



Adhoc Facial artery perforator flaps in oral Submucosal Fibrosis Reconstruction

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ABSTRACT

INTRODUCTION: Oral sub mucosal fibrosis, also known as "idiopathic scleroderma of the mouth", "juxta epithelial fibrosis" or "sclerosing stomatitis" is a slow onset disease and is a chronic premalignant condition of the oral cavity.

Among the various world populations, its incidence is highest in the Indian subcontinent where its incidence varies from 0.2% to 0.5% regionally^[1]. It manifests as difficulty in opening the mouth leading to difficulty in chewing, swallowing, dysarthria, trismus leading to poor oral hygiene, burning sensation and decreased salivation. Treatment modalities include conservative approaches such as local steroidal and hyaluronidase injections, placental extract, along with physiotherapy and nutritional supplements. Surgical procedures include simple release of fibrosis followed by skin grafting, buccal pad of fat as pedicled flap, tongue flaps, palatal flaps and radial forearm free flaps for reconstruction. Adhoc facial artery perforator based flaps circumvent most of the disadvantages of the above mentioned flaps so as to have as easy learning curve and maneuverability, adequacy of flap dimension, prevent the recurrence of the disease and aesthetically acceptable donor site scar along the nasolabial fold.

AIM: Retrospective cohort study (with level II evidence) to evaluate the efficacy of adhoc facial artery perforator flaps in the surgical management of severe oral sub mucosal fibrosis.

MATERIALS AND METHODS: 12 patients with severe Grade III or Grade IVa oral sub mucosal fibrosis (less than 20mm inter-incisor distance)^[3] were chosen following the inclusion and exclusion criteria. Patient's history was taken and preoperative examination was done. Pre-operative, intra-operative and post-operative photographs were taken and inter-incisor distance was measured. With naso-tracheal intubation, complete release of the fibrotic bands in both buccal areas and an extensile approach coronoidectomy were performed bilaterally if needed to achieve the desired mouth opening. Adhoc facial artery perforator flap were marked and elevated to cover the defect in the buccal mucosa on both sides. The donor site was closed primarily. Post operatively oral hygiene was maintained; physiotherapy and jaw exercises were initiated and continued.

RESULTS: Average mouth opening (inter incisor distance), preoperatively was 16.25 mm and post operatively was 36.4mm (immediate post op) and 36.25mm at one-year follow-up. Out of the 12 patients, one had seroma, one had hematoma and one had infection in the early post-operative period. There was no flap dehiscence or necrosis in any of the cases. Adhoc facial artery perforators' constant presence was confirmed in all the cases. Secondary raw areas in all the cases were closed primarily in layers. The resultant scar was aesthetically acceptable and was along the nasolabial fold. None of them developed into hypertrophic scar or keloids. All of them also achieved no recurrence with good amelioration of symptoms like burning and decreased salivation

CONCLUSION: Adhoc facial artery perforator flap is a versatile flap which provides an excellent method for the surgical reconstruction of the defect created by the release of oral sub mucosal fibrotic bands, with a good and sustained (one year follow up) post-operative mouth opening with minimal donor site morbidity. The versatility of these flaps is attributed to their constant and reliable robust vascularity.

KEYWORDS : Adhoc facial artery perforator flap, Oral sub mucosal fibrosis, coronoidectomy, trismus.

INTRODUCTION

About 2.5 million people are affected by oral sub mucosal fibrosis worldwide. Of this, there is a high prevalence in India, that too in the southern part of India. Its exact etiology is still ambiguous but several factors such as areca nut chewing, nicotine, chillies, autoimmunity, hypersensitivity, nutritional deficiency, increased lysyl oxidase levels, genetic and immunological causes, have been attributed [2]. Oral sub mucosal fibrosis (OSMF) is a chronic slow onset debilitating disease of the oral cavity characterized by progressive inflammation and fibrosis of the lamina propria and deeper connective tissues (sub mucosal tissues), resulting in marked rigidity and trismus [3]. It can manifest as blanching or stiffness of the oro pharyngeal mucosa, burning sensation of the mouth, loss of gustatory sensation, reduced mobility of tongue and soft palate or intolerance to eating hot and spicy food. Very rarely it can also cause mild hearing loss due Eustachian tube blockage. The most frequently affected site is the buccal mucosa but any part of the oral cavity might be involved, even the tonsillar pillars, pharynx and rarely even the larynx [4]. This condition has a strong association with areca nut chewing, which is an age-old tradition in India. The active agent is Arecoline, an alkaloid that is found in betel nut that

stimulates fibroblasts and thereby increases collagen production by 150%^[5]. A study in 2004 revealed clearly, a dose dependent relationship between the duration and frequency of areca nut chewing and the development of OSMF^[6]. All the patients in our study had only preferential involvement of buccal mucosa.

