

A modified frenectomy technique: a new surgical approach

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The frenum is a mucosal fold that attaches the lips or cheeks to the alveolar mucosa, gingiva, and underlying periosteum. Consequences of an abnormal frenal attachment include gingival recession, decreased vestibular depth, decreased range of lip movement, and involvement of interdental papilla, causing a diastema. Several methods to eliminate ectopic frenal attachments have been suggested, including frenectomy (elimination) and frenotomy (repositioning). This case report describes the use of a modified frenectomy technique in a 15-year-old girl with excess gingiva between the maxillary central incisors, which exhibited a 3-mm diastema. First, a semi-lunar primary incision was made in the palatal surface at a 5-mm distance from the tip of the papilla. Next, sulcular incisions were made around the tooth, and the papilla was transposed to the buccal via a papilla preservation flap. After complete elimination of frenal attachments in the bone, the flap was repositioned and sutured to the palatal surface. Afterward, the frenum was classically cut and sutured. Through this approach, the position of the frenum was changed apically without invading the papilla. At the 3-month follow-up, it was found that the modified technique (combination of papilla preservation flap and frenotomy) had minimized the surgical scar on the buccal surface, preserved the papilla, and yielded optimal esthetic results.

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Frena are mucosal folds that attach the lips or the cheeks to the alveolar mucosa, gingiva, or underlying periosteum. Ectopic frena can cause complications such as gingival recession, decreased vestibular depth, decreased range of lip movement, and involvement of interdental papilla; they also may interfere with oral hygiene.¹⁻⁷

Involvement of the papilla in most cases results in persistent diastema and subsequent esthetic problems. Thus, several surgical techniques have been suggested for treatment purposes.¹⁻⁵ *Frenectomy* is defined as complete elimination of the frenum and its attachments, while *frenotomy* refers to incision and repositioning of a frenal attachment.⁸ These procedures used to be categorized as types of *mucogingival surgery*, a term Friedman first coined in 1957.⁹ In 1996, a consensus committee at the World Workshop in Periodontics stated that this term should be replaced with *periodontal plastic surgery*, as suggested by Miller in 1993.^{10,11}

The body has 4 principal types of tissue: epithelial tissue, connective tissue, muscle tissue, and nervous tissue. Henry et al histologically evaluated the superior labial frenum and reported that it contains compact collagen and elastic fibers covered by orthokeratinized and, in some areas, parakeratinized epithelium.¹² They found no muscular fibers in the frenum. However, some other studies have found horizontal bands and oblique muscular fibers in frena related to the orbicularis oris.¹³

The maxillary labial frenum is an ectolabial band remnant attached to the upper lip tubercle. When the maxillary central incisors develop with a wide diastema, the underlying bone is not formed. As a result, a V-shaped bone defect may form between the maxillary central incisors as a consequence of the ectopic labial frenum.

Placek et al classified 4 types of frenal attachment: (1) mucosal, where the frenal attachments extend anteriorly to the mucogingival junction; (2) gingival, where the frenal attachments enter the attached gingiva; (3) papillary, where the frenal attachments extend into the papilla; and (4) papillary penetrating, where the frenal attachments cross the alveolar bone and extend to the palatal papilla.¹⁴

A frenal attachment can be diagnosed by pulling on the patient's upper lip. If the attachment is abnormal, pulling on the lip will result in movement of the tip of the papilla or blanching of tissue due to ischemia at the site. Frenectomy is indicated in the following situations: when an ectopic frenum results in a midline diastema, when the close vicinity of the frenum to the gingival margin results in gingival recession and impairs oral hygiene, or when an ectopic frenum is associated with inadequate attached gingiva and a shallow vestibule.¹⁴

There are several possible approaches to frenectomy: classic frenectomy, Z-plasty, V-Y plasty, electrosurgery, and use of carbon dioxide laser.¹⁵⁻¹⁸ When an ectopic frenum prevents

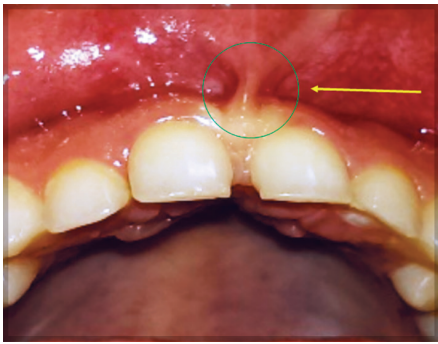


Fig 1. The pulling test demonstrates an abnormal frenal attachment (circle).



Fig 2. A semilunar incision is made in the palatal surface and continued in the form of a sulcular incision to elevate the flap.

