ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 4, Issue – 3, May - 2021, Page No. : 114 - 120

Prevalence of variations in maxillary labial frenum attachment among various skeletal malocclusions - a cross sectional study

[1]Dr. Shashikanth Hegde, Professor, Department of Periodontology, Yenepoya Dental College, Manglore, India

[2]Dr. S. Sai Sravan, Post graduate, Department of Periodontology, Yenepoya Dental College, Manglore, India

[2]Dr. Rajesh Kashyap S, Professor and Head, Department of Periodontology, Yenepoya Dental College, Manglore, India

[4]Dr. Arun Kumar M. S, Professor, Department of Periodontology, Yenepoya Dental College, Manglore, India

[5]Dr. Vinita Boloor, Professor, Department of Periodontology, Yenepoya Dental College, Manglore, India

[6]Dr. Priyanka Menon, Post graduate, Department of Periodontology, Yenepoya Dental College, Manglore, India

Corresponding Author: Dr. S. Sai Sravan, Post graduate, Department of Periodontology, Yenepoya Dental College, Manglore, India

Citation of this Article: Dr. Shashikanth Hegde, Dr. S. Sai Sravan, Dr. Rajesh Kashyap S, Dr. Arun Kumar M. S, Dr. Vinita Boloor, Dr. Priyanka Menon, "Prevalence of variations in maxillary labial frenum attachment among various skeletal malocclusions - a cross sectional study", IJDSIR- May - 2021, Vol. – 4, Issue - 3, P. No. 114 – 120.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: Frenal attachments are thin folds of mucous membrane with enclosed muscle fibers that attach the lips to the alveolar mucosa and underlying periosteum. Most often, during the oral examination of the patient the dentist gives very little importance to the frenum, for assessing its morphology and attachment. However, it has been seen that an abnormal frenum can be an indicator of a syndrome or can cause severe mucogingival problems.

Objective: To assess the most prevalent type of maxillary labial frenum based on its attachment in class I, class II and class III skeletal malocclusion patients.

Materials and Methods: The present cross-sectional study enrolled 96 patients comprising both males and females within the age group of 18 – 30 years. Patients who were subjected for fixed orthodontic therapy were included in the study.

Based on the skeletal pattern, the selected patients were grouped into

Group A - Skeletal class I patients (32 patients)

Group B - Skeletal class II patients (32 patients)

Group C - Skeletal class III patients (32 patients)

The clinical diagnosis of frenal attachment is made by pulling the lip outwards and upwards in maxillary arch and outwards and downwards in the mandibular arch.

The frenal attachment was recorded according to the classification by Mirko et al. (1974). The data was arranged in a tabulated form and analyzed using SPSS software. Chi square test was used for the analysis of the data.

Results: Out of 96 study participants, gingival type (39.58%) was most prevalent followed by papillary (27.08%), mucosal (26.04%), and papillary penetrating type (7.29%). There is no statistical significant difference between the type of maxillary labial frenum based on its attachment in class I, II and III skeletal malocclusions

Conclusion: A labial frenum that is attached close to the gingival margin could be an etiological factor in midline diastema, mucogingival problems, and affect the growth of the alveolar process. Hence, an early diagnosis of abnormal frenum prevents the emergence of periodontal as well as orthodontic problems.

Keywords: Diastema, Frenal attachment, Mucogingival problems, Skeletal malocclusion.

Introduction

Frenulum labii superioris also commonly known as maxillary labial frenum is a mucosal fold that attaches upper lip to alveolar mucosa, gingiva and the periostium.[1] Histologically, it is made of loose connective tissue fibers, abundance of elastic fibers, and mucous glands in the subcutaneous tissue on either side of the central artery and vein.[2] The significance of the high attachment of the labial frenum in the etiology of some types of the periodontal disease has been widely acknowledged.[3] Orthodontic and anatomic approaches have led many authors to classify the type of the frenum exclusively according to the morphological means.[4] From the periodontal point of view, however, the evaluation of the frenum-periodontium interrelations would seem to be worthwhile.[5]

