BULLETIN OF STOMATOLOGY AND MAXILLOFACIAL SURGERY
Volume 21, Issue 4

DOI: 10.58240/1829006X-2025.21.4-294

CLINICAL RESEARCH

COMPARING BUCCAL FAT PAD AND NASOLABIAL FLAP APPROACHES FOR ORAL SUBMUCOUS FIBROSIS RECONSTRUCTION

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Received: *Apr 5, 2025;* ***Accepted:*** *Apr.May25, 2025;* ***Published:*** *May.30,2025*

ABSTRACT

Objective: This study evaluated and compared the effectiveness of the buccal fat pad and nasolabial flap techniques in surgically treating oral submucous fibrosis, with emphasis on improvements in mouth opening and oral commissure width after surgery.

Materials and Methods: Twenty patients with clinically confirmed oral submucous fibrosis and a mouth opening less than 20 mm were included. They were divided equally into two groups: Group 1 (10 patients) received treatment with a nasolabial flap, while Group 2 (10 patients) was managed using the buccal fat pad. Measurements of incisal mouth opening and oral commissural width were taken before and after surgery. Data analysis was conducted using paired and unpaired t-tests, considering p-values ≤ 0.05 as statistically significant.

Results: Both surgical interventions resulted in significant postoperative increases in mouth opening and commissural width. Notably, patients in the buccal fat pad group exhibited a more pronounced improvement in these parameters at the 6-month postoperative mark compared to those treated with the nasolabial flap.

Conclusion: The nasolabial flap and buccal fat pad both serve as viable surgical methods for managing oral submucous fibrosis. The buccal fat pad demonstrated superior functional outcomes in terms of mouth opening and commissural width, although nasolabial flaps remain an effective treatment alternative.

Keywords: Buccal fat pad, commissural width, mouth opening, nasolabial flap, Oral submucous fibrosis

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INTRODUCTION

Oral submucous fibrosis (OSMF) is a well-recognized condition that has been described since the time of Sushruta as *Vidari*[1]. In modern medical literature, the condition was first described by Schwartz in 1952 as *atrophic idiopathica mucosa oris* [2]. The term "oral submucous fibrosis" was introduced by Pindborg and Sirsat in 1966 and remains in use today.

They defined OSMF as “an insidious, chronic disease that affects any part of the oral cavity and sometimes the pharynx. Although occasionally preceded by or associated with the formation of vesicles, it is always linked to a juxtaepithelial inflammatory reaction followed by fibroelastic change of the lamina propria

and epithelial atrophy, leading to stiffness of the oral mucosa and causing trismus and an inability to eat" [3].

As the disease progresses, it results in difficulty with mastication, phonation, and swallowing. OSMF is most prevalent in the Indian subcontinent, with reported prevalence rates in Southeast Asia ranging from 0.04% to 24.4% [4]. It is classified as a premalignant condition with a notable malignant transformation risk ranging from 1.9% to 7.6% [5].

Research indicates that the etiology of OSMF is multifactorial and complex. Systemic factors such as vitamin B12 deficiency, iron deficiency, zinc deficiency, and anemia contribute alongside local irritants like chilies, chewable tobacco, areca nut, and pan [6]. The earliest clinical symptom is a persistent burning sensation in the buccal mucosa, especially when consuming spicy foods. Clinically, OSMF is divided into three stages: stomatitis, fibrosis, and sequelae. The stomatitis stage is characterized by erythematous areas and vesicles on the buccal mucosa, which rupture and heal with fibrosis. This fibrosis subsequently leads to trismus[7].

Treatment for OSMF has traditionally focused on palliation, primarily aimed at improving mouth opening and alleviating symptoms. Conservative medical treatments are generally ineffective in advanced stages, where surgical intervention becomes necessary. Severe trismus poses a significant surgical challenge. Surgical approaches have evolved, centering on the release of fibrotic bands followed by reconstruction of the resulting defects. Various grafts and flaps have been used for reconstruction, including island palatal mucoperiosteal flaps [8], bilateral tongue flaps [9], split-thickness skin grafts [10], radial forearm free flaps [11,12], buccal fat pad grafts [13], and nasolabial flaps.

The present study aims to compare the efficacy of Buccal Fat Pad (BFP) and Nasolabial Flap (NLF) techniques in the surgical management of oral submucous fibrosis. The primary objectives are to evaluate postoperative mouth opening and oral commissural width following these procedures. The null hypothesis assumes no significant difference exists between the two surgical techniques.

