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Breastfeeding Effects with Early Intervention for Ankyloglossia (Tongue-tie)

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BREASTFEEDING EFFECTS WITH EARLY INTERVENTION FOR ANKYLOGLOSSIA (TONGUE-TIE)

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Abstract

Background: Anklyoglossia or tongue-tie in infants often goes undiagnosed primarily due to the lack of knowledge for assessing tongue-tie thus disrupting a successful breastfeeding experience. Education, diagnosis, and treatment of ankyloglossia are vital in order to create a successful breastfeeding outcome.

Purpose: To determine the effects of breastfeeding with early intervention for ankyloglossia (tongue-tie).

Theoretical/Conceptual Framework: Benner's concept of Novice to Expert allows nurses to develop skills over time through education and personal experiences. Weidenbach's concept of The Helping Art of Clinical Nursing applies to direct patient care, teaching, and advice.

Methods: Cumulative Index to Nursing and Allied Health Literature (CINAHL) and SCOPUS databases were used to discover appropriate and useful information for this literature review. Sixty-three articles were retrieved and twenty-five of which were solely used for this particular review of literature.

Results/Findings: Nurse-midwives, lactation consultants, and other providers should be trained to assess, diagnose, and treat tongue-tie in an infant who is experiencing breastfeeding difficulties to ensure a better breastfeeding experience with longer duration for the mother/infant dyad.

Implications for Nurse-Midwifery Practice: Once a nurse-midwife has become trained and credentialed in performing frenotomies, he or she can improve and extend services offered to breastfeeding mothers and their babies, also enhancing the midwife's professional practice.

Conclusion: Having the knowledge and tools available to assess and treat tongue-tie is an important part of the nurse-midwifery scope of practice. Early intervention and treatment of ankyloglossia has been shown by research-based studies to improve breastfeeding outcomes.

Keywords: ankyloglossia, tongue-tie, breastfeeding, Hazelbaker Assessment Tool for Lingual Frenulum Function (HATLFF), frenotomy, LATCH, infant breastfeeding assessment tool

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Chapter I: Introduction

Breastfeeding is not only the most nutritive source of food for the infant, but it also has many great health benefits for the mother. Successful breastfeeding involves both the mother and the infant, called the breastfeeding dyad. There are often times when breastfeeding is not easy for either the infant or the mother, which causes the mother to give up. Ankyloglossia (tongue-tie) is one of these situations in which breastfeeding can become rather difficult and is a common condition that affects 4.2-10.7% of infants (Rowen-Legg, 2015). Ankyloglossia is a potentially treatable cause of breastfeeding complications, though this is still controversial. Breastfeeding difficulties do not always arise from tongue-tie, but it can cause problems with latching and maintaining a successful latch, inefficient feeding cycle resulting in poor weight gain, maternal pain, and reduced milk production/supply (Jackson, 2012). Those breastfeeding problems are often the most common reasons for cessation of breastfeeding.

Ankyloglossia is a congenital abnormality that is presented when an infant has a short, fibrous lingual frenulum. When this occurs, it may restrict tongue mobility thus causing difficulties with breastfeeding in infants (Sethi, Smith, Kortequee, Ward, & Clarke, 2013). Tongue-tie occurs not only in newborns but also in children who have not had it corrected. Essentially a tight frenulum will affect tongue mobility to varying degrees, which can greatly interfere with successful breastfeeding. According to Rowen-

Legg (2015), in order for an infant to breastfeed more effectively, it is vital that he or she latches onto the areola by using the upper gum ridge, buccal fatty pads, and tongue. Suckling can only begin with forward movement of the jaw and tongue. A tight seal is maintained with minimal action with the help of the tongue. If the infant is experiencing restricted tongue movement, it is difficult to maintain that tight seal on the areola, thus causing significant nipple pain and an inability to successfully allow for the let-down of milk.

Due to the lack of knowledge about assessing tongue-tie as well as imperative signs and symptoms to look for, there are many infants who go undiagnosed. An effective way to assess whether tongue-tie will interfere with breastfeeding is to use the Hazelbaker Assessment Tool for Lingual Frenulum Function (HATLFF) (Amir, James, & Beatty, 2005). This tool was developed by Hazelbaker in hopes of obtaining a quantitative assessment for the severity of the tongue-tie and recommendations regarding the possibility of frenotomy (release of the frenulum). This tool assesses the likeliness of tongue-tie impacting breastfeeding negatively and includes five appearance items: appearance of the tongue when lifted, elasticity of frenulum, length of the lingual frenulum when tongue lifted, attachment of lingual frenulum to tongue, and attachment of lingual frenulum to inferior alveolar ridge (Amir et al., 2005). There are seven function items assessed within the HATLFF tool that include: lateralization, lift of tongue, extension of tongue, spread of anterior tongue, cupping, peristalsis, and snapback (Amir et al., 2005). Timely recognition of a tongue-tied newborn, one-on-one assistance from a certified lactation consultant, and early surgical intervention through frenotomy are all vital aspects of preventing early cessation of breastfeeding and increasing the duration of

breastfeeding (Berry, Griffiths, & Westcott, 2012). It is imperative that providers such as midwives along with certified lactation consultants be trained to perform procedures like a frenotomy on newborns. If properly trained, those providers would not need a consultation from a physician-, cutting down on physician referral time and cost. With increased education regarding to the topic of ankylogossia and breastfeeding, certified lactation consultants and certified nurse-midwives will have the ability to diagnose and release tongue-ties in breastfeeding babies to resolve breastfeeding problems more quickly.

Need for Critical Review of a Nurse-Midwifery Problem

There is a need for a critical review of the effects of early intervention for infants born with tongue-tie on breastfeeding. A case-control design by Ricke, Baker, Madlon-Kay, and DeFor-, (2005) revealed insufficient literature using solely the HATLFF tool to determine the severity of tongue-tie in breastfeeding infants and whether those infants with tongue-tie have decreased rates of breastfeeding at one week and one month of age.

The infants chosen for this particular study were from a Midwestern hospital newborn nursery and were examined for tongue-tie. Forty-nine tongue-tied and 98 control infants were enrolled in this study. The prevalence of tongue-tie was 4.2%, and those babies were three times more likely than the control babies to be bottle fed at only one week. By one month, tongue-tied babies were as likely as the controls to be bottle fed only (Ricke et al., 2005). The scoring on HATLFF is based on categories of Perfect, Acceptable, and Function Impaired. It was noted that 12 of the 49 tongue-tied infants had HATLFF scores of perfect, none had acceptable scores, and six had scores of function impaired (Ricke et al., 2005). This study concluded that affected infants are

much more likely to be exclusively bottle fed by one week of age, but the HATLFF alone is not a useful tool to identify which tongue-tied infants are at risk for breastfeeding problems. The use of the Infant Breastfeeding Assessment Tool (IBFAT) with mothers in an effort to assess and measure infant breastfeeding competence along with using the HATLFF will help indicate whether the infant has a vigorous, effective feeding ability (Ricke et al., 2005).

A randomized controlled trial was completed by Hogan, Westcott, and Griffiths (2005) regarding the division of tongue-tie in infants with feeding problems. Their goal was to determine whether a tongue-tied infant's feeding problem continued with current medical treatment such as referral to a certified lactation consultant or if immediate division of the tongue-tie worked best and helped the infant to feed better. They found that there was often a dramatic and immediate improvement in breast or bottle feeding after division by 81%. On the other hand, they also found that babies with tongue-tie can often times feed adequately without having a frenotomy procedure done (Hogan et al., 2005). They concluded that not all infants diagnosed with tongue-ties at birth need to have a division done. Rather, proper education and simply being aware that tongue-ties can cause significant feeding problems will allow for more prompt division in symptomatic babies. The division of tongue-ties (frenotomy) continues to be quite controversial. More critical review regarding the proper assessment tools needs to be done, and training should be available for professionals such as certified nurse midwives to perform frenotomies.

Significance to Nurse-Midwifery

In the past, release of the frenulum (frenotomy) has generally been performed by medical practitioners such as family practice physicians or pediatricians. However, because a frenotomy is a minimally invasive, low-risk procedure, it certainly falls within the scope of other clinicians such as certified nurse midwives. According to Amir, James, Kelso, & Moorhead (2011), performing frenotomies in the 1950s had declined because few mothers were breastfeeding. Most recently, however, there has been an increase in breastfeeding rates, posing the question of whether releasing tongue-tie is truly beneficial. Since 2005, 11 midwives and international board certified lactation consultants (IBCLCs) have been credentialed to perform frenotomies in Australia (Amir et al., 2005). Ultimately, by having certified nurse midwives become credentialed to perform the frenotomy procedure, practices will save time and money because they will not have to make a referral to the physician. This in turn will help minimize any delay in the management of infants experiencing difficulties with breastfeeding.

Conceptual Model/Theoretical Framework

The theoretical frameworks selected for this critical appraisal were Benner's from Novice to Expert (Benner, 1982) and Weidenbach's The Helping Art of Clinical Nursing (Weidenbach, 1963). Benner's concept gives an excellent description of nurses developing skills along with a better understanding of patient care over time from both a strong educational foundation and personal experiences (Petiprin, 2015). Benner believed there are five levels to nursing experience: novice, advanced beginner, competent, proficient, and expert. A nursing student in his or her first year of clinical education who has limited ability to predict what might happen in a certain situation

would be considered novice. An expert level nurse has developed a deeper foundation of experience, has an intuitive mindset regarding clinical situations, and provides the most exquisite nursing care (Petiprin, 2015). Benner's concept focuses on experience that will ultimately help guide the nurse or provider to greater intuition, ethical/moral reasoning, and personal knowledge. This model is based on philosophy and uses practical reasoning, looking at what underlies reality and helps to guide nursing practice (Altmann, 2007). Benner's model speaks to all nursing practice as well as midwifery specifically. For nurse-midwives, obtaining education and experience in performing frenotomies can only benefit their practice.

