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Review Article

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From Diagnosis to Surgical Intervention: A Comprehensive Review of Paediatric Frenectomy

Tanı Sürecinden Cerrahi Müdahaleye Uzanan Yol: Pediatrik Frenektomi Üzerine Kapsamlı Bir Derleme

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Abstract

The frenulum is an essential intraoral structure that facilitates the coordinated function and mobility of the tongue and lips. During childhood, abnormal development of the frenulum may result in various clinical complications, including speech disorders, feeding difficulties, and orthodontic anomalies. Among the most frequently observed anomalies are ankyloglossia (tongue-tie) and hypertrophic labial frenulum, which are commonly managed through a surgical procedure known as frenectomy. Frenectomy involves the excision or reshaping of the aberrant frenulum and aims to enhance oral functions and support proper craniofacial development. In recent years, minimally invasive techniques such as laser-assisted frenectomy have gained popularity as alternatives to conventional surgical methods. These laser-based procedures offer several clinical advantages, including reduced intraoperative bleeding, minimal postoperative discomfort, and accelerated wound healing, thereby improving the overall patient comfort in paediatric populations. This narrative review examines the clinical indications, efficacy, benefits, and limitations of various frenectomy techniques used in paediatric dentistry. Furthermore, conventional and modern approaches were compared to identify the most suitable treatment strategies for paediatric patients based on current scientific evidence.

Keywords Ankyloglossia · frenectomy · labial frenulum · laser frenectomy · paediatric dentistry

Öz

Frenulum, oral kavitede dil ve dudak hareketlerini destekleyen önemli bir anatomik yapıdır. Çocukluk döneminde frenulumun anormal gelişimi; konuşma bozuklukları, beslenme güçlükleri ve ortodontik anomaliler gibi çeşitli klinik problemlere yol açabilmektedir. En sık karşılaşılan frenulum anomalileri arasında ankiloglossi (dil bağı) ve hipertrofik labial frenulum yer almakta olup, bu durumların tedavisinde frenektomi adı verilen cerrahi işlem uygulanmaktadır. Frenektomi, anormal frenulumun eksizyonu veya yeniden şekillendirilmesini içeren bir girişimdir ve oral fonksiyonların iyileştirilmesi ile kraniofasiyal gelişimin desteklenmesini amaçlamaktadır. Son yıllarda, geleneksel cerrahi tekniklere ek olarak lazer destekli frenektomi gibi minimal invaziv yaklaşımlar giderek yaygınlaşmıştır. Lazerle gerçekleştirilen uygulamalar; daha az kanama, minimal postoperatif ağrı ve daha hızlı iyileşme gibi avantajlar sunmakta ve çocuk hasta grubunda hasta konforunu artırmaktadır. Bu derlemede, çocuk diş hekimliğinde kullanılan farklı frenektomi teknikleri; klinik endikasyonlar, etkinlik, avantajlar ve sınırlılıklar açısından değerlendirilerek, güncel literatür ışığında kısa ve uzun vadeli etkileriyle birlikte tartışılacaktır. Ayrıca, geleneksel ve modern yaklaşımlar karşılaştırılarak çocuk hastalar için en uygun tedavi seçenekleri ortaya konulacaktır.

Anahtar Kelimeler Ankiloglossi · frenektomi · labial frenulum · lazer frenektomi · çocuk diş hekimliği

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INTRODUCTION

Frenula are connective tissue structures that link the tongue, lips, and alveolar mucosa, serving critical anatomical and functional roles within the oral cavity. These structures are involved in the coordination of oral motor movements and play an essential role in speech, feeding, and the maintenance of oral hygiene (1). During childhood, anatomical or functional abnormalities of the frenulum can lead to various clinical complications. In particular, anomalies such as ankyloglossia (tongue-tie) and hypertrophic labial frenulum have been associated with breastfeeding difficulties, speech disorders, orthodontic problems, and aesthetic concerns (2).

Frenectomy, a surgical procedure used in the management of these conditions, involves the complete excision or reshaping of the aberrant frenulum. Although traditionally performed using scalpel-based techniques, advances in laser technology have introduced less invasive alternatives. Laser-assisted frenectomy offers several advantages, including minimal bleeding, reduced operative time, enhanced patient comfort, and faster healing, thereby increasing its preference, especially in paediatric populations (3).

In recent years, there has been increasing scholarly and clinical attention towards the identification and management of frenulum anomalies in paediatric patients, resulting in a notable expansion of research in this domain. Despite this growing interest, the literature presents considerable variation regarding the indications, efficacy, postoperative outcomes, and potential limitations of surgical interventions. Accordingly, this review aims to evaluate the clinical indications, surgical approaches, laser applications, and treatment outcomes of paediatric frenectomy considering the current evidence.

