Vestibular frenectomy in periodontal plastic surgery

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ABSTRACT

Vestibular frena are bands of soft tissue that connect the lip or cheek to the alveolar mucosa or to the gum and that can restrict their movements. These mucosal folds can, in some cases, attach too close to the teeth and are associated to a persistent diastema. Additionally, if this frenum is too tight, it can cause gum recession by pulling the gums away from the teeth. The position of a frenum can become more apical and be corrected during growth with anterior teeth eruption. However, when it causes self-consciousness, pain, or gum recession, a frenectomy is indicated. The frenectomy is a simple procedure which involves total surgical removal of a frenum. The presence of a hypertrophic maxillary vestibular medial frenum associated with a diastema is the most commonly encountered indication in children. Its elimination will contribute to diastema closure that will stay stable over time.

KEYWORDS

Median maxillary labial frenum, median mandibular labial frenum, diastema, frenectomy, periodontal plastic surgery

INTRODUCTION

In the oral cavity, mucosal folds stretching between the alveolar mucosa and the keratinized and attached gingiva are intended to stop, control, or limit the movements of anatomical regions. These folds are referred to as frena (singular "frenum"). They include the median labial, vestibular,

maxillary, and mandibular frena, which limit lip movements; the labial and medial lingual frena, which limit tongue movements; and the lateral vestibular frenum, which limits cheek movement⁷.

Median vestibular, maxillary, and mandibular frena were described by Placek *et al.*

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(1974)³² in terms of their attachments relative to marginal periodontium. They proposed the following classification: see Fig. 1a, b, c, and d.

This classification can also be used to distinguish between the attachment of the lateral and the lingual frena. In 2011, a study with 226 children (mean age 8.5 years), in terms of maxillary median maxillary frenum attachment, 10.2% children had mucosal attachment, 41.6% had gingival attachment, 22.1% had papillary

attachment, and 26.1% had interdental attachment⁸. In other words, 48.2% frena had attachment interfering with the sulcus. A gingival–mucosal frenum has a single attachment distributed over two or three attachment points¹⁸, and this is most commonly seen with the lateral frenum. A frenum is not responsible for periodontal pathology or the presence of a diastema. It can be considered as an associated unfavorable anatomical factor. They may represent

Figure 1a

Mucosal attachment: maxillary labial frenum is attached to the alveolar mucosa at the edge of the mucogingival line.

Figure 1b

Gingival attachment: Low attachments of maxillary labial frena are embedded in the attached gingiva.

Figure 1c

Papillary attachment: the maxillary labial frenum is attached to the papillary gingiva. The mobilization of the lip (tensile test) results in this case a displacement of the marginal gingiva of the central incisors.

Figure 1d

Interdental attachment: maxillary labial frenum joins the top of the gingival septum and merges with the buccal papilla. This anatomical situation is generally related to the persistence of the interincisal diastema.

an anatomical anomaly of the gingiva and/or the alveolar mucosa³¹.

For this reason, complete or partial removal of frena may be indicated for periodontal and/or orthodontic reasons.

The frenectomy must be part of the treatment plan for other defects or pathologies²⁹. These include

- limitation of tongue and lip movements;

- orthodontic closure of a diastema;
- purely esthetic indications;
- gingival or periodontal recessions;
- position on edentulous ridge that impedes the completion of a prosthesis;
- associated lack keratinization;
- mobile mucosa around implants;
- periodontal disease linked to the presence of plaque and preventing the maintenance of hygiene.

INDICATIONS FOR VESTIBULAR FRENECTOMY

Frenectomy may be performed for periodontal and orthodontic indications.

Periodontal Indications

Frenum exerting marginal gingiva traction and/or obstructing hygiene.

A “normal” frenum is attached a few millimeters from the marginal gingiva, delimiting a band of keratinized tissue and attached coronally to the frenum attachment.¹⁷

A very large frenum can also simply prevent periodontal or even oral hygiene (Fig. 2) because of its volume.

When this mucosal fold moves during the muscular movements for phonation, facial expressions, and chewing, the tissues to which it is attached are pulled.

If these tissues that frena are attached to are keratinized and attached to the gingiva, tissue movement will be absent. If, on the other hand, frena are attached to the free gingiva or if a periodontal lesion or recession has caused the tissues to migrate till the attachment, there will no longer be any

keratinized tissue or attached gingiva³⁸, resulting in the opening of a gingival sulcus or a periodontal pocket (Fig. 3).

