Original Article

Evaluation of the non-endoscopic and endoscopic-assisted platysma flap – A randomized control trial

ABSTRACT

Background and Aim: As oral submucous fibrosis (OSMF) is a chronic progressive disorder, the treatment is based on the severity of the disease. Surgical treatment is the only choice for grade III and grade IV OSMF cases because the patient can neither clean his/her mouth nor properly chew. The resulting soft tissue defect requires resurfacing with various well-vascularized tissues such as extraoral flaps, intraoral flaps, microvascular flaps, and allografts that have been used. Reconstruction of the resultant defects proved to be challenging. Till date, none of the flaps has been proven to be effective and is universally accepted for the treatment of OSMF because of various drawbacks of the available techniques. This study was conducted to know whether an endoscopic-assisted platysma flap is associated with better outcomes in terms of ease of operation and postoperative function than the conventional approach.

Materials and Methods: This study included 40 patients of grade III and grade IV OSMF reporting to the outpatient department of oral and maxillofacial surgery in a tertiary center of North India. These patients were divided randomly into two groups. Group I and Group II had 20 patients each, undergoing endoscopic-assisted platysma flap and non–endoscopic-assisted platysma flap for reconstruction after resection of OSMF bands, respectively. Data were analyzed for the mouth opening, operating time, flap viability, congestion of neck and oral cavity, signs of inflammation, neurologic assessment, and measurement of the drain.

Results: The results showed significant increase in mouth opening from the preoperative value to the values immediately after surgery and at 24 h, 1 week, 15 days, 1 month, 3 months, and 6 months after surgery in both the study groups. Reduced bleeding incidence was found in group I compared to group II, with better postoperative outcomes noted during follow-up. But the mean intraoperative time of the subjects in group I was 130.80 ± 5.5.908 min and in group II was 105.74 ± 2. 491 min. Increased time taken in group I may be due to the long learning curve.

Conclusion: The present study concluded that the Endoscope-assisted technique has a key role during supra and subplatysmal dissection to allow for better accessibility, handling, and visibility of the flap and its orientation in relation to the underlying structures to avoid postoperative complications and to overcome the drawback of platysma myocutaneous flap in reconstruction of OSMF defects.

Keywords: Endoscope, oral submucous fibrosis, platysma myocutaneous flap, reconstruction, surgical technique

INTRODUCTION

Oral submucous fibrosis (OSMF) is defined as "an insidious, chronic mucosal condition affecting any part of the oral cavity and sometimes pharynx, associated with fibroelastic transformation of juxta epithelial connective tissue layer and epithelial atrophy leading to progressive stiffness of the oral mucosa causing trismus and inability to eat".[1] The prevalence varies from 0.20% to 0.55% in India, with a higher percentage being found in the southern part of the country.[2] It is also having a malignant transformation potential of 7%–13%.[3]

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Various medical and surgical options are under consideration for the management of OSMF. Unfortunately, no guideline or ideal option is available for the treatment of OSMF in grade 3 and 4 cases. Surgical treatment is the only choice for grade 3 and grade 4 OSMF cases because the patient can neither clean his/her mouth nor properly chew. Options for the reconstruction of oral defects created by the surgical operation of OSMF include local flaps like the buccal fat pad, tongue flap, nasolabial flap, and platysma myocutaneous flap. Free flaps like thigh flaps, radial forearm flaps, and skin grafts were also mentioned in the literature.

Platysma flap is a good flap for the reconstruction of defects created by the resection of bands in OSMF because of its thickness and nonhairy and pliable skin. Reconstruction with the platysma flap is a technique-sensitive, high-learning curve surgical procedure, its results are very good regarding esthetics, function, overall quality of life, and it is also economical.

The elevation of the flap through a single incision is a difficult job in terms of accessibility and visibility. So, we introduced the endoscope [Figure 1] in the elevation of the flap for ease of operation and better outcome and evaluated it.

