



(CASE REPORT)



Frenotomy for Ankyloglossia: Conventional technique under general anesthesia in pediatric patients

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Abstract

Introduction: Ankyloglossia, commonly known as tongue-tie, is a prevalent birth defect characterized by a shortened and taut lingual frenulum, resulting in various complications. It occurs more frequently in males and can lead to breastfeeding difficulties, poor weight gain, and challenges in oral hygiene. The purpose of this article is to discuss frenotomy as a surgical intervention for ankyloglossia, involving the removal of the lingual frenulum under general anesthesia.

Case History: a 9-year-old male patient with class III ankyloglossia, experiencing difficulty in pronouncing words and maintaining oral hygiene due to a short lingual frenulum. Despite initial behavioral challenges, comprehensive dental treatment, including frenectomy under general anesthesia, was successfully performed.

Discussion: Ankyloglossia, or tongue-tie, results from cellular degeneration of the lingual frenulum, often associated with a genetic mutation in the MTHFR gene, affecting folate processing. Tongue development involves the migration of muscles from pharyngeal arches, leading to attachment issues at the lingual frenulum, causing ankyloglossia. Untreated consequences include feeding difficulties, dental decay, and speech articulation challenges. Conventional frenotomy, a simple and efficient technique, offers rapid, cost-effective symptom relief, promoting smooth recovery and improved outcomes compared to laser procedures.

Conclusion: frenotomy for ankyloglossia under general anesthesia effectively improves tongue mobility and alleviates associated symptoms. General anesthesia ensures patient comfort and facilitates precise execution of the procedure. The conventional frenotomy technique enhances tongue movements, highlighting the efficacy of surgical intervention for this condition.

Keywords: Ankyloglossia; Frenotomy; General Anesthesia; Quality of Life

1. Introduction

Ankyloglossia, or tongue-tie, is a common birth defect characterized by a shortened and tight lingual frenulum. This condition can either pull the tongue downward due to posterior ankyloglossia or attach the frenulum too far forward on the underside of the tongue, essentially "tying" it to the mouth floor (1). Ankyloglossia occurs more frequently in males than females, with a ratio of 3 to 1. Its occurrence in the overall population varies between 4% and 10.7%, though these percentages are based on studies that used varying diagnostic criteria (2). In newborns brought in due to breastfeeding difficulties, the occurrence of tongue-tie ranges from 12.8% to 56% across different research findings (3).

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Symptoms linked with ankyloglossia include maternal breast discomfort, challenges in breastfeeding for infants, poor weight gain, dehydration, and shortened feeding durations. Ankyloglossia can also lead to different mechanical issues, such as struggles in tasks like licking ice cream among adolescents and adults, and an inability to play wind instruments or to clean teeth with the tongue. Some studies suggest that this congenital condition is seldom symptomatic (4).

Regarding treatment, the division of tongue-tie is a low-risk procedure with few complications. Surgical approaches for addressing tongue-ties can be categorized into three methods. Frenotomy entails a straightforward incision of the frenulum. Frenectomy involves the complete removal of the frenulum. Frenuloplasty encompasses diverse techniques to release the tongue tie and rectify the anatomical condition. There is insufficient evidence to support the preference for any specific technique among these three main approaches (3)

Combining speech therapy with procedures like frenulectomy, frenulotomy, or frenuloplasty can serve as a treatment avenue for enhancing tongue mobility and consonant pronunciation. By targeting constraints in tongue movement and engaging in tailored speech exercises, speech therapy offers an opportunity for individuals with ankyloglossia to enhance their articulation and overall speech skills (2).

In cases of ankyloglossia, prompt intervention is crucial to alleviate feeding challenges, overcome mechanical limitations, and address potential speech impediments, ensuring an improved quality of life for the individual.

