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Original Article

Longitudinal evaluation of diastema closure in patients submitted to labial frenectomy in different phases of the mixed dentition: A historical cohort

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ABSTRACT

Background: There is a controversy in the literature concerning the indications for frenectomy to treat interincisal diastema. Aims and Objectives: The aim of this study was to evaluate the spontaneous closure of the interincisal diastema in patients submitted to upper labial frenectomy (ULF) during the mixed dentition. **Materials and Methods:** Records from patients treated between 2009 and 2014 in the course of Pediatric Dentistry Surgery at Fundecto–USP were evaluated to select those that were submitted to ULF during the mixed dentition using the Chelotti technique. Initial clinic characteristics and radiographic data related to the abnormal upper labial frenum were collected. The patients were called for a return visit to evaluate the diastema closure. The prevalence of children with diastema reduction after the frenectomy was determined by descriptive analysis. Logistic regression was used to evaluate the association between exposure factors and diastema reduction. **Results:** From 449 eligible records, 53 were selected and 25 were in a return visit. It was not possible to find association between the exposure factors and diastema closure. **Conclusion:** There is no relation between the time of surgery intervention and diastema closure. However, the intervention during the mixed dentition led to a partial diastema reduction in 80% of the cases.

KEYWORDS: Diastema closure, labial frenectomy, labial frenum

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Introduction

The upper labial frenum is a fold in the oral mucosa, located in the midline region, extending from the inner surface of the upper lip to the interincisal attached gingiva. Its function is to stabilize and limit the excessive movement of the lip, which would result in an excessive exposure of the gingival mucosa.[1] This anatomical structure is present since the newborn; however, during all the period of deciduous dentition, the labial frenum is attached in the incisive papilla, being called abnormal labial frenum (ALF). The physiological tendency is that the frenum gets atrophic

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and retracts in the apical direction, according to the child's growth, the development of the alveolar process of the maxilla, and the dental eruption of the permanent upper incisors, in the mixed dentition phase. However, in some cases, the frenum remains attached in the original palatine position and is therefore considered pathological and called an ALF.[1]

The diagnosis of the ALF is made in the mixed dentition, from the moment the permanent upper central incisors are present in the mouth. Palatal papilla ischemia is observed when the interincisal labial frenum and diastema are drawn, together with other unfavorable clinical conditions.[2] This condition favors the accumulation of biofilm and food debris due to the difficulty of hygiene in the region, retraction of tissue in the cervical of the tooth, and restriction in the labial movements, harming even phonetics.[3] Another cause of the diastema is the pressure exerted by the canines on the roots of the incisors, approaching the apices toward the midline and pushing the crowns in the opposite direction.[4] This stage of child development is called the stage of the ugly duckling when any type of orthodontic treatment for diastema closure is contraindicated. Some pathological conditions may also cause interincisal diastemas, such as supernumerary teeth and odontomas.[5]

Thus, if the diagnosis of the ALF is made, after careful evaluation, it can be treated either by frenectomy or by frenotomy.[5]

Most of the articles on this issue are talking about techniques and there are some reports of cases.[2,6-8] However, there are still doubts and controversies about the best time for surgical intervention, leaving some questions unanswered.[9-14] Looking for the best scientific evidence available on the subject at the time, a systematic review was found,[13] covering complications and conditions associated with upper labial frenum, as well as recommended treatments, but still without clarification as to the best time for the surgical intervention.

Considering the lack of studies evaluating the closure of the interincisal diastema after patients underwent upper labial frenectomy (ULF), this study is totally justified. The general objective of this historical cohort study was to evaluate if patients with ALF who underwent labial frenectomy using the Chelotti repositioning technique[14] presented a spontaneous reduction of the interincisal diastema after the intervention and to verify whether or not there was any difference in intervening in different phases of the mixed dentition, observing the closure or not of the diastema. In addition, it was evaluated the best moment for the surgical treatment of the persistent ALF, analyzing the closure of the diastema of patients who were submitted to this type of procedure, at different ages and periods of development of the mixed dentition.

Methods

A historic cohort study was conducted in patients undergoing surgical orthodontic treatment, according to the guidelines of the STROBE Protocol[15] after approval by the Research Ethics Committee of the Ibirapuera University.

