

SURGICAL TECHNIQUES USED IN LINGUAL FRENOTOMIES: LITERATURE REVIEW

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Abstract: Introduction: The study aims to highlight the indications, advantages, disadvantages, and technological advances related to the procedure. Objective: This article reviews the main surgical techniques used in lingual frenotomy to treat ankyloglossia, also known as “tongue-tie,” which affects oral function and can cause difficulties in breastfeeding and speech. Methodology: The research was carried out by selecting relevant scientific articles, dissertations, and theses from the National Center

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for Biotechnology Information (PubMed), Virtual Health Library (BVS), and Scientific Electronic Library Online (SciELO) databases, in English, Spanish, and Portuguese. Studies published between 2012 and 2024 were included. Discussion: Ankyloglossia, or “tongue-tie,” results from the incomplete formation of the lingual frenulum, affecting speech, breathing, and breastfeeding. Early diagnosis is crucial, with the Tongue Test being mandatory in Brazil since 2014. Treatment can be conservative or surgical, such as frenotomy, with laser standing out for its precision and rapid recovery. Imaging technologies help in surgical planning, increasing the safety and efficacy of the procedure. The joint action of speech therapists, pediatricians and dentists is essential. Results: The literature review includes articles selected based on previously defined inclusion and exclusion criteria. Searches were performed in the PubMed, BVS and SciELO databases, covering publications in English, Spanish and Portuguese. Conclusion: We conclude that it is essential to understand the different techniques and their implications, choosing the most appropriate method based on the patient’s needs. With the continuous evolution of technologies, we understand that there are few studies in the literature and it is expected that lingual frenotomy will become increasingly effective, improving the quality of life of individuals with ankyloglossia.

Keywords: Oral surgery, Ankyloglossia, Lingual frenulum and Early childhood.

INTRODUCTION

Ankyloglossia, also known as “tongue tie,” occurs when a band of tissue that joins the tongue to the floor of the mouth, the lingual frenulum, is shorter or thicker than normal standards. (Silva et al, 2022) This condition can cause breastfeeding difficulties, speech problems, and oral health complications, and early diagnosis and appropriate intervention are essential. (Leite et al, 2024)

Several surgical techniques for performing lingual frenotomy have been developed and improved in recent years with the aim of reducing risks, minimizing postoperative discomfort, and



maximizing functional results. In contemporary times, there are two main strategies for the total or partial excision of this brake. (Procopio, 2017)

The goal of frenectomy, a surgical intervention that aims to completely free the tongue, is to completely remove the lingual frenum from children from one year of age. Frenotomy, on the other hand, has become commonly used in neonates and infants up to one year of age because it consists of the partial removal of the lingual frenum, with only one incision and detachment, without removing the residual portion and, generally, without bleeding, since the frenulum in infants is usually thin and quite avascular. (Almeida et al, 2024)

The procedure is safe and beneficial for the patient when performed by a qualified specialist, and can be performed through the use of scissors and electrocautery as the most commonly used surgical techniques. (Junqueira, 2014)

The technology has been considered an alternative to conventional techniques, presenting several advantages such as: shorter operative work time, cauterization and sterilization of tissues, hemostasis, less need for local anesthesia and fewer postoperative complications (pain, swelling and infection). In addition, the need for suturing is eliminated and an even depth at the surgical site is maintained, reducing unnecessary damage to the tongue muscle. (Kara, 2008)