The malignant potential of sub mucosal fibrosis, as a precancerous lesion is still underrated and is complex eluding problem. Studies in India have shown that oral cancer co-exists in around 10% of the cases, malignant transformation occurred in around 4.5%, with co-existent precancerous lesions such as leukoplakia in 26% of the patients^[7].

Several conservative measures such as vitamin supplements, local steroid and hyaluronidase injections have given poor results especially in severe cases^[8].

The simple release of fibrosis and skin grating has shown recurrence due to graft contracture and scarring^[9].

Buccal pad of fat is also an option for surgical treatment modality.

Though the ease of raising flap is an advantage, its anterior reach is not usually adequate. Hence the smaller available dimension of this flap led to secondary contracture. This modality of treatment was followed in our department prior to this adhoc facial artery perforator flap reconstruction. It was associated with high recurrence rate and therefore the procedure was abandoned.

Islanded palatal mucoperiosteal flap that is based on the greater palatine artery might also get involved in the disease and lead to recurrence. Extraction of the second molar tooth that is required for the flap cover without tension is an added morbidity^[10].

Bilateral tongue flaps can cause disarticulation errors, severe dysphagia and the risk of post-operative aspiration. They also have the disadvantage of limited donor site tissue and their reach is frequently inadequate. The involvement of tongue by oral sub mucosal fibrosis is seen in 38% of the cases^[11].

Adhoc perforator flap^[12] is the island perforator flap that is raised on the perforators which are overlying the source vessels and which cannot be picked up preoperatively by Doppler examination. Therefore it needs exploration by nondelineating incision first and then designing the flap based on the single best perforator location.

AIM: Retrospective cohort study (with level II evidence) to evaluate the efficacy of adhoc facial artery perforator flaps in the surgical management of severe oral sub mucosal fibrosis cases with inter incisor mouth opening less than 20mm

STUDY DESIGN

Retrospective cohort study (with level II evidence). ALL THE STROBES RECOMMENDATIONS FOR THE STUDY DESIGN WERE FOLLOWED.

STUDY PERIOD

This study was conducted between January 2012 to January 2016.

MATERIALS AND METHOD

Inclusion Criteria

- All the patients presenting with grade III and IVa oral submucosal fibrosis (less than 20mm inter-incisor distance mouth opening)
- Those who had complete abstinence from tobacco or other inciting substances for minimal period of 4 months were only operated and included in the study
- Those with stable oral cavity epithelium (ruling out malignancy) and adequately controlled dental sepsis who were fit enough to be for surgery and general anaesthesia

Exclusion Criteria

- Patients with minimal disease and those failed to comply with abstinence
- Malignancy and other florid premalignant conditions associated with OSMF
- Temporomandibular Joint arthrosis
- Patients with Coronary Artery Disease, Diabetes Mellitus, Collagen vascular disease, Rheumatoid Arthritis, bleeding diathesis were excluded.

A written informed consent was obtained from all the patients included in the study. A detailed history was taken and a thorough preoperative examination was done. Pre-operative, intra-operative and post-operative inter-incisor distance was measured and photographs were taken. Pre-operatively all patients were given psychiatric counseling for discontinuing nicotine/betel nut chewing. Only the patients who had discontinued nicotine and betel nut chewing habits at least four months prior were taken up for surgery. Preoperative routine blood investigation and lung function tests, cardiac evaluation were performed for these patients. Pre-operative biopsies were done to rule out malignancy and to confirm the diagnosis. Psychiatrist and psychologist's counseling was given in the follow up period to the patients for consolidating the efforts on abstinence from nicotine and betel nut

chewing. Twelve patients of various ages with severe OSMF were taken up for the surgery. All of them were followed-up for an average period of 12.5 months postoperatively.

We followed the modified Khanna and Andrade classification^[2] of OSMF for picking up cases of severe category. All our patients had only buccal, peri commissural and palatal disease distribution because of their predominant habit of vestibule retention of inciting agents. Following is the modified Khanna and Andrade classification used in the selection criteria.

