Pad Versus Buccal Fat Pad in Management of Oral Submucous Fibrosis: A Comparative Prospective Study

Gaurav Singh¹ · Madan Mishra¹ · Amit Gaur¹ · Abhinav Srivastava¹ · Bharat Shukla¹ · Gourab Das¹

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Abstract

Objective The objective of this study was to assess the effectiveness of collagen membrane as biological dressing over buccal fat pad (BFP) during crucial postoperative healing phase in the surgical management of oral submucous fibrosis (OSMF).

Study Design The study comprised of 40 patients of OSMF of group IVa (Khanna and Andrade). Patients were randomly divided in two groups (20 patients in each group). Group I patients were treated using buccal fat pad only, whereas collagen membrane was used as a covering over harvested BFP in group II patients. Postoperative follow-up was done at 1 week, 3 weeks, 6 months and 1 year.

Result Mean postoperative mouth opening achieved in both the groups was comparable at every follow-up visit. Infection was evident in four patients of group I at 1-week follow-up, whereas none of the group II patients developed infection. Pain score was lesser in group II patients as compared to group I. Relapse was seen in two patients in group I and one patient in group II. Time taken for epithelialization was 2–3 weeks in both the groups.

Conclusion Although intraoperative time was increased in group II application of collagen membrane reduced infection when compared with group I. Also, the chances of damage to BFP are reduced during the hygiene maintenance at surgical site and jaw-opening exercise. Reduction in pain scores during postoperative period in group II patients was an additional advantage.

Keywords Collagen membrane · Buccal fat pad · Oral submucous fibrosis

Introduction

Oral submucous fibrosis (OSMF) is a chronic, progressive, precancerous condition of oral mucosa, oropharynx and rarely larynx, commonly seen in the Indian subcontinent [1]. Epidemiological data show that the number of cases has increased rapidly in India from an estimated 250,000 cases in 1980 to 2 million cases in 1993 [2]. OSMF was first reported by Schwartz in 1952 among 5 Indian females from Kenya and he coined the term ‘Atropical Idiopathica Mucosae Oris’ to this condition. In 1953, Joshi described this condition as ‘Submucous fibrosis’. [3, 4] A condition resembling OSMF was described as early as 600BC by Sushruta, and it was named as ‘Vidari’ having features of progressive narrowing of mouth, depigmentation of oral mucosa and pain on having food [5]. OSMF typically affects buccal mucosa [6], tongue, lips, soft palate [7] and occasionally pharynx and esophagus [8]. Sometimes this condition is preceded by vesicle formation [9]. It is always associated by fibrous band and histologically observed juxta-epithelial inflammatory reaction followed by a fibroelastic change of lamina propria with epithelial atrophy leading to stiffness of oral mucosa, trismus and inability to eat [10].

Various known etiological factors for this disease can be areca nut chewing, capsaicin in chillies, micronutrient deficiency of iron, zinc and essential vitamins. A possible autoimmune basis to the disease with demonstration of various autoantibodies and an association with specific human leukocyte antigens has been reported, which increases the possibility of the genetic predisposition as

✉ Madan Mishra
mm.15mds@gmail.com

¹ Department of Oral and Maxillofacial Surgery, Sardar Patel Post Graduate Institute of Dental and Medical Sciences, Lucknow Uttar Pradesh, India

well [11]. Pindborg JJ in 1989 classified OSMF into three stages: Stage I—stomatitis including erythematous mucosa, vesicles, mucosal ulcers, melanotic mucosal pigmentation and mucosal petechiae. Stage II—fibrosis occurs in healing vesicles and ulcers, which is the hallmark of this stage. Stage III—sequelae of OSMF as: Leukoplakia (found in more than 25% of cases), speech and hearing deficit may occur (because of involvement of tongue and Eustachian tube) [9]. Khanna and Andrade proposed a comprehensive classification based on clinical and histological features: group I—maximum interincisal opening (MIO) >35 mm (early OSMF without trismus); group II—MIO range 26–35 mm (mild to moderate disease); group III—MIO range 15–25 mm (moderate to severe disease); group IVa—MIO < 15 mm (severe disease); group IVb—extremely severe premalignant/malignant intraoral lesions noted [2].

