

Original articles

Anatomical classification of lingual frenulum in babies

Classificação anatômica do frênulo lingual de bebês

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ABSTRACT

Purpose: to analyze the anatomical aspects of the lingual frenulum of babies attended the Reference Center for Hearing Health / CRESA, of the Pontifical Catholic University of Goiás / PUC Goiás.

Methods: it is a cross-sectional, observational, analytical study with a quantitative approach. Babies between 1 and 4 months, of both genders, fed in the womb, were evaluated; babies with anatomical and physiological changes in the face, pre or post maturity or neurological impairment were excluded. For the anatomical classification of the lingual frenulum were analyzed the thickness of the frenulum and its attachment on the tongue and mouth floor, from the "Lingual frenulum protocol with scores for infants" (MARTINELLI; MARCHESAN; BERRETIN-FELIX, 2013).

Results: it was possible to view the frenulum in 165 babies, being 104 normal and 61 altered. In just one baby was not possible to see the frenulum. Among the normal frenulum, were prevalent those with the attachment in the middle third and visible from the sublingual caruncles. Among the altered frenulum was more frequent those with attachment between the middle third and the apex and visible from inferior alveolar crest. Thin thickness was predominant. Among the babies with altered frenulum, 24 had altered suction and, of the babies with normal frenulum 18 had altered suction.

Conclusion: the lingual frenulum were classified as normal or altered, being predominant normal lingual frenulum and thin thickness. Altered frenulum was prevalent in males. Babies with altered lingual frenulum showed more change of alteration in suction, although the correlation between frenulum and suction was low.

Keywords: Lingual Frenulum; Anatomy; Infant; Classification

RESUMO

Objetivo: analisar os aspectos anatômicos do frênulo lingual de bebês atendidos no Centro de Referência em Saúde Auditiva / CRESA da Pontifícia Universidade Católica de Goiás / PUC Goiás.

Métodos: trata-se de um estudo transversal, observacional, analítico, com abordagem quantitativa. Foram avaliados bebês entre 1 e 4 meses, de ambos os gêneros, alimentados no seio materno, sendo excluídos bebês com alterações anatomofisiológicas na face, pré ou pós maturidade ou com comprometimento neurológico. Para a classificação anatômica do frênulo lingual foram analisadas a espessura do frênulo e a sua fixação na língua e no assoalho da boca, a partir do "Protocolo de avaliação do frênulo da língua com escores para bebês" (MARTINELLI; MARCHESAN; BERRETIN-FELIX, 2013).

Resultados: foi possível visualizar o frênulo em 165 bebês, sendo 104 normais e 61 alterados. Em apenas 1 bebê não foi possível visualizar o frênulo. Dentre os frênulos normais, predominou os com fixação no terço médio e visível a partir das carúnculas sublinguais. Dos frênulos alterados foi mais frequente aqueles com fixação entre o terço médio e o ápice e visível a partir da crista alveolar inferior. Predominou a espessura delgada. Dos bebês com frênulo alterado, 24 apresentaram sucção alterada e, com frênulo normal, 18 apresentaram sucção alterada.

Conclusão: os frênulos linguais foram classificados em normal e alterado, sendo predominante o frênulo lingual normal e a espessura delgada. A alteração do frênulo prevaleceu no gênero masculino. Bebês com frênulo lingual alterado apresentaram mais chances de alteração na sucção, embora a correlação entre frênulo e sucção tenha sido baixa.

Descritores: Freio Lingual; Anatomia; Lactente; Classificação

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INTRODUCTION

The tongue is an organ that participates in important functions in the oral cavity, such as sucking, swallowing, chewing and speech^{1,2}. Its lower side features a fold of mucous membrane that connects the floor of the mouth, called lingual frenulum^{3,4}.

The frenulum allows free movement of the tongue. During embryonic development, when there is no full apoptosis of the frenulum, the residual tissue may compromise the tongue mobility and, hence, the oral functions, which may lead to ankyloglossia⁵.

