

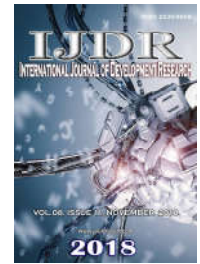


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TENDENCY OF TONGUE POSITIONING DURING CRYING IN INFANTS WITH AND WITHOUT LINGUAL FRENULUM ALTERATION

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ABSTRACT

The study aimed to verify the interference of lingual frenulum with tongue positioning during crying in infants with normal and altered lingual frenulum. From the administration of the Neonatal Tongue Screening Test (NTST) 641 healthy full-term infants of both genders were diagnosed with or without lingual frenulum alteration at the first month of life. Both groups were included in this study. The tendency of tongue positioning during crying was observed and analyzed in both groups and the Chi-square test was used for the statistical treatment at 5% significance level ($p < 0,05$). Of the 641 subjects, 222 infants (34,6%) had lingual frenulum alteration and 419 (65,4%) had normal lingual frenulum. Of the 222 infants with lingual frenulum alteration, 87 (39,2%) were female and 135 (60,8%) were male. Of the 419 with normal lingual frenulum, 217 (51,7%) were female and 202 (48,3%) were male. In infants with normal lingual frenulum, the tongue tended to be in the midline position or elevated during crying. In infants with altered lingual frenulum, the tongue tended to be in the midline position with lateral elevation or down-positioned with lateral elevation. The statistical analysis demonstrated there is a relationship between the lingual frenulum and the tendency of tongue positioning during crying ($p = 0,001$). Tongue positioning during crying is different in infants with and without lingual frenulum alteration.

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INTRODUCTION

When compared to other species, human beings have the most refined tongue movements, which are present in the oral functions: sucking, chewing, swallowing, and speech. Although the tongue plays a key role in performing orofacial functions, its complex anatomic-physiology still lacks understanding. As a result, the diagnosis and treatment of tongue alterations lags behind that for other structures of the head and neck (Sanders and Mu, 2013). Tongue-tied subjects may perform all orofacial functions; however, they adapt and/or compensate the movements to suck, chew, swallow, and speak.

Those adaptations/compensations may interfere with tongue muscular balance (Genna, 2012; Silva et al., 2009; Marchesan, 2004; Ostapiuk, 2010; Marchesan et al., 2010). Both the Lingual Frenulum Protocol with Score for Infants (LFPSI) and the Neonatal Tongue Screening Test (NTST) are validated and have been used to assess infant's lingual frenulum and tongue movements in several hospitals, maternities, research centers in Brazil and abroad. The NTST allows the assessment of lip posture during rest, the shape of tongue tip during elevation, the tendency of tongue positioning during crying, the thickness and attachment of lingual frenulum to the tongue and to the floor of the mouth (Martinelli et al., 2012; Martinelli et al., 2013; Martinelli et al., 2016a, 2016b). Two other tongue assessment tools also propose to observe tongue elevation during crying (Hazelbaker, 1993; Ingran et al., 2015). Tongue elevation is important since it allows the tongue to be

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positioned on the palatal rugae during rest, on the palate for appropriate swallowing and to produce the sounds that require the elevation of the tip of the tongue. The aim of this study was to verify the interference of lingual frenulum alteration with tongue positioning during crying.

MATERIALS AND METHODS

The study was approved by the ethic committee of CEFAC under the number CAAE 47729715.3.0000.5538. From the administration of the Neonatal Tongue Screening Test (NTST) 641 healthy full-term infants of both genders were diagnosed with or without lingual frenulum alteration at the first month of life. According to the NTST, scores equal or greater than 7 indicate lingual frenulum alteration and scores equal or lower than 4 indicate normal frenulum (Martinelli *et al.*, 2016b). Both groups, with normal and altered lingual frenulum were included in this study. Infants diagnosed with posterior lingual frenulum or infants who did not have a precise lingual frenulum diagnosis as well as prematurity, perinatal complications, craniofacial anomalies neurological disorders and syndromes were the exclusion criteria. All the assessments were filmed for posterior analysis. Two lingual frenulum experienced speech language pathologists, specialists in orofacial myofunctional therapy, analyzed the images recorded during each lingual frenulum assessment. Based on their agreement about the results the infants were split into two groups: normal lingual frenulum and altered lingual frenulum. Besides identifying whether the lingual frenulum was altered or not, the specialists analyzed the tendency of tongue positioning during crying for both groups. The Chi-square test was used for the statistical treatment at 5% significance level ($p < 0,05$).