Weidenbach (1963) is another nurse theorist who developed The Helping Art of Clinical Nursing. This nursing theory helps define the patient as any person receiving some sort of help from the health care system including: care, teaching, and advice. In this nursing theory, because health education qualifies someone as a patient, that person does not necessarily need to be ill or injured to be a patient (Petiprin, 2015). Within Weidenbach's theory it is important to note that the patient's need for help must come from his or her own perception of the situation, such as in the case of a new mother and infant having difficulties with breastfeeding. Differentiating fact from assumption and being able to relate them to cause and effect help frame a nurse's clinical judgement and allow the nurse to make good decisions (Petiprin, 2015). The helping art of clinical nursing also entails being able to fully understand a patient's needs and concerns, to develop goals and a plan to enhance a patient's ability, and to make a plan to improve the patient's condition (Petiprin, 2015). Weidenbach's theory goes hand in hand with the concept of the mother/baby dyad and with the discussion of tongue-tied infant. Not only

is the mother's voice heard, but the baby is also assessed, and a plan is made to relieve the presenting problem in an effort to allow for a pleasant breastfeeding experience for the dyad.

Statement of Purpose/Research Question

As breastfeeding has continued to rise over the last decade, an increased number of women have struggled to initiate breastfeeding. Nurse-midwives, pediatricians, certified lactation consultants, and staff nurses must assist mothers who struggle with this process. Tongue-tied infants, account for 12.8% of breastfeeding problems (Henry & Hayman, 2014). Tongue-tie or ankyloglossia is a significant deterrence to successful breastfeeding in the newborn, as approximately 4.2-10.7% of infants are diagnosed with this condition (Rowen-Legg, 2015). This condition is a contributing factor in why a woman chooses to cease exclusive breastfeeding much sooner than anticipated due to the infant not gaining weight appropriately or the woman experiencing a great deal of discomfort because of painful, cracked nipples. There is some difference of opinion among professional health care providers regarding when a frenotomy should be done to correct tongue-tie. The guiding research question for this critical appraisal of the literature is: What are the breastfeeding effects with early intervention of ankyloglossia (tongue-tie)?

Summary

As the nurse-midwifery practice continues to evolve and grow, so should education regarding diagnosing and correcting infants who are tongue-tied.

Breastfeeding continues to be on the rise. If there is a condition such as ankyloglossia that is hindering this natural process, the recommendation may be to correct this anomaly as soon as possible to allow for the best outcome for the mother/infant dyad. There is a great deal of evidence that early tongue-tie intervention provides the best outcome for successful breastfeeding. Therefore, more education is needed for healthcare professionals regarding early tongue-tie intervention in an effort to have consistency of management for affected infants. This chapter described the appropriate assessment process to diagnose a tongue-tied infant, early intervention as a necessity for the mother/infant dyad to continue to be successful with breastfeeding, the need for a critical review of the literature, the significance to nursing, and the theoretical frameworks supporting the review.

Chapter II describes the search strategies used to identify research studies, criteria for including or excluding research studies, number and types of studies selected, along with criteria for evaluating research studies. Chapter III provides a literature review and analysis of the evidence and includes a synthesis of the major findings along with the strengths and weaknesses of the research studies. Chapter IV discusses the trends, gaps, future research, application and integration of the theoretical framework.

Chapter II: Methods

Search Strategies Used to Identify Research Studies

The intent of this critical appraisal of the literature is to determine if early tongue-tie intervention affects breastfeeding. An initial search was conducted using the Cumulative Index to Nursing and Allied Health Literature (CINAHL) database entering the key words-, "ankyloglossia" and "breastfeeding." This search retrieved 10 items which were published between 2005 and 2015. A second search was conducted using the SCOPUS database using the keywords-, "ankyloglossia"-, "breastfeeding"-, and tongue-tie." This search retrieved 53 articles that were published between the years 1990-2015. After searching the literature, the subject terms that occurred most frequently were, "ankyloglossia surgery"-, "ankyloglossia complications"-, and "breastfeeding." The analysis of subject terms condensed the number of studies in CINAHL and SCOPUS to 59. Of those 59 articles, 25 were successfully utilized for this literature review. Along with the results obtained throughout the literature search, the references within the research studies brought additional literature for review.

Criteria for Including or Excluding Research Studies

A wide variety of research studies such as randomized controlled trials and prospective studies, qualitative and quantitative studies, literature review, and meta-

analysis of high and good quality were included within the matrix. Many research articles were not included within the matrix as the information did not relate to the subject matter of this particular review. Studies that described the effects of early tongue-tie intervention such as frenotomy on breastfeeding were included in this review. Other studies included in this review were those that discussed early diagnosis of tongue-tie and assessment tools necessary for proper diagnosis.

Number and Types of Studies Selected

A total of 63 studies related to ankyloglossia surgery, ankyloglossia complcations, ankyloglossia diagnosis, and breastfeeding comprised the initial selection of articles. The studies were sorted according to original research, literature review, systemic reviews, and meta-analysis. Additionally, studies were sorted according to types of research, including randomized controlled trials, qualitative studies and quantitative studies. Each study was evaluated with regard to the correlation between early tongue-tie intervention and breastfeeding. The 25 articles that were included in the final review were organized into several different categories. There were seven randomized trials; two systemic reviews of literature; one randomized prospective study; three literature reviews, one qualitative research paper; one qualitative study; one journal reflection; two qualitative narrative analyses; one meta-analysis; three prospective studies; one case-controlled design study; one cohort survey and retrospective review; and one descriptive personal story.

Criteria for Evaluating Research Studies

The criteria used to evaluate the research studies in this critical appraisal were based on The Johns Hopkins Nursing Evidence-Based Practice: Model and Guidelines

(JHNEBP) (Dearholt & Dang, 2012). The JHNEBP model bases the appraisal of studies on the level and quality of evidence provided. Studies in Level I include experimental, randomized controlled trial (RCT); and systemic review of RCTs with or without meta-analysis. The Level II studies include quasi-experimental, systemic review of a combination of RCTs and quasi-experimental studies, and quasi-experimental studies with or without meta-analysis. Level III includes non-experimental, systemic review of a combination of RCTs, quasi-experimental and non-experimental with or without meta-analysis, qualitative or systemic review with or without meta-analysis. Level IV includes an opinion of respected authorities and/or nationally recognized expert committees/consensus panels based on scientific evidence which includes clinical practice guidelines and consensus panels. Lastly, Level V includes experiential and non-research evidence such as: literature reviews, quality improvement, case reports, and opinion of nationally recognized experts based on experiential evidence (Dearholt & Dang, 2012).

Research studies are considered of high quality if they are consistent with a sufficient sample size for the design, adequate control with definitive conclusions, and consistent recommendations. A good quality research study is reasonably consistent with its results, has a sufficient sample size with fairly definitive conclusions, and some control. A research study is considered low quality if it contains little evidence with inconsistent results and has an insufficient sample size from which conclusions are unable to be drawn (Dearholt & Dang, 2012).

Summary

The effects of early tongue-tie intervention on breastfeeding continue to be debated among many health care professionals. The inclusion of 25 studies for the final matrix provides a thorough analysis of the evidence regarding this topic. This chapter described search strategies used to identify research studies, criteria for including or excluding studies, the number and types of studies selected, and criteria for evaluation of the selected research.

Chapter III: Literature and Analysis

This chapter will provide a review and analysis of literature related to early intervention for tongue-tie and its effects on breastfeeding. The release of tongue-tie, also known as frenotomy, is a procedure that has been used for many years. According to Amir et al., (2011), frenotomy was performed routinely during the 19th century if tongue-tie was presumed to directly affect breastfeeding. During the 1950s, fewer mothers breastfed their babies, and there was a decline in the frenotomy procedure (Amir et al., 2011). More recently, there has been a steady increase in the number of women breastfeeding their infants, which has led to a discussion of whether a frenotomy is beneficial to an infant who has been diagnosed with tongue-tie. This discussion will provide a synthesis of the major findings in regards to early interventions of tongue-tie along with an evaluation of the strengths and weaknesses of the studies.

Synthesis of the Matrix

The matrix was utilized as an effort to successfully organize the literature and look for specific trends regarding improving the knowledge for health professionals, certified nurse midwives, and certified lactation consultants. The chosen 25 studies were organized in a matrix with the following headings: citation, purpose, sample, design, measurement, results/conclusions, recommendations, level and quality (see Appendix A). The matrix was organized alphabetically by author. Each of the 25 research studies used in the matrix was analyzed for purpose and major findings in regards to the research question being evaluated, and they were assigned a level and quality based on the Johns

Hopkin's criteria. There are eight articles considered to be level I, four level II, five level III, five level V, and three level VII.

Synthesis of the Major Findings

The major findings of the research articles will relay the importance of diagnosis and treatment of tongue-tie. According to Amir et al. (2011), it is important to teach and educate midwives and lactation consultants to assess, diagnose, and treat tongue-tie. The intervention is simple and cost effective, and it benefits continued breastfeeding (Amir et al., 2011). This treatment will improve the outcome for breastfeeding mothers and their infants.

When to perform a frenotomy

According to Berry et al. (2012) "The World Health Organization recommends exclusive breastfeeding for the first 6 months of life" (p. 189). Breastfeeding oftentimes does not continue for as long as recommended and of the infants born in 2011, "49% were breastfeeding at 6 months and 27% at 12 months" (CDC, 2014, p.2). The study by Berry et al. (2012) found an immediate improvement in breastfeeding when a frenotomy was performed on infants with tongue-tie. Early intervention is important to increase success for long-term breastfeeding. In a study conducted by Steehler, Steehler, & Harley (2012), the overall belief that frenotomy benefitted breastfeeding success was 86% of patients who chose to have the frenotomy done in the first week of life. While breastfeeding can improve immediately, follow-up on continued outcomes and support is important for the breastfeeding mother (Berry et al., 2012). If appropriate follow-up and support is given to the mother, it will likely improve long-term breastfeeding goals.

It is important to thoroughly assess whether a frenotomy does need to be performed. Frenotomy is a simple and quick intervention, but it should nevertheless not be done unless necessary. For example, bonding of the mother and the infant is a factor that can affect breastfeeding (Ridgers, McCombe, & McCombe, 2009). Once a thorough assessment and proper bonding have been confirmed, then a frenotomy would be a logical intervention if needed to support breastfeeding.