Methodology

This narrative review was conducted through a comprehensive search of the PubMed, Scopus, and Web of Science databases for articles published between 2000 and 2024. Keywords included *"ankyloglossia," "frenectomy," "frenulum anomalies," "paediatric dentistry,"* and *"laser frenectomy."* Inclusion criteria were studies focusing on paediatric populations that discussed the clinical characteristics, diagnostic methods, surgical approaches, and treatment outcomes of frenectomy. Case reports with insufficient data, non-English publications, and studies unrelated to paediatric patients were excluded.

The levels of evidence were considered according to the Oxford Centre for Evidence-Based Medicine criteria, and the methodological quality of systematic reviews and clinical trials was appraised based on the PRISMA and CONSORT guidelines where applicable. Reference lists of the included articles were also screened to identify additional relevant studies.

Structural and Clinical Characteristics of the Frenulum

The frenulum is a mucosal and connective tissue band that may occasionally incorporate muscle fibres. The maxillary labial frenulum typically presents a triangular morphology, anchoring the upper lip to the alveolar mucosa or gingiva. In neonates, it often extends across the alveolar ridge, forming a midline raphe that may reach the palatal papilla. With the eruption of teeth and subsequent alveolar development, the point of attachment of the frenulum progressively migrates, ultimately attaining its characteristic adult form (1).

Two main structures are observed in newborns: the lingual frenulum (tongue-tie) and the maxillary labial frenulum (upper lip tie). The lingual frenulum, present in nearly all neonates (99.5%), stabilises the tongue, lips, and cheeks during foetal development, helping to balance hard and soft tissues. However, its restrictive nature can contribute to orthodontic, phonetic, prosthetic, or periodontal problems (2, 4).

While the lingual frenulum was traditionally regarded as a simple mucosal fold, histological and functional studies conducted by Mills et al. have redefined it as a complex and dynamic anatomical structure. Their research demonstrated that the frenulum comprises not only the mucosa but also muscle fibres and connective tissue, allowing it to undergo shape modifications in response to tongue movement. This structural complexity highlights its critical involvement in key oral functions such as articulation, deglutition, mastication, and especially breastfeeding (5).

Ankyloglossia, defined as a short, thickened, or fibrotic lingual frenulum, restricts tongue motion and may impair sucking, swallowing, speech, and chewing. Clinically, it can present with a notched tongue tip, reduced mobility, and phoneme articulation difficulties (5, 6). It affects approximately 4%–10% of neonates, with higher prevalence in males (7).

High frenulum attachments, particularly near the gingival margin or papilla, are considered as risk factors for periodontal deterioration. Such aberrant insertions may cause localised gingival recession, dentine sensitivity, root caries, and aesthetic concerns (1).

Classification of Frenulum Anomalies and Clinical Findings

Placek and colleagues introduced a classification framework for labial frenulum attachments grounded in their anatomical positioning within the gingival tissues, delineating four specific attachment patterns (Figure 1-4) (8):

Type I – Mucosal: The frenulum attachment extends up to the mucogingival junction.

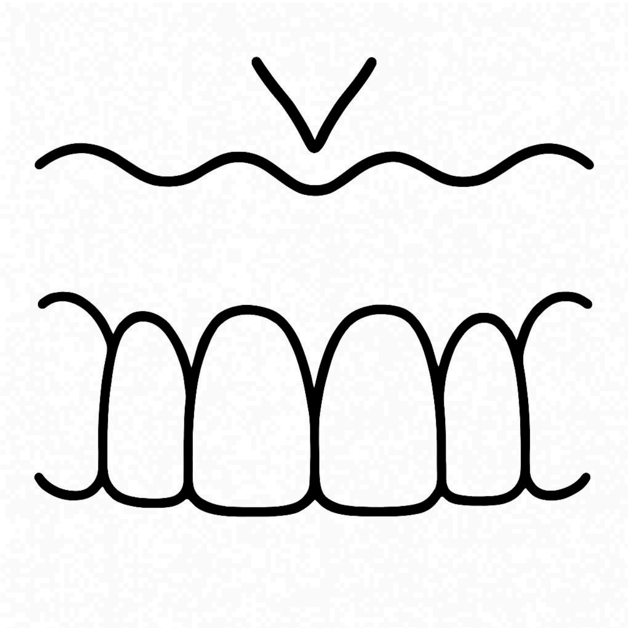

Figure 1. Mucosal type of the upper labial frenulum attachment.