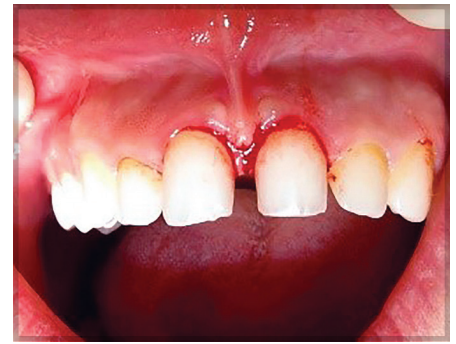


Fig 3. The semilunar incision started on the palatal surface has been continued in the form of a sulcular incision to the interproximal area.

closure of a diastema between the maxillary central incisors or the frenum itself is responsible for the occurrence of a midline diastema, buccal incisions may leave scars after the healing process if the frenum is of the papillary penetrating type. In the new technique for labial frenectomy in the maxilla, surgical incisions are made on the palatal surface. Frena extending to the palatal papilla may be associated with bone defects in the midline. Thus, the attachments in the bone surface and underneath the papilla must be completely eliminated. For this purpose, the papilla preservation flap can be combined with classic frenectomy to efficiently preserve the papilla.

Modified frenectomy technique

A modified surgical technique for management of ectopic frena has been developed and performed at the Department of Periodontics, Shahid Beheshti University of Medical Sciences, Tehran, Iran. The technique is designed to minimize the surgical scar on the buccal surface and preserve the papilla, thereby yielding optimal esthetic results.

First, a semilunar incision is made in the palatal surface 5 mm from the tip of the papilla. Next, sulcular incisions are made around the teeth. The papilla preservation flap is elevated between the teeth to transpose the papilla from the palatal to the buccal.¹⁹ A 1.0- to 1.5-mm full-thickness flap, extensive enough to allow easy access to the bone defect, is elevated at the buccal surface. The attachments are separated from the defect and bone surface with a curette. After the attachments in the defect are completely eliminated, the flap is repositioned and sutured to the palatal surface. The frenum is then classically cut and sutured via frenotomy. In this way, the position of the frenum is changed apically without invading the papilla.

Case report

Examination and diagnosis

A 15-year-old girl with no relevant medical history presented with a chief complaint of excess gingiva between her maxillary central incisors. There was a 3-mm diastema between the maxillary central incisors. The patient reported a history of orthodontic treatment. Considering the small width of the maxillary central incisors and the results of orthodontic analyses, the orthodontist recommended composite resin reshaping

of the teeth instead of orthodontic movement for diastema closure. An ectopic labial frenum had to be removed prior to restorative treatment.

Extraoral and intraoral examinations were carried out. Gingival sulcus depth was measured at 6 points around each of the maxillary central and lateral incisors. The maximum depth was found to be 2 mm. At the buccal surface of each tooth, 7 mm of keratinized gingiva was present. The gingival biotype was thick, and there was no attachment loss. The interdental papilla occupied almost half of the clinical crown length in the proximal space between the central incisors, masking the cemento-enamel junction of the teeth (class II according to the classification by Nordland & Tarnow).²⁰ The vestibular depths in this area were 10 mm from the gingival margin of the central incisors and 14 mm from the tip of the papilla between the central and lateral incisors.

Oral hygiene instructions were given to the patient in another session, and emphasis was placed on the importance of oral hygiene measures. The patient received initial prophylaxis as well.

According to the previously described classification, the patient demonstrated a papillary penetrating attachment, and frenectomy via the aforementioned modified technique was indicated. Two weeks after prophylaxis, the patient was recalled for surgery. The probing depths were measured again, the patient's oral hygiene status was assessed, and the diagnosis of ectopic frenum was reconfirmed (Fig 1).

Surgical technique

Infiltration anesthesia was induced at the lateral sides of the labial frenum as well as the incisopalatal area. A microsurgical blade was used to make the primary incisions.

Stage 1

The first stage of surgery combined a modified frenectomy approach and a papilla preservation flap.

Step 1. A semilunar incision was made at the midpalatal suture behind the central incisors (Fig 2). The incision was continued in the form of a sulcular incision to the mesial of the central incisors and extended to their distobuccal line angles (Fig 3). This primary incision was made for the purpose of papilla preservation.

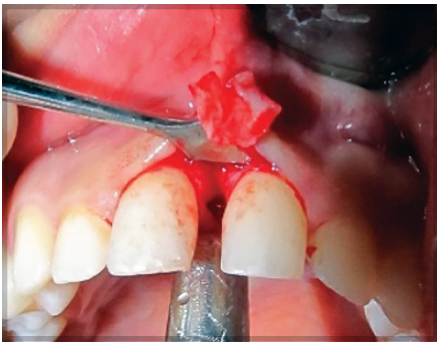


Fig 4. A Buser periosteal elevator is used to transpose the interdental papilla from the palatal to the buccal.



Fig 5. The palatal surface is sutured with 5-0 chromic gut suture.



Fig 6. The frenum is dissected at a 2-mm distance from the papilla.

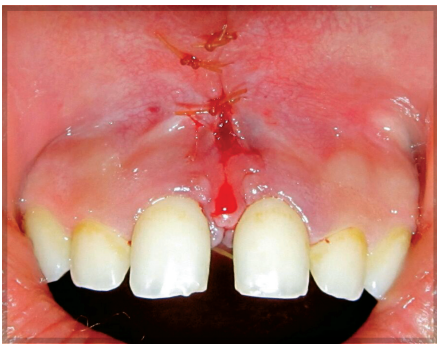


Fig 7. The labial surface is sutured with 5-0 chromic gut suture.



