FLORIDA ASSOCIATION OF SPEECH-LANGUAGE PATHOLOGISTS AND AUDIOLOGISTS

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FLASHA
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Lingual Frenulum Protocol

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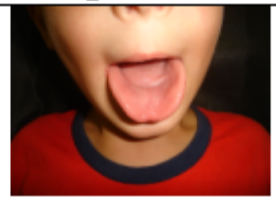
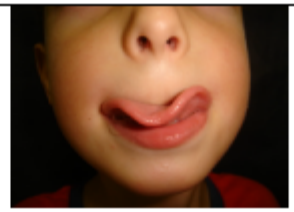
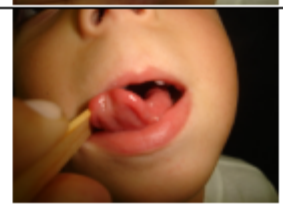
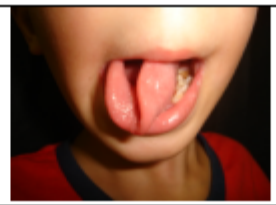
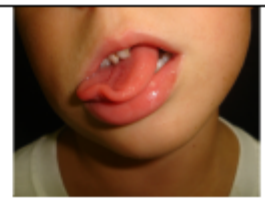
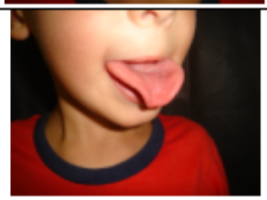
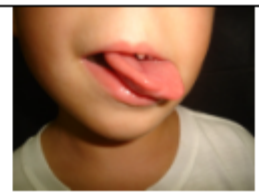
Definition

- Tongue-tie (ankyloglossia) is a **birth defect** in which the tissue that attaches the tongue to the bottom of the mouth (lingual frenulum) is restrictive.
- Movements of the tongue **may be** restricted, **depending on the grade** of attachment to the mouth.
- Tongue-tie is an in**he**rited birth defect. Usually the mother or father or a close relative also had the condition.

http://www.cigna.com/healthinfo/hw183100.html

Familial ankyloglossia

	Grandmother	Daughter	1º grandson	2º grandson	3º grandson
Tongue protrusion					
Tongue elevation					
Tongue on the right side					
Tongue on the left side					
Tongue elevation inside the mouth					

By Roberta Martinelli, 2010

- Ankyloglossia, commonly known as tongue tie, is a **congenital oral anomaly** which may decrease mobility of the tongue tip, and it is caused by an unusual **short, thick lingual frenulum**, a membrane connecting the underside of the tongue to the floor of the mouth.
- Ankyloglossia **v**aries in grade of severity **from mild cases** characte**ri**zed by mucous membrane bands **to complete ankyloglossia** where**b**y the tongue is **te**thered to the floor of the mouth.

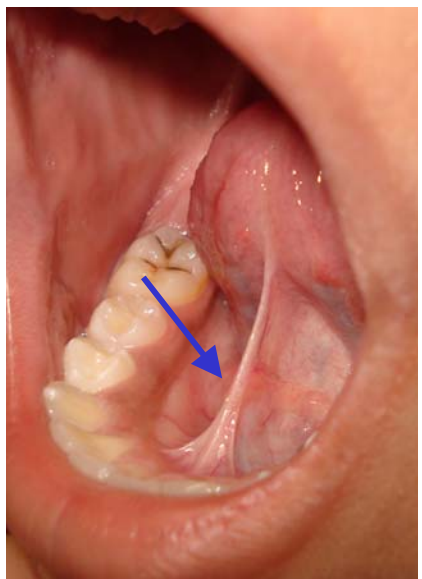
http://en.wikipedia.org/wiki/Ankyloglossia

Frenula normal and altered

Tongue Tie and Frenotomy in the Breastfeeding Newborn

Isabella Knox, MD, EdM
Department of Pediatrics, Division of Neonatology, University of Washington, Seattle, Wash.
NeoReviews Vol.11 No.9 September 2010 e513

"Tongue tie or ankyloglossia has been the subject of much controversy. Tongue tie occurs when a common minor embryologic tissue remnant -- persistence of midline sublingual tissue that usually undergoes apoptosis during embryonic development --causes restriction of normal tongue movement" (Knox, 2010).



Tongue Tie and Frenotomy in the Breastfeeding Newborn
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Terminology

According to Knox, 2010

Frenulum (or frenum): a membranous fold of skin or mucous membrane that supports or restricts the movement of a part of organ.
Persistent lingual frenulum: presence of a frenulum between the underside of the tongue and the floor of the mouth; this does not necessarily cause clinical dysfunction.
Tongue tie: restriction of tongue movement or function by a persistent lingual frenulum. Note that some authors use “tongue tie” to refer to the presence of *any* sublingual tissue. In this article, a clear distinction is made between frenulum tissue, which may be present and in no way interfere with tongue function, and tongue tie, in which the frenulum is restrictive.
Ankyloglossia: synonym for tongue tie.
Frenotomy (or frenulotomy): surgical procedure in which the frenulum is incised.
Frenectomy (or frenulectomy): surgical procedure in which frenulum tissue is excised.

Messner AH, Lalakea ML. Ankyloglossia: controversies in management. Int. J. Pediatr. Otorhinolaryngol. 2000;54 (2-3):123–31.

- Opinion varies, however, regarding how frequently ankyloglossia truly causes problems. Some professionals believe it is rarely symptomatic, whereas others believe it is associated with a variety of problems. The disagreement among professionals was documented in a study by Messner and Lalakea (2000).
- The authors sent a survey to a total of 1598 otolaryngologists, pediatricians, speech-language pathologists and lactation consultants with questions to ascertain their beliefs on ankyloglossia.
- 797 of the surveys were fully completed and used in the study. 69% answered that ankyloglossia is frequently associated with feeding difficulties. The majority of this percentage was lactation consultants and the minority was pediatricians; while 60% of otolaryngologists and 50% of speech pathologists answered that ankyloglossia is sometimes associated with speech difficulties, only 23% of pediatricians had the same answer; 67% of otolaryngologists and 21% of pediatricians answered that ankyloglossia is sometimes associated with social and mechanical difficulties.

- The frenulum consequences are not clear for some professionals.
- We believe that patients who have difficulty to chew and swallow, and mainly a speech disorder, may have frenulum alteration.
- An appropriate protocol will help speech-language pathologists to assess the tongue frenulum.

The reality

- Tongue tie may cause problems in feeding, breastfeeding, oral hygiene, dental health, dental occlusion, tongue mobility, chewing, swallowing, voice, speech and even in self-esteem.
- **Most of the health professionals do not know how they can diagnose the frenulum alteration.**
- Some of these professionals think this problem is not so important because the consequences are not so severe.

Most frequent SLPs doubts about tongue frenulum

1. How can we identify alterations in the tongue frenulum?
2. How can we evaluate these alterations?
3. How can we measure the tongue frenulum?
4. How can we classify the tongue frenulum alterations?
5. How can we be sure that the frenulum has any alteration?
6. What is the damage caused by the frenulum alteration?

Most frequent doubts

7. Can tongue frenulum alterations cause speech problems?
8. Can SLPs solve tongue frenulum alterations? How?
9. Can SLPs elongate the tongue frenulum?
10. What comes first, therapy or surgery?
11. What is the best age to do the surgery?
12. After surgery, is therapy necessary?

What literature says about these questions

- It depends on who answers the questions: physicians, dentists, SLPs or other professionals.
- The literature is controversial about this subject.
- For example, many physicians in Brazil indicate surgery only when the tongue has a heart shape during protrusion.
- This is a mistake, as you can see in the next case.

This is a very short frenulum. The tongue movements are altered, but in any of these photographs you will see a heart shape.

7.8-year-old boy

Why I started studying frenulum

- I have been working with speech since 1978. In 1981, I saw a 6.6-year-old boy. The complaint was an alteration in the phone [s] – frontal lisp.
- When I did the clinical exam and diagnosed him, I realized he had a problem in the tongue frenulum and, probably, this was interfering in his speech.
- Of course, at that time, I was not totally able to classify the frenulum, but I could realize there was a relation between speech and tongue frenulum.

After that case, I started evaluating lingual frenulum, but I did not have a formal protocol

- At first, I searched if there was some lingual frenulum protocol published, and I found one for babies designed by a SLPs during her master degree (Halzelbaker, 1993).
- I also found two other protocols designed by dentists. Both creating methods to measure lingual frenulum (Lee et al, 1989; Kotlow, 1999).
- I designed the first protocol for children and adults in 2004 evaluating oral functions and establishing a quantitative method to classify lingual frenulum as normal or altered (Marchesan, 2005).
- From that protocol I continued researching and designed a new one with scores (Marchesan, 2010).

Halzelbaker, A.K. The assessment tool for lingual frenulum function (ATLFF): Use in a lactation consultant private practice. Pasadena, CA: Pacific Oaks College; 1993. Thesis.

Lee, S.K., Kim, Y.S. & Lim, C.Y. A pathological consideration of ankyloglossia and lingual myoplasty. Taehan Chikkwa Uisa hyophoe Chi. 1989;27:287-308.

Kotlow, L.A. Ankyloglossia (tongue-tie): a diagnostic and treatment quandary. Quintessence International. 1999;30: 259-62.

Marchesan, I.Q. Lingual Frenulum: quantitative evaluation proposal. The International Journal of Orofacial Myology. 2005; 31:39-48.