Stage I: early OSMF without mouth opening difficulties

Stage II: mild to moderate disease (mouth opening inter incisor distance (MIO) 20-35mm)

Stage III: moderate to severe disease (MIO 15-20mm)

Stage Iva: Severe disease (MIO <15mm)

Stage IVb: Extremely severe – malignant/premalignant lesion noted intra orally

CADAVERIC DISSECTION (fig no1, 2)

Dissection was performed with 4X loupe magnification in 23 face specimens of preserved cadavers. A "Facial Artery Perforator triangle" which had maximum number of facial artery perforators was determined. This was bounded superiorly and medially by zygomaticus major, inferiorly by rizorius and laterally by a line connecting the inner canthus to the anterior inferior angle of the masseter, which corresponds, to the surface anatomy of the facial vein. Rizorius is represented by a line joining the apex of the intertragic notch to the angle of the mouth. A line represents Zygomaticus major from the angle of mouth to the malar prominence.

Facial artery perforators are unique, as they are not accompanied by any prominent venae comitantes. Venous drainage is by multiple minute venules found within the substance of the fat around the facial artery perforators.

Measurements in Cadavers

An average of 2.5 perforators were found in this triangle.

All the perforators were either passing through the buccinators fascia or the lateral part of the orbicularis oris peripheralis.

These perforators form the basis of the Adhoc facial artery perforator flap.



Fig no1; facial artery perforator dissection in the perforator triangle showing 3 perforators

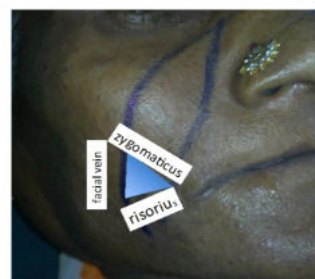


Fig 2; Surface anatomy of facial artery perforator triangle

OPERATIVE TECHNIQUE

Using video laryngoscopy/ fiber optic bronchoscope, nasotracheal intubation was done in all the patients. All of them were classified as difficult intubation and the need for tracheostomy was included in the informed consent. Nasotracheal tube was fixed, optimally positioned over the dorsum nasi and preferentially southbound tubes were used. Patient was laid in 10 degree anti Trendelenburg position. A 4X loupe magnification was used during the surgery.

Incision was started inferior to the commissure, near the sulcus and carried across the cheek to the soft palate, falling short of the midline, well below the opening of the parotid duct. The sub mucosal fibrous bands were cut down and excised until the buccinator fascia was clearly seen. Posteriorly pterygo mandibular raphe, superior constrictor and palatal fascia were exposed. A similar procedure was repeated on the contralateral side. Lower third molar on both sides were removed. Now using Ferguson Mouth gag, with steady pressure, mouth was opened to the maximum possible degree. If resistance was still felt, through the same incision, bilateral coronoidectomy was done since secondary adoptive contracture of temporalis is common in these OSMF cases. Mouth gag was introduced again and maximal mouth opening was done. With this extensile approach, an average of 36.5 mm incisor-to-incisor distance mouth opening was attained.

On either side, 2.2 to 3.5cm, maximal width facial artery adhoc perforator flap (elliptically shaped), was marked along the nasolabial fold with the cranial apex at the nasojugal fold and caudal apex falling short of lower mandibular border.

Lateral non-delineating incision was placed initially. Flap was raised in the supra SMAS plane which is present over the epimysium of the facial musculature.

Dissection was done towards the Facial Artery Perforator triangle, which we had defined in the cadaveric dissection. Perforators were dissected leaving behind a cuff of fat to safeguard the venous drainage. The single best perforator was chosen after trial clamping of other perforators, based on its ability to perfuse the whole extent of the flap. Incision was completed, flap was raised over the medial aspect craniocaudally in the supra SMAS plane, in such a way such that three fourths (larger blade) of the propeller flap lies cranial to the single best perforator, one fourth (smaller blade) is caudal to the perforator. Now by blunt dissection, anterior and inferior to the facial vein and artery below the large sensory buccal branch, buccinator is split and a dehiscence is created into the vestibule of the oral cavity, which invariably enters on an average, 2 cm from the commissure (within the surgically released oral cavity mucosal defect). Now the flap is introduced through the dehiscence without torsion of the pedicle. Then the flap is sutured using Polycapronic acid suture material from soft palate to the lower sulcus in such a way that the cranial blade is inserted into the distal part of oral mucosal defect and small blade is inserted into the mesial part of oral mucosal defect. Using polycapronic acid suture material and incorporating the principle of elliptical closure, deep layer splinting with delayed absorbable material and subcuticular skin suturing with polycapronic acid 5-0 suture materials the secondary defect was closed along the nasolabial fold. Procedure was repeated on the contralateral side. Excised specimen was sent for the histo pathological examination to rule out any malignancies. In all the patients, extubation was done on the evening of surgery in a delayed manner.