The ankyloglossia is a congenital oral anomaly that varies from mild to severe degrees, resulting, in different levels, in reduction of tongue movements⁶.

The evaluation of the lingual frenulum of babies generally comprises visual observation of the aspects of the frenulum, tongue mobility, non-nutritive sucking, nutritive sucking and swallowing^{5,7}.

The lingual frenulum can be diagnosed as normal or altered, depending on the criteria used by the evaluator⁸. There is considerable controversy among health professionals regarding the classification of the lingual frenulum altered⁹. Different classifications are found in the literature: lisp^{1,10,11}; ankyloglossia^{1,12-15}; short frenulum, long frenulum, frontal lisp¹; short mucosal, long mucosal with mandibular fixing and hypertrophic with fixing the alveolar ridge¹²; short, anterior fixation and short with anterior fixation^{4,16} and altered frenulum^{8,17,18}.

The diagnosis of alterations in the frenulum requires a thorough knowledge of the evaluator on the anatomy of the tongue and the different aspects of the frenulum and adjacent regions. In addition, the professional must know which functions can be influenced by changes in the lingual frenulum⁸.

The altered lingual frenulum can cause implications in speech^{3,6,12,16,17,19,20}, malocclusion and oral hygiene¹²; inadequate latch, trauma and pain in the nipple that contribute to early weaning^{3,13,14}; limitation of tongue movements^{6,17,18}; suction difficulties^{3,6,17,18}; impairment of swallowing^{6,17,18}, chewing^{17,21} and slow weight gain³.

In the literature revision on the last 14 years, were found 06 articles on the lingual frenulum changes index (Table 1).

Faced with losses generated by an altered lingual frenulum, it was perceived how important an early diagnosis is in order to promote the development of feeding and child communication. In this sense, the objective of this study was to analyze the anatomy of the lingual frenulum of babies attended the Reference

Center for Hearing Health/CRESA of the Speech Therapy Department of the Pontifical Catholic University of Goiás/PUC Goiás.

METHODS

This research was approved by the Research Ethics Committee of PUC Goiás, with process n^o503708 and followed all the rules established by Resolution 466/12 of the National Health Council.

This is a cross-sectional, observational and analytical study with a quantitative approach.

Were included babies between 1 month and 4 months, of both genders, fed in the womb, referred to the evaluation of the lingual frenulum in CRESA/PUC Goiás, from August 2014 to February 2015, whose mothers were willing to authorize and sign the Instrument Consent. Were excluded babies with anatomophysiological changes in the face, pre or post-maturity or with neurological impairment interfering in the sucking and/or swallowing.

Babies were evaluated in clinics in CRESA/PUC Goiás. Data collection occurred in the last 7 months, held twice a week.

In evaluation of the lingual frenulum was used the "Lingual frenulum evaluation protocol for infants"¹⁸. The Anatomical frenulum classification in normal or abnormal was carried out at from the part of the analysis I (item 4) of the Protocol which includes the thickness of the frenulum, the attachment of the frenulum in sublingual face (ventral) of the tongue and the attachment of the frenulum on the floor from the mouth. The orofacial functions (Part II) were observed non-nutritive sucking (language movement) and nutritive sucking (rhythm of sucking, coordination of sucking/swallowing/breathing, biting the nipple and tongue snaps during suction).

The total duration of the intervention was about 20 minutes, including the interview, the assessment with the baby, photos and footage record, feedback of the results to responsible and the delivery of speech-language pathology report with the diagnosis of lingual frenulum.

Babies, whose frenulum was identified as altered, were referred to the speech therapy with report of lingual frenulum to basic health units corresponding to their respective neighborhoods. In basic health units, they scheduled an appointment with the pediatrician. After this consultation, the patient would be set to the pediatric dentistry clinic for evaluation of the dentist, so

these professionals were responsible to define the best procedure for each patient.

The data collection were organized in a spreadsheet of Microsoft® Excel 2007 and transferred to Statistical

Package for Social Sciences 20/SPSS 20.0. Descriptive analysis was performed, the chi-square test and correlation Kendall's for statistical analysis, and adopted the level of significance of 5% ($p \leq 0,05$).

