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BREASTFEEDING SYMPTOMS WITH TONGUE- AND LIP-TIE

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Abstract

Purpose: The aims of this study were to describe maternal and infant symptoms relative to tongue- and lip-tie severity and describe changes in symptoms and feeding efficiency from pre- to post-frenotomy.

Study Design and Methods: A one-group pre- and post-intervention study design was used. Data from a dental practice were collected from medical records of infants less than 1 year old who underwent a frenotomy procedure for tongue- and/or lip-tie. Infant and maternal symptoms were compared with severity of tongue- and lip-tie using binary logistic regression. Wilcoxon Signed Rank test compared pain scores and feeding duration pre- and post-frenotomy. Linear regression compared total number of symptoms reported pre-frenotomy with tongue- and lip-tie severity.

Results: $N = 121$ dyads were included. More severe classifications of tongue- and lip-tie were significantly associated with certain infant and maternal symptoms pre-frenotomy. Improvements were noted in all reported infant symptoms post-frenotomy. Feeding duration times significantly decreased post-frenotomy.

Clinical Implications: Infants and mothers experience problematic symptoms with feeding associated with tongue- and lip-tie. Nurses are the primary care providers during postpartum and should be alert to signs and symptoms that may suggest oral restrictions. Early evaluation and involvement of feeding experts may improve the breastfeeding experience of the dyad.

Key words: Ankyloglossia; Breastfeeding; Feeding behavior; Lingual frenum.

Ankyloglossia, commonly referred to as tongue-tie, is the condition in which the connection between the tongue and the bottom of the mouth is shorter than expected (National Health Service [NHS], 2020). Approximately 8% of infants are born with tongue-tie (Hill et al., 2021). This oral anomaly may be noted at birth or in the first few weeks of life, when issues with breastfeeding occur (Kotlow, 2015). Negative breastfeeding symptoms associated with tongue-tie include crackled or bleeding nipples, low milk supply, and mastitis (NHS, 2020). The World Health Organization (2019), the Centers for Disease Control and Prevention (2018), and the American Academy of Pediatrics (Meek et al., 2022a; Meek et al., 2022b) recommend exclusive breastfeeding (EBF) for the first 6 months of life. However, many infants with tongue-tie do not reach that goal due to complications such as inadequate latch, inefficient feeding, and maternal pain (Edmunds et al., 2011). Lip-tie is a condition in which the connection between the upper lip and the upper gum is short and tight (Nakhash et al., 2019) and which may alter latch and suckling abilities during breastfeeding (Ghaheiri et al., 2017). Nipple pain is one of the most common reasons for stopping EBF (Kent et al., 2015), with significant improvement in pain following frenotomy (Hill & Pados, 2020; Kotlow, 2015).

In addition to nipple pain, breastfeeding mothers of infants with tongue-tie have described symptoms such as creased, flattened, or blanched nipples after feeds; cracked, bruised, or blistered nipples; bleeding nipples; severe pain with infant latching; incomplete breast drainage; infected nipples; plugged ducts; reduction in milk flow; and mastitis or nipple thrush (Kotlow, 2004). Although there are limited data on infant symptoms in the context of tongue-tie, these infants are described as having symptoms of reflux or colic (Siegel, 2020), poor latch or inability to latch, sliding off nipple, prolonged feeds, falling asleep during feeds, gumming, or chewing on nipple, poor weight gain/failure to thrive, and inability to hold pacifier (Kotlow, 2004). Ghaheiri et al. (2017) found improvements in infant reflux and weight gain post-frenotomy. The American Academy of Breastfeeding Medicine supports treatment of tongue-tie, as it may im-

prove comfort with breastfeeding, improve milk transfer, and extend duration of breastfeeding (LeFort et al., 2021). The American Academy of Pediatrics (2016) and the American Academy of Pediatric Dentistry (2022) support treatment of tongue-tie if the restriction is causing an inability to latch onto the breast, but acknowledge that not all infants require surgical intervention.

