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RESEARCH ARTICLE

EVALUATION OF VARIATION IN THE MAXILLARY LABIAL FRENAL ATTACHMENT AND ITS MORPHOLOGY IN POPULATION

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ABSTRACT

Introduction: Maxillarv labial frenum is a fold of the mucous membrane which connects lip to the alveolar process of the jaw. The upper labial frenum is a normal anatomic structure with inherent morphological variations. **Aim:** To evaluate the variation in the maxillary labial frenum attachments and its morphology in population. **Materials and Methods:** This study was conducted on 100 subjects within age group of 15–35 years. Intraoral examination was done to evaluate the maxillary labial frenum attachment location and morphology by direct visual method and photographs were taken. **Result:** In this study, depending upon the extend of attachment fiber the most common type is mucosal (65%) followed by gingival type (25%), and papillary type (3%) is least common. The most common morphological type is normal frenum (60%) followed by normal frenum with nodule (17%) and normal frenum with appendix (13%). The least common morphological type is bifid labial frenum (1%). **Conclusion:** Maxillary labial frenum have different morphological variation and it may cause mucogingival problem. So the practitioner necessary to give importance for frenum assessment during clinical examination to prevent periodontal problem and need to relocate or excise high frenal attachment during mucogingival surgery (root coverage) for complete coverage of root.

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INTRODUCTION

The frenum is a mucous membrane fold that attaches the lip and the cheek to the alveolar mucosa, the gingiva, and the underlying periosteum (Henry *et al*., 1976). Frenum is one of the most variable anatomical structures. It can be defined as a "fibrous band of tissue attached to the bone of the mandible and maxillae, and is present superficial to muscle attachments (Zarb, 2004). Frenum are mostly seen in the vestibular mucosa of the mandible and maxilla. It usually seen in the midline or premolar region (Priyanka *et al*., 2013). The upper labial frenum is triangular in shape and attaches the lip to the alveolar mucosa and gingiva. It extends over the alveolar process in infants and it forms a raphe that reaches the palatal papilla. This attachment generally changes to assume the adult configuration through the growth of alveolar process as the teeth erupt (Henry *et al*., 1976). Maxillary labial frenum are a dynamic structure that is subjected to variations during different stages of human growth and development (Delli, 2013). Depending upon the extension of attachment of fibers, frenum have been classified as: (Placek, 1974).

- Mucosal - when the frenal fibers are attached up to mucogingival junction;
- Gingival - when fibers are inserted within attached gingiva;
- Papillary - when fibers are extending into interdental papilla;
- Papilla penetrating - when the frenal fibers cross the alveolar process and extend up to palatine papilla.

Maxillary labial frenum has demonstrated variations and anomalies depending on the attachment of fibers and structure of frenum (Townsend *et al*., 2013). Sewerin has also classified the morphological variations of frenum as: (Sewerin, 1971)

- Normal frenum
- Normal frenum with a nodule
- Normal frenum with appendix
- Normal frenum with nichum
- Bifid labial frenum
- Persistent tectolabial frenum
- Double frenum
- Wider frenum.

The purpose of this study is to determine the prevalence of the type of maxillary labial frenal attachments and morphological variation among population.

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MATERIAL AND METHODS

The sample consisted of 100 subjects comprising both males and females within the age group of 20–40 years who visited the outpatient department of periodontics in government Dental College, Aurangabad. All the subjects were explained about the study, and a written informed consent was obtained from all the subjects. The subjects who had undergone an operation on upper labial frenum, any trauma or injury to the mucosa of maxillary incisors region, any congenital/developmental abnormality in upper frenum or premaxilla, and one or both maxillary central incisors missing were excluded from the study. The examination of frenum was done by upward distention of the upper lip following which photographs were taken of the variations of frenum if present. The data thus collected were subjected to statistical analysis.

RESULTS

According to the classification given by Placek *et al*[5] in this study 65% of the patients presented with mucosal type which is the most common type of frenal attachment, 25% gingival type, 7% papilla penetrating type, and 3% papillary type which is least common type of frenal attachment (Table 1).

The prevalence of midline diastema was found to be more in the papilla penetrating and papillary type of frenal attachmentas compared to gingival type of frenal attachment (Table 1). According to the classification given by Sewerin[7] in this study, 60% of patients had regular, falciform fold (normal frenum) while in 17% of patients, there is a nodule present in frenum (frenum with nodule). In 13% of patients, there was presence of appendix in frenum (frenum with appendix), 4% of patients were presented with double frenum, 2% of patients were presented with wider frenum, 3% of patients were presented with multiple frenum, 1% of patient were presented with bifid frenum (Table 2).

DISCUSSION

Median maxillary labial frenum (MMLF) is present in thecenter of the upper lip that connects to the midline of the attached gingiva between the central incisors. The origin of frenum is often wide but the tissue ofthe frenum itselfnarrows in width. Frenum is inserted in the midline into the outer layer of periosteum, and into the connective tissue of the intermaxillary suture and the alveolar process (Hupp, 2009). The main function of maxillary frenum is to provide stability to the upper lip (Priyanka, 2013).

