

Morphological and attachment variations of median maxillary labial frenum

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Abstract

Introduction: Median maxillary labial frenum also known as frenulum labii superioris or superior labial frenum is a soft membranous fold providing support and stability to the upper lip and is subject to variation in shape, size and position during growth. The aim of this study was to determine the morphological and attachment variations in the maxillary frenum of patients to bring awareness to its importance for any further dental treatment.

Material and Methods: Patients reporting to the out patient department of Islamabad Dental Hospital were evaluated visually with respect to morphology and attachment of the frenum on the basis of Sewerin and Mirko's classifications respectively.

Results: Out of a total of 600 patients examined for morphology of the frenum 326 patients had simple frenum, while tectolabial, simple frenum with appendix, simple with a nodule and frenum with nodule presented in 208, 38, 19 and 6 patients respectively. On the basis of the attachment type 351 had gingival while 233 had mucosal attachment, whereas papillary and papillary penetrating was reported in 13 and 3 patients respectively. Both genders showed an almost equal distribution of the morphological as well as attachment types.

Conclusions: The simple frenum has the highest representation in the morphological types. In the attachment types gingival type showed the highest occurrence followed by mucosal type.

Keywords: Diastema; esthetics; frenulum

Introduction

The median maxillary labial frenum is on the inside middle part of the upper lip. It is a layer of mucous membrane that is found between the upper central incisors. Histologically connective tissue, epithelium, nerve fibers, elastic and collagen fibers are found¹ whereas Knox and Young reported horizontal and oblique bands of Orbicularis Oris.² Labial frenum has unpredictable variation in reference to size, shape and position during different time periods of growth and development.³ During growth period it is of less clinical importance as it has the ability to decrease in size. At a younger

age frenum is generally wide and thick, with time it becomes thin and small.⁴

Abnormal frenum might indicate a syndrome.^{5,6} Syndromes associated with different frenal attachments are Ehlers-Danlos syndrome, Infantile hypertrophic pyloric stenosis, Holoprosencephaly, Ellis-Van Creveld syndrome and Oro facial digital syndrome.^{7,8} Frenum provides stability to the upper lip and is involved in mastication process.⁹ Abnormal frenum attachment can lead to distension of gingival sulcus because of frenal pull causing severe periodontal pockets as there is increase plaque accumulation. It may even affect the denture fit or retention.¹⁰ It can even be a common cause for midline diastema.^{10,11} Frenum has been reported to be an effect and not a cause of diastema¹² while in a case report by Qazi and Attaullah,¹³ a prominent frenum has been indicated as one of the cause of diastema. Gingival recession may be caused by the

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frenum when attached too closely to gingival margin because of hindrance of proper placement of toothbrush or because of muscle pull.^{4, 14}

It is necessary to correctly diagnose the etiological factors behind a malformed labial frenum in order to proceed with the best possible intervention relevant to the specific etiology for the dental treatment to continue successfully. In patients seen for orthodontic treatment not enough importance is given to the maxillary frenum on intra-oral examination. Esthetic concerns have increased its importance by the awareness of achieving a perfect smile.¹⁵ It will furthermore provide a baseline data for future studies in this area of research.

Material and Methods

This uni-centric quantitative, cross-sectional study was carried out on 600 patients by convenience sampling reporting to the OPD of Islamabad Dental Hospital. Patients with prior history of any surgery or injury to the maxillary labial frenum, of any orthodontic treatment or presently undergoing orthodontic treatment, cleft lip and palate and with congenital deformities were excluded from the study.

A verbal consent was taken from the parent or the patient himself prior to examination. After demographic data collection, patients were examined lying in a supine position using direct visual method on the dental unit. The upper lip was gently lifted with the index finger and thumb of both hands. The examination was calibrated on the basis of the fact that the clinically seen frenum matched with the picture shown of the given morphological type. Attachment levels were assessed by clinically matching with the picture and further supported by instrumentation to check the attachment criteria. Morphology of the maxillary labial frenum was classified into different groups according to the Sewerin's¹⁶ frenum classification (Figure 1), and on the basis of attachment location given by Mirko et al⁴

(Figure 2). The variation in morphologies and attachment were evaluated along with gender-wise distribution. Data was analyzed through SPSS version 22.