Marchesan, I.Q. Protocolo de avaliação do frênulo da língua. Rev Cefac. 2010; 12(6):977-89.

The aim of my speech is to present the lingual frenulum protocol with scores, which is divided into two parts

- The first part evaluates the general aspects of the tongue, and the second one evaluates the functional aspects of the tongue.
- The protocol provides scores that will help professionals to identify the frenulum alteration level, and relate the frenulum alteration to the oral function alterations, mainly the speech alterations.

The most important

- All assessments of the tongue frenulum must consider more than one characteristic.
- For example, we can't evaluate the frenulum only by what we see, or only by tongue movements.
- That means a frenulum protocol is very important.

Tongue Frenulum Protocol

History

Clinical Examination

Marchesan, I.Q. Protocolo de avaliação do frênulo da língua. Rev Cefac. 2010; 12(6):977-89.

History

Name: _____ **Gender F ( ) M ( )**

Examination date: __ / __ / __ **Age:** ___ **years and** ___ **months** **Birth:** __ / __ / __

Responsible: _____ **Relative:** _____

Studying: ☐ yes ☐ no Grade:

Working: ☐ yes ☐ no Profession:

Worked before ☐ no ☐ yes Professional Area:

Practicing sports: ☐ no ☐ yes Type:

Address: _____

City **State:** _____ **ZIP:** _____

Phone: Home: (____) _____ Office: (____) _____ Cell: (____) _____

e-mail: _____

Father's name: _____ **Mother's name:** _____

Siblings:

☐ no ☐ yes How many: _____

Who referred patient for evaluation *(Name, specialist, phone)*:

_____

Why?

Main complaint: _____

Other complaints affecting:

(0) no (1) sometimes (2) yes

( ) lips	( ) tongue	( ) sucking	( ) chewing	( ) deglutition
( ) breathing	( ) speech	( ) tongue frenulum	( ) voice	( ) hearing
( ) learning	( ) facial aesthetic	( ) posture	( ) occlusion	( ) headache
( ) TJM clicking	( ) TMJ pain	( ) neck pain	( ) shoulders pain	
( ) mouth opening difficulty	( ) mandible range of motion			( ) Other

Family history – any other relative has frenulum alteration

☐ no ☐ yes Who? Surgery was necessary: ☐ yes ☐ no

Health problems

☐ no ☐ yes What kind:

Breathing problems

☐ no ☐ yes What kind:

Suckling

Breast-feeding:	☐ yes Age: _____	☐ no	The baby had difficult suckling? ☐ no ☐ yes
Bottle:	☐ yes Age: _____	☐ no	What difficulty: _____

Feeding – chewing difficulties

☐ no ☐ yes What:

Feeding – deglutition difficulties

☐ no ☐ yes What:

Oral habits:

☐ no ☐ yes What:

Speech alterations:

☐ no ☐ yes What:

Any social or professional issues due to speech alteration?

☐ no ☐ yes Social ☐ no ☐ yes Response: _____
Professional ☐ no ☐ yes Response:

Voice alteration:

☐ no ☐ yes What:

Frenulum of the tongue surgery:

☐ no ☐ yes When: _____ How many: _____
What professional performed surgery: _____
Results: ☐ good ☐ satisfactory ☐ unsatisfactory

Add other important information_____

CLINICAL EXAMINATION

tongue posture on the floor; asymmetrical tongue; heart shape

tongue protrusion during deglutition; saliva on the inferior lip; heart shape

I – GENERAL TESTS

II – FUNCTIONAL TESTS

I – GENERAL TESTS

Measurements using a caliper. Larger or equal 50,1% (0) – Less or equal 50% (1) FINAL RESULT =

Take measurements from superior right or left incisive to the inferior right or left incisive. Consider the same tooth for all the measurements.	Value in millimeters
Open mouth wide	
Open mouth wide with the tongue tip touching the incise papilla	
Difference between the two measurements, in percentage	%

Alterations during tongue elevation (best result = 0 e worst result = 2) FINAL RESULT =

Open mouth wide; raise the tongue without touching the palate	NO	YES
1. Tip of the tongue's shape: oblong or square	(0)	(1)
2. Tip of the tongue's shape: like a heart	(0)	(1)

Frenulum fixation. Add A and B (best result = 0 e worst result = 3) Final result =

A – Mouth floor:	
Visible only from the sublingual caruncles	(0)
Visible from inferior alveolar crest	(1)

Fixation in another point: _____

B – Sublingual:	
In the middle of the tongue	(0)
Between the middle and the apex of the tongue	(1)
At the apex	(2)

Clinical frenulum classification (best result = 0 e worst result = 2) Final result =

Normal	(0)	Borderline	(1)	Altered	(2)

I – GENERAL TESTS

If the frenulum was considered altered it would be because:

The frenulum seems normal but it is attached between the middle and the apex of the tongue	The frenulum is short	The frenulum is short and it is fixed between the middle and the apex of the tongue
Ankyloglossia (frenulum attached to apex of the tongue)	Another reason	Unsure

General test evaluation total score: best result = 0 worst result = 8

When the score of the general test evaluation is equal or greater than 3, the frenulum may be considered altered.

I – GENERAL TESTS

Measurements using a caliper. Larger or equal 50,1% (0) – Less or equal 50% (1) FINAL RESULT =

Take measurements from superior right or left incisive to the inferior right or left incisive. Consider the same tooth for all the measurements.	Value in millimeters
Open mouth wide	46,00
Open mouth wide with the tongue tip touching the incise papilla	37,55
Difference between the two measurements, in percentage	81,63 %

Marchesan, I.Q. Lingual Frenulum: quantitative evaluation proposal. The International Journal of Orofacial Myology. 2005; 31:39-48.

Calculating the proportion

- Mouth open wide : 46,00 mm
- Mouth open with the tongue touching papilla: 37,55 mm

46,00 -------100%
37,55 -------- X

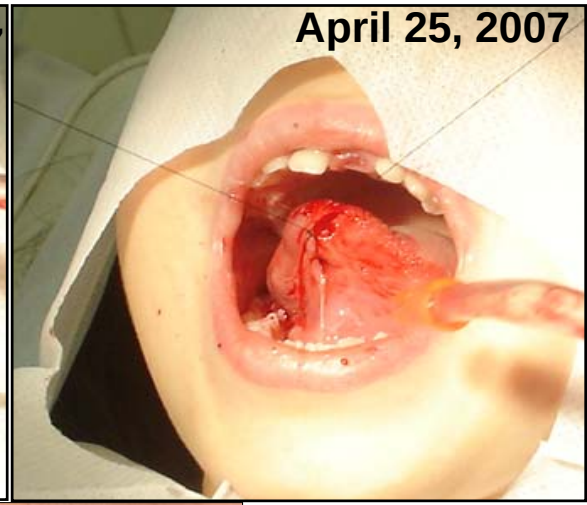
X = 81,63%

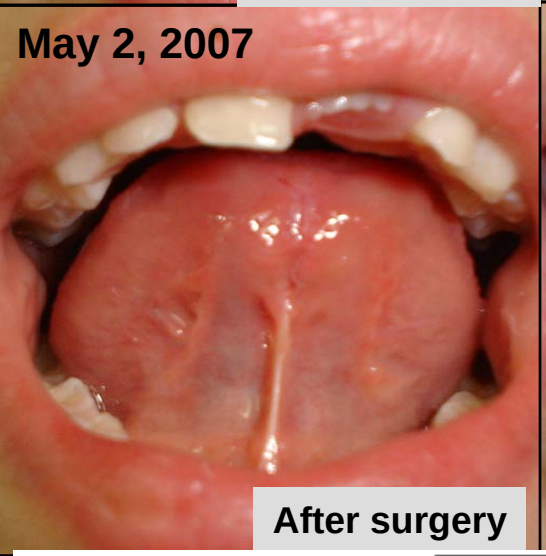
Possible results

- Over 60% = **normal frenulum**
- Under 50% = **abnormal frenulum**
- Between 51% and 59% = **doubt**

Marchesan, I.Q. Lingual Frenulum: quantitative evaluation proposal. The International Journal of Orofacial Myology. 2005; 31:39-48.

