Versatility of Buccal Pad Fat and Temporoparietal Fascia Flap in Surgical Management of Oral Submucous Fibrosis

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Abstract

The various surgical procedures for surgical management of oral submucous fibrosis (OSMF) include excision of fibrous bands with or without grafts or flaps. Materials for attempted grafting included skin, placental grafts, and artificial dermis. Materials that can be used as flaps are tongue flaps, buccal fat pad, greater palatine pedicle flaps nasolabial flaps, anterolateral thigh flap, radial forearm flap, and temporalis fascia flap. The temporoparietal flap is ultrathin surgically single layer fibrovascular sheet with high vascularity, flexibility, pliability, and versatility. Ten cases with Grade III and Grade IV OSMF with 5 patients planned for reconstruction with buccal fat pad and 5 patients planned for temporoparietal fascia flap (TPFF) after surgical resection of fibrotic bands were undertaken for the study. After 7 days, both flaps healed nicely with complete epithelization of the two flaps occurred. There were no complications except for hyperplasia of TPFF that covered the defect. Postoperative histopathological examination of hyperplastic temporoparietal fascia revealed well-differentiated squamous-cell carcinoma in one patient and in another case, there was failure of TPFF. Both buccal pad fat and TPFF are reliable for the reconstruction of buccal mucosal defects in surgical management of OSMF.

Keywords: Buccal pad fat, oral submucous fibrosis, temporoparietal fascia

Introduction

Oral submucous fibrosis (OSMF) was first described by Schwartz and later by Joshi. OSMF is defined "as an insidious, chronic disease of unknown etiology, reported mainly in Indians, affecting the entire oral cavity, sometimes the pharynx, and rarely the larynx. Although occasionally preceded by vesicle formation, the basic changes are a juxtaepithelial inflammatory reaction followed by a fibroelastic transformation of the connective tissue in the lamina propria associated with epithelial atrophy. In the later stages, stiffness of the oral mucosa occurs causing limitation of mouth opening and difficulty in eating."[1]

Yeh[2] found that the buccal fat pad (BFP) had a constant blood supply by an abundant net of vascular anastomoses with a volume of 9.6 cc (range 8.3–11.9 cc) and defects up to 3 cm × 5 cm can be closed adequately without compromising the blood supply. They concluded that the buccal fat pad graft could be successfully used for the reconstruction of surgically created mucosal defect in OSMF.

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Mokal *et al*.,[3] treated total of five patients with new technique of release of submucous fibrosis and reconstruction using superficial temporal fascia flap and split skin graft. The masseter muscle origin was released from the zygomatic arch and the temporalis muscle insertions were released from the coronoid process through an external approach. The entire fibrosed mucosa was released intraorally to create a mucomuscular defect, thus achieving full mouth opening. The superficial temporal fascia flap was then brought in and sutured to the intraoral defect, which was then covered with a split-thickness skin graft. All patients had complete survival of flap and full take of the skin graft.

Neder,[4] in 1983, revealed the advantages of buccal pad of fat as a donor site for procedures in the maxillofacial

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region when a not excessive amount of fatty tissue was used for grafting. He offered the following advantages for the procedure of buccal fat pad grafting as: it was technically easy procedure, both donor and recipient site were in the oral cavity and there was no visible scar in the donor area, the anatomic proximity of the donor site to the recipient site permitted rapid grafting.

The objective of this study is to compare the effectiveness of temporoparietal fascia flap and buccal fat pad in reconstruction of buccal mucosa defects in surgical management of OSMF (interincisal distance) and to evaluate the available flap surface area available, thickness and postoperative healing of the two flaps, ease of harvest, and donor site morbidity.