MATERIALS AND METHODS

Study Design, Setting, and Duration: This research was conducted as a randomized, prospective, interventional study featuring a parallel group design with a balanced allocation ratio of 1:1.

Sample Size:

Using G*Power software, with an effect size of 0.80, alpha level set at 0.05, and statistical power of 80%, a total sample size of 20 patients was calculated, with 10 participants allocated to each group.

Eligibility Criteria:

Patients included were those clinically diagnosed with oral submucous fibrosis exhibiting an interincisal mouth opening of less than 20 mm and motivated to discontinue harmful habits. Exclusion criteria encompassed patients with systemic illnesses contraindicating general anesthesia, medically compromised individuals, those unwilling to provide informed consent, and patients presenting with other clinical or radiological causes of trismus.

Procedure:

Patients presenting with complaints of restricted mouth opening, burning sensations, intolerance to spicy foods, or a combination thereof were screened clinically and histopathologically for OSMF. Data collection was standardized using a pre-designed proforma. Informed consent was obtained from all participants. Photographic documentation was performed at baseline. Participants were randomized into two groups via a lottery system: Group 1 underwent surgical management using the nasolabial island flap, while Group 2 was treated with the buccal fat pad graft. Routine hematological investigations and histopathological assessments were conducted preoperatively. All surgeries were performed under general anesthesia via fiberoptic nasotracheal intubation by a single experienced surgeon.

Surgical Technique:

After infiltration of local anesthesia with 1:200,000 epinephrine along the planned incision lines, bilateral intraoral incisions were made at the buccal mucosa level using a number 15 blade and electrocautery, avoiding the Stenson's duct orifice. The incision extended from the oral commissure anteriorly to the anterior pillar of the fauces, soft palate, or pterygomandibular raphe posteriorly, depending on the extent of fibrosis assessed by palpation. Blunt dissection and undermining were performed until fibrous restrictions were completely released.

Nasolabial Flap Reconstruction (Group 1): Following excision of fibrous bands and achievement of adequate mouth opening, third molars were extracted. An elliptical nasolabial flap was designed extending from the nasolabial fold tip to the mandibular border, marked with methylene blue. Flap width ranged between 1.5 and 2 cm, tapering at the ends. The flap was elevated in the plane of the superficial musculoaponeurotic system with preservation of a 1.5-2 cm pedicle near the oral commissure. A transbuccal tunnel was created near the modiolus, and the flap was transposed intraorally without tension. The flap edges were sutured to the defect margins using 3-0 vicryl

sutures. Donor site closure involved subcutaneous undermining and layered closure with 3-0 vicryl and 4-0 ethilon sutures (Figure 1).

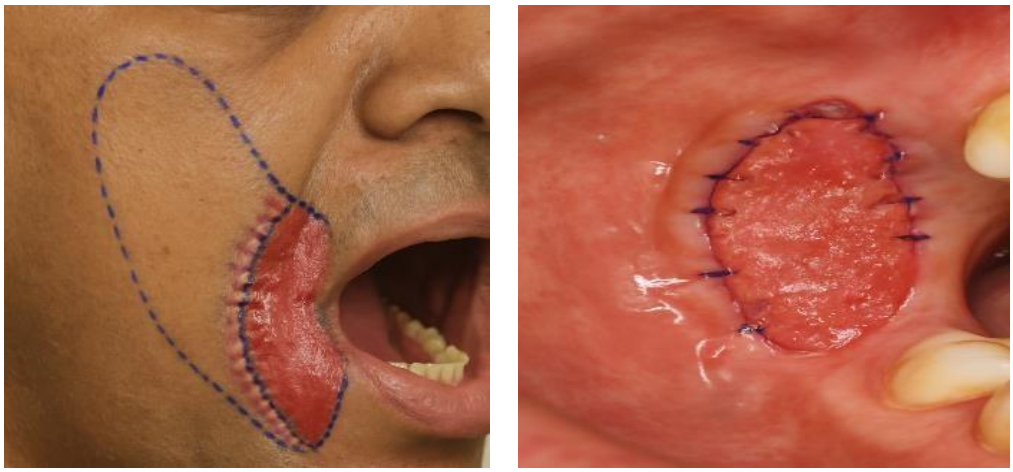

Figure 1. Nasolabial Flap Reconstruction and Clinical Image Showing Nasolabial Flap Coverage of Buccal Mucosal Defect Post-Surgery

Buccal Fat Pad Graft Reconstruction (Group 2)

After fibrous band release and adequate mouth opening, the buccal fat pad was accessed through the posterosuperior margin of the defect. The fat pad was gently teased out via blunt dissection to cover the defect without tension and secured with interrupted and mattress 3-0 vicryl sutures (Figure 2).