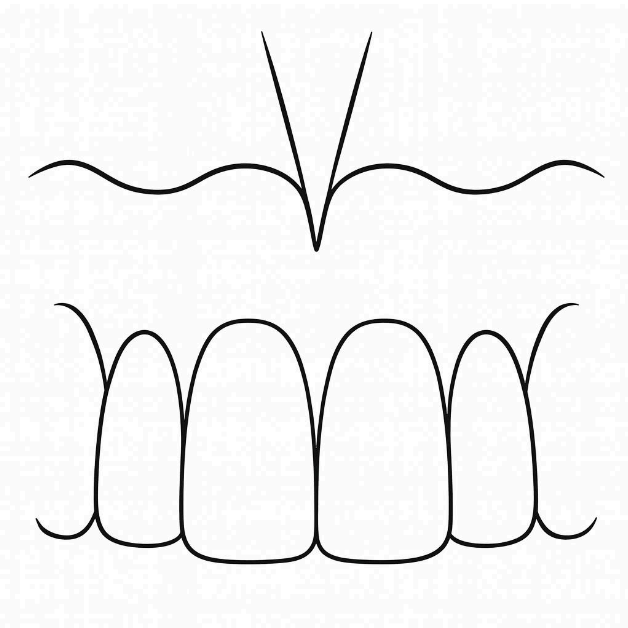

Figure 2. Gingival type of the upper labial frenulum attachment.

Type II – Gingival: The frenulum terminates within the boundaries of the attached gingiva.

Type III – Papillary: The frenulum terminates within the papillary region.

Type IV – Papilla-penetrating: The frenulum penetrates the interdental papilla and extends into the palatal attached gingiva.

According to research by Kinney et al. (9) in 2024, it was emphasised that the position of the frenulum may change

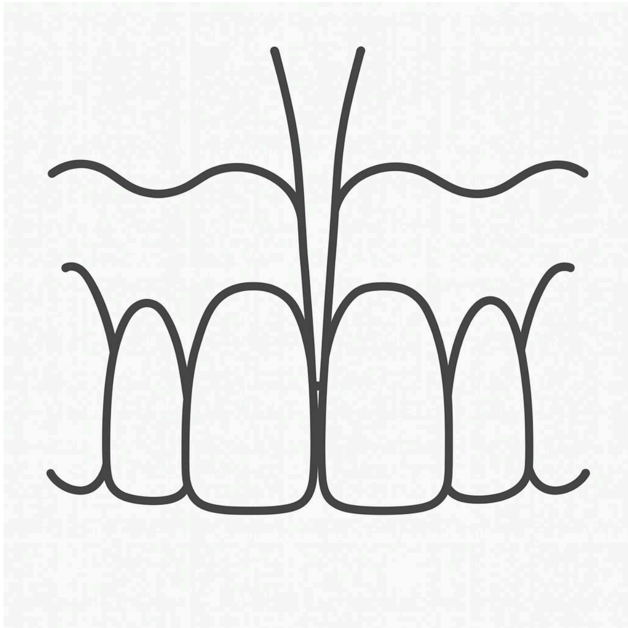

Figure 3. Papillary type of the upper labial frenulum attachment.

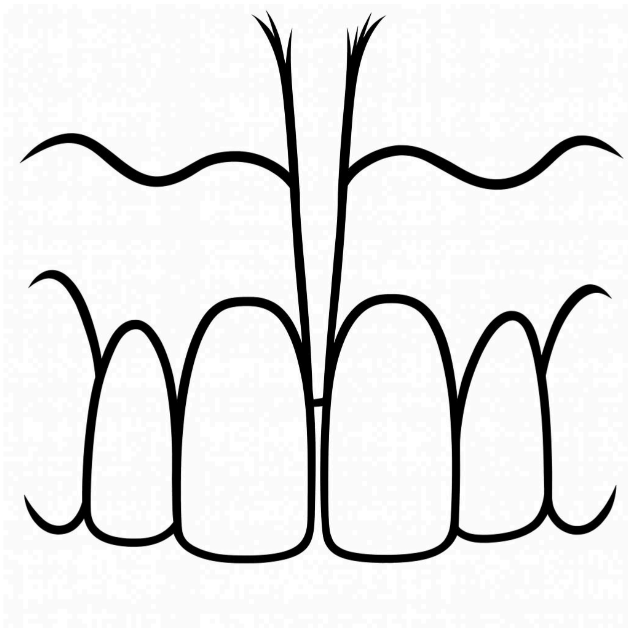

Figure 4. Papilla-penetrating type of the upper labial frenulum attachment.