In a study where 66 infants were assessed for a period of one year, 35 infants needed a frenotomy (Amir et al., 2005). The parents of the infants did feel that the treatment improved their breastfeeding experience but did not completely resolve it. Treatment for tongue-tie is a simple and safe procedure, and if it does help improve the success of breastfeeding, it is worthwhile to have it done.

Practitioners performing frenotomy

Family practice physicians may perform the frenotomy in the hospital or in the out-patient clinic setting. In the hospital setting, a neonatologist observing ankyloglossia; will perform the frenotomy (Dollberg, Botzer, Grunis, & Mimouni, 2006). Other practitioners who could help with performing frenotomies are pediatric dentists (Dollberg et al., 2006). Nurse-midwives and lactation consultants are also able to assess for tongue-tie and perform frenotomy (Amir et al., 2011).

Effects of frenotomy on breastfeeding

Buryk et al. (2011) states, "The American Academy of Pediatrics recommends that infants breastfeed for the first year of life […] based on the evidence for decreased rates of infection, diabetes, obesity, and other medical conditions and on enhanced cognitive development" (p. 283). Performing a frenotomy resulted in mothers having

decreased nipple pain and much more successful breastfeeding (Buryk et al., 2011). It may be beneficial to do further research on the timing of a frenotomy as some infants with tongue-tie do establish successful breastfeeding. However, this study provides evidence for pediatricians, otolaryngologists, oral surgeons, and lactation consultants to perform treatment of tongue-tie resulting in good outcomes for mother and infant (Buryk et al., 2011). Research by Steehler et al. (2012) found that 367 infants with tongue-tie, 82.9% continued to breastfeed following the frenotomy procedure for an average of seven months total. It was also noted 33.3% of mothers stopped breastfeeding after choosing not to have the frenotomy done.

The Pediatrics Committee of the Canadian Pediatric Society found inconsistency in outcomes when treating tongue-tie (Cawse-Lucas, Waterman & St. Anna, 2015). The evidence did not support improved LATCH scores. LATCH assessment includes latch, audible swallowing, nipple type, comfort, and hold (Cawse-Lucas et al., 2015). Frenotomy is not recommended unless there is a definitive impairment to breastfeeding (Cawse-Lucas et al., 2015).

Strengths and Weaknesses of the Research Studies

Looking at many different research studies, each contained strengths and weaknesses. Three of the most salient studies related to this critical appraisal of the literature discussed the strengths and weaknesses or limitations of these studies (Berry et al., 2012, Berry et al., 2011, & Hogan et al., 2005). A strength that was noted with the double-blind, randomized, controlled trial of tongue-tie frenotomy was a score sheet used to assess breastfeeding success. The LATCH assessment and the Infant Breastfeeding Assessment Tool were used to provide a measure of success (Berry et al., 2012). Ideally,

looking at before and after assessments of several feedings would have provided further information, but this was not an option due to time limitations of the parents. Another limitation was the age at which the tongue-tie assessment should be done on an infant to result in a successful outcome for breastfeeding. There is the dilemma of division too early posing criticism that the infant may still feed well without intervention. On the other hand, division too late may produce a worn-out mother/infant dyad which may raise the concern that the infant will not continue to breastfeed long term (Berry et al., 2012). The recommendation is to perform a frenotomy in symptomatic babies by the age of two weeks (Berry et al., 2012).

Another study "used validated and reliable tools for grading ankyloglossia or the post-frenotomy outcome measures" (Buryk et al., 2011, p. 285). Grading is important because up to half of breastfed babies with tongue-tie will not have any problems. This study used a randomized, controlled, blinded design in which all the infants struggled with breastfeeding and it was found that using assessment tools was a great strength. The use of assessment tools such as LATCH and the Infant Breastfeeding Assessment Tool for grading ankyloglossia and measuring pain along with maternal report of breastfeeding adequacy allows for earlier treatment of tongue-tie and immediate improvements in nipple pain and long term breastfeeding (Buryk et al., 2011). Limitations included not having long-term outcomes to assess. Also, once the frenotomies had been performed, the blinded participants (parents) were no longer blinded as they could easily look in their infants' mouths and see whether a frenotomy was performed (Buryk et al., 2011).

In the study done by Hogan et al. (2005), one of the strengths was the immediate assessment and following of infants post-delivery. Quick inspection of the infant for

tongue-tie at the time of delivery, during the first newborn assessment or on daily physician rounds is an easy way to confirm an earlier diagnosis (Hogan et al., 2005). The healthcare professionals, midwives, nurses, and doctors were taught what to observe and palpate upon examination of the infants' mouth (Hogan et al., 2005). Printed photographs of various severities of tongue-tie were provided to assist in early diagnosis and treatment. Limiting this study was the small percentage of infants with tongue-tie. There were conflicting opinions among practitioners about whether the tongue-tie actually caused feeding problems. It would have been beneficial to provide the actual mother with more tools to measure the effect of frenotomy on breastfeeding (Hogan et al., 2005).

Summary

This review of literature indicated that early intervention for tongue-tied infants has the potential to improve the breastfeeding experience for the mother and infant and will also help support long-term, continued breastfeeding. It is vital to intervene early in an effort to promote longer periods of breastfeeding to benefit the infant later in life with decreased rates of infection, diabetes, obesity, and other medical conditions in addition to enhanced cognitive development. When diagnosing an infant for tongue-tie, it is vital for practitioners to utilize the LATCH assessment and Infant Breastfeeding Assessment Tool prior to moving forward with performing a frenotomy. Of course, not all researchers believe that a frenotomy will help infants with tongue-tie overcome breastfeeding difficulties. Because of this, further research is warranted in order to determine the full benefit for breastfeeding of early intervention for tongue-tie.

Chapter IV: Discussion and Conclusions

This chapter includes a synthesis of the literature, current trends for treatment of ankyloglossia (tongue-tie), gaps in the literature along with recommendations for further research, implications for nurse-midwifery practice, and integration and application of the theoretical framework. The purpose of this critical review of literature is to determine the effect on breastfeeding of early intervention for tongue-tie. For nurse-midwives to be proficient in the treatment of tongue-tie, they should be knowledgeable in assessing the severity of tongue-tie and have the skill set used to perform a frenotomy. When nurse-midwives know how to assess and perform early intervention, the success rate of breastfeeding may be increased.

Literature Synthesis

The research question that guided this study was: what are the effects on breastfeeding of early intervention for ankyloglossia (tongue-tie)? If a simple intervention such as the frenotomy can be performed in the hospital or out-patient setting and result in improved breastfeeding outcomes it should be considered a valid intervention for tongue-tie. The overall goal with early intervention of tongue-tie is a positive breastfeeding outcome for mother and infant.

Trends

In a review of the current trends in literature, the author found that in infants who are diagnosed with a significant tongue-tie that interferes with breastfeeding,

improvement in breastfeeding follows after a frenotomy. Todd & Hogan (2015) believe that more than 90% of mothers had an instant improvement of breastfeeding and nipple pain when frenotomies were performed on their infants. Their study showed that if breastfeeding was not going well, a frenotomy should be done as soon as possible for long-term breastfeeding success. Trends showed that the sooner a frenotomy was done, the more likely the mother was to continue breastfeeding as her nipple pain was not as severe (Todd & Hogan, 2015).

These trends also showed that early assessment of tongue-tie and early treatment are important for breastfeeding success. Years ago, the assessment was done in the delivery room, and a frenotomy was performed immediately. The popularity of formula feeding resulted in a decrease in assessing the frenulum in newborns. With knowledge of the benefits of breastfeeding to both infants and mothers, early assessment and treatment of tongue-tie is becoming a necessary practice. Research supports early assessment and referral to clinicians, lactation consultants, pediatricians, and even oral surgeons if necessary (Henry & Haymen, 2014).

Another trend presented in the literature was that of using breastfeeding tools that can facilitate "accurate, rapid breastfeeding appraisal, and targeting breastfeeding advice to mothers acquiring early breastfeeding skills or for those experiencing problems with an older infant" (Ingram, Johnson, Copeland, Churchill, & Taylor, 2015, p. 132). One way to assess rapidly would be to use the Bristol Breastfeeding Assessment Tool (BBAT), which assesses positioning, attachment, sucking, and swallowing. The BBAT scores on levels of poor, moderate, or good (Ingram et al., 2015). Using current tools can help researchers target areas needing more research or further attention and treatment. Using a

simple assessment tool provides rapid and accurate information to both practitioners and parents.

Gaps in the Literature

Gaps exist in the literature reviewed. Assessing the success of frenotomy on breastfeeding can be a challenge considering the parents' anxiety and distress when an infant is having feeding problems (Sethi et al. 2013). Another gap in research methods is not allowing enough time after the frenotomy to assess the infants' feeding (Sethi et al., 2013). This study does not have any blinding. Participants went into the study believing that tongue-ties cause feeding problems which can affect the validity of the study. Another concern is that there is not a universally accepted tool for assessing tongue-tie (Sethi et al., 2013).

An additional gap in research is the number of infants and mothers who do not consistently follow up in the long-term assessment of the study (Ricke et al., 2005). This can result in some portions of the study having fewer numbers of subjects, which can make it difficult to determine the accuracy of the end results. Some assessment tools, such as the HATLFF, were found to be less useful. In order to have a successful research study, the assessment tools need to provide pertinent information. In the medical field, there are conflicting viewpoints on the benefits of frenotomy. Therefore, research to provide education on the effectiveness and safety of treatment for tongue-tie is necessary (Edmunds, Miles & Fulbrook, 2011).

Recommendations for Further Research

Because of the gaps in the literature, it is vital to perform further research not only about which tools would be the most beneficial for nurses and practitioners to utilize but

also about whether a frenotomy is the best management option for a better breastfeeding experience. Breastfeeding is the most nutritive option for infants. Therefore, being able to thoroughly assess an infant believed to be tongue-tied and managing the tongue-tie properly will only enhance the experience of both the mother and infant. Having adequate research on which to base decisions will allow providers to educate the parents on what would be the best option for their infant.

