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CASE REPORT

Management of Posterior Ankyloglossia using the Er,Cr:YSGG Laser

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ABSTRACT

Ankyloglossia or tongue-tie, refers to a minor anomaly in the attachment of the membrane or frenum that attaches the tongue to the floor of the mouth, which may interfere with normal function and mobility of the tongue. Ankyloglossia is a poorly recognized and inadequately defined condition and has been reported to cause breastfeeding difficulties, dental issues and speech problems. This article discusses assessment criterions to diagnose posterior ankylogossia and lays down treatment protocol in neonates using the Er,Cr:YSGG (Waterlase MD).

Keywords: Posterior ankyloglossia, Frenum, Tongue-tie, Frenectomy, Lasers, Er,Cr:YSGG laser.

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INTRODUCTION

The World Health Organization (WHO) recommends breastfeeding exclusively for the first 6 months of life with the introduction of complementary foods and continued breastfeeding up to 2 years of age or beyond. Genuine physiopathological reasons for not being able to breast-feed are very rare and almost all the women should be able to lactate, however, how effectively the mother and infant anatomically connect is a crucial factor to the success of this immensely interactive and co-dependant process. A significant number of mothers abandon breastfeeding and turn to formula bottle-feeding due to undiagnosed and untreated anatomical impediments to the feeding dyad. This most fundamental mammalian processes is sacrificed at the altar of undetected posterior ankyloglossia and an unfavorable thick maxillary labial frenum attachment.

Tongue and Lip Mobility in Breastfeeding

Mobility of the infants lip and tongue is critical to the breast-feeding process. For a neonate to latch on effectively and draw milk from the mother's breast, the infant needs to simultaneously gape wide, extend the tongue forward and flange the lips to create a seal, and then contour its tongue in a groove around the nipple and the areola to form a teat resulting in an effective and deep latch. A thick and inelastic mandibular frenum attachment (tongue-tie, ankyloglossia) causes the tongue to retract during the wide gape. This has the potential to psychologically and physically traumatize both mother and infant leading to stressful breastfeeding and its attendant problems.

A number of high-quality studies demonstrate the relationship of tongue tie and breastfeeding. Messner et al. in 2000,[1] in a large study from the USA demonstrated that tongue-tie causes breastfeeding difficulties and pain for mothers. This study demonstrated that mothers of infants with tongue-tie experienced more breastfeeding difficulties than mothers whose infants did not have tongue-tie and that tongue-tie can affect breastfeeding duration.

The purpose of this case report is:

1. To identify several assessment criterions that may help better recognize posterior ankyloglossia.
2. To help identify other midline anomalies hampering breastfeeding.
3. To lay down patient position protocols and laser protocols to treat the same.

ANKYLOGLOSSIA

Since, the early 1990s breastfeeding literature is replete with case studies of infants with ankyloglossia and its treatment.[2-6] Tongue-tie or ankyloglossia is described as a congenital condition with an unusually thickened, tightened or shortened frenum (membrane or string under the tongue—Hillan 2008; Wallace and Clarke 2006). The term 'ankyloglossia' comes from the Greek words *agkilos* for crooked or loop and *glossa* for tongue.[7]

The history of ankyloglossia dates back in the writings of 3rd century BC by Aristotle and Roman civilization in the 2000-year-old writings of Celsus. It also has a mention in the Bible and the Quran about Moses being tongue-tied.[8]

Ankyloglossia is caused by insufficient apoptosis during the early embryonic stage of the midline sublingual tissue.

The severity of the ankyloglossia is determined by classifications by Elizabeth Coryllos.[9]

Type 1: Tip of the tongue to, in front of the alveolar ridge.
Type 2: 2 to 4 mm behind the tongue tip, attaches on or just behind the alveolar ridge.
Type 3: Attaches mid-tongue to the floor of the mouth.
Type 4: Sits at the base of the tongue, is thick, shiny and very inelastic also called as posterior or submucosal tongue-tie.

Hong classified ankyloglossia as anterior or posterior. Anterior ankyloglossia was defined by Hong as tongue-ties

with a prominent lingual frenum and/or restricted tongue protrusion with tongue tip tethering.[10]

INCIDENCE OF ANKYLOGLOSSIA

Ankyloglossia or tongue-tie, represents a significant proportion of the identified impediments to successful breastfeeding. It is more common in boys than in girls and seems to be genetic in origin.[11] The prevalence of ankyloglossia ranges between 4.2 and 10.7% in the population.[12]

The incidence is 2.8 to 10.7% in infants.[13] The varying figures of incidence of ankyloglossia could be attributed to fact that there is no standard method of diagnosing ankyloglossia. Tongue-tie usually presents as a sole anomaly, but very rarely may be associated with cleft palate or Pierre Robin sequence[14] (formerly known as Pierre Robin syndrome).