Frena are often seen in maxilla and mandible in midline or premolar region. Maxillary labial and mandibular labial and lingual frenum are most notable frenum of oral cavity. Its primary function is to provide stability of upper and lower lip and the tongue and to retain the lip in harmony with the growing bones of the maxilla. The extent of their involvement in mastication is still not clear.[6] Aberrant frenal attachment leads to diastema, promotes plaque accumulation, gingival recession, bone loss and hinders proper smiling and speaking. It also has septomaxillary ligament that transmits septal growth force to premaxilla.[7]

The size and location of the frenum varies among individuals and it inserts into the soft tissues covering the alveolar process. When the frenum inserts into the gingiva in a manner that allows the frenum to retract the gingival margin, to facilitate diastema development, or to limit lip movement, it is considered abnormal.[8,9] Delaire had explained anatomic and neurophysiologic correlations existing between the labial frenum, septopremaxillary ligament, and interincisal suture which are important determinants of vertical and anteroposterior relationship of mandible and nasomaxillary complex. He further stated that inadequate muscular reconstruction and mutilation of the labial frenum could result in growth abnormalities.[10]

Most often, during the oral examination of the patient the dentist gives very little importance for frenum examination, for assessing its morphology and attachment. However it has been seen that abnormal frenum can be an indicator of a syndrome.[6] A torn labial frenum can be a indicator of child abuse.[11] Biber JT[12] in his review article has documented various complication resulting from oral piercings. Of the different piercing sites in the mouth, maxillary labial frenum piercing is also popular and can result in complications.[13]

A frenum can become problematic if tension from lip movement pulls the gingival margin away from the tooth, or if the tissue hinders the closure of a diastema during orthodontic treatment. There are various syndromes associated with relatively specific frenal abnormalities, ranging from multiple, hyper plastic, hypoplastic, or an absence of frena which includes Ehlers-Danlos syndrome,

Infantile hypertrophic pyloric stenosis, Holoprosencephaly, Ellis-van Creveld syndrome, and Oro-facial-digital syndrome.[14] Aim of the present study was to assess the most prevalent type of maxillary labial frenum based on its attachment in class I, class II and class III skeletal malocclusion patients.

Materials and Methods

A cross-sectional study was conducted in 96 adults consisting of both males and females with an age ranging from 18 to 30 years who were undergoing orthodontic treatment in our institution. The study protocol was approved by the Institutional Ethics Committee and a written informed consent was obtained from the study participants. The participants who had any congenital/developmental defects, trauma/injuries in the premaxillary region, history of prior orthognathic/frenal surgeries, and under any medication known to affect the gingiva were excluded from the study. Demographic details such as age and gender were recorded. These mean values of the variables are shown in Table.

Sn.	Group	Mean age (SD)	Males	Females	Total
1	Class 1	24.44 (4.165)	16	16	32
2	Class 2	25.22 (4.094)	14	18	32
3	Class 3	26.00 (3.767)	20	12	32
Over all study sample		25.22 (4.022)	50	46	96

Table 1: Mean age and gender distribution in each group

The study participants were categorized into Class I, Class II, and Class III skeletal pattern (32 individuals in each of the three groups) based on the cephalometric variables. Using the standardized digital lateral cephalogram which is then digitized.

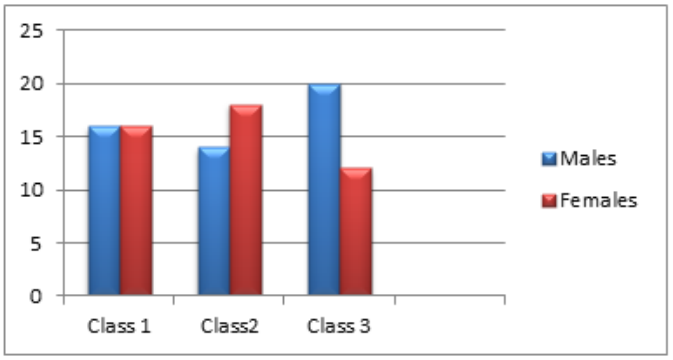
Clinical examination of the frenum was conducted in the dental chair under adequate light by a single examiner. Attachment site of the frenum and its morphology were examined under direct visual method, by upward distension of the upper lip following which intraoral photographs were taken for all the study participants.