physiologically with age, and that high attachments observed during childhood may gradually shift to more apical positions over time. In this context, various classification systems, such as those proposed by Placek, Kotlow, and Hazelbaker, have been developed to assess frenulum attachment across different age groups. However, due to the lack of standardisation among these systems, limitations have been noted in making consistent clinical comparisons. Additionally, it has been suggested that labial frenula with attachments extending beyond the papillary region (Types III and IV) may contribute to maxillary midline diastemas that are resistant to orthodontic treatment; nevertheless, the literature also highlights that not all diastemas are necessarily caused by frenulum-related factors (9).

For evaluating the lingual frenulum, the Coryllos classification is widely used. This system categorises the frenulum into four types based on its anatomical location beneath the tongue (10):

The type 1 frenulum originates very close to the tip of the tongue, significantly restricting tongue mobility and often resulting in a heart-shaped tongue appearance. The type 2 frenulum is positioned approximately 2–4 mm posterior to the tongue tip and also causes limited tongue movements. The type 3 frenulum is located in a more posterior, submucosal region. Although it is less visible, it may still lead to functional limitations and the Type 4 frenulum is entirely submucosal and not visible upon clinical examination, yet it can result in severe restrictions in tongue mobility.

This classification system is particularly useful in assessing sucking and speech functions in newborns and in guiding decisions regarding the need for surgical intervention. Frenotomy procedures performed in cases of Type 3 and Type 4 ankyloglossia have been reported to be effective in managing breastfeeding difficulties. However, current clinical guidelines emphasise that anatomical evaluation alone is not sufficient to determine surgical indications. Therefore, a multidisciplinary approach is recommended, incorporating functional parameters such as sucking efficiency, the ability to elevate the tongue, and overall oral motor skills (11).

Blanch Test: A Diagnostic Clinical Method

Before deciding on surgical intervention, clinical evaluation methods play a crucial role in the diagnostic assessment. One of the most commonly used techniques for this purpose is the Blanch test (12). This test involves gently pulling the frenulum and observing any blanching or movement of the tissue at the tip of the papilla (Figure 5). Blanching in the papillary area is considered an indicator of an abnormal frenulum attachment. Such anatomical variations may be treated with appropriate surgical approaches such as frenotomy or frenectomy, taking into account the size and attachment level of the frenulum (13).

Figure 5. Blanch test.

In a recent study, 466 healthcare professionals, including dietitians, speech therapists, and myofunctional therapists, were surveyed regarding the methods they use to assess maxillary and buccal frenulum restrictions. It was reported that 66.5% of the participants routinely used the blanching test as part of their clinical evaluations. This finding highlights the blanching test as a widely adopted and practical tool in clinical decision-making processes (14).

A study conducted by Mills et al. demonstrated significant interindividual variation in the appearance of the lingual frenulum; however, it emphasised that these anatomical differences are not necessarily correlated with functional limitations. This finding that diagnostic and treatment decisions based solely on anatomical assessment may be insufficient. Therefore, anatomical evaluation methods such as the blanching test should be complemented with functional assessments to ensure accurate clinical judgement (5).

Indications for Frenectomy and Surgical Approaches

A highly attached frenulum may cause tension at the gingival margin during lip movements, leading to the opening of the gingival sulcus into the oral cavity and displacement of the gingiva over the tooth surface (15). Over time, this can result in gingival recession, adversely affecting periodontal health. Additionally, factors such as the formation of diastema, reduced vestibular depth, insufficient keratinised gingival tissue, and consequent plaque accumulation may impair the individual's ability to maintain optimal oral hygiene (16). A high frenulum attachment may also negatively impact aesthetic appearance, speech functions, and prosthesis stability. These changes can accelerate the progression of periodontal disease, potentially leading to attachment loss and alveolar bone resorption (17).

An abnormally structured frenulum can be surgically corrected through frenotomy, frenectomy, or frenuloplasty procedures. Frenotomy is a minimally invasive surgical procedure performed to alleviate the restricted movement of the tongue or lip caused by the frenulum. It involves a small incision, is completed in a short time, carries minimal risk, and often does not require anaesthesia; it is particularly preferred in infants and young children. In contrast, frenectomy is a more extensive surgical intervention that entails complete removal or substantial reshaping of the frenulum (Figure 6-9). This procedure is typically indicated when the frenulum causes significant functional impairment or interferes with orthodontic treatment, and it is usually performed under local anaesthesia with sutures. Frenuloplasty, on the other hand, aims to reposition or modify the frenulum without complete excision. It is indicated in cases of functional limitations or discomfort and can be performed in both paediatric and adult patients, with the surgical approach tailored to the individual needs of the patient (18).

