

LINGUAL FRENULUM: CLASSIFICATION AND SPEECH INTERFERENCE

Irene Queiroz Marchesan PhD., SLP

ABSTRACT

Purpose: To propose a classification of the different lingual frenulum and to relate them to speech disorders. **Methods:** We evaluated 1402 patients' frenulum with an age range of 5 years 8 months to 62 years 10 months between 1978 and 2002. Pictures were taken of the altered frenulum. Measures of maximal mouth opening, with and without tongue suction, were taken with a sliding caliper. Speech samples were also taken. Frenulum were then classified as normal; short; with anterior insertion, and short with anterior insertion. **Results:** From the 1402 patients evaluated, 127 (9%) presented with an altered frenulum insertion. For this study we considered only those with short or with anterior insertion. For those who had an altered frenulum, 62 (48.81%) presented with speech disorders. The more frequent speech disorders were: omission and substitution of /r/; {R}, and consonant clusters with /r/, and of /s/ and /z/. Frontal and lateral lipps also occurred. The frenulum of 21 patients was classified as short and of these, 12 patients (57%) presented with speech disorders. Of the 106 patients with anterior insertion, 50 (47.2%) presented with a speech disorder. After statistical analyses the relation between altered frenulum and speech disorders was considered significant with $p < 0.001$. **Conclusion:** The lingual frenulum was classified as normal, short and with anterior insertion. An altered frenulum may predispose the individual to exhibit an accompanying speech disorder.

KEYWORDS: Lingual frenulum; tongue physiology; speech disorders

INTRODUCTION

Ankyloglossia is the partial or complete fusion of the tongue to the floor of the mouth. Ankyloglossia is also characterized by limited movement of the tongue due to a short or absent frenulum (Singh & Kent, 2000; Houaiss, 2001). The literature indicates that partial ankyloglossia is a congenital anomaly in which the tissue under the tongue is very short or can be attached very close to the tongue tip. This can result in difficulty protruding the tongue (Moore & Dalley, 2001; Berg, 1960). An alternate definition of ankyloglossia is that it is a developmental anomaly characterized by a short, thick lingual frenulum resulting in limitations of tongue movement (Garcia-Pola et al., 2002).

For the Speech Language Pathologist (SLP), what would characterize a normal or altered lingual frenulum? The SLP should

be aware of characteristics of a normal or altered lingual frenulum. Clinical observation by SLPs have frequently described patients with altered frenula as "tongue-tied" when tongue movements are limited, or when orofacial functions such as swallowing, mastication, and speech are affected. The SLP may also characterize the frenulum as altered by the location of attachment of the frenulum or by flaccidity of the tongue. There is currently no universal classification system for the various types of frenulum alterations. Such alterations have been referred to in the literature as: tonguetied, short frenulum, thick, fibrotic, anterior insertion or ankyloglossia. The same terms are found when the position of the tongue is inadequate or when its functions are also altered.

In the literature, the most frequent alterations caused by ankyloglossia are those related to speech (Lee et al., 1989;

Mukai et al., 1993; Velanovich, 1994; Wright, 1995; Kotlow, 1999; Sanches-Ruiz et al., 1999; Messner et al., 2000; Elias Podesta et al., 2001; Messner & Lalakea, 2002; Lalakea & Messner, 2003) followed by those related to feeding mainly during nursing (Berg, 1990; Velanovich, 1994; Kotlow, 1999; Messner et al., 2000; Elias Podesta et al., 2001; Marmet et al., 1990; Ballard et al., 2002). Restricted tongue movements occur next in terms of frequency (Garcia-Pola et al., 2002; Wright, 1995; Messner et al., 2000; Messner & Lalakea, 2002; Lalakea & Messner, 2003; Defabianis, 2000). Some authors also related ankyloglossia to deglutition disorders (Wright 1995; Kotlow 1999; Sanches-Ruiz et al., 1999), developmental anomalies of the structures of the face (Lee, 1989; Defabianis, 2000), teeth, occlusion, periodontal tissue alterations (Garcia-Pola et al., 2002; Lee, 1989; Kotlow, 1999; Sanches-Ruiz et al., 1999; Elias Podesta et al., 2001; Kaimenyi, 1998), as well as negative social effects (Kotlow, 1999).