According to the literature, the areca-quid chewing habit (with/without tobacco) is the main etiologic factor that causes stimulation of underlying fibroblasts that proliferate to transform fibrotic bands in submucosal region. The habit of chewing areca nut leads to muscle fatigue. Gollnick *et al*. stated that glycogen consumption is physiologically related to cellular activity. Overactivity of the muscle results in excessive glycogen consumption, leading to glycogen depletion. The increased muscle activity and diminished blood supply following connective tissue change lead to muscle degeneration and fibrosis.[1]

Treatment based on stoppage of areca nut chewing habit, use of steroids, gamma interferon or anti-inflammatory placental extracts, dietary supplementation with iron, Vitamin A, or Vitamin B, anti-oxidants followed by vigorous mouth opening exercises as well as injection of hyaruronidase to break the fibrotic bands.[5-8]

Nonsurgical treatments have role in initial stages of the disease before trismus starts. As OSMF progresses to moderate-to-severe trismus, surgical intervention is required. Multiple surgical modalities have been attempted, from moderately invasive to significantly invasive. This can include a radial forearm free flap,[3] superficial temporalis fascia pedicled flap,[9] anterolateral thigh flap[10] combined with or without split-thickness skin graft coverage. The temporoparietal flap is ultrathin surgically single layer fibrovascular sheet with high vascularity, flexibility, pliability, and versatility.[3]

We used temporoparietal flap[2] for the reconstruction of mucosa defects in 5 patients and buccal fat[3] pad in another 5 patients to study the effectiveness between the two.

The surgical procedure for the treatment of OSMF consisted of[1] removal of all the intraoral fibrotic tissue, masticatory muscle myotomy, and coronoidectomy[11] and reconstruction of intraoral surgical defects with flap.

Materials and Methods

This study includes versatility of buccal fat pad and temporoparietal fascia flap (TPFF) in reconstruction of oral mucosal defects (lining) after surgical excision or incision of the fibrous bands in OSMF who reported to the Department of Oral and Maxillofacial Surgery of PMNM Dental College and Hospital, Bagalkot with a chief complaint of long-standing difficulty in mouth opening and positive history of betel nut, tobacco chewing. All patients were examined thoroughly and clinically and confirmed as OSMF based on Khanna and Andrade's[12] grading of OSMF.

The patients were screened according to the inclusion and exclusion criteria and their preoperative interincisal distance was measured and recorded.

Inclusion criteria

1. Grade III and Grade IV OSMF requiring surgical management and reconstruction according to Khanna and Andrade's grading
2. Medically fit patient for surgery under general anesthesia.

Exclusion criteria

1. Medically compromised patients for the surgical procedure under General Anesthesia
2. Grade I and Grade II OSMF according to Khanna's grading
3. Patients with previous surgical treatment for OSMF
4. Trismus due to other reasons.

A total of 10 cases with Grade III and Grade IV OSMF with 5 in each group, planned for reconstruction with buccal fat pad and another five patients planned for TPFF after surgical resection of fibrotic bands were undertaken for the study. All the procedures were carried out under general anesthesia, wherein the patients were intubated using the fiberoptic nasotracheal intubation. Orthopantomograph was taken to evaluate the position of third molars.

The patient was anesthetized using fiberoptic nasotracheal intubation. The incisions were made with an electrosurgical knife along each side of the buccal mucosa at the level of the occlusal plane away from the Stenson's orifice [Figure 1]. Incisions were extended posteriorly to the pterygomandibular raphe and anteriorly as far as the corner of the mouth, depending on the location of the fibrotic bands which restricted mouth opening. These fibrotic bands were incised or excised as detectable by palpation.[2,4,13,14] The wounds created were further freed by manipulation until no restrictions were felt. The mouth was then forced open with a Heister mouth opener to an acceptable range. The coronoid processes were approached from the wounds created and ressected with burs, chisels, and mallet. The insertion of temporal muscle was released.[11] All the third molars teeth were extracted. After coronoidectomy, forceful mouth opening up to 35–50 mm as measured from the incisor edges using scale was performed.