If only the alveolar mucosa remains, maintaining good oral hygiene becomes difficult because it is painful, and gingival inflammation is likely to promote the progression of gingival recession (especially in children)³⁵, or the formation of periodontal pockets.

Ramfjord³⁶ (1993) based the indication of frenectomy primarily on the possibility to maintain gingival health through proper hygiene. In these circumstances, frena are considered

Figure 2
Frenum attachment in the palatal papilla.

Figure 3
Apical traction of the tissues bordering the recession on 41 by the medial vestibular mandibular frenum.

minor etiological factors in periodontal pathology and/or more effective etiological factors in mucogingival problems.⁵

Lateral frena frequently exert traction on the free gingiva and make the vestibule shallow, impeding the passage of the toothbrush.

The traction exerted by the frenum on the marginal periodontium is harmful because it can:

- open the gingivodental sulcus;
- allow the accumulation of bacterial plaque²¹;
- interfere with hygiene (especially if there is no keratinized gingiva at all)⁴;
- apical traction on the tissues at the bordering an early recession;
- tension on surgically displaced tissues.

This unfavorable clinical situation frequently encountered with Placek³² type-3 and type-4 frena. Without intervention, the orofacial muscles of facial expression and the movement of the lips and cheeks can move the free gingiva.

In the presence of type-IV periodontium in Maynard and Wilson (1980)²³ classification, the situation represents an area of weakness.

The following associated clinical signs indicate a frenectomy:²⁷

- Whitening of the internal papilla or the free gingiva during traction;¹¹
- The limitation of labial or lingual movement (short and taut frenum);
- The proximity of attachment to the free marginal gingiva;
- The large width of the frenum at its attachment¹³;
- The opening of the gingivodental sulcus during traction.

Unesthetic frena

Elimination of unsightly frena has its place in the overall therapeutic arrangement of Class-1 and Class-2 malocclusions²² and the treatment of gingival contour asymmetries (line of necks)²⁵ (Fig. 4a and b).

In most cases, a simple movement of the frenum attachment is sufficient.

Figure 4a
Hypertrophic median upper labial associated with incomplete passive eruption of 11, 12, and 21.

Figure 4b
Frenectomy associated with surgical coronal elongation to harmonize the gingival contour.

It must not leave a scar. Frenectomy will be esthetically satisfactory more frequently when associated with a laterally positioned flap technique²⁴ or a gingival⁵ graft to cover the excised site.

Frenum-related with periodontal pathology

During development of periodontitis and the evolution of a periodontal pocket, a frenum can become harmful by exerting traction on delicate tissues in the region of the pocket in question. However, it may not interfere when the periodontium is healthy. The mandibular frenum is associated with recessions in 5% patients studied by Bork and Weiler (1958)⁶, regardless of age.

The presence of a bulky frenum or frenum attached in the keratinized tissue may compromise the stability of postoperative periodontal tissue; periodontal treatment must involve tissue movement and impeccable postoperative immobility to treat the deep periodontium (guided tissue regeneration,

induced tissue regeneration, bone filling, coronally positioned flap) or marginal periodontium (displaced flaps associated or not associated with connective tissue grafts, tunneling).

The frenum may simply be shifted apically, at least 15 days before the operation. In some cases, frenectomy is performed during surgical treatment (Fig. 5a, b, c, and d).

Figure 5a
Photograph at initial presentation: presence of gingival recessions on 31, 32, 41, and 42 associated with a traction of the lower labial frenum.

Figure 5b
Photograph after frenectomy.

Figure 5c
Immediate postoperative photograph after
buried connective graft transplant.

Figure 6a
Occlusal view of a hypertrophic frenum
associated with the presence of an interincisal
diastema.

Figure 5b
Situation at 6 months postoperatively.

Figure 6b
Lateral view.

Orthodontic Indications

Hypertrophic median frenum and anterior superior diastema

A hypertrophic median frenum may interfere with the orthodontic closure of certain diastemas (Fig. 6a and b).

Even if the indications for frenectomy along with diastema closure are not common, it remains optional³³. In many cases, interincisal diastemas close spontaneously^{12,13,37}.

The spontaneous closure of diastemas depends on the action of three processes:

- centripetal pressure exerted by the eruption of surrounding teeth, and in particular maxillary canines;

- growth of the premaxilla;
- contractile force of trans-septal interincisal fibers.