Eight studies that discussed the incidence of ankyloglossia were located. Some of these studies involved newborns because of breastfeeding alterations (Messner et al., 2000; Ballard et al., 2002; Friend et al., 1990; Flinck et al., 1994), and others studies targeted infants (Garcia-Pola, 2002; Sedano et al., 1989; Pereira et al., 2002; Voros-Balog & Vincze, 2003). The incidence found varied from 0.88% (Voros-Balog & Vincze, 2003) to 8.3% (Sedano et al., 1989; Pereira et al., 2002) in the sample. In one study of 273 newborns that had been identified as having breastfeeding difficulties, the rate of ankyloglossia of 12.8% was documented (Ballard et al., 2002). The male-female ratio was 3:1 (Friend et al., 1990). Only one study was identified that classified the frenulum as mucous short, mucous large with jaw insertion and hypertrophic (Elias-Podesta et al., 2001).

The aim of this current study is to propose a new classification of altered lingual frenula and to relate the frenulum alterations with speech disorders.

METHODS

From 1978 to 2001, 1402 patients were evaluated. 715 (51%) were female and 687 (49%) were male, with an age range of 5 years, 8 months to 62 years, 10 months old. The patients came with different complaints but all complaints related to orofacial myofunctional deficits. The data collection was the same for all patients. Patients were referred by dentists, school personnel and physicians. One SLP saw all patients during these 23 years. All the patients spoke Portuguese.

Pictures were taken of all patients' lingual frenulum and measurements were taken with a caliper. The measurements included: the maximal distance between the upper right incisal edge to the inferior right incisal edge with the mouth wide-open and the same distance with the tongue sucked up on the palate. When the difference between these two values was one-half or more, the frenulum was considered normal. When the value with the tongue sucked up on the palate was less than 13 mm, the frenulum was considered short.

Normal frenula were defined as those in which the insertion was from the midline under the tongue to the floor of the mouth beneath the inferior alveolar ridge (Fig 1).

Short frenula were defined as those that:

- did not allow adequate movement of the tongue;

- had an insertion in the inferior alveolar ridge or beneath;

- did not allow tongue suction on the palate even if there was an insertion in the midline under the tongue;

- when the tongue was raised the shape of the tip was more square;

- when the tip of the tongue was raised toward the palate only the edges can raise;

FIGURE. 1
Normal Frenulum

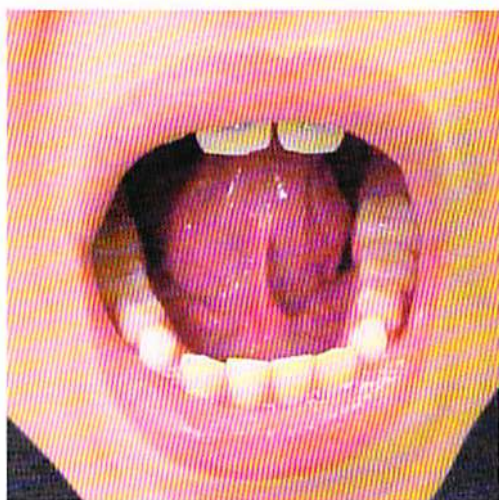


FIGURE 2
Frenulum with anterior insertion



FIGURE 3
Short Frenulum

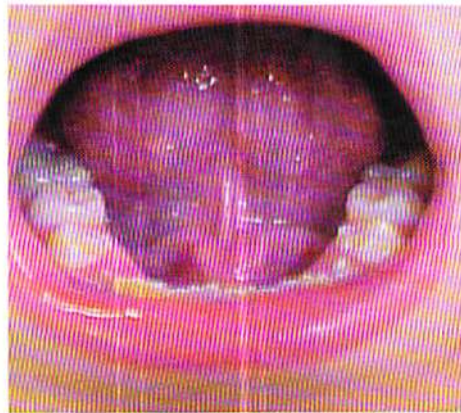
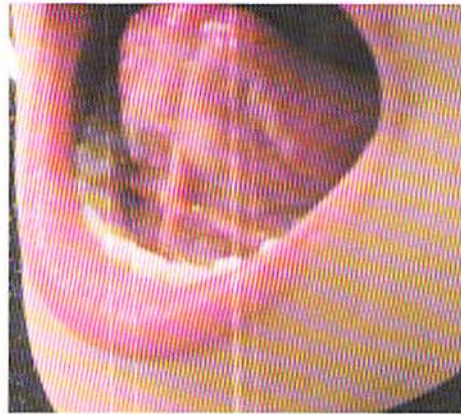
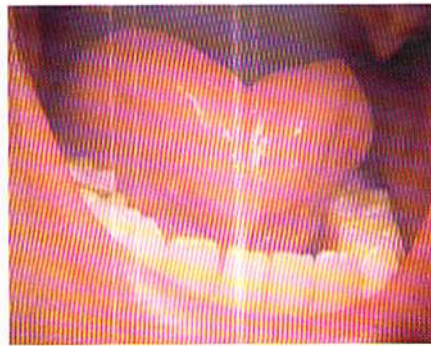


FIGURE 4
Frenulum short and with anterior insertion



for the tongue to reach the palate the patient needed to almost close the mouth;

when the tongue is sucked up on the palate the distance between the incisal edges was less than 13mm (Fig 2).