For release, mobilization and securing the buccal fat pad on buccal mucosa defects the procedure for surgical management of OSMF was same till coronoidectomy and forceful mouth opening [Figure 2] after which an incision high in the maxillary vestibule, beginning above the second molar and extending

posteriorly for 2 cm was performed.[14] The incision is made 5 mm above the attached gingiva of the second molar and extends through mucosa and then the fibers of the buccinator muscle to expose maxillary periosteum. The buccal fat pad was approached by bluntly opening the fine hemostat or scissor and then gently dissecting until the fat protruded into the mouth.[15] The buccal fat pad was teased into the mouth gently by applying external pressure over the cheek until a sufficient amount was obtained to cover the defect without tension. The buccal fat pad was then secured in place with horizontal mattress sutures. The same procedure was performed on the other site. The graft was secured with bolster gauze pack using transcutaneous sutures with 1-0 mersilk.

The flap was secured with bolster gauze pack using transcutaneous sutures with 1-0 mersilk. Patient was then extubated and shifted to recovery room.

Some opt for color Doppler to study vascular anatomy of temporoparietal flap for ease of harvest of the flap, but we had not opted for color Doppler.

Marking for temporoparietal flap[16] was done with methylene blue. The galea was exposed with hemicoronal incision marked with methylene blue. The incision was extended below till preauricular crease and in front of tragus. The incision was deepened to the subcutaneous layer below the hair follicle with a #15 BP. blade in the subfollicular plane against the hair follicle. Mild traction with skin hooks separated the scalp from underlying tempoparetal fascia. The anterior and posterior scalp flaps were elevated off from underlying temporoparietal fascia. Anteriorly, the flap elevation was restricted to avoid the temporal branch of facial nerve. Small perforating vessels from main vessel were cauterized. The elevation of temporoparietal flap was performed using rounded dissecting scissors in the subgaleal plane downward to zygomatic arch. The flap was transferred to the oral cavity through tunnel made below zygomatic arch with a blunt artery forceps. Suturing of flap to buccal mucosa was performed with 3-0 vicryl. Drains were placed in temporal region and scalp incision and wound closed with 4-0 ethilon suture [Figures 3-7].

The patients were given intravenous antibiotics for a period of five days followed by oral for another five days. Thorough irrigation with povidone iodine 5%, saline and chlorhexidine gluconate 0.2% w/v was done twice a day for the postoperative period of about 10 days. They were put on Ryle's tube feeding[2] for seven days. After seven days postoperatively, the bolster pack was removed. Patients were started on mouth opening exercises (using wooden sticks) from the 3rd postoperative day,[2] with a frequency of four times a day with duration of half an hour, and later the frequency and duration was increased to facilitate improvement in the mouth opening until values that were achieved intraoperatively. Patients were evaluated for mouth opening both intraoperatively and at intervals of the 1st week, one month, three months, and six months postoperatively.

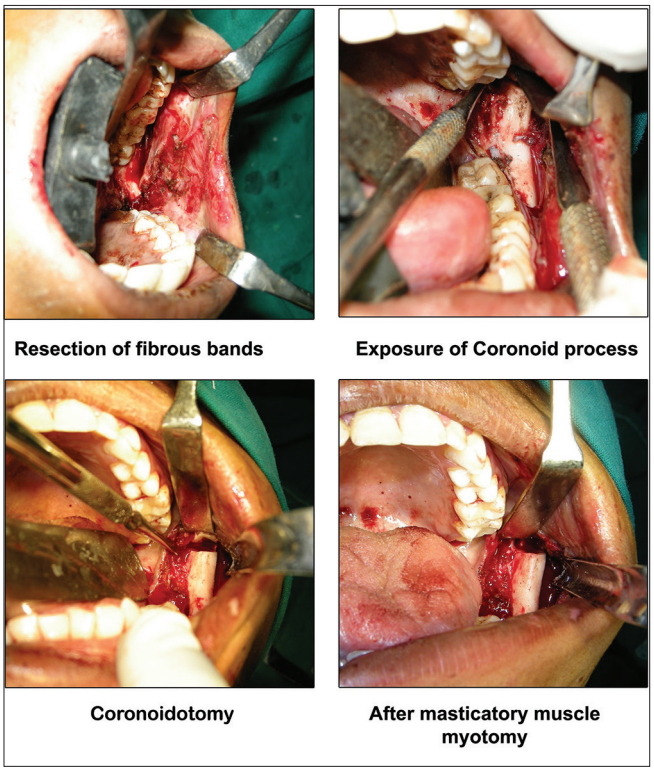

Figure 1: Resection of fibrotic bands, coronoidotomy and masticatory muscle myotomy