2. Case History

A 9-year-old male patient reported to the Department of Pediatric Dentistry in Syaiful Anwar Hospital, Malang, Indonesia, with the patient's parents complained that their child's tongue is restricted and has difficulty pronouncing certain words. Additionally, they have difficulty maintaining oral hygiene and cleaning their teeth. The patient has mental retardation. The patient's medical history indicated no evidence of any systemic illness or familial predisposition.

Upon intraoral examination, it was observed that the lingual frenulum was short, with the anterior part of the tongue attached at the base. Based on Kotlow's classification, the patient was diagnosed as a case of class III ankyloglossia. Upon assessment, narrow dental arches were noted, accompanied by significant misalignment of teeth, along with the presence of numerous retained deciduous teeth in teeth 54, 65, 75, 83, 85 and cavities in teeth 53, 16, 63, 26, 36, 46. An orthopantomogram (OPG) revealed multiple impacted teeth.

Furthermore, from the initial appointment onward, the patient exhibited highly uncooperative behavior due to his intellectual disability. According to the Frankl behavioral rating scale, the patient received a rating of 1, indicating a significantly negative response. Considering these circumstances, it was determined that comprehensive dental treatment under general anesthesia (GA) was the appropriate course of action.

Table 1 Kotlow's classification

Classification	Category	Range of free tongue
Class I	Mild ankyloglossia	12-16 mm
Class II	Moderate ankyloglossia	8-11 mm
Class III	Severe ankyloglossia	3-7 mm
Class IV	Complete ankyloglossia	< 3mm

General anesthesia (GA) was administered following evaluations by a pediatrician and anesthesiologist. Various systemic assessments were conducted, including a complete blood cell count and thoracic examination, all of which indicated normal and stable conditions. Prior to the procedure, the patient was advised to abstain from food and drink for six hours. GA was induced using an endotracheal tube inserted through the mouth, along with the administration of Midazolam 1 mg, ketamine 1 mg, fentanyl 150 mcg, and atracurium 15 mg. Additionally, inhalation of midazolam was utilized.

Once the patient was under anesthesia, asepsis was conducted, followed by the restoration with glass ionomer cement (GIC) on decayed teeth 53, 16, 63, 26, and 46, with prior preparation of these teeth.



Figure 1 Intraoral photography was taken during the procedure of GIC restoration conducted under general anesthesia. (Figure 1a): preparation of cavity on tooth 53 under general anesthesia. (Figure 1b): application of dentin conditioner on the cavity of tooth 53. Figure 1c: application of GIC using plastic instruments.

