

Retrospective Cohort Study on Effect of Frenulotomy Techniques on Breastfeeding

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ABSTRACT

Objective: The primary objective of this study was to compare the outcomes between frenulotomy by bedside technique and surgery under general anesthesia to successful breastfeeding in ankyloglossia infants. The secondary objective was to compare the differences in the infants' body weight, length of hospital stay and overall maternal satisfaction.

Methods: A quantitative research of retrospective cohort study was conducted in Naresuan University Hospital, Thailand between July 2012 and June 2017. We enrolled all infants born and identified the infants diagnosed with ankyloglossia. The severity of ankyloglossia was assessed at birth. Age of infants at the time of frenulotomy was on the second day of life. The outcomes of two types of frenulotomy were compared.

Results: Ankyloglossia was diagnosed in 187 (6.3%) of 2,968 infants born. The main breastfeeding problems in both groups were maternal sore nipples, cracked nipples and poor latch on. The infants in the bedside technique group had more successful rate of exclusive breastfeeding at day 7 when compared with the surgical group (87.3% and 39% respectively, $p < 0.001$). More percent increment of infant's body weight at day 7 in the bedside technique group than the surgical group (60% and 20.8% respectively, $p < 0.001$). Overall maternal satisfaction in the bedside technique group was notably higher than that in the surgical group (96.4% and 59.7% respectively, $p < 0.001$). The length of hospital stay was less in the bedside group for 1.2 days. More weight gain was found in the bedside group.

Conclusion: Frenulotomy is the procedure that should be performed in indicated ankyloglossia infants. This study found that bedside technique frenulotomy had association to a more satisfactory outcome than surgery under general anesthesia to successful breastfeeding.

Keywords: Ankyloglossia; tongue-tie; frenulotomy; breastfeeding (Siriraj Med J 2020; 72: 407-414)

INTRODUCTION

Breastfeeding benefits include immunity, decreased risk of allergy, greater intellectual quotient than formula-fed infants especially in exclusive breastfeeding for over 6 months.^{1,2} Generally, mother and newborn are evaluated immediately during the postnatal period concerning breastfeeding position, latching technique, and sucking efficiency of the newborn. The correct latch-on technique displays peristaltic tongue movements. Infants with ankyloglossia or tongue-tie limit the range of motion of

the tongue due to the tight lingual frenulum.³ This causes severe discomfort to the mother having sore and cracked nipples and eventually fails to exclusively breastfeed.⁴⁻⁷

A frenulotomy is a surgical intervention usually done when the indications include latch-on problems, maternal sore nipples and substantial weight loss in infants.⁸⁻¹⁶ The benefits after frenulotomy such as better latching, maternal nipple pain reduction, and maintenance of breastfeeding practices have been reported.^{11,15,17,18} The conventional technique is the surgical frenulotomy

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done by the surgeons in the operating room under general anesthesia. An alternative way is the frenulotomy performed on the bedside by experienced neonatologists. This technique eliminates risks of general anesthesia and the infants are able to latch on immediately after the procedure.^{14,19}

The primary objective of this study was to compare the outcome of two frenulotomy procedures for successful breastfeeding in ankyloglossia infants. In addition, the secondary objective was to compare the differences in the infants' body weight, length of hospital stay and overall maternal satisfaction.

MATERIALS AND METHODS

A quantitative research of retrospective cohort study was conducted. Data were collected from all infants born in Naresuan University Hospital, Phitsanulok, Thailand, whom were diagnosed with ankyloglossia and undergone frenulotomy between July 2012 and June 2017. The medical records of all included infants were reviewed. This study was approved by the Institutional Review Board of Naresuan University (COA No.539/2016). The assessment for a severity of ankyloglossia was done by using a quantitative tool. The inclusion criteria were the infants with ankyloglossia and undergone frenulotomy. The exclusion criteria were the infants with ankyloglossia who had a conservative treatment, incomplete follow up, missing data records or ankyloglossic infants who were unable to breastfed since birth according to any infant or maternal reason. The contents of all enrolled medical records included the assessment of ankyloglossia by using a quantitative tool, called "Siriraj Tongue Tie score; STT

score"²⁰⁻²² (Fig 1), which scores both the appearance of tongue tie and the function of the tongue in attaching the maternal nipples. The indication for frenulotomy was the STT score of less than 8.^{20,21}

The included infants were divided into 2 groups of frenulotomy types according to attending physician's consideration. The first group comprised infants with ankyloglossia who underwent frenulotomy by a bedside technique done by one neonatologist. The technical procedures^{5,10,23,24} were as follows: First, the neonatologist applied a 2% Xylocaine Viscous topical anesthetic at the frenulum. The arterial clamps were used to stop the blood supply and hold the frenulum in place. Then, the frenulum was immediately snipped using the Metzenbaum scissors. Next, cotton buds were utilized to divide any attached residual frenulum at the base of tongue. Lastly, pressure was applied at the incision site using sterile-gauze in order to stop the bleeding.