Tongue-tie has also been associated with Opitz syndrome, orodigitofacial syndrome, Van der Woude syndrome and X-linked cleft palate. A tight lingual frenum is considered a minor malformation by some investigators.[15] It is also found to be a part of certain malformation syndromes.[16,17] Although a high-arched palate and recessed chin may be seen as part of the craniofacial constellation, most commonly a tight lingual frenum is seen as an isolated finding in an otherwise normal infant.[18]

In a prospective study, Messner et al. reported the incidence of ankyloglossia in a well-baby population and studied whether affected patients with this condition experienced breastfeeding difficulties. Only 50 babies of the 1,041 newborns that were screened in the well-baby nursery had tongue-tie as defined by their liberal definition. This incidence of 4.8% corresponds with what is reported in the literature.[1]

In a study done by Jeanne L Ballard, Christine E Auer, Jane C Khoury, examined 2,763 breastfeeding inpatient infants and 273 outpatient infants with breastfeeding problems for possible ankyloglossia and assessed each infant with ankyloglossia, using the Hazelbaker assessment tool for lingual frenulum function. Ankyloglossia was diagnosed in 88 (3.2%) of the inpatients and in 35 (12.8%) of the outpatients.

The reported prevalence of ankyloglossia varies from 0.02 to 4.8%, but only causes feeding difficulties in 44% of breastfeeding mothers.[1]

In the authors' opinion, the varying percentages of the incidence of ankyloglossia in the newborn population as shown in the different studies does not appear to be representative of true incidence of ankyloglossia in the newborn population particularly owing to the factor of non-standard diagnosis of ankyloglossia.

RELATIONSHIP BETWEEN ANKYLOGLOSSIA AND BREASTFEEDING

The effect of ankyloglossia on breastfeeding has been a matter of controversy in the medical literature for 50 years.[19] Ankyloglossia in infants is associated with 25 to 60% incidence of difficulties with breastfeeding,[20] such as failure to thrive, maternal nipple damage, maternal breast pain, poor milk supply, breast engorgement and refusal of the breast. Studies have shown that, for every day of maternal pain during the initial 3 weeks of breastfeeding, there is a 10 to 26% risk of cessation of breastfeeding. The ineffective latch caused by ankyloglossia could be one of the primary underlying causes of all of these problems.[1]

DIAGNOSIS OF ANKYLOGLOSSIA

Assessment of the infant tongue is challenging as both maternal nipple-areola tissue and the tongue and other oral structures of the baby are not visible during breastfeeding. Posterior ankyloglossia is difficult in its diagnosis. Careful examination of the attachment of the frenum to the base of the tongue is imperative to reveal this subtle anatomical limitation to tongue mobility. Practitioners who may be looking for a heart-shaped tongue tip are most likely to miss the posterior tongue-tie which is a short frenula along the posterior half of the tongue and is normally found to be buried under the oral mucosa.[21]

Murphy maneuver is a test to diagnose posterior ankyloglossia which involves running a finger along the underside of the baby's tongue to assess possible frenulum restriction.

The Hazelbaker assessment tool for lingual frenulum function (HATLFF) was developed to provide a quantitative assessment of ankyloglossia and has been proven to be highly reliable. However, it was not widely used since the process of scoring is lengthy and complex.[19]

The parameters analyzed in the Hazelbaker assessment are length, attachment site and elasticity and the functional parameters include extension cupping and peristalsis of the tongue.

Morphofunctional analysis, such as length of the frenum and interincisal distance are important aids in assessment of ankyloglossia but the mother's history, which should include quality of infants latch and degree of nipple pain during breastfeeding is a crucial input and needs to be to correlated with the lingual function and appearance scores.

The breastfeeding history would comprise maternal factors and infant factors.

Maternal Factors

- Creased or blanched nipples after feeding: Flattened cracked, bruised or blistered nipples
- Bleeding nipples
- Severe pain with latch
- Incomplete breast drainage
- Infected nipples
- Plugged ducts
- Mastitis and nipple thrush
- Low milk supply.

Infant Factors to Consider

- No latch
- Unsustained latch
- Slides off nipple
- Prolonged feeds
- Unsatisfied after prolonged feeds
- Falls asleep on the breast
- Gumming or chewing on the nipple
- Poor weight gain or failure to thrive
- Unable to hold pacifier.