Fig 3; case1 -16-year duration khaini chewer with severe OSMF



Fig 4; Intraoperative picture after release on both sides extensile step coronoidectomy was done



Fig 5; mouth opening achieved on table



Fig 6; Marking of adhoc facial artery perforator flaps over the "facial artery perforator triangle"



Fig 7; Adhoc facial artery perforator flap raised on the single best perforator



Fig 8; Flap inset in to the oral mucosal defect



Fig 9; 6 months post op results



Fig 10; almost imperceptible donor scar with maintained mouth opening at 24 months postop.



Fig 11; absence of hair growth and mucosalisation at 24 months postop



Fig 12; case 2 severe OSMF with trismus. He is betel nut chewer for past 16 years



Fig 13 Results after excisional release and bilateral adhoc facial artery perforator flap reconstruction

Post operatively; oral gargle with chlorhexidine was started on the first postoperative day. Oral feeding commenced on the second post op day and physiotherapy and jaw exercises were initiated on the fifth day. Mucosalisation decreased hair growth in the internalized flap in male patients. All patients have aesthetic scar along the nasolabial fold. None of them had scar hypertrophy or stretching of the scar. On the 12.5 months (average) follow-up, all patients had maintained their mouth opening. 50% of them were treated with drugs for Nicotine discontinuation.

COMPLICATIONS

One patient developed hematoma on the first post-operative day, few sutures were removed and the hematoma was let out, hemostasis was secured and flap was re-sutured. Another patient developed seroma on the third postoperative day, which resolved with conservative management. Infection occurred in one patient who also concurrently had preoperative poor oral hygiene. Pus was let out, wash given and pus culture and sensitivity and directive antibiotic therapy based on antibiogram was given and the infection subsided. All adhoc facial artery perforator flaps survived well.

RESULTS

In our study, there was a male predominance in the incidence with a Male to Female ratio of 3:1. The average age was 38.5 years. Average mouth opening (inter incisor distance), preoperatively was 16.25mm and post operatively was 36.4mm (immediate post op) and 36.25mm at one-year follow-up. Out of the 12 patients, one had seroma, one had hematoma and one had infection in the early post-operative period. There was no flap dehiscence or necrosis in any of the cases. Adhoc facial artery perforator's constant presence was confirmed in all the cases. Secondary raw areas in all the cases were closed primarily in layers. The resultant scar was aesthetically acceptable and was along the nasolabial fold. None of them developed into hypertrophic scar or keloids. All patients had good amelioration of symptoms like burning and decreased salivation and none had recurrence of difficulty in mouth opening.

S. No	Age	Sex	Addictive Habit	Duration of Submucosa l Fibrosis	Coronoidectomy	Dimension of the Adhoc artery perforator (CM)		Amount of mouth opening(mm)			complication
						Length	Breadth	Pre-operative	Intra-operative	1yr follow up	
1	30	M	Betel nut	1 y	+	6.7	2.8	15	32	34	Nil
2	28	M	Pan chewer	3	+	6.4	2.5	18	40	40	Nil
3	32	F	Betel nut	2 y	-	5.9	2.3	12.5	28	27	Nil
4	40	M	Quid		+	6.3	3.2	16	35	38	Nil
5	50	M	Smoker	1 y	+	6.4	3.2	19.5	42	38	Hematoma
6	36	M	Gutka	6 mon	+	6.9	2.8	19	37	30	Nil
7	32	M	Pan chewer	9 mon	+	5.8	2.6	18	38	40	Nil
8	41	M	Snuff in vestibule	8mon	+	6.6	2.9	16	32	36	Nil
9	45	F	Betal nut	2y	+	5.5	2.2	19	39	41	Seroma

10	52	M	Quid	5 mon	+	7.3	3.5	14	41	42	Mild Infection healed well
11	38	F	Quid	6mon	+	5.9	3.4	11.5	37	35	Nil
12	39	M	Smoker	1y	+	6.7	3.1	16.5	36	34	Nil
Average	38.583							16.25	36.416	36.25	

