FACULTY OF PAEDIATRICS
ROYAL COLLEGE OF PHYSICIANS OF IRELAND

The National Programme for Paediatrics and Neonatology
PAEDIATRICS

# The Assessment and Management of Ankyloglossia (Tongue Tie) in Newborns and Early Infancy

The Faculty of Paediatrics, Royal College of Physicians of Ireland,
The National Programme for Paediatrics and Neonatology

**A Consensus Statement** January 2025

# Contents

## Recommendations

1. Ankyloglossia, in the absence of breastfeeding difficulties or symptoms, does not need any intervention as it is estimated that the majority of infants with ankyloglossia will breastfeed successfully.
2. Posterior ankyloglossia is an anatomically incorrect term and must not be used as a reason to perform a surgical procedure on an infant.
3. Any breastfeeding dyad experiencing challenges must be assessed by an international board-certified lactation consultant (IBCLC) or healthcare professional with specialist lactation training to optimise breastfeeding techniques. Thorough assessment and lactation support keep frenotomy rates low.
4. Multidisciplinary team input and communication are vital to supporting breastfeeding infants with ankyloglossia and their families. Close monitoring is recommended during and after hospital discharge or in the community. Communication between paediatricians, lactation specialists, general practitioners, and public health nurses is essential.
5. A frenotomy can be helpful where ankyloglossia is contributing to breastfeeding difficulties, e.g. maternal pain and poor infant weight gain. This is called symptomatic ankyloglossia.
6. Frenotomy should be performed as a treatment for symptomatic ankyloglossia only and not as a prophylactic procedure. The frenotomy procedure is not without risks.
7. When frenotomy is deemed advisable, a local pathway should be in place for the infant to receive this service.
8. No evidence suggests laser frenotomy is bet er than cold steel frenotomy.
9. Frenotomy, if indicated, must only be performed by a trained healthcare professional experienced in infant care. As with all surgical procedures, informed consent should be obtained, alternative options should be outlined, and the risks and benefits of the procedure should be explained. The infant must be documented as having received intramuscular Vitamin K. Any family history of bleeding disorders should be reported, and haematological advice should be sought if present.
10. Post-operatively, there should be a follow-up to monitor complications such as haemorrhage and pain. Parents should have a post-operative plan outlining the next

steps in an emergency. Breastfeeding support should be provided pre- and post-operatively; if the infant still has feeding issues, the infant needs reassessment.

11. There is no evidence that post-operative stretching exercises should be recommended. Some healthcare professionals recommend other therapies, such as craniosacral therapy or myofascial release. These are not evidence-based and are costly for parents.
12. There is no evidence that frenotomy prevents speech delay or speech articulation issues; therefore, prophylactic frenotomy is not advised. If there are concerns about a child's speech, speech and language and hearing assessments are indicated.
13. Based on an extensive literature review, this working group recommends frenotomy when there are active breastfeeding issues at ributable to ankyloglossia.
14. There is no evidence that lip and buccal ties are a true pathological entity, so procedures to divide them should be discouraged.
15. Further research is required to collect accurate data in Ireland and to fund lactation support and publicly available clinics to ensure equity of access.

## Background

Ankyloglossia (commonly known as tongue-tie) in infants has recently attracted greater attention from parents and clinicians. The reason for this increased attention is that, in some cases, the condition interferes with the ability of the mother[1] and her infant to breastfeed successfully. The challenge faced by healthcare professionals is to distinguish when ankyloglossia is simply an incidental finding or when it might be interfering with breastfeeding. It is important to achieve the correct equipoise. On the one hand, over-treatment needs to be avoided, whereas on the other hand, frenotomy should be prescribed and made available for those infants who will benefit from the procedure. The clinical tools and expertise necessary for assessing ankyloglossia and quantifying its impact on breastfeeding have improved. It is timely that the Faculty of Paediatrics publish a document on diagnosing, assessing, and managing ankyloglossia. This document aims to guide doctors, lactation consultants, midwives, nurses, and allied health and social care professionals (AHSCPs) who encounter infants with ankyloglossia in their day-to-day practice.

[1] Acknowledging not all people who choose to breastfeed or chest feed their babies identify as mothers/women. RCPI supports all parents and breast/chest-feeding people

## Introduction

Ankyloglossia is a condition that limits tongue movement due to a restrictive lingual frenulum. Healthcare professionals need to be well informed about the indications for frenotomy in breastfed infants with ankyloglossia. The condition does not commonly affect the feeding of bottle-fed infants.

