

Ankyloglossia-related changes in the stomatognathic system

Anquiloglossia: ocorrência de alterações do sistema estomatognático

Marcela Forgiarini MORISSO¹
Luana Cristina BERWIG¹
Ana Maria Toniolo da SILVA¹

ABSTRACT

Objective

This study investigated the occurrence and frequency of changes in the stomatognathic system of patients with ankyloglossia.

Methods

A total of 1516 patients aged 5 to 16 years, of both genders, attending public schools or seen at the Speech and Language Therapy Service of the Federal University of Santa Maria were screened for ankyloglossia. A pediatric dental surgeon was responsible for the diagnoses. Children diagnosed with ankyloglossia were then submitted to speech-language and orthodontic assessments.

Results

Only 21 of the 1516 screened patients were diagnosed with ankyloglossia, which prevailed in males and children aged 5 to 6 years and 11 to 12 years. Changes in tongue resting position, tongue mobility, deglutition and articulation were found in most children. The most common orthodontic change was Class I malocclusion but Class III malocclusion and diastema of the lower incisors were also found.

Conclusion

Ankyloglossia is a rare tongue condition, more common in males, and may affect the structures and functions of the stomatognathic system.

Indexing terms: Lingual frenum. Stomatognathic system. Tongue. Tongue diseases.

RESUMO

Objetivo

Verificar a ocorrência de alterações do sistema estomatognático em pacientes com anquiloglossia.

Métodos

Foram triados 1 516 pacientes, com idades entre 5 e 16 anos, de ambos os sexos, provenientes de escolas municipais e estaduais ou que passaram pelo setor de triagem do Serviço de Atendimento Fonoaudiológico da Universidade Federal de Santa Maria. O diagnóstico de anquiloglossia foi realizado por um odontopediatra, por meio de exame clínico. Após o diagnóstico, os pacientes eram encaminhados para as avaliações fonoaudiológica e ortodôntica.

Resultados

Dos pacientes triados, 21 apresentaram diagnóstico de anquiloglossia, sendo que houve prevalência no sexo masculino e nas faixas etárias dos 5 aos 6 anos e dos 11 aos 12 anos. A maioria apresentou alterações na postura e mobilidade lingual, bem como nas funções de deglutição e fonoarticulação. Na classificação da oclusão a mais frequente foi a Classe I, sendo que a Classe III e o diastema interincisal inferior tiveram menor ocorrência entre os pacientes.

Conclusão

A anquiloglossia é uma anomalia lingual rara, mais frequente no sexo masculino e que causa alterações nas estruturas e funções do sistema estomatognático.

Termos de indexação: Freio lingual. Sistema estomatognático. Língua. Doenças da língua.

¹ Universidade Federal de Santa Maria, Departamento de Fonoaudiologia. Av. Roraima, 1000, Cidade Universitária, Camobi, 97105-900, Santa Maria, RS, Brasil. Correspondência para / Correspondence to: MF MORISSO. E-mail: mforgia@gmail.com.

INTRODUCTION

The lingual frenulum is a structure of the tongue. It is defined as a median fold of mucous membrane that extends from the floor of the mouth to the underside of the tongue and consists of dense connective tissue and, occasionally, of the superior fibers of the genioglossus¹⁻². Ankyloglossia is characterized by a short lingual frenulum, popularly known as tongue-tie³⁻⁴.

Ankyloglossia is a congenital oral anomaly characterized by a short lingual frenulum. This anomaly limits the movements of the tongue to varying degrees, depending on the frenulum attachment location⁵.

Ankyloglossia may be complete or partial. Partial ankyloglossia is more common than complete, which is very rare⁶. The difference between complete and partial ankyloglossia is that in the former, the tongue is completely fused to the floor of the mouth, and in the latter, only partially fused⁷. A very short frenulum or one very close to the tip of the tongue characterizes partial ankyloglossia¹.

There has been controversy about this tongue anomaly for many years. Frenectomy indication criteria depend on the expert's profession and knowledge about the condition².

Frenectomy is a surgical procedure normally done by ear, nose and throat (ENT) specialists or dental surgeons. Speech-language therapists examine the characteristics of the lingual frenulum, lingual mobility, suction (especially in newborns), mastication, deglutition and speech. The results of this examination will determine the course of action, which may be speech-language therapy, more detailed examination and/or frenectomy².

This study investigated the occurrence and frequency of stomatognathic changes associated with ankyloglossia.

