Morphological and attachment site variations of maxillary labial frenulum

Jelena Lečić¹, Svjetlana Janković², Bojana Davidović², Ana Cicmil¹, Olivera Govedarica¹, Smiljka Cicmil¹

¹University of East Sarajevo, Faculty of Medicine, Department of Periodontology and Oral medicine, Foča, Bosnia and Herzegovina;
²University East Sarajevo, Faculty of Medicine, Department of Pediatric and Preventive Dentistry, Foča, Bosnia and Herzegovina

SUMMARY
Introduction Maxillary labial frenulum (MLF) is a mucous membrane fold that shows diversity in morphology, position and clinical significance throughout life. The aim of the study was to evaluate different morphological variations and MLF attachment site prevalence in elementary school children.

Material and methods The study included 110 children of “Ljutica Bogdan” Primary School in Kalinovik, Bosnia and Herzegovina. Clinical examinations were performed visually under natural light. The upper lip was lightly elevated with the forefingers and thumbs of both hands in horizontal alignment from alveolar ridge. Morphological variations were registered in accordance with Sewerin classification and attachment site according to Placek et al.

Results The study included 49 (44.6%) male and 61 (55.4%) female subjects. Mucosal MLF was registered in 57.3%, gingival in 17.3%, papillary in 20.9% and papilla penetrating in 4.5% of examined children. Frenulum simplex was registered in 64.6%, persistent tectolabial frenulum in 4.5%, frenulum with appendix in 9.1%, frenulum with nodule in 14.5%, duplication of frenulum in 5.5%, frenulum with two or more variations was registered in 1.8% of respondents. No difference was observed in morphological variations and attachment site positions between genders.

Conclusion Most prevalent MLF morphological type was frenulum simplex and mucosal attachment site. Familiarity with MLF morphology, attachment site position as well as prevalence of different variations is very important in everyday clinical practice from the aspect of proper oral hygiene maintenance, periodontal disease prevention, orthodontic treatment and proper surgical therapy.

Keywords: maxillary labial frenulum; morphology; attachment; children

INTRODUCTION

Maxillary labial frenulum (MLF) is a mucous membrane fold that shows diversity in morphology, position and clinical significance throughout life. This dynamic structure connects lip and periosteum of the upper jaw alveolar ridge. It contains epithelium, collagen fibers, blood vessels, nerves and occasionally minor salivary glands, as well as isolated stratified muscle fibers [1]. In 1971, Sewerin [2] described and classified eight morphological variations of the MLF. Based on the anatomical position of attachment site, Placek et al. [3] classified the MLF to four different types. These two classifications are most frequently used in the literature to date.

If the frenulum is too coronary positioned, oral hygiene may be difficult to maintain, it would create a retention site for accumulation of dental plaque, and contribute to development of caries and periodontitis [4]. The traction of frenulum positioned in such manner can contribute to localized gingival recession, diastema between central incisors and compromise course and success of orthodontic treatment [5]. All of the above indicate need for timely surgical correction of MLF in order to prevent possible complications.

On the other hand, given the morphological diversity of the MLF and the fact that it shows the tendency of decreasing and apical displacement during growth and development [6], it is important to correctly identify and distinguish possible variations in order to avoid erroneous indications for surgical intervention [7].

Since the literature provides no data on MLF diversity in this area, the aim of our study was to evaluate prevalence of different morphological variations as well as MLF attachment site prevalence rates in elementary school children.

MATERIALS AND METHODS

The research was conducted in accordance with the Helsinki Declaration and principles of Good Clinical Practice. The study included 110 respondents, the pupils of the “Ljutica Bogdan” Primary School in Kalinovik, Republica Srpska, Bosnia and Herzegovina. Respondents and

Address for correspondence: Jelena LEČIĆ, Medicinski fakultet Foča, Studentska 5, 73300 Foča, Bosnia and Herzegovina; jelena.lecic@ues.rs.ba
parents were informed about the nature of research. The study included only systemically healthy children who did not have orofacial defects, with no prior surgical interventions at the MLF and whose parents gave their consent in writing. Clinical examinations were performed by visual method under natural light. The upper lip was lightly elevated with the forefingers and thumbs of both hands in a horizontal alignment from the alveolar ridge.

MLF attachment site position was registered based on the classification according to Placek and associates [3] in the following way:

- Mucosal Frenulum – The coronary end of the frenulum extends to the muco-gingival margin.
- Gingival frenulum – The coronary end of the frenulum is attached on attached gingiva.
- Papillary frenulum – The coronary end of the frenulum is attached to interdental papilla.
- Papilla penetrating frenulum – The coronary end of the frenulum attaches to interdental central papilla or goes on palatal side or even to papilla incisive.