Results

Data were analyzed using IBM SPSS Statistics Base 24.0, SPSS South Asia Private Limited, Bangalore, India. Descriptive statistics and Chi-square tests were performed to evaluate the difference in the prevalence of frenum typology in three groups. $P < 0.05$ was considered to be statistically significant. The mean age of the individuals and gender distribution in Class I, Class II, and Class III skeletal pattern are shown in Table 1. In Class I group the mean age was 24.44±4.165 years, in Class II the mean age was 25.22±4.094 years and in class III the mean age was 26.00±3.767 years. In Class I there were 16 males and 16 females. In Class II there were 14 males and 18 females. In Class III there were 20 males and 12 females.

Sn.	Type of Frenal attachment	Gender		Total	P Value
		Males	Females		
1	Mucosal	12	13	25	0.889
2	Gingival	19	19	38	
3	Papillary	15	11	26	
4	Papillary penetration	4	3	7	

Table 2: Maxillary labial Frenal attachment based on Gender



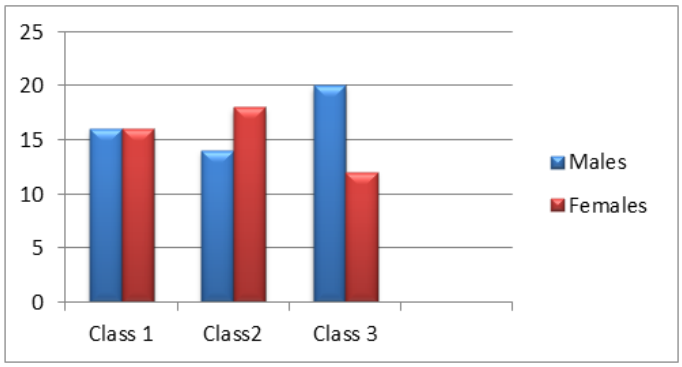
Graph 1: Distribution of study subjects based on occlusion and gender

No statistical significant difference was observed in males and females for different types of frenum based on the attachment site.

Table 3 shows the overall comparison of maxillary labial frenum attachment site in all three groups.

Sn.	Groups	Mucosal	Gingival	Papillary	Papillary Penetration	P Value
1	Class 1	9	16	6	1	0.512
2	Class 2	7	12	9	4	
3	Class 3	9	10	11	2	
Total		25	38	26	7	

Table 3 : Maxillary labial Frenal attachment based on type occlusion



Graph 2: Distribution of study subjects based on occlusion and Frenal attachment

Out of 96 study participants, gingival type (39.58%) was most prevalent followed by papillary (27.08%), mucosal (26.04%), and papillary penetrating type (7.29%). There is no statistical significant difference between the proportion of the gingival type which is the most prevalent in Class I (50%) and Class II (37.5%) than Class III (31.25%). The cumulative percentage of papillary and papillary penetrating type of attachment is more in Class II and III (40.60%).

Discussion

Since the frenum is in passive relation with the growth of the alveolar process,[15] an attempt is made to study the prevalence of frenum in various skeletal patterns based on the attachment site and the morphology of frenum. The primary role of the frenum is to provide stability to the upper lip and to maintain a balance between the growing bones.[16,17] The pull on the septopremaxillary ligament which is enclosed in the frenum induces alveolar basal bone development and translative growth of entire maxilla.[18] Pushing of the nasal septal cartilage is transmitted to the anterior nasal spine by the septopremaxillary ligament and the nasolabial muscles.[19] Henceforth, the displacement of the maxilla downward and forward occurs by the direct thrust of the septal cartilage, biomechanical forces exerted by the forward traction of the nasolabial muscles, and the induction mechanism emanating from the septopremaxillary ligament and maxillary labial frenum resulting in forward traction of premaxilla.[20] When the frenum is in close proximity to the gingival margin, it limits the movement of these structures, particularly the anterior portion of the maxilla.[21,22] An adequate zone of attached gingiva is essential for maintaining the gingival health.[23] Hence, a frenum which is inordinately large and wide with no apparent zone of attached gingiva in the permanent dentition and/or when the interdental papilla shifts when the frenum is extended, is said to be pathogenic.[9,24] It interferes with plaque control measures and leads to gingival recession and periodontal pocket.[5,16,17] The frenal attachment is considered normal when it is attached apically away from the gingival margin, usually at the mucogingival junction[21] and does not exert pull on the attached or marginal gingival (pull syndrome).[5]