Figure 2. Buccal Fat Pad Graft Reconstruction

Postoperative Care and Follow-up

Patients were followed up on postoperative days 7, 15, 30, and 90. Prophylactic antibiotics were administered routinely. Extraoral sutures in Group 1 were removed between days 7 and 10 post-surgery. After the tenth day, patients in both groups commenced rigorous physiotherapy using a Heister's mouth gag, gradually increasing duration and frequency to restore intraoperative mouth opening. Patients were instructed and motivated to continue physiotherapy independently for six months. Interincisal mouth opening was measured using a ruler in millimeters at each follow-up visit.

Statistical Analysis

Data were coded and entered into Microsoft Excel, then analyzed using IBM SPSS Statistics Version 20. Descriptive statistics (means, standard deviations, percentages) were computed. Inter-group comparisons were performed using the unpaired t-test, while intra-group comparisons employed the paired t-test. Statistical significance was set at $p \leq 0.05$.

RESULTS

In groups 1 and 2, mouth opening and commissural width were significantly improved (P <0 .05) compared to the preoperative value as analyzed by paired t-test (Table 1 and Table 2) (Figure 1 and Figure 2).

Inter-group comparison showed that incisal mouth opening and inter-commissural width improved to a greater extent in the nasolabial flap than buccal fat pad and was statistically significant (P <0 .05) (Tables 3 and 4)(Figure 3 and 4).

Table 1. Intra-Group Comparison of Nasolabial Flap

		Mean	Std Deviation	Mean difference	P value
Incisal mouth opening	Pre	10.10	4.012	22.9	0.001(S)
	Post	33.00	3.800		
Commissural width	Pre	42.10	2.906	7.4	0.001(S)
	Post	49.50	4.60072		

S – Statistically significant

Table 2. Intra-Group Comparison of Buccal Fat Pad

		Mean	Std Deviation	Mean difference	P value
Incisal mouth opening	Pre	11.90	1.792	15.7	0.001(S)
	Post	27.60	3.921		
Commissural width	Pre	43.30	3.59166	1.1	0.001(S)
	Post	44.40	3.53396		

S – Statistically significant

Table 3. Inter Group Comparison of Incisal mouth opening

		Mean	Std Deviation	Mean difference	P value
Pre	Group 1	10.10	4.012	1.8	0.21
	Group 2	11.90	1.792		
Post	Group 1	33.00	3.800	5.4	0.006(S)
	Group 2	27.60	3.921		

S – Statistically significant

Table 4. Inter Group Comparison of Commissural Width

		Mean	Std Deviation	Mean difference	P value
Pre	Group 1	42.100	3.63	1.2	0.46
	Group 2	43.300	3.59		
Post	Group 1	49.500	4.60	5.1	0.01(S)
	Group 2	44.400	3.23		

