

## Research Note

### Poster 1: Rest position of the tongue in infants with and without lingual frenulum alteration

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## POSTER 1: REST POSITION OF THE TONGUE IN INFANTS WITH AND WITHOUT LINGUAL FRENULUM ALTERATION

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### ABSTRACT

Rest position of the infants' tongue with and without lingual frenulum alteration is poorly reported in the literature. The present study aims to verify the rest position of the tongue in infants with and without lingual frenulum alteration. A cross-sectional study was conducted with 324 infants. While the infant was sleeping, deep sleep, the SLP, facing the baby, opened the infant's mouth by pushing down the infant's chin with their thumbs, and at the same time, elevated the upper lip using their index fingers. The maneuver provided the visualization of the infant's tongue position at rest: elevated or down. The Chi-square test was used for statistical treatment of the data at 5% level of significance ( $p < 0.05$ ). The variables included in the Chi-square analyses were: a) tongue elevated, b) tongue down-positioned, c) normal lingual frenulum, and d) altered lingual frenulum. The statistical analysis demonstrated that there was an association between the tongue position at rest and the characteristics of the lingual frenulum. When the lingual frenulum was altered, the infant's tongue rest position tended to be down in the oral cavity ( $p < 0.001$ ). In infants with lingual frenulum alteration, the tongue at rest tended to be down-positioned, between the gum pads. In infants with normal lingual frenulum, the tongue at rest tended to be elevated.

**KEYWORDS:** Lingual frenum, Tongue position, Language and Hearing Sciences, Clinical Protocols

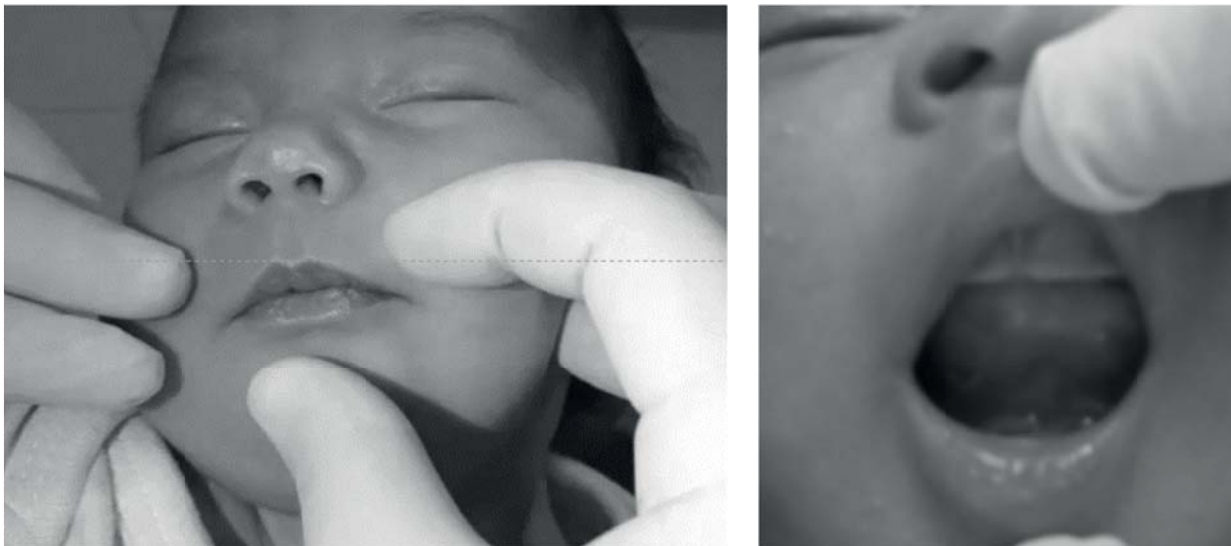
### INTRODUCTION

The tongue is a specialized organ of taste that actively participates in sucking, chewing, swallowing, and speech (Singh & Kent, 2000; Marchesan, 2004; Camargo, Marchesan, Oliveira, Svicero, Pereira, & Madureira, 2013; Silva, Costa, Nemr, & Marchesan, 2009; Derrick, Stavness, & Gick, 2015). Infant's sucking movements favor adequate lip closure during rest and the correction of physiological mandibular retrognathism (Serra-Negra, Pordeus, & Rocha, 1997). Moreover, these movements contribute to the correct tongue position in the central incisor palatine region, due to the tonicity acquired with the intense activity of the tongue muscles (Neiva, Cattoni, Ramos, & Issler, 2003).

Studies demonstrate the importance of tongue movements for milk extraction during breastfeeding (Geddes, Kent, Mitoulas, &

Hartmann, 2008; Burton, Deng, McDonald, & Fewtrell, 2013; Elad, Koslovsky, Blum, Laine, Po, Botzer, Dollberg, Zelicovich, & Ben Sira, 2014). They also report the interference of tongue-tie when breastfeeding (Geddes, Langton, Gollow, Jacobs, Hartmann, & Simmer, 2008; Garbin, Sakalidis, Chadwick, Whan, Hartmann, & Geddes, 2013; Sethi, Smith, Kortequee, Ward, & Clarke, 2013; Henry & Hayman, 2014; Martinelli, Marchesan, Gusmão, Honório, & Berretin-Felix, 2015; Ito, 2014).

