Surgical Management of Aberrant Labial Frenum Using Modified Z-Frenuloplasty: A Case Report

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Frenum is a mucous membrane fold that attaches lips and cheek to the alveolar mucosa, gingiva, and the underlying periosteum. The maxillary frenum can contribute to esthetic problems and can compromise the orthodontic outcome in cases of midline diastema, thus leading to treatment relapse. In addition to this, it may jeopardize the health of the gingival, when it is attached too tightly to the gingival margin, by interference in the plaque control or owing to the muscle pull. These situations can be managed with the help of frenectomy. The presenting case report demonstrates the frenectomy of an anomalous labial frenum in a 20-year-old male using modified Z-frenuloplasty technique.

Keywords: Diastema, Frenectomy, Frenum, Z-plasty

INTRODUCTION

Esthetic concerns have led to an increased demand in seeking dental treatment for achieving perfect smile. Midline diastema in central incisors is one of the major esthetic problems encountered in adults. Since the presence of an aberrant frenum is one of the causative factor of the persistence of a midline diastema, it becomes essential to focus on the importance of frenum in terms of morphology and attachment.¹ The frenum is a mucous membrane fold that attaches the lip and the cheek to the alveolar mucosa, the gingiva, and the underlying periosteum.² Oral cavity exhibits most notably the maxillary labial frenum, the mandibular labial frenum, and the lingual frenum. Labial frenum attachments are thin folds of mucous membrane containing muscle fibers originating from orbicularis oris muscle of upper lip which provides attachment to the alveolar mucosa and underlying periosteum. Developmentally, the maxillary labial frenum is a post-eruptive remnant of the ectolabial band that connects the tubercle of the upper lip to the palatine papilla.³ Based on the extension of the attachment of fibers, they are classified as:³

Mucosal: When the frenal fibers are attached up to mucogingival junction.

Gingival: When fibers are inserted within attached gingiva.

Papillary: When fibers extend into interdental papilla.

Papilla penetrating: When fibers cross the alveolar process attach to palatine papilla.

The maxillary frenulum provides stability to the upper lip. It is composed of attachment of thin fibrous tissue connecting the upper lip to the gingival tissue between the central incisors. When the two central incisors erupt widely separated, no bone is deposited inferior to the frenum. This leads to a V-shaped bony cleft formation between the two central incisors and an aberrant frenum attachment. The mandibular frenum is considered anomalous when it is associated with a decreased vestibular depth and an inadequate attached gingival width. When there is a thick fibrous tissue attachment between the upper incisors, it results in the formation of hyperplastic frenum and is often associated with a midline diastema. It can lead to periodontal and speech problems. The abnormal frenal attachment can be detected visually by applying tension over the frenum to see the movement of the papillary tip or blanching of the associated area because of the resulting ischemia in the region.⁴ Unusually, wide frenum is characterized as pathogenic. Clinically, papillary and papilla penetrating frenal attachments are considered pathological and are associated with papillary loss, gingival recession, diastema...
formation, difficulty in brushing, misaligned teeth, and psychological disturbances.\textsuperscript{3}

Frenal attachments that encroach on the marginal gingival leads to distention of the gingival sulcus, favoring plaque accumulation, increasing the rate of progression of gingival recession and thereby leading to recurrence after treatment.\textsuperscript{5}

The management of an aberrant frenum can be accomplished by “frenectomy” or “frenotomy” procedures. The terms frenectomy and frenotomy signify operations that differ in degree of surgical approach.\textsuperscript{6}

Frenectomy is a complete removal of the frenum, including its attachment to the underlying bone whereas frenotomy involves relocation of the frenal attachment.\textsuperscript{7} According to Olivi \textit{et al.}, clinical indications for frenum removal are as follows:\textsuperscript{7}
1. Anomalous frenum associated with inflamed gingiva, resulting from poor oral hygiene
2. Anomalous frenum associated with gingival recession
3. Maxillary frenum associated with diastema after complete eruption of the permanent canines
4. Abnormal maxillary frenum (Class III or IV), resulting in the presence of a diastema during the mixed dentition
5. High frenal attachment resulting in gingival recession.