Over time, and with advancements in technology, various surgical techniques have been developed for performing frenectomy procedures. In addition to conventional methods using a scalpel, modern techniques now incorporate soft tissue lasers and electrocautery devices. Commonly used approaches in clinical practice include traditional scalpel frenectomy, the Miller technique, V-Y plasty, Z-plasty, and methods utilising laser or electrosurgical devices (19).

Figure 6. Preoperative view showing high labial frenulum attachment.

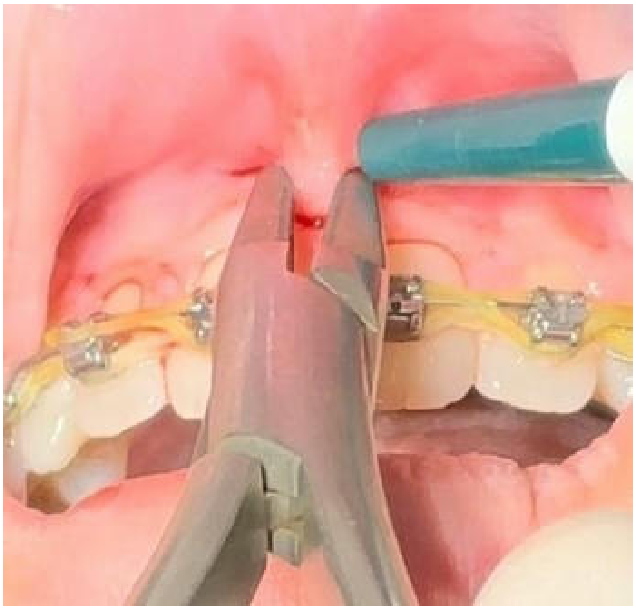

Figure 7. Clamping and positioning of the frenulum prior to surgical excision.

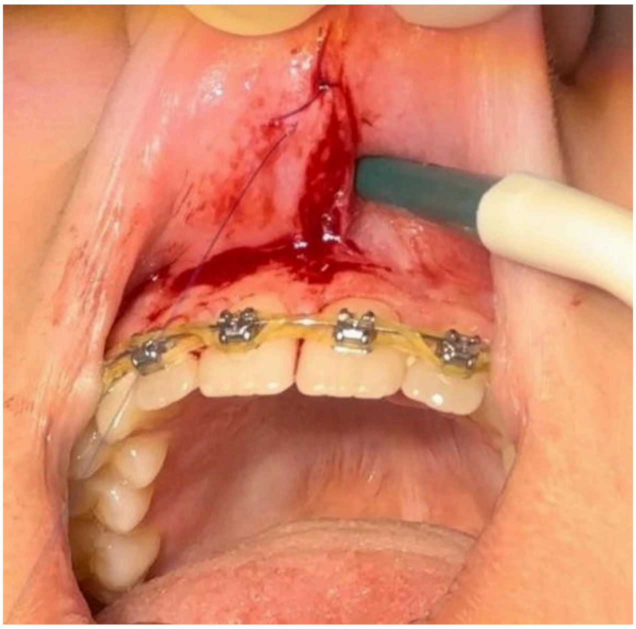

Figure 8. Intraoperative view during frenulum excision.

Laser technology offers several advantages due to its photophysical properties, including effective tissue ablation, successful haemostasis, detoxification, and antimicrobial effects (19). Laser-assisted frenectomy procedures provide

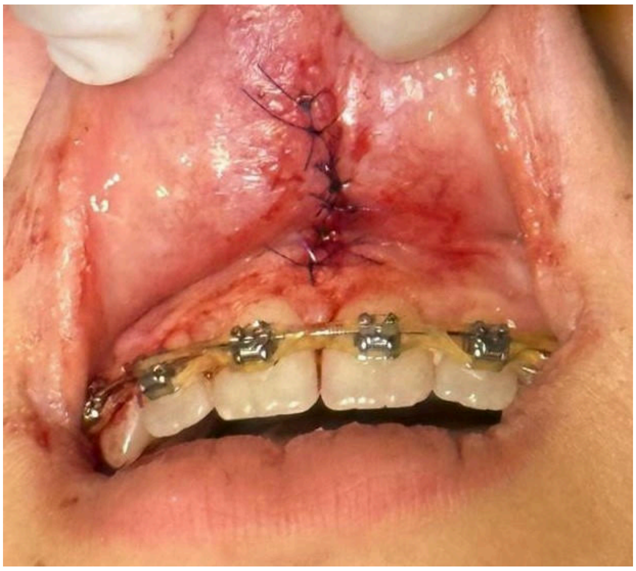

Figure 9. Postoperative view after suturing.