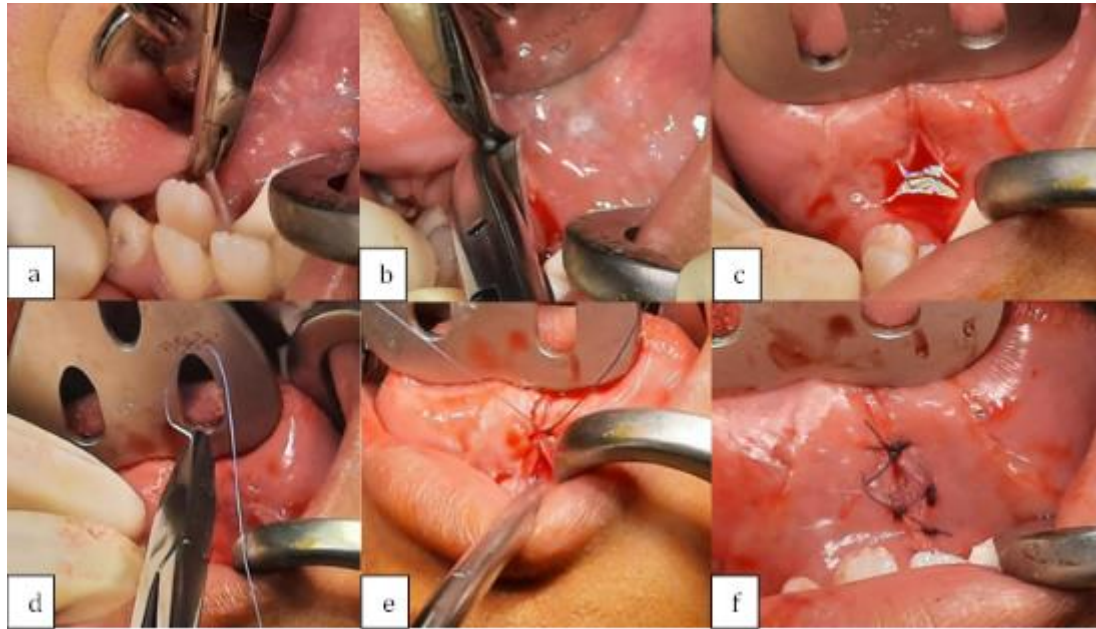


Figure 2 Frenotomy procedure using conventional method. (Figure 2a): fixation of lingual frenulum using clamp. (Figure 2b): cutting the lingual frenulum using surgical scissors. (Figure 2c): the excision result is in the shape of a diamond. (Figure 2d): suturing with Vicryl 4.0 (absorbable silk). (Figure 2e): suturing using a simple interrupted method. (Figure 2f): The result shows 4 sutures at each corner of the diamond shape.

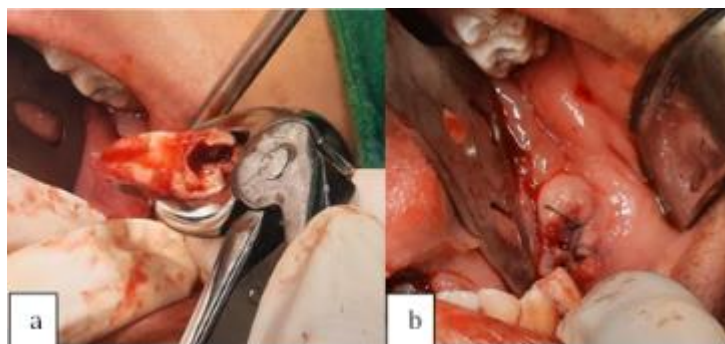


Figure 3 Procedure of tooth extraction 36. (Figure 3a): extraction using mandibular crown forceps. (Figure 3b): suturing 4 stitches using Vicryl 4.0.

Subsequently, a frenectomy procedure was performed on the patient's ankyloglossia, with fixation of the upper and lower lingual frenulum using a clamp, and the frenulum was cut using surgical scissors, freeing the area of the lingual frenulum. Following this, four sutures were applied using Vicryl 4.0 (absorbable silk). The tongue appears to be able to protrude.

After frenotomy, extraction was performed on molar tooth 36 diagnosed with necrosis pulp and deemed non-restorable, followed by hemostasis for bleeding control using Vicryl 4.0 thread with a simple interrupted technique.

Upon completion of all procedures, the patient's parents received instructions, which encompassed allowing the patient to drink once consciousness had sufficiently recovered, avoiding hot or warm foods and beverages, refraining from touching scars, maintaining oral hygiene, scheduling regular follow-up appointments, and performing periodic tongue massages.

A week later, a follow-up assessment took place, during which the patient's parents noted the absence of pain and an increase in appetite. Intraoral examination revealed post-frenectomy wounds without any signs of redness or swelling. Finally, follow-up guidance was given, emphasizing the importance of maintaining oral hygiene and regularly performing tongue massages.



Figure 4 Intraoral photograph during follow-up. (Figure 4a): condition on that day after general anesthesia. (Figure 4b): intraoral photograph after 1 week.