METHODS

A total of 1526 children and adolescents aged 5 to 16 years, of both genders, attending municipal and state schools in the city of Cachoeira do Sul, Rio Grande do Sul, or seen at the Federal University of Santa Maria Speech and Language Therapy Service (SAF-UFSM), were screened for ankyloglossia. Individuals with a history of frenectomy or speech and language therapy were excluded and the remainder, 21 subjects, 16 males and

5 females, diagnosed with ankyloglossia were included after their caregivers signed a free and informed consent form.

Ankyloglossia was diagnosed by a pediatric dental surgeon. The children were asked to suction their tongues flat to the hard palate and open their mouths to expose the lingual frenulum. When the child was unable to do so, a wooden spatula was used to elevate the tongue to the hard palate. The children were also asked to protrude their tongues. These procedures verified the children's ability to suction and/or touch the hard palate with their tongues with their mouths open and the degree of tongue protrusion⁸⁻⁹. The lingual frenulum was classified as short if the children were fully or partially unable to comply¹⁰.

Once the children were diagnosed, they were sent to a speech and language therapist for assessment of the stomatognathic system, based on Ferraz's¹¹ considerations. The assessment followed SAF-UFSM recommendations, which includes examining the stomatognathic system for structural and functional changes and recording them.

The following structures and features were examined: posture, cheek tension and mobility, lips and tongue. Abnormal resting positions of the tongue included low resting position (resting within the lower arch) or forward resting position (tip touching lower incisors). Tongue tension was considered inappropriate when the tongue was usually low or forward, or did not have the strength to push away a wooden spatula when the spatula was gently pushed against the tongue. Tongue mobility was considered low when the child could not competently elevate, lower, move sideways, protrude or retract the tongue or make clicking noises¹¹.

Functions of the stomatognathic system relevant to this study were suction, mastication, deglutition and articulation. Suction was determined by the child's ability to drink water with a straw. Suction was considered inadequate when the child had difficulty suctioning, protruded the tongue, contracted the mentalis and/or did not suck in cheeks. Mastication was assessed using corn starch cookies and considered inappropriate when the food was mostly chewed on only one side, lips were not sealed, orbicularis oris muscle moved excessively, chewing was too quick or too slow and/or food was squeezed against the hard palate. Deglutition was assessed by sprinkling water under the child's tongue. Deglutition was considered abnormal when the tongue moved forward and/or laterally, orbicularis oris muscle contracted excessively, head made compensatory movements, lower lip interposed, mentalis muscle contracted, and/or noise was produced. Articulation was assessed by asking the child to

repeat phonetically balanced words without visual clues. The following were considered abnormal: interdentalization (lisp), distortion of the phoneme /r/ and changes in tongue position when pronouncing the phonemes, that is, articulation using the lower incisors¹¹. The children's speech was recorded with the digital recorder Panasonic RR-US380 should there be any doubts. This study only considered articulation disorders, not language disorders.

After speech-language assessment, the patients were assessed by an expert orthodontist. The assessment checked for diastema between the lower incisors and classification of occlusion. Deciduous dentition classification was based on deciduous canine relationship, as suggested by Foster & Hamilton¹². Assessment of mixed and permanent dentitions followed Angle's¹³ classification, that is, the relationships between the first permanent molars. Class I occlusions without deviations were considered appropriate.

Once all the assessments were made, patients who had two or more of the following features were considered candidates for frenectomy, as suggested by Navarro & López¹⁴: articulation disorders, diastema between the lower incisors due to a short frenulum, partial or total inability to rest the tongue against the hard palate, changes in the normal mandibular growth pattern.

The changes found in all 21 participants were tabulated as absolute and relative frequency distributions.

This study is part of a project of the UFSM orofacial motricity division and was approved by the local Research Ethics Committee under protocol number 23081.015493/2008-91.

RESULTS

Ankyloglossia was more common in males aged 5 to 6 years and 11 to 12 years (Table 1).

Most patients had a forward tongue position (85.72%), normal tongue tension and low tongue mobility (85.71%) (Table 2).

The most affected functions of the stomatognathic system were deglutition and articulation, found in 80.95% and 95.24% of the patients, respectively (Table 3).

The most common articulatory change was lingual interdentalization (lisp), found in 76.19% of the patients (Figure 1).

Class I malocclusion was found in 71.42% of the study sample and diastema of the lower incisors in 14.28% (Table 4).