Thus, the presence of agenesis, an eruption, growth anomaly, and/or an interruption of the contractile fibers causes the diastema to persist. However, the indications for frenectomy associated with an orthodontic diastema closure is based on studies by Ewen and Pasternak (1964)¹⁴ and James (1967)¹⁹. The first study showed that when restraint was removed after closure of

the interincisal diastema, the space was opened again. After a fresh diastema closure and frenectomy, when the restraint was removed, the space remained closed. James, on the other hand, selected 10 cases with a median diastema and complete and stable teeth in patients aged 12–22 years. One year after total frenectomy, diastema dimensions showed a decrease in eight patients, remained stable in one patient, and increased in the remaining patient.

In the presence of a diastema, frenectomy is indicated in the following situations:

- divergent or rotating central incisors;
- maxillary lateral incisor absent, the space between the central incisors must be closed before the fixed prosthesis;
- persistence of the diastema during retraction of the anterior block in Angle Class-II division 1;
- appearance of an interincisal diastema during orthodontic treatment (frequently associated with extraction of first premolars);
- absence of a central incisor whose therapeutic choice is to close space¹⁹.

Even if the indications for frenectomy along with diastema closure are not common, it remains optional. However, controversy exists regarding the

most appropriate time in the treatment plan to intervene. For some, frenectomy should precede diastema closure⁹, the downside being the risk of causing very fibrous scar tissue or granulation tissue that will be an obstacle to orthodontic closure. Thus, for others, the diastema must first be closed and the frenectomy performed during orthodontic restraint^{16,24}, if possible at the end of skeletal growth. Some cases have even shown a spontaneous closure of the diastema after the frenum removal²⁰.

Delaire (1974)¹⁰ recommends waiting until age 8 years to treat a maxillary frenum. This is because before that age, maxillary labial frenum, through its fibrous attachments at the interpremaxillary suture, represents a sutural disjunction factor and a growth factor under the influence of the traction of the upper labial muscles, and it is consequently an active expansion factor.

Depending on the criteria for bone growth, it would seem logical to intervene as late as possible. Indeed, the attachment height of a frenum depends in large part on the vertical development of alveolar processes³⁴. A frenum may appear hyperplastic due to a lack of height of the alveolar structures¹⁵. It will therefore be necessary to take into account the patient's actual age, the eruption of the six anterior teeth, and also the alveolar bone development to determine the best time to intervene.

OPERATIVE TECHNIQUES OF THE VESTIBULAR FRENECTOMY²⁶

Depending on the type of frenum attachment, a frenotomy or frenectomy may be performed. Frenotomy will be sufficient to treat a superficial frenum

attachment. Frenectomy will treat a deep periosteal frenum attachment and may remove a frenum attached into the intermaxillary suture.

Frenotomy leaves a periosteal wound whereas frenectomy exposes an area of decaying bone:

- up to the mucogingival line during the total frenectomy;
- only on the basis of the frenum in the partial frenectomy.

Submucosal parapical anesthesia is administered by a slow, traceable injection, at a distance from the periosteum, to avoid painful and traumatic distension of vestibular tissues. A palatal withdrawal may be considered if the frenum attachment is palatal.

The frenum is highlighted by a strong attachment to the lip (Fig. 7a) and immobilized by self-locking grips.

The incisions in the attached gingiva are beveled, 1 mm on either side of the frenum attachment on the gingiva, and delineate both sides of a triangle whose gingival apex may eventually be in the interdental space or on the palatal surface (Fig. 7b). If incisions extend into the interdental space, the marginal periodontium of each central incisor should be respected. Then a second triangle at the opposite apex is dissected

on the inner surface of the lip, in the labial mucosa, using a blade or gingiva scissors. The common base of the two triangles is the mucogingival line of the adjacent teeth.

All of the tissue within the diamond is resected. The frenum attachment is released in total thickness if the objective is a frenectomy, or in partial thickness if the objective is a frenotomy. The result is a diamond-shaped wound (Fig. 7c).

In the presence of a palate-attached frenum, it is advisable to remove the fibers located in the intermaxillary suture using a periodontal curette. Respect for the interdental papilla is strongly recommended especially in adults³.

The edges of the diamond are joined together by a series of discontinuous stitches or a single overstretch from the lip to the gingiva (Fig. 7d) using resorbable polyfilament (or nonabsorbable monofilamentous) suture thread 5/0 or 6/0 in diameter on 1/2 short circular needles (11–13 mm). The triangular excision area of the frenum in its gingival part is protected by a cross suture or a Surgicel® type cellulose pad.

Figure 7a
The frenum is highlighted by a strong attachment to the lip.

Figure 7b
The incisions in the attached gingiva are beveled, at 1 mm on both sides of the frenum attachment on the gingiva of the interdental papilla.