Detailed assessment and careful selection are important, as 50% of infants with ankyloglossia will not encounter any associated issues (1). There has been a worldwide increase in the diagnosis and treatment of ankyloglossia; however, there is much variability in international practice regarding healthcare professionals' assessments and management of infants with this condition (2-4). Information via the internet and social media has increased awareness of ankyloglossia and frenotomy, with some misinformation and inconsistency in the quality of articles and reports published (5).

This document is the consensus statement from a multidisciplinary working group established by the Faculty of Paediatrics, Royal College of Physicians of Ireland. Its purpose is to provide information and guidance for Irish healthcare professionals who receive referrals to assess and treat breastfed infants with ankyloglossia.

The document does not address lip and buccal ties because there is no evidence that these are pathological entities or that dividing them is beneficial. The term posterior tongue tie is an incorrect anatomical term, so it will not be used in this document (6).

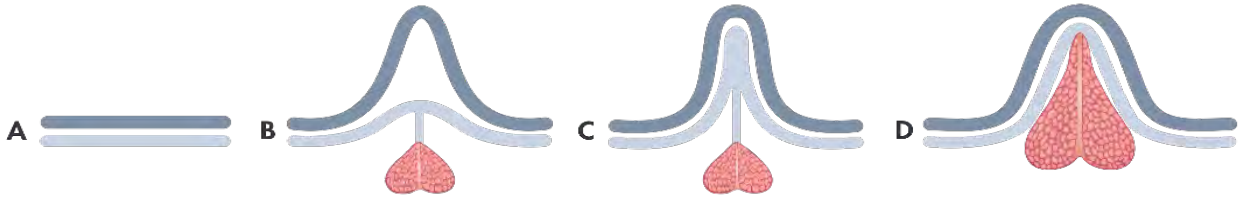
## The Normal Anatomy of the Tongue

During early gestation, the tongue starts to develop at 4/5 weeks from the 1$^{st}$ to 4$^{th}$ pharyngeal arches. The anterior two-thirds of the tongue is derived from the 1$^{st}$ pharyngeal arch, and the posterior third is derived from the 2$^{nd}$, 3$^{rd}$ and 4$^{th}$. A U-shaped sulcus develops in front of and on both sides of the oral part of the tongue. This allows the tongue to be free and mobile, except at the lingual frenulum, where it remains attached(7). If the lingual frenulum inserts more anteriorly on the tongue's ventral surface, it increases the likelihood of symptomatic ankyloglossia. A lingual frenulum is a normal finding, with a range of normal positions (8).

Anatomical studies have shown that the lingual frenulum is a dynamic, layered structure formed by oral mucosa and the underlying floor of mouth fascia, mobilised into a midline

fold with tongue elevation and/or retraction. The genioglossus muscle is suspended from the floor of the mouth and, in some individuals, can be drawn up into the fold of the frenulum. Branches of the lingual nerve are located superficially on the ventral surface of the tongue, immediately beneath the fascia, making them vulnerable to injury during frenotomy procedures. The lingual frenulum has a direct connection to the anterior tongue, with potential for impact on the movement of the anterior and mid tongue. The lingual frenulum is not directly connected to the posterior tongue and is embryologically of different origin (9, 10). Because of this, the term' posterior tongue tie' is anatomically incorrect nomenclature (6).


**The previous model of lingual frenulum – a submucosal band**




**From Mills et al. – a fascial layer with overlying mucosa**

## The Definition of Ankyloglossia (Tongue Tie)

Ankyloglossia is when the lingual frenulum is abnormally short, tight or thick. This may restrict movement of the tongue, particularly the mid tongue, and have a negative impact on breastfeeding. The diagnosis is not purely anatomical or appearance-based; there must also be a limitation of tongue movement. Anatomic variants of the lingual frenulum do not necessarily lead to breastfeeding difficulties for the mother or infant (11-13).

The term' symptomatic ankyloglossia' has been suggested for use when an abnormally short, tight or thick frenulum is present and is causing breastfeeding difficulty (6). This helps differentiate between infants with a normal variant and those requiring further evaluation

and treatment. This document will use the term' symptomatic ankyloglossia' when describing ankyloglossia, which causes difficulty in breastfeeding.

## The Frequency of Ankyloglossia

The prevalence of ankyloglossia and the use of frenotomy in Ireland is unknown. There is a well-documented increase internationally in ankyloglossia referrals, diagnosis and frenotomy procedures, with regional variations noted within countries. A systematic review of 15 eligible papers suggests the overall prevalence of ankyloglossia in infants aged <1 year is 8% internationally (14). Prevalence was 10% when using a standardised assessment tool compared with 7% when using visual examination alone. Ankyloglossia may be asymptomatic, but difficulties in feeding have been reported in 12-44% of infants (15). The systematic review did not examine how many infants with ankyloglossia had a frenotomy performed.