Table 1. Distribution of publications of indices of alterations of lingual frenulum of babies, according the author, year, objectives, sample, age and results

Authors/Year	Objective	Sample/Age	Results of alterations of lingual frenulum
MESSNER; LALAKEA; ABY; MACMAHON, 2000 ¹³	To analyze the incidence of ankyloglossia and difficulties of breastfeeding in babies with ankyloglossia.	Were examined 1.041 babies, from 0 to 30 days.	Fifty newborns (4.8%) were identified with ankyloglossia, 36 males and 14 females. Breastfeeding difficulties were experienced by 9 (25%) of the mothers of babies with ankyloglossia
BALLARD; AUER; KHOURY, 2002 ¹⁴	To identify the incidence, gender, age and the impact of the ankyloglossia in breastfeeding babies and the efficacy of the frenuloplasty with respect to solving specific breastfeeding problems.	3.032 babies, from 0 to 30 days, were examined	123 babies with ankyloglossia were identified, 70 presented symptoms of poor latch and 53 nipple pain. After frenuloplasties, it was observed an improvement in the latch in all cases and maternal pain levels fell significantly. The proportional of males for females was 15:1.
RICKE; BAKER; MADLON-KAY; DEFOR, 2005 ¹⁰	To determine whether breast-fed infants with altered lingual frenulum have decreased rates of breastfeeding at 1 week and 1 month of age, to determine the prevalence of lingual frenulum altered in babies; to test the usefulness of the Hazelbaker protocol in assessing the severity of altered frenulum in breastfeeding newborns.	3.490 babies were examined, the age was not mentioned.	80% of babies with altered frenulum have successful in the breastfeeding in 1 week, with 3 times more chance to use bottle. By 1 month, altered frenulum babies were as likely as controls to be bottle fed only. There was 148 (4.24%) of babies with altered lingual frenulum, 103 males and 45 females. The Hazelbaker is not useful to identify if babies with lingual frenulum alteration has difficulties to breastfeeding.
HOGAN; WESTCOTT; GRIFFITHS, 2005 ²³	To determine whether, in babies with altered lingual frenulum and a feeding problem, the medical treatment (referral to a lactation consultant) or immediate division works best and enables the babies to feed normally.	Were examined 1.866 babies, from 0 to 30 days.	Were identified 10,7% (n=201) babies with ankyloglossia, 124 males and 77 females, of whom 88 had breastfeeding or bottlefeeding problems. Chirurgical intervention resulted in improved feeding in 54 (95%) of babies. This procedure was significantly better for feeding improvement than the intensive support of the feeding consultant.
MARTINELLI; MARCHESAN; BERRETIN-FELIX, 2013 ¹⁸	To verify the anatomical features of the lingual frenulum influence in sucking and swallowing functions in term infants, in order to propose adjustments in the protocol proposed by Martinelli et al, 2012.	Were examined 100 babies, with 30 days.	Among 100 evaluated babies, 29 was not possible to see the frenulum. Of the 71 (71%) whom was possible to see it, 16 (22.5%) had anatomical features that restricted the tongue movement in nutritive and not nutritious sucking, and 55 (77.5%) remaining considered normal.
MARTINELLI; MARCHESAN; BERRETIN-FELIX, 2014 ¹⁷	To evaluate anatomical features of the lingual frenulum of babies on the 1st, on the 6th and 12th month of life, comparing with the literature.	71 babies were examined at 1, on the 6th and 12th month of life.	16 (22.5%) babies were diagnosed with altered frenulum. It was found that the lingual frenulum did not modify in the first year of life.

RESULTS

214 babies were analyzed in the period between August, 2014 and February, 2015. Taking into account the inclusion and exclusion criteria, 166 babies were included in this study. As for the 48 excluded infants, 72.9% (n=35) fed by bottle, 25% (n=12) were over the

age of 4 months and 2.1% (n=1) had Down syndrome, 50% of them were preterm and 8.3% post-term.