More research is needed to better understand how maternal and infant symptoms interact, which mother-baby dyads achieve the greatest benefit from correction of tongue- and lip-ties, and which infant symptoms suggest

FIGURE 1. PARENTAL QUESTIONNAIRE OF INFANT AND BREASTFEEDING SYMPTOMS

Infant Assessment	
Birth Date _____ Today's Date _____	
Medical Problems: <input type="checkbox"/> Heart Disease <input type="checkbox"/> Bleeding Disorders <input type="checkbox"/> Other	
<input type="checkbox"/> Male <input type="checkbox"/> Female Birthweight _____ Present Weight _____	
<input type="checkbox"/> Vaginal Birth <input type="checkbox"/> Cesarean Birth Any birth complications?	
Medical History	
Was your infant premature? <input type="checkbox"/> Yes <input type="checkbox"/> No -If yes, how many weeks? _____	
Does your infant have any heart disease? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Has your infant had any surgery? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Has your infant experienced any of the following? Please check all that apply	
<input type="checkbox"/> Shallow latch at breast or bottle	<input type="checkbox"/> Gumming or chewing your nipple when nursing
<input type="checkbox"/> Falls asleep while eating	<input type="checkbox"/> Pacifier falls out easily, doesn't like, won't stay in
<input type="checkbox"/> Slides or pops on and off the nipple	<input type="checkbox"/> Milk dribbles out of mouth when nursing
<input type="checkbox"/> Colic symptoms/Cries a lot	<input type="checkbox"/> Short sleeping requiring feedings every 1-2 hours
<input type="checkbox"/> Reflux symptoms	<input type="checkbox"/> Snoring, noisy breathing, or mouth breathing
<input type="checkbox"/> Clicking or smacking noises when eating	<input type="checkbox"/> Feels like a fulltime job just to feed baby
<input type="checkbox"/> Spits up often?	<input type="checkbox"/> Nose congested often
Amount/Frequency _____	
<input type="checkbox"/> Gagging, choking, coughing when eating	<input type="checkbox"/> Baby is frustrated at the breast or bottle
<input type="checkbox"/> Gassy (toots a lot)/Fussy often	<input type="checkbox"/> How long does baby take to eat?
<input type="checkbox"/> Poor weight gain	<input type="checkbox"/> How often does baby eat?
<input type="checkbox"/> Hiccups often	<input type="checkbox"/> Lip curls under when nursing
Do you have any of the following signs or symptoms? Please check all that apply.	
<input type="checkbox"/> Creased, flattened, or blanched nipples	<input type="checkbox"/> Poor or incomplete breast drainage
<input type="checkbox"/> Lipstick-shaped nipples	<input type="checkbox"/> Infected nipples or breasts
<input type="checkbox"/> Blistered or cut nipples	<input type="checkbox"/> Plugged ducts/engorgement/mastitis
<input type="checkbox"/> Bleeding nipples	<input type="checkbox"/> Nipple thrush
Pain on a scale of 1-10 when first latching _____	<input type="checkbox"/> Using a nipple shield

Note. Questionnaire adapted with permission from Dr. Richard Baxter, DMD, MS

impaired feeding in the setting of these oral anomalies. Understanding the current gaps in the literature, the aims of this study were to describe maternal and infant symptoms relative to tongue- and lip-tie severity, describe changes in symptoms from pre- to post-frenotomy, and describe feeding efficiency as measured by feeding duration in minutes pre- and post-frenotomy.

Methods

Sample

This study was approved by the university's Institutional Review Board. The sample was provided by a pediatric dental office in Massachusetts. Infants less than 1 year of age diagnosed with tongue-tie and/or lip-tie and undergoing frenotomy between September 2020 and April 2021 were eligible for inclusion. Medical record data were deidentified and extracted by a member of the dental office staff. Infant and maternal feeding symptoms provided by parental report as recorded in the medical record were compared before and after treatment via frenotomy. A priori power analysis using G*Power 3.1.9.4 (G*Power, Germany) determined a sample size of 54 was needed to obtain 95% power with a medium effect size (0.5) for two-tail significance at .05.

Description of the Frenotomy Procedure

At this office, one dentist conducts all assessments and frenotomy procedures. Diagnoses of oral tethered tissues were made using Kotlow's criteria for tongue-tie and lip-tie severity (Kotlow, 2004). Kotlow's criteria determine the degree of tongue restriction based on the length of freely mobile tongue in millimeters. The pediatric dentist provided thorough physical assessment, diagnosis of oral restriction(s), and frenotomy procedure through usual clinical care procedures. Frenotomy was performed using a CO₂ laser. The infant was swaddled, eye protection was applied, and their head was immobilized by a dental assistant. The parent was instructed on gentle wound massage of the frenotomy site(s) four times daily for at least 3 weeks postprocedure. A 1-week follow-up was scheduled at the end of the frenotomy visit.