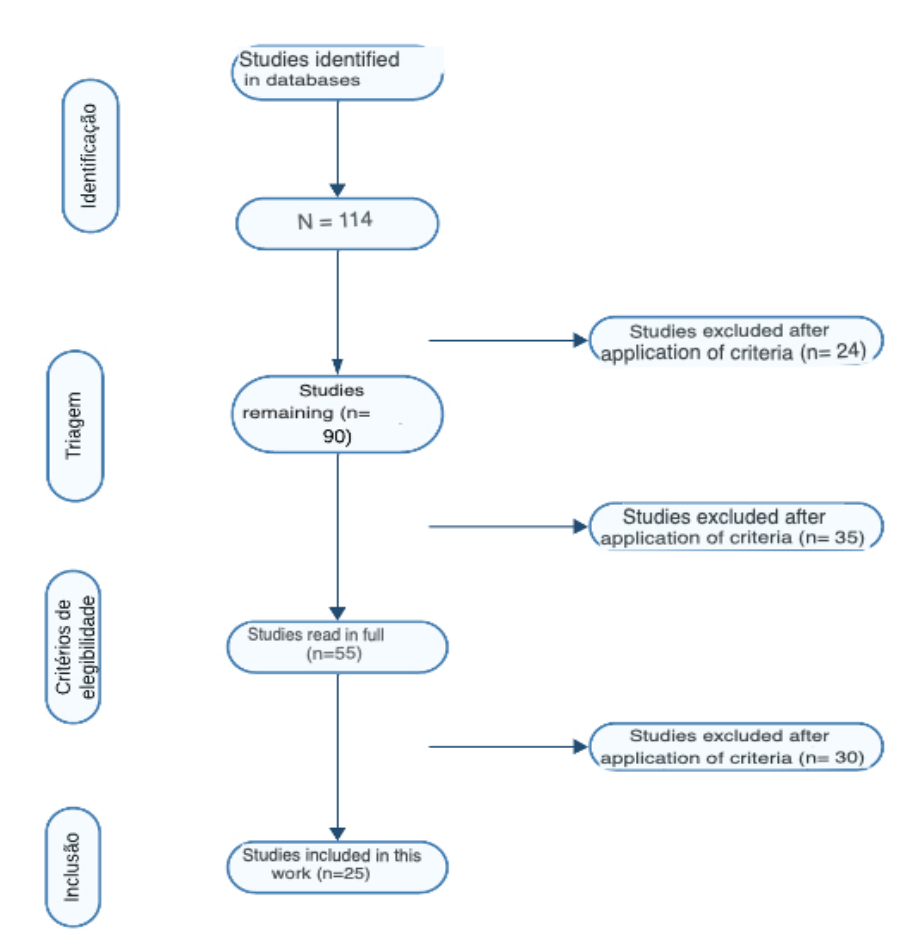
Since 2014, screening of neonates to identify ankyloglossia has been mandatory in all maternity hospitals and hospitals in the country, due to law number 13.002/2014. Thus, it was found that the prevalence of ankyloglossia in Brazil ranges from 0.88% to 16.0%. (Martinelli, 2013)

This article aims to review the main surgical techniques used in lingual frenotomy, highlighting their indications, advantages, disadvantages and technological advances that have contributed to the evolution of this procedure, aiming to provide a comprehensive and updated view of surgical practices in the correction of ankyloglossia.



METHODOLOGY

Regarding the systematization of this integrative literature review, the most relevant scientific articles, dissertations, and theses on the subject were initially selected from the following databases: National Center for Biotechnology Information, U.S. National Library of Medicine (Pubmed), Virtual Health Library (VHL) and Scientific Electronic Library Online (SciELO), in English, Spanish and Portuguese. For the inclusion criteria, studies from the period between 2012 and 2024 were used, with some other studies established in the literature that were related to the theme guided. The descriptors in Health Sciences (DeSC): “Oral Surgery”, “Ankyloglossia”, “Lingual Frenulum” and “Early Childhood”. Monographs, articles not accessible online, articles outside the period presupposed by the inclusion criterion, and indexed in other databases were excluded.



Source: developed by the authors.

FINDINGS

For the literature review, 25 articles were selected according to the previously established inclusion and exclusion criteria. The searches were carried out through the following databases: National Center for Biotechnology Information, U.S. National Library of Medicine (Pubmed), Virtual Health Library (VHL) and Scientific Electronic Library Online (SciELO), in English, Spanish and Portuguese. Image 2 details the descriptions of each of these articles.