Treatment of OSMF comprises of conservative management such as use of micronutrients and minerals, carbon dioxide laser, pentoxifylline, lycopene, immunized milk, interferon gamma, turmeric, hyalase, chymotrypsin and collagenase and intralesional injections of hyaluronidase [12, 13] which can be combined with placenta extract and steroids [12–14]. Surgical management is treatment of choice in severe cases. In surgical intervention masticator myotomy, coronoidectomy/coronoidotomy and surgical release of fibrotic bands are required. Reconstruction may be done with buccal fat pad (BFP) flap, skin grafts [15], tongue flap [6], greater palatine pedicled flap [2], placental graft [16], artificial dermis and anterolateral thigh flap [17], temporalis fascia flap and radial forearm flap [18] and nasolabial flap [19].

The BFP was first recognized and described by Bichat in 1802 [20, 21]. It is a specialized fatty tissue mass which remains constant in terms of size, even in cases of extreme weight gain or loss [22, 23]. It lies in buccal space and has a rich blood supply through branches of maxillary artery, facial artery and superficial temporal artery [14]. Average volume of BFP is 9.6 ml (range 8.3–11.9 ml) [24]. Tideman et al. [25] described that BFP epithelializes in 2–3 weeks. BFP being delicate and fragile, extreme care must be practiced not only during its harvest but also during its healing phase.

Biological dressings like collagen create the most physiological interface between the wound surface, environment and impermeable to bacteria. Collagen, the most abundant protein in the body, plays a critical role in the successful completion of adult wound healing. Its deposition, maturation and subsequent remodeling are essential to the functional integrity of the wound [25].

The aim of this study was to assess the effectiveness of collagen membrane as biological dressing over BFP during

crucial postoperative healing phase in the surgical management of OSMF (Khanna and Andrade group IVa).

Materials and Methods

The present study included 40 patients (32 males and 8 females, age ranging from 16 to 53 years) diagnosed of oral submucous fibrous (Khanna and Andrade group IVa). The inter-incisor space was measured in every case before and after surgery (Fig. 1). Before operating the patient, proper counseling was done regarding the adverse effects of areca nut, betel leaves, tobacco chewing and patients were advised for discontinuation of any adverse habit. Patients were also counseled about the importance of postoperative follow-up and physiotherapy. A written informed consent was obtained from all the patients. Approval from institutional ethical committee was obtained before study. All patients were evaluated for fitness to general anesthesia. Patients were randomly divided into two groups (20 patient patients per group). Patients in group I were treated with buccal fat pad flap only, whereas patients in group II were treated with buccal fat pad flap and collagen membrane (sterile collagen membrane of Bovine origin of dimension 5 × 5 cm).

Surgery was performed under general anesthesia. Patients were intubated either by blind nasal, retrograde or flexible fiber optic laryngoscope. Two percent lignocaine with 1:80,000 adrenaline was locally infiltrated along the

Fig. 1 Preoperative mouth opening

planned incision line. The incision started entirely on the inner aspect of buccal mucosa, along the line of occlusion behind the commissure of lip and extended posteriorly preferably up to pterygomandibular raphe region depending on the location of fibrous bands. The incision was carried out to the depth of the submucosal layer. Incised band were further disentangled manually till no restriction was felt, and same procedure was done on opposite side as well. Then, the coronoid process was exposed from the same incision which was made for fibrous band resection. The insertion of temporalis muscle was released from coronoid process and anterior border of ramus. Coronoidectomy was done using chisel and mallet. The mouth was then forced open with Heister jaw opener to an acceptable range of more than 35 mm. Prophylactic extraction of all erupted third molars was done. Through the same incision, in the region of maxillary molars, access to BFP was gained by blunt dissection, preferably using hemostat. When fat protruded in oral cavity, gentle milking was done extraorally which teased out the buccal fat pad. When sufficient amount of fat was obtained, it was used to cover the defect without tension. The flap was secured with 3-0 polygalactine 910, round body suture material by

simple interrupted suturing method (Fig. 2). Same procedure was performed on opposite side.

In group II, collagen membrane was secured over the BFP by 3-0 polygalactine 910 (Fig. 3). Finally, intraoral pressure dressing was given with gauge pieces and chlorhexidine gluconate dressing in all the patients and dressing was changed every 24 hourly.

