

## Association Of High Frenal Attachment And Midline Diastema

Research Article

Faazila Fathima<sup>1</sup>, Aravind Kumar Subramanian<sup>2\*</sup>, Senthil Murugan P<sup>3</sup><sup>1</sup> Saveetha Dental College And Hospitals, Saveetha Institute Of Medical and Technical Sciences, Saveetha University, Chennai, 600050, India.<sup>2</sup> Professor and Head, Department of Orthodontics, Saveetha Dental College and Hospitals, Saveetha Institute Of Medical And Technical Sciences, Saveetha University, Chennai, India.<sup>3</sup> Associate Professor, Department of Oral Surgery, Saveetha Dental College and Hospitals, Saveetha Institute Of Medical and Technical Science, Saveetha University, Chennai 77, India.

## Abstract

Midline diastema is a space between the maxillary or mandibular central incisors. It can be due to various etiology such as genetic, environmental, and so on. The presence of diastema between the central incisors in the adult patient has esthetics and malocclusion concerns. Proper history taking and correct diagnosis of the etiology of diastema is essential to ensure successful orthodontic correction, and no future relapse. This study aims to evaluate the association between high frenal attachment and midline diastema. 700 orthodontic patients were included in the study. The prevalence of midline diastema and high frenal attachment in these patients were evaluated. The data was entered in SPSS and analyzed through the Chi square test. From the study it was observed that high frenal attachment was present in 38.8% of the patients with midline diastema. High frenal attachment showed more prevalence in males than females in the younger age group. Within the limits of the study it can be concluded that association of high frenal attachment in patients with midline diastema was significant. High frenal attachment in midline diastema patients was observed predominantly in males in the younger age group.

**Keywords:** Etiology; High Frenal Attachment; Midline Diastema; Orthodontic Treatment.

## Introduction

Aesthetics and function are the two most important goals of modern-day dentistry [1-3]. Midline diastema is one of the most frequently seen malocclusions. Andrews described the dental midline diastema as a rather common form of incomplete occlusion characterized by a space between the maxillary and mandibular central incisors [4]. A midline diastema is generally considered a part of normal dental development during mixed dentition period [5, 6]. However, there are multiple factors which can cause diastema between the maxillary central incisors in adults, which is an esthetic problem that can be closed either orthodontically or restoratively [7-9].

The frenum is a mucous fold that serves as an attachment for lips and cheeks to the alveolar mucosa, the gingiva, and periosteum. This frena hampers the gingival health when they are attached

too close to the marginal gingiva. This happens either due to an interference in the plaque control or to a pull by muscle [10, 11]. The maxillary frenum presents with aesthetic problems and can also compromise the orthodontic treatment outcome in cases of midline diastema, therefore causing recurrence after the treatment [12]. An abnormal frenum can be managed by frenectomy [13]. Abnormal frenum is detected visually by observing movement of the papillary lip after applying tension and also by blanching seen due to ischemia of the region. Midline diastema due to high frenal attachment may be caused by the attachment of the labial frenum into the notch in the alveolar bone so that a band of heavy fibrous tissue lies between the central incisors making them erupt wide apart [14, 15]. Other causes for spacing between the maxillary incisors can be microdontia; macrognathia, supernumerary teeth, peg laterals, missing lateral incisors, midline cysts and habits such as thumb sucking, mouth-breathing and tongue-thrusting [16, 17]. Treating the midline diastema is a problem for the dental

**\*Corresponding Author:**

Aravind Kumar Subramanian,  
Professor and Head, Department of Orthodontics, Saveetha Dental College and Hospitals, Saveetha Institute Of Medical And Technical Sciences, Saveetha University, Chennai, India.  
Tel: +91-9841299939  
E-mail: aravindkumar@saveetha.com

**Received:** July 23, 2020

**Accepted:** August 18, 2020

**Published:** August 28, 2020

**Citation:** Faazila Fathima, Aravind Kumar Subramanian, Senthil Murugan P. Association Of High Frenal Attachment And Midline Diastema. *Int J Dentistry Oral Sci.* 2020;8(2):0016:80-83. doi: <http://dx.doi.org/10.19070/2377-8075-SI02-080016>

**Copyright:** Aravind Kumar Subramanian ©2020. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

practitioner as many different aetiologies are reported to be associated with it [18, 19].