Rates of ankyloglossia vary by country, and there is a worldwide increase in the rate of diagnosis and frenotomy procedures performed. In Norway, the newborn clinical examination is recorded in the Norwegian Medical Birth Registry. 92% of Norwegian infants are breastfed at 6 weeks of age. 2.8% of infants were noted to have ankyloglossia at birth in 2019, and 2.2% of Norwegian infants (79% of those with ankyloglossia) underwent a frenotomy within 4 weeks of birth (16). Much higher rates of ankyloglossia are reported in Brazil. Early breastfeeding initiation in Brazil is 62.5% (17). A law passed in Brazil in 2014 made the 'Linguinha' (tongue tie) test compulsory for all infants at birth. The Martinelli Lingual Frenulum Protocol for Infants is used for this purpose (18). This has led to an incidence rate of 16.1% in the Palmas region of Brazil (19).

A Canadian population-based cohort study from 2004 to 2013 found that the incidence of ankyloglossia increased by 70% (from 5.0 to 8.4 per 1000 live births), and the rate of frenotomy also increased by 89% (from 2.8 to 5.3 per 1000 live births) (20). Between 2006 and 2016, the rate of frenotomy procedures in Australia increased by 420%, from 1.22 per 1000 population in 2006 to 6.35 per 1000 in 2016 (3).

A US study from 1997 to 2012 quotes an 866% increase in frenotomy rates. The national study quantified these trends using paediatric discharge databases, showing a nearly tenfold increase in ankyloglossia diagnoses and frenotomy procedures (2).

A study of 776 breastfeeding dyads found that 44% required breastfeeding support and 15% of infants reported ankyloglossia. Only 26% of those with documented ankyloglossia required frenotomy (4% of the total cohort). On multivariate analysis, 'no previous breastfeeding experience' was more likely to lead to breastfeeding difficulties than ankyloglossia (OR 4.4 vs 2.6) (21).

The increasing trends in referrals and procedures result from multiple clinical and cultural factors driving diagnosis, referrals, and intervention. These include increases in breastfeeding rates, increased awareness of ankyloglossia as a potential contributor to breastfeeding difficulties by healthcare professionals and the general public, and more active assessment for ankyloglossia among paediatricians and other healthcare professionals. Frenotomy is quoted as being significantly associated with male sex, white non-Hispanic ethnicity, higher parental income and education, and a greater number of siblings and family history.

Further work is needed to estimate more accurately the prevalence of ankyloglossia and the use of frenotomy within Irish health services.

| | Ankyloglossia rate | Frenotomy rate | Change |
|---|---|---|---|
| Norway (2019) | 2.8% | 2.2% | ↑ x 7 diagnosis<br>↑ x 13 frenotomy |
| Brazil (2020) | 16.1% | | |
| Canada (2016) | 8.4 per 1000 | 5.3 per 1000 | ↑ 70% diagnosis<br>↑ 89% frenotomy |
| Australia (2018) | | 6.35 per 1000 | ↑420% frenotomy |
| USA (2017) | | | ↑855% frenotomy |

# The Impact of Ankyloglossia on Breastfeeding

## History:

Feeding issues are common in breastfeeding dyads. Nipple pain and trauma, as well as breast engorgement, may be associated with ankyloglossia. Regular, effective milk removal in the first few weeks is essential for establishing milk supply, which could be negatively impacted by symptomatic ankyloglossia.

Difficulty maintaining a latch in an infant may result in failure to thrive. Inefficient feeding may lead to infants feeding very frequently, which can compound maternal pain. Symptoms often attributed to ankyloglossia are common in all infants. Therefore, an internationally board-certified lactation consultant (IBCLC) must undertake a full history, examination, and feeding assessment.

## Examination:

The mother should be examined for nipple trauma and appropriately treated. The infant should have a full clinical examination by a suitably qualified healthcare professional. Plagiocephaly, torticollis, micrognathia, facial nerve palsy, and facial capillary haemangiomas are some of the findings that may contribute to feeding issues. On examination of the oral cavity, anatomical findings such as cleft palate should be ruled out. Restriction of tongue extension, elevation, or lateral movement restriction should be documented. The tongue may have a heart shape. The infant can demonstrate this passively or when crying. The examiner should then assess movement with a gloved finger. Tools such as a grooved retractor may be helpful. The quality of the infant's suck should be examined. The finger of the examiner should not easily slip from the mouth, the tongue should cup around the finger, a sensation of biting from the lower gum should not be felt, and an assessment of the size of the oral cavity can be performed. Preterm and low birth weight infants may have a small mouth and low muscle tone.