MATERIALS AND METHODS

This study included 40 patients of grade III and grade IV (Khanna JN and Andrade NN, 1995)[3] [Figures 2 and 3] OSMF reporting to the outpatient department of oral and maxillofacial surgery in a tertiary center of North India. The patients were enrolled in clinical trials, irrespective of sex, cast, and creed. These patients were divided randomly (computer-generated randomization) into two groups. Group I consisted of 20 patients undergoing endoscopic-assisted platysma flap for reconstruction after resection of OSMF bands. The endoscope used in this study had the following specifications: overall dimensions 165 × 63 × 35 mm, display 2.5" full-color TFT-LCD, resolution 307,200 pixels, focus type auto, focus range 5–35 mm, and light source high-luminance white light-emitting diode (LED). No other modification was needed in any other instrument. This study was conducted after obtaining approval from Institutional Ethics committee with Ref No.X-PGTSC-IIA/P2 dated – 27/12/2022.

Group II consisted of 20 patients undergoing non–endoscopic-assisted platysma flap for reconstruction after resection of OSMF bands. Data were analyzed for the time taken, viability, neck and oral cavity congestion, signs of inflammation, neurologic assessment, and drain measurement.

Inclusion criterion was patients with grade III and grade IV OSMF who were willing to participate in the study. Exclusion criteria were patients of age >60 years and patients with previous neck incisions/previous radiotherapy/generalized fibromatosis/oral manifestation of scleroderma/chronic debilitating conditions such as uncontrolled diabetes mellitus (DM), Hypertension, etc.

Assessment criteria for clinical evaluation were intraoperative time taken (time starting from incision to the time taken for the flap to reach the oral cavity checked using a stopwatch), viability (pin prick test- bleeding yes/no), congestion of neck and oral cavity, pain (Visual Analog Scale), measurement of drain, and improvement in interincisal mouth opening. Patients were evaluated on the day of operation and on the third day, 1 week, 15 days, 1 month, 3 months, and 6 months after the operation.

Figure 1: Sync Vision i01 OTO endoscope

Figure 2: Clinical Photograph showing Preoperative mouth opening (in non-endoscopic assisted patient)

Surgical procedure: Fibrotomy of the buccal mucosa bands along with extraction of the third molar teeth was done. Adequate mouth opening was achieved using Heister [Figures 4 and 5]. Surgical defect size was measured.

A single neck incision [Figure 6] was made after the estimation of length and width at the base of the flap, so that the dimension of the platysma flap matched the surgical defect size. The skin incision was made, and the superficial fascia was visualized in the form of fat after the skin incision. It was incised and retracted superiorly, and the supraplatysmal flap [Figure 7] was developed up to the inferior border of the mandible. The skin paddle was sutured with the underlying muscle to prevent shearing of the perforators.

Below the marked pedicle [Figures 8 and 9], the platysma muscle was incised 1–2 cm away from the paddle and subplatysmal dissection was continued, taking care not to breach the investing layer of the deep cervical fascia [Figure 10]. Platysma muscle flap was developed up to the inferior border of the mandible.

In endoscopic-assisted technique, a flexible fiberoptic endoscope [Figure 11] was inserted into the tunnel created for better visualization of the underlying structure (external jugular vein, a cervical branch of the facial nerve) and medial aspect of the platysma, meticulously taking care to preserve the submental branches of the facial artery and the marginal mandibular nerve.

The flap was transported into the oral defect with the help of artery forceps by creating a soft tissue tunnel visualized through the surgical endoscope. The harvested flap was sutured [Figures 12 and 13] to the surgical defect, which was created by the release of fibrous bands. The donor site was closed primarily, and a suction drain was placed in the neck.

OBSERVATION AND RESULTS

Intraoperative time taken [Table 1] was found to be significantly more in group I subjects compared to group II subjects. The mean intraoperative time of the subjects in group I was 130.80 ± 5.5.908 min and in group II was 105.74 ± 2. 491 min. Increased time taken in group I may be due to a long learning curve.