The incidence of midline diastema ranges from 1.6% to 25.4% and is inversely proportional to age [20]. Exact diagnosis and removal of the etiology is the key to obtain stable results in the treatment of midline diastema [21, 22]. Therefore this study was conducted to evaluate the association of high frenal attachment and midline diastema.

## Materials and Methods

This is a retrospective university setting study conducted in Saveetha dental college and hospitals. Population selection was random. Approval was obtained from the institutional study committee (IEC). The ethical approval number for the present study is SDC/SIHEC/2020/DIASDATA/0619-0320. Two examiners were involved in the study. Data of patients who reported to Saveetha Dental College were reviewed. The data was entered in the college system in a methodical manner. For the present study, data of orthodontic patients were reviewed. Clinical examination, orthodontic diagnosis and photographs of these patients were evaluated to find the presence of midline diastema and high frenal attachment. A total of 700 case records were reviewed. Cross verification of data for error was done by presence of additional reviewer and by photographic evaluation. Simple random sampling was done to minimize sampling bias. This study was generalized to the south Indian population. After reviewing 700 case records, filtering was done on data required. The final sample size was 260 patients with midline diastema.

The data was entered in excel manually and imported to IBM SPSS software for analysis. Independent variables included age, gender and high frenal attachment. Dependent variables included midline diastema. Descriptive and inferential statistics was used. Incomplete or censored data was excluded from the study.

## Results and Discussion

High frenal attachment was present in 38.8% of the individuals with midline diastema. Younger age group had more prevalence of high frenal attachment and males showed more prevalence of high frenal attachment than females.

In the age group of 10 to 35 years, 42.4% of the individuals showed high frenal attachment. High frenal attachment accounted for 37.5% in the age group of 36 to 50 years and 11.2% in the age group of about 50 years (figure1). P value was 0.034. Hence, association between age of the patients with midline diastema and high frenal attachment is statistically significant. Out of 157 males with midline diastema, 40.2% of them had high frenal attachment. Out of 103 females with midline diastema, 36.8% of them had high frenal attachment (figure 2). P value was 0.621, hence, association between gender of the patients with midline diastema and high frenal attachment is statistically not significant. High frenal attachment was prevalent in 38.8% of the patients with midline diastema. Majority, that is 61.1% of the patients with midline diastema had high frenal attachment (figure3).

Campbell et al., stated that midline diastema could be transient or created by developmental, pathological or iatrogenic factors [23]. Treatment of diastema varies and it requires correct diagnosis of its etiology and early intervention relevant to the specific etiology. Correct diagnoses include medical and dental history, radiological and clinical examination and possibly tooth size evaluation [23, 24].

In contrast to the results of this study, Kaimenyi and Adams, reported in their study that hypertrophic labial frenum is considered as a major aetiological factor for midline diastema [25]. However, some researchers, like Popovich et al, believe that there is an inverse relationship between high frenal attachment and midline diastema [26]. According to them, labial frenum persists owing to the existing diastema and, as the dentition applies minimal pressure on the tissues, there is little or no atrophy of the frenum. Kamath M K et al stated that enlarged labial frenum is considered a contributing factor for persistent diastema but is attributed only to a small proportion of cases [27].

According to Bennett et al [28] the maxillary midline diastema is caused by a high labial frenum, but the stability of space closure is not influenced by frenulum excision. Gardiner [29] also supported this view. This was contradicted by Haynes who stated that high frenum is an effect and not a cause for the incidence of diastema [30]. But most of the researchers agree that removal of the high bulbous labial frenum is important for the stability after the closure of the midline diastema [31].