Post-surgery data





Measurements	Open Mouth Wide	Tongue touching papilla	Relation between the measurements
Evaluation	30,55	No measurement	No measurement
After 18 therapies	41,80	21,80	52,15
One week after surgery	41,18	19,28	46,82
After one month	42,22	31,17	73,83

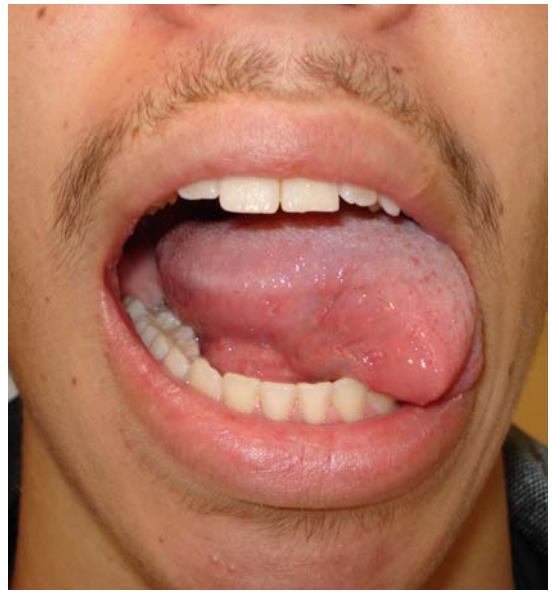
C.K.R.S.
16.10-year-old boy
Main complaint: speech
Short and anterior frenulum

MEASUREMENT	Open mouth wide	Tongue tip touching the incise papilla	Difference between the two measurements
Before frenectomy	Impossible to measure	Impossible to measure	Impossible to measure
One month after frenectomy	**58,53**	**29,35**	**50,14**
6 months after frenectomy	**56,82**	**40,13**	**70,62**

Before frenectomy
October 31, 2008

6 months after frenectomy
May 13, 2009

Before frenectomy October 31, 2008

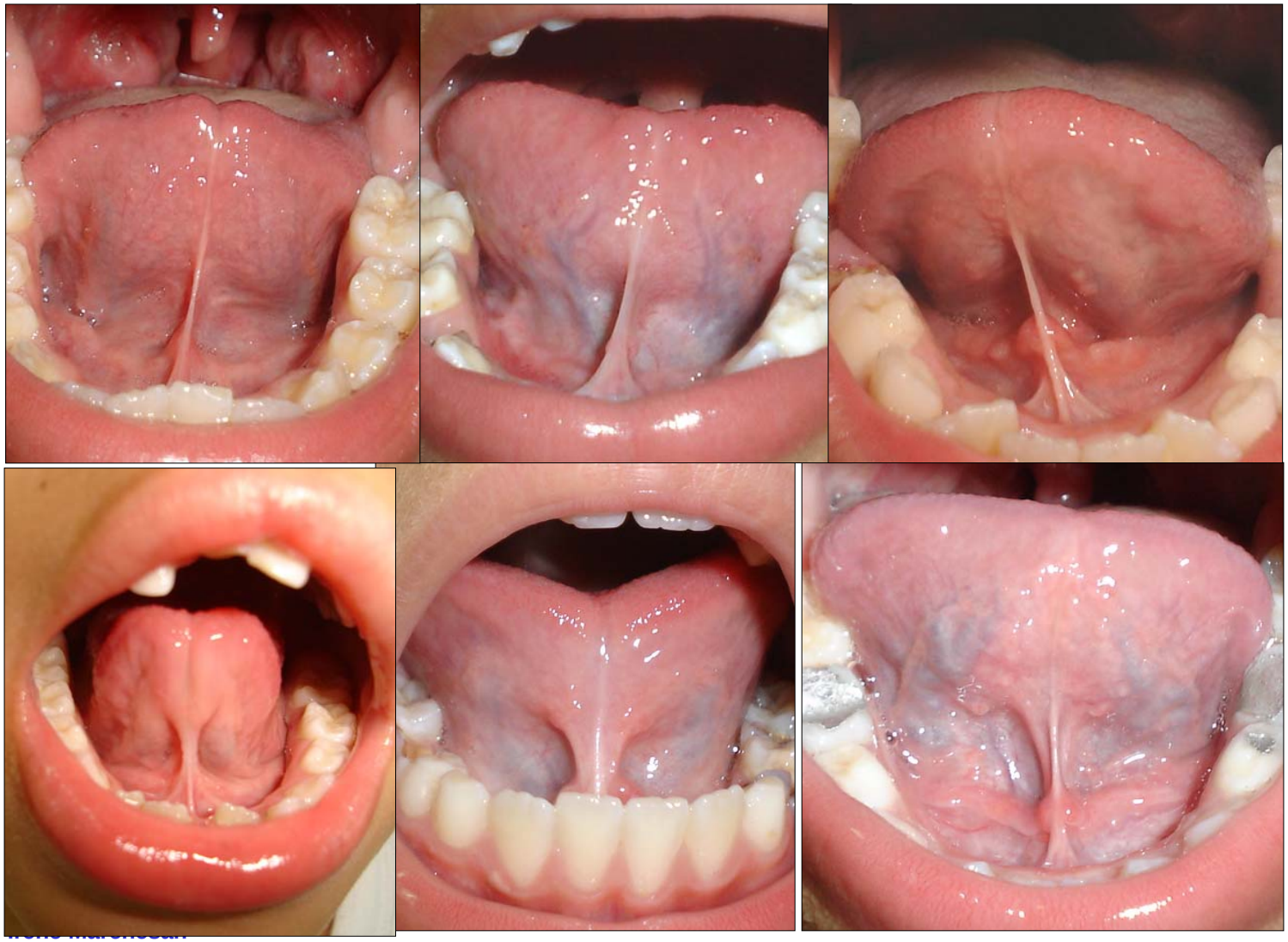


6 months after frenectomy May 13, 2009

Alterations during tongue elevation (best result = 0 e worst result = 2) FINAL RESULT =

Open mouth wide; raise the tongue without touching the palate	NO	YES
1. Tip of the tongue's shape: oblong or square	(0)	(1)
2. Tip of the tongue's shape: like a heart	(0)	(1)

altered



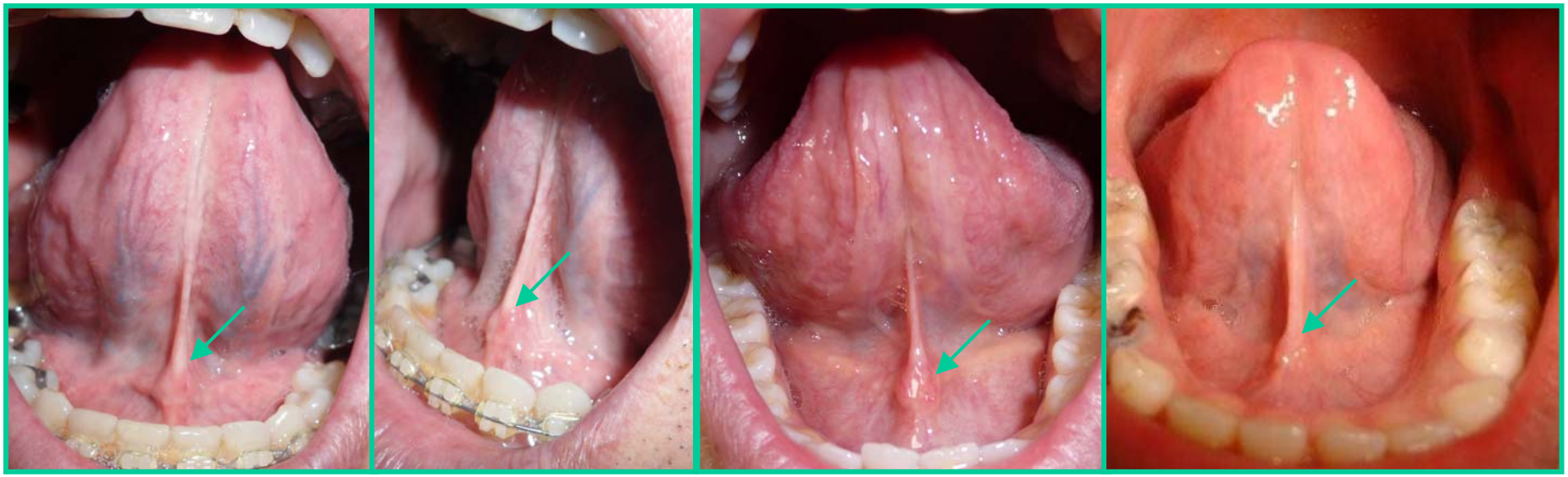
normal

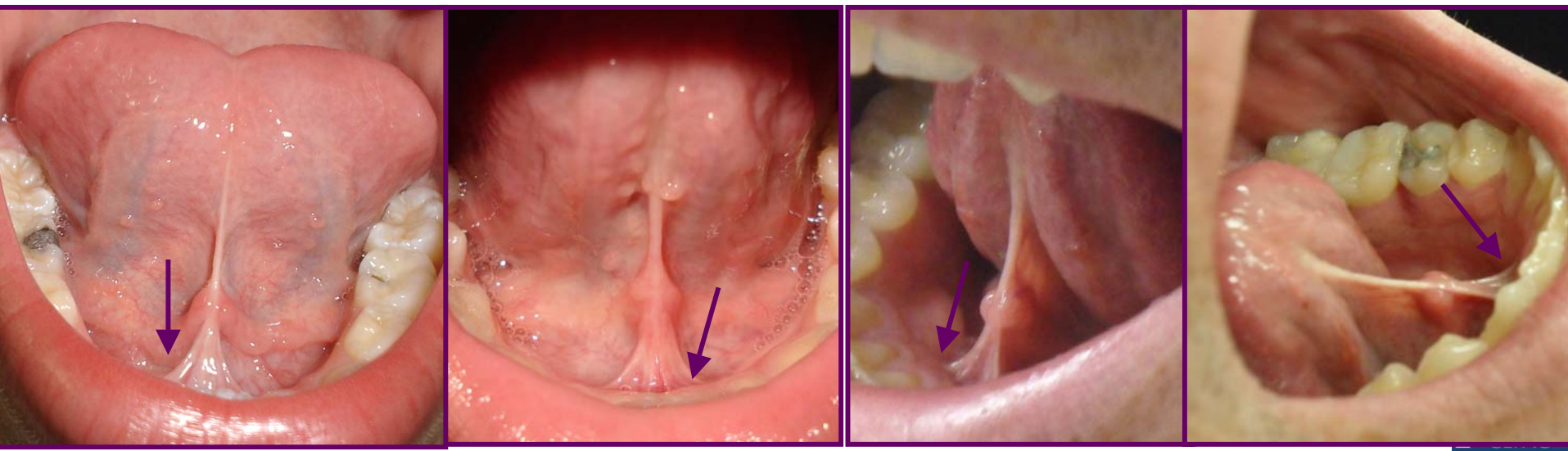
To see the heart shape it is better to raise the tongue than to protrude