According to assessments made by a pediatric dental surgeon, speech and language therapist and orthodontist found that 42.85% of the patients were candidates for frenectomy (Figure 2).

Table 1. Absolute and relative distributions of gender and age group (n=21).

| Variables | Subjects with ankyloglossia | |
|--------------|-----------------------------|--------------|
| | Absolute (n) | Relative (%) |
| Gender | | |
| Male | 16 | 76.19 |
| Female | 5 | 23.81 |
| Age group | | |
| 5y - 6y11m | 6 | 28.57 |
| 7y - 8y11m | 3 | 14.29 |
| 9y - 10y11m | 3 | 14.29 |
| 11y - 12y11m | 6 | 28.57 |
| 13y - 14y11m | 1 | 4.76 |
| 15y - 16y11m | 2 | 9.52 |

Table 2. Absolute and relative distributions of tongue features (n=21).

| Variables | Subjects with ankyloglossia | |
|---------------------------|-----------------------------|--------------|
| | Absolute (n) | Relative (%) |
| Position | | |
| Normal (incisive papilla) | 0 | - |
| Low | 3 | 14.28 |
| Forward | 18 | 85.72 |
| Tension | | |
| Normal | 15 | 71.42 |
| Loose | 6 | 28.58 |
| Tight | 0 | - |
| Mobility | | |
| Normal | 3 | 14.29 |
| Low | 18 | 85.71 |

Table 3. Absolute and relative distributions of suction, mastication, deglutition and articulation features (n=21).

| Variables | Subjects with ankyloglossia | |
|--------------|-----------------------------|--------------|
| | Absolute (n) | Relative (%) |
| Suction | | |
| Normal | 18 | 85.71 |
| Changed | 3 | 14.29 |
| Mastication | | |
| Normal | 16 | 76.20 |
| Changed | 5 | 23.80 |
| Deglutition | | |
| Normal | 4 | 19.05 |
| Changed | 17 | 80.95 |
| Articulation | | |
| Normal | 1 | 4.76 |
| Changed | 20 | 95.24 |

Table 4. Absolute and relative distributions of malocclusion classes and diastema of the lower incisors (n=21).

| Variables | Subjects with ankyloglossia | |
|--------------------------------|-----------------------------|--------------|
| | Absolute (n) | Relative (%) |
| Malocclusion classes | | |
| Class I | 15 | 71.43 |
| Class II - first division | 3 | 14.29 |
| Class II - second division | 2 | 9.52 |
| Class III | 1 | 4.76 |
| Diastema of the lower incisors | | |
| Present | 3 | 14.29 |
| Absent | 18 | 85.71 |

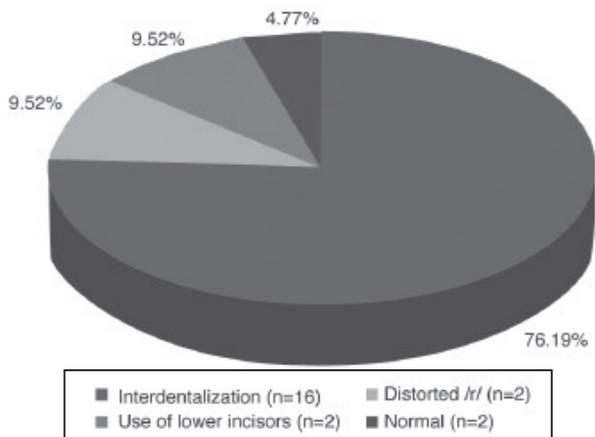


Figure 1. Distribution of articulation changes.

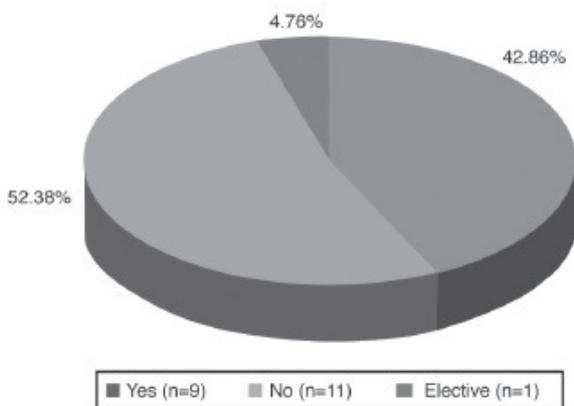


Figure 2. Candidates for frenectomy in the study sample.