Data were initially collected from medical records. Subsequently, the patients aged 6–12 years attended regularly at the Pediatric Surgery Course of FUNDECTO-USP were re-evaluated during a return visit.

All patient records were considered to compose the sample of patients attending the course from 2009 to 2014. Of these, only patients who underwent ULF were selected in the mixed dentition period. Medical records with incomplete data were excluded from the study in addition to patients who underwent corrective orthodontic treatment after surgery.

Patients indicated for ULF were evaluated and operated on by course surgeons. In a standardized manner and based on the classification of Sewerin 1971, these should have the following clinical characteristics for the correct diagnosis and indication: mixed dentition, presence of interincisal diastema, low frenum insertion, near the gingival margin, and ischemia of the incisive papilla when the upper lip is drawn (blanching test).[13] Care was taken to verify, through diagnostic radiographic examination, the absence of foreign bodies in the midline region of the maxilla.

All patients were operated on through the Chelotti apical repositioning technique of the ALF.[7,8] It consists of the removal of only the portion of the frenum that presents unwanted insertion, maintaining morphology and function of this structure and providing the optimal esthetic result. In this technique, the mucosa is not clamped, which would produce a scar by the maceration of the tissue.

The authors, always in consensus, collected the clinical characteristics, prior to ULF of the patients selected for this study. For this purpose, a data collection form was developed [Table 1].

The data to compose this phase of the study were collected during a return visit of the patients from the course. At that time, the clinical aspects of the patients after the ULF were analyzed and recorded. The radiographic examination was dispensable since the finding of closure or not of the diastema is clinical and visual.

The prevalence of children with diastema reduction after the ULF was determined by descriptive analysis. Logistic regression was used to evaluate the association between exposure factors and possible outcomes. For

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Table 1: Distribution of presence of partial, total, or nondiastema reduction in according to the characteristics of patients in the moment of intervention and results of unadjusted regression analysis

Characteristics	Presence of partial diastema		Total diastema reduction		Without diastema reduction	
	n (%)	OR (95% CI)	*n* (%)	OR (95% CI)	*n* (%)	OR (95% CI)
Sex						
Male	4 (16)	0.533 (0.058-4.912)	3 (12)	0.250 (0.027-2.319)	3 (12)	1 (reference)
Female	5 (20)	1 (reference)	8 (32)	1 (reference)	2 (8)	
Moment of intervention						
After central incisors	3 (12)	6.00 (0.221-162.531)	1 (4)	1.00 (0.34-29.807)	1 (4)	
After lateral incisors	5 (20)	5.00 (0.273-91.518)	8 (32)	4.00 (0.329-48.656)	2 (8)	
After canines	1 (4)	1 (reference)	2 (8)	1 (reference)	2 (8)	
Initial teething						
Mixed	7 (28)	5.333 (0.343-82.827)	5 (20)	3.00 (0.285-31.633)	2 (8)	
Permanent	2 (8)	1 (reference)	6 (24)	1 (reference)	3 (12)	
Time between intervention and outcome						
0-1	2 (8)	0.667 (0.047-9.472)	1 (4)	0.111 (0.006-1.917)	2 (8)	
1-2	4 (16)	2.667 (0.158-45.141)	1 (4)	0.222 (0.009-5.275)	1 (4)	
>2	3 (12)	1 (reference)	9 (36)	1 (reference)	2 (8)	

OR=Odds ratio; CI=Confidence interval

this, a univariate analysis was initially performed for each of the independent variables, and those with $P < 0.20$ would be included in the multiple logistic regression analysis model.

Results

From 449 eligible records, 52 patients who underwent ULF were selected. Through the inclusion and exclusion criteria, 25 patients were called and attended the return visit and then selected to participate in the study.

It was observed that of the 25 patients included, 11 (44%) showed total diastema reduction after ULF and 13 patients (52%) presented reduction of the diastema when the frenectomy was performed after lateral eruption. Intervention in mixed dentition resulted in a reduction of diastema in 80% of cases.

In the univariate analysis, it was not possible to observe any association between the exposure factors and the outcomes, as expressed in Table 1. Sex, time of intervention, type of dentition at the time of reevaluation, and time between intervention and outcome were associated with the amount of diastema present in the patient.