Frenulum fixation. Add A and B (best result = 0 e worst result = 3) Final result =

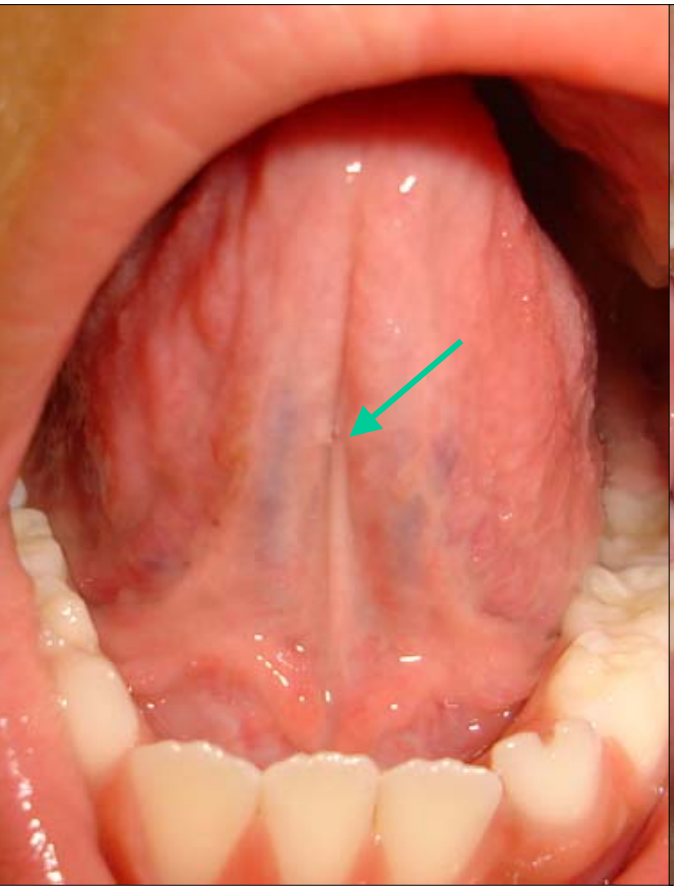
A – Mouth floor:	
Visible only from the sublingual caruncles	(0)
Visible from inferior alveolar crest	(1)

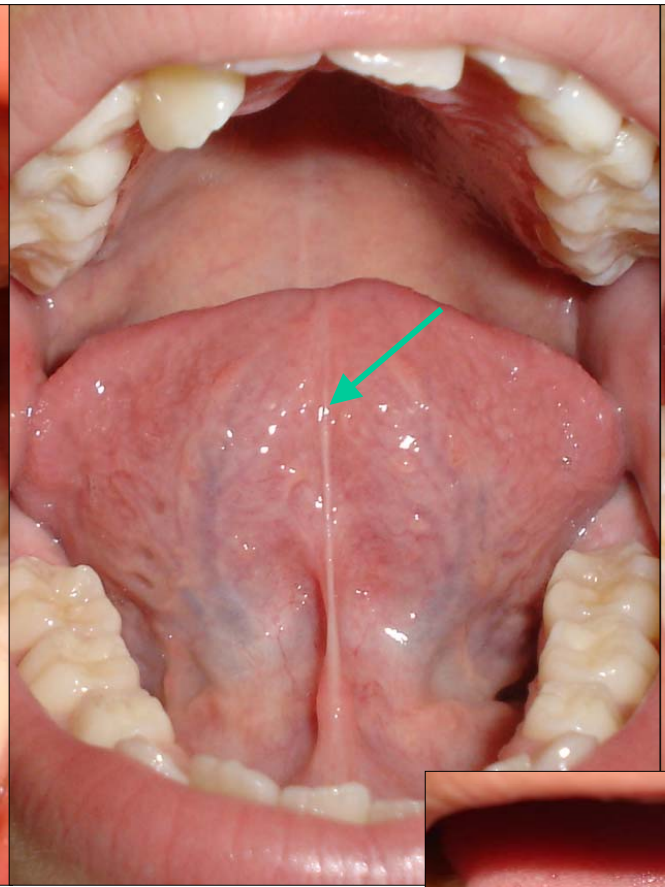
Fixation in another point: _____

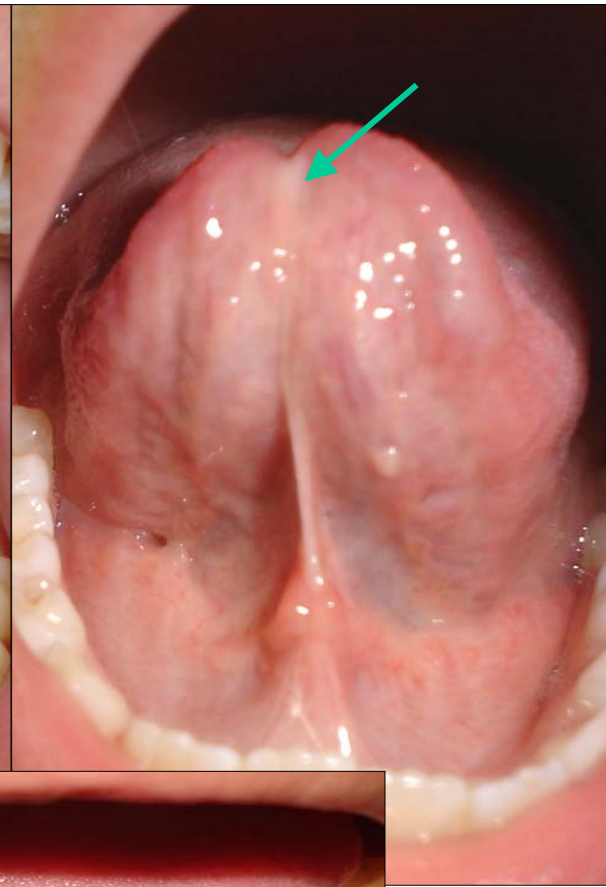




B – Sublingual:	
In the middle of the tongue	(0)
Between the middle and the apex of the tongue	(1)
At the apex	(2)

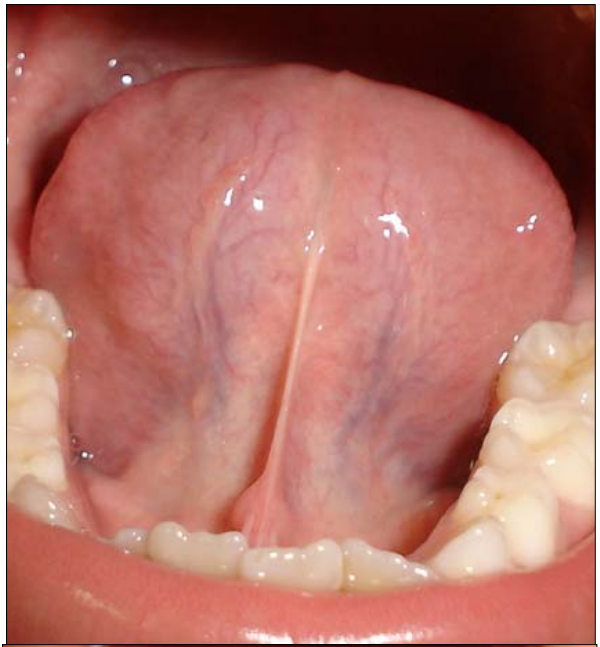


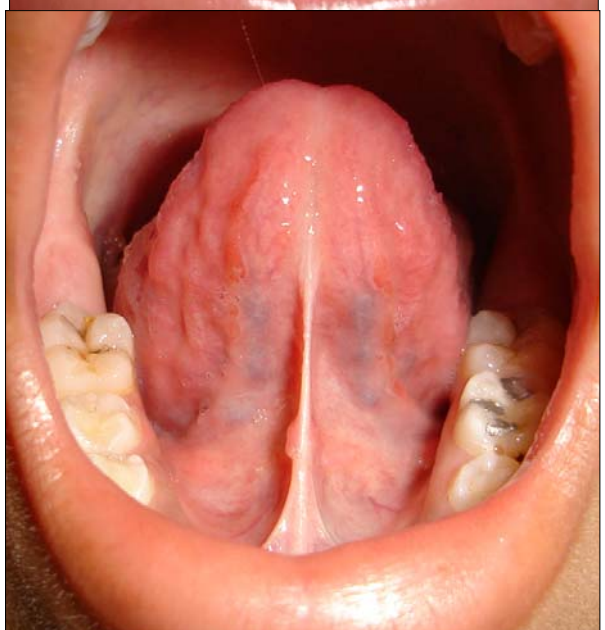




Clinical frenulum classification (best result = 0 e worst result = 2) Final result =

Normal (0)	Borderline (1)	Altered (2)





Examples of different frenulum types

(A) **Normal:** it is attached from underneath the tongue to the floor of the mouth. In general, the frenulum is visible from the tongue down to the saliva caruncles.

(B) **Anterior:** when the frenulum is attached, underneath the tongue, at any point between the tongue midpoint and the apex.

(C) **Short:** it is attached underneath the tongue, as in the normal frenulum, but it is shorter than normal. In general, the frenulum is still visible underneath the tongue touching the alveolar crest.