Interincisal mouth opening between the two study groups: The mean intraoperative mouth opening [Table 2] of the subjects in group I was 42.95 ± 1.701 mm and in group II was 43.65 ± 1.089 mm. This result is similar to the intraoperative interincisal mouth opening of 34 mm (17–37 mm) in the study

Figure 3: Clinical Photograph showing Preoperative mouth opening (in endoscopic assisted)

Figure 4: Clinical Photograph showing Intra-operative mouth opening(in non-endoscopic assisted patient)

Figure 5: Clinical Photograph showing Intra-operative mouth opening (in endoscopic assisted)

without bilateral coronoidectomy/coronoidotomy by Bande *et al*. (2012)[4] and Bande *et al*. (2017).[5] Mean mouth opening between the two groups was compared immediately after surgery and at 24 h, 1 week, 15 days, 1 month, 3 months, and

6 months after surgery. In group I subjects, the preoperative mean mouth opening was 9.000 ± 4.37577 mm. Immediately after surgery, it was 34.30 ± 2.536 mm, which got gradually improved to 37.10 ± 4.424 mm during the sixth-month follow-up. In group II subjects, the mean preoperative mouth opening was 7.8500 ± 5.38297 mm. Immediately after surgery, it was 34.70 ± 1.750 mm, which got gradually improved to 38.55 ± 2.438 mm at the sixth-month follow-up [Figures 14 and 15]. In studies by Bande *et al.*,[5] Rajkumar K *et al.*,[6] and Shetty *et al.*,[7] the mean mouth opening was 41, 42, and 31 mm, respectively. This slight dissimilarity in result may be due to differences in subjects' OSMF grade, bilateral coronoidectomy/coronoidotomy after the release of fibrous bands.

There was a significant increase in mouth opening from the preoperative value to the value immediately after surgery and at 24 h, 1 week, 15 days, 1 month, 3 months, and 6 months after surgery in both the study groups.

In group II [Table 3], out of 20 patients, three subjects had their flap torn during dissection, but none of the flaps were torn in group I subjects. No significant difference was seen in flap tearing between the two study groups. Meticulous handling of the flap is crucial in its survival. Dissection limited to holy planes leads to proper flap elevation and seldom the flap tears. Flap tear can be more in case of individuals with very thin platysma flap, improper patient position, failure to appreciate the muscle fiber orientation, and muscular atrophy. Endoscope-assisted technique

Table 1: Intergroup comparison of intra-op time taken

		n	Mean	Std deviation	Std error mean
Intraoperative time	Group I endoscopic	20	130.80	5.908	1.321
	Group II Non-endoscopic	20	105.74	2.491	0.571
P					0.001*

*The statistical value is significant i.e, *P* value less than 0.005

Table 2: Intergroup comparison of intraoperative mouth opening

		n	Mean	Std deviation	Std error mean
Intraop mouth opening	Group I endoscopic	20	42.95	1.701	0.380
	Group II non-endoscopic	20	43.65	1.089	0.244
P					0.1289 ns

Table 3: Group-wise distribution of study subjects based on the status of tearing flap

			Tearing of flap		Total
			No	Yes	
Group	Group I endoscopic	*n*	20	0	20
		%	100.0%	0.0%	100.0%
	Group II non-endoscopic	*n*	17	3	20
		%	85.0%	15.0%	100.0%
Total		*n*	37	3	40
		%	92.5%	7.5%	100.0%
P					0.115, ns