Results

The patients included in the study were in the age group of 16–40 years comprising all male group. Out of 10 patients, it

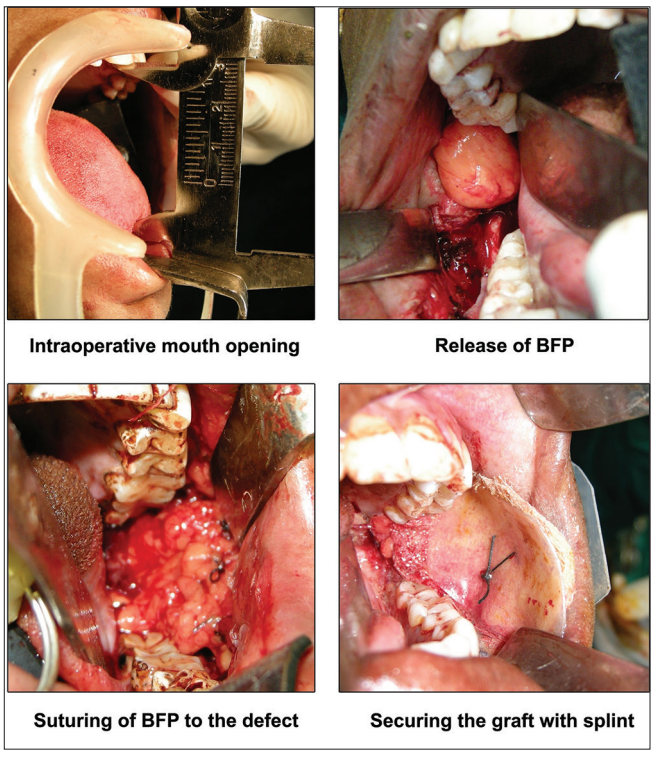

Figure 2: Release of buccal pad fat and securing the flap with splint

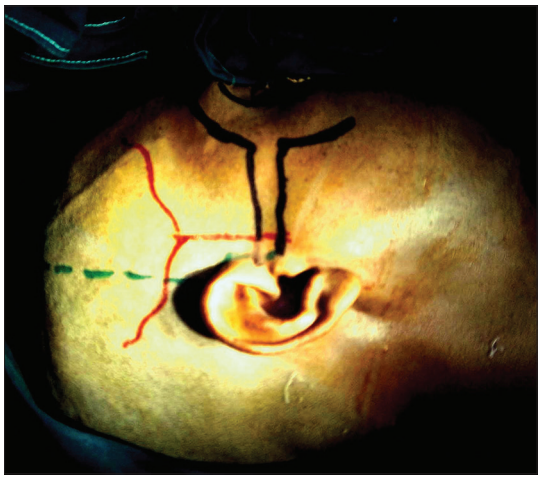

Figure 3: Marking of incision for harvest of temporoparietal flap

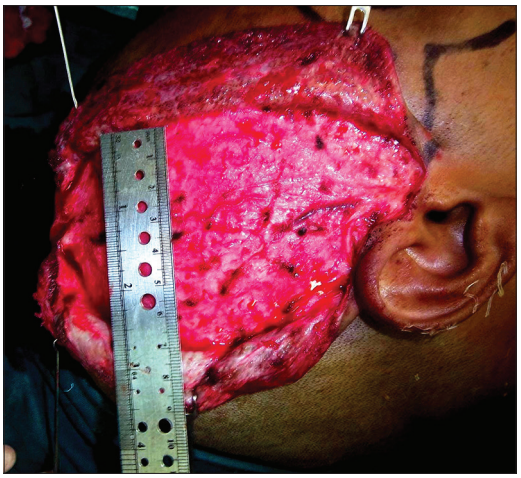

Figure 4: Exposure of temporoparietal fascia

Figure 5: Temporoparietal fascia flap exposed to be transferred to oral cavity

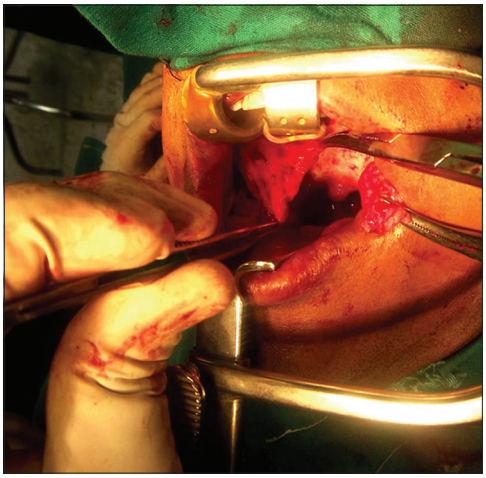