Postoperatively all the patients received intravenous antibiotics and nasogastric feeding for 1 week. Daily input of 2–2.5 l was maintained. Mouth-opening exercises were started from third postoperative day by Heister's jaw opener (three times a day for 15 min each time) for initial 3 months and with reduced frequency for as long as 1 year. MIO was increased gradually till approximate intraoperative mouth-opening values were achieved.

The patients were analyzed for intraoperative time, postoperative interincisal mouth opening (in mm.), infection, pain (analyzed by VAS on scale of 0–10), wound dehiscence and relapse (at different time intervals which lasted for 1 year). Statistical analysis was done using Statistical Package for the Social Sciences (SPSS) 16.0 software and unpaired t test.

Results

In our study, 40 cases of OSMF of group IVa (Khanna and Andrade) were included. The age of patients ranged from 18 to 65 years (mean age—32.55 in group I and 33.95 in group II). High predisposition was present for males (4:1–32 males and 8 females). No statistically significant

Fig. 2 Buccal fat pad sutured over the defect

Fig. 3 Collagen membrane covering harvested BFP

difference in age and gender was found between the groups. The mean preoperative mouth opening was 13.55 mm in group I and 13.06 mm in group II. The mean intraoperative mouth opening achieved was 38.96 mm in group I and 39.62 mm in group II. The mean postoperative mouth opening after 1 year was 35.48 mm in group I and 36.51 in group II (Table 1).

In group I, complete relapse was seen in two patients after 1-year follow-up, they developed refibrosis and trismus. Infection was evident in four patients of 20 group I cases. The wound dehiscence was noted in two patients after 1-week follow-up which was subsequently managed conservatively. The time taken for complete epithelialization of BFP was 2–3 weeks. Pain score was 4 on VAS after 1-week follow-up that reduced significantly in further follow-up weeks. Average time taken to complete the surgical procedure in group I patients was 2 h.

In group II, complete relapse was seen in one patient after 1-year follow-up. We did not encounter infection or wound dehiscence in any group II case. Epithelialization took place in 2–3 weeks. Pain score was 2 on VAS after 1-week follow-up. Average time taken to complete the surgical procedure in group II patients was 2 h and 30 min.

Discussion

Various medical and surgical modalities have been employed for treatment of OSMF. Medical treatment has its own limitations and is not effective in treating advance cases of OSMF (group IVa—Khanna and Andrade). Surgical excision of fibrous band may cause scarring and worsens the condition. Split thickness graft has not yielded exuberant results. Reconstruction of defects with local flaps had varying results and has its own disadvantages; tongue flaps prove to be bulky and require additional surgery. Bilateral tongue flaps cause disarticulation and dysphagia, and this causes increased risk of aspiration. Greater palatine pedicled flaps have size limitation and are inaccessible to posterior margins of surgical defect. Anterolateral thigh flap, temporalis fascia flap and radial forearm flap are

associated with donor site morbidity; these procedures are time consuming, exhaustive and technique sensitive. Nasolabial flap may result in facial scars which are highly unaesthetic and unacceptable for younger patients [26].

Yeh first described the use of BFP with encouraging results and least morbidity. This can be attributed to the fact that it is a local pedicled graft [14]. Although BFP has several advantages over other flaps in the surgical management of OSMF (it is quick, simple, equally effective, technically easier flap to use, it can be harvested through the same incision thus has low morbidity with excellent functional outcomes), but being a delicate and fragile structure, extreme care must be practiced not only during its harvest but also during its healing phase to maintain its integrity. The BFP can be damaged during postoperative phase by vigorous rinsing and exercise. Its irregular surface is prone for food lodgment that might lead to infection and add to postoperative complications. Therefore, initial 2–3 weeks are very crucial as the BFP epithelizes during this time period. At the same time, initial 2–3 postoperative weeks are important for maintaining mouth opening (achieved intraoperatively) by jaw-opening exercises and intraoral hygiene must be maintained during this phase.

It seems prudent to have a protective covering over BFP so as to prevent its damage during crucial initial 2–3 weeks that could protect the harvested BFP from physical damage during jaw-opening exercise and employment of oral hygiene measures. That would also provide a smooth cover over irregular surface of the harvested BFP to reduce the possibility of food lodgment that could lead to infection on exposed irregular surface of BFP.