Frenula with anterior insertion were defined as insertions occurring from the middle to the tip of the tongue (Fig 3). Some frenula were characterized as short and with anterior insertion (Fig 4).

An investigation of 1402 patients' files was completed in 2002. An Excel spreadsheet was used to facilitate comparisons between the frenulum type and the occurrence of a speech disorder. Pictures of the different frenulum were also compared. A CHI – Square X^2 (with correction from Yates) was used to determine significance.

Human Subjects Committee approval was obtained for this investigation, and informed consent was obtained for all patients who elected to enroll.

RESULTS

Of the 1402 patients that were evaluated it was determined that 127 (9%) presented with an altered frenulum insertion. In this study the altered frenula were classified as predominantly short (21/127 – 16.5%) or predominantly with anterior insertion (106/127 – 83.5%).

Of the 127 patients with altered frenulum, 62 (48.81%) exhibited speech disorders of the following types: omission and substitutions of the phoneme /r/ and {R} in consonant clusters with /r/; and of /s/ and /z/; frontal and lateral lisp also occurred, with frontal lisps more frequent than lateral. Sometimes speech was classified as distorted or imprecise. Some of these patients presented less space between maxilla and mandible during speech. Excessive lateral or anterior mandible movements, and excessive saliva, during speech were also observed.

Of the 127 patients with altered frenulum 68 (53.55%) were female and 59 (46.45%) were male.

Of the 21 patients classified with short frenulum, 12 (57%) presented with speech disorders.

Of the 106 patients classified with anterior insertion frenulum, 50 (47.2%) presented with speech disorders.

A statistically significant relation between altered frenulum and speech disorders ($p < 0.001$) was observed.

DISCUSSION

It is important for SLP's to define and classify an altered frenulum. It is also the role of the SLP to determine which type of altered frenulum is found in patients, and which therapy is most appropriate or if it is necessary to refer for a frenuloplasty.

In this current study attempts were made to determine the incidence and to classify the altered insertion of lingual frenulum. Attempts were also made to verify if there was any relation between altered lingual frenulum and speech.

Observation indicated that in patients with normal frenulum orofacial functions and mobility of the tongue were better than when the frenulum was altered. It was also determined by observation that when the frenulum is short and the tip of the tongue raises, in general this elevation involves the floor of the mouth and at times even the mandible. In addition it was noted that short frenula are, in general, thicker than the others.

The incidence of frenulum alterations was found to be 9%, which is in accordance with other studies that found an 8.3% (Sedano et al., 1989; Pereira et al., 2002) to 12.8% incidence (Ballard et al., 2002). Some studies indicated that the incidence of altered frenulum was only 0.88% (Voros-Balog & Vincze, 2003). This author believes that the difference is due to the variable

ages of the participants and the use of different criteria for the definition of what is considered an altered frenulum.

Results of this study demonstrated that 48.81% of the patients that presented with altered frenulum had speech disorders. Results of studies in the literature indicate various incidence levels between the occurrence of both an altered frenulum and speech disorders: 28.5% (Lee et al., 1989); 32% (Wright, 1995); 38% (Sanchez-Ruiz et al., 1999) or 50% (Lalakea & Messner, 2003).

In relation to gender findings of the current study demonstrated that 53.55% of those with altered frenula were female. This finding is in disagreement with the only other study that was located which observed a 3:1 male to female ratio for patients with alterations in the lingual frenulum (Friend et al., 1990).

According to definitions found in the literature, ankyloglossia is a short frenulum that causes difficulty in movements of the tongue. The classification system used here offers greater precision in the definition of various types of alterations found in the frenulum. Thus, the frenulum was classified as normal, short, and with anterior insertion

for this investigation. However, an additional type may also be suggested because observations indicated that some frenulum are short and have an anterior insertion. Further studies and evaluation criterion are necessary for better precision in the classification and in the description of the consequences of an altered frenulum.