Figure 6: Temporoparietal fascia flap transferred to oral cavity

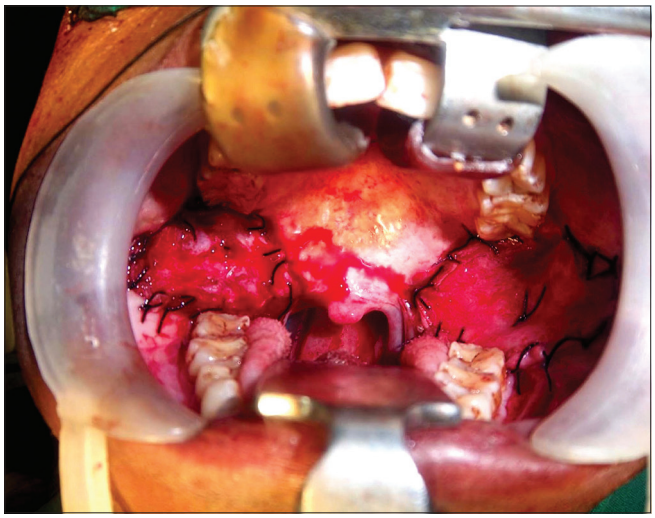

Figure 7: Temporoparietal fascia flap sutured in buccal mucosa

Figure 8: Preoperative mouth opening

was observed that the fibrosis had mainly involved retromolar pad, buccal mucosa, in all the patients while the involvement of soft palate was seen in 20% of cases. The patients selected for surgical management had interincisal opening of 8 mm (Stage IV) to 17 mm (Stage III) OSMF. None of them had undergone any medical or surgical procedure.