Figure 6: Clinical Photograph showing Isolation of skin paddle

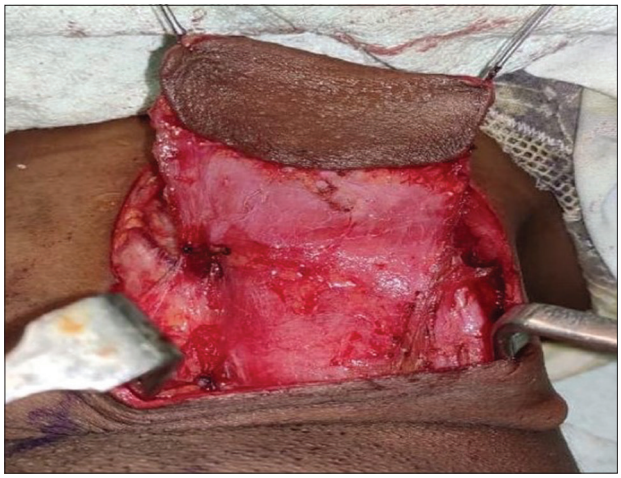

Figure 7: Clinical Photograph showing Harvesting of platysma flap (in non-endoscopic assisted patient)

Figure 8: Clinical Photograph showing Markings showing Platysma muscle, sternocleidomastoid muscle, lower border of the mandible, and skin paddle(in endoscopic assisted patient)

Figure 9: Clinical Photograph showing Markings showing Platysma muscle, sternocleidomastoid muscle, lower border of the mandible, and skin paddle(in endoscopic assisted patient)

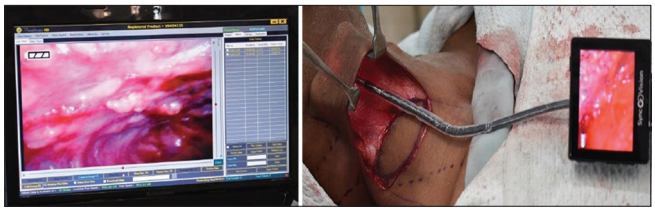

Figure 11: Clinical Photograph showing Positioning of endoscope & visualization of the tunnel on monitor during intra-operative tunnel making(in endoscopic assisted)

has a key role during subplatysmal dissection to allow for better visualization of the flap and its orientation in relation to the underlying structures, thus reducing the chances of flap tear.

A significant difference [Table 4] was found in the distribution of bleeding status between the two study groups. In group I, none of the study subjects were found to have moderate bleeding. All group I patients had only mild bleeding. In group II patients, moderate bleeding was seen in 30% of the study subjects and 70% had mild bleeding. Reduced bleeding incidence in group I can be due to better accessibility, visibility, and appreciation of the vital structures in the subplatysmal and tunnel area, alerting the surgeon regarding any vessel injury and nerve injury.

Among both, the study groups [Table 5] Extraction of malposed/impacted third molar teeth was done in all the study subjects in both the groups to avoid related trismus. Extraction of the third molar was done in all cases in the studies by Bande *et al*. (2012)[4] and Bande *et al*. (2017).[5] Sachin Rai *et al*. (2017)[8] observed significant subjective improvement in all the patients after a month of removal of third molars in case of early stages of OSMF. They hypothesized that "Third molars are often impacted, carious or periodontally involved and develop pericoronal inflammation due to accumulated plaque. This aggravates the inflammatory process and the subsequent fibrosis in the retromolar region and the adjacent

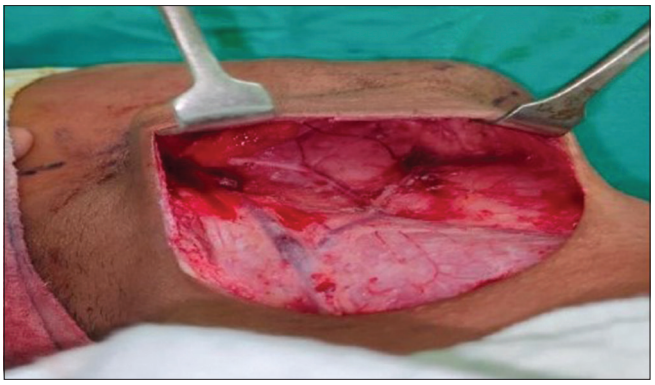

Figure 10: Clinical Photograph Showing subplatysmal plane after flap harvesting

Figure 12: Clinical Photograph showing Insetting of platysma flap (in non-endoscopic assisted patient)

buccal mucosa that are also the most affected in OSMF." So, they concluded that third molar extraction helps in reducing inflammation and fibrosis in the retromolar region, thus easing mouth opening.