numerous clinical benefits, such as minimal bleeding, the elimination of the need for sutures (due to secondary intention healing), shorter operative times, lower preoperative anxiety levels, reduced or absent postoperative pain, and oedema in paediatric patients (20). However, one of the most critical considerations in laser procedures is the potential for thermal damage to the surrounding tissues. Therefore, the type and wavelength of the laser must be meticulously selected according to the characteristics of the target area (3).

During laser-assisted frenectomy, the frenulum is generally secured with a haemostat to ensure stabilisation. The laser fibre tip is initially applied in direct contact with the tissue, and incisions are made superior and inferior to the haemostat. These incisions converge at the clamping point, enabling the complete removal of the frenular tissue. After the excision, laser ablation was employed to target the residual muscle fibres. Any carbonised tissue is carefully debrided using sterile gauze soaked in physiological saline. The surgical site is then managed through secondary intention healing (3).

Laser systems used in frenectomy procedures are categorised according to their emission wavelengths, tissue interaction profiles, and therapeutic indications. This categorisation is primarily determined by how effectively the laser energy is absorbed by specific tissue components, which in turn influences the procedural efficiency and clinical outcomes (20).

Classification and Clinical Characteristics of the Laser Systems

Laser systems employed in frenectomy procedures are systematically classified according to their emission wavelengths, tissue-specific absorption characteristics, and corresponding clinical outcomes. Each laser modality demonstrates distinctive interactions with biological tissues, thereby offering procedural advantages depending on the context of use. Optimal laser selection should be guided by the anatomical site of application, the therapeutic objectives of the intervention, and the patient's individualised clinical profile (Table 1) (20, 21).

Diode lasers (810–980 nm), which are highly absorbed by haemoglobin and melanin, are commonly employed in soft tissue surgeries because of their effective haemostasis, minimal invasiveness, and reduced need for suturing. Erbium lasers, specifically Er:YAG (2940 nm) and Er,Cr:YSGG (2780 nm), are efficiently absorbed by water and hydroxyapatite, making them suitable for both soft and hard tissue applications, including paediatric cases, due to their minimal thermal damage and accelerated healing. CO_2 lasers (10,600 nm) are also water-absorptive and are preferred for precise soft tissue incision and coagulation, offering advantages such as minimal intraoperative bleeding and often eliminating the need for sutures. Finally, Nd:YAG lasers (1064 nm), with deep tissue penetration and a strong bactericidal effect, are mainly used in periodontal and soft tissue procedures (20, 21).

This study aimed to compare the effects of the Er:YAG laser and conventional surgical techniques on postoperative pain, wound healing, and patient satisfaction. A total of 28 patients were enrolled and randomly allocated into two groups. In the Er:YAG laser group, consisting of 15 individuals, the surgical parameters were adjusted to 3 W or 4 W depending on the type of lingual frenulum. In the control group, composed of 13 individuals, the conventional scalpel technique involving transverse incision and longitudinal suturing was employed. Postoperative assessments revealed that, at all time points, pain scores measured using the Visual Analog Scale (VAS) were significantly lower in the laser group than in the control group. Similarly, wound healing scores recorded on days 3 and 7 were statistically more favourable in the laser cohort. On the other hand, no significant differences were observed between the groups in terms of mental status, feeding satisfaction, or tongue function. These findings suggest that the Er:YAG laser may offer superior outcomes in minor soft tissue surgeries, particularly in terms of postoperative pain management and wound healing, when compared to conventional scalpel techniques (22).