Measures

Parent–infant dyads who completed the 1-week post-frenotomy visit were included for analyses. All data were provided via parental report of maternal and infant symptoms using the symptom report form provided by the dental office. Tongue- and lip-tie classification were extracted from the medical record. The parent completed the pre-frenotomy survey prior to the consultation visit. Baseline infant data included sex, date of birth, gestational age at birth, cardiac disease, surgical history, bleeding disorders, mode of birth, and birth-weight. At the initial visit, the parent was asked about the presence of infant feeding symptoms and maternal symptoms, if breastfeeding. At the 1-week follow-up visit, parents were asked if these same infant and maternal symptoms had improved. At both time points, pain with breastfeeding and average length of feeding ses-

TABLE 1. CHARACTERISTICS OF SAMPLE (N = 121)

Characteristic	n (%)
Infant Gender	
Male	63 (52.1)
Female	56 (46.3)
Not answered	2 (1.6)
Type of Birth	
Vaginal	78 (64.5)
Caesarean	38 (31.4)
Not answered	5 (4.1)
Preterm Birth (<37 weeks)	
No	98 (81)
Yes	23 (19)
Infant Birth Complications	
No	103 (85.1)
Yes	18 (14.9)
Infant Heart Disease	
No	120 (99.2)
Yes	1 (0.8)

sions in minutes was obtained. Pain was reported via numeric rating scale of 0–10 at both time points. The parent was provided a comprehensive list of possible infant symptoms, checking off any that were applicable to their infant (yes or no). The parent was also provided a comprehensive list of possible breastfeeding symptoms, noting any that were applicable if breastfeeding (yes or no). These lists were developed by the dentist at the practice. Figure 1 depicts the infant and breastfeeding symptoms ascertained in the parent questionnaire.

Data Analysis

Sample characteristics were calculated using descriptive statistics. Pre-frenotomy, infant and maternal symptoms were coded as dichotomous variables to identify if each symptom was present or absent. At the post-frenotomy follow-up, the symptoms were again coded as dichotomous variables to indicate if the symptom had improved (yes or no). Each infant and maternal symptom reported pre-frenotomy was compared with severity of both tongue- and lip-tie using binary logistic regression. Pain scores and feeding duration in minutes were compared at both time points using Wilcoxon Signed Rank test, as the data were not normally distributed. Linear regression was used to compare the total number of symptoms reported pre-frenotomy with tongue- and lip-tie severity. Improvement for each infant and maternal symptom was described using percentage of improvement of each symptom. Significance was set at alpha < .05 for all statistical tests.

Results

There were 121 dyads in the sample. Average infant age was 9.5 weeks (*SD* = 11.63) with a mean follow-up time of 8.6 days (*SD* = 4.1). All infants were diagnosed with



Nipple pain is the most common maternal symptom experienced when breastfeeding infants with tongue-tie.

both tongue- and lip-tie, with the majority diagnosed with Class III restriction of both anomalies (54.5% and 49.6%, respectively). Sample demographics are provided in Table 1.

More severe tongue-tie was significantly associated with maternal report of bleeding nipples ($B = 1.084$, $p = .01$). For every increase in tongue-tie severity classification (Class I to Class IV), the odds of having bleeding nipples increased by 74.7% ($\text{Exp}(B) = 2.956$). More severe tongue-tie was significantly associated with the infant gagging, choking, or coughing during feeding ($B = .608$, $p = .03$). With each increase in tongue-tie severity, likelihood of gagging, choking, or coughing increased by 64.8%. For lip-tie, more severe restriction was significantly associated with the infant gumming or chewing on the nipple ($B = .644$, $p = .049$), with 65.6% increased odds of this symptom with each increased level of lip-tie severity. Total number of infant or maternal symptoms reported was not significantly different by tongue- or lip-tie severity classification.

Maternal pain with breastfeeding was significantly less post-frenotomy ($p < .01$, $z = -5.69$). Average pain score using the numeric rating scale was 4/10 ($SD = 2.51$) pre-frenotomy compared with 2/10 ($SD = 1.84$) post-frenotomy. Average feeding length in minutes was 31.5 minutes ($SD = 18.93$) pre-frenotomy and 23.6 minutes ($SD = 14.22$) post-frenotomy. This decrease in feeding was significant ($p < .01$, $z = -4.93$). Improvement rates of each infant and maternal symptom post-frenotomy are provided in Table 2.