The second group consisted of those who underwent frenulotomy by one surgeon.^{25,26} The infants with ankyloglossia were transported to the operating room. After administering the general anesthesia, the surgeon used the electrocautery to cut the frenulum to prevent bleeding. The infants had to stay in the recovery room before sending them back to their mothers.

Data records collected contains birth weight, sex, gestational age, LATCH score^{9,10,14,27-29} before frenulotomy, maternal nipple pain score (visual analog scale : VAS for nipple pain severity)^{28,30-32} before frenulotomy, overall maternal satisfaction after each frenulotomy procedure, complications after frenulotomy and the length of hospital stay.







Tongue	Frenulum	 mild ③	 moderate ②	 severe ①
Nipple	Function	 ③ protraction	 ② retraction	 ① inversion
	sensation	Tongue at areola ④	Tongue at nipple ②	No Latch on ①

Fig 1. Siriraj Tongue Tie score (STT score)^{20,21}

After hospital discharge, the information of follow up data records at 7 days and 6 months were reviewed and statistically analyzed as for the results of the increment of body weight in 7 days and exclusive breastfeeding success rate in 7 days and 6 months.

Statistical analysis

Data were analyzed using SPSS version 22 (IBM Corp., Armonk, NY). Continuous data were shown as mean+standard deviation (SD). Categorical data were shown as frequency and percentage. Independent T-test and Chi-square test were used to compare continuous and categorical data, respectively. The absolute differences between the two types of frenulotomy procedure with the p-values of <0.05 are considered to be statistically significant.

RESULTS

Of 2,968 infants born between July 2012 and June 2017, 187 infants were identified and diagnosed as having a significant ankyloglossia and met the inclusion criteria. Of these, 110 ankyloglossia infants were identified as to be in the first group of whom underwent bedside frenulotomy and 77 in the second group of whom underwent surgical frenulotomy under general anesthesia. [Table 1](#) provides the demographic details and information of each frenulotomy group. The main breastfeeding problems in the first group were maternal nipple sore (76 from 110, 69.1%), cracked nipple (47 from 110, 42.7%) and poor latch on (20 from 110, 18.2%). The LATCH score was less than 7 (78.2%, mean+SD 6.2+1.5). The average maternal nipple pain score was 1.2±0.7. In the second group, there were similar breastfeeding problems as in the first group. There were maternal nipple sore (58 from 77, 75.3%), cracked nipple (53 from 77, 68.8%) and poor latch on (17 from 77, 22.1%). The LATCH score was less than 7 (90.9%, mean+SD 5.9±1.3). The average maternal nipple pain score was 1.5±0.7.

Although the indication for frenulotomy was the STT score less than 8, there were 6 infants that undergone frenulotomy despite the STT score more than 8. The reasons were parental concern about feeding problems, speech articulation problems. Therefore, the doctor had to do the frenulotomy after their discussion.³³

Data shown in [Table 2](#) are follow-up records in each frenulotomy group. The infants in the first group had the mean body weight of 3,083.5±358.9 grams on day 7. Their increment of body weight was 60%, 39.6±14.4 grams. The mean percentage of body weight difference at birth and on day 7 was 1.4±0.5 grams. The success rate of exclusive breastfeeding on day 7 and 6 months

were 87.3% and 70.0%, respectively. On the contrary, the infants in the second group had the mean body weight of 3,028.2±361.3 grams on day 7. The increase of body weight was 20.8%, -24.6±13.7 grams. The mean percentage of body weight difference at birth and on day 7 was -0.7±0.5 grams. The success rate of exclusive breastfeeding on day 7 and 6 months were 39.0% and 1.3%, respectively.

Analysis between the two types of frenulotomy procedures showed that infants who had the bedside technique (the first group) of frenulotomy had a significantly higher success rate of exclusive breastfeeding on day 7 than those who had surgery under general anesthesia (the second group) (87.3% and 39.0%, respectively, $p < 0.001$). When using Risk ratio, the infants in the first group had greater chances of successful exclusive breastfeeding on day 7 when compared with the second group. (RR = 2.23; 95%CI: 1.68 to 2.99) as shown in [Table 3](#).

