

# Prevalence of Breastfeeding Difficulties in Newborns with a Lingual Frenulum: A Prospective Cohort Series

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## Abstract

**Objective:** The prevalence of a lingual frenulum in newborn infants is reportedly 0.3–12%. The purpose of this study was to describe the prevalence of a lingual frenulum based on the Coryllos classification in nonselected newborn infants after delivery, hypothesizing that it is higher than the values reported in the literature.

**Study Design:** The lingual frenula of 200 healthy infants were evaluated by visual examination and palpation within the first 3 days after delivery. The frenulum was categorized according to the four Coryllos classifications. Each infant's mother responded, immediately after the examination, to a structured questionnaire on the quality and type of feeding. An additional structured telephone interview with the 179 breastfeeding mothers was conducted 2 weeks later.

**Results:** All but one infant ( $n=199$ ) had an observable or palpable lingual frenulum that was Coryllos type 1 ( $n=5$ ), type 2 or 3 ( $n=147$ ), or type 4 ( $n=47$ ). Although our study was not powered enough to test for any correlation between the cessation of breastfeeding and the type of frenulum, we found no statistical correlation between the Coryllos type of lingual frenulum and the presence of breastfeeding difficulties.

**Conclusions:** A lingual frenulum is a normal anatomical finding whose insertion point and Coryllos classification are not correlated with breastfeeding difficulties. We suggest that the term “lingual frenulum” should be used for anatomical description and that the term “tongue-tie” be reserved for a lingual frenulum associated with breastfeeding difficulties in newborns.

## Introduction

**A**LINGUAL FRENULUM (ANKYLOGLOSSIA or “tongue-tie”) restricts the tongue's amplitude of motion and is a potential cause of breastfeeding difficulties.<sup>1–3</sup> Its prevalence among newborn infants had been reported to range between 0.3% and 12%.<sup>2,4–10</sup> Most of the reports that addressed the prevalence of a lingual frenulum did not clearly define the term, and their conclusions were based on a mixture of anatomic and functional (in terms of breastfeeding) findings.

In this study, we first describe the anatomy of a lingual frenulum in a large group of nonselected newborn infants immediately after delivery. We hypothesize that a short lingual frenulum is more common than the values reported in the literature and that its association with breastfeeding difficulties is much lower than commonly believed.

## Subjects and Methods

We recruited 200 healthy infants delivered after 35 weeks of gestation. They were recruited whenever one of the

investigators (A.H. or R.M.) was on duty and when both parents provided written consent to participate in the study, which was approved by our local Institutional Review Board. We excluded infants born earlier than gestational week 35 and infants with congenital anatomical anomalies.

Prior to the initiation of the study, the principal investigator (S.D.) conducted a detailed teaching session on the identification and typing of the lingual frenulum based on the Coryllos classification (type 1 = at the tip of the tongue, type 2 = 2–4 mm behind the tip of the tongue, type 3 = midtongue, and type 4 = against the base of the tongue),<sup>11</sup> and the researchers verified their complete agreement on the definitions. The infants were evaluated during the first 3 days of life by physicians who were blinded to any feeding difficulties even if they existed. Oral examinations consisting of visual examination and palpation with a gloved finger under the infant's tongue were conducted by two physician researchers (A.H. and R.M.) who are experienced in the evaluation and treatment of lingual frenula. They noted the presence and description of a lingual frenulum and classified it as Coryllos

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type 1–4.<sup>11</sup> The extent of tongue elevation, notch at the tongue-tip, width of the frenulum, and the distance of the tongue to the salivary glands were estimated visually.

After completion of the infant's physical examination, the mother responded to a structured questionnaire on the quality of feeding. An additional structured telephone interview was conducted with the breastfeeding mothers 2 weeks later.

#### Statistical analysis

In order to test for association between Coryllos type and breastfeeding difficulties, we used the chi-squared test (Minitab Statistical Package Release 14; Minitab, State College, PA). A value of  $p < 0.05$  was considered significant.

#### Results

We recruited 200 infants at the Tel Aviv Medical Center newborn nursery. They were all born after normal vaginal or uncomplicated cesarean delivery and had normal prenatal follow-up findings. The mean  $\pm$  SD birth weight was  $3.255 \pm 0.439$  kg, and the mean gestational age was  $38.9 \pm 1.4$  weeks. The mean maternal age was  $31.9 \pm 4$  years. Of the 200 mothers who were initially interviewed, 179 were breastfeeding and were contacted for interview 2 weeks later. Two of those mothers were lost to follow-up after 2 weeks.

A lingual frenulum had been observed or palpated in all but one infant ( $n = 199$ ) (Table 1). The frenulum was Coryllos type 1 (a lingual frenulum that was inserted at the tip of the tongue) in five infants (2.5%), type 2 in 71 infants (36%), and type 3 in 76 infants (38%). It was type 4 (i.e., not immediately visible upon inspection of the mouth but palpated easily below the tongue) in 47 infants (23%). It is interesting that there was only one infant (0.5%) in whom a lingual frenulum could neither be seen nor palpated.