Morphological variations of MLF were registered in accordance with classification by Sewerin [2] as follows:


Statistical data processing was performed using SPSS 22 (SPSS for Windows, version 22, Chicago, IL). Descriptive analysis was used to determine the prevalence of different MLF morphological as well as attachment sites variations. The χ2 test was used to analyze the relationship between individual MLF variations and gender of the subjects. Statistical significance was determined at p < 0.05.

RESULTS

The study included 49 (44.6%) male and 61 (55.4%) female subjects.

When the attachment site position was observed, the following data were obtained: mucosal MLF (Figure 1) was recorded in 57.3%, gingival (Figure 2) in 17.3%, papillary (Figure 3) in 20.9%, papilla penetrating (Figure 4) in 4.5% of examined children. No difference was observed in relation to MLF attachment site position between genders (p > 0.05) (Table 1).

Frenulum simplex (Figure 5) was the most common and registered in 64.6% of respondents. Persistent tectolabial frenulum (Figure 6) in 4.5%, frenulum with appendix (Figure 7) in 9.1%, frenulum with nodule (Figure 8) was observed in 14.5% and duplication of frenulum (Figure 9) in 5.5% of subjects. Bifid frenulum and recess of the frenulum were not registered, while the frenulum with two
or more variations was registered in 1.8% of respondents. No difference in MFL morphological variations was observed between genders ($p > 0.05$) (Table 2).

**DISCUSSION**

A variety of MLF morphology is noticed in everyday clinical practice. According to the literature, certain MLF may cause difficulty in speaking, mastication, aesthetics and denture retention. If MLF attachment site is located near or across the gingival margin it may make oral hygiene maintenance difficult, pull gingiva away from the tooth and consequently facilitate dental plaque accumulation, contributing to the creation of periodontal pockets and/or causing recession of the gingiva [4] Placek et al. [8] indicated that gingival, papillary and penetrating papillary MLF contributed to lower periodontal resistance in people with periodontal disease.

Some authors suggest that penetrating papillary frenulum may lead to diastema between central incisors, and its
To the results of our study (4.5%). While making a final decision that involves treatment of this form of frenulum, one should also have in mind the fact that during growth and development, MLF changes attachment site in terms of apical displacement up to fifteen years of age [6], and a large percentage of persistent tectolabial frenulums observed in deciduous dentition evolves over time into a simple form [1]. Unlike the results of other studies where frenulum duplication was not observed [6, 14], it was registered in 5.5% of respondents of our study. Bifid frenulum and recess of the frenulum were not recorded in our study, what is in accordance with the literature data that states that their presence in the population is less than 1%. [1] Frenulum with two or more variations was recorded in 1.8% of respondents of this study, and in 0.71% of respondents in the study of Thosar et al. [14]. In some other studies this morphological variation was not observed [1, 15]. In our study as well as in the study of Obradović et al. [6], there was no statistically significant difference in relation to different MFL morphologic types between genders while Jindal et al. [4] recorded greater presence of simple frenulum, frenulum with appendix and frenulum with nodule in females.

**CONCLUSION**

Maxillary labial frenulum is prone to certain changes during growth and development of children. This fact should be kept in mind when diagnosing as well as undertaking certain therapeutic procedures. Frenulum simplex and mucosal attachment were the most common forms of MLF in our study. Familiality with MLF morphology, attachment site position as well as prevalence of different MLF attachment sites in relation to gender was not observed in our study, which is consistent with the results of other studies [5, 6].

In the current study, the most frequent morphological MFL variation was simple frenulum, and that is consistent with previous studies [1, 2, 6, 7]. Second morphological variation by frequency in our study was simple frenulum with nodule, as recorded in the studies of Nagaveni and Umashankara [1], Townsenda et al. [7] as well as Thosar et al. [14]. Unlike those, in the Obradović et al. study [6] simple frenulum with an appendix was second by frequency. Frenulum with a nodule and frenulum with appendix were present in 14.5% and 9.1% subjects in our study, respectively. It is interesting to note that these variations, which do not have any pathogenic potential, may be misunderstood as lesions and be subjected to unnecessary surgical intervention, biopsy. Large number of conducted MLF biopsies suggests a lack of knowledge about these normal oral structures [7].