MAXILLARY LABIAL FRENUM AND ITS RELATED IMPEDIMENT TO BREASTFEEDING

A maxillary frenum is defined as a vertical band of lip tissue extending from the inside portion of the upper lip attaching to the alveolar mucosa to the maxillary arch.[20]

A classification of maxillary frenum attachment has been developed by Dr Kotlow on the basis of the position of the lip attachment to maxillary arch's soft tissue.

Kotlow's Classification of Maxillary Frenum

Class I: Attached to the marginal gingiva
Class II: At the junction of free attached gingiva
Class III: Attachment in front of the anterior papilla
Class IV: Attachment to anterior incisive papilla and extending into hard palate.

In instances when the frenal attachment is papillary or papilla penetrating it (class III and class IV), hinders the mobility and function of the upper lip and subsequently affects breastfeeding.[20]

Treatment

In the 1970s the midwives used to divide frenum linguae of newborn babies with their fingernails. In 1983, Lao and Ong[22] described a grooved tablespoon for tongue-tie release.

Disturbances caused due to morphofunctional variation of the tongue and lip frenum warrant interventional treatment-based solely on functional factors. Before deciding whether to treat or not to treat ankyloglossia, its effect on tongue function, a morphofunctional analysis, nipple pain and soreness must be evaluated. Not all cases require intervention. The presence of a non-disturbing lingual frenum does not justify its treatment. In the light of current research on breastfeeding and its importance to neonatal growth early intervention in case of demonstrable functional disturbance is imperative.

Surgery in the Hospital

Surgery in the hospital is a cumbersome procedure for the parents as well as the infant as it involves a half-day stay, fasting prior to the operation, administration of general anesthetic and sutures at the operated site. There is usually discomfort until healing is complete and this may take approximately 10 days.

Laser Surgery

The use of lasers in treating posterior ankyloglossia makes it a minimally invasive procedure. Lasers have many advantages over conventional treatment options. They are bactericidal, provide a bloodless operating field, and do not require placement of sutures or local anesthetic. Additionally, they are fast and safe without significant post-surgical complications.

LASER-ASSISTED SURGERY OF POSTERIOR ANKYLOGLOSSIA

Case Presentation

A 30-year-old primigravida presented to the lactation specialist with a 10-day-old baby reporting low milk supply. The infant had not gained weight (13% less than birth weight on day 10) and the mother experienced excruciating pain while breastfeeding. The mother reported the baby being painfully attached to the breast constantly throughout the day and night with no signs of satisfaction. The mother stated the first attempt at breastfeeding was difficult and painful.

Clinical Infant's Oral Evaluation with Digit Test

The infant tongue was unable to cup the finger of the lactation specialist as normally predicted prefeeding behavior. Tongue retraction and excessive gum biting was observed and it was almost impossible to get a finger under the tongue. An overactive gag reflex was elicited on the digit test. Assessment indicated significant tongue restriction indicative of posterior ankyloglossia based on guidelines of Hazelbakers assessment (Fig. 1). The maxilla also

Fig. 1: V-shaped tongue

Fig. 3: Patient positioning

Fig. 2: Thick labial frenum

Fig. 4: Indian baby bath position

revealed a high thick labial frenum which was diagnosed to be grade II according to Dr Lawrence Kotlow's classification (Fig. 2).

Breastfeeding management methods were instituted to maintain mother's milk supply and counter birth-related trauma on the cranium of the baby. The second oral assessment of the baby confirmed: No change in oral seal during breastfeeding, continued tongue retraction and gum biting.

After a comprehensive examination of both the infant and mother, it was concluded that a procedure to relieve the lingual frenum and maxillary frenum would be beneficial to the infant.

Preparation of the Infant for Laser Surgery

Psychological preparation of the mother is the first step in preparing the infant. Counseling and emotional support from both the dentist and lactation consultant are the cornerstone of successful treatment outcomes for neonates.

A new position for placement of the infant was devised to help stabilize the head and jaws. In 'The Indian baby bath' position the head of the baby was placed between the legs of the mother (Figs 3 and 4). Lateral support from the legs provided some stabilization from lateral movement of the head. The baby's legs were positioned near the mother's thighs. The head low placement of the head allowed the tongue to roll back making the surgical site easily accessible. Additionally, the baby's movement in a vertical direction was controlled by a stabilizing hand. Two fingers were placed on either side of the frenum. As the baby's jaws clamped on the fingers some amount of jaw stabilization was achieved. The great advantage was that at every stage the baby could view the mother's face and be reassured by the same. All standard laser safety norms were followed.