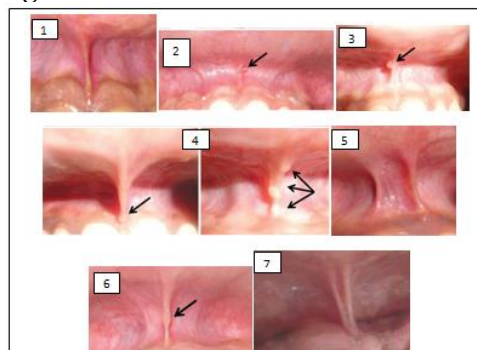


Figure 1: Sewerin's morphological types of maxillary labial frenum.

Simple frenum, 2. Persistent tectolabial frenum, 3. Simple frenum with appendix, 4. Simple frenum with nodule, 5. Double frenum, 6. Frenum with nichum, 7. Bifid frenum



Figure 2: Placek Mirko classification of frenal attachments.

Mucosal, 2. Gingival, 3. Papillary, 4. Papillary penetrating

Results

Out of a total of 600 patients examined (5yrs to 63yrs), 326 showed the presence of simple frenum (168 males and 158 females). The second most common morphology presented by both genders was the persistent tectolabial frenum, which was seen in 208 patients. The simple frenum with an appendix and a nodule appeared in only 38 and 19 subjects respectively, with rare presence of other morphological types (Table 1). The occurrence of these morphologies between genders was almost the same.

Table I: Frequency of Morphological types in Males and Females

| | | Morphology Types | | | | | | | | Total |
|--------------|--------|------------------|-------------------------------|-----------------------------|---------------------------|---------------|--------------------|--------------|---|-------|
| | | Simple frenum | Persistent tectolabial frenum | Simple frenum with appendix | Simple frenum with nodule | Double frenum | Frenum with nichum | Bifid frenum | Frenum with two or more variations at the same time | |
| Gender of | Male | 168 | 100 | 23 | 7 | 1 | 2 | 0 | 0 | 301 |
| Participants | Female | 158 | 108 | 15 | 12 | 0 | 4 | 1 | 1 | 299 |
| Total | | 326 | 208 | 38 | 19 | 1 | 6 | 1 | 1 | 600 |

The distribution of types of maxillary median labial frenum according to their attachment levels was also examined in a total sample of 600 patients. 351 showed the gingival type while 233 showed the mucosal type. Papillary and papillary penetrating occurred in 13 and 3 patients respectively.

Looking at the gender wise distribution (Figure 3) the gingival type was found more in the males (31%) than females (27%), while more females (21%) showed the mucosal type as compared to males (17%).

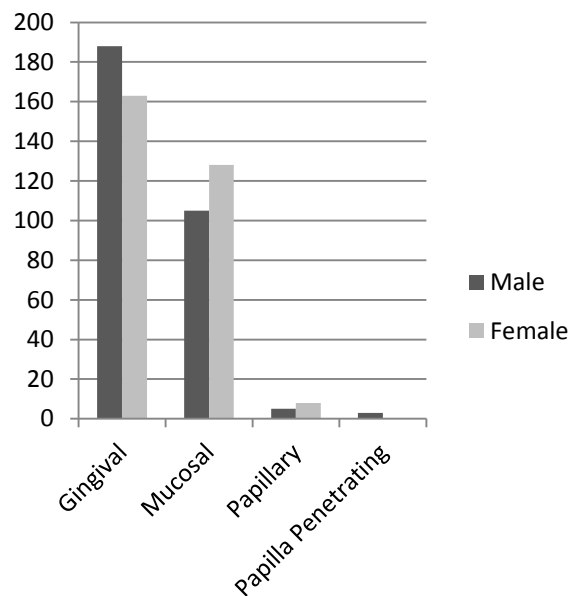


Figure 3: Attachment types of median maxillary labial frenum in both genders

Discussion

Thin folds of mucous membrane enclosing fibers from orbicularis oris muscle² form the labial frenal attachment having its attachment above the upper lip on the inside between the central incisors. Frena which are aberrant often cause problems such as loss of papilla, recession, diastemas, difficulty in brushing,

alignment of teeth and psychological disturbances.¹⁷ Various different classifications have been proposed for the labial frenum. Visually it is hard to depict a difference between abnormal or any variations of the maxillary frenum. In 1971 Modified Sewerins topology described eight different types of normal variations of maxillary frenum as simple, persistent tectolabial, simple with appendix, simple with nodule, double frenum, frenum with nichum, bifid frenum and frenum with two or more variation at a time.¹⁶ A revised classification of median maxillary labial frenum in comparison to modified Sewrins typology was introduced afterward.