As suggested in literature, there are several variations found in upper labial frenum. These variations can be classified according to attachment of fibers of frenum or can be structural variations in frenum. It has been considered that papillary and papilla penetrating frena are pathologic.[25,26] In a study done by Mirko et al.[5] it was proposed that different type of frenal attachment

influences the periodontal condition with gingival, papillary, and papilla penetrating types of maxillary frenal attachments showing lower periodontal resistance in persons with pathologic changes as compared to healthy persons with similar frenal attachment. There are very few studies that have been published pertaining to the type of the upper labial frenum and its prevalence.

In this study, the prevalence of gingival frenal attachment was found to be most common (39.58%) with papillary frenal attachment as second (27.08%) followed by mucosal (26.04%) with papillary penetrating type (7.29%) least common. In the similar study done by Mirko et al.[5] the prevalence was found to be as mucosal (46.6%), gingival (34.3%), papillary (3.1%), and papillary penetrating (16.1%). Our study results are in contrast with that of study by vikas jindal et al,[23] the prevalence of mucosal frenal attachment was found to be most common (66.0%) followed by gingival frenal attachment (28.4%), papillary penetrating (3.2%) and papillary type (2.40%). The difference in results in this study as compared to Mirko et al.[5] and Vikas jindal et al[23] could be due to the diversity of population. In gender-based comparison, no statistically significant difference was found which was similar to the study done by Townsend et al.[27]

According to the present study, there were 28.1% subjects in Class I, 21.8% subjects in class II and 28.1% subjects in Class III with mucosal attachment. There were 50% subjects in Class I, 37.5% subjects in class II and 31.25% subjects in Class III with gingival attachment. There were 18.7% subjects in Class I, 28.1% subjects in class II and 34.37.25% subjects in Class III with papillary attachment. There were 3.12% subjects in Class I, 12.5% subjects in class II and 6.25% subjects in Class III with papilla penetrating attachment type.

A study done by Christabel SL[15] found that there were no papillary and papilla penetrating varieties of frenum in the permanent dentition which is in contrast to our study where we found 27.08% and 7.29% of papilla and papilla penetrating respectively. Our study results are in contrast with the studies done by Rajani ER et al[28] and Tony Varghese et al[29] in which they found the prevalence of papillary and papilla penetrating type of frenum are significantly more in Class III skeletal pattern.

Conclusion

Though the earlier studies have shown that papillary and papilla penetrating frenal attachment more comman in skeletal II and III malocclusion, present study did not show any significant association between frenal attachment and skeletal malocclusion. However aberrant frenum can interfere with the success of periodontal therapy and can manifest in various mucogingival problems and even in post orthodontic relapse. Early diagnosis of aberrant frenum is the key in preventing its consequences on periodontal health.

References

1. Kotlow L. Diagnosis and treatment of ankyloglossia and tied maxillary frenum in infants using Er:YAG and 1064 diode lasers. Eur Arch Paediatr Dent 2011;12:106-12.
2. Noyes HJ. The anatomy of frenum labia in newborn infants. Angle Orthod 1935;5:3-8.
3. Corn, H.: "Technique for Repositioning the Frenum in Periodontal Problems," In: H. E. Grupe D.D.S., Ed.: Dent. Clin. North Am., P: 79-98, W. B. Saunders Company, Philadelphia, London, 1964.
4. Crowley, R. E.: "An Anatomic Anomaly of the Maxillary Labial Frenum." Amer. J. Orthodont., 42:142, 1956.
5. Mirko P, Miroslav S, Lubor M. Significance of the labial frenum attachment in periodontal disease in man. Part 1. Classification and

epidemiology of the labial frenum attachment. J Periodontol. 1974 Dec;45(12):891-4.