As for the age at examination, it was observed that 62.1% (n=103) of the babies were 1 month old, 21% (n=35) two months, 12.7% (n=21) 3 months and 4.2% (n=7) 4 months old. With regard to the gender, 51% (n=84) were females (Table 2).

Table 2. Frequency of chronological age and gender of babies attended in Reference Center in Hearing Health/CRESA between August, 2014 and February, 2015.

Sociodemographic factors	n	%
Age (months)		
1 month	103	(62,1%)
2 months	35	(21%)
3 months	21	(12,7)
4 months	7	(4,2%)
Gender		
Female	84	(51%)
Male	82	(49%)

In the analysis of lingual frenulum were find that most babies (63%) had frenulum with normal aspect (Figure 1).

In only 1 (0.6%) baby was not possible to view the frenulum. From babies with altered frenulum, 54% (n=33) were male and 46% (n=28) female. There was no statistically significant difference between gender and the anatomy of the frenulum ($p=0.38$).

Regarding to the thickness of the frenulum, 95.1% (n=157) had thin and 4.8% (n=8) thick frenulum. Among the thick frenulum, 50% (n=4) had a fixation on the middle third/sublingual caruncles and 50% (n=4)

between the middle third and the apex/inferior alveolar crest.

Regarding the fixing in the sublingual surface (ventral) of the tongue and floor of mouth, in relation to the normal frenulum, predominated in the fixation in the middle third/sublingual caruncles (28%). In the altered frenulum, the highest frequency was with fixing between the middle third and the apex/inferior alveolar crest (32.2%). (Figure 2).

Among the babies with normal frenulum, 10.8% had changed suction and among the babies with altered frenulum, 14.5% had changed suction (Figure 3).

There was a low correlation, with statistical significance, between the frenulum and suction ($p < 0.01$), whose coefficient was 0.252.

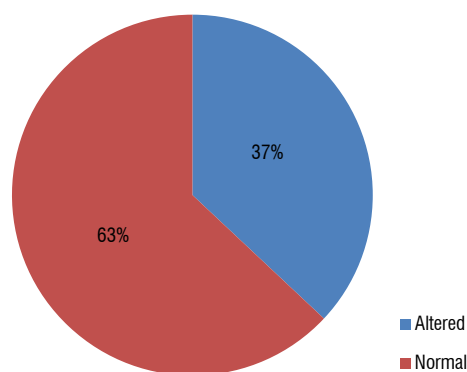


Figure 1. Classification lingual frenulum of babies attended in the Reference Center in Hearing Health/CRESA between August, 2014 and February, 2015

DISCUSSION

The lingual frenulum classifications are used to evaluate and characterize the structure in normal and altered²². Diagnosis and early intervention of the lingual frenulum promote breastfeeding and speech development. Deprivation of lingual movement may compromise sucking^{3,6,17,18}, chewing^{17,21}, swallowing^{6,17,18}, speech^{3,6,12,17} and lead to early weaning^{3,13,20}.

In this study, participated babies aged between 1 month and 4 months, different from previous studies