**Figure 1. Bar graph representing association between age of the patients with midline diastema and high frenal attachment. X axis denotes age and Y axis denotes the number of patients with midline diastema. It shows that presence of high frenal attachment in midline diastema patients was more prevalent in the younger age group. [Pearson Chi square value=5.621, df=2, p-value=0.034(<0.05); statistically significant].**

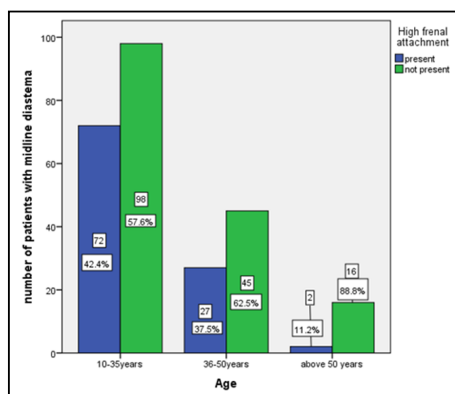


Figure 2. Bar graph depicts the association between gender of the patients with midline diastema and high frenal attachment. X axis denotes gender and Y axis denotes the number of patients with midline diastema. High frenal attachment was present more in males compared to females. [Pearson Chi square value=4.323, df=5, p value=0.621(>0.05); hence statistically not significant].

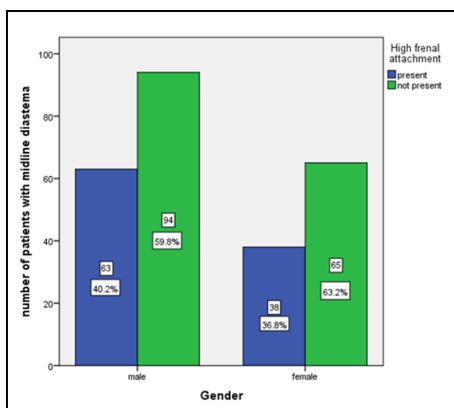
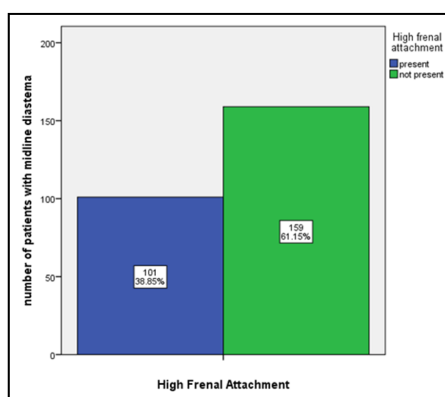


Figure 3. Bar graph representing frequency of high frenal attachment among midline diastema patients. X axis denotes high frenal attachment and Y axis denotes the number of patients with midline diastema. It shows that high frenal attachment was present (blue) in 38.8% of patients with midline diastema and not present (green) in 61.1%.



Reji Abraham states that several aetiological factors are reported and discussed in the literature and no single aetiological factor is agreed upon for the development of a midline diastema [32].

Similar to the present study, Jonathan P T et al observed high frenal attachment commonly in younger age group which he stated may be due to apical migration of frenum over time [33]. Taylor observed in his study that as age increased, the percentage of diastema significantly decreased [34].

Spilka and Mathews stated that relapse is a major concern in the correction of midline diastema [35]. Thus exact diagnosis and removal of the aetiology is the key to obtaining a stable result in treatment of midline diastema.

This study could pave way for more research to be done on the etiology of midline diastema which will help in accurate diagnosis and provide successful treatment options. The limitations of the study are limited to certain demographics and limited study samples.

**Conclusion**

Within the limitations of the study, it can be concluded that association of high frenal attachment in patients with midline diastema was significant. Also high frenal attachment in midline

diastema patients was observed predominantly in males in the younger age group.