DISCUSSION

The incidence of ankyloglossia in the screened children was 1.38%. The incidences and prevalences of ankyloglossia reported in the literature vary from 0.88% to 10.7%¹⁵⁻¹⁸ but the ages or age group of the affected population are not mentioned. According to Podestá et al.¹⁹, this large variation may stem from different diagnostic criteria.

This study confirms that partial ankyloglossia is more common than complete ankyloglossia^{4,6}. The results also suggest a higher incidence of ankyloglossia in males (76.19%), which is also in agreement with other studies^{16,19-20}.

Most (85.72%) of the present study sample presented low tongue mobility. This is in agreement with other studies claiming that low tongue mobility is the main characteristic of ankyloglossia^{4,18,21-22}. According to Geddes et al.²², ankyloglossia prevents affected individuals from touching the hard palate or buccal mucosa with their

tongues or protruding them. Studies have also reported that low tongue mobility prevents some simple activities, such as licking ice-cream, removing excess food leftovers from teeth after deglutition, moistening lips, French kissing or playing wind instruments, and may cause social embarrassment^{4,19,23}.

The resting position of the tongue was abnormal in the entire sample (n=21): 85.72% and 14.28% presented forward and low resting positions, respectively. In a similar study, Ruffoli et al.²¹ found that 75.5% of their patients with ankyloglossia had normal tongue position, 20.5% had low tongue position and 4% had forward tongue position. Changes in tongue position are common in individuals with ankyloglossia since a short lingual frenulum holds the tongue close to the floor of the mouth, preventing its tip from touching the incisive papilla²⁴.

Since ankyloglossia usually changes tongue position and mobility, it may also affect stomatognathic functions²⁵. Ankyloglossia may explain the high rate of articulation and deglutition changes found in affected individuals.

Almost the entire sample (95.24%) had articulation changes. The most mispronounced phonemes were /t/, /d/, /n/, /l/, /s/ and /z/. These letters require elevation of the tongue which is not always possible with a short frenulum^{14,19,24}.

Deglutition also requires elevation of the tongue since the food bolus must be pressed against the hard palate to be swallowed¹⁴. This may explain the association between ankyloglossia and deglutition changes, which were found in 80.95% of the sample.

Contrary to the frequent articulation and deglutition changes found in individuals with ankyloglossia, suction was affected in only 14.28% of the sample. This may be explained by the sample's age range, which varied from 5 to 16 years. There have been many reports in the literature of a close association between ankyloglossia and sucking ability in the first months of life^{15,22,26-30}, since breastfeeding requires pressing the nipple against the hard palate and moving the tongue rhythmically²⁶. Frenectomy is always indicated when tongue tie hinders breastfeeding^{14,19,22,26}.

Mastication changes were also infrequent in this study, affecting 23.80% of the sample. Some studies associate inefficient mastication with ankyloglossia^{1,9,19} but no studies were found analyzing this stomatognathic function in individuals with short frenulum.

Although low tongue position is common in patients with ankyloglossia, it is not possible to state that this promotes orthodontic changes, since only 23.73% of

the sample had Classes II and III malocclusions. Another study found a much higher prevalence of malocclusion, 55.5%, in individuals with ankyloglossia²¹. The relationship between ankyloglossia and malocclusion was established by a few studies that listed low tongue position as one of the causes of Class III malocclusion. Instead of shaping the upper arch, the tongue presses against the lower arch, possibly resulting in mandibular overdevelopment and maxillary underdevelopment^{19,21}.

Diastema of the lower incisors was also uncommon since only 14.28% of the patients were affected. None of the study references investigated the occurrence rate of diastema of the lower incisors in this population, although some claimed that it may accompany ankyloglossia because of the pressure made by the tongue against those teeth¹⁹.

Therefore, the frequent structural and functional changes of the stomatognathic system found in individuals with ankyloglossia suggest that other changes are possible, but surgical intervention is not always necessary.

CONCLUSION

Ankyloglossia is more prevalent in males aged 5 to 6 years and 11 to 12 years. Low resting tongue position and mobility prevailed in the study sample. Deglutition and articulation were the most affected functions of the stomatognathic system. The most common articulation and orthodontic changes found by the present study were interdentalization of the phonemes /t/, /d/, /n/, /l/, /s/ and /z/, and Class I malocclusion, respectively.

Collaborators

MF MORISSO helped to design the study, collect data, interpret the results and write the article. LC BERWIG helped to interpret the results and write the article. AMT SILVA supervised the study and helped to write the article.

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