Title	Authors and year	Goal	Methodology/ Key findings
TREATMENT OF ANKYLOGLOSSIA: LITERATURE REVIEW Ibero-American Journal of Humanities, Sciences and Education. periodicorease.pro.br, 18 Oct. 2022.	Silva, E. L. A. da., Silva, J. R. B. da., & Marechal, B. B. (2022)	The objective of this study is to present a literature review on ankyloglossia, its diagnosis and treatment.	The most common surgical techniques for removing the lingual frenulum are frenotomy, frenectomy, frenuloplasty, and laser surgery.
INDICATIONS FOR LINGUAL FRENECTOMY SURGERY - A LITERATURE REVIEW INDICATIONS FOR LINGUAL FRENECTOMY SURGERY - A LITERATURE REVIEW.	Letícia, C., Leite, A., Monteiro, G., de Albuquerque, T., Oliveira, E., Matos Lima, S., de Lima Silva, G., Cavalcanti, V., Santos, Antônio Evangelista da Silva, L., Pedroza da Canceição, M., Luiza, A., Girão, P., Silva de Assunção, T., de Farias Barbosa, E., & de Literatura, R. (2024).	To report a case of Lingual Frenectomy as a treatment option for ankyloglossia. Some studies indicate a predilection for males.	If treated early, ankyloglossia will not imply early weaning or speech alteration when related to tongue tie. Among the frenectomy techniques currently used, the conventional one performed with scissors or scalpel blade, is still the most used, followed by the one performed with an electric scalpel, and finally the laser frenectomy technique, which, although very facilitating and promising, still suffers a high degree of rejection by professionals due to its high cost for acquisition and the need for more thorough training.
Lingual frenotomy in infants.	PROCOPIO, I. M. S.; COSTA, V. P. P.; LIA, E. N. (2017)	The objective of this study was to review the literature on anomalous lingual frenulum in infants, relating diagnosis and treatment.	They have not identified a gold standard method for diagnosing ankyloglossia in infants, although the diagnosis is relatively simple.
Ankyloglossia in pediatric patients.	MARIA DE ALMEIDA, M.; CALAPEZ, P.	Literature review on the diagnostic criteria and classifications of ankyloglossia, its impact on pediatric patients and to evaluate the indication for surgical or conservative treatment, taking into account its efficacy, ideal age of execution, risks and complications.	The main focus is research on ankyloglossia in newborns and children. The text addresses the prevalence, diagnosis, and classifications of the condition, in addition to exploring its impacts on breastfeeding, speech, chewing, and lingual motricity. In addition to evaluating surgical treatments (frenotomy and frenectomy) and conservative treatments.



Surgical techniques for the treatment of ankyloglossia in children: a case series. J Appl Oral Sci.	Junqueira MA, Cunha NN, Costa e Silva LL, Araújo LB, Moretti AB, Couto Filho CE, Sakai VT. (2014).	To describe a series of clinical cases of ankyloglossia, which were addressed by various techniques. In addition, information on the indications, contraindications, advantages and disadvantages of the techniques was presented.	This paper reports a series of clinical cases of ankyloglossia in children, which were approached by different techniques: frenotomy and frenectomy with the use of hemostatic forceps, two hemostatic forceps, a directing groove or laser. Information on the indications, contraindications, advantages and disadvantages of the techniques was also presented.
Evaluation of patient perceptions of frenectomy: a comparison between the Nd:YAG laser and conventional techniques. Photomed Laser Surg. 2008; 26(2):147-152	Kara C. (2008).	The aim of the randomized controlled clinical trial described here was to determine the anxiety levels of patients before frenectomy using the Nd:YAG laser and the conventional technique, and to compare the effects of these two methods on the degree of postoperative pain, discomfort, and functional complications (feeding and speech).	To present a proposal for the evaluation of the frenulum of the tongue in infants with scores.
Protocol for infants: relationship between anatomic and functional aspects. Rev. CEFAC. 2013; 15(3):599-610	Roberta Lopes de Castro Martinelli, Irene Queiroz Marchesan, Giedre Berreini-Felix (2013)	To verify which characteristics of the frenulum of the tongue influence the sucking and swallowing functions in full-term babies, in order to propose adjustments to the protocol proposed by Martinelli et al (2012).	This is a cross-sectional study. A total of 100 subjects participated, 44 females and 56 males, born in the only maternity hospital in a city in the interior of São Paulo, between September 2011 and April 2012.
Protocol for the evaluation of the frenulum of the tongue in infants.	MARTINELLI, R. L. C.; MARCHESAN, I. Q.; RODRIGUES, A. C.; FELIX, G. B. (2012).	A review of the literature was carried out, and then a PROTOCOL FOR THE EVALUATION OF THE FRENULUM OF THE TONGUE IN INFANTS was prepared, approved by the Research Ethics Committee of the Bauru School of Dentistry of the University of São Paulo, under number 113/2011.	It presents a proposal for the evaluation of the frenulum of the tongue in babies with scores.