(D) **Short and anterior:** a combination of (B) and (C).

(E) **Ankyloglossia:** when there is lack of, or minimal lingual frenulum, or the frenulum is attached to the apex of the tongue so that the tongue movements are very much limited.

Normal: it is attached from underneath the tongue to the floor of the mouth. In general, the frenulum is visible from the tongue down to the saliva caruncles.

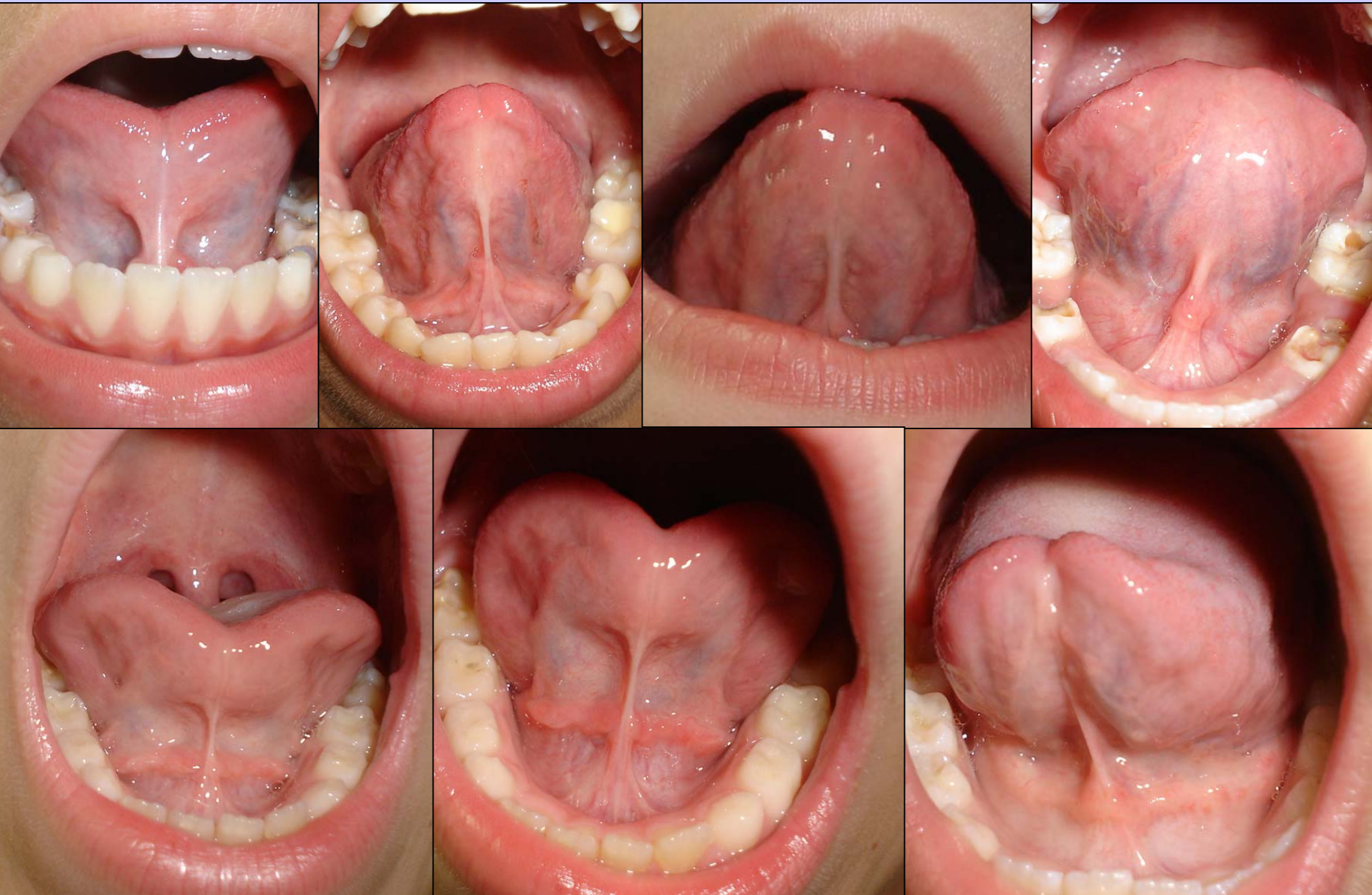




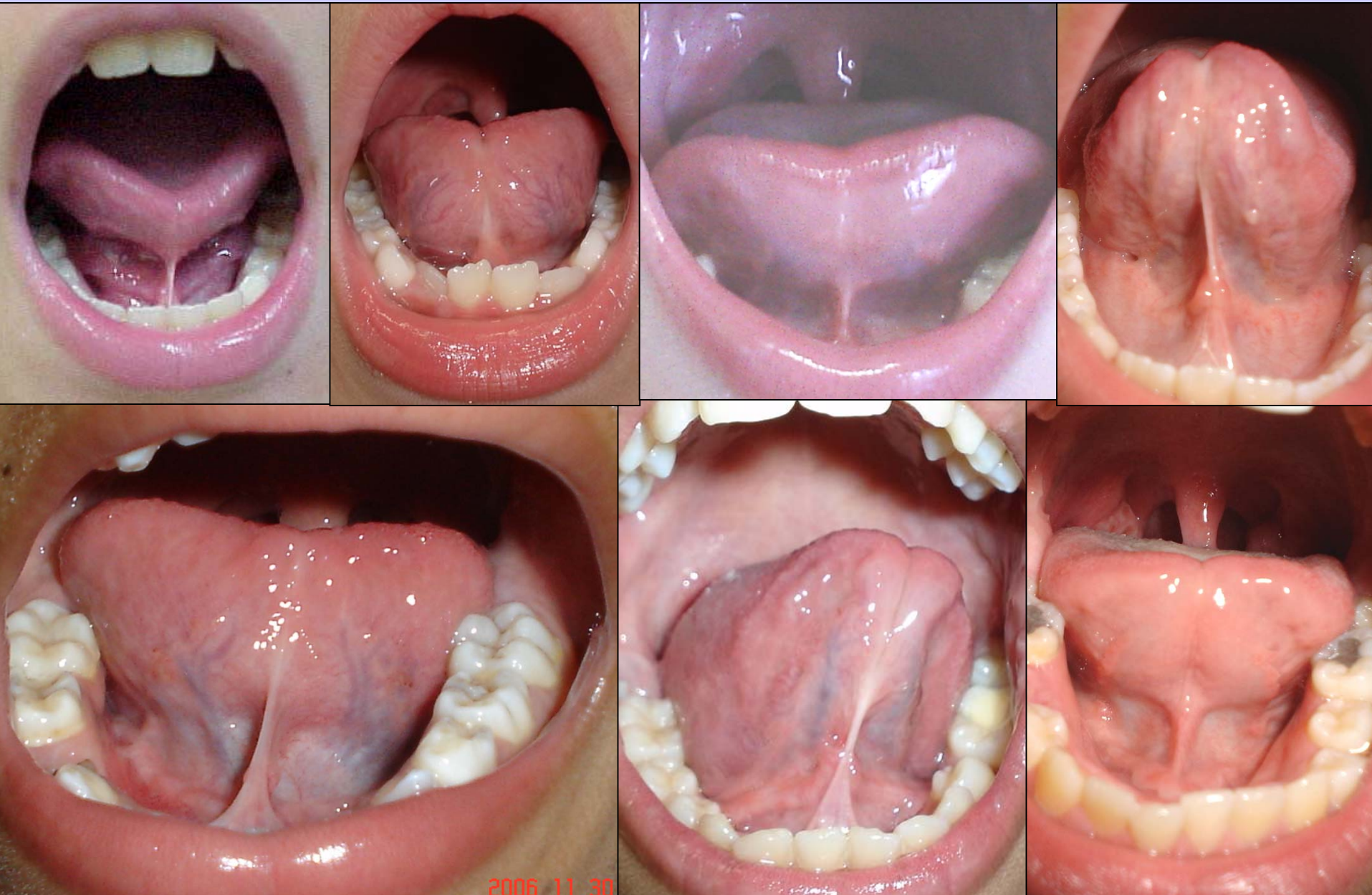
As we can see, there are different patterns of normality

Anterior: when the frenulum is attached, underneath the tongue, at any point between the tongue midpoint and the apex.

Short: it is attached underneath the tongue, as in the normal frenulum, but it is shorter than normal. In general, the frenulum is still visible underneath the tongue touching the alveolar crest.



Short and anterior: a combination of both



Ankyloglossia: when there is lack of, or minimal lingual frenulum, or the frenulum is attached to the apex of the tongue so that the tongue movements are very much limited.

II - FUNCTIONAL TESTS

Tongue mobility (best result = 0 e worst result = 14). Final result =

	Successful	Partially successful	Unsuccessful
Protrude and retract	(0)	(1)	(2)
Touch the upper lip with the apex	(0)	(1)	(2)
Touch the right commissura labiorum	(0)	(1)	(2)
Touch the left commissura labiorum	(0)	(1)	(2)
Touch U&L molars	(0)	(1)	(2)
Apex vibration	(0)	(1)	(2)
Sucking against the palate	(0)	(1)	(2)

Tongue position during rest (best result = 0 e worst result = 4). Final result =

Not visible	(0)
On the floor of the mouth	(1)
Protrudes between the teeth	(2)
Laterally protrudes between teeth	(2)

Tongue mobility (best result = 0 e worst result = 14). Final result =

	Successful	Partially successful	Unsuccessful
Protrude and retract	(0)	(1)	(2)
Touch the upper lip with the apex	(0)	(1)	(2)
Touch the right commissura labiorum	(0)	(1)	(2)
Touch the left commissura labiorum	(0)	(1)	(2)
Touch U&L molars	(0)	(1)	(2)
Apex vibration	(0)	(1)	(2)
Sucking against the palate	(0)	(1)	(2)

Something very important about the tongue lateralization at right and left comissura labiorum.