In addition, the types of frenulotomy procedures were associated with overall maternal satisfaction ($p < 0.001$). The satisfaction rate in the first group was 96.4% while the second group was 59.7%. When using Risk ratio, the first group had greater chances (1.62) of overall maternal satisfaction after frenulotomy (RR = 1.62; 95%CI: 1.34 to 1.94). The types of frenulotomy procedures were also associated with the increment of infant's body weight on day 7 ($p < 0.001$). Increase of infant's body weight on day 7 for the first and second groups was recorded at 60.0% and 20.8%, respectively. The Risk ratio result was 2.89 higher in the first group (RR = 2.89; 95%CI: 1.82 to 4.58) as shown in [Table 3](#).

The mean nipple pain scores for the groups undergoing bedside technique and surgical technique were 1.2±0.1 and 1.5±0.1, respectively. This was not statistically significant ($p = 0.012$). The mean difference was -0.3 (95%CI: -0.5 to -0.1).

The infants in the first group had a significant shorter length of hospital stay than the infants in the second group (4.4±0.2 vs 5.6±0.2, $p < 0.001$). The first group had lesser length of hospital stay than the second group with the mean difference of 1.2 days (95%CI: -1.8 to -0.7).

The infants in the first group had the average mean difference in infant's body weight of 39.6±14.4 grams while in the second group had the average mean difference of -24.6±13.7 grams. When compared, there was a statistical significance ($p = 0.002$) in the weight difference between the two groups. The results also found that infants in the first group had more weight gain (64.3 grams) when compared to the second group (95%CI: 23.5-105.1) as shown in [Table 4](#).

TABLE 1. Participant Demographics.

Characteristics	Bedside technique (n=110) (%)	Surgical technique (n=77) (%)	P-value
Sex			
Male	63 (57.3)	48 (62.3)	0.488
Gestational age (weeks)			
> 37	106 (96.4)	74 (96.1)	
Birth weight (grams)			
< 3,000	45 (40.9)	34 (44.2)	0.658
Mode of delivery			
Vaginal	47 (42.7)	34 (44.2)	0.464
Cesarean section	58 (52.7)	42 (54.5)	
Vacuum extraction	5 (4.6)	1 (1.3)	
STT score (Siriraj Tongue tie score)			
> 8	4 (3.6)	2 (2.6)	
Mean (\pm S.D.)	6.4 (0.9)	6.5 (0.8)	
Breast feeding problems (may be >1 problems)			
Cracked nipple	47 (42.7)	53 (68.8)	<0.001
Sore nipple	76 (69.1)	58 (75.3)	0.352
Inadequate milk flow	35 (31.8)	17 (22.1)	0.143
Short nipple	14 (12.7)	9 (11.7)	0.831
Poor latch on	20 (18.2)	17 (22.1)	0.510
Significant infant's weight loss	2 (1.8)	2 (2.6)	0.717
LATCH score			0.021
< 7	86 (78.2)	70 (90.9)	
>7	24 (21.8)	7 (9.1)	
Mean (\pm SD)	6.16 (1.5)	5.9 (1.3)	
Nipple pain score (VAS)			0.012
Mean (\pm SD)	1.2 (0.7)	1.5 (0.7)	

TABLE 2. Outcome after Frenulotomy.

Outcome	Bedside technique (n=110) (%)	Surgical technique (n=77) (%)	P-value
Body weight on day 7 (grams)			0.303
Mean (± SD)	3,083.5 (358.9)	3,028.2 (361.3)	
Body weight difference (grams)			<0.001
Increase	66 (60.0)	16 (20.8)	
Decrease	44 (40.0)	61 (79.2)	
Mean (± SD)	39.6 (14.4)	-24.6 (13.7)	
Percentage of body weight difference			0.003
Mean (± SD)	1.4 (0.5)	-0.7 (0.5)	
Exclusive breastfeeding on day 7			<0.001
Yes	96 (87.3)	30 (39.0)	
Exclusive breastfeeding on the 6th month			<0.001
Yes	77 (70.0)	1 (1.3)	

TABLE 3. Outcome Comparison between two types after frenulotomy.

Outcome	Bedside technique (n=110) (%)	Surgical technique (n=77) (%)	Risk ratio (RR) (95 % CI)	P-value
Successful rate of exclusive breastfeeding on day 7				
Success	96 (87.3)	30 (39.0)	2.23 (1.68-2.99)	<0.001
Not success	14 (2.7)	47 (61.0)		
Overall maternal satisfaction				
Satisfy	106 (96.4)	46 (59.7)	1.62 (1.34-1.94)	<0.001
Unsatisfied	4 (3.6)	31 (40.3)		
Increment of infant's body weight on day 7				
Increase	66 (60.0)	16 (20.8)	2.89 (1.82-4.58)	<0.001
Decrease	44 (40.0)	61 (79.2)		

TABLE 4. Comparison of nipple pain score, length of hospital stay and the difference of infant's body weight.