## Feeding Assessment:

An IBCLC should perform a complete feeding assessment before frenotomy(22)**.** The **l**atch is the most important aspect of breastfeeding. An IBCLC will assess how well the infant latches, the presence of an audible swallow, and maternal/infant comfort and can suggest positional adjustments. The infant's weight gain and behaviour are also assessed. During

feeding, the infant's tongue should be observed extending downward and forward and forming a groove around the lower areola when they feed, securely latched on with no slipping or poor seal.

The laid-back position has been proven to decrease the incidence of nipple pain and trauma compared with traditional breastfeeding positions. It is conducive to achieving the correct latch and should always be taught (23).

## Ankyloglossia Assessment Tools

There are many tools to aid the practitioner when assessing tongue function and classifying ankyloglossia. The **Hazelbaker Assessment Tool for Lingual Frenulum Function (ATLFF)** assesses tongue function and appearance. It is scored on seven functions: elevation, extension, lateralisation, cupping, peristalsis, snap back and spread of the front part of the tongue. It can be challenging and requires training to be accredited to use the tool, which some view as a disadvantage. However, a full feed must be observed, which can be useful as a feeding assessment (24). Other tools developed to classify ankyloglossia are considered shorter versions of the ATLFF tool. These include the Bristol Tongue Assessment Tool (BTAT) and the Tongue Tie and Breastfed Infants Assessment Tool (TABBY) (25, 26). Both consist of four functions for assessment: extension, elevation, tip appearance, and attachment of the frenulum to the gum.

The **Kotlow grading system** measures the length of the free tongue from the tip to where the frenulum is attached (27, 28).

The **Coryllos system c**lassifies four types of restricted frenulum based on the point of attachment to the tongue, e.g., type 1 is attached to the tip of the tongue. This tool is very widely used. However, some people have reservations about using it, as it relies only on describing the anatomy and appearance and does not assess tongue movement (29, 30)**.**

Ideally, ankyloglossia that needs intervention should be classified according to feeding history, function, and appearance. A "superior" tool should consider the tongue's anatomical and functional abilities (31). **The Martinelli Lingual Frenulum Protocol** for infants combines features of history, clinical examination, and description of the lingual frenulum (18).

No 'gold standard' exists for assessment, and the diagnosis of symptomatic ankyloglossia varies depending on the tool used. The Agency for Healthcare Research and Quality reported that a standardised approach is needed to identify and classify ankyloglossia and accurately describe its natural history by severity, including the long-term risk of feeding problems(32).

The authors of the Academy of Breastfeeding Medicine Position Statement on Ankyloglossia in Breastfeeding Dyads state that no specific tool should be used in the clinical setting to decide whether a frenotomy is indicated. Such a decision can only be made after a skilled clinical breastfeeding assessment (33).

## Speech and Language Therapy & Clinical Feeding Assessment

If an infant is suspected of having a feeding difficulty, a comprehensive feeding evaluation is essential to identify underlying causes and help direct appropriate management. Infant feeding is a complex process involving both the infant and the mother; all components impacting feeding need to be considered. The Irish Association of Speech and Language Therapists (SLTs) outline what a trained SLT needs to consider when evaluating an infant with a suspected feeding difficulty.

Assessment, Diagnosis and Management of Feeding, Eating and Drinking Difficulties (FEDS) in Neonates and Infants should encompass:

- Conducting clinical assessment of the infant and family for FEDS disorders, including neuro-developmental assessments
- Conducting, interpreting and reporting on comprehensive instrumental evaluation of the infant for feeding and swallowing problems that delineate structures and dynamic functions of feeding, eating, drinking and swallowing
- Identifying normal and abnormal swallowing anatomy and physiology and identifying underlying dysfunction to assist in the diagnosis
- Provide support and intervention/treatment for the infant's FEDS disorders (evidence-based when available)
- Remediating the presenting difficulties by devising comprehensive care plans

- Identifying and trialling interventions to remediate or compensate for the presenting difficulties
- Collaborating with other team members in identifying the need for additional assessments and consultations
- Identifying suspected additional disorders in the upper aero-digestive tract and making appropriate onward referrals.

The IASLT also delineates the skills, knowledge, and postgraduate training SLTs must have to be competent to conduct feeding evaluations (34).