In a research entitled **“Other features that may help lingual frenulum assessment”,** done with 107 children from a public school from, 6.6 to 10.7 years old, we saw that subjects identified as altered frenula had greater percentage of asymmetrical lateralization when compared with the subjects considered as having normal lingual frenula. Thus, tongue and its lateralization may help dispel doubts about the normality of the lingual frenula during their assessment.

Results	TONGUE LATERALIZATION	
	Symmetric	Asymmetric
Normal frenulum 58,9% (63)	52,4% (33)	47,6% (30)
Altered frenulum 41,1% (44)	31,8% (14)	68,2% (30)

Altered frenulum and asymmetric lateralization

Marchesan, I.Q.; Costa, M.L.V.C.M. Other features that may help lingual frenulum evaluation. In: Annals from 39ª Convention International Association of Orofacial Myology IAOM and 1º Orofacial Myology International Congress. São Paulo – Brazil. August, 2010.

Tongue position during rest (best result = 0 e worst result = 4). Final result =

Not visible	(0)
On the floor of the mouth	(1)
Protrudes between the teeth	(2)
Laterally protrudes between teeth	(2)










II - FUNCTIONAL TESTS

Speech (best result = 0 e worst result =12) Final result =

Test 1 – Informal speech
e.g.: What is your name? How old are you? Do you study/work? Tell me about your school/work. Tell me about something interesting.
Test 2 – Ask to count from 1 to 20. Ask to say the days of the week. Ask to say the months of the year.
Test 3 – Ask to name the pictures from the picture table

Speech tests	Omission		Substitution		Distortion	
	No	Yes	No	Yes	No	Yes
1	(0)	(1)	(0)	(1)	(0)	(2)
2	(0)	(1)	(0)	(1)	(0)	(2)
3	(0)	(1)	(0)	(1)	(0)	(2)

Check for which sound there is omission or substitution or distortion

p		t		k		b		d		g			m		
n		ɳ		f		s		x		v			z		
j		l		ʎ		r		rr		{S}	{R}		tl		
pr	br	tr	dr	cr	gr	fr	vr	pl	bl	cl	gl		fl	vl	

If the alteration occurs in only one or two tests, identify in which test there was alteration

Picture Table for the speech evaluation

Table with the words for speech evaluation

Picture	Patient production	Picture	Patient production
Clock		Cockroach	
Pencil		Strawberry	
Cat		Giraffe	
Dice		Door	
Bird		Rabbit	
Sofa		Lion	
Scissors		Plate	
House		Train	
Bike		Dragon	
Star		Letter	
Truck		License plate	
Eye		Arrow	
Key		Blouse	
Airplane		Flute	
Butterfly		Radio	
Dog		Car	
Phone		Zebra	
Flower		Blue wing	
Gift		Umbrella	
Alligator		Fish	
Hammer		Horse	
Cross		Ladybug	
Grass		Chicken	
Owl		Crown	
Athlete		Globe	

II - FUNCTIONAL TESTS

Other aspects to be observed during speech (best result = 0 e worst result =10) Final result =

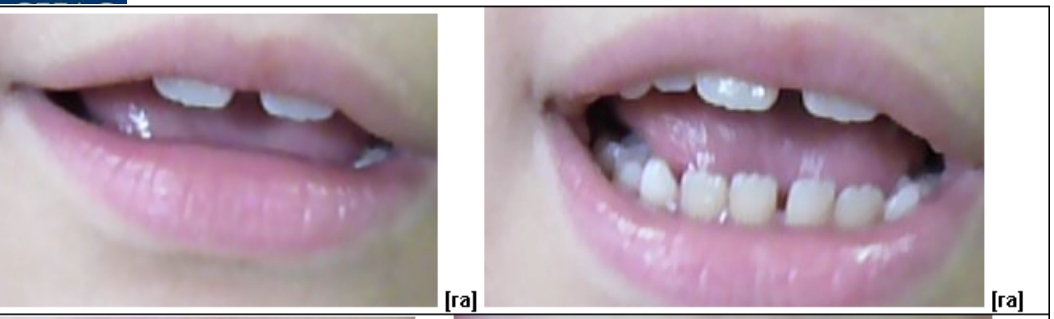
Mouth opening:	(0) adequate	(1) reduced		(1) open wide
Tongue position:	(0) adequate	(1) on the floor	(2) protruded	(2) visible sides
Mandible movements:	(0) no alteration	(1) right displacement	(1) left displacement	(1) forth displacement
Speed:	(0) adequate	(1) increased	(1) reduced	
Speech precision:	(0) adequate		(1) altered	
Voice:	(0) no alteration		(1) altered	

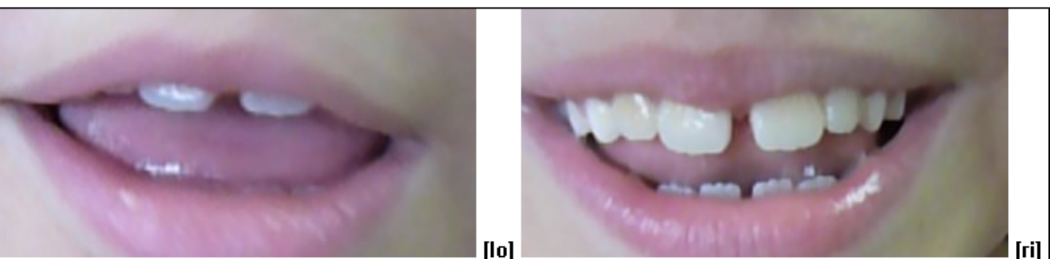
Functional assessment total score: best result = 0 and worst result = 40

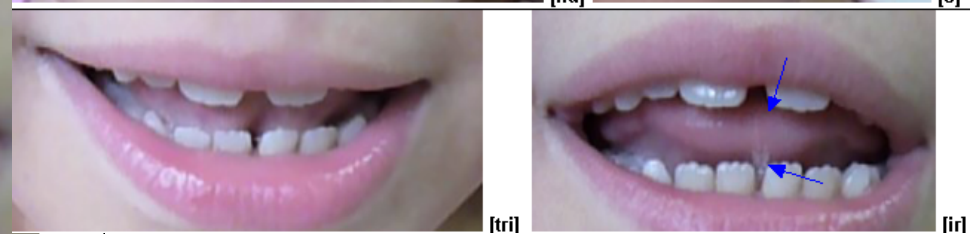
Lips and mandible movements during speech

Irene Marchesan

The tongue movements during speech







Functional assessment total score: best result = 0 and worst result = 40

Tongue mobility (best result = 0 e worst result = 14).

Tongue position during rest (best result = 0 e worst result = 4).

Speech (best result = 0 e worst result =12).

Other aspects to be observed during speech (best result = 0 e worst result =10).

When the score of the functional assessment is equal or greater than 25, the frenulum may be considered altered.

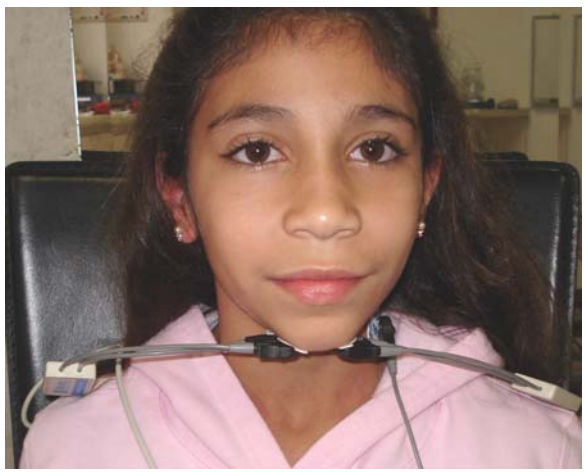
Documentation:
Photography and video of tongue mobility and speech assessment