Discussion

In this study, we described symptoms associated with tongue- and lip-tie for both infants and their breastfeeding mothers. More severe tongue-tie and lip-tie resulted in an increased likelihood of some of the infant and maternal symptoms assessed. The more severe restriction caused by tongue-tie may affect infant's control of swallowing, resulting in more gagging, choking, or coughing reported during feeding (Kotlow, 2011). If the tongue is unable to roll backward because it is restricted by a tongue-tie, then milk may collect. Choking or coughing may also increase the risk of aspiration, as the infant is unable to effectively move the bolus of liquid to the posterior pharynx (Barnes et al., 2010). More severe lip-tie restriction led to a greater likelihood of the infant gumming or chewing on the nipple, a causative factor in maternal nipple pain (Geddes et al., 2008). Future research is necessary to better understand how tongue- and/or lip-tie in conjunction with

TABLE 2. IMPROVEMENT IN INFANT & MATERNAL SYMPTOMS POST-FRENOTOMY (N = 121)

	Symptom	Present before Frenotomy	Improved after Frenotomy	% Reporting Improvement
Infant				
	Shallow latch	81 (66.9)	89 (73.6)	110 ^a
	Fall asleep while eating	103 (85.1)	83 (68.6)	80.6
	Slide off breast	84 (69.4)	81 (66.9)	96.4
	Colic	28 (23.1)	35 (28.9)	125 ^a
	Reflux symptoms	43 (35.5)	33 (27.3)	76.7
	Clicking	84 (69.4)	74 (61.2)	85.7
	Spit up	45 (37.2)	43 (35.5)	95.6
	Gag/choke/cough	67 (55.4)	60 (49.6)	89.6
	Excess gas	72 (59.5)	60 (49.6)	83.3
	Weight gain	19 (15.7)	15 (12.4)	78.9
	Hiccups	93 (76.9)	79 (65.3)	85
	Gumming/Chewing	55 (45.5)	55 (45.5)	100
	Pacifier hold	59 (48.8)	41 (33.9)	69.5
	Milk leaking	86 (71.1)	74 (61.2)	86
	Sleep session duration	39 (32.2)	49 (40.5)	126 ^a
	Snoring	48 (39.7)	35 (28.9)	72.9
	Nasal congestion	36 (29.8)	32 (26.4)	88.9
	Lip curl	63 (52.1)	64 (52.9)	102 ^a
Maternal				
	Creased nipples	51 (42.1)	36 (29.8)	70.6
	Lipstick shape	28 (23.1)	10 (8.3)	35.7
	Blistered nipples	27 (22.3)	21 (17.4)	77.8
	Bleeding nipples	18 (14.9)	6 (5)	33.3
	Poor drainage	57 (47.1)	46 (38)	80.7
	Infected nipples	5 (4.1)	2 (1.7)	40
	Nipple thrush	6 (5)	0 (0)	0
	Side preference	31 (25.6)	14 (11.6)	45.2
	Nipple shield	27 (22.3)	10 (8.3)	37

^aRepresents improvement post-frenotomy that was not reported as a symptom pre-frenotomy

differing maternal anatomy may lead to pain. There may be mother–infant dyads that are able to successfully breastfeed without tongue-tie revision; more research is needed to better understand which dyads benefit most from treatment of these oral restrictions.

Maternal pain with breastfeeding in the setting of tongue-tie is well-documented in the literature (Hill & Pados, 2020; Messner et al., 2000). There is an expected level of discomfort, ranging from moderate to intense, when breastfeeding during the first week (Tait, 2000). Considering the normal variability of breast and nipple anatomy, maternal pain with breastfeeding continuing after 1 week can be attributed to maternal anatomy such

as flat or inverted nipples, infant anatomy such as tongue- or lip-tie, spasms, or infection such as thrush (Amir et al., 2021). Infant abnormalities such as tongue-tie affect the infant's ability to suckle properly, as the tongue cannot curve around the nipple, resulting in inadequate feeding and sore nipples (Tait, 2000). As the infant gets older, and their mouth gets larger, poor suckling and its consequential pain may improve (Ventura et al., 2021). Nipple pain is the most common reason for not achieving 6 month of EBF (Kent et al., 2015), suggesting that awaiting infant maturity to resolve issues present in first weeks of life is not a sustainable solution for both infants and mothers.