No significant difference [Table 6] was found in the status of damage to any vein between the two study groups. Out of 20 patients in group II, three subjects were found to have damage to the vein, but none of the patients in group I had venous damage, hinting the potential advantage of endoscope in identification of and preserving the vital structures.

No significant difference [Table 7] was found in the viability of the flap in the prick test between the study groups. The submental artery was the primary vessel to the platysma muscle. The superior thyroid artery, occipital artery, and posterior auricular artery were identified as secondary vessels. The external jugular vein provided the primary venous drainage, followed by the submental vein. When the pedicle is strangled, twisted, and excessively stretched, the flap's artery supply is impaired, resulting in flap necrosis, either partial (limiting to tip) or complete. The pinprick test

Table 4: Group-wise distribution of study subjects based on the status of bleeding

			Bleeding		Total
			Mild	Moderate	
Group	Group I endoscopic	*n*	20	0	20
		%	100.0%	0.0%	100.0%
	Group II non-endoscopic	*n*	14	6	20
		%	70.0%	30.0%	100.0%
Total		*n*	34	6	40
		%	85.0%	15.0%	100.0%
P					0.010*

*The statistical value is significant i.e, *P* value less than 0.005

Table 5: Group-wise distribution of study subjects based on the status of extraction of teeth

			Extraction of teeth Yes	Total
Group	Group I endoscopic	*n*	20	20
		%	100.0%	100.0%
	Group II non-endoscopic	*n*	20	20
		%	100.0%	100.0%
Total		*n*	40	40
		%	100.0%	100.0%

Table 6: Group-wise distribution of study subjects based on the status of damage to any vein

			Damage to any vein		Total
			No	Yes	
Group	Group I endoscopic	*n*	20	0	20
		%	100.0%	0.0%	100.0%
	Group II non-endoscopic	*n*	17	3	20
		%	85.0%	15.0%	100.0%
Total		*n*	37	3	40
		%	92.5%	7.5%	100.0%
P					0.115, ns

Table 7: Group-wise distribution of study subjects based on the status of tearing flap

			Viability of flap in prick test		Total
			No	Yes	
Group	Group I endoscopic	*n*	2	18	20
		%	10.0%	90.0%	100.0%
	Group II non-endoscopic	*n*	5	15	20
		%	25.0%	75.0%	100.0%
Total		*n*	7	33	40
		%	17.5%	82.5%	100.0%
P					0.204, ns

Figure 13: Clinical Photograph showing Insetting of platysma flap (in endoscopic assisted patient)

Figure 14: Clinical Photograph showing Post-operative Mouth opening after 6 month(in non-endoscopic assisted patient)

Figure 15: Clinical Photograph showing Post-operative Mouth opening after 6 month (in endoscopic assisted patient)

can be a first-line bedside technique to check the viability of the flap. In group I, the pinprick test was negative in two subjects (10%) out of 20 patients, which is suggestive of flap nonviability. In group II, the prick test was negative in five subjects (25%) out of 20 samples during the follow-up. This result is similar to the results of the study by Bande *et al.*[4] It is also supported by the studies of Bande *et al*., (2017),[5] S. Ramanujam *et al*. (2015),[9] Jacek Szudek *et al.* (2007),[10] Uma Shankar Pal *et al*. (2022).[11]

On comparative evaluation of venous congestion, there was no significant difference [Table 8] seen between the two groups. Venous congestion was seen in two (10%) of the study subjects in group I and five (25%) of the study subjects in group II. The main complication of the platysma flap is venous congestion. The venous drainage of the platysma muscle is through the external jugular and submental veins.[12] Utmost care should, therefore, be taken to preserve these vessels. Venous congestion can also be due to kinking of veins near the pedicle area and postoperative edema compromising the venous outflow. So, adequate tunnel width is a key factor in preventing flap compression and venous congestion. Minimal tissue traction lessens the postoperative edema. The surgical endoscope helps in proper visualization of the tunnel in both supraplatysmal as well as plane (but it requires a certain learning curve). So, it reduces the accidental damage to veins and nerves and intraoperative bleeding and, therefore, reduces the intraoperative time.