3. Discussion

Ankyloglossia's etiopathogenesis is not well understood. Failure in cellular degeneration of the lingual frenulum results in a much longer attachment between the floor of the mouth and the undersurface of the tongue, resulting in tongue-tie or ankyloglossia. Tongue tie is often associated with a fairly common genetic mutation of the MTHFR gene. This gene controls the production of an enzyme called Methyl-Tetra-Hydro Folate-Reductase. People with a variant of this gene have a difficult time processing folate or folic acid, which can contribute to other midline defects as well as general health issues (5). The tongue starts to develop at about 4 week's intra uterine. The tongue originates from the first, second, and third pharyngeal arches which induce the migration of muscles from the occipital myotomes. 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 highly mobile, except at the region of the lingual frenulum, where it remains attached. Disturbances during this stage cause ankyloglossia (6). However, because the tongue normally is short at birth and then grows longer at the tip, the prevalence is much lower in adults. Ankyloglossia is associated with other syndromes, namely, the Pierre Robin Syndrome, the Oral-Facial-Digital Syndrome, Meckel's syndrome, the trisomy 13 syndrome, the Robinow Syndrome, the short rib syndrome, the ATR-X Syndrome, Fraser's Syndrome, the Wiedemann-Beckwith syndrome, van der Woude's syndrome, and the gloss palatine ankylosis syndrome (7).

The untreated consequences of ankyloglossia encompass various issues, including feeding difficulties in infants, potential malnutrition, and an increased risk of dental decay due to inadequate tongue cleaning resulting from limited sweeping motions. This can lead to challenges in swallowing and chewing, potentially causing gastrointestinal discomfort, lower midline gaps in teeth with or without gum disease, gum recession, and an open bite caused by tongue thrusting and lower incisor flare. Additionally, untreated cases may lead to poorly fitting dentures in elderly individuals and may induce psychosomatic stress in older children or adults who face ridicule from peers or colleagues due to tongue-tie, leading to embarrassing situations (5). Moreover, patients often encounter difficulty articulating certain sounds, such as "t, d, n, l, s, j, zh, ch, th, dg," and particularly "r," because of the tongue's limited ability to roll properly (8).

In this case, we used the conventional frenotomy technique. Conventional frenotomy (CF) is a brief procedure in which the lingual frenulum is cut using scissors or a scalpel (9). Performing frenotomy with a straightforward technique utilizing surgical scissors is a prevalent and efficient approach for managing tongue ties and lip ties. Its benefits include:

- **Rapid Procedure:** The process is brief and can be accomplished within a short timeframe, proving convenient for individuals of all ages (10).
- **Simplicity:** The use of surgical scissors simplifies the procedure, making it accessible to various healthcare professionals, including pediatricians and dentists (11).
- **Minimal Risk:** Complications are rare, particularly when executed by experienced healthcare practitioners.
- **Cost-Effectiveness:** Compared to laser frenectomies, this method is typically more affordable, rendering it accessible to those with limited financial means or lacking insurance coverage.
- **Effective Symptom Relief:** It alleviates symptoms like breastfeeding difficulties, speech impairments, and oral health issues, enhancing the overall well-being of affected individuals.
- **Versatility:** It can be applied to both infants and adults, offering a flexible solution for addressing diverse tongue tie and lip tie concerns.
- **Smooth Recovery:** Patients usually experience straightforward recovery post-frenectomy, enabling them to resume normal activities within a few days.

The advantages of employing a simple technique with conventional technique for frenotomy establish it as a favored and efficacious method for managing tongue ties and lip ties, providing a multitude of benefits for both patients and healthcare providers (12). Patel et al. found that compared to lasers, patients treated with the conventional scalpel showed improved healing beyond the seventh day and one month after surgery (13). Messner et al. observed in their study that over 75% of patients experienced noticeable enhancements in speech articulation post-surgery, as evaluated by a speech pathologist, compared to their preoperative condition (14).

4. Conclusion

In conclusion, frenotomy with a conventional technique for ankyloglossia under general anesthesia is effective in improving tongue mobility and relieving associated symptoms. The use of general anesthesia ensures patient comfort and enables precise execution of the procedure. The conventional method of frenotomy enhanced tongue movements, emphasizing the efficacy of surgical intervention in the condition.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

The authors have no conflict of interest.

Statement of informed consent

Informed consent was obtained from patient.

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