Figure 7c

The incisions in the attached beveled gumline delineate the two sides of a triangle. The second triangle at opposite vertex is dissected on the inner side of the lip, in the labial mucosa. The common base of the two triangles corresponds to the mucogingival line. The entire area is in the shape of a diamond.

Figure 7d

The edges of the diamond are brought together by a series of interrupted sutures or a simple overlocking stitch starting from the lip toward the gingiva.

The sutures can be removed, starting on the 7th postoperative day in children and adolescents, who heal very quickly (Fig. 7th), whereas on the 10th day in adults.

The postoperative results of this cold blade technique are very rarely painful according to our clinical experience. However, we can find in the scientific literature a case for using CO₂ laser to replace the blade and with the goal of decreasing postoperative pain².

Figure 7e

Sutures are removed in adolescents who heal very quickly, starting on the 7th postoperative day.

Figure 7f

Closing of the diastema. The interincisal interdentary papilla has a harmonious architecture.

If the frenum is oversized and has a papillary attachment, and the area left bare very wide, or if the site is involved in the esthetics of the smile, a triangular gingival graft transplant from an adjacent vestibular interdental donor site may be added⁵. The advantage is that it prevents second-line healing, which can result in a different color and/or texture of the gingiva. A laterally positioned flap²⁴ can also play this protective role. Bagga (2006)³ describes the possibility of making a flap displaced laterally bilaterally. At the mandible, the technique utilized relies upon the amount and thickness of keratinized and attached tissue and/or the presence of a recession on the mandibular

Figure 8a

17-year-old patient with agenesis of 31/41 with persistence of 81, Miller class-III recessions on 32/42 and a hypertrophic lower labial frenum that fits high on the bony crest.

Figure 8b

Situation 2 months after frenectomy and free gingiva graft. The mucogingival complex was reinforced at the 32/42 level and at the ridge level and the vestibule was deepened.

incisors. Frequently, a frenectomy can be performed alone to precede a buried mucosal graft transplant or at the same time as an epithelial-mucosal graft transplant, which has the advantage of simultaneously strengthening the

mucogingival complex and deepening the vestibule (Fig. 8a and b)

The maxillary and mandibular lateral frena are most often repositioned by frenotomy because they are smaller than the median frenum, but the indications for frenectomy remain the same.

RESULTS

Results are good if two fundamental principles are respected:

- partial or complete dissection of the frenum attachment;
- immobilization of the labial or lingual alveolar mucosa at a distance from the attached gingiva or healing site by second intention.

Elimination of traction on the free gingiva

The frenectomy is effective in restoring anatomical conditions conducive to

the long-term maintenance of periodontal health (Fig. 7f and Fig. 9a and b).

Restoration of esthetic gingival contour

For the esthetics of the gingival smile, it is an effective cosmetic procedure if care is taken not to allow the development of unsightly scars from the surgical technique to develop. Sometimes frenectomy healing without tissue input can leave a thin scar that fades over time, while combining the frenectomy with a triangular gingival graft taken from the vestibule, the esthetic result is optimal.

Figure 9a
Palatal frenum attachment pulling on the marginal gingiva of 11 and 21.

Figure 9b
Healing 3 months after the frenectomy and closure of the diastema.

Optimal Healing of Periodontal Surgery

Frenectomy is an essential prerequisite for performing surgical techniques that move tissues and/or require perfect immobilization during healing (in all periodontal regeneration techniques). The frenectomy assists the technical achievement and immediate postoperative tissue stability (Fig. 5b).

Stable closure of the diastema (Fig. 10a and b)

Edwards (1977)¹³ showed that in the presence of abnormal frenum associated with diastema, there is a strong tendency for recurrence after orthodontic closure.

For Naves (1967)²⁸, frenectomy has, in some cases, a therapeutic role on the diastema. In fact, diastemas were completely decreased after a few weeks by this single intervention. But what about the participation of growth and eruption, even for only a few weeks, if these are very active periods?

In any case, to avoid diastema recurrence, it would appear to be more important to have a gingival band attached

along the median line and that the central incisors be all at once (crown and root)²⁴.

Figure 10a
Very large frenum associated with a very wide diastema preventing the eruption of the lateral incisors: absence of the eruption corridor.

Figure 10b
Very fast closure of the diastema and spontaneous eruption of 12 and 22 a few weeks after the frenectomy.

CONCLUSION

The frenectomy is a simple and routine procedure in periodontal plastic surgery, which should be performed at the right time, according to the indications. In some more complex cases, a free or pedicle epithelial–mucosal graft

transplant may be required along with frenectomy.

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