Sewerin in his study used a sample ranging from age of 0 to 60 years and devised a classification. The present study used classification by Sewerin as majority of the studies found it more practical and easy to use. Simple frenum (54%) was the most prevalent type recorded in this present study followed by the persistant tectolabial frenum (35%). This is in accordance with the other studies.^{6,16,18} Sewerin in 1971 looked at a Danish population exclusively finding 60.2% of patients with a simple frenum and 19% of the tectolabial type. Nagavena and Umashankara also found this type to occur at 60% followed by tectolabial type at 21%. This is also in accordance to the study by Townstead et al¹⁹ on American population which concluded a rate of 68.6% occurrence of the simple frenal type with the tectolabial type at a very low occurrence of less than 2%. Crowley in an even earlier study in 1956 found frenal tags in 24% of Caucasian males hypothesizing, "The deepening of the upper labial groove takes place on either side of the

midpoint and leaves a residual anterioposterior fold of tissue untouched and remains as the tectolabial frenum. It is believed the tissue tag is a result of an irregularity in the process of resorption."²⁰

Nagavena and Umashankara in their study concluded that the morphological type to appear with the third highest frequency is the simple frenum with a nodule followed by simple frenum with an appendix (18% and 1%) whereas the present study demonstrated simple frenum with an appendix to occur at a greater frequency trailed by simple with a nodule (6% and 3%). This contradicts with the results of Townsted et al as their study concluded the presence of simple frenum with appendix and nodule both to be at a higher rate amid their sample instead of the tectolabial frenum.

During the eruption of teeth, the attachment of the maxillary frenum generally changes from a raphe that extends over the alveolar process and reaches the dental papilla to assume the adult configuration. Due to different esthetic options being provided greater numbers of patients are opting for orthodontic treatment. The demand for a perfect smile line by the patients has increased its significance.

In 1974 Placek Mirko⁴ introduced the classification types based on attachment location into gingival, mucosal, papillary and papillary penetrating, depending on whether the attachment is located in the attached gingiva, the mucogingival junction, the interdental papilla, and through the interdental papilla right up to the palate, accordingly. Papillary and papillary penetrating give rise to midline diastema.⁴ Frena are usually examined clinically and identified by applying tension over the frenum to observe the movement of the papillary tip or blanching is seen due to ischemia in that area.

Many studies have investigated the relationship between the presence and absence of diastemas and the median

maxillary labial frenum along with other possible etiological factors. The present study only observed the types in the sample and showed a higher predominance of the gingival attachment (58%), followed by the mucosal, papillary and papillary penetrating by 38%, 2% and 0.5% respectively. Deepa²¹ in her study on children below 6 years assessed the relationship of diastema and maxillary frenum and found the gingival and papillary types to be higher in children with diastemas. On the other hand a study by Boutsis²² recorded a higher percentage of papillary penetrating in their sample and was concluded to be the main type in diastema. These studies have been done specifically on patients with diastema, whereas the present study is on all patients reporting to the hospital irrespective of diastema presence.

An abnormal upper labial frenum is proficient of retracting the gingival margin, creating a diastema, limiting lip movement, and in cases of a high smile line, affecting esthetics also.²³ Frenectomy is advised when an abnormal frenum is present. The frenum comes under the classification of pathogenic when it is unusually wide or there is no evident zone of attached gingiva along the midline or the interdental papilla shifts when frenum is extended.

It is of utmost importance that due weightage should be given to frenum assessment during oral examination in order to avoid misdiagnosis of normal variations as abnormal frenum. It is also necessary to correctly diagnose the etiological factors behind a malformed labial frenum in order to proceed with the best possible intervention relevant to the specific etiology for the dental treatment to continue successfully. A greater amount of emphasis should be applied on the proper examination of the frenum during routine dental checkup in the outpatient departments. Also its relevance to smile esthetics and being one of the leading causes of diastema, further makes it important to properly identify the frenum before

orthodontic treatment so that proper planning for a successful outcome is achieved.

Still further studies are required to evaluate the association of development of the maxillary labial frenum in different age groups and its subsequent appearance to intervene at the proper time in case of an abnormal occurrence.

Conclusions

When considering the morphology of maxillary labial frenum the simple frenum showed the highest occurrence followed by the persistent tectolabial type in genders. Gingival type presented with the highest frequency followed by the mucosal type when attachment types were evaluated. Gender wise distribution of attachment was almost the same.

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