## The Effect of Ankyloglossia on Speech and Articulation

Several systematic reviews have assessed the link between ankyloglossia and speech/articulation difficulties (23, 35-37). Overall, they conclude that there is currently poor evidence linking the effect of ankyloglossia on speech and articulation. This is due in part to poor study methodologies, small numbers of participants, the dearth of standardised clinical protocols, and a lack of clarity in definition/classification in the assessment of ankyloglossia and speech disorders.

One review concluded that the literature does not provide any data on any significant association between speech difficulties and ankyloglossia in children. It stated that ankyloglossia division in early infancy cannot be recommended to prevent future articulation problems. More recently, it has been noted that there is still insufficient high-quality evidence available to draw any conclusions regarding whether there is a positive correlation between ankyloglossia and the incidence of speech articulation disorders.

Another review of children found similar outcomes and suggested that widely accepted standardised assessment tools and well-designed clinical studies are needed. Many individual studies on this topic are small in scale, often involve case studies, and do not consider other reasons for articulation/speech difficulties, focusing solely on ankyloglossia(36, 38, 39).

A recent scoping review indicated that ankyloglossia might be associated with speech difficulty. However, the precise contribution of the ankyloglossia is difficult to ascertain, and it was recommended that comprehensive evaluation by a speech and language therapist is

important before any surgical interventions are considered in the older child. This review confirms that the evidence does not indicate that early frenotomy benefits later speech outcomes. The clinical consensus is that in an infant with minimal restriction in tongue mobility, frenotomy to prevent a future speech disorder is unnecessary (40).

## The Differential Diagnosis of Poor Feeding & Inadequate Weight Gain

Symptoms attributed to ankyloglossia – poor feeding, unsettled, windy infant, and suboptimal weight gain can be the presenting features of many other conditions encountered in a young infant. Cases referred with presumed ankyloglossia may turn out to have another diagnosis. Infants should be reviewed and examined by a healthcare professional trained to do so if there are concerns about feeding. History-taking and clinical examination principles are important to avoid making a diagnostic error. An incorrect diagnosis will result in delayed treatment and the potential for an adverse outcome. The following are some examples of conditions that may impair feeding:

### Defects in the palate

Always ask about milk coming down the nose when feeding. This may indicate an issue such as a cleft palate. A sub-mucous cleft is more difficult to identify. This cleft is hidden under the soft palate mucosa due to the failure of the underlying muscle sling to form. The clue is the presence of a bifid uvula. Other signs are a bluish-grey discolouration on the midline of the soft palate and a bony notch at the back of the hard palate. The condition has associations with 22q.11 deletion (when a small part of chromosome 22 is missing) and Stickler's syndrome (a connective tissue disorder that can include ocular findings of myopia, cataract, and retinal detachment; hearing loss that is both conductive and sensorineural; midfacial underdevelopment and cleft palate).

### Congenital ranula and other intra-oral lesions

This is another intraoral condition characterised by a bluish-coloured cystic swelling on the floor of the mouth. It is a retention cyst of the sublingual or submandibular salivary gland. It can distort the tongue position if sufficiently large, leading to feeding difficulty and airway obstruction. Oral or facial capillary haemangioma may also cause feeding impairment.

### Asymmetry of the head and neck

Secondary to intrauterine position or torticollis, this may impair an infant's ability to latch. Referral to physiotherapy is helpful. Similarly, injury to the facial nerve may impair feeding.

### Neurological examination

The infant's tone should be assessed as part of the neurological examination. The infant's gestational age can affect this. Hyperbilirubinaemia may cause drowsiness in an infant.

### Congenital heart disease

This is always an important consideration. Ask about breathlessness or sweating during and after a feed. Examine for the presence of a murmur. Murmurs are more likely to be significant if grade 3 or higher in intensity, holosystolic, and present in diastole.

### Airway issues

Laryngomalacia and neonatal rhinitis are common, and their symptoms overlap with ankyloglossia, i.e. poor weight gain, fussiness at the breast, and noisy feeding. Less common airway anomalies, such as unilateral choanal atresia, should also be considered.

### Weight loss

When weight loss occurs in a young infant, it is important to determine whether it is due to insufficient milk intake or excess fluid loss. If in doubt, check the electrolytes. Renal tubular disorders, such as RTA (renal tubular acidosis) and Bartter's syndrome, present with polyuria and electrolyte imbalance.

### Urinary tract infection (UTI)

There needs to be a high index of suspicion of a UTI in infants under three months. UTI symptoms in this age group may be subtle; they include low-grade fever, poor feeding, and faltering growth. It is an important diagnosis, as these infants will require immediate hospitalisation and IV antibiotics.