When considering the best choices for educating not only staff but also the providers such as nurse-midwives, annual education is vital on how to assess for tongue-tie in infants along with the proper and appropriate management to ensure the very best breastfeeding outcome. Not all infants with tongue-tie have difficulties with breastfeeding. Therefore, nurses and health care providers such as nurse-midwives should be taught the signs and symptoms to watch for in both the mother and infant (see Appendix B). It is important that the education provided includes the visible characteristics an infant may display a case of tongue-tie.

There are two specific assessment tools that are often used on infants who are experiencing difficulty with breastfeeding: LATCH and BBAT. All nurses and healthcare providers must have a good understanding of these tools in an effort to properly diagnose an infant with tongue-tie. The LATCH tool has five parameters: latch, audible swallowing, nipple type, comfort, and hold that model the Apgar score. Each of these parameters scores zero to two, and total scores correlate with longer duration of breastfeeding (Ingram et al., 2015). This particular tool is useful both before and after a frenotomy has been performed on an infant.

The Bristol Breastfeeding Assessment Tool (BBAT) is also a very useful tool for practitioners to evaluate the effects of newborn breastfeeding following frenotomy. The BBAT scoring ranges from zero to eight and scores of zero to three are correlated with more severe reduction of tongue function. The BBAT tool is easy to use and gives a rapid appraisal to help target challenges during breastfeeding, particularly with tongue-tied infants. With the proper education and training to assess for tongue-tied infants, a plan must be put into place for the management of tongue-ties. Qualified and credentialed practitioners are responsible for performing frenotomies in order to promote what is best for the infant and a longer duration of breastfeeding (Ingram, Johnson, Copeland, Churchill, & Taylor, 2015).

Implications for Nurse-Midwifery Practice

This critical appraisal of the literature has implications for nurse-midwifery practice. With appropriate education, training, and supervision, a credentialed nurse-midwife is able to perform the assessment for tongue-tie along with safe and effective management (Amir et al., 2011). Once a nurse-midwife has become trained and credentialed, there is a great improvement and extension of services that can be offered to breastfeeding mothers and their babies, which also enhances the midwife's professional practice. It is important for each facility to have a policy in place to assess an infant for tongue-tie along with protocols to safely and effectively manage this congenital abnormality. Without proper education for nursing staff and providers along with a plan for intervention, it would be extremely difficult to make a difference for all infants who have troubles with breastfeeding. Because breastmilk is so vital to the health of an infant, nurses and providers alike must be thoroughly educated in assessing for tongue-tie and

the management of it. This will ensure the best possible breastfeeding outcome for all mother/infant dyads.

Application and Integration of Theoretical Framework

It is important for providers such as nurse-midwives to develop competence in assessing for tongue-tie and making the decision to proceed with a frenotomy in an effort to establish early intervention for the breastfeeding mother/infant dyad. Understanding and applying theoretical concepts for early intervention for tongue-tie is crucial as it will ultimately lead to the infant receiving breastmilk longer. Benner's model of novice to expert and Weidenbach's helping art of clinical nursing were two theoretical frameworks used to help frame conclusions on the caregiver's role in early intervention for tongue-tie and its effect on breastfeeding. These two theories guided the analysis of the articles chosen along with the analysis of data.

Benner believed that there are five levels to nursing experience. Thus, this theory is extremely relevant to a provider gaining experience in the early diagnosis of tongue-tie and eventually becoming an expert with the frenotomy procedure. In Benner's concept, experience ultimately leads to intuition, ethical/moral reasoning, and personal knowledge (Altmann, 2007). Weidenbach's theory helped guide this review of literature by allowing the patient to follow his or her own perceptions regarding when to seek out help. This can be the case for the mother and infant dyad experiencing breastfeeding difficulties. Clinical nursing comes into play in this particular theory because the nurse should understand a patient's needs and concerns, be able to develop goals, and be able to develop a plan to enhance a patient's ability to improve his or her condition (Peltiprin,

2015). By utilizing Weidenbach's theory, when an infant is tongue-tied, the mother's voice is heard when she reports concerns regarding breastfeeding. This allows for the baby to be assessed for tongue-tie and a plan put in place for an intervention.

Conclusions

The majority of studies reviewed have clearly shown that better breastfeeding experiences are possible for the mother/infant dyad when there is early intervention for tongue-tie. The information obtained has shown that breastfeeding difficulties are not always caused by tongue-tie which makes it that much more important for nurses and practitioners to be prepared to offer breastfeeding help if the mother begins to experience signs and symptoms of problems that are possibly related to ankyloglossia. Today's culture is moving progressively to breastfeeding, which can also cause more infants to be diagnosed with tongue-tie. For that reason, health-care professionals such as nurse-midwives should be able to practice the low-risk procedure of frenotomy to help increase breastfeeding outcomes for both the mother and baby. Having the knowledge and tools available to assess and treat tongue-tie are an important part of the nurse-midwifery scope of practice. The nurse-midwife is an integral part of the immediate postpartum period in which ankyloglossia can be assessed and treated.

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Appendix A
Matrix of the Literature