**References**

- [1]. Sivamurthy G, Sundari S. Stress distribution patterns at mini-implant site during retraction and intrusion--a three-dimensional finite element study. *Prog Orthod.* 2016;17:4. Pubmed PMID: 26780464.
- [2]. Hamdan AM, Al-Omari IK, Al-Bitar ZB. Ranking dental aesthetics and thresholds of treatment need: a comparison between patients, parents, and dentists. *Eur J Orthod.* 2007 Aug;29(4):366-71. Pubmed PMID: 17702796.
- [3]. Samantha C, Sundari S, Chandrasekhar S, Sivamurthy G, Dinesh S. Comparative Evaluation of Two Bis-GMA Based Orthodontic Bonding Adhesives - A Randomized Clinical Trial. *J Clin Diagn Res.* 2017 Apr;11(4):ZC40-ZC44. Pubmed PMID: 28571259.
- [4]. Andrews LF. The six keys to normal occlusion. *Am J Orthod.* 1972 Sep;62(3):296-309. Pubmed PMID: 4505873.
- [5]. Krishnan S, Pandian S, Kumar S A. Effect of bisphosphonates on orthodontic tooth movement-an update. *J Clin Diagn Res.* 2015 Apr;9(4):ZE01-5. Pubmed PMID: 26023659.
- [6]. Kamisetty SK, Verma JK, Arun, Sundari S, Chandrasekhar S, Kumar A. SBS vs Inhouse Recycling Methods-An Invitro Evaluation. *J Clin Diagn Res.* 2015 Sep;9(9):ZC04-8. Pubmed PMID: 26501002.
- [7]. Singh NS, Singh NS, Thangjam P. Maxillary Palate Maxillary Incisor using diode LASER: a case report. *Journal of Evolution of Medical and Dental Sciences.* 2014 Jul 21;3(29):8142-7.
- [8]. Subramanyam D. Laser Assisted Labial Frenectomy-A Case Report. *Research Journal of Pharmacy and Technology.* 2019 Aug 1;12(8):3883-5.
- [9]. Jain RK, Kumar SP, Manjula WS. Comparison of intrusion effects on maxillary incisors among mini implant anchorage, j-hook headgear and utility arch. *J Clin Diagn Res.* 2014 Jul;8(7):ZC21-4. Pubmed PMID: 25177631.
- [10]. Viswanath A, Ramamurthy J, Dinesh SP, Srinivas A. Obstructive sleep apnea:

- awakening the hidden truth. *Niger J Clin Pract.* 2015 Jan-Feb;18(1):1-7. Pubmed PMID: 25511335.
- [11]. Felicita AS. Quantification of intrusive/retraction force and moment generated during en-masse retraction of maxillary anterior teeth using mini-implants: A conceptual approach. *Dental Press J Orthod.* 2017 Sep-Oct;22(5):47-55. Pubmed PMID: 29160344.
- [12]. Rubika J, Sumathi Felicita A, Sivambiga V. Gonial angle as an indicator for the prediction of growth pattern. *World Journal of Dentistry.* 2015;6(3):161-3.
- [13]. Sverin I. Prevalence of variations and anomalies of the upper labial frenum. *Acta Odontol Scand.* 1971 Oct;29(4):487-96. Pubmed PMID: 5289336.
- [14]. Pandian KS, Krishnan S, Kumar SA. Angular photogrammetric analysis of the soft-tissue facial profile of Indian adults. *Indian J Dent Res.* 2018 Mar-Apr;29(2):137-143. Pubmed PMID: 29652003.
- [15]. Felicita AS. Orthodontic management of a dilacerated central incisor and partially impacted canine with unilateral extraction - A case report. *Saudi Dent J.* 2017 Oct;29(4):185-193. Pubmed PMID: 29033530.
- [16]. Becker A. The median diastema. *Dent Clin North Am.* 1978 Oct;22(4):685-710. Pubmed PMID: 359378.
- [17]. Ramesh Kumar KR, Shanta Sundari KK, Venkatesan A, Chandrasekar S. Depth of resin penetration into enamel with 3 types of enamel conditioning methods: a confocal microscopic study. *Am J Orthod Dentofacial Orthop.* 2011 Oct;140(4):479-85. Pubmed PMID: 21967934.
- [18]. Oesterle LJ, Shellhart WC. Maxillary midline diastemas: a look at the causes. *J Am Dent Assoc.* 1999 Jan;130(1):85-94. Pubmed PMID: 9919036.
- [19]. Felicita AS, Chandrasekar S, Shanthasundari KK. Determination of cranio-facial relation among the subethnic Indian population: a modified approach - (Sagittal relation). *Indian J Dent Res.* 2012 May-Jun;23(3):305-12. Pubmed PMID: 23059564.
- [20]. Higley LB. Maxillary labial frenum and midline diastema. *ASDC J Dent Child.* 1969 Nov-Dec;36(6):413-4. Pubmed PMID: 4900331.
- [21]. Dinesh SP, Arun AV, Sundari KK, Samantha C, Ambika K. An indigenously designed apparatus for measuring orthodontic force. *J Clin Diagn Res.* 2013 Nov;7(11):2623-6. Pubmed PMID: 24392423.
- [22]. Felicita AS. Orthodontic extrusion of Ellis Class VIII fracture of maxillary lateral incisor - The sling shot method. *Saudi Dent J.* 2018 Jul;30(3):265-269. Pubmed PMID: 29942113.
- [23]. Campbell PM, Moore JW, Matthews JL. Orthodontically corrected midline diastemas. A histologic study and surgical procedure. *Am J Orthod.* 1975 Feb;67(2):139-58. Pubmed PMID: 1054215.
- [24]. Huang WJ, Creath CJ. The midline diastema: a review of its etiology and treatment. *Pediatr Dent.* 1995 May-Jun;17(3):171-9. Pubmed PMID: 7617490.
- [25]. Kaimenyi JT. Occurrence of midline diastema and frenum attachments amongst school children in Nairobi, Kenya. *Indian J Dent Res.* 1998 Apr-Jun;9(2):67-71. Pubmed PMID: 10530193.
- [26]. Popovich F, Thompson GW. Maxillary diastema: indications for treatment. *Am J Orthod.* 1979 Apr;75(4):399-404. Pubmed PMID: 285615.
- [27]. Kamath MK, Arun AV. Midline diastema. *International Journal of Orthodontic Rehabilitation.* 2016 Jul 1;7(3):101.
- [28]. Bennett KA. Oral anatomy. By Harry Sicher and E. Lloyd DuBrul. 502 pp. and 319 ill. CV Mosby Co., St. Louis. 1970. \$17.50.
- [29]. Gardiner JH. Midline spaces. *The Dental practitioner and dental record.* 1967 Apr 1;17(8):287-97.
- [30]. Haynes S. Prevalence of upper lip posture and incisor overjet. *Community Dent Oral Epidemiol.* 1977 Mar;5(2):87-90. Pubmed PMID: 265200.
- [31]. Koora K, Muthu MS, Rathna PV. Spontaneous closure of midline diastema following frenectomy. *J Indian Soc Pedod Prev Dent.* 2007 Mar;25(1):23-6. Pubmed PMID: 17456963.
- [32]. Abraham R, Kamath G. Midline diastema and its aetiology--a review. *Dent Update.* 2014 Jun;41(5):457-60, 462-4. Pubmed PMID: 25073229.
- [33]. Jonathan PT, Thakur H, Galhotra A, Galhotra V, Gupta N. Maxillary labial frenum morphology and midline diastema among 3 to 12-year-old school-going children in Sri Ganganagar city: A cross-sectional study. *J Indian Soc Pedod Prev Dent.* 2018 Jul-Sep;36(3):234-239. Pubmed PMID: 30246742.
- [34]. Taylor JE. Clinical observations relating to the normal and abnormal frenum labii superioris. *American journal of orthodontics and oral surgery.* 1939 Jul 1;25(7):646-50.
- [35]. Spilka CJ, Mathews PH. Surgical closure of diastema of central incisors. *Am J Orthod.* 1979 Oct;76(4):443-7. Pubmed PMID: 291344.