In the study of Mohan et al. [15] persistent tectolabial frenulum was observed in 5.63% of subjects, which is similar to the results of our study (4.5%). While making a final decision that involves treatment of this form of frenulum, one should also have in mind that early (preventive) removal of MLF may result in fibrous tissue formation that can by itself prevent mesial displacement of incisors and diastema closure [9]. Accordingly, MLF surgery should not be performed until permanent canines erupt. Surgical treatment is recommended only in cases when diastema persists even after their eruption [10]. One of the easiest and most commonly used tests for indicating MLF treatment is Graber’s test. The test is positive if after lifting upper lip, maxillary labial frenulum tissue together with interdental papilla becomes ischemic [11].

Mucosal MLF attachment was registered in majority of subjects involved in this study, and the least prevalent was penetrating papillary frenulum, what is consistent with the results of Jancuk et al. [12] and Obradović et al. [6] who reported most common gingival frenulum attachment (76%) and the least present papillary penetrating frenulum (2%) in 100 students at the Faculty of Medicine. In the study conducted by Kaimeny et al. [13] none of the children who participated in the study had penetrating papillary frenulum.

The difference in the prevalence of different MLF attachment sites in relation to gender was not observed in our study, which is consistent with the results of other studies [5, 6].

In the current study, the most frequent morphological MFL variation was simple frenulum, and that is consistent with previous studies [1, 2, 6, 7]. Second morphological variation by frequency in our study was simple frenulum with nodule, as recorded in the studies of Nagaveni and Umashankara [1], Townsenda et al. [7] as well as Thosar et al. [14]. Unlike those, in the Obradović et al. study [6] simple frenulum with an appendix was second by frequency. Frenulum with a nodule and frenulum with appendix were present in 14.5% and 9.1% subjects in our study, respectively. It is interesting to note that these variations, which do not have any pathogenic potential, may be misunderstood as lesions and be subjected to unnecessary surgical intervention, biopsy. Large number of conducted MLF biopsies suggests a lack of knowledge about these normal oral structures [7]. In the study of Mohan et al. [15] persistent tectolabial frenulum was observed in 5.63% of subjects, which is similar to the results of our study (4.5%). While making a final decision that involves treatment of this form of frenulum, one should also have in mind the fact that during growth and development, MLF changes attachment site in terms of apical displacement up to fifteen years of age [6], and a large percentage of persistent tectolabial frenulums observed in deciduous dentition evolves over time into a simple form [1]. Unlike the results of other studies where frenulum duplication was not observed [6, 14], it was registered in 5.5% of respondents of our study. Bifid frenulum and recess of the frenulum were not recorded in our study, what is in accordance with the literature data that states that their presence in the population is less than 1%. [1] Frenulum with two or more variations was recorded in 1.8% of respondents of this study, and in 0.71% of respondents in the study of Thosar et al. [14]. In some other studies this morphological variation was not observed [1, 15].

In our study as well as in the study of Obradović et al. [6], there was no statistically significant difference in relation to different MFL morphologic types between genders while Jindal et al. [4] recorded greater presence of simple frenulum, frenulum with appendix and frenulum with nodule in females.

**REFERENCES**


Received: 15.01.2019 • Accepted: 09.04.2019
Zastupljenost različitih morfoloških varijacija i nivoa pripoja frenuluma gornje usne kod dece

Jelena Lečić1, Svjetlana Janković2, Bojana Davidović2, Ana Cicmil1, Olivera Govedarica1, Smiljka Cicmil1

1Univerzitet u Istočnom Sarajevu, Medicinski fakultet, Katedra za parodontologiju i oralnu medicinu, Foča, Bosna i Hercegovina; 2Univerzitet u Istočnom Sarajevu, Medicinski fakultet, Katedra za dečju i preventivnu stomatologiju, Studijski program Stomatologija, Foča, Bosna i Hercegovina

UVOD

Frenulum gornje usne (FGU) predstavlja nabor sluzokože koji pokazuje raznolikost u morfologiji, poziciji i kliničkom značaju tokom života. Ova dinamična struktura povezuje usne i alveolarni nastavak gornje usne. Ako je frenulum postavljen isuviše koronarno, može otežati održavanje oralne higijene, prevenciju parodontalnih oboljenja, uspeh ortodontske terapije i pravilno postavljanje indikacija za hiruršku intervenciju [7].