There are several definitions of ankyloglossia or 'tongue-tie' in the literature. Some authors state that tongue-tie is manifested by an abnormally short and thick lingual frenulum (Horton, Crawford, Adamson, & Ashbell, 1969). Other authors describe tongue-tie as a congenital condition with an unusually thickened, tightened or shortened frenulum (membrane or string under the tongue) (Wallace & Clarke, 2006). Based on



**Figure 1 – Maneuver for visualization of infant’s tongue position at rest**

embryology studies, Knox (2010) states that tongue-tie occurs when a common minor embryologic tissue remnant, persistence of midline sublingual tissue that usually undergoes apoptosis during embryonic development, causes restriction of normal tongue movement.

A recent study reports that tongue-tie is a known factor in altering orofacial growth, that affects the development of the maxilla due to the low placement of the tongue. It also leads to the abnormal development of a high and narrow hard palate, and secondarily, mouth breathing during sleep. These changes are said to occur early in life, as the orofacial growth is particularly fast during the first two years of life (Huang, Quo, Berkowski, & Guilleminault, 2015). Another study states that tongue-tie that is left untreated at birth is associated with Obstructive Sleep Apnea Syndrome (OSAS) at a later age. As a result, a systematic screening for the syndrome should be conducted when this anatomical abnormality is observed (Guilleminault, Huseni, & Lo, 2016).

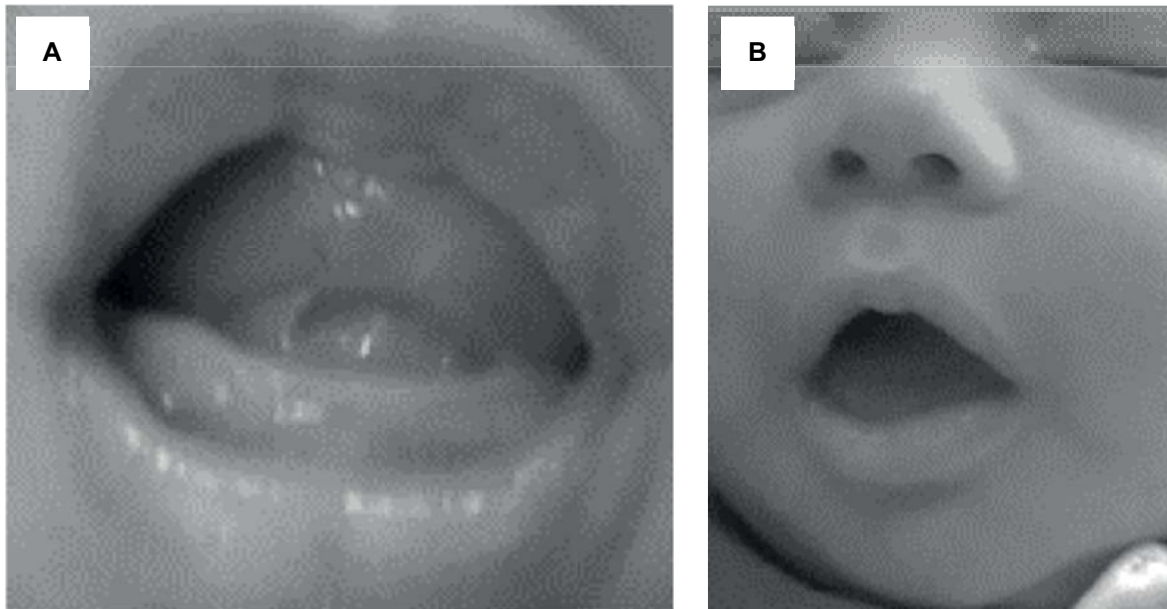
The aforementioned studies have demonstrated the importance of adequate tongue rest position in the palate and disagrees with the literature that states that the newborn’s tongue rests that will be occupied by the teeth (Correa, 2010; Guedes-Pinto, Bönecker, &

Rodrigues, 2009). Overall, the rest position of the tongue in infants with and without lingual frenulum alteration is poorly reported in the literature. The present study aims to verify the rest position of the tongue in infants with and without lingual frenulum alteration.

## **MATERIALS AND METHODS**

A cross-sectional study was conducted with 324 infants, 146 females and 178 males. The study included healthy full-term infants of both genders, 48 hours after their birth, who were being exclusively breastfed. Prematurity, perinatal complications, craniofacial anomalies, neurological disorders, and visible genetics syndromes were the exclusion criteria.