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Amir, L. H., James, J. P., & Beatty, J. (2005). Review of tongue-tie release at a tertiary maternity hospital. *Journal of Paediatrics & Child Health, 41*(5-6), 243-245. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=2009075989&site=ehost-live&scope=site	To review the first twelve months of assessment and release of lingual frenulum (frenotomy) and to report on the breast-feeding outcomes and parental satisfaction.	Fifty-seven infants were randomly assigned to have immediate frenotomy by the lactation consultant/ infant feeding specialist or to receive help with positioning and attachment by the lactation consultant and review in forty-eight hours.	Randomized controlled trial.	A structured telephone interview was conducted with the mother at least 3 months after the assessment. Data were collected about the presenting problem and the effect of release of the tongue-tie (if performed). Parents were also asked about their satisfaction with the procedure and of problems following the release.	**Results** Sixty-six babies were assessed in twelve months. If infants were assessed as: (i) having impaired lingual function (using the Hazelbaker assessment tool for lingual frenulum function) (HATLFF); (ii) the frenulum visualized to be a thin membrane; and (iii) the parent(s) gave informed consent, the frenulum was released. Initial and follow-up data are available on forty-six infants. Infants had a mean age of eighteen days (range 3–98), 63% were male infants and most had difficulties with attachment to the breast. **Conclusion** Frenotomy was performed on thirty-five infants and breastfeeding improved in 83%. Parents reported high levels of satisfaction with the frenotomy procedure and no complications were reported.	Frenotomy is a safe and easy procedure. Infants with a significant tongue-tie that is interfering with breastfeeding have shown an improvement with breastfeeding following frenotomy. Further testing of the Hazelbaker assessment should be conducted, including interrater reliability.	Level I. Good quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Amir, L., H., James, J., P., Kelso, G., & Moorhead, A., M. (2011). Accreditation of midwife lactation consultants to perform infant tongue-tie release. *International Journal of Nursing Practice, 17*(6), 541-547. doi:10.1111/j.1440-172X.2011.01969.x	To outline the process of setting up and maintaining credentialing for midwife lactation consultants (International Board Certified Lactation Consultants (IBCLCs) to assess infant tongue-ties and perform frenotomy when appropriate at a tertiary maternity hospital.	A total of 11 midwives/ lactation consultants were credentialed. In a total of 12 months, 327 frenulotomies were performed and 80% (262) of those were completed by the trained midwives/ lactation consultants.	Randomized controlled trials.	The method of training involved completing 10 supervised HATLFF assessments, a minimum of 5 observations of frenulotomy procedures, and a minimum of 5 performed frenulotomies under supervision. A minimum of 10 frenulotomy procedures were to be performed each year in order for the clinician to stay certified. A record is also kept of the clinicians training.	**Results** In 12 months a total of 327 frenotomies were performed; 262 (80%) of those by midwives/IBCLCs. The training and credentialing program has been shown to improve services to breastfeeding mothers and their babies and extend professional practice. **Conclusion** Credentialed nurse/midwife/lactation consultants can diagnose and release tongue-ties in breastfeeding babies, which facilitates faster resolution of breastfeeding problems.	While this article does not provide much information on whether the success of breastfeeding was greatly affected after frenulectomy, it gives an insight on the possible affects early intervention to frenulectomy performed by a clinician, such as a nurse, can have. This service can be performed earlier by an available, trained clinician whom is skilled in breastfeeding support rather than waiting to see a pediatrician.	Level I. Good quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Berry, J., Griffiths, M., & Westcott, C. (2012). A double-blind, randomized, controlled trial of tongue-tie division and its immediate effect on breastfeeding. *Breastfeeding Medicine*, *7*(3), 189-193. doi: 10.1089/bfm.2011.0030	To investigate if a maternally reported, immediate improvement in breastfeeding following division of tongue-tie is due to a placebo effect.	Sixty breastfed babies 5–115 days old (mean, 32 days; median, 23 days) were randomized to division (Group A) or non-division (Group B).	Randomized controlled trial.	The mother and a trained observer were blinded and assessed breastfeeding before the intervention. Fifty-seven babies were analyzed because blinding failed in three of the babies in Group A. Following the intervention, the mother's and observer's views were noted, and then those infants allocated to non-division had their tongue-tie divided.	**Results** Seventy-eight percent (21 of 27) of mothers in Group A reported an immediate improvement in feeding following the intervention, compared with 47% (14 of 30) in Group B. At 1-day follow-up, 90% (54 of 60) reported improved feeding following division. At the 3-month follow-up, 92% (54 of 59) still reported improved feeding, with 51% (30 of 59) continuing to breastfeed. **Conclusion** There is a real, immediate improvement in breastfeeding, detectable by the mother, which is sustained and does not appear to be due to a placebo effect.	The breastfeeding mothers should have been assessed on the ''before'' and ''after'' scores and sensation over two normal feeds, several hours apart, that took place as the mother responded to her baby's usual cues for feeding. Earlier division has been shown to allow a faster recovery of normal feeding patterns and a more successful outcome. Possibly, breastfeeding advisors should be aiming for division in symptomatic babies by 2 weeks old.	Level I. Good quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Buryk, M., Bloom, D., & Shope, T. (2011). Efficacy of neonatal release of ankyloglossia: A randomized trial. *The American Academy of Pediatrics*, *128* (2), 280-288. Retrieved from http://dx.doi.org/doi:10.1542/peds.2011-0077	The primary objective was to determine whether frenotomy for infants with ankyloglossia improved maternal nipple pain and ability to breastfeed. A secondary objective was to determine whether frenotomy improved the length of breastfeeding.	The sample was taken over a twelve month period in neonates who had difficulty breastfeeding and significant ankyloglossia along with the mother experiencing nipple pain. They were assigned to two different groups; either a frenotomy (30 infants) or a sham procedure (28 infants).	Randomized, single-blinded controlled trial.	Breastfeeding was assessed by a pre-intervention and post-intervention nipple-pain scale and the Infant Breastfeeding Assessment Tool. The same tools were used at the 2-week follow-up and regularly scheduled follow-ups over a 1-year period. The infants in the sham group were given a frenotomy before or at the 2-week follow-up if it was desired.	**Results** Both groups demonstrated statistically significantly decreased pain scores after the intervention. The frenotomy group improved significantly more than the sham group (*p*.001). Breastfeeding scores significantly improved in the frenotomy group (P .029) without a significant change in the control group. All but 1 parent in the sham group elected to have the procedure performed when their infant reached 2 weeks of age, which prevented additional comparisons between the 2 groups. **Conclusion** Immediate improvement in nipple pain and breastfeeding scores was demonstrated, despite a placebo effect on nipple pain.	Although this procedure is rapid, simple, and without complications, additional studies should be done to determine the optimal timing of frenotomy and the ideal screening tool to detect significant ankyloglossia.	Level I. Good quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Cawse-Lucas, J., Waterman, S., & St Anna, L. (2015). Clinical inquiry: Does frenotomy help infants with tongue-tie overcome breastfeeding difficulties? *Journal of Family Practice, 64*(2), 126-127. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=2012901125&site=ehost-live&scope=site	To explain that there are too many conflicting representations of frenulectomy and breastfeeding success in order to prove frenulectomy procedures necessary in tongue-tied newborns.	58 infants were randomized (mean age 6 days) with ankyloglossia (rated 8 out of 10 on a standardized severity scale) to receive either frenotomy or no intervention.	A systematic review of several randomized control trials was written.	A 50-point Short Form McGill Pain Questionnaire used to measure maternal nipple pain at baseline, immediately after, and at 2, 4, 8, and 52 weeks. Also in one of the studies telephone interviews were done at 24 hours and in another study they measured LATCH scores at baseline and again at 5 days with intention to treat.	**Results** Mothers in the intervention group reported a 10% greater reduction in nipple pain after frenotomy compared with the control group. Two RCTs evaluating frenotomy and LATCH (**L**atch, **A**udible swallowing, nipple **T**ype, **C**omfort, and **H**old) scores, which include a component measuring maternal comfort, found no breastfeeding improvements. **Conclusion** Infants that were randomized into the frenotomy or sham group were observed by independent observers to measure outcomes with the LATCH score and the Infant Breastfeeding Assessment Tool (IBFAT) They observed no significant differences in LATCH or IBFAT scores between groups.	Ankyloglossia is a relatively uncommon congenital anomaly, and associations between ankyloglossia and breastfeeding problems in infants have been inconsistent therefore it is not recommended that a frenotomy is done. A frenotomy should only be done if there is a clear association between significant tongue-tie and major breastfeeding problems.	Level I. Good Quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Dollberg, S., Botzer, E., Grunis, E., & Mimouni, F. B. (2006). Immediate nipple pain relief after frenotomy in breast-fed infants with ankyloglossia: A randomized, prospective study. *Journal of Pediatric Surgery*, *41*, 1598-1600. http://dx.doi.org/doi:10.1016/j.jpedsurg.2006.05.024	To test the hypotheses that a frenotomy for ankyloglossia alleviates symptoms of breastfeeding difficulties.	A sample of twenty-five mothers of full-term healthy, appropriate-for-gestational age infants aged 1 to 21 days with ankyloglossia were recruited because of sore nipples. Infants were randomized to either of 2 sequences: (1) frenotomy, breastfeeding, sham, breastfeeding (n = 14) or (2) sham, breast-feeding, frenotomy, breastfeeding (n = 11).	Randomized, prospective study.	All personnel taking care of the child after each sham or frenotomy procedure, as well as the mother, were masked as to whether frenotomy or sham had been performed. The mother was not allowed to examine the infant's mouth prior to putting the infant to the breast. In every sequence, and after each sham or frenotomy procedure, a standardized latch score (10 points minimum difficulties) and pain score using a standard visual analogue pain scale (10 points maximum pain) were obtained from the mother by the lactation consultant.	**Results** There was a significant decrease in pain score after frenotomy than after sham (P = .001). There was also a nearly significant improvement in latch after the frenotomy in these mothers (P = .06). **Conclusion** The authors feel that frenotomy appears to alleviate nipple pain immediately after frenotomy. They do speculate that ankyloglossia plays a significant role in early breastfeeding difficulties, and that frenotomy is an effective therapy for these difficulties.	There are no specific recommendations noted within this article.	Level II. Good quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Edmunds, J., Miles, S., & Fulbrook, P. (2011). Tongue-tie and breastfeeding: A review of the literature. *Breastfeeding Review*, *19*(1), 19-26. Retrieved from http://web.a.ebscohost.com.ezproxy.bethel.edu/ehost/pdfviewer/pdfviewer?vid=3&sid=8afeb37b-abef-4683-baad-5ee9afff5ea4%40sessionmgr4002&hid=4104	This is a review of research literature to analyze the evidence regarding tongue-tie to determine if appropriate intervention such as frenotomy can reduce its impact on breastfeeding cessation.	Eighty articles were retrieved, of which 25 were relevant to this review. Of these, 19 were research articles, including a randomized controlled trial, two prospective uncontrolled cohort studies, a randomized prospective study, two telephone surveys, a prospective controlled study, a case controlled study, seven case series, two audits of tongue-tie services and two surveys.	Literature review of both quantitative and qualitative research papers on tongue-tie and breastfeeding.	A study in the USA found that fifty infants from a total of 1041 infants (4.8%) in the well-baby nursery were identified as having tongue-tie. Of these, 36 mothers of infants with tongue-tie who planned to breastfeed were compared with a matched control group of 36 mothers of unaffected infants. The researchers found that 83% of infants with tongue-tie were breastfed for at least 2 months compared to 92% of the control infants without tongue-tie. In another study, 3490 infants were assessed, with 148 infants identified as being tongue-tied; a prevalence of 4.2%. Researchers found that tongue-tied infants were three times more likely to be bottle-fed at 1 week than control infants, but by 1 month control infants and tongue-tied infants were equally likely to be bottle-fed.	**Results** Research evidence demonstrates that tongue-tie does negatively affect breastfeeding for infants and mothers. Where tongue-tie has no effect, no treatment of tongue-tie is warranted, but where tongue-tie is affecting breastfeeding, the evidence indicates that frenotomy offers significant benefit, and is a simple, safe and effective procedure. **Conclusion** There is a lack of consensus regarding tongue-tie management, with some medical personnel not supporting the need for surgical intervention. It is important to raise awareness of the effectiveness and safety of frenotomy as a treatment for tongue-tie, especially when the procedure has been shown in large clinical trials to have positive breastfeeding outcomes in both mother and child.	Further research using blinded randomized controlled trials to compare frenotomy with no treatment for tongue-tie would, theoretically, provide the strongest evidence for frenotomy.	Level V. High quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Geddes, D., Kent, J. C., McClellan, H. L., Garbin, C. P., Chadwick, L. M., & Hartmann, P. E. (2010). Sucking characteristics of successfully breastfeeding infants with ankyloglossia: A case series. *Acta Paediatrica, 99*(2), 301-303. doi:10.1111/j.1651-2227.2009.01577.x	The purpose of this study was to understand the controversy surrounding ankyloglossia and that it most likely stems from the lack of knowledge of the effect the condition has on feeding, and in particular breastfeeding.	This study included five breastfed babies who were examined with sub-mental ultrasound scans, intra-oral vacuums, and a test-weigh method to measure intake all while breastfeeding.	Quantitative research study	Sub-mental ultrasound scans of the infant oral cavity were made during a breastfeed to image tongue motion. Intra-oral vacuums were measured simultaneously via a supply line filled with sterile water connected to a pressure transducer. The test-weigh method was used to measure milk intakes for the monitored feed and three mothers measured every feed for a twenty-four hour period.	**Results** Of the five infants that participated in this study; infants 1, 2, and 3 displayed no compression of the nipple. Infant 4 had strong minimum vacuum and displayed compression of the base of the nipple. Infant 5 had very weak maximum vacuum compression of the tip of the nipple. **Conclusion** Maternal pain, milk intake, or milk production were not affected by either vacuum or compression of the nipple. Furthermore, the force and volume of the milk ejected from the breast as well as the extent of restriction of the infant tongue may influence the vacuum level required by the infant to effectively remove milk. Thus, these results suggest that some mothers may have particular breast/nipple or milk ejection characteristics that contribute to successful breastfeeding of infants with ankyloglossia.	Further studies are required to compare both infant and maternal characteristics for infants with ankyloglossia that are able to breastfeed successfully and those that cannot.	