### Windiness, fussiness, unsettled behaviour, poor sleep and crying

Parents commonly report these symptoms in young infants, regardless of the mode of feeding or the presence of a restricted lingual frenulum, and these symptoms will improve over time (41). There is no evidence that ankyloglossia is associated with these symptoms in a thriving infant.

## The Treatment Options for Symptomatic Ankyloglossia

All infants in Ireland have their mouths examined as part of their Newborn Clinical Examination (42). A review with an infant feeding specialist is advised if a restrictive lingual frenulum is noted on examination and the mother is breastfeeding. Conservative management with advice on infant latch and positioning is the mainstay of the initial treatment of symptomatic ankyloglossia. It has been shown that healthcare professionals providing skilled support to breastfeeding women can reduce the number of surgical procedures performed without affecting breastfeeding outcomes (43). Frenotomy intervention rates in the Canterbury District Health Board, New Zealand, reduced from 11.3% to 3.5% following a clinical education program, the involvement of a multidisciplinary team, and the standardisation of assessment (43).

If there are breastfeeding challenges, it is important to provide emotional support for the mother and her partner. This can be availed of from sources including the Public Health Nurse, General Practitioner, IBCLC/lactation specialist, mychild.ie and via voluntary peer support groups.

Surgical intervention for symptomatic ankyloglossia can reasonably be offered after other causes of breastfeeding problems have been evaluated and treated. Frenotomy may decrease maternal nipple pain. Although the evidence is not strong, addressing pain is important for successful continued breastfeeding (6).

As with any procedure, the first step is to ensure that the infant has been assessed appropriately and that the procedure is necessary. Next, the parent(s) needs to provide informed written consent. Most importantly, they need to be aware of bleeding (which might require admission, further procedures, or rarely blood transfusion), pain, feeding issues, infection, reattachment, and the chance that symptoms do not improve after the procedure. The parent(s) should also be informed that a watch-and-wait approach is reasonable, and they should be provided with red flag signs and contact details if they want a further assessment.

The first consideration is analgesia. Local anaesthetics can cause methaemoglobinaemia in infants (44). Topical anaesthetics might make it difficult for the infant to breastfeed post-procedure and put them at risk of aspiration. Breastfeeding is vital for settling the infant and

stopping bleeding (45-48). Therefore, 24% sucrose is a safer option that releases endorphins in the infant for approximately five minutes after administration (49). It should be administered two minutes before the procedure—a recent Cochrane review showed it could be beneficial for quick procedures (50).

The lingual frenulum is a fold in the mucosa and fascia of the mouth floor. Deep to this is the genioglossus muscle. Near the frenulum are branches of the lingual nerve, arteries, and veins. However, staying in the midline, having good retraction, and incising the minimum amount of tissue for optimal function make trauma to these structures less likely. Trauma of the lingual nerve branches may cause anaesthesia or paraesthesia of the tongue, which could exacerbate the already challenging breastfeeding process (9).

### Frenotomy

Frenotomy involves placing the frenulum under tension and dividing the thinnest point (while avoiding tongue muscle and the submandibular ducts) with cold steel (e.g., scissors or a scalpel). This method is the most commonly employed and has the most robust evidence base. It can be colloquially called "a snip," "a clip," "a release," "a division," or "a revision". Sterile scissors and tongue protectors are widely available. There is an increase in the use of lasers by healthcare professionals(27). There is insufficient evidence to support claims that one technique of frenotomy, such as laser, is superior to other techniques (49). A cold steel incision may cause less epithelial damage and less inflammation, so it heals quicker with a shorter duration of pain and quicker resumption of normal feeding (44, 51, 52).

### Frenuloplasty

This technique is more technically challenging and slower to perform. The surgeon creates mucosal flaps (Z-plasty) that increase the frenulum's length when sutured together, but this frequently requires general anaesthesia and is unsuitable for infants.

Some techniques purportedly have advantages over others, e.g., less bleeding with laser and better articulation outcomes with frenuloplasty. However, the current data does not support this—prospective head-to-head studies with standardised assessment tools and details such as operative time and pain scores (33, 49, 53).

Prolonged or repeated general anaesthetics should be avoided in children under three years of age due to the potential risk to the developing brain (54, 55). Poor cooperation can make

procedures challenging in toddlers and older children, so a general anaesthetic may be helpful. A brief general anaesthetic risk is mitigated if the child has been appropriately assessed and requires the procedure. Any procedure should be performed by a trained professional experienced in caring for infants and young children (6, 56). As with any surgical procedure, before performing a frenotomy, the performing provider should take a "time out" to:

a. Obtain a signed consent.
b. Discuss alternatives, risks, and benefits of the procedure
c. Discuss and provide pain control options
d. Document previous receipt of intramuscular vitamin K
e. Provide information on postsurgical care and follow-up.