MATERIJAL I METODOLOGIJA

Istraživanje je sprovedeno u skladu sa Helsinškom deklaracijom i Princima dobre kliničke prakse. U studiju su uključeni 110 ispitanika, tj. učenika Osnovne škole „Ljutica Bogdan“ u Kalinoviku, Republika Srpska, Bosna i Hercegovina. Ispitanici su uključeni samo sistemski zdrava dece koja nisu imala oro-facijalne defekte, kod kojih nije rađena hirurška intervencija na FGU i čiji su roditelji pismenim putem dali svoj pristanak za pregled. Klinički pregledi su izvedeni vizuelnom metodom pod prirodnim osvetljenjem. Gornja usna je lagano ekartirana kažiprstima i palčevima obe ruke u horizontalnom smeru.

Za dijagnostiku nivoa pripoja FGU korišćena je klasifikacija prema Plačeku i saradnicima [3] na sledeći način:

– Mukozni frenulum: Koronarni kraj frenuluma se pruža do mukogingivalne granice.
– Gingivalni frenulum: Koronarni kraj frenuluma se pruža na fiksiranu gingivu.
– Papilarni frenulum: Koronarni kraj frenuluma se pruža na interdentalnu papilu.
– Penetrirajući papilarni frenulum: Koronarni kraj frenuluma zahvata interdentalnu centralnu papilu i prelazi na njenu palatalnu stranu ili čak zahvata papilu incizivu.

Morfološki tipovi FGU su registrovani u skladu sa klasifikacijom prema Severinu [2] na sledeći način:

1. jednostavni frenulum; 2. perzistentni tektolabijalni; 3. jednostavni frenulum sa apendiksom; 4. jednostavni frenulum sa nodulom; 5. dvostruki frenulum; 6. frenulum sa nišom; 7. bifidni frenulum; 8. frenulum sa godišnjim razvojem.

Statistička obrada podataka je izvedena uz pomoć programa SPSS 22 (SPSS for Windows, version 22, Chicago, Ill.). Deskriptiv-
nom analizom je određena zastupljenost različitih morfoloških tipova, kao i nivoa pripoja FGU. Chi-test je korišćen za analizu odnosa pojedinih tipova FGU i pola ispitanika. Statistička značajnost je određena na p < 0,05.

REZULTATI

U studiju je uključeno 49 (44,6%) ispitanika muškog i 61 (55,4%) ispitanika ženskog pola.

Kada je nivo pripoja u pitanju, dobijeni su sledeći podaci: mukozni FGU (Slika 1) registrovan je kod 57,3%, gingivalni (Slika 2) kod 17,3%, papilarni (Slika 3) kod 20,9%, a penetrirajući papilarni FGU (Slika 4) kod 4,5% pregledane dece. Nije primetena razlika u zastupljenosti različitih nivoa pripoja FGU između polova (p > 0,05) (Tabela 1).

Jednostavni frenulum (Slika 5) bio je najzastupljeniji i registrovan je kod 64,6% ispitanika, perzistentni tектолабijalni frenulum (Slika 6) kod 4,5%, jednostavni frenulum sa apendiksom (Slika 7) kod 9,1%, jednostavni frenulum sa nodulom (Slika 8) uočen je kod 14,5%, te dvostruki frenulum (Slika 9) kod 5,5%. Bifidni frenulum i frenulum sa nišom nisu registrovan, dok je frenulum s dve ili više varijacija registrovan kod 1,8% ispitanika. Nije uočena razlika u zastupljenosti različitih morfoloških tipova FGU između polova (p > 0,05) (Tabela 2).

DISKUSIJA

U svakodnevnoj kliničkoj praksi se primećuje raznolika morfologija FGU. Prema navodima iz literature, određeni FGU za posledicu mogu da imaju potencijal u govoru, mastikaciji, estetici, kao i retenciji mobilnih protetika u odnosu na zdrave. Jednostavni frenulum i mukozni pripoj su najzastupljeniji i rečeni studiji je jednostavni frenulum sa nodulom, kao što su zabeležili Nagaveni i Umashankara [1], Townsenta i sar. [7], Thosara i sar. [14], u svojim studijama. Za razliku od pomenuta, u studiji Obradovića i sar. [6] jednostavni frenulum sa apendiksom je bio drugi po zastupljenosti.

ZAKLJUČAK

Frenulum gornje usne je sklon određenim promenama tokom rasta i razvoja deteta. Tu činjenicu treba imati na umu da tokom rasta i razvoja ona se povećava u veličini i značajnosti [1]. U stvarajuju ovoj varijaciji treba razmotriti i druga moguća varijacije, među kojima su izvedeni primjeri određenih studija. Interesantno je prihvatiti činjenicu da ove varijacije, koje nemaju patogeni potencijal, mogu biti pogrešno interpretirane kao povrede koje nemaju boljeg uspeha u kliničkoj praksi [7].