CLINICAL IMPLICATIONS

- More than 80% of parents initiate breastfeeding after birth.
- Nurses are the primary caregivers during postpartum to assist with breastfeeding.
- An interprofessional approach that includes a feeding specialist and clinicians knowledgeable in the assessment and diagnosis of oral restrictions is paramount for early identification and treatment to support the breastfeeding relationship and address parental concerns related to feeding.
- Assessing infants for feeding ability is a primary role of nursing care, recognizing that symptoms including milk leaking from the mouth, coughing, and sliding off the breast may warrant further evaluation.
- Nurses should assess the breastfeeding dyad for symptoms consistent with oral restrictions, and advocate for evaluation by a provider knowledgeable in breastfeeding and oral restrictions.
- Early reporting of symptoms may reduce breastfeeding discomfort and prolong breastfeeding duration, with nurses playing a pivotal role in assessing and reporting issues in the breastfeeding dyad.

Infant symptoms (shallow latch; gumming and chewing; sleep session duration; and lip curl) had reports of improvement post-frenotomy although not always reported as problematic pre-frenotomy. Although not analyzed due to the exploratory nature of this study, marked improvements were reported for all infant symptoms' parents listed pre-frenotomy (Table 2). Future research should consider qualitative methods to better evaluate clinical significance of symptom improvement. There was a total of 18 reportable symptoms for infants and 9 reportable symptoms for mothers. Symptoms were reported as present regardless of the severity of tongue- or lip-tie, suggesting that treatment of tongue- and lip-tie has notable effects on parental perception of symptoms, and severity of the restriction(s) is only one factor in deciding to treat. Available assessment tools to diagnose tongue- and lip-ties have not been comprehensively evaluated for their psychometric properties. The Kotlow measures evaluate amount of freely mobile tongue and tension of the maxillary frenum, but do not address functional limitations of the infant's oral anatomy. However, in our study we found more severe tongue- and lip-tie, using Kotlow's criteria, are associated with some of the symptoms assessed in this population.

With the average follow-up time of 8.6 days, it is unlikely that infant maturation would account for the improvements in infant symptoms. However, we do not have enough information from the medical record data to understand if there were additional interventions post-frenotomy that could account for symptom improvement, such as lactation support, maternal diet changes, or pharmacologic treatments. More research is necessary to understand some of the symptoms that have not been explained in the literature, such as short sleep

duration, snoring, or colic and how these symptoms could be associated with oral restrictions. Follow-up with mother-infant dyads further out past frenotomy would help us to understand if symptoms plateau or continue to improve over time. Further understanding of the physiologic basis for maternal and infant symptoms in the context of tongue- and lip-tie is needed, with identification of symptoms necessitating intervention.

Our findings should be viewed considering the study's limitations. This was a retrospective medical record review; thus we were unable to validate questionnaire results with participants. There is no long-term data collection conducted by this office, so we do not know if symptoms continued to improve or plateau over time. Demographics of the sample were limited to what is collected by the office, and all participants were treated for both tongue- and lip-ties. As such, results cannot be generalized to the larger population, and we are unable to determine if one or both oral restrictions contributed most to symptom improvement. Absence of a comparison group of infants without tongue- and lip-ties is another limitation.

Clinical Implications

In this study, all reported maternal and infant symptoms improved following tongue- and lip-tie correction, some having significant association with severity of these restrictions. It is crucial to acknowledge that infants and mothers experience problematic symptoms associated with tongue- and lip-tie. More research is needed to better understand infant symptoms in the setting of these oral anomalies. An interprofessional approach that includes a feeding specialist and clinicians knowledgeable in the assessment and diagnosis of oral restrictions is paramount for early identification and treatment to support the breastfeeding relationship and address parental concerns related to feeding. Although frenotomy is outside of the nursing scope of practice, nurses play a pivotal role in the initiation and maintenance of breastfeeding. Understanding the symptoms that correspond to these oral restrictions may help reduce breastfeeding cessation, with nurses alerting providers of oral anomalies that complicate feeding. ❖

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The authors declare no conflicts of interest.

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