Tongue tie and frenotomy in the breastfeeding newborn. NeoReviews. 2010; 11(9):513-9.	Isabella Knox (2010)	To make the reader identify ankyloglossia, understand the pathophysiological mechanisms of the signs and symptoms and know how to correctly refer a breastfeeding baby for frenotomy	It presents the relationship between ankyloglossia in infants and breastfeeding.
Validation of the tongue frenulum assessment protocol in infants. Doctoral Thesis. University of São Paulo, São Paulo, 2016.	Roberta Lopes de Castro Martinelli (2016)	This study aimed to validate the protocol for the evaluation of the frenulum of the tongue in babies.	The protocol was applied to 100 healthy babies, born at term, at 30 days of life, exclusively breastfed. The validation process consisted of the analysis carried out by three examiners.
Position of lips and tongue in rest in newborns with and without ankyloglossia. CoDAS. 2021	Campaign SMA, Martinelli C RL, Palhares DB. (2021)	Check the resting position of lips and tongue in newborns with and without ankyloglossia.	This was a cross-sectional study conducted with 130 newborns at a University Hospital. In babies without ankyloglossia they tend to keep their lips closed and their tongue elevated at rest. Babies with ankyloglossia, on the other hand, tend to keep their lips parted and their tongue in a low position in the oral cavity.
Tongue tie can impair breastfeeding and breathing. Hospital Sirio Libanês. 2016.	MARTINS, G. S. Q (2016).	To characterize and compare speech disorders related to lingual frenulum alterations in schoolchildren, of the 8; 6 years old at 10; 11 years between control and research groups.	A total of 52 school-age children (8; 6 years to 10; 11 years of age), of both genders, with and without ankyloglossia. It is not possible to determine whether the phonetic alterations are the same for the different lingual frenulum alterations.
WANG et al., 2021			
Lingual frenulum and its relationship with breastfeeding: understanding of a health team. Communication Disorders. 2019 Mar 29; 31(1):77-86.	Karkow IK, Pankiw PM, Godoi VC de, Costa CDC, Fujinaga CI (2019)	To verify the understanding of health professionals regarding the relationship between the lingual frenulum and breastfeeding.	This is a descriptive study, of a qualitative nature. Data collection was carried out in one Hospital and two Childcare Services. In view of the statements of the participating professionals, it was observed that there is no consensus on the understanding of the relationship between breastfeeding and the lingual frenulum.
Ankyloglossia: case report. RSBO. 2011; 8(1):102-7.	Melo NSFO, Lima AAS, Fernandes A, Silva, RPGVC. (2011)	To describe a case of ankyloglossia in a 2-year-old female child.	The study highlights the importance of early diagnosis of ankyloglossia, especially in infants, to prevent problems related to breastfeeding and speech development.



Frenotomy for tongue-tie in newborn infants. Cochrane database of systematic reviews. [s.l.]; 2017. p.1-35.	O'Shea J, Foster JP, O'Donnell CPF, Breathnach D, Jacobs SE, Todd DA et al. (2017)	To determine whether frenotomy is safe and effective in improving oral feeding ability among infants less than three months of age with tongue tie.	The researchers did not report serious complications, however, the total number of babies studied was small, thus limiting the certainty of this finding.
Benefits of frenotomy in the treatment of ankyloglossia: a clinical case report. Rev Odontol Integr Cent-West. 2022; 2(1):76-81.	Silva JF, Santos MA, Souza LS. (2022)	To analyze what are the main benefits of frenectomy surgery in the lives of dental patients.	Frenectomy consists of the removal of an anatomical structure of the oral cavity, called lingual and labial frenulum, which can grow abnormally, causing several obstacles in the patient's life.
L I N G U A L F R E N E C T O M Y : CASE REPORT. UNIFUNC HEALTH AND BIOLOGICAL SCIENCES, v. 3, n. 5,	OLIVEIRA, D. A. M. DE; SANCHES, I. P. R.; ANTONIO, R. C. 2 dez. (2019)	It presents a case report of ankyloglossia with lingual frenectomy treatment of a child patient.	It demonstrates how effective early diagnosis and surgical treatment are in these cases.
C O M P A R A T I V E ANALYSIS BETWEEN TWO SURGICAL TECHNIQUES OF LINGUAL FRENOTOMY	Christian de Prado, Rodrigo Demétrio, Ana Carolina A. Nuernberg, Gabriela da Costa.	The study was necessary to define the safest surgical technique, showing that there were fewer cases of complications in children under 6 months of age with the pathology in question.	An analytical experimental study of the randomized clinical trial type was carried out in high-complexity hospitals in the Extreme South of Santa Catarina in the years 2018 and 2019, which included 48 infants under the age of six months diagnosed with ankyloglossia and fed orally, operated by resection with surgical scissors or by resection with electrocautery, and followed up in the immediate postoperative period, at one week and one month after the procedure
Tonsillectomy in adults: predictive factors of postoperative complications.	Peca, R., Correia, M., Rosa, C., Correia-Rodrigues, P., & Luís, L. (2024)	Analysis of surgical indications and predictors of postoperative complications of tonsillectomy in adults.	Clinical files were consulted to obtain demographic and clinical data and defined outcomes: post-tonsillectomy hemorrhage; revision of hemostasis in the operating room; resorting to the emergency service (ED) due to lack of pain control.