Table 1. Prevalence of variation in frenal attachment

Type of frenum	Male (n%)	Female (n%)	Total (n%)	Midline diastema (n%)
Mucosal	41 (69.49)	24 (58.53)	65 (65%)	0 (0%)
Gingival	15 (25.42)	10 (24.39)	25 (25%)	7 (28%)
Papillary	0 (0)	3 (7.31)	3 (3%)	3 (100%)
Papilla penetrating	3 (5.08)	4 (9.75)	7 (7%)	7 (100%)

Table 2. Prevalence of structural variation in frenum

Variation	Male (n%)	Female (n%)	Total (n%)
Normal frenum	33	27	60 (60%)
Normal frenum with nodules	11	6	17 (17%)
Normal frenum with appendix	7	6	13 (13%)
Bifid frenum	1	0	1 (1%)
Wider frenum	0	2	2 (2%)
Double frenum	2	2	4 (4%)
Multiple frenum	3	0	3 (3%)

Figure 1

Figure 2

Figure 3

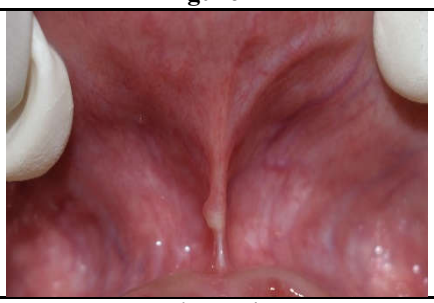

Figure 4

Figure 5

Figure 6

Figure 1) bifid frenum, 2) multiple frenum, 3) double frenum, 4) normal frenum with appendix, 5) normal frenum with nodule, 6) wider frenum

Figure 1

Figure 2

Figure 3

Figure 4

Figure 1) mucosal, 2) gingival, 3) papillary 4) papilla penetrating

Several morphological variations of MMLF are being observed in practice which is not documented in the literature. Aberrant frenummay cause problems such as loss of interdental papilla, gingival recession, midline diastema, difficulty in brushing, alignment of teeth (Diaz-Pizan, 2006). Abnormal frenal attachment may cause speech abnormality, (Miller, 1985) unable to maintain oral hygiene (Mirko, 1974). So maxillary labial frenum need to examine carefully as it may serve as potential cofactor for peri-mucositis and peri-implantitis (Otto, 2008). As suggested in literature, there are several variations found in maxillary labial frenum. Those variations can be classified according to fibers attachment of frenum or can be morphological variations in frenum. Papillary and papilla penetrating frenum has been considered as pathologic. (Dewel, 1966) Lindsey (Lindsey, 1977) and Popovich (1977) *et al* reported that the papilla penetrating type of frenal attachment decreased with increase in age. This could be attributed to the fact that the apical migration of frenum is due to the growth of alveolar process in coronal direction. In study done by Mirko *et al* 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 personswith pathologic changes as compared to healthy persons with similar frenal attachment (1974).

In this study the prevalence of mucosal frenal attachment was found to be most common 65.0% with gingival frenal attachment as second 27% followed by papillary penetrating 7% with papillary type 3% least common. In the similar study done by Mirko *et al* the prevalence was found to be as mucosal 46.6%, gingival 34.3%, papillary 3.1%, and papillary penetrating 16.1%. (Mirko, 1974) According to Jindal *et al* the prevalence of mucosal frenal attachment was found to be most common 66.0% with gingival renal attachment as second 28.4% followed by papillary penetrating 3.2%with papillary type 2.40% least common. (Jindal, 2016).

The difference in results in this study as compared to Mirko *et al.* (1974) and Jindal *et al*. (2016) could be due to the diversity of population. During development, the failure of the frenum to migrate apically has been implicated as the causative factor in the persistence of the midline diastema. It may be caused by the insertion of the labial frenum into the notch in the alveolar bone so that a band of heavy fibrous tissue lies between the central incisors (Kaimenyi, 1998) In this study, the prevalence of midline diastema was found to be more in papillary penetrating and papillary type of frenal attachment as compared to gingival type of frenal attachment. The difference in results in this study as compared to study done by Mirko *et al.* (1998) and Jindal *et al*. (2016) who found that midline diastema was more prevalent in the papillary penetrating type of frenal attachment.

Various studies have found difference in the structural variations of the frenum. Sewerin[7] had classified structural variations in frenum. In this study, most commonly observed frenum was the normal frenum 60%. Similar results were seen in the studies done by Townsend *et al*[6] who reported the prevalence of normal frenum as 68.64% while Jindal *et al*[16] who reported most commonly observed frenum was the normal frenum 77.60% while Mohan *et al*[18] reported 66.21% prevalence of upper labial frenum. In a similar study done by Sewerin[7]the prevalence of normal frenum of 60.2% was reported.

In this study, the prevalence of normal frenum with nodule was 17%, which was reported to be 9.1% in the study done by Sewerin (Sewerin, 1971) 17.42% in the study done by Townsend *et al*. (2013) 12.41% in the study done by Jindal *et al*[16]and 19.92% was reported by Mohan *et al.* (2014). The prevalence of normal frenum with appendix was 13% in this study, which was reported to be 19.9% in the study by Sewerin (Sewerin, 1971) 10.45% in the study by Townsend *et al.* (2013) 9.1% in the study done by Jindal *et al.* (2016) and 6.38% in a study of Mohan *et al* (2014). There was absence of

other variations seen by Sewerin (1971) such as normal frenum with nichum, persistent tectolabial frenum.

Conclusion

Maxillary labial frenum has different type of frenal attachment and morphological variation which may cause mucogingival problem such as gingival recession, midline diastema due to high frenal attachment. So the practitioner necessary to give importance for frenum assessment during clinical examination to prevention of periodontal problem and need to relocate or excise high frenal attachment during mucogingival surgery (root coverage) for complete coverage of root.

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