Level III. Low quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Gray, J., Margaret. (2014). What impact does tongue-tie in the newborn have on breastfeeding success? *Australian Journal of Child & Family Health Nursing, 11*(1), 30-33. Retrieved from http://search.ebscohost.com.library.gcu.edu:2048/login.aspx?direct=true&db=ccm&AN=2012813422&site=ehost-live&scope=site	To provide clearer guidance regarding the impact of tongue-tie on breastfeeding and the benefits and disadvantages of treating tongue-tie in newborn babies.	Approximately twenty-six articles were obtained and considerations included attitudes toward the procedure both from a physician and parent's point of view as well as clinical studies on LATCH and HATLFF scores.	Systemic review of both qualitative and quantitative research.	In one study, mothers were blinded as to whether the tongue-tie had been released or not as were the observers who used a score sheet using a modified LATCH and Breastfeeding Assessment Tool in an attempt for the researchers to remain objective. In another study, data was collected over a 10-month period by doing in-depth interviews with 10 women. The babies were aged between three days and three weeks and only one mother had a Cesarean section but they all knew their babies had something wrong but did not know what it was. Lastly another study which enrolled 49 tongue tied babies and 98 control babies to determine if tongue-ties decreased rates of breastfeeding at one week and one month via telephone follow-up survey. Breast-feeding Assessment Tool (IBFAT)	**Results** Tongue-tie does not always cause breastfeeding problems, but when it does it results in sore nipples, poor attachment, and short frequent feeds. Frenulotomy offers a quick and safe solution and, in 80-90% of cases there is marked improvements in breastfeeding. **Conclusion** Neonates need to be examined, and prompt referral pathways developed for them, if they have tongue-tie and breastfeeding difficulties that cannot be assisted by skilled lactation advice.	More trials are needed to gain a consensus between and among the various professions who deal with the newborns who are found to have these difficulties. It is also suggested that more education on this topic is needed, so that more professionals can confidently detect, inform and refer mothers on the basis of current evidence available.	Level V. High quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Greenwood, G. (2013). The benefits to breastfeeding and success rates of a frenulotomy in newborns with ankyloglossia. *British Journal of Midwifery, 21*(6), 439-442. Retrieved from http://search.ebscohost.com.library.gcu.edu:2048/login.aspx?direct=true&db=ccm&AN=2012148044&site=ehost-live&scope=site	To explain the process of discovering a newborn's tongue tie and the education process that the nurse and mother subsequently will experience.	This particular article is a reflection of a nurse-midwife student on diagnosing an infant with anyloglossia and the effects it had on the infant and successful breastfeeding.	Journal reflection.	This author critically evaluated the literature surrounding the benefits of a frenulotomy when ankyloglossia is present in the newborn, with the aim to improve breastfeeding outcomes.	**Results** The student nurse-midwife was able to take time and reflect mentally on a situation she did not know much about initially and turn it into a great learning experience. She educated herself on the topic she knew very little about by conducting evidence based research and was able to turn around and teach this information to her patient. **Conclusion** After presenting this information the mother decided that a frenulectomy would be helpful for her baby and the nurse sought consultation to a certified professional to perform the procedure.	As a student it is important to learn through experience and be aware of when to ask a midwife mentor for support to ensure safe practice. It is hoped that this will inform other students and encourage continued reflection on practice.	Level VII. Good quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Henry, L., & Hayman, R. (2014). Ankyloglossia its impact on breastfeeding. *Nursing for Women's Health, 18*(2), 122-129. doi:10.1111/1751-486X.12108	To assess for ankyloglossia that can cause a newborn to ineffectively suckle at the breast. When nurses, lactation consultants and other providers recognize this situation, they can refer women for further care and treatment, which can ultimately lead to breastfeeding success.	One mother is interviewed on her personal experiences she faced while breastfeeding her two sons and the significant differences she noted with breastfeeding due to ankyloglossia.	Qualitative narrative analysis.	This article contrasts two very different experiences of one mother breastfeeding her two sons to demonstrate the potential impact of ankyloglossia on breastfeeding.	**Results** Surgical intervention was delayed and the infant was put to the breast for two months. Complications kept resurfacing and the infant had trouble gaining weight. This patients second baby was diagnosed with tongue-tie and had a frenotomy within 24 hours of birth. This mother was able to successfully breastfeed her second child with no further issues. **Conclusion** Ankyloglossia can present significant challenges to breastfeeding, but when recognized early and when referrals are made to appropriate clinicians, such as lactation consultants, pediatricians and oral surgeons, it can be treated and successful breastfeeding can occur.	It is recommended to provide the mother with resources to assist in successful breastfeeding so the mother is able to make an informed decision on what type of treatment given to her infant.	Level V. Good quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Hogan, M., Westcott, C., & Griffiths, M. (2005). Randomized, controlled trial of division of tongue-tie in infants with feeding problems [corrected] [published erratum appears in J PAEDIATR CHILD HEALTH 2006 dec;42(12):829]. *Journal of Paediatrics & Child Health, 41*(5-6), 246-250. Retrieved from http://search.ebscohost.com.library.gcu.edu:2048/login.aspx?direct=true&db=ccm&AN=2009075992&site=ehost-live&scope=site	To determine whether, in infants with a tongue-tie and a feeding problem, the current medical treatment (referral to a lactation consultant) or immediate division works best and enables the infants to feed normally.	All babies born within March 1, 2002 and July 31, 2002 were assessed for tongue-tie at the Princess Anne Hospital. Once discovered by both visual and palpation, a group of 201 babies were found with tongue-tie. Of these, 88 experienced breastfeeding or bottle feeding problems. 57 chose to enroll in this study. 29 were put in the control group of receiving medical treatment (lactation consultation) for feeding, but one improved and the other 28 did not.	Randomized controlled trial.	After receiving 48 hours of medical treatment with no improvement these babies were given a frenulectomy and all fed normally except one. Of the 28 who had immediate deviation instead of medical treatment first, all improved but one had success with a nipple shield in addition. An overall study of those who received frenulectomy for the tongue-tie resulted in 95% (54/57) having an improvement in feeding.	**Results** The incidence of tongue-ties for this study was 10.7%. Of these, 44% had a problem breastfeeding or artificial feeding. 57 babies had division and it significantly improved feeding for mother and baby. **Conclusion** This trial has clearly shown that tongue-ties can affect feeding and that division is safe, successful and improved feeding for mother and baby significantly better than the intensive skilled support of a lactation consultant.	Babies with symptomatic tongue-ties should have them divided by an accredited, suitably trained, suitably qualified lactation consultant, who can diagnose and treat the tongue-tie and then provide ongoing support to the mother and the baby.	Level I. High quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Ingram, J., Johnson, D., Copeland, M., Churchill, C., & Taylor, H. (2015). The development of a new breast feeding assessment tool and the relationship with breast feeding self-efficacy. *Midwifery, 31*(1), 132-137. doi:10.1016/j.midw.2014.07.001	To develop a breast feeding assessment tool (BBAT) to facilitate improved targeting of optimum positioning and attachment advice and to describe the changes seen following the release of a tongue-tie.	Within this particular study, 218 breast feeds (160 mother–infant dyads); seven midwife assessors were involved.	Randomized controlled study.	During the trial, infants who were under two weeks old and experiencing breast feeding difficulties thought to be due to tongue-tie were referred to the research team midwives. Breast feeding was assessed using the LATCH and IBFAT tools at baseline, five days later and when the infants were eight weeks old. Mothers also completed the self-efficacy BSES-SF at the three time points. The BBAT was developed and introduced part way through recruiting infants into the trial.	**Results** There was good internal reliability for the final 4-item BBAT and the midwives who used it showed a high correlation in the consistency of its use. Midwives were able to score a breastfeed consistently using the BBAT and helped give mothers advice about improving positioning and attachment to make feeding less painful. **Conclusion** The BBAT is a concise breast feeding assessment tool facilitating accurate, rapid breast feeding appraisal, and targeting breast feeding advice to mothers acquiring early breast feeding skills or for those experiencing problems with an older infant. Accurate assessment is essential to ensure enhanced breast feeding efficiency and increased maternal self-confidence.	The BBAT could be used both clinically and in research to target advice to improve breast feeding efficacy. Further research is needed to establish its wider usefulness.	Level I. High quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Jackson, R. (2012). Improving breastfeeding outcomes: The impact of tongue-tie. *Community Practitioner, 85*(6), 42-44. Retrieved from http://search.ebscohost.com.library.gcu.edu:2048/login.aspx?direct=true&db=ccm&AN=2011666062&site=ehost-live&scope=site	To review and critique the controversy over whether a tongue tie is problematic to breastfeeding and whether release improves breastfeeding.	Approximately four randomized controlled trials were critiqued within this particular article.	Literature review on the key ideas of successful breastfeeding and how ankyloglossia can affect both the mother and baby. The author also evaluated and critiqued several research studies on the opinions of frenulotomy and the impact it has on breast feeding success.	In one study by Hogan et al., they found 10.7% of babies born during their research appeared to be tongue-tied but only 44% of those experienced feeding problems. Consenting participants were randomized to either 48 hours of care from a lactation consultant (LC), or immediate release of the tongue tie. Only 1/29 in the LC group's breastfeeding improved, but 96% (27/28) of the release group improved. In another study by Berry et al., they conducted a double-blinded RCT and placed mothers randomly into the release arm or non-release arm group. The infants were taken out of the room for their allocated intervention then given back to their mothers to breastfeed without the mothers looking into their mouths. 78% in release group were correct and 47% in non-release group were correct.	**Results** Overall, the results from all four studies within this article state that babies who have a frenotomy procedure have better success with breastfeeding versus those who do not have the intervention done. **Conclusion** Post-frenulotomy mom and babies showed a higher success rate with breastfeeding, milk production increase, less nipple pain, and even a placebo-type effect of positivity within the mother's experience of breast feeding. Consequentially, more babies born with this anomaly are benefiting from their mothers' breast milk	It is recommended to educate the mothers on what is to be done prior to having the frenulotomy procedure done on their infants such as hand expressing breast milk after a feeding to supplement the infant. The extra stimulation will also help compensate for the sub-optimal sucking action of the tongued-tied baby, until the release procedure allows normal tongue movement. The mothers supply will naturally increase to meet the baby's needs. Support appointments are advisable while awaiting the appointment with the surgeon.	Level V. High quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Kumar, M., & Kalke, E. (2012). Tongue-tie, breastfeeding difficulties and the role of frenotomy. *Acta Paediatrica, 101*(7), 687-689. doi:10.1111/j.1651-2227.2012.02661.x	The purpose of this article was an attempt answer two important clinical queries in the area of debate over the role of ankyloglossia (tongue-tie) in infants with breastfeeding difficulties. The two questions are: (i) whether ankyloglossia is associated with breastfeeding difficulties and (ii) whether frenotomy helps mother–baby dyad in such setting?	The authors evaluated evidence that has been presented over the last 10-15 years on infants with ankyloglossia and breastfeeding difficulties.	Literature review on recent evidence	Cohort and randomized control trials were referenced in this article. The article by Hogan et al mentioned earlier in this review was referenced. The authors emphasized the strong associations between the occurrence of ankyloglossia and breastfeeding difficulties presented in reviewed studies. It was mentioned in an article by Ballard et al that there was a fourfold higher incidence of ankyloglossia in infants with breast feeding difficulties in comparison to those who did not have ankyloglossia experiencing breast feeding difficulties (12.8% vs. 3.2%). To answer their second question, several RCT's were referenced that showed a strong association in breastfeeding success after frenulotomy procedure in tongue-tie infants.	**Results** No significant side effects were noted in any of the studies. Frenotomy procedure showed significant improvements of symptoms in mother-infant dyads with very high maternal satisfaction rates. **Conclusion** Neonates with tongue-tie are at increased risk for breastfeeding difficulties. An early recognition of this association by primary care provider and prompt referral to a lactation consultant is important. In cases with clearly documented breastfeeding difficulties, frenotomy often results in rapid improvement in symptoms.	It is recommended that in the presence of ankyloglossia with breastfeeding difficulties in an infant should constitute a valid indication for referral for frenotomy. An early referral for frenotomy in such an infant would be important to prevent prolongation of unnecessary misery for the mother–infant dyad.	Level V. Good quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Miranda, B. H., & Milroy, C. J. (2010). A quick snip: A study of the impact of outpatient tongue tie release on neonatal growth and breastfeeding. *Journal of Plastic, Reconstructive & Aesthetic Surgery*, *63*, 683-685. http://dx.doi.org/doi:10.1016/j.bjps.2010.04.003	To assess the impact of outpatient department (OPD) frenulotomy on neonatal growth and breastfeeding, focusing on objectively quantifying the effects on neonatal weight, by percentile at 2 weeks post-procedure.	Frenulotomy was performed in 62 neonates, without any complications, and 51 families were fully traced. Eleven families returned later than 2 weeks, or were lost to followup. OPD assessment, within 2 weeks of referral, occurred in 100% (51/51) of cases	Prospective study.	Data were collected prospectively, over an 8-month period, on the day of frenulotomy and at 2 weeks post-procedure at OPD appointment. Referral, assessment and surgery dates were recorded (including complications), as well as the following; age, weight, number of breastfeeding and supplementary bottle feeding sessions/24 h, nipple pain score (out of 10), nipple cracking, nipple bleeding and latch success. Age and weight were plotted onto sex specific growth charts to calculate percentile changes.	**Results** Weight gain occurred in 100% (51/51) of neonates at 2 weeks post-frenulotomy, of which 90% (46/51) gained in centile, 6% (3/51) remained at the same centile and 4% (2/51) dropped 7.5 centiles. Sixty-three percent of mothers reported breastfeeding session improvements. Nipple pain, cracking, and bleeding also improved in 100% of cases post-frenulotomy. Nipple pain score improved by 83%. Latch difficulty was reported by 55% and improved in 89% of cases. **Conclusion** Ankyloglossia may interfere with neonatal breastfeeding and a frenotomy is quick, safe, and effective.	It is recommended that an integration into routine neonatal checks, with prompt referral for OPD frenulotomy when initial management has failed.	Level II. High quality