Other speech assessment procedures

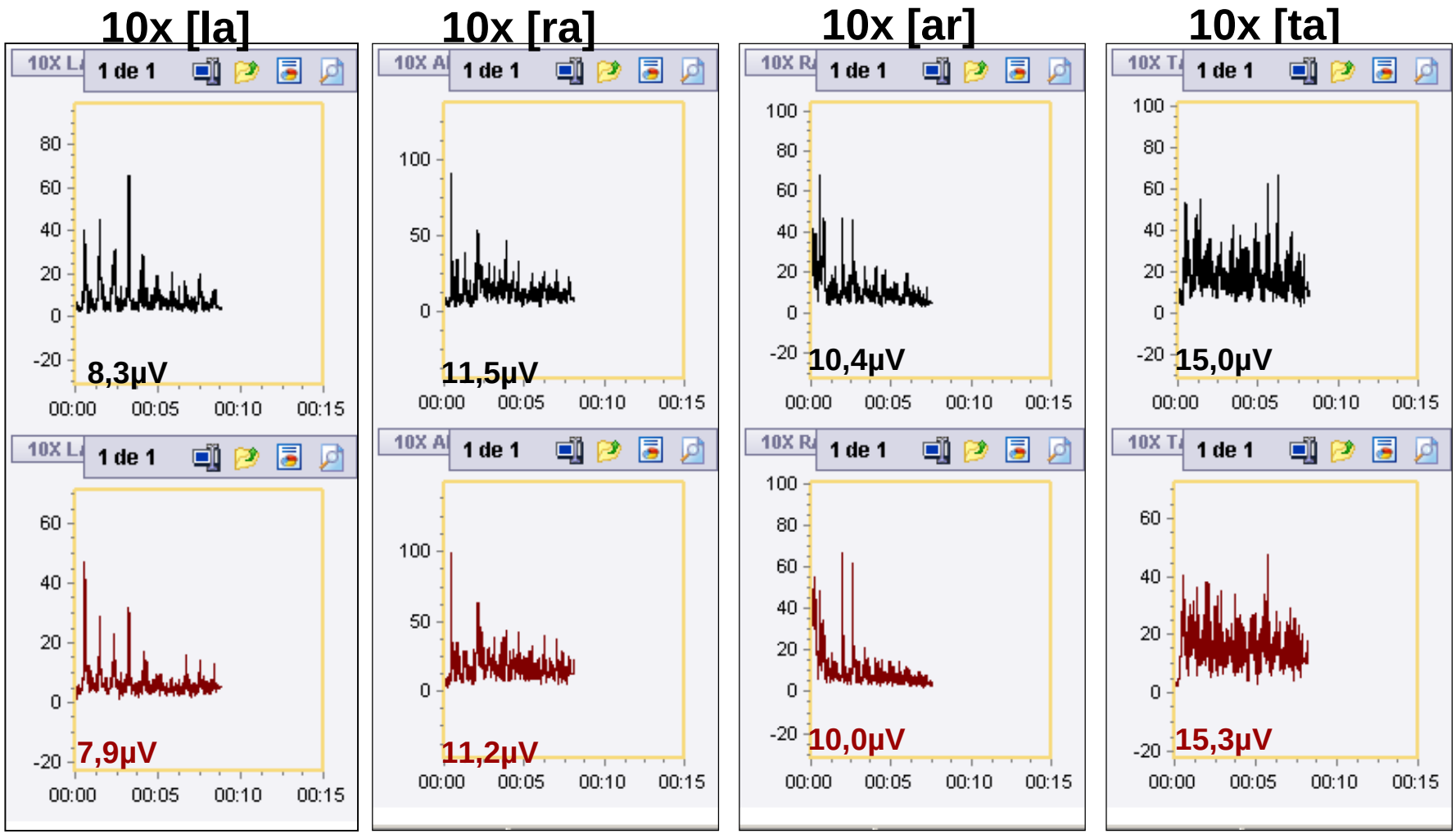
- When the frenulum is altered, the speech may or may not be altered
- In some patients we realize the speech alteration through auditory perception
- In other patients we have the feeling that “something” is different, but it is difficult to detect exactly what it is
- Because of that, we began to do electromyography and acoustic analysis in all the patients with frenulum alteration

Electromyography

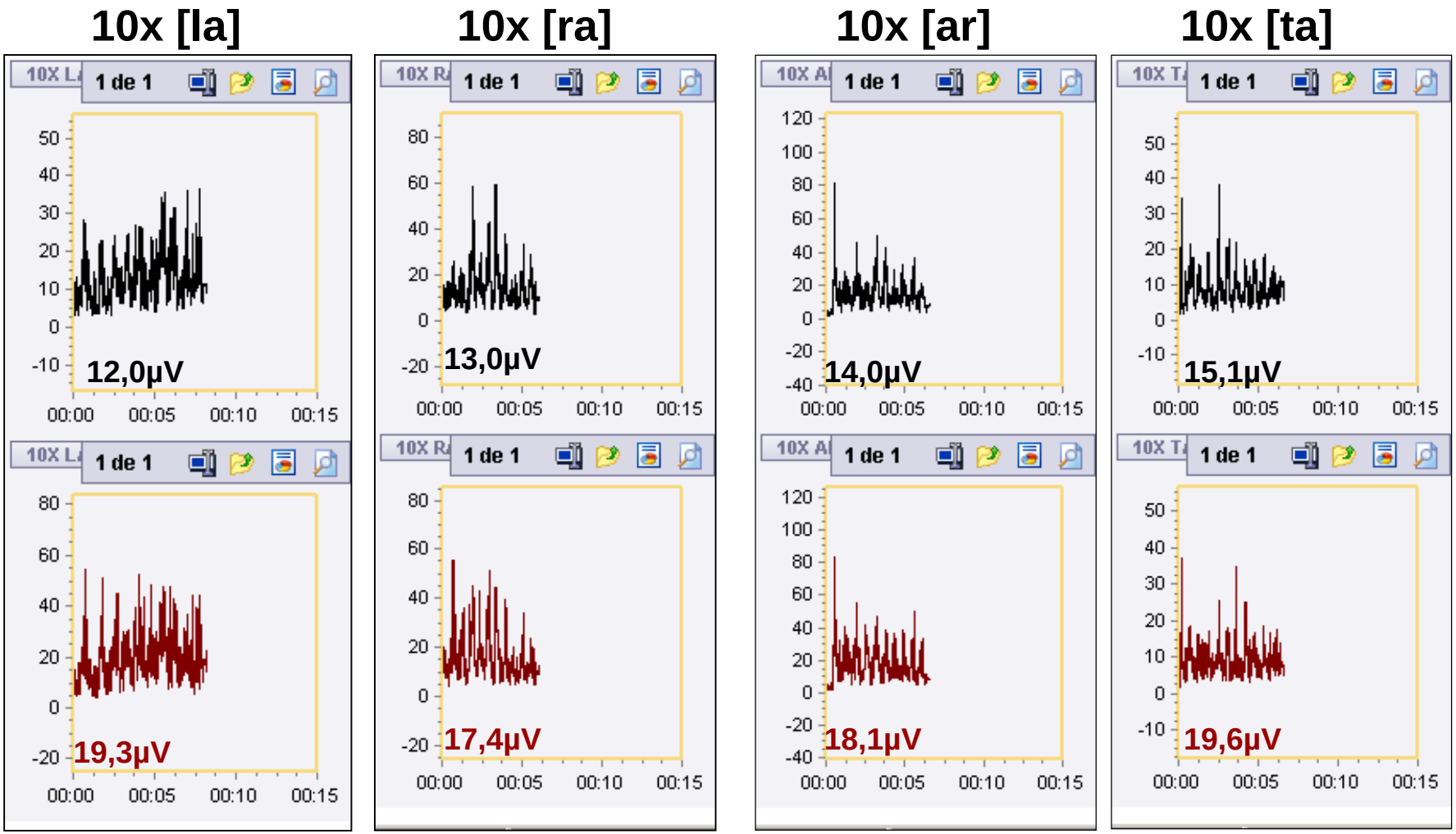
- The electrodes are placed externally at the supra-hyoid muscle to evaluate the electric activity;
- The patient is requested to repeat 10 times each of these following syllables: [ʃa], [la], [aR], and [ta];
- After the exam: the graph obtained is analyzed and the average electrical activity between the right and left sides supra-hyoid muscle is compared.



Patient with normal frenulum



Patient with altered frenulum



Results

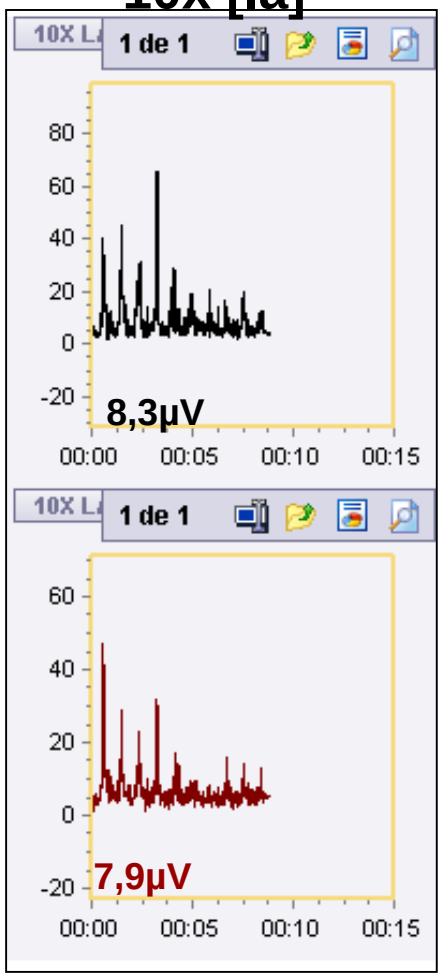
In the exams, we have observed the following differences in people with altered frenulum:

1. **more peaks on the graph, probably demonstrating more effort to produce the syllables.**
2. **the average electrical activity between the right and left sides supra-hyoid muscle is very different, probably demonstrating difference between the tongue sides.**