48 hours after birth, the “Neonatal Tongue Screening Test” (Martinelli, Marchesan, Lauris, Honório, Gusmão, & Berretin-Felix, 2016) from the Lingual Frenulum Protocol for Infants (Martinelli, Marchesan, & Berretin-Felix, 2013) was administered to the newborns to assess lingual frenulum. The Neonatal Tongue Screening Test (NTST) has been found to be a valid and reliable assessment tool that ensures accuracy when diagnosing lingual frenulum alterations in newborns (Martinelli, Marchesan, Lauris, Honório, Gusmão, & Berretin-Felix, 2016).



**Figure 2 – Infants’ tongue position at rest: A) elevated – apex touching rugae palatinae; B) down – between the gum pads**

All assessments were performed by only one doctored Speech-Language Pathologist, experienced in Orofacial Myofunctional Disorders. The assessments were registered in patient records and videotaped. As part of the hospital’s routine, newborns are expected to return 30 days after discharge for a new SLP assessment. All of the infants returned and were seen by the same SLP.

During sleep, it was observed that some infants had their mouths open while others had theirs closed. The SLP observed that the infants who had lingual frenulum alteration according to the NTST, administered 48 hours after birth, tended to keep their mouth open during sleep, while infants with normal lingual frenulum tended to sleep with their mouth closed.

While the infant slept, in deep sleep, the SLP faced the baby, opened the infant’s mouth by pushing down the infant’s chin with the thumbs, and at the same time, elevated the upper lip using the index fingers as shown in Figure 1. The maneuver provided the visualization of the infant’s tongue position at rest: a) elevated – with the apex touching rugae palatinae;

b) down – with the tongue between the gum pads as shown in Figure 2.

Based on the observations of the SLP, the present study was conducted to verify the relation between lingual frenulum and tongue rest position during sleep. The Chi-square test was used for statistical treatment of data at 5% level of significance ( $p < 0.05$ ). The variables included in the Chi-square analyses were: a) tongue elevated position, b) tongue down-position, c) normal lingual frenulum, and d) altered lingual frenulum. The study was approved by the Ethics Committee of the Faculty of Odontology of Bauru – University of Sao Paulo under the number 48047015.1.0000.5538.

## RESULTS

The statistical analysis demonstrated that there was an association between the tongue position at rest and the characteristics of the lingual frenulum. When the lingual frenulum was altered the infant’s tongue rest position tended to be down in the oral cavity ( $p < .001$ ), as demonstrated in Table 1.

**Table 1: Relation between lingual frenulum and tongue rest position**

| n=324 infants                  | With lingual frenulum alteration | Without lingual frenulum alteration | Chi-square Value | P Value |
|--------------------------------|----------------------------------|-------------------------------------|------------------|---------|
| Tongue rest position: down     | 61 (67.78%)                      | 26 (11.11%)                         |                  |         |
| Tongue rest position: elevated | 29 (32.22%)                      | 208 (88.89%)                        | 106.2652         | < .001* |
| <b>TOTAL</b>                   | <b>90 (27.78%)</b>               | <b>234 (72.22%)</b>                 |                  |         |

\* Statistical significance

## DISCUSSION

Rest position of the tongue in infants with and without lingual frenulum alteration is poorly reported in the literature. Two books that discussed this issue in Odontopediatrics, reported that the newborn's tongue rests between the gum pads, filling the space that will be occupied by the teeth (Correa, 2010; Guedes-Pinto, Bönecker, & Rodrigues, 2009). However, this cross-sectional study conducted with 324 infants demonstrated that the infants' tongue at rest might be found in either an elevated or down-positioned. Additionally, the study evidenced that the lingual frenulum does interfere with rest position of the tongue. In fact, the rest position of the tongue should be considered when assessing the lingual frenulum. The findings in the present study are in agreement with a retrospective study that reports that the down position of tongue, because of tongue-tie, may alter orofacial growth which then directly affects the development of the maxilla. The tongue tie can result in the abnormal development of a high and narrow hard palate, and thus an open mouth breathing posture during sleep. These changes can occur early in life, as the orofacial growth is particularly fast during the first two years of life (Huang, Quo, Berkowski, & Guilleminault, 2015; Guilleminault, Huseni, & Lo, 2016).

It is not possible, however, to diagnose lingual frenulum alteration based only on the tongue position at rest. A set of characteristics must be considered when diagnosing the range of the restriction of the lingual movements caused by lingual frenulum alteration (Martinelli, Marchesan, & Berretin-Felix, 2013). Diagnosing lingual frenulum alterations may be a difficult task for a health professional who has little knowledge of the anatomy of the oral cavity, including tongue anatomy, lingual frenulum, and orofacial function (Marchesan, 2010). For a correct assessment, the American Speech-Language-Hearing Association (ASHA, 2005) and the International Association of Orofacial Myology (Paskay, 2006) have proposed the administration of valid assessment protocols. Future studies aiming to assess newborn's tongue position at rest, after frenotomy, may demonstrate the importance of revision for better tongue mobility, breastfeeding, and resting position during sleep.

## CONCLUSION

In infants with lingual frenulum alteration, the tongue at rest tended to be down-positioned, between the gum pads. In infants with normal lingual frenulum, the tongue at rest tended to be elevated. Data from this study will help health professionals identify possible lingual frenulum alterations.

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