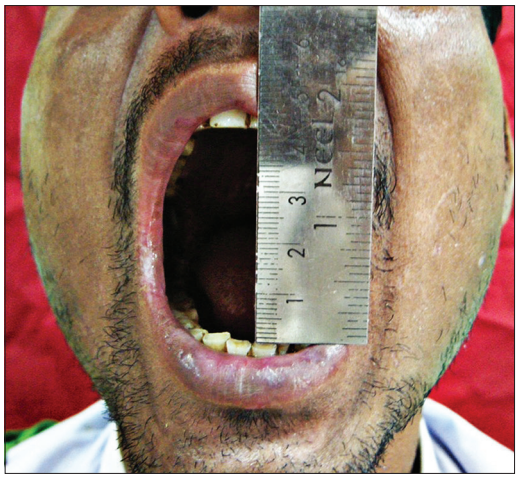

Figure 9: Postoperative mouth opening

The inter-incisal distance was chosen as the objective parameter to identify the severity of the disease. The preoperative interincisal distance was in the range of 2–17 mm [Figure 8]. After release of fibrotic bands, coronoidectomy and masticatory muscle myotomy a mean forced intraoperative mouth opening of 49.8 mm was achieved in those patients covered with buccal fat pad (Group I) and a mean forced intra-operative mouth opening of 44.6 mm was achieved in those patients covered with TPFF (Group II). On the 1st week postoperative day, a mean mouth opening of 45.4 mm was observed in those patients whose defects were covered with buccal fat pad [Figure 9] and mean mouth opening of 34.8 mm was observed in those patients whose defects were covered with temporoparietal flap. Regular mouth opening exercises commenced on the tenth postoperative day with a frequency of four times day and duration of 15 min was carried out. Later both the frequency and duration was increased which aided in further increasing mouth opening. The inter-incisal mouth opening was 38.4 mm in case of buccal pad fat and 18.4 mm in case of TPFF after 6 months follow-up [Tables 1 and 2]. The patients were motivated both pre- and post-operative for the cessation of habit and mouth opening exercises.

Discussion

The TPFF[3] has an axial pattern blood supply from superficial temporal blood vessels. The buccal pad fat with partly an axial pattern transfer from the transverse facial artery and partly with a mesenchymal random pattern transfer owes its vascular inflow and base.

Mokal *et al*.[3] advocated use of vascularized TPFF with release of strong muscles of mouth closure such as masseter from its origin and temporalis from its insertion. Well vascularized superficial temporal fascia flap brings good blood supply for the fibrosed muscles and mucosa to improve its function. They concluded that the technique is very invasive, time-consuming, and need great surgical skills.

Figure 10: Postoperative follow-up shows hyperplasia of temporoparietal fascia flap

The buccal fat pad has a good blood supply, efficient uptake at recipient site, and spontaneous epithelialization in the oral cavity with minimal donor site morbidity make it an ideal flap. The pediceled temporoparietal flap is highly versatile in covering buccal mucosa defects and spontaneous epithelization in oral cavity.

Khanna and Andrade[12] reported the incidence of shrinkage, contraction, and rejection of split skin graft as very high, owing to a poor oral condition, with recurrence in 12 cases.

Nasolabial flaps cannot be extended adequately to cover the raw area, as they cause facial scars and hair bearing[3] and cause widened corner mouth.

In our study, patients were followed up for postoperative rehabilitation for 6 months. They were motivated for vigorous mouth opening exercises and oral supplement of anti-oxidants like alfa-lipoic acid 100 mg, multivitamin capsules with topical triamcinolone acetonide 0.1%[13] on mucosal surface at bedtime.

Pinto *et al*.[17] performed 40 dissections on 34 fresh adult cadavers. The flap vascular anatomy was studied by injecting latex into the superficial temporal vessels. Oral cavity and oropharynx reconstruction simulations were performed after flap transposition into the mouth by passing it under the zygomatic arch. They concluded that the flap is suitable for the coverage of hypothetical defects in the most oral cavity and pharyngeal sites.

Tighe[18] reported a case where there was fibrosis of the TPFF used in the reconstruction after resection of intraoral squamous-cell carcinoma followed by a course of radiotherapy leading to reduced mouth opening. He concluded that the combination of surgery and radiotherapy with the intraoral use of TPFF may lead to flap fibrosis and limited mouth opening. In this study, there was a fibrosis of temporoparietal flap in one patient leading to reduced mouth opening after the 6th month of follow-up.

Table 1: Mouth opening (mm) in oral submucous fibrosis cases before and after reconstruction with buccal pad fat

Preoperative interincisal distance (mm)	Intraoperative (forced) interincisal distance (mm)	Postoperative interincisal distance (mm)			
		After 1st week	After 1 month	After 3 months	After 6 month
15	50	47	45	45	44
16	50	44	44	42	42
17	50	44	42	44	37
16	49	46	40	40	39
15	50	46	44	43	30

Table 2: Mouth opening (mm) in oral submucous fibrosis cases before and after reconstruction with temporoparietal fascia flap