\textbf{Surgical Interventions Available}
Several surgical procedures have been employed to correct abnormal frenula. These include excision, Millers technique, V-Y plasty and Z-plasty.\textsuperscript{8} However, frenectomies commonly fail due to a high risk of reoccurrence and hypertrophic scarring. The likelihood of failure can be reduced by using a technique known as Z-frenuloplasty, which is a soft tissue surgery used to lengthen frenum and to improve the functional and cosmetic appearance of scars. It provides excellent outcomes in cases of hypertrophic thick frenula with a low insertion and a shallow sulcus. In this technique, the length of the frenum is incised with a scalpel and releasing incisions are used, one on the superior border of frenum and other on the inferior boarder in opposite directions. The two flaps are raised and then interchanged with each other so that the frenal length is increased.\textsuperscript{9} Primary Z-plasty flaps are created using an angle of 60 degrees on each side. Classic 60° Z-plasty lengthens scars by 75%, while 45° and 30° designs lengthen scars by 50% and 25%, respectively.\textsuperscript{10} A curvilinear form of Z-plasty (also known as S-plasty) may be used when straight lines may be particularly evident, for e.g., in the cheek. Design of the Z-plasty with unequal angles and limbs creates a situation, in which the smaller triangle moves significantly less than the larger triangle. This may be useful in areas where small amounts of tissue need to be moved with as little distortion as possible e.g. near eyes, lips.\textsuperscript{11,12} Another modified approach include, a horizontal incision without severing the frenum in the midline along with basic Z-plasty flaps that are transposed in the similar manner.\textsuperscript{13} The Z pattern is efficient as:
- It facilitates re-distribution of tension on the skin and the wound and helps in healing along the skin lines
- It minimizes scar formation and has got a camouflaging effect.

The present case report aimed to approach aberrant labial frenula using novel modified Z-plasty technique of frenectomy with an added note on merits and the demerits of this procedure.

\textbf{CASE REPORT}

We report here a case of a 20-year-old male referred to the Department of Periodontology and Oral Implantology, National Dental College and Hospital, Derabassi. Patient reported with the chief complaint of a midline diastema between the maxillary central incisors. On examination, a hypertrophied papillary frenum associated with midline diastema was found (Figure 1). Along with it, tension test was positive with inadequate width of attached gingiva. Patient was told about the procedure and an informed consent was taken.

\textbf{Surgical Procedure}

The area was anesthetized using local infiltration by using 2% lignocaine with 1:80,000 adrenaline. The “Z-shape” triangular flap was prepared using incisions as depicted in Figure 2. The length of the base of the frenum was incised with 6 a scalpel and at each end, incisions (ranging between 60° and 90° angulation) were made in equal length to that of the band. With the help of a tissue forceps, the submucosal tissues were dissected beyond the base of each flap, into the loose non-attached tissue planes. A double rotation...
flap of at least 1 cm in length was prepared (Figure 3). With the surgical blade, the deeper fibers are detached from the underlying periosteum in a criss-cross manner. Periosteal scoring was done so as to prevent the realignment of fibers. The resultant flaps were mobilized and transposed at 90° to close the vertical incisions horizontally. They were then sutured to the defect on the opposite side of the other flap base and secured in position by using interrupted braided silk suture (Figure 4). After the above procedures, patient was asked to maintain a soft diet for a week, and antibiotics and analgesics were also prescribed. Patient was instructed to follow routine post-operative instructions and to maintain good oral hygiene using mechanical and chemical plaque control techniques. Patient was followed after 10 days, later for review (Figure 5).

**DISCUSSION**

In the present arena of periodontal plastic surgeries, more conservative and precise techniques are being adopted to achieve more functional and esthetic results. The management of anomalous and aberrant frenum has gained much of interest in the present era. Recent techniques added frenal relocation by Z-plasty, frenectomy with soft-tissue graft and laser applications to avoid typical diamond-shaped scar and facilitate healing. Each method has its advantages and disadvantages. A study by Heller et al. in 2005 compared the treatment outcome for Z-frenuloplasty and the traditional horizontal to vertical frenuloplasty in the management of ankyloglossia. Of 16 patients recruited in the study, 11 patients underwent a Z-frenuloplasty and 5 patients had their ankyloglossia corrected with the horizontal to vertical frenuloplasty. The frenulum length, length of tongue protrusion and speech was analyzed pre and post-operatively. The results revealed that Z-frenuloplasty was a superior technique than the other, with an improvement in frenulum length and tongue protrusion of 37.5 ± 13.5 mm compared to the other method at 36.2 ± 7.6 mm respectively. In addition, it was also found that 91% of the patients with Z-frenuloplasty showed improvement in speech compared to other 40% who underwent the horizontal-to-vertical frenuloplasty. Since

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**Figure 2:** Z-shaped incisions  
**Figure 3:** Flaps reflected and periosteal scoring performed  
**Figure 4:** Flaps secured with interrupted sutures  
**Figure 5:** 10 days post-operatively
the conventional procedure of frenectomy, a number of modifications of the various surgical techniques including Miller’s technique, V-Y plasty and Z-plasty have been utilized to manage problems associated with an anomalous labial frenum. The main advantage of the Z-plasty method over the conventional technique is minimal scar tissue formation. The disadvantage of this method is its technique sensitivity.13,14

CONCLUSION

To achieve a functional and an esthetic outcome, adequate technique should be selected based on the type of the frenal attachment. The Z-frenuloplasty procedure is considered to be safe and a cost efficient procedure resulting in better functional and esthetic appearance. This technique allows for tissue healing by primary intentions, increasing recovery and reducing the risk of tissue contractures. However, due to the limited evidence currently available on this method, further research is needed to compare the different surgical approaches of frenectomy to obtain the desired outcome.

REFERENCES