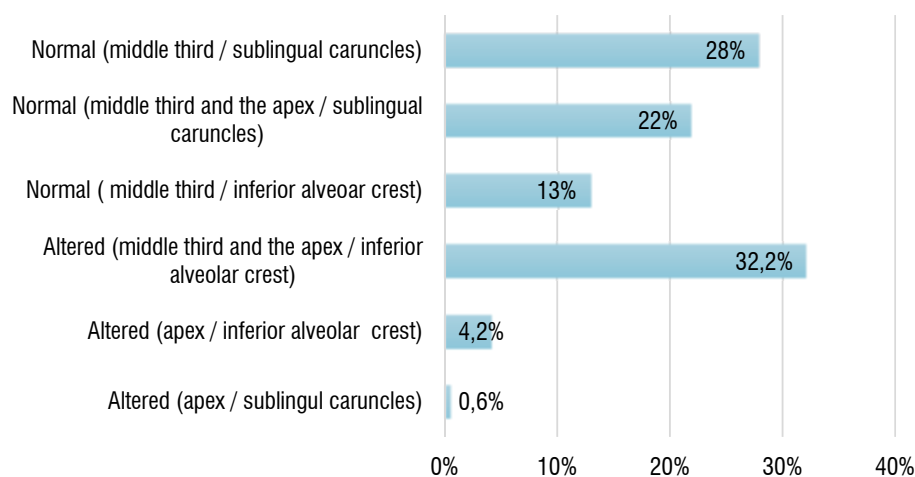


Figure 2. Distribution of the anatomic aspects of lingual frenulum in babies attended in the Reference Center in Hearing Health/CRESA - Puc Goiás between August, 2014 and February, 2015

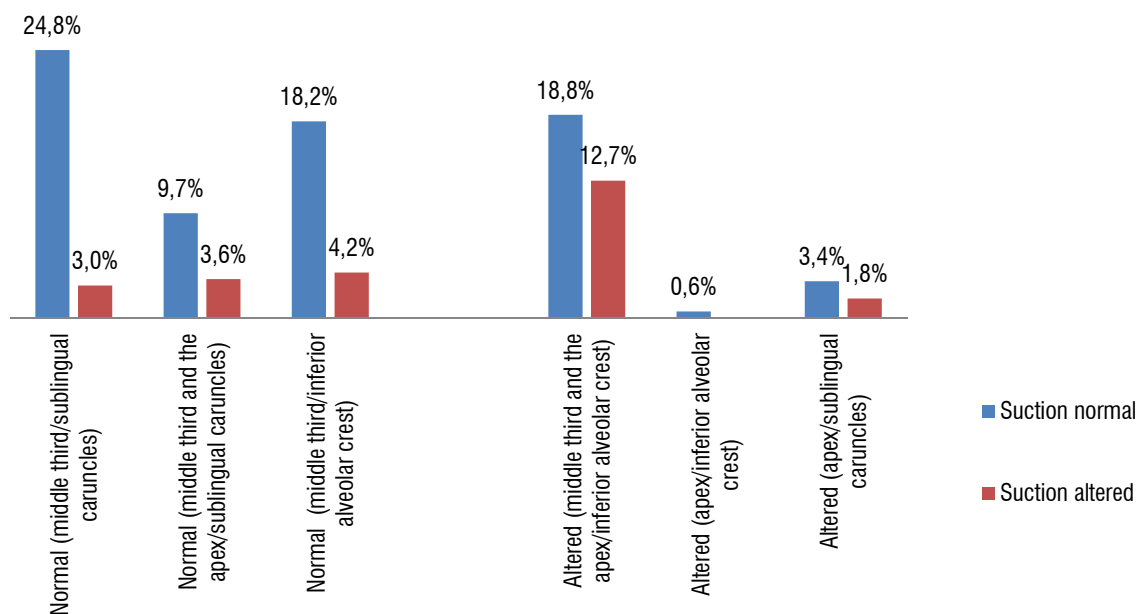


Figure 3. Distribution of changes in suction in normal and altered frenulum in babies attended in Reference Center in Hearing Health/CRESA - Puc Goiás between August, 2014 and February, 2015

that evaluated only newborns. Only two studies evaluated the anatomical characteristics of the lingual frenulum of babies older than 1 month, 1 on the 1st, on the 6th and 12th month of life and another between 0 and 72 months. In this study predominated the age of 1 month, suggesting an awareness of responsible for babies on the importance of evaluation of the lingual frenulum as well as health professionals who carried out the referrals. The predominant age contributed to the diagnosis and early intervention of lingual frenulum favoring the breastfeeding.

The results found in this study showed a similar sample between female and male. Among the others

studies, only one¹⁸ reported gender of the sample, with a prevalence of male. Other reviewed studies only mentioned gender in the prevalence of alteration of the frenulum^{10-15,18,23}.

In clinical evaluation, in only 1 baby was not possible to see the lingual frenulum, in contrast with previous research that evaluated 100 babies and in only 29 was not possible to see the frenulum¹⁸. In this case, it is recommended to follow the baby until be possible to see the frenulum under the mucosa curtain during the first year of life¹⁸.