CONCLUSIONS

Lingual frenula are able to be classified as normal, short, and with anterior insertion. The altered lingual frenulum predisposes the patient to speech alterations.

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FIGURE 3
Short Frenulum

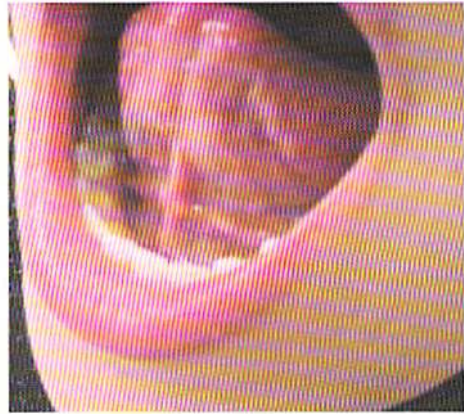


FIGURE 4
Frenulum short and with anterior insertion

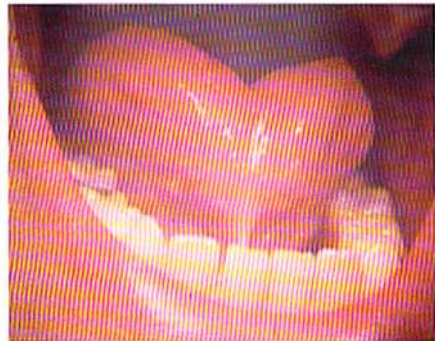


FIGURE. 1
Normal Frenulum

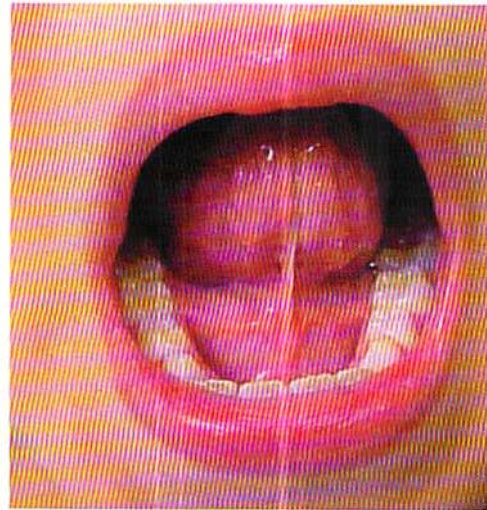
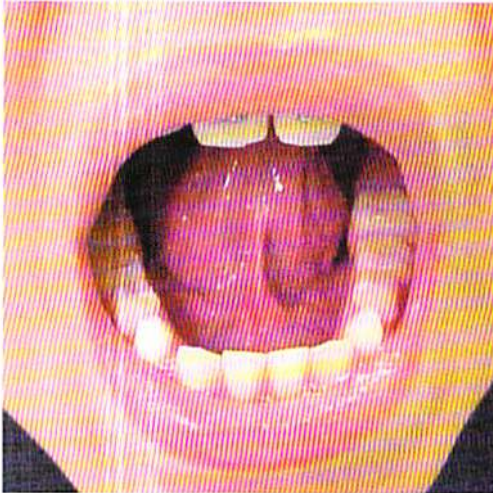
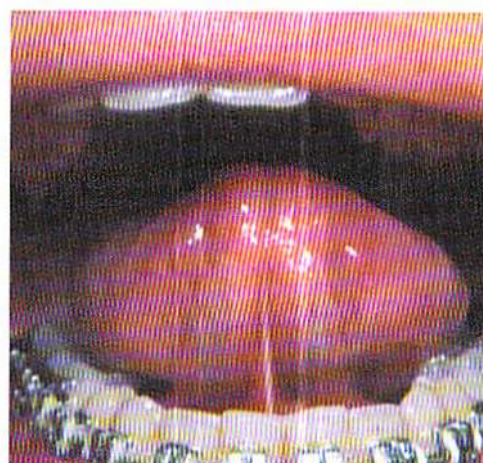
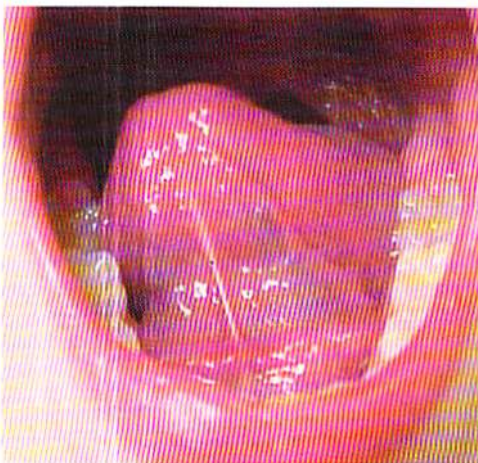


FIGURE 2
Frenulum with anterior insertion



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ages of the participants and the use of different criteria for the definition of what is considered an altered frenulum.