Raw wounds of oral cavity are healed by epithelialization and granulation. Healing phase is further affected by poor oral hygiene and constant movements of cheek and tongue. These wounds are prone to infection and scarring. It has been well documented that infection rate and degree of contraction are greatly reduced when wounds are dressed with biological dressings [2]. The advantages of collagen membrane as a wound dressing material in OSMF surgery include the easy availability of collagen

Table 1 Comparison of mouth opening between the groups

Time period	Group I (<i>n</i> = 20) <i>n</i> = number of patients	Group II (<i>n</i> = 20) <i>n</i> = number of patients
Preoperative	13.55 ± 3.26	13.06 ± 3.18
Intraoperative	38.96 ± 4.33	39.62 ± 4.08
1-Week follow-up	36.27 ± 5.69	37.76 ± 4.74
3-Week follow-up	35.47 ± 2.80	36.76 ± 2.84
6-Month follow-up	35.70 ± 4.15	36.85 ± 4.63
1-Year follow-up	35.48 ± 2.35	36.51 ± 3.56

membrane, convenience of application, good tolerance of collagen by oral tissue without any adverse effect [27].

Sterile collagen membrane of Bovine origin can be used as a cover over harvested BFP. It is easily available as commercial product. Collagen when used to cover raw areas provides coverage for sensitive nerve endings thereby diminishing degree of pain [28]. The adherence of collagen membrane is initially due to fibrin–collagen interaction and later due to fibrovascular ingrowth into the collagen. With time, it slowly undergoes collagenolysis and is eventually sloughed off. It resists masticatory forces for sufficient time, to allow granulation tissue to form [29].

In the present study, prophylactic extraction of all the molars was done, to avoid the trauma to BFP flap at retromolar region. Bilateral temporalis myotomy and coronoidectomy was done as fibrosis progresses to temporalis tendon in cases of advanced OSMF. Chang et al. [30] described the significance of temporalis myotomy and coronoidotomy in surgical treatment of OSMF. The results were identical to those in our study. The mean intraoperative mouth opening achieved was 38.96 mm in group I and 39.62 mm in group II.

The mean postoperative mouth opening achieved in both the groups was comparable at every follow-up visit (Table 1).

Infection was evident in four cases of group I, whereas none of the group II patients developed infection in post-operative phase. It could be attributed to the fact that collagen membrane creates physiological interface between wound and external environment which is impermeable to bacteria, thus helps in preventing infection of surgical site. It also provides a smooth surface over BFP that prevent food lodgment at surgical site.

Pain was assessed on visual analogue scale (VAS). After 1-week follow-up, pain score was 4 in group I and 2 in group II. This can be attributed to the fact that collagen membrane provides coverage for sensitive nerve endings thereby diminishing degree of pain, specially after 1 week when regular dose and frequency of analgesic is withdrawn.

Dehiscence was not present in any patient of group II, whereas two patients of group I developed dehiscence after 1-week follow-up, this was due to the presence of stretched ends of flap sutured to the corner of mouth.

Relapse was seen in two patients in group I and one patient in group II. These patients were non-compliant and did not follow postoperative instructions properly. In these patients, interincisal opening reduced to less than 10 mm after 1-year follow-up.

Time taken for epithelialization in present study was 2–3 weeks in both groups and within 6-month normal contour, frangibility and elasticity were restored (Fig. 4). Similar results were found in study by Tideman et al. [25].

Fig. 4 Normal contour of mucosa after 6 months

Although intraoperative time was increased in group II application of collagen membrane reduced infection when compared with group I. During the initial healing phase, collagen membrane protected the BFP from physical damage while practicing oral hygiene measures and jaw-opening exercises. Reduction in pain scores during post-operative period in group II patients was an additional advantage.

Conclusion

This study was primarily aimed to evaluate the outcomes of BFP (group I) and BFP along with collagen membrane (group II) in surgical management of oral submucous

fibrosis. Following possible conclusions can be drawn from the present study.

1. Collagen membrane is easily available, easy to use, economical, good tolerance of collagen by oral tissue and good adaptability over harvested BFP.
2. Though surgical time increases on application of collagen membrane, it is acceptable as pain score, physical trauma, food lodgment and consequent infection at surgical site are reduced. It provides sufficient protection and helps in maintaining structural integrity of BFP during healing phase.

However, we suggest further comparative studies with a larger sample size to evaluate the final clinical outcome of individual method and to validate the use of collagen membrane as a protective covering over harvested BFP in the surgical management of oral submucous fibrosis.

Compliance with Ethical Standards

Conflict of interest None.

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