Of the 165 babies in which it was possible to see the frenulum, it was classified as normal or altered^{17,18}.

Previous studies have classified the altered frenulum babies as ankyloglossia^{1,12-15}, lisp^{1,10,11} or simply change the frenulum²³. Part of the studies^{10,11,14,15} used Hazelbaker protocol to classify the frenulum and the other part did not mention the criteria and instruments used^{12,13,16,17,19,20,23}.

As the thickness of the frenulum, the highest incidence was thin frenulum which corroborates other studies^{13,17}. The thick frenulum favors breastfeeding difficulties¹³, in order to contribute to early weaning.

Most babies had normal frenulum, in accordance with the literature^{10,13,14,17,18}. However, it was found 37% of babies with lingual frenulum alterations, this frequency is higher than presented in previous studies^{10,13-15,23}. From the raised studies, the highest percentage of lingual frenulum alteration was 22.5%^{17,18}. It is believed that this difference is related to the criteria used in the classification of the frenulum in each study and the sample size, which differ in these studies. This research considered the anatomical aspect of the frenulum to classify it as normal or altered. This criterion may have influenced the high index of altered frenulum, since the suction was not considered as a classification parameter and its frequency of alterations was low, which could decrease the altered frenulum index. Regarding the altered frenulum prevailed male babies, in agreement with previous studies^{10-15,18,23}.

No other analyzed study sub-classified the frenulum from the evaluation of the frenulum fixing tongue and mouth floor, as done in this study. It was found the predominance of frenulum with fixing in the middle third and sublingual caruncles and between the middle third and the apex and the inferior alveolar crest, normal and altered, respectively. Were found a single study¹⁸ that observed, isolated, the fixing of the frenulum in the tongue and in the floor, in which prevailed the frenulum with fixing the tongue in the middle third, and on the floor, in the alveolar crest. As for the other studies, it was found that the sub-classification occurred in the degree of change in severity of the frenulum¹¹, severity and thickness of the frenulum¹³, as total and partial ankyloglossia¹² and the others no sub-classified the frenulum^{10,14,15,23}.

From babies with normal frenulum, 10.8% had altered suction. Problems like irritability, lips reversed in the suction, inadequate latch and posture were observed during breastfeeding, although not see covered in the protocol. It is believed that several factors interfere with the baby's suckling, beyond the frenulum, as the mother's lack of experience with the

practice of breastfeeding, the anatomy of the breast, the latch and the inadequate baby posture, fatigue, among others^{24,25}.

From the babies with altered frenulum, 14.5% had altered suction. The alteration of the lingual frenulum brings harm to breastfeeding and the baby sucking^{3,6,10,13,14,17,18,23}, since the participation of tongue movements is essential for this function. In this sense, any limitation on the movement of the tongue can compromise it⁵.

The correlation between the lingual frenulum and suction, despite being significant, was low, in accordance with previous studies that mentioned a minority of problems in the breastfeeding of babies with altered lingual frenulum^{10,13,23}. However, the change rate was higher than in infants with normal frenulum, justifying the early diagnosis of frenulum. Whatever the etiology of early weaning, it is worth investing in prevention, to take into account the importance of breastfeeding and sucking on the baby's development.

CONCLUSION

The lingual frenulum were classified as normal and altered, with predominance of the normal lingual frenulum. Alterations in the lingual frenulum corresponded to 37% of babies, with higher incidence in males. Among the normal frenulum, the prevalence was of babies with fixing of the frenulum in the middle third, visible from sublingual caruncles. Regarding the altered frenulum, they were more frequent with fixation between the middle third and the apex and visible from the inferior alveolar crest, the thin thickness was the most observed in both cases.

Despite the low correlation between the frenulum and suction, babies with altered lingual frenulum had more chances in the change of suction, which justified the realization of frenulum evaluation aiming an early intervention and promotion of breastfeeding and speech development.

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