Results of this study demonstrated that 48.81% of the patients that presented with altered frenulum had speech disorders. Results of studies in the literature indicate various incidence levels between the occurrence of both an altered frenulum and speech disorders: 28.5% (Lee et al., 1989); 32% (Wright, 1995); 38% (Sanches-Ruiz et al., 1999) or 50% (Lalakea & Messner, 2003).

In relation to gender findings of the current study demonstrated that 53.55% of those with altered frenula were female. This finding is in disagreement with the only other study that was located which observed a 3:1 male to female ratio for patients with alterations in the lingual frenulum (Friend et al., 1990).

According to definitions found in the literature, ankyloglossia is a short frenulum that causes difficulty in movements of the tongue. The classification system used here offers greater precision in the definition of various types of alterations found in the frenulum. Thus, the frenulum was classified as normal, short, and with anterior insertion

for this investigation. However, an additional type may also be suggested because observations indicated that some frenulum are short and have an anterior insertion. Further studies and evaluation criterion are necessary for better precision in the classification and in the description of the consequences of an altered frenulum.

CONCLUSIONS

Lingual frenula are able to be classified as normal, short, and with anterior insertion. The altered lingual frenulum predisposes the patient to speech alterations.

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for the tongue to reach the palate the patient needed to almost close the mouth;

when the tongue is sucked up on the palate the distance between the incisal edges was less than 13mm (Fig 2).

Frenula with anterior insertion were defined as insertions occurring from the middle to the tip of the tongue (Fig 3). Some frenula were characterized as short and with anterior insertion (Fig 4).

An investigation of 1402 patients' files was completed in 2002. An Excel spreadsheet was used to facilitate comparisons between the frenulum type and the occurrence of a speech disorder. Pictures of the different frenulum were also compared. A CHI – Square X^2 (with correction from Yates) was used to determine significance.

Human Subjects Committee approval was obtained for this investigation, and informed consent was obtained for all patients who elected to enroll.

RESULTS

Of the 1402 patients that were evaluated it was determined that 127 (9%) presented with an altered frenulum insertion. In this study the altered frenula were classified as predominantly short (21/127 – 16.5%) or predominantly with anterior insertion (106/127 – 83.5%).

Of the 127 patients with altered frenulum, 62 (48.81%) exhibited speech disorders of the following types: omission and substitutions of the phoneme /r/ and {R} in consonant clusters with /r/; and of /s/ and /z/; frontal and lateral lisp also occurred, with frontal lisps more frequent than lateral. Sometimes speech was classified as distorted or imprecise. Some of these patients presented less space between maxilla and mandible during speech. Excessive lateral or anterior mandible movements, and excessive saliva, during speech were also observed.

Of the 127 patients with altered frenulum 68 (53.55%) were female and 59 (46.45%) were male.

Of the 21 patients classified with short frenulum, 12 (57%) presented with speech disorders.

Of the 106 patients classified with anterior insertion frenulum, 50 (47.2%) presented with speech disorders.

A statistically significant relation between altered frenulum and speech disorders ($p < 0.001$) was observed.

DISCUSSION

It is important for SLP's to define and classify an altered frenulum. It is also the role of the SLP to determine which type of altered frenulum is found in patients, and which therapy is most appropriate or if it is necessary to refer for a frenuloplasty.

In this current study attempts were made to determine the incidence and to classify the altered insertion of lingual frenulum. Attempts were also made to verify if there was any relation between altered lingual frenulum and speech.

Observation indicated that in patients with normal frenulum orofacial functions and mobility of the tongue were better than when the frenulum was altered. It was also determined by observation that when the frenulum is short and the tip of the tongue raises, in general this elevation involves the floor of the mouth and at times even the mandible. In addition it was noted that short frenula are, in general, thicker than the others.

The incidence of frenulum alterations was found to be 9%, which is in accordance with other studies that found an 8.3% (Sedano et al., 1989; Pereira et al., 2002) to 12.8% incidence (Ballard et al., 2002). Some studies indicated that the incidence of altered frenulum was only 0.88% (Voros-Balog & Vincze, 2003). This author believes that the difference is due to the variable