DISCUSSION

Oral sub mucosal fibrosis is a chronic debilitating disease of the oral cavity causing progressive difficulty in opening the mouth leading to poor oral hygiene and a high probability of turning into oral malignancy. The treatment is a challenge as the disease has a multivariate pathogenesis. It is well established that that the surgery is the treatment of choice for severe category of OSMF. But this surgical intervention with cessation of inciting agent must stop the progression of disease with lasting effect. It should also ameliorate all the associated symptoms and prevents the occurrence of malignancy. But again this also depends on the patient's will to stay from the inciting substances. Hence, relief from symptoms and improved mouth opening is the objective of treatment of this disease. Treatment modalities have been broadly categorized as conservative and surgical. Conservative treatment includes local steroidal injections, hyaluronidase injections and physiotherapy with jaw exercises. All advanced cases require surgical intervention. The simplest of all surgical treatment is release of fibrosis and skin grafting. This carries the disadvantage of high chances of recurrence due to graft contracture. Also it has a relatively higher failure rate due to the less vascularity of the fibrotic bed.

Islanded Palatal flaps carry the disadvantage of the need for the removal of the second molar tooth for tensionless inset of the flap cover and the added morbidity of the palate itself being involved by the disease. Bilateral palatal flaps cause a very large secondary defect on the palatal bone. In other scenarios, these palatal flaps are unable to provide sufficient tissue for the covering the raw area created following the release of the fibrosis.

Bilateral tongue flaps usually have the disadvantage of limited donor site tissue along with the problems of dysarthria, severe dysphagia and the risk of post-operative aspiration. There is also a high probability of tongue flap dehiscence and the involvement of tongue by the disease process in 38% of the cases. Tongue flap is a staged procedure where flap division is done only in the second stage.

Buccal pad of fat as a treatment modality to cover the secondary defect, though a simple procedure with easy access, often becomes atrophic. Also it has a limited anterior reach and hence the anterior most part of the release is left to heal by secondary intention, which leads to contracture.

Bilateral radial forearm free flap requires microvascular expertise and carries a slightly higher risk of failure than pedicled flaps. These flaps are usually hairy and near 40% of them require a secondary debulking procedure (17).

Adhoc facial artery perforator flaps are ideal for older individuals where skin laxity provides a large flap to cover the intra oral raw area. But in younger individuals also it serves equally well with well-concealed scar as shown in our case 1. (Fig 3 to 11). And the secondary defect can be closed primarily. Well-camouflaged scar in the nasolabial fold and less propensity to become hypertrophic scar. The advantages include, its close proximity to the defect. It is technically easy to master. It is microvascular surgery minus microvascular anastomosis. It is single stage procedure. Adhoc facial artery perforator flaps are thin and pliable with no need for any thinning or any secondary procedures. They have robust blood supply and provides good prospectus of wound healing without dehiscence even in the scar bed. Even the mucosalisation of the skin, which happens over 6 months to 1 year, prevents hair growth in male patients. It has anatomically constant perforators in the "facial artery perforator triangle" where we have defined. None of our

patients on average of one-year follow-up had recurrence and had no chewing or swallowing difficulty and all had satisfactory scar on the face. All patients had group therapy, psychologists counseling and close monitoring on their abstinence from inciting substances during follow-up. All the cases treated in this series have shown adequate mouth opening in the one-year follow-up. Compared to other studies^[13,14,15,16], in our study we found severe cases have male preponderance. (M:F was 4:1). In this study males outnumbered the females. Male preponderance in south India is also shown by other studies^[13].

Mean age group in our study is 36±1.3. Severe OSMF is seen in relatively young individuals because of their increasing psychological dependency on the inciting substances like tobacco products and betel nut chewing.

None of the patients in our series required any secondary procedures like debulking, trimming of flap and so on.

Life table statistical analysis followed in the study. It has clear advantage over the skin grafting with p value of 0.05. Nevertheless where there exists no standardized protocol in the surgical management of oral sub mucosal fibrosis the adhoc facial artery perforator flaps are useful regional flaps for reconstruction following the excisional release of fibrous bands

CONCLUSION

Surgical release and correction of oral sub mucosal fibrosis has a better outcome than conservative modalities. In terms of recurrence, adhoc facial artery perforator flap cover provides a clear advantage over skin grafting. Adhoc perforator artery based flaps provide an ideal cover with very good functional outcome, no recurrence and acceptable aesthetic scar. All the flaps healed well without complications such as necrosis, dehiscence or infection. It is a versatile flap with a constant reliable vascularity. The ease of flap elevation, its proximity to the intra oral defect, adequacy of availability of flap in the required dimension, minimal swallowing and speech difficulties and the cosmetically acceptable donor site scar along the nasolabial fold makes it an excellent choice for the surgical treatment of Oral sub mucosal fibrosis.

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Nil

CONFLICT OF INTEREST

There are no conflicts of interest

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