Preoperative interincisal distance (mm)	Intraoperative interincisal distance (mm)	Postoperative interincisal distance (mm)			
		After 1st week	1 month	3 months	After 6 months
13	50	40	38	-*	-*
9	36	33	30	24	10
8	47	38	33	30	29
2	45	24	21	20	23
12	45	39	36	32	30

* Postoperative histopathological examination after 1 month follow up revealed well differentiated squamous cell carcinoma. Hence, he has been reoperated for the same, therefore subsequent postoperative interincisal distance not taken

Nayak and Deschler[19] performed reconstruction of an intraoral defect with a TPFF in three patients. All defects were on the lateral buccal space with a significant anterior or posterior extension. They concluded that the TPFF is a thin, vascular, durable flap that is a viable option for reconstruction of selected intraoral defects in patients who are not suitable candidates for other methods.

TPFF is a thin, highly vascularized connective tissue layer just deep to the hair follicles and subdermal layer of fibrofatty tissue.[20] The temporoparietal fascial layer becomes increasingly adherent to this overlying layer as more fibrous septae and blood vessels traverse the layers toward the vertex. The flap ranges from 2 to 4 mm in thickness and can be harvested with dimensions up to 17 cm × 14 cm.[20]

The superficial blood vessels nourish the temporoparietal fascial layer. The superficial temporal artery and vein courses through this layer. The superficial temporal artery bifurcates approximately 2 cm above the zygomatic arch into anterior and posterior branches. Each of the main branches then sends perforating branches to the overlying subdermal layer. The superficial temporal vein runs more superficially increasing its risk of injury during harvest.[20]

The frontal branch of the facial nerve runs just deep to the temporoparietal fascia. It traverses the zygomatic arch obliquely one finger breadth behind the posterior edge of the zygomatic process of the frontal bone. The auriculotemporal nerve is within 5 mm of the superficial temporal artery until 1.5 cm above the helix and may be injured if the incision extends till the superficial temporal artery.[20]

The complications of the TPFF surgery are[21] hematoma/seroma formation, wound healing problems, alopecia, partial, or total flap failure. Venous insufficiency is more common than arterial insufficiency. This problem can be prevented by preserving more soft tissue around the pedicle and avoiding torsion of the pedicle and kinking in the tunnel that may end up with partial or total flap loss.[21]

In our study, after 7 postoperative days both complete epithelization of the two flaps occurred, but there was a hyperplasia of temporoparietal fascia flap that covered the defect [Figure 10]. The patients were followed up after 1 month. After 1 month patients complained of bulkiness intraorally in the region of temporoparietal flap which resulted in cheek biting in the region of flap during occlusion. The hyperplastic tissue was excised with electrocautery and biopsy was performed. Out of four patients, in one patient, postoperative histopathological examination of excised hyperplastic tissue revealed well-differentiated squamous-cell carcinoma. Hence, he has been reoperated for wide resection with neck dissection followed by reconstruction with free flap. In another patient, there was failure of TPFF. His mouth opening was again reduced to 10 mm. Another two patients revealed moderately dysplastic changes. These two patients were recalled after 7 days and after 1 month to evaluate the postoperative healing after excision of hyperplastic tissue. After 7 days of excision of hyperplastic tissue, there was complete healing and re-epithelization and patients had no interference with occlusion.

In our study, we had not used skin graft over TPFF. There was flap failure in one patient reconstructed with TPFF. Since we had not used skin graft, the healing of wound occurred due to granulation tissue formation followed by wound contraction and fibrosis. This might lead to flap failure and reduced mouth opening. This study concluded that the bilateral masticatory muscle myotomy and coronoidectomy

with the resection of fibrous bands followed by covering the defect with buccal pad fat or superficial temporal fascia flap provided good healing and re-epithelization of the defect with increase in interincisal opening even after 6 months of postoperative findings.

Conclusion

BFP has a advantage when it is used in recipient site after resection of fibrotic bands due to its rich blood supply. The TPFF is a thin, highly vascularized connective tissue layer with axial pattern blood supply. Hence both BFP and TPFF are reliable for the reconstruction of buccal mucosal defects in surgical management of OSMF.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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