S – Statistically significant

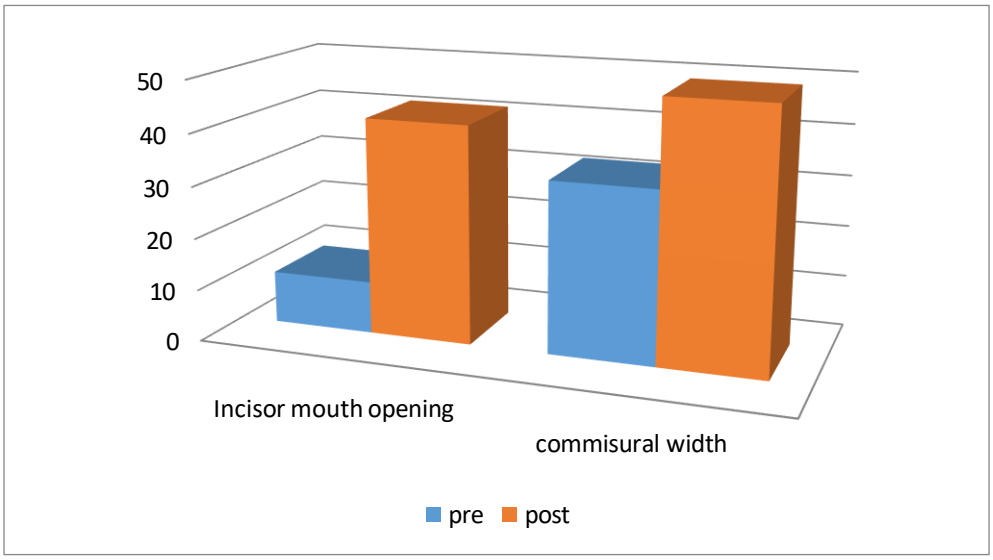

Figure 1. Intra-Group Comparison of Nasolabial Flap

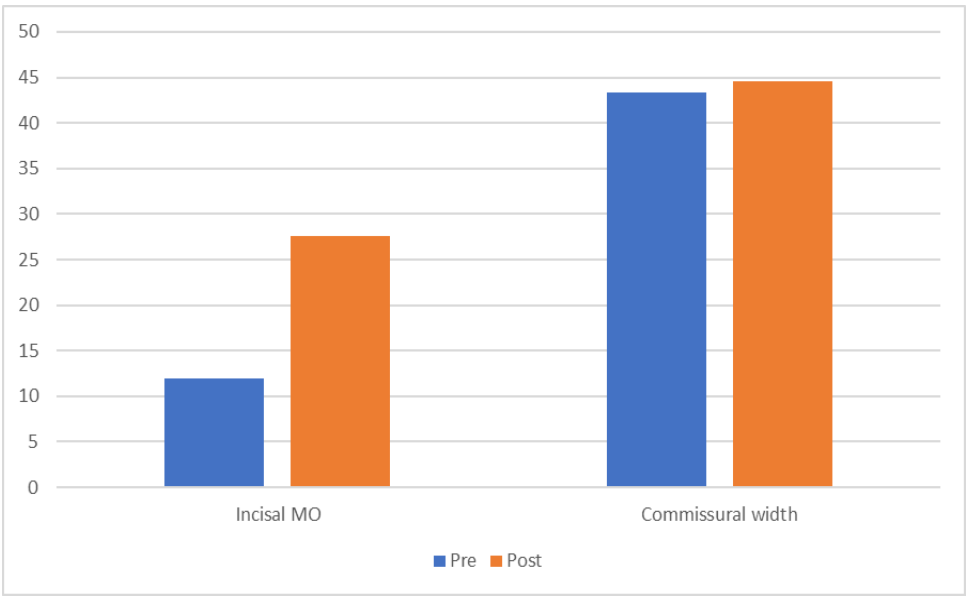

Figure 2. Intra Group Comparison of Buccal Fat Pad

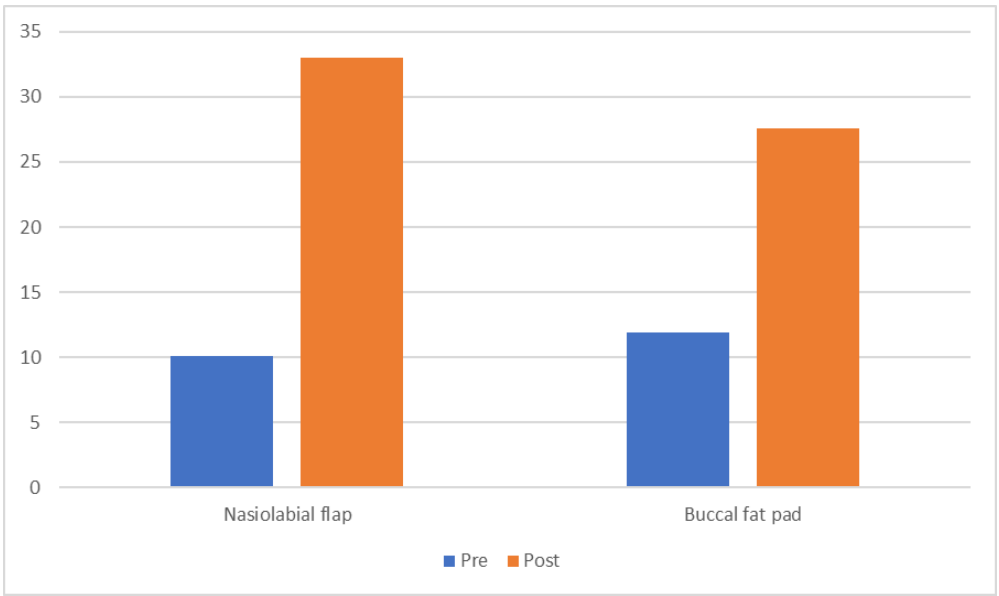

Figure 3. Inter group comparison of incisal mouth opening

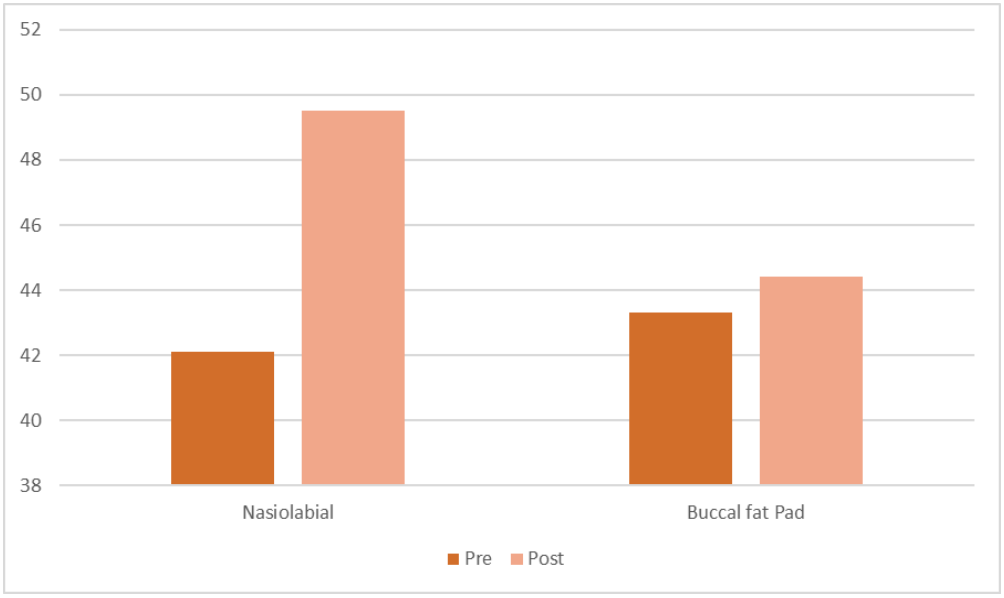

Figure 4. Inter-Group Comparison of Commissural Width

DISCUSSION

Oral submucous fibrosis (OSMF) is a chronic, progressive, scarring disorder recognized as a precancerous condition, primarily linked to the habitual chewing of betel quid[15]. The management of OSMF encompasses various therapeutic strategies including habit cessation, pharmacological treatments, surgical intervention, and oral physiotherapy. Conservative treatments such as intralesional injections of hyaluronidase, placental extracts, chymotrypsin, interferon-gamma, curcumin, pentoxifylline, and antioxidants like lycopene are typically effective for patients with early-stage (grades 1 and 2) OSMF. However, patients with advanced disease (grades 3 and 4), characterized by mouth opening less than 25 mm, often require surgical correction [16].