Safety of tonsillectomy in adults: a population-level analysis of 5968 patients.	Chen MM, Roman SA, Sosa JA, Judson BL. JAMA Otolaryngol Head Neck Surg (2014); 140(3):197–202.	To characterize the mortality, complications and reoperation rate in tonsillectomy in adults.	Outcomes of interest included mortality, complications, and reoperations in the 30-day postoperative period. Statistical analysis included χ^2 test, t-test, and multivariate logistic regression.
Laser lingual frenotomy in newborns with ankyloglossia: a prospective cohort study	Dell'Olio, F., Baldassare, M.E., Russo, F.G., Schettini, F., Siciliani, R.A., Mezzapesa, P.P., Tempesta, A. Laforgia, N., Favia, G., Limongelli, L.		The authors conducted a prospective observational cohort study. Newborns with ankyloglossia (classified using the Coryllos and Hazelbaker criteria) with or without difficult breastfeeding (according to the Infant Breastfeeding Assessment Tool) underwent diode laser frenotomy. The authors analyzed as main outcomes the intensity of perioperative pain measured by the CRIES scale, the occurrence of complications and quality of healing, the quality of breastfeeding, postoperative weight gain of the newborn, maternal nipple pain, and the presence of lesions as secondary outcomes.
Ankyloglossia and frenectomy: a literature review	Azevedo, A.V., Marinho, J.L., Barreto, R.C.	The objective of this study is to present a literature review on ankyloglossia, its main characteristics and the main surgical techniques indicated for frenectomy or frenotomy.	The tongue is a muscle with important oral functions and when it suffers congenital changes, a surgical intervention is indicated along with the monitoring of a speech therapist.
Sucking evaluation by ultrasonography in breastfeeding women: a scoping review protocol	Mello, A.F.F.A., Martinelli, R.L.C., Lima, A.P.A.F., de Almeida, A.N.S., de Andrade, R.A., Da Silva, H.J.	To identify studies related to the sonographic evaluation of sucking function in infants.	The search strategy will be performed in the electronic databases MEDLINE (via PubMed), EMBASE, Web of Science and Scopus and the studies will be selected based on the inclusion and exclusion criteria established by two trained professionals, independently. The protocol for the analysis of the articles will consider the year of the study, study design, number of babies evaluated, age, methodology for evaluating sucking, methodology for acquiring sonographic images of sucking and methodology for ultrasonographic analysis of suction.



Lingual frenotomy in newborns, from diagnosis to surgery: case report	De Almeida, K.R., Leal, T.P., Kubo, H., Castro, T.E.S	The objective of this study was to describe a clinical case report of diagnosis and frenotomy in a newborn with breastfeeding difficulties and followed up for 6 months. Newborn, vaginal delivery, 5 days of life without health changes, presenting difficulty in breastfeeding	Improvement in the protocol scores was observed in the immediate applications and after 24 hours. The newborn was followed up for six months monthly, through data collection on the vaccination card and questions directed to the mother.
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DISCUSSION

The tongue is a specialized organ located in the oral cavity, which plays a crucial/essential role in the functions of sucking, swallowing, chewing and speaking. (Martinelli, 2012). While the lingual frenulum consists of a reduced membranous fold located on the floor of the oral cavity and is formed through the process of apoptosis, around the seventh gestational week, in the ventral formation phase of the tongue, where its anterior two-thirds are divided from the lingual floor. Therefore, when this process is not completed during the embryonic stage, it can result in total or partial ankyloglossia, also known as “tongue tie”, restricting tongue movements. (Knox et al, 2010)