Treatment

Local anesthetic gel was applied to both the surgical sites. Both the procedures were done using the Er,Cr:YSGG which

is a 2,780 nm free running pulsed soft and hard tissue laser commercially known as Waterlase MD. A flexible fibre-optic device delivers the laser energy. For soft tissue procedures the laser itself does the cutting with the water stream acting as a coolant. A visible light emitted from distal end of the handpiece pinpointed the area of treatment. Since the Er,Cr:YSGG laser irradiation caused splashing of water and blood as a result of explosive ablation, adequate high-speed evacuation was required to prevent contamination.

Laser Setting

The laser settings were checked and test fired:

- Power output—0.5 to 1 W
- Pulse energy—25 to 50 mJ
- Repetition rate—20 Hz
- Air flow—11%
- Water flow—4%

The settings used on the infant were lower than those normally used in adult patients owing to the differences in the thickness of the tissue. The oral tissues in infants are less fibrotic and thinner compared with the oral tissues of adult patients.

Preliminary to Patient Treatment

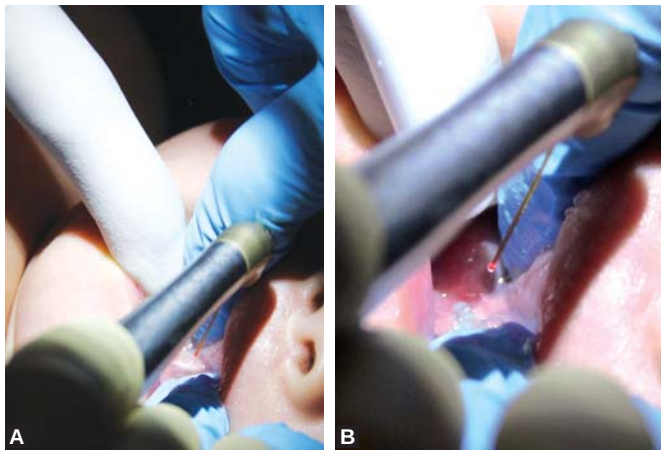
Prior to the treatment, the infants head was secured in the Indian baby bath position. The operatory was secured and following safety precautions followed.

1. The operatory was secured and proper laser warning sign was placed at the door of the operatory. The laser was set and test fired for proper operation and tip function.
2. The infant, mother, staff and dentist were given appropriate eye protection.
3. The patient's record and treatment plan was reviewed.

THE TREATMENT USING THE Er,Cr:YSGG LASER

Both the procedures were done a week apart.

Lingual frenectomy: The infant's head was steadied using the 'Indian baby bath' procedure as described above. The laser tip was used in non-contact mode with continuous and controlled movement to avoid any injury to the surrounding oral tissues. Care has to be taken to avoid any injury to the floor of the mouth where salivary glands, blood vessels, as well as the Wharton's duct are located. Once the tissue was ablated, it was checked with the movement of a finger to check for any remnants of tissue or any interference. After the completion of the surgery the infant was allowed to suck on cotton (Figs 5A and B).



Figs 5A and B: Treatment using Waterlase MD

Maxillary frenectomy: The maxillary frenectomy was done with the same laser using the same settings at the lingual frenectomy. The patient's head was stabilized, all the necessary precautions were taken and the laser was applied to the maxillary frenum in a non-contact mode and the tissue was ablated.

Postoperative Care

Postoperative prevention of frenum reattachments is one of the most critical elements of a successful treatment outcome. Educating the parent, and instilling a regimen of daily surgical site massage during and after breastfeeding for at the minimum of 6 days after the laser surgery was implemented. Breast milk acts as an analgesic and the act of breastfeeding brings comfort to the infant.[20] Dr Kotlow also recommends that prior to each feeding the mother sweep her finger across the floor of the mouth opening the area.

Postoperative Management of Pain

To prevent or reduce post-surgical soreness and discomfort, it is recommended to give the infant an appropriate dose of acetaminophen/paracetamol at the time of surgery and again 4 and 8 hours post-surgery.

Patient Recall

The infant was recalled for a checkup the following day and then after 7 days to check the healing.

CONCLUSION

Anatomical variation in lingual and maxillary buccal frenum attachment in neonates can lead to significant breastfeeding difficulties. The breastfeeding dyad could be hampered in case of failure to diagnose and detect the extent of the problem. Conformational diagnosis can only be presented

based on morphofunctional factors. Inability to feed, failure to thrive, maternal nipple pain and early weaning to the bottle are factors that would help decide, if surgical intervention is warranted. Once surgery is advised the laser surgery with the Er,Cr:YSGG is a far easier and superior option as compared to conventional surgery under general anesthesia with sutures, associated pain and postoperative complications. Post-surgery success in breastfeeding is exhilarating for the mother and extremely beneficial to the neonate.

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