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
O'Callahan, C., Macary, S., & Clemente, S. (2013). The effects of office-based frenotomy for anterior and posterior ankyloglossia on breastfeeding. *International Journal of Pediatric Otorhinolaryngology*, *77*, 827-832. http://dx.doi.org/http://dx.doi.org/10.1016/j.ijporl.2013.02.022	To assess the effect of office-based frenotomy on reversing breastfeeding difficulties among infants with problematic ankyloglossia, and to examine characteristics associated with anterior and posterior ankyloglossia.	There were 311 infants evaluated for ankyloglossia and 299 (95%) underwent a frenotomy. Most infants were classified as having Type III (36%) or IV (49%) ankyloglossia compared to only 16% with anterior (Type I and Type II combined).	Systemic Review with Meta-analysis	The mothers of the infants involved in the study completed a post-intervention web-based survey about breastfeeding difficulties they experienced before and after the frenotomy.	**Results** Sixty-four percent of the 118 respondents who reported nipple pain while breastfeeding prior to the intervention reported no nipple pain one week post-intervention and exclusive breastfeeding was reported by nearly all respondents (92%) post-intervention. **Conclusion** Breastfeeding difficulties associated with ankyloglossia in infants, particularly posterior, can be improved with a simple office-based procedure in most cases. The diagnosis and treatment of ankyloglossia should be a basic competency for all primary care providers and pediatric otorhinolaryngologists.	Because the rates of breastfeeding are increasing it is important that the diagnosis of ankyloglossia in infants should be a basic competency for all primary care providers. Treatment of anterior ankyloglossia is already becoming widespread, and access to regional otolaryngology, oral surgery, and dental providers with the experience and the special skills to perform posterior frenotomies will be essential.	Level III Good quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
O'Shea, M. (2002). Neonatal issues. Licking the problem of tongue-tie. *British Journal of Midwifery, 10*(2), 90-92. Retrieved from http://search.ebscohost.com.library.gcu.edu:2048/login.aspx?direct=true&db=ccm&AN=2002160170&site=ehost-live&scope=site	To review the problems associated between the tongue-tie and breastfeeding as well as the lack of clinicians willing to perform the frenotomy procedure.	The sample was the observance in treatment of three cases. Two of the cases were not being currently breastfed and therefore could not have been concluded within the pertinence of breastfeeding success. The mothers had given up breastfeeding after difficulties but still chose to pursue frenulotomy. The third baby was bottle fed but was noted that it fed very slowly and met criteria per the physician performing frenulotomy.	Qualitative narrative analysis	All three infants within this sample did have a frenotomy procedure done and all three did feed better afterwards. It was not noted if the two mothers who were bottle feeding their infants tried to then switch back to breast or not.	**Results** All three infants assessed had a frenotomy procedure done with very great success with feedings after the procedure. **Conclusion** The author concludes that not all tongue-tied infants need to be 'snipped' as the degree of ankyloglossia varies greatly. However, if a tongue-tie is causing a feeding problem the infant should be referred as soon as possible for assessment and treatment.	With a small number of observations, this study does not represent strong enough data for or against frenulotomy. The average age of infants observed was 3 months and did not support the question of whether early intervention of frenulotomy was successful in breastfeeding challenges. It would be recommended that the sample size would be much larger along with recruiting mother/infant dyads who are within 2 weeks of age so early intervention can take place.	Level VII. Low quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Ricke, L. A., Baker, N. J., Madlon-Kay, D. J., & DeFore, T. A. (2005,). Newborn tongue-tie: Prevalence and effect on breast-feeding. *Journal of American Board of Family Practice*, *18*(1), 1-7. http://dx.doi.org/doi:10.3122/jabfm.18.1.1	The purposes of this study were to (1) determine whether breast-fed infants with tongue-tie have decreased rates of breast-feeding at 1 week and 1 month of age, (2) to determine the prevalence of tongue-tie, and (3) to test the usefulness of the Assessment Tool for Lingual Frenulum Function (ATLFF) in assessing the severity of tongue-tie in breastfeeding newborns.	3,490 infants were screened and of those 49 cases and 98 controls remained.	A case-control design was used with 2 controls individually matched to each case.	Tongue-tied babies were examined using the ATLFF. Of the 49 cases and 98 controls that remained, 4 infants had a frenotomy procedure completed. A one week phone survery was completed by 38 cases and 71 controls. And a one month survey was completed by 33 cases and 65 controls.	**Results** Tongue tied babies were three times more likely to be bottle fed at only one week. By one month, tongue-tied babies were as likely as controls to be bottle fed only. Twelve of the tongue-tied infants had ATLFF scores of "Perfect," none had scores of "Acceptable," and 6 had scores of "Function Impaired." The remaining 31 infants had scores that fell into none of these categories. **Conclusion** If a frenotomy is to be done it should be performed before 1 week of age, when significant numbers of tongue-tied infants will have already stopped breastfeeding.	There clearly is a need for a tool that clinicians can use to identify those tongue-tied infants who are likely to have breast-feeding problems. However, based on these study findings, the ATLFF is not adequate for this purpose. There are many subjective components to this objective measure, which can lead to the differing study results.	Level III. Good quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Ridgers, I., McCombe, K., & McCombe, A. (2009). A tongue-tie clinic and service. *British Journal of Midwifery*, *17*(4), 230-233. Retrieved from http://content.ebscohost.com.ezproxy.bethel.edu/ContentServer.asp?T=P&P=AN&K=2010265194&S=R&D=rzh&EbscoContent=dGJyMNLr40Seqa44yOvsOLCmr02ep69Ssq64TK6WxWXS&ContentCustomer=dGJyMPGut1G0p7FLuePfgeyx44Dt6fIA	To understand there is substantial evidence that the presence of a tongue tie can interfere with, and adversely affect, breastfeeding. Division of a tongue-tie in this situation produces significant improvements.	Two hundred and twenty tongue ties were divided, from a cohort of 7982 live births, over a 16 month period.	Randomized controlled trial.	Any infant identified in the community with a tongue tie, and any infant with feeding difficulties, will usually be referred to the clinic. The counsellor will observe the mother feeding the infant and offer appropriate remedial advice and assistance. If this is unsuccessful and a tongue-tie is identified as the cause of the problem the child is referred for rapid surgical assessment. Following the procedure the mothers are contacted again either by the breastfeeding counsellor or an administrative assistant at the clinic or by phone if they have not returned in the four weeks since division, and invited to take part in a structured interview to assess any changes in feeding, whether breast or bottle-fed.	**Results** Feeding problems were fully resolved in 168 (67%), improved in 47 (21%) and unchanged in only 5 (2%) cases. **Conclusion** All the parents involved in this study report significant satisfaction with the service in terms of results, absence of complications, and ease of access. It is felt that this represents a very simple and effective procedure for this relatively common indication.	It is important to understand that the procedure is only performed after a period of support and advice from the breastfeeding counsellor, as recommended in the NICE guidelines. It remains appropriate that the counsellor and the surgeon, together, oversee the appropriate use of the service.	Level I. Good quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Sethi, N., Smith, D., Kortequee, S., Ward, V. M., & Clarke, S. (2013). Benefits of frenulotomy in infants with ankyloglossia. *International Journal of Pediatric Otorhinolaryngology*, *77*, 762-765. http://dx.doi.org/http://dx.doi.org/10.1016/j.ijporl.2013.02.005	This study aimed to evaluate indications and outcomes of frenulotomy performed in infants with ankyloglossia for breastfeeding difficulties.	85 patients were prospectively identified as they underwent frenulotomy in Pinderfields Hospital ENT outpatient department between February 2008 and February 2011. 52 patients were successfully followed up with a telephone questionnaire about effects on breastfeeding and any complications.	Prospective randomized study.	All 85 infants underwent frenulotomy in the outpatient clinic. 52 patients were successfully followed up at least 5 months after the procedure by telephone to enquire about any effects on breastfeeding and any complications. The presence of tongue-tie was assessed by the senior authors according to the history of breastfeeding difficulties, any family history of tongue-tie and a full examination of the oral cavity. The ability to protrude the tongue was observed, along with the ability to suckle on a finger. The length and elasticity of the frenulum was assessed as was the shape of the tongue on elevation. If a problematic tongue-tie was deemed to be present it was divided.	**Results** All mothers had experienced problems breastfeeding prior to frenulotomy. Following frenulotomy 40/52 (77%) of mothers reported an improvement in breast-feeding within 2 weeks of the procedure. **Conclusion** This study supports the view that ankyloglossia is a common cause of breastfeeding difficulties. However the lack of universal improvement in breastfeeding following frenulotomy suggests that it is not the only cause of problems and supports the clinician approaching these situations holistically and exploring other causes.	Further prospective randomized studies would be useful to try and identify an easily applicable tool that would impact on advising patients and decision-making. It is essential that there is a rapid access pathway for these infants to be assessed and treated in outpatients.	Level II. High quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Steehler, M. W., Steehler, M. K., & Harley, E. H. (2012). A retrospective review of frenotomy in neonates and infants with feeding difficulties. *International Journal of Pediatric Otorhinolaryngology*, *76*, 1236-1240. http://dx.doi.org/http://dx.doi.org/10.1016/j.ijporl.2012.05.009	To measure maternal breast feeding benefit after infant frenotomy. To investigate if timing of neonatal/infant frenotomy affects outcome.	Medical records of neonates and infants suspected to have ankyloglossia between April 2006 and February 2011 were reviewed. A total of 367 neonatal and infant consultations were performed for feeding difficulties due to suspected ankyloglossia.	Cohort survey and retrospective review.	In this population, infant demographic data was compiled; including: age, sex, ethnicity, breastfeeding history (maternal and infant), family history of ankyloglossia, the degree of lingual frenulum restriction (based on ankyloglossia grading scale), and whether or not frenotomy was performed. Using previous hospitalization and clinic records, an IRB approved telephone survey of this patient cohort was performed. The survey consisted of up to 14 questions involving infant feeding ability, length of breast feeding, and whether or not an intervention was performed based on clinical findings and physical examination. The data was compiled and reviewed for analysis.	**Results** Neonatal and infant consultations (N = 367) were performed for feeding difficulties due to suspected ankyloglossia, 302 of these infants underwent frenotomy for ankyloglossia. A total of 91 mothers agreed to participate in a follow-up telephone survey regarding the intervention. Results showed that 80.4% of mothers strongly believed the procedure benefited their child's ability to breastfeed, and 82.9% of mothers were able to initiate/resume breastfeeding after the procedure was performed. **Conclusion** The belief that frenotomy significantly benefitted an infant's ability to feed significantly differed in patients that had the procedure performed in the first week of life (86%) as compared to infants that had the procedure performed after the first week of life (74%).	Further evaluation into the benefits and outcomes of frenotomy on this patient cohort may include determining its effects on speech and language development.	Level III. High quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Todd, D., A. (2014). Tongue-tie in the newborn: What, when, who and how? Exploring tongue-tie division. *Breastfeeding Review, 22*(2), 7-10. Retrieved from http://search.ebscohost.com.library.gcu.edu:2048/login.aspx?direct=true&db=ccm&AN=2012661742&site=ehost-live&scope=site	To describe what type of tongue-tie causes problems with breast feeding, what type should be divided, who should have a division of the frenulum and when, and how the division should be performed.	There were approximately ten systemic literature reviews done within this article.	Literature review to support the recommendations regarding this subject.	The classification of the tongue-tie (TT) does not determine whether a frenulotomy is needed, but rather the clinical symptoms that accompany it. When division of the frenulum was delayed longer than 7 days of age, ceasing of breastfeeding increased. Mothers who experienced breastfeeding challenges with a newborn who had ankyloglossia gave up breastfeeding at an average of their newborn being one week old.	**Results** The percentage of TTs divided in a hospital environment is around 5% of all births, and this figure has not substantially changed over the last 10-15 years. Tongue-ties should be divided in the first few days of life or as soon as they have been identified as a problem and should be divided with a simple snip with a sharp pair of blunt ended scissors to the base of the tongue, without anesthesia. **Conclusion** This review has shown that there is a wide range of TTs requiring TT division, ranging from the posterior to the type 1 or anterior TT. The appearance of the TT varies and is not indicative of how well a baby will feed. Skilled assessment and support is needed to review the function of the tongue and assist the mother and baby with feeding. All mothers and babies deserve to have a pain-free breastfeeding experience.	The recommendation of dividing tongue tied infants within the first few days of life will prevent the start of a cascade of feeding and maternal issues that are associated with TTs. This would include: poor weight gain, colicky babies, damaged painful nipples, mastitis and early weaning. Breastfeeding provides babies with the best start in life and is a key contributor to infant health and having a TT can be a deterrent to achieving a good breastfeeding relationship for mother and baby.	Level V. Good quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Todd, D., A., & Hogan, M., J. (2015). Tongue-tie in the newborn: Early diagnosis and division prevents poor breastfeeding outcomes. *Breastfeeding Review, 23*(1), 11-16. Retrieved from http://search.ebscohost.com.library.gcu.edu:2048/login.aspx?direct=true&db=ccm&AN=2012953250&site=ehost-live&scope=site	In 2011, the Centenary Hospital Neonatal Department guidelines were modified and recommended delaying the division of infant tongue-tie (TT) until after 7 days of life. This paper looks at the effect of these guidelines in practice by comparing patient characteristics and breastfeeding practices before and after the change.	This article used prospective data from mothers and babies who had TT division to compare breastfeeding practices in 2008 and 2011. Data included: gestational age (GA), birth-weight (BWt), gender, age at TT division, degrees of TT and maternal feeding pre/post TT division.	Prospective randomized study.	The data retrieved included records of gestational age (GA), birth weight (BWt), gender, age at time of TT division, degree of TT, maternal issues around feeding a baby with a TT and immediate post TT division complications. Each infant with a TT was assessed for the extent of the TT according to a modified Coryllos classification that was used in our previous study. The main modification to the classification included the addition of the submucosal Type 5 TT. TTs were divided according to the Neonatal Department guidelines and, regardless of the type of TT, all were divided to the base of the tongue, confirmed with a finger sweep of the wound to ensure complete division to the base of the tongue.	**Results** A majority (>90%) of mothers noted an immediate improvement in feeding and decreased nipple pain. No significant complications occurred. **Conclusion** The rate of TT division did not change after the implementation of new guidelines post 2011. However, there has been a significant increase in the age at TT division and the number of mothers unable to breastfeed, primarily due to nipple pain and poor attachment. If feeding is problematic, the TT should be divided as early as possible to reduce breastfeeding cessation and improve breastfeeding satisfaction.	It is imperative for the nurse to assess and implement the referral process for frenulectomy, especially if despite all breastfeeding teaching shows unsuccessful. Educating the mother on the effects of tongue-tie on breastfeeding can better help her understand how breastfeeding is being impaired as well as give her an insight on what she can do to better this experience for her.	Level II. Good quality.