## Side Effects of Surgical Treatment

The anatomical location of the lingual frenulum makes it vulnerable to various post-operative and intraoperative complications. When performed by an experienced healthcare professional (49), lingual frenotomy is generally safe and well-tolerated. However, complications have been reported, including haemorrhage, airway obstruction, injury to oral mucosa or salivary glands, oral aversion, inadequate release requiring revision, infection, and scar tissue formation.

The 2017 Cochrane review (which included five trials, 302 infants under 21 days) did not report any complications of excessive bleeding, infection, or damage to intra-oral structures (57). However, a recent randomised controlled trial reported that 1 in 50 infants experienced a post-operative adverse event (bleeding (*n* 1), accidental cut to the tongue (n=1) and salivary duct damage (*n* = 1) (58).

The annual incidence of frenotomy complications that required hospital admission in New Zealand was 13.9/100,000. The most frequently reported complications included poor feeding, apnoea, apparent life-threatening events or brief resolved unexplained episodes, other respiratory symptoms, pain, bleeding and weight loss. One infant had undergone four frenotomies and subsequently developed an oral aversion (59).

A recent prospective study of 56 laser frenotomies in infants described intraoperative bleeding in 17 infants. Only one child had minor bleeding postoperatively, and there were no infections. Unexpected complications included refusal of the pacifier in 39 cases (69.6%), and 15 infants (26.8%) were frequently awake following the procedure (60).

An online survey of 211 healthcare professionals (all members of the Academy of Breastfeeding Medicine) investigating their experience of complications following frenotomy revealed that 61% of the respondents had cared for a child with a complication or misdiagnosis. The most common misdiagnoses were neuromuscular dysfunction and inadequate breastfeeding support, while the most common complications were a repeat procedure (32%) and oral aversion (28%). The conclusion was that complications can occur after frenotomy (61).

Airway obstruction after frenotomy has been reported in infants with retrognathia, micrognathia, neuromuscular disorders, and hypotonia. A frenotomy can worsen glossoptosis and lead to airway obstruction and concomitant dysphagia. In addition, feeding difficulties in children with neuromuscular disorders and hypotonia may not be resolved by frenotomy(62).

Injury to oral mucosa or salivary glands, e.g. ulceration or swelling, can occur in infants. Submandibular swellings, mucoceles and ranulas have been reported following frenotomy (63, 64). Post-operative haemorrhage causing hypovolemic shock has been reported with the need for blood transfusions in 2 neonates and a 13-month-old child (65-67).

There have been reports of oral aversion following frenotomy, most likely secondary to the noxious stimulus of the procedure and post-procedure pain (63, 65, 68, 69). Informed consent should include an explanation of these risks. Frenotomy is not without risk and should only be performed after a multidisciplinary evaluation of feeding problems, following exclusion and remediation of other causative factors or underlying conditions. Expectations of parents must be realistic when agreeing to the procedure since frenotomy may not improve breastfeeding.

## Post-Frenotomy Care

The authors of the Academy of Breastfeeding Medicine's Position Statement on Ankyloglossia have advised that post-frenotomy care and assessment should include the following (33):

- Close clinical follow-up to determine the effectiveness of the procedure.
- Assessment by a suitably qualified healthcare professional to pursue an alternative diagnosis if the procedure does not alleviate the infant's symptoms.
- Identifying adverse events or complications, e.g. protracted bleeding, persistent pain, wound site infection and/or oral aversion.
- Documenting whether impairment or cessation of breastfeeding occurred post-procedure
- Ensuring further breastfeeding assistance, if necessary, is available.

The authors of the Academy of Breastfeeding Medicine protocol and the American Academy of Pediatrics Clinical Report also stated that there is no evidence to advise post-operative stretches at or near the frenotomy site (6, 33). Practices worldwide differ, and there is much controversy about whether these exercises should be recommended after frenotomy (70). There is also a dearth of qualitative research assessing parental experiences of post-operative wound stretches and exercises.

A 2022 retrospective study of 599 infants undergoing frenotomy, of whom 282 used post-frenotomy massage, found no statistically significant difference between the incidence of re-occurrence and breastfeeding improvement post-frenotomy in the massage group (MG) versus the non-massage group (NMG) showing that there was no benefit to instructing parents to perform wound massage post-procedure and that breastfeeding outcomes were similar in both groups (71). Before this study, three of the five paediatric surgery consultants in their unit advised post-frenotomy wound massage. These results informed changes to their post-frenotomy care instructions, with all consultants no longer recommending wound massage. Of those who responded in the MG, 56.5% (n=52) were non-compliant with the exercises, claiming anxiety, difficulty in performing massage, conflicting advice from other health care professionals and lack of information as reasons.