Procedure	N	Mean	S.D.	Mean Difference	95 %CI	P-value
Nipple pain score						0.012
Bedside technique	110	1.2	0.1			
Surgical technique	77	1.5	0.1	-0.3	-0.5 to -0.1	
Length of hospital stay (days)						<0.001
Bedside technique	110	4.4	0.2			
Surgical technique	77	5.6	0.2	-1.2	-1.8 to -0.7	
Difference of infant's body weight						0.002
Bedside technique	110	39.6	14.4			
Surgical technique	77	-24.6	13.7	64.3	23.5 to 105.1	

DISCUSSION

Ankyloglossia is the condition that leads to limitation of tongue movement by the attachment of lingual frenulum to floor of mouth. This can lead to maternal sore and cracked nipples, and eventually a failure of exclusive breastfeeding.^{1,6} Several studies have shown the association between ankyloglossia and unsuccessful breastfeeding. They found that predominant cause that brings the mothers to the hospitals is sore nipples but after the surgical release, the nipple pain score has considerably improved with a significant correlation of the average score point of the nipple pain before and after the surgery.^{5,9,13,34,35} However, the nipple sore that occurs in the first 3 weeks of breastfeeding causes 10-26% of the mothers to stop breastfeeding.³⁶ Schlomer et al. have reported that 64-84% of infants are diagnosed with ankyloglossia. In fact, difficult latch on can be found in 25% of infants with ankyloglossia compared with only 3% in normal infants. In their study, using an infant breastfeeding assessment tool, significant difference in scores between pre and post frenulectomy has been found among ankyloglossia infants.³⁷

The definition of ankyloglossia in our current study was based on Siriraj Tongue Tie Score (STT Score), which is a standard quantitative assessment tool for ankyloglossia evaluation in Thailand.^{20,21} The STT score is used to evaluate the appearance of frenulum, nipple function and sensation of tongue when infants was latching on. The benefit of this assessment tool is that physicians and nurses can

accurately detect ankyloglossia and provide indication for treatment.³⁸ Surgical frenulotomy performed in the operating room with general anesthesia is a conventional treatment for ankyloglossia. In contrast, the bedside technique, which is currently used, is advantageous on both the mother and the infants. This method is conveniently performed at bedside or outpatient department without anesthesia complications and infants can be breastfed immediately after the procedure.^{19,39,40} However, only few studies were conducted regarding the advantages of bedside technique and data on the comparison between the two types of procedures are insufficient.

Our study found that the incidence of ankyloglossia was 6.3%. The main breastfeeding problems are nipples sore, cracked nipple and poor latch on, which are similar to the previous studies.^{5,13,34} After we analyzed the data from two groups of frenulotomy procedures, we found that infants who underwent bedside technique had a significant success rate of exclusive breastfeeding at day 7 as compared with the surgical procedure with general anesthesia. The types of frenulotomy procedures are associated with the increment of infant's body weight on day 7, with the bedside technique outperforming the surgical technique. The overall maternal satisfaction rate after frenulotomy is higher and the length of hospital stay is significantly shorter in the bedside technique than in the surgical technique. The factors that affected different outcomes between the two techniques were the mode of anesthesia. In bedside technique, we used the

local anesthesia so the infants can immediately return to breast fed. While we were using the general anesthesia in surgical technique that need longer time to return to breastfeeding after surgery. The types of equipment we used for frenulotomy also affected different outcomes. The electrocauterization that we used in surgical technique can cause the complication such as wound swelling more than the scissor in bedside technique. Therefore, the infants had more length of hospital stay and the overall successful in breastfeeding was less in the surgical technique. In our study, we did not found the complication such as massive blood loss, wound infection or any damage to the tongue or salivary glands after each procedures. The limitation of this study is its retrospectivity where the randomization between groups could not be done and there is a lack of control group without undergoing frenulotomy.

The expected benefit of our research is to encourage the physicians charge with the care of breastfeeding mothers of infants with ankyloglossia on how to effectively select the appropriate frenulotomy procedures. However, the characteristics of ankyloglossia such as the thickness and the muscular type ankyloglossia, the surgical technique with electrocautery should be considered to minimize the risk of active bleeding.

CONCLUSION

Ankyloglossia is one of the major issues affecting breastfeeding of infants. The significant problems associated with ankyloglossia are maternal nipple sore, cracked nipples and poor infant latch on which may cause early cessation of breastfeeding. Frenulotomy is the procedure that should be performed in indicated ankyloglossia infants. This study found that bedside technique frenulotomy had association to a more satisfactory outcome to successful breastfeeding, more increment of infant's body weight, higher maternal satisfaction and also shorten duration of hospitalization than surgical technique. Further randomized, prospective, and long-term follow-up studies are also needed to determine whether the types of frenulotomy is appropriate to any infants.

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