The male-to-female ratios among the different types of lingual frenulum are reported in Table 1, and there were no statistical correlation between gender and the Coryllos type. The breakdown of the number of breastfeeding mothers by the type of frenulum is provided in Table 1.

We further conducted a structured telephone interview 2 weeks after the study entry in order to establish the rates of breastfeeding and of breastfeeding difficulties among the study infants. Table 2 displays the anatomical findings and breastfeeding difficulties among them based on the Coryllos classification in the mothers and infants who were breastfeeding at study entry. When first queried, 179 mothers (89%)

were breastfeeding and intended to continue doing so. The other 21 mothers did not plan to breastfeed. After 2 weeks, 157 of the 179 mothers (87%) were still breastfeeding. Two mothers, whose infants were classified as type 4, were lost to follow-up. Of the remaining 20 mothers who discontinued breastfeeding by 2 weeks, 11 reported that they did so because of difficulties in breastfeeding. Of these, five were type 2 infants, four were type 3, and two were type 4. Reasons for discontinuation of breastfeeding in these mothers were sore nipples in three cases, latch problems in six cases, and unspecified in one case. Although our study was not powered enough to test for any correlation between the cessation of breastfeeding and the type of frenulum, we found no statistical correlation between these variables ( $p = 0.4$ ).

Seven of the study infants underwent lingual frenotomy because of clinical symptoms suggestive of symptomatic tongue-tie. Of these, one infant had type 1 frenulum, five had type 2, and one had type 3. The mother of the one infant who was classified as having a type 1 lingual frenulum reported improvement in breastfeeding, as did the mothers of three of the five infants with type 2 and the one with type 3. It is interesting that four infants, two of them primiparous, had a type 1 lingual frenulum and continued to breastfeed without difficulty despite not having undergone a frenotomy. The mother of the infant in whom no frenulum was observed or palpated did experience breastfeeding difficulties in the form of sore nipples.

In addition to the Coryllos classification, we also described the frenulum by tongue elevation, notch at the tongue-tip, width of the frenulum, and the distance of the tongue to the salivary glands as estimated visually. There was no significant association between any of those anatomical findings and breastfeeding difficulty in terms of nipple pain, sore nipples, or difficulties in latching. There was also no correlation between those physical findings and maternal complaints with the type of lingual frenulum. These data as well as further anatomical descriptive details are provided in Table 2.

#### Discussion

The concept of posterior tongue-tie was initially introduced by Coryllos et al.<sup>11</sup> in the statement by the American Academy of Pediatrics Section on Breastfeeding in 2004. Studies conducted prior to this publication, as well as some studies that appeared later, did not report on posterior tongue-tie. In our study we found a 38% incidence of "classical

TABLE 1. RELATIONS BETWEEN BREASTFEEDING AND TYPE OF LINGUAL FRENULUM

Type of frenulum (n = 200)	n (%)	Male:female ratio	Mothers breastfeeding [n (%)]		Stopped breastfeeding owing to breastfeeding difficulties
			At study entry	After 2 weeks <sup>a</sup>	
1	5 (2.5)	3:2	5 (100)	5 (100)	0
2	71 (36)	45:26	62 (87)	55 (88)	4
3	76 (38)	41:35	72 (94)	64 (89)	4
4	47 (23)	23:24	39 (83)	32 (82)	2
No frenulum	1 (0.5)	1:0	1 (100)	1 (100)	0
Total	200	113:87	179	157	10

<sup>a</sup>Of the 200 participants, 21 were not breastfeeding at study entry, and two of the breastfeeding mothers were not available for telephone interview. Percentages are calculated from mothers who were breastfeeding at study entry.

TABLE 2. ANATOMICAL FINDINGS AND MATERNAL REPORT ON BREASTFEEDING DIFFICULTIES IN THE STUDIED BREASTFEEDING INFANTS

	<i>Coryllos type of frenulum</i>				
	<i>1</i>	<i>2</i>	<i>13</i>	<i>4</i>	<i>None</i>
Breastfeeding mothers ( <i>n</i> = 179)	5	62	72	39	1
Sore nipples (%)	40	42	51	33	100
Range pain scale (0–10)	0–7	0–8	0–7	0–10	9
Sores (%)	40	16	21	18	100
Severity of sores (%)					
Minor	100	80	87	57	100
Medium		20	13	43	
Major					
Type of latch (%)	40	34	19.4	13	100
Repeated separation	50	38	43	60	100
Not feeding from breast		14.5		40	
Falling asleep on breast	50	38	50		
NA		9.5	7		
Frenulum width (notch) (%)	60	11	0	0	0
Thin	40	18	57	36	
Thick		18	5.5	64	100
Thin in front and thick in back	60	64	37.5		
Other					
Tongue elevation (%)					
Up to half mouth height	60	27.5	1	2.5	
More than half mouth height	40	72.5	99	97.5	100
Description of the submucosal part of the frenulum (%)					
None		5	3		100
Nonelastic	20	82	47	5	
Very nonelastic		1.5	3	2.5	
Elastic	80	10	47	90	
NA		1.5		2.5	
Tongue to salivary glands distance (mm) (mean ± SD)	NA	2.66 ± 0.51 (NA = 56)	3.33 ± 0.49 (NA = 60)	4.5 ± 2 (NA = 10)	5