In addition, intervention in mixed dentition resulted in 12% of the patients without diastema reduction, while 36% presented total reduction. Regarding the time between frenectomy and total diastema reduction, patients who were evaluated after 2 years presented a 36% total diastema reduction. The results of the present study did not indicate a statistical difference between the phases of the mixed dentition, but the mixed dentition period seems to be the best for the frenectomy according to studies.[11,16,17]

Discussion

Since the presence of the ALF is one of the etiological factors of the interincisal diastema, which leads to several esthetic and functional problems, a rapid and correct diagnosis is essential and if necessary, professional intervention.[12,13]

There is no consensus in the literature as to the best time to surgically intervene in the ALF, but some recommend waiting until the permanent lateral incisors erupt.[16] Others indicate that the surgery should be performed after eruption of the permanent canines.[11] Others say that surgical intervention can already be performed after eruption of the permanent central incisors.[17] Thus, the design of the present cohort study was justified in an attempt to elucidate these patients indicated and submitted to ULF.[14]

The aim of this research was to carry out a survey, through clinical evaluations after the surgical treatment of ULF of the ALF, for later analysis of the data obtained and possible elucidation of the controversies about the proposed theme. Moreover, define the best moment, during the mixed dentition phase, for the intervention, aiming at the spontaneous closure of the interincisal diastema is of great importance, according to some authors,[18] as it may prevent a possible posterior orthodontic treatment, optimizing the treatment. On the other hand, other authors[19] say that diastema closure is more effective when the frenectomy is associated with posterior orthodontic treatment than with frenectomy alone.

There was a great advantage in carrying out the study in a single institution since it followed a standard protocol of care and documentation of the cases. Due to the standardization of all data evaluated, it was possible to have the security of monitoring and comparing the results obtained without interference

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from different techniques or differences in care and initial diagnosis. However, difficulties were found in relation to the complete filling of medical records and patient attendance at scheduled appointments, which considerably reduced the sample.

During the return visit, the following clinical conditions were assessed: absence of ischemia of the interincisal papilla, total or partial reduction or absence of the interincisal diastema, type of dentition at the moment of the control, and time elapsed between the surgery and reevaluation.[1,5,8]

In this study, it was not possible to find an association between the exposure factors and the outcomes evaluated. Perhaps, this is due to the sample size, besides the difficulties of locating and filling the medical records. However, the first cohort study, which has limitations but has its importance, is again underlined. On the other hand, it may be that there is no association between the intervention phase and the closure or not of the interincisal diastema, and the lack of studies with similar evaluations makes it difficult to standardize the number of samples.

Although with a reduced sample, this is the first historical cohort study presenting a sample accompanying the evolution in occlusion development of patients submitted to ULF. This shows the lack of studies on the issue. One of the advantages of this type of study is that it has great utility in the investigation of several different results that can arise after a single type of exposure, in this case, results obtained in the closing of diastema after surgical intervention. Among the disadvantages, we can mention the difficulty in relation to the loss of follow-up. The sample should be monitored over a long period of time, and often, the situation of a research participant may change during the process, leading to the exclusion of the sample.[14]

Within this research group, it is easy to follow diagnoses and surgical procedures in children indicated for surgery. Based on the difficulties and limitations found in this study, modifications will be made to the filling of medical records and other needs detected to improve the quality of the research. In a subsequent study, the number of patients studied can be increased, the time from surgery to subsequent clinical control can be standardized, or a larger number of follow-up visits can be performed. For future studies, strategies will be created next to the study group and the team of the studied institution to achieve a more efficient control, including a greater number of patients analyzed. However, this research proved to be important to clarify the difficulties surrounding this type of study, serving as a guide for future work.

Conclusions

The current literature presents a lack of studies of this nature, indicating the need for more research on the issue since the subject is of great relevance for pediatric dentistry. In this way, a quicker and more effective resolution of the case can be obtained by optimizing the treatment and eliminating the esthetic and functional problems caused by the ALF, which may prevent even a possible future need of orthodontic treatment. Within the limitations of the present cohort study, it can be concluded that there is no association between the moment of the surgical intervention and the level of diastema closure. However, a follow-up of 5 to 10 years after the frenectomy may show different results, with much higher rates of diastema reduction.

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Conflicts of interest
There are no conflicts of interest.

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