The correct interrelationship of the lips, tongue and jaw is essential not only for speech, but also for proper breathing, chewing and swallowing. The baby’s ideal breathing is considered exclusively nasal, which occurs when there is lip sealing during sleep or at rest. When this sealing does not happen, the tongue does not position itself on the palate to allow air to pass through, and the jaw is not in the ideal position, resulting in mouth breathing. (Martinelli et al, 2021)

While for the motor function of language to occur properly, it is essential that there is an anatomical and functional balance of the stomatognathic system, since speech is an action that can be performed through this system, thus allowing the phonoarticulatory organs to perform the necessary movements. Since the lingual frenulum is one of the fundamental factors for speech production, then when there is an alteration in it, normal speech articulation can be impaired, causing changes in diction. (Martin, 2016)

As for swallowing and sucking, especially in newborns, there is difficulty in breastfeeding due to the restriction of tongue movements, which can impair nutrition and even early weaning of the newborn. Undoubtedly, breastfeeding reduces the risks of common childhood diseases, such as allergies, infections, diabetes, obesity and cognitive development problems. (Karkow et al, 2019)

Therefore, it is crucial to emphasize the importance of an early diagnosis and that the intervention should be carried out by qualified and skilled professionals, following the appropriate



diagnostic protocols, in addition to following the treatments recommended by the literature. (Melo et al, 2011) And, as a result of this need, on June 20, 2014, in Brazil, Law 13.002 was approved, which establishes the obligation to perform the Tongue Test in all maternity hospitals, with the objective of evaluating the lingual frenulum, thus preventing possible future consequences caused by ankyloglossia. (O'Shea et al, 2017)

It is significant to emphasize the importance of interdisciplinarity, with emphasis on the partnership between Speech-Language Pathology and Audiology, Pediatrics and Dentistry. After the diagnosis of ankyloglossia, there are two types of treatment: conservative and surgical. Generally, these methods are combined to achieve better results, the strategies range from speech therapy for the lengthening of the frenulum to surgical interventions, such as frenotomy with scissors or electrocautery. (Oliveira et al, 2019) Performing frenotomy can contribute to improving breastfeeding, tongue movement and maternal comfort.

Frenotomy can be performed with scissors or electrocautery, although generally safe, it may present some complications, as identified in the literature. Among the most common complications are infections and hemorrhages. Rare complications include lingual muscle injury, duct damage, submandibular lesions, and frenulum regrowth, which may require new intervention. According to a study conducted by Peça et al (2024), the rate of reoperation in the 30 days after surgery varies, being 3.2% in some studies for frenotomies in adults. (Chen, 2014) However, to date, there are no scientific studies comparing the complications associated with the reported techniques.

The technological advances of lingual frenotomies have innovated the procedure, bringing efficiency and safety. One of the most significant innovations is the use of laser, which makes it possible to perform frenotomy in a minimally aggressive way. This technique reduces bleeding during surgery and speeds up healing, resulting in less pain for the patient and a faster recovery (Dell'Olio et al, 2022). In addition, the laser's precision minimizes damage to adjacent tissues, increasing the safety of the procedure (Azevedo et al, 2020)

Another important advance is the use of imaging technologies, such as ultrasonography and



computed tomography, which offer a detailed visualization of the region before surgery. This allows for a more accurate assessment of the patient's condition and a more personalized approach during the procedure. (Melo et al, 2023) These advances not only improve the quality of care, but also ensure comfort and safety for patients undergoing these interventions.

FINAL CONSIDERATIONS

Lingual frenotomy is a crucial surgery to correct ankyloglossia, which can affect patients' oral function and quality of life. While classical frenotomy remains widely used, newer methods such as electrocautery frenotomy offer benefits including less bleeding and faster recovery.

Technological advances have boosted surgical practice, with minimally invasive techniques and modern equipment that provide more effective and personalized care. These developments not only improve clinical outcomes but also make the patient experience more comfortable.

Thus, it is essential to understand the different techniques and their implications, choosing the most appropriate method based on the patient's needs. With the continuous evolution of technologies, there are still few studies in the literature and it is expected that lingual frenotomy will become increasingly effective, improving the quality of life of individuals with ankyloglossia.

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