Fig 8. Ten days after suture removal, the frenum is more apically positioned.



Step 2. A Buser periosteal elevator was used to elevate the flap palatally, through the diastema, and move it buccally (Fig 4). A 1.0- to 1.5-mm full-thickness flap was then elevated to completely eliminate the frenal attachments to the buccal bone.

Step 3. Since the frenal attachments had a buccopalatal direction and had entered the bone defect, the defect was completely cleaned of these attachments using a Sugarman bone file.

Step 4. The flap was repositioned in its original place in the palate and sutured with 5-0 chromic gut suture (Fig 5).

Stage 2

The second stage of surgery was a frenotomy accomplished without invading the papilla.

Step 1. The frenum was classically dissected at a 2-mm distance from the papilla (Fig 6).

Step 2. Following frenotomy, the wound margins were undermined to achieve better closure.

Step 3. Suturing was completed with 5-0 chromic gut suture (Fig 7).

Stage 3

The third stage of surgery consisted of low-level diode laser irradiation to decrease postoperative bleeding and enhance healing. The laser irradiation was administered on the day of surgery and the first postoperative day.

Postoperative instructions were given to the patient, and she was scheduled to undergo suture removal 1 week later.²¹

Follow-up

At 1 week postoperatively, due to the presence of inflammation, the depth of gingival sulcus had decreased by a maximum of 1 mm compared to its value immediately after surgery. The depth returned to its baseline value by the next session (7 days). The papillary height did not show any significant change postoperatively. Ten days after suture removal, the frenum was more apically positioned compared to its preoperative status (Fig 8). The patient was recalled after 2 and 3 months. At 3 months, buccal scarring was minimal, and composite resin restorations were placed for diastema closure (Fig 9). One month after placement of the restorations, the space between the central incisors was completely filled by the interdental papilla, and there were no signs of excessive traction caused by the frenum (Fig 10).

Discussion

If an ectopic frenum is not eliminated, it may cause gingival recession and a diastema. Excessive movement of the upper lip can adversely affect the process of wound healing and soft tissue maturation and compromise the treatment outcome of conventional frenectomy procedures. Several surgical techniques have been introduced for eliminating or changing the position of an ectopic frenum, each having their own indications. However, none of these techniques addresses papilla preservation and its significance. This is especially important when the ectopic frenum has caused a diastema and penetrated the interdental papilla.



Fig 9. Composite resin restorations are placed for diastema closure 3 months after surgery. Scarring is minimal.



Fig 10. The results 1 month after restorative treatment (4 months after surgery) confirm that the modified frenectomy has preserved papilla and resulted in minimal scarring.

In a classic frenectomy, part of the papilla inevitably must be eliminated if the frenum has penetrated it, and this approach can cause significant esthetic problems for the patient.¹⁵ Likewise, papillary involvement is not addressed in Z-plasty or the Miller frenectomy technique. In other words, the conventional techniques follow the same path for all types of ectopic frena and remove part of the papilla in case of frenal invasion. However, papilla preservation in the esthetic zone has gained increasing attention in recent years, because regeneration of lost papilla is difficult, if not impossible.²²⁻²⁴

Most of the conventional frenectomy techniques impair the normal function of the frenum, since they completely remove it. In complete elimination of frena by frenectomy, even the deepest frenal attachments are cut. For this reason, the surgical site is often extensive and usually results in an extensive scar.

In contrast, the technique described in the current case report aims to preserve the papilla with minimal postsurgical scarring. This approach also allows preservation of interdental papilla in patients with a diastema. Another advantage is that the frenum is not completely removed. Instead, it is positioned more apically. Only the attachments entering the bone are cut. In this way, attachments of the lip to the alveolar bone and gingiva maintain the natural function of the frenum. Because excision of tissue is limited, the modified frenectomy technique does not cause excess trauma to the buccal surface and does not compromise the interdental papilla.

The positive effects of diode laser irradiation on wound healing have been confirmed in recent years.²⁵⁻²⁸ Thus, irradiation is suggested as an adjunctive therapy in cases wherein a long healing period may negatively affect the outcome of surgery.

Although the modified frenectomy technique results in a smaller scar at the buccal surface and preserves the interdental papilla, it has a disadvantage: It requires an extra incision in the palatal surface to preserve the papilla. In addition, this report presents the results of this approach in only a single patient. The outcomes of clinical application of the technique in more patients must be assessed in order to allow evidence-based decision making.

Conclusion

At the 3-month follow-up of the patient, the papilla preservation flap in conjunction with a frenectomy resulted in minimal surgical scarring buccally and preservation of the interdental papilla. The modified frenectomy represents a new approach to traditional mucogingival surgeries and not only eliminates the ectopic frenum but also preserves the papilla. Use of a modified frenectomy along with a papilla preservation flap results in minimal changes in the height and shape of the papilla in patients with diastemas wider than 2 mm.

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