6. Mintz SM, Siegel MA, Seider PJ. An overview of oral frena and their association with multiple syndromes and nonsyndromic conditions. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2005;99:321–324.
7. Hall BK, Precious DS. Cleft lip, nose, and palate: the nasal septum as the pacemaker for midfacial growth. Oral Surg Oral Med Oral Pathol Oral Radiol. 2013;115:442–447.
8. Devishree, Gujjari SK, Shubhashini PV. Frenectomy:A review with the reports of surgical techniques. JCDR 2012;6:1587-92.
9. Abraham R, Kamath G. Midline diastema and its aetiology- A review. Dent Update 2014;41:457-60, 462-4.
10. Delaire J. The potential role of facial muscles in monitoring maxillary growth and morphogenesis. In: Carlson DS, McNamara JA, editors. Muscle Adaptation in the Craniofacial Region. Monograph no. 8. Craniofacial Growth Series. Ann Arbor, (MI): The University of Michigan; 1978. p. 157-80.
11. Macintyre DR ,Jones GM, Pinckney RC .The role of dental practitioner in the management of non – accidental injury to children.Br Dent J 1986;1616;3:108-110.
12. Biber JT. Oral piercing ; The Hole story .Northwest Dent 2003 Jan Feb ; 82(1);13-17.
13. Folz BJ, Lippert BM,Kuelkens C and Werner JA. Jewellery induced diseases of the head and neck. Ann PlastSurg 2002 ; 49 (3):264-71.
14. Priyanka M, Sruthi R, Ramakrishnan T, Emmadi P, Ambalavanan N. An overview of frenal attachments. J Indian Soc Periodontol. 2013;17:12–15.
15. Christabel SL, Gurunathan D. Prevalence of type of frenal attachment and morphology of frenum in children, Chennai, Tamil Nadu. World J Dent 2015;6:203-7.
16. Northcutt ME. The lingual frenum. J Clin Orthod 2009;43:557-65.
17. Kashyap RS, Zareena, Hegde S, Kumar AM. Management of aberrant frenum: A case report. IOSR J Dent Med Sci 2015;14:10-3.
18. Frankel R, Frankel C. Orofacial Orthopedics with the Function Regulator. Basel: Karger Publications; 1989.
19. Precious D, Delaire J. Balanced facial growth: A schematic interpretation. Oral Surg Oral Med Oral Pathol 1987;63:637-44.
20. Standerwick RG, Roberts WE. The aponeurotic tension model of craniofacial growth in man. Open Dent J 2009;3:100-13.
21. Bervian J, Cazarotto F, Perussolo B, Patussi EG, Pavinatto LC. Description of the upper labial frenulum characteristics in preschool children of Passo Fundo, Brazil. Braz Res Pediatr Dent Integr Clin 2016;16:351-7.
22. Kotlow LA. Oral diagnosis of abnormal frenal attachments in neonates and infants: evaluation and treatment of the maxillary and lingual frenum using the Erbium: YAG Laser. J Pediatr Dent Care 2004;10:11-4.
23. Jindal V, Kaur R, Goel A, Mahajan A, Mahajan N, Mahajan A, et al. Variations in the frenal morphology in the diverse population: A clinical study. J Indian Soc Periodontol 2016;20:320-3.
24. Miller PD Jr. The frenectomy combined with a laterally positioned pedicle graft. Functional and

esthetic considerations. J Periodontol 1985;56:102-6.

25. Chaubey KK, Arora VK, Thakur R, Narula IS. Perio-esthetic surgery: Using LPF with frenectomy for prevention of scar. J Indian Soc Periodontol 2011;15:265-9.
26. Dewel BF. The labial frenum, midline diastema, and palatine papilla: A clinical analysis. Dent Clin North Am 1966;1:175-84.
27. Townsend JA, Brannon RB, Cheramie T, Hagan J. Prevalence and variations of the median maxillary labial frenum in children, adolescents, and adults in a diverse population. Gen Dent 2013;61:57-60.
28. Rajani ER, Biswas PP, Emmatty R. Prevalence of variations in morphology and attachment of maxillary labial frenum in various skeletal patterns - A cross-sectional study. J Indian Soc Periodontol 2018;22:257-62.
29. Varghese T, Kalburgi V, Dodani K, Nagpa NP. Various morphological variations in attachment of maxillary labial frenum: an observational study. J Res Adv Dent. 2018;8(1):189-92.