NA, not assessed.

tongue-tie,” or Coryllos types 1 and 2, which is significantly higher than all previously reported findings. We speculate that well-trained examiners using a predefined anatomically oriented description give a more accurate estimation of the true prevalence.

In the present study, we found that practically all infants had a lingual frenulum to some degree. Although most of the infants had a Coryllos type 2 or 3 lingual frenulum, we found no association between its morphology or anatomy and the presence of maternally reported breastfeeding difficulties.

Several studies have reported the prevalence of tongue-tie in well baby populations, using different criteria for describing the condition.<sup>2,4–10</sup> Flinck et al.<sup>6</sup> diagnosed ankyloglossia when the lingual frenulum was attached close to the border of the papillated part of the tongue, preventing its protrusion; they found a prevalence of 2.5%. Jorgenson et al.<sup>4</sup> reported a prevalence of 1.7% using the following criteria for the diagnosis of ankyloglossia: “the lingual frenum prevented protrusion of the tongue, the lingual frenum extended to the papillary surface of the tongue, or the frenum caused a fissure in the tongue tip during normal movement”. Friend et al.<sup>5</sup> screened 500 well infants using the same criteria as Jorgenson et al.<sup>4</sup> and found a prevalence of 4.4%. The infants in the report of Hogan et al.<sup>9</sup> were inspected visually by midwives, neonatal nurse practitioners, and junior doctors

after an explanation and comparison to a sheet of paper with photographs of tongue tie (i.e., no evaluation of posterior tongue-tie by palpation); those authors reported a prevalence of 10.7%. The attending physician on service in the study by Messner et al.<sup>2</sup> reported tongue-tie as part of the routine physical examination, with no specific attention to the status of the lingual frenulum; the reported prevalence was 4.8%. The nursing staff in the investigation by Ricke et al.<sup>7</sup> visually inspected infants for tongue-tie and referred those suspected of having it to the study investigators for confirmation; the reported prevalence was 4.24%. González Jiménez et al.<sup>10</sup> screened healthy infants and reported a 12.1% prevalence of infants with ankyloglossia who also had functional feeding dysfunction diagnosed by the Hazelbaker tool.<sup>12</sup>

In our study, two researchers with considerable expertise in tongue-tie evaluation and treatment prospectively assessed the anatomy of the lingual frenulum by both inspection and palpation after a detailed teaching session verifying their complete agreement on the definitions.

During everyday clinical practice, it is tempting for a caregiver to define tongue-tie on the basis of observation alone. However, in our study, we could not demonstrate any association between the Coryllos type or any other anatomical findings and either breastfeeding difficulties or cessation of breastfeeding. In our study, frenotomy was considered

as being indicated for only seven infants, and the mothers of five of them reported improvement in breastfeeding. Our study was not designed or powered to assess the correlation between breastfeeding difficulties and anatomical findings. A larger-scale study would be needed to elucidate this association.

The many terms used to describe a lingual frenulum are due to the intermix of anatomical and functional descriptions. The interchangeable terms of “tongue-tie,” “ankyloglossia,” “sublingual frenulum,” and “short frenulum” are misleading to both lay people and professionals. Based on our current data, we recommend the following terminology:

1. Infants and mothers dyads who have breastfeeding difficulties not solved by a lactation consultation and judged as being due to the infant’s lingual frenulum should be clinically diagnosed as having “symptomatic tongue-tie” or “symptomatic ankyloglossia.”
2. Infants with no breastfeeding difficulties and those with breastfeeding difficulties that are corrected after a lactation consultation should be considered as having an asymptomatic “sublingual frenulum.”
3. The term “short frenulum” should be abandoned, given that clinical measurement of the length of the lingual frenulum is impossible and can be based solely on subjective assessment.

These definitions would differentiate between a normal anatomical finding and an abnormality in tongue function that affects breastfeeding. Given that 99.5% of infants have a sublingual frenulum and in the face of a paucity of clear indications for lingual frenotomy in the medical literature, we suggest that a lingual frenotomy should be reserved to infants with “symptomatic tongue-tie.” We recognize that the only untoward sequela of frenotomies is an extremely rare episode of excessive bleeding. As such, our recommendation is intended to save the parental anxiety and costs associated with an unnecessary procedure.

#### Disclosure Statement

No competing financial interests exist.

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