## Lactation Support

It is widely agreed that both pre-operative and post-operative lactation care are imperative in managing ankyloglossia. Lactation support with latch optimisation and position changes allows up to 50% of infants with ankyloglossia to avoid a frenotomy (72). Post-operative lactation support to optimise breastfeeding is essential to facilitate the repetitive use of muscles, allow the frenotomy wound to heal optimally, and support optimal tongue functioning and breastfeeding (33, 70).

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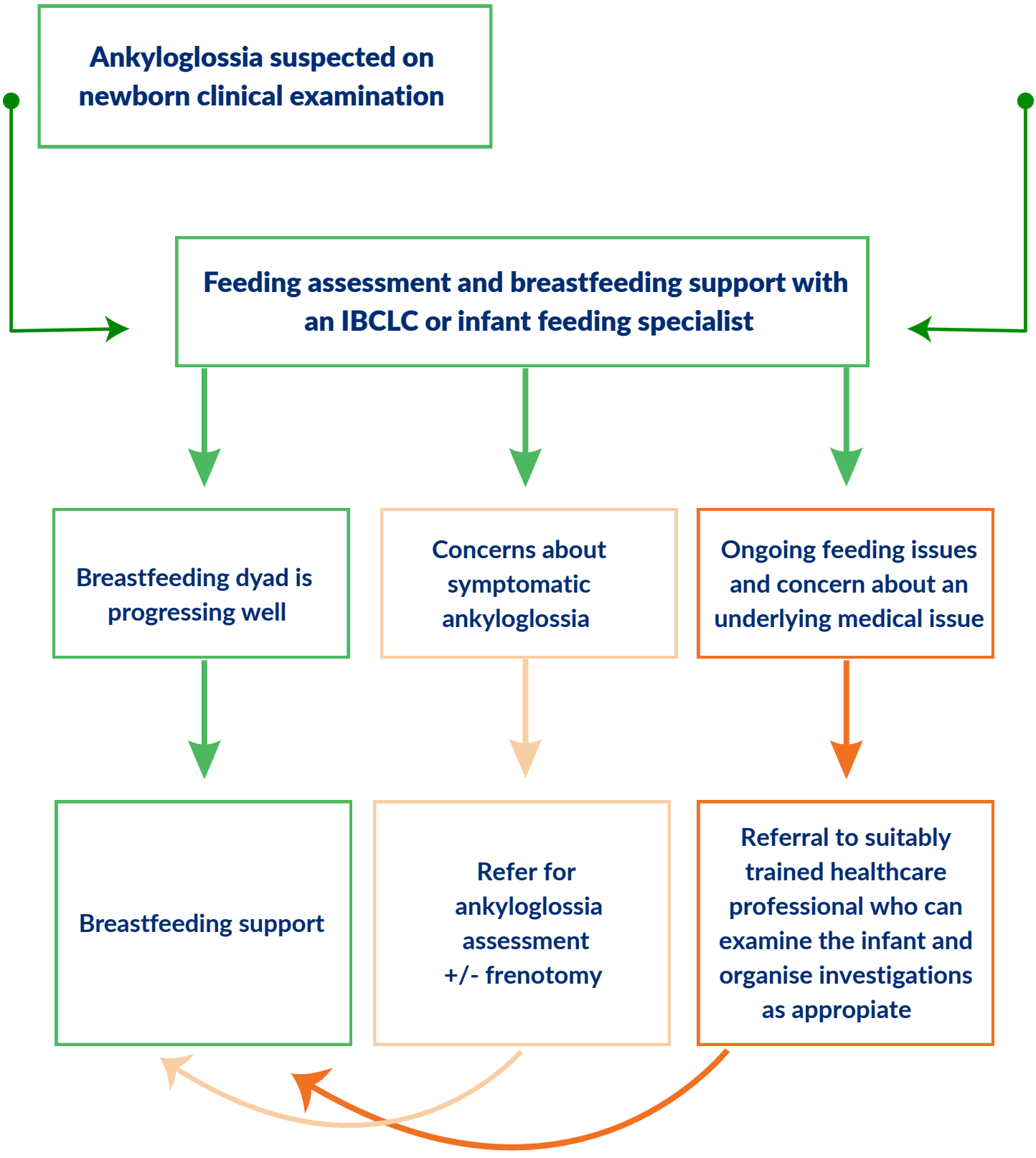
# Ankyloglossia Management Algorithm



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