Surgical management involves excision of fibrotic bands under general anesthesia, followed by defect reconstruction using various flap techniques. The nasolabial flap (NLF) and buccal fat pad (BFP) flap are among the most commonly employed reconstructive options. The nasolabial flap is favored for anterior oral and maxillofacial defect reconstruction due to its robust vascular supply via extensive anastomoses. Despite its advantages, the NLF carries potential complications including intraoral hair growth, visible extraoral scarring, orocutaneous fistula formation, hematoma, infection, and hypertrophic scarring, especially when donor site closure is performed under tension [16].

Pravin Lambade et al. 2016 [17] conducted a prospective two-year study involving 20 OSMF patients with mouth openings less than 16 mm who underwent fibrotomy defect reconstruction using NLF. Intraoperative mouth openings ranged from 32 to 44 mm, and postoperative follow-up revealed mouth openings between 20 and 44 mm after two years. Early postoperative complications included prominent intraoral hair growth and visible extraoral scars. Similarly, Qayyum MU et al. 2018[18] reported on the use of nasolabial and extended nasolabial flaps for oral defect reconstruction in OSMF, noting preoperative mouth openings from 5 to 16 mm that increased to 29 to 39 mm at six months postoperatively. Some complications such as poor scarring and flap trauma from wisdom teeth were observed but managed effectively.