Özener et al. (23) retrospectively compared diode laser-assisted and conventional surgical frenectomy in patients with abnormal maxillary labial frenulum attachments. Among the 429 reviewed cases, 70 patients meeting specific criteria (age, sex, frenulum type, presence of diastema, periodontal

Table 1. Laser Systems Used in Frenectomy Procedures

Laser Type	Wavelength	Absorption Target	Applications	Advantages	Disadvantages
Diode Laser	810–980 nm	Haemoglobin, Melanin	Soft tissue surgery, frenectomy, gingivectomy	Effective haemostasis, low cost, no need for sutures	Risk of thermal damage and limited penetration
Er:YAG	2940 nm	Water, Hydroxyapatite	Soft and hard tissue surgery	Minimal thermal damage and rapid healing	Risk of hard tissue damage and high device cost
Er,Cr:YSGG	2780 nm	Water, Hydroxyapatite	Soft and hard tissue surgery and frenectomy	Low carbonisation, fast healing, good control	High cost, steep learning curve
CO_2 Laser	10,600 nm	Water	Soft tissue surgery and frenectomy	Efficient haemostasis, precise incision, minimal bleeding	High thermal effect, risk to the surrounding tissues
Nd:YAG	1064 nm	Haemoglobin, Melanin	Periodontal therapies and soft tissue surgery	Deep penetration, bactericidal effect	Risk of deep tissue damage, limited usage

status, and surgical method) were included. They were categorised based on the frenulum type: gingival (32.9%), papillary (38.6%), and papilla-penetrating (28.6%). Thirty-six patients underwent scalpel surgery, while 34 underwent diode laser-assisted procedures. The plaque index (PI), gingival index (GI), and probing depth (PD) were recorded at baseline and at six weeks. Although the baseline values were similar, the PI and GI scores were significantly lower in the laser group at six weeks. No significant difference was found in PD values, and no recurrences or reattachments were noted in 91.4% of cases during the 1-year follow-up. The study concluded that both techniques are clinically effective, with diode laser-assisted frenectomy offering favourable outcomes and reduced inflammation in the early postoperative period (23).

A Clinical Approach to Frenulum Anomalies in Children

Frenectomy may be indicated in paediatric patients when aberrant frenulum attachments cause functional, periodontal, orthodontic, aesthetic, or prosthetic concerns. Structural restrictions, particularly in cases of ankyloglossia, may affect breastfeeding, mastication, speech, and oral hygiene (24, 25). In neonates, a short or thickened lingual frenulum can hinder latching and milk transfer during breastfeeding (7). An aberrantly positioned frenula may also exert tension on the periodontal tissues, leading to gingival recession, while an ectopic labial frenula can compromise the stability of the orthodontic appliance (26, 27).

The clinical guidelines published by the *American Academy of Paediatric Dentistry (AAPD)* in 2022 emphasises that surgical decisions regarding lingual and labial frenula in paediatric patients should be based not only on anatomical variations but also on functional limitations. Functional indications include clinical findings such as difficulties with breastfeeding, speech impairments, and challenges in maintaining oral hygiene. While the *AAPD* acknowledges that anatomical classification systems—such as the Placek classification—may assist in the diagnostic process, it underscores that these systems alone are insufficient to determine surgical indications (28).

Similarly, the consensus statement released by the *International Association of Paediatric Dentistry (IAPD)* in 2022 states that surgical intervention may be an effective option in managing breastfeeding and speech problems in children diagnosed with ankyloglossia. However, the statement also notes the potential complications of surgical procedures, including bleeding, scar tissue formation, and the risk of reattachment. Furthermore, it recommends tailoring the surgical technique to the child's age—specifically, performing frenotomy with cold scissors in neonates and employing either laser or conventional frenectomy methods in older children (29).

Clinical studies support these guidelines. A 2014 study on 30 neonates reported significant improvements in breastfeeding scores and maternal comfort after frenotomy (30). A larger investigation in 2022 involving 526 newborns confirmed improved breastfeeding outcomes although multidisciplinary care—including lactation support—was emphasised as a key factor alongside surgery (31).

The growing interest in upper lip frenectomy has been linked to concerns about breastfeeding difficulties and midline diastema. However, the evidence remains inconclusive. A systematic review highlighted the potential contribution of papillary or papilla-penetrating frenula to diastema formation but recommended postponing frenectomy until after the eruption of maxillary lateral incisors or after orthodontic closure to minimise relapse (32).

Timing of Frenectomy During Orthodontic Treatment and Clinical Decision Making

Frenectomy is commonly indicated in orthodontic cases involving maxillary midline diastema, particularly when an abnormal labial frenum is present in the anterior region. Prominent frenula not only lead to diastema formation but may also restrict upper lip mobility (33). Thereby complicating orthodontic adjustments and reducing the comfort of appliance use. In addition, certain types of frenula have been associated with gingival recession and subsequent periodontal problems. When the frenum extends into the interdental or papillary region, it can hinder space closure during orthodontic treatment and increase the risk of post-treatment relapse. Therefore, the appropriate timing of the surgical intervention is critical for both the effectiveness of the orthodontic outcome and its long-term stability (32).