Citation	Purpose	Sample	Design	Measurement	Results/ Conclusions	Recommendations	Level & Quality
Vines, G. (2006). Readers' forum. Tongue tied. *AIMS Journal, 18*(2),19. Retrieved from http://search.ebscohost.com.library.gcu.edu:2048/login.aspx?direct=true&db=ccm&AN=2009499668&site=ehost-live&scope=site	To explain a woman's clinical symptoms as well as the newborns tongue-tie, and the results of this woman's daughter having a frenulectomy.	This article included one sample of a mother's personal story regarding her infant daughter.	No clinical trial done but rather a descriptive personal story.	A referral was made from a lactation consultant to a pediatric team on whether to have a frenulectomy done on this infant who was 14 weeks old at the time.	This infant did end up having the frenulectomy done at 14 weeks of age and has continued to breastfeed at the time of this article in which she was then 20 months old.	It is important that education is done by all professionals including lactation consultants so that situations such as a tongue-tied infant are caught early on. The parents can then be educated and make a decision that is best for their child.	Level VII. Good quality.

Appendix B

Signs and Symptoms of Tongue-Tie

"Maternal presentation is commonly characterized by:	*"Infant signs and symptoms include:*
· nipple pain and damage · misshapen nipple following feed · low milk supply · plugged ducts · mastitis · frustration and dissatisfaction with breastfeeding · untimely weaning"	· poor latch and suck ·clicking sound while nursing (poor suction) · ineffective milk transfer · inadequate weight gain or weight loss · irritability or colic · fussiness and frequent arching away from the breast · fatigue within one to two minutes of beginning to nurse · difficulty establishing suction to maintain a deep grasp on the breast · gradual sliding off the breast · "chewing" of the nipple · inadequate weight gain or weight loss (especially with infants who appear to nurse well"

Henry, L., & Hayman, R. (2014). Ankyloglossia its impact breastfeeding. *Nursing for Women's Health, 18*(2), 122-129. doi:10.1111/1751-486X.12108