The buccal fat pad graft has gained popularity for reconstructing small to medium intraoral defects involving the palate, gingival sulcus, alveolus, and buccal mucosa. It is a straightforward, reliable, and convenient graft that requires no secondary surgical site, offers excellent vascularity, and is resistant to infection, with minimal associated disadvantages [16]. Saravanan et al.2012[19] reported on eight OSMF cases treated with BFP grafts. Patients presented with preoperative mouth openings ranging from 3 to 18 mm, underwent coronoidectomy, and achieved intraoperative openings of 25 to 38 mm. Postoperative mouth openings ranged from 25 to 36 mm. The grafts healed uneventfully and epithelialized within 3–4 weeks. The authors concluded that the BFP is a suitable interpositional graft due to its anatomic position, rich blood supply, and ease of harvest and mobilization.

Our current comparative analysis rejects the null

hypothesis, indicating a significant difference between NLF and BFP in surgical defect closure for OSMF. At three months postoperatively, Group 1 (NLF) showed an average mouth opening increase of 1.8 mm, whereas Group 2 (BFP) showed an increase of 5.4 mm ($p < 0.05$). Similarly, postoperative commissural width increased by 1.2 mm in Group 1 and 5.1 mm in Group 2, both statistically significant ($p < 0.05$). Thus, for patients with OSMF, BFP demonstrated superior functional outcomes compared to NLF.

Several previous studies support our findings. Lathi et al.2022 [20] and Anehosur et al. 2020[21] observed comparable results; Lathi et al. reported a mean postoperative incisal opening increase of 22.9 mm and intercommissural width increase of 7.4 mm following NLF, whereas the BFP group had a mean mouth opening increase of 15.7 mm with negligible commissural width change. Their conclusion favored NLF as the superior interpositional material in stage IV OSMF cases for minimizing relapse, reserving BFP for stage III cases. Anehosur et al. found significant postoperative increases in interincisal mouth opening and commissural width favoring the NLF group compared to the BFP group.

Conversely, studies by Rai et al. 2013[22] and Sikkerimath et al. 2020[23] reported differing outcomes, with BFP yielding better results. Rai et al. documented mean postoperative mouth openings of 32 mm for NLF and 29 mm for BFP groups, with no significant differences in commissural widths. They noted higher complication rates with NLF, including partial flap necrosis, oral commissure widening, and temporomandibular joint subluxation. BFP avoided issues such as extraoral scarring and intraoral hair growth. Sikkerimath et al. reported postoperative mouth openings of 40 mm and 34.7 mm for BFP and NLF groups, respectively, concluding that BFP provided superior outcomes regarding mouth opening and complications.

A systematic review by Basu et al. [16] analyzed five studies involving 484 patients (BFP=224, NLF=260), reporting mean postoperative mouth openings of 29.8 mm for BFP and 31.9 mm for NLF over an average follow-up of 26.4 months. Another meta-analysis by Wadde KA et al.2024[24] reviewed data from 152 patients, finding that BFP achieved 1.41 times greater maximal interincisal opening and 0.25 times more improvement in commissural width than NLF, favoring BFP in OSMF treatment.

Agrawal et al.2018[25] and Pardeshi et al. [26] recommended BFP for mild trismus cases (mouth opening >15 mm) and NLF for severe trismus (<15 mm) due to the latter's bulk. Ambereen et al.2019[27] suggested combining both techniques, using BFP for posterior oral cavity reconstruction and NLF for anterior defects in OSMF.

CONCLUSION

The findings from this study, when compared with the existing literature, suggest that the nasolabial flap offers better results as an interpositional graft in enhancing both incisal mouth opening and commissural width. Nonetheless, more extensive research with larger sample sizes and longer follow-up durations is needed to more thoroughly evaluate surgical treatments for oral submucous fibrosis. Moreover, future investigations should also focus on additional factors such as wound healing, facial appearance, and postoperative complications to provide a more comprehensive assessment of these grafting methods.

DECLARATIONS

Funding
The work was not funded.

Ethical Approval
"Not applicable"

Consent for publication
"Not applicable"

Ethical approval
None

Competing interest
The authors declare that there are no competing interest.

Acknowledgements
Nil

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