The midline diastema may lead to aesthetic concerns and self-esteem issues, particularly during childhood and adolescence. Such conditions can predispose individuals to social isolation, peer bullying, and psychological distress. Therefore, the timing of frenectomy should not be based solely on anatomical and functional criteria but should also consider the psychosocial status of the child. In selected cases, early intervention may be considered within a multidisciplinary framework to mitigate the potential psychological impact (32).

Recent studies have demonstrated that abnormal frenulum morphology and attachment are not limited to localised oral manifestations but may also have significant effects on skeletal development, occlusal relationships, and orthodontic treatment planning (34-36). In individuals with ankyloglossia, dental and skeletal discrepancies such as arch constriction and increased overbite have been observed (34). Similarly, a higher prevalence of Class III malocclusion has been reported among individuals with low-attached maxillary labial frenula (35). Moreover, frenulum morphology and insertion type have been statistically associated with occlusal classification and history of orthodontic treatment (36). These findings highlight the importance of evaluating the frenulum not only in terms of functional limitations (e.g., breastfeeding, speech, oral hygiene) but also as a potential contributing factor affecting maxillofacial development and long-term orthodontic stability (9, 34).

The contemporary literature highlights two main perspectives on the timing of frenectomy. One approach recommends performing the procedure before initiating orthodontic treatment, whereas the other favours delaying it until after the diastema has been orthodontically closed. Recent evidence indicates a growing preference for the latter, that post-closure frenectomy may yield more favourable and stable treatment results (32, 37).

Ahn et al. explored the clinical perspectives and practices of orthodontists in the UK concerning frenectomy through a cross-sectional survey. The study involved 353 respondents who completed a 14-question online questionnaire. Approximately 75% of participants indicated regular use of the Blanch test for diagnosing abnormal frenula, whereas only 15% reported incorporating radiographic methods. Although three-quarters of the orthodontists regarded frenectomy as an integral component of orthodontic therapy, there was notable variability in their opinions regarding the optimal timing of surgical intervention (38).

In a distinct survey conducted among members of the *AAPD*, the *American Association of Orthodontists (AAO)*, and the *American Association of Oral and Maxillofacial Surgeons (AAOMS)*, clinicians' perspectives on the aetiology, diagnosis, and treatment of maxillary midline diastema were evaluated. The results revealed variability in opinions among oral and maxillofacial surgeons regarding the appropriate timing of frenectomy and the sequence of diastema closure. *AAOMS* has stated that labial frenectomy is a procedure that can be performed at any age following the eruption of the permanent teeth. In contrast, most paediatric dentists and orthodontists supported performing frenectomy after the eruption of permanent canines and upon completion of orthodontic treatment (37).

In another study conducted by Tanık et al., periodontal parameters and diastema width were assessed in 50 patients presenting with abnormal frenula in the maxillary or mandibular midline regions. Measurements were taken before and after frenectomy, which was performed using conventional surgical techniques, and patients were followed for a period of one year. The interdental distance was measured with a calliper, while periodontal assessments included probing depth, plaque index, bleeding on probing, amount of attached gingiva, and gingival recession. The findings demonstrated a meaningful decrease in the space between the teeth along with marked enhancements across all assessed periodontal indicators after the frenectomy procedure (39).

Based on all these findings, the most commonly recommended approach in labial frenectomy procedures integrated with orthodontic treatment is to perform the surgical intervention after the diastema has been orthodontically closed. This strategy helps prevent unnecessary surgical procedures while enhancing orthodontic stability. Moreover, labial frenectomy contributes to improved treatment outcomes by eliminating frenulum-related restrictions, alleviating discomfort associated with orthodontic appliances, and addressing diastema and alignment issues, thereby leading to more aesthetically pleasing results. However, the timing of the frenectomy should be carefully planned on an individual basis, considering the specific clinical condition of each patient.

CONCLUSION

Frenulum-related anomalies can compromise breastfeeding, speech, periodontal health, and orthodontic stability, often requiring an interdisciplinary management approach. Frenectomy may be performed using either conventional or laser-assisted techniques, with the latter increasingly favoured for its minimally invasive nature and favourable healing outcomes. In orthodontic contexts, evidence that postponing frenectomy until after diastema closure may improve long-term stability.

Future research should focus on the development of standardised diagnostic protocols, comparative trials between conventional and laser-assisted approaches, and long-term follow-up studies. In addition, investigations into functional outcomes including breastfeeding success, speech development, and patient-reported quality of life as well as the role of multidisciplinary care are essential to optimise clinical decision-making in paediatric frenectomy.

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