RESULTS AND DISCUSSION

Of the 641 subjects, 222 infants (34,6%) had lingual frenulum alteration and 419 (65,4%) had normal lingual frenulum. Of the 222 infants with lingual frenulum alteration, 87 (39,2%) were female and 135 (60,8%) were male.

actions. That phenomenon has been researched by professionals from several fields (Chittora and Patil, 2017; Sahin *et al.*, 2017; Wolke *et al.*, 2017; Li *et al.*, 2018). The results of the analysis regarding the tendency of tongue positioning of infants with normal and altered lingual frenulum during crying demonstrated an association between lingual frenulum and tendency of tongue positioned during crying ($p=0,001$). Of the 419 infants with normal lingual frenulum, during crying, 341 (81,4%) tended to have the tongue in the midline position; 47 (11,2%) had the tongue elevated. Thus, 92,6% of infants with normal lingual frenulum did not tend to have tongue with lateral elevation during crying. Those findings indicate that in most infants with normal lingual frenulum the tendency is to have the tongue in the midline position during crying. This tendency may be explained by the fact that since there is no restriction of tongue movements, the superior longitudinal muscle can perform the tongue elevation (Sanders and Mu, 2013; Stavness *et al.*, 2012). Conversely, of the 222 infants with altered lingual frenulum, 126 (56,8%) tended to have the tongue in the midline position with lateral elevation and 58 (26,1%) had the tip of the tongue down-positioned with lateral elevation during crying. Thus, 82,9% tended to have the tongue with lateral elevation during crying. Those findings may be explained by the fact that when a muscle is not able to perform an action another muscle will try to compensate the limitation (Tecco *et al.*, 2015). The elevation of the lateral of the tongue is performed mainly by the styloglossus and the elevation of the tip of the tongue is performed by the superior longitudinal (Sanders and Mu, 2013; Stavness *et al.*, 2012). In the presence of lingual frenulum alteration, the styloglossus – right and left – can perform the elevation of the laterals of the tongue; however, the superior longitudinal muscle has its movements restricted by the lingual frenulum, hindering the elevation of the anterior part the tongue. Further studies on the compensations/adaptations of tongue muscle when there is restriction of movements due to lingual frenulum alteration are still needed. Future studies about the tendency of tongue positioning during crying after frenotomy may contribute for a better understanding about the interference of the lingual frenulum with tongue functions.

Table 1. Association between lingual frenulum and tendency of tongue-positioning during crying

n = 641	Tendency of tongue-positioning during crying				p-value
	Midline	Elevated	Midline with lateral elevation	Tip down-positioned with lateral elevation	
419 (65,4%)	341 (81,4%)	47 (11,2%)	16 (3,8%)	15 (3,6%)	0,001*
Normal lingual frenulum					
222 (34,6%)	38 (17,1%)	0 (0%)	126 (56,8%)	58 (26,1%)	0,001*
Altered lingual frenulum					

During crying, 38 (17,1%) infants had the tongue in the midline position; 126 (56,8%) had the tongue in the midline position with lateral elevation; and 58 (26,1%) had the tip of the tongue down-positioned with lateral elevation. None of the infants with lingual frenulum alteration had elevated tongue during crying. Of the 419 with normal lingual frenulum, 217 (51,7%) were female and 202 (48,3%) were male. During crying, 341 (81,4%) had the tongue in the midline position; 47 (11,2%) had the tongue elevated; 16 (3,8%) had the tongue in the midline position with lateral elevation; and 15 (3,6%) had the tip of the tongue down-positioned with lateral elevation. The statistical analysis demonstrated association between the lingual frenulum and the tendency of tongue positioning during crying, as demonstrated in Table 1. Infant crying is a complex phenomenon including the sound production by the vocal cords, the laryngeal, face, lungs, and oral cavity muscle

Conclusion

Tongue positioning during crying is different in infants with normal and altered lingual frenulum; therefore, lingual frenulum interferes with the positioning of the tongue during crying.

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