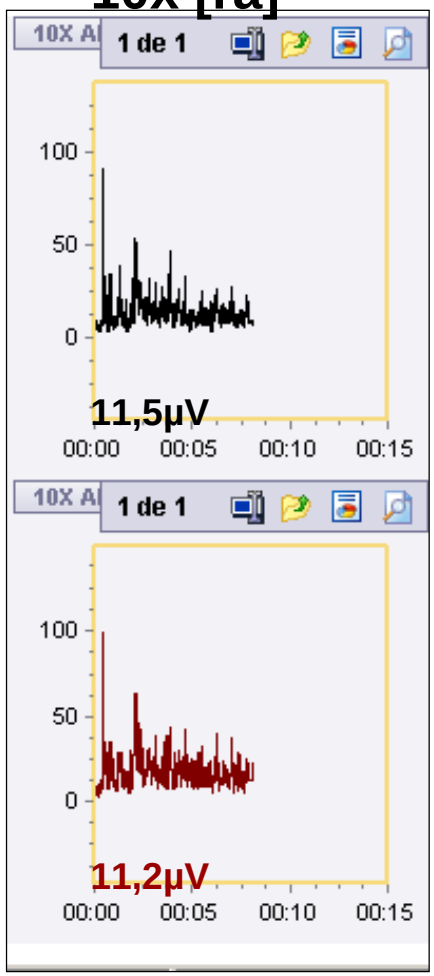
Comparing the EMG in patient with normal and altered frenulum

Normal frenulum

10x [la]

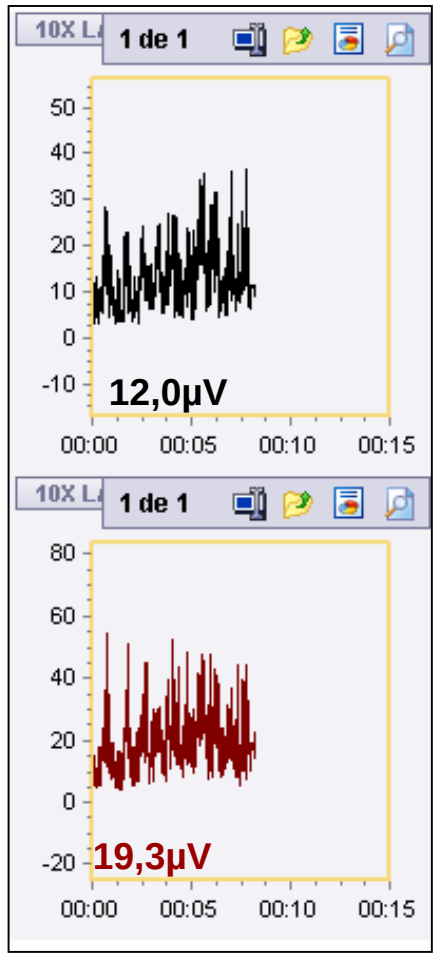


10x [ra]

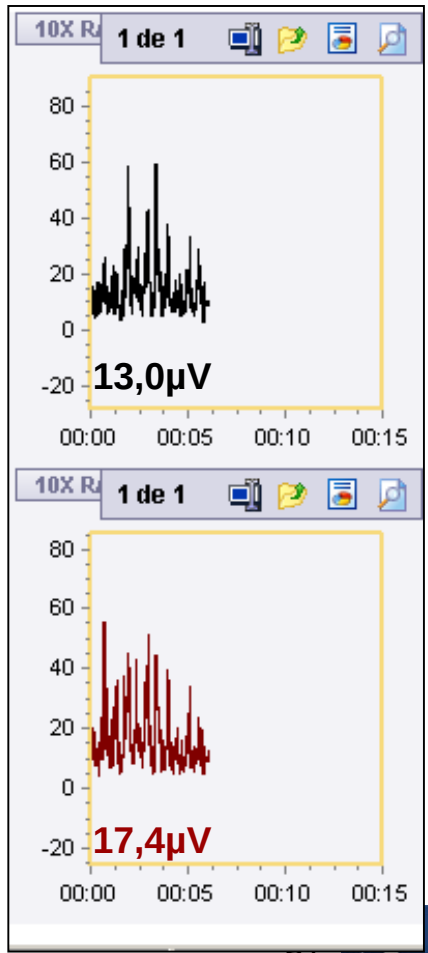


Altered frenulum

10x [la]



10x [ra]



Acoustic analysis of speech

A tool that allows to:

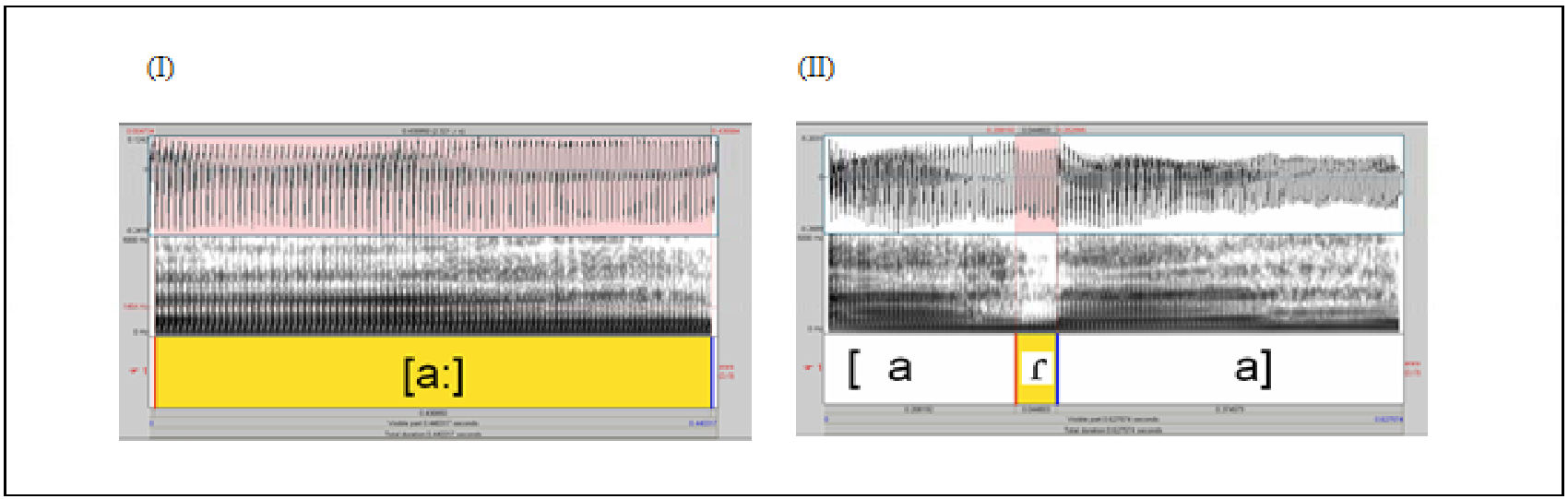
– evaluate compensatory strategies detected in speech signal;

– follow the evolution in therapy by means of non-invasive techniques of speech assessment,

– develop rehabilitation strategies by means of real time acoustic analysis technologies;

– establish correlation between speech producution and perception.

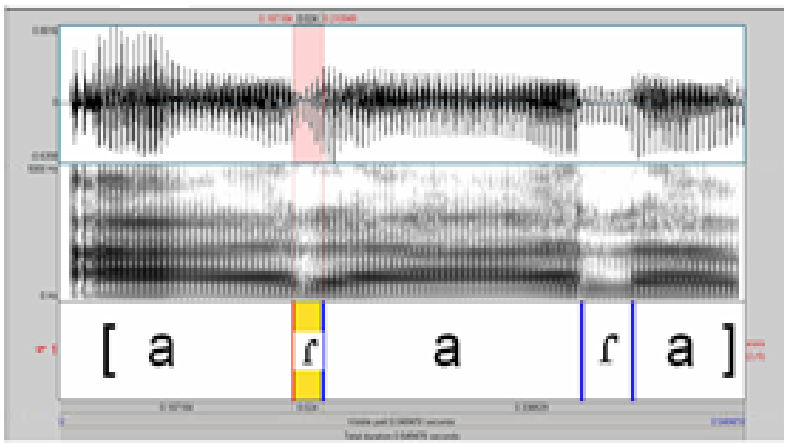
Waveform and wide-band spectrograms of the production of the word “arara” in the pre-operative (I) and post-operative (II) stages in a case of lingual frenectomy.



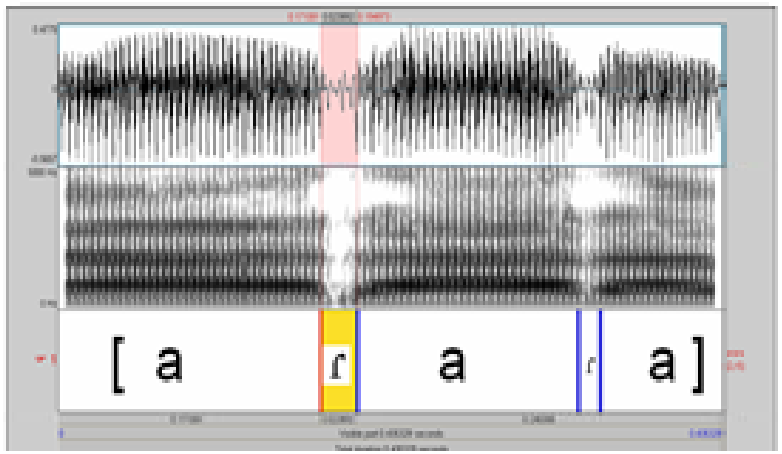
No[ɾ] signs in the pre-operative, only in the post-operative

Waveform and wide-band spectrograms of the productions of the word “arara” in the pre-operative (I) and post-operative (II) stages in a case of lingual frenectomy

(I)



(II)



The patient had |ɾ] signs in pre-operative and this sign improved in the post-operative

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Part of CEFAC's team

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