This result of our study is similar to venous congestion in study by S. Ramanujam *et al*. (2015)[9] and R. Puxeddu *et al*. (2007).[13]

In the follow-up, at 24 h, the pain score (Visual Analog Scale) [Figure 16] was found to be significantly more in group II subjects; but on the seventh day, 15th day, and at 1 month, 3 months, and 6 months, no significant differences were seen in the pain scores of study subjects of the two groups. The logic behind excess pain in group II may be excess stretch and more use of cautery. In group I, the mean pain score was 33.50 ± 7.452 at 24 h, 11.00 ± 3.078 on the seventh day, and from the 15th day onward, the scores declined to zero. In group II, the mean pain score was 42.50 ± 15.853 at 24 h, 17.00 ± 14.546 on the seventh day, 6.50 ± 16.944 on the 15th day, and 3.50 ± 10.894 at 1 month; after this, it declined to zero.

Pain scores significantly decreased from 24 h to the seventh day, 15th day, 1 month, 3 months, and 6 months in both the study groups at all study intervals.

Table 8: Group-wise distribution of study subjects based on venous congestion

			Venous congestion		Total
			Absent	Present	
Group	Group I endoscopic	*n*	18	2	20
		%	90.0%	10.0%	100.0%
	Group II non-endoscopic	*n*	15	5	20
		%	75.0%	25.0%	100.0%
Total		*n*	33	7	40
		%	82.5%	17.5%	100.0%
P					0.204, ns

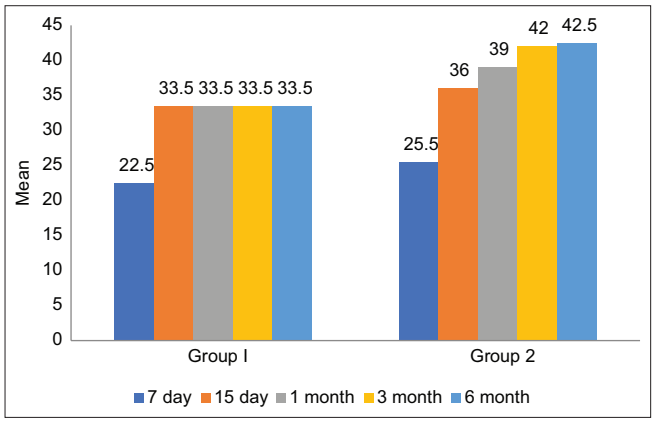

Figure 16: Inter group Comparison of pain score at different time intervals

CONCLUSION

Platysma myocutaneous flap is a sound reconstructive option in case of grade 3 and/or 4 OSMF, in terms of ease of flap harvest, optimal postoperative esthetics, and mouth opening and having similarity with the oral mucosa regarding its flexibility, thickness, and Non hairy skin. In the case of a platysma myocutaneous flap, the surgical endoscope can take up the key role during supraplatysmal and subplatysmal flap elevation with a learning curve.

According to this study, incorporation of a surgical endoscope has the following advantages:

1. Endoscope increases the intraoperative accessibility and visibility of vital structures.
2. Endoscopes can be useful for demonstration purposes and to improve surgical skills among learners.

Declaration of patient consent

The authors declare that they have obtained consent from patients. Patients have given their consent for their images and other clinical information to be reported in the journal. Patients understand that their names 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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