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CASE REPORT

Management of Ankyloglossia in a Non-Syndromic Patient Using a Super Pulsed Laser: A Life-Changing Treatment- A Case Report

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ABSTRACT

Objective: Ankyloglossia affects a person's overall well-being and life, from malnutrition due to poor feeding and mechanical problems to psychological stress and low self-esteem, thus affecting social life. This case reports the use of non-scalpel techniques, such as a super pulsed laser, to manage ankyloglossia in a non-syndromic patient suffering from speech incompetence and restricted tongue mobility and highlights its advantages over other conventional techniques. **Case Report:** A 17-year-old male patient presented with a complaint of restricted tongue mobility, due to which he could not pronounce certain words clearly. As the patient was apprehensive about the use of a scalpel, it was decided to manage ankyloglossia using a diode laser against the conventional scalpel technique. Thus, the laser-assisted lingual frenectomy using GaAs super pulsed laser was used to excise the lingual frenulum. **Conclusion:** This case report suggests that ankyloglossia can be successfully treated by using laser-assisted surgery and gives superior results specifically in terms of lesser pain and bleeding.

Key words: ankyloglossia, frenotomy, laser-assisted surgery, lingual frenulum, super pulsed laser

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INTRODUCTION

The tongue is the only body structure linked to only one end. On the other hand, the opposite end is free, which is unique to it and helps with processes such as deglutition, phonation, and mechanical cleansing action. But, when its free end is likewise tied, its activities are severely hampered, resulting in a slew of issues. The buccal mucosa, lips, and tongue are joined to the alveolar mucosa in the oral cavity by a triangle-shaped tissue fold known as the frenulum. It keeps the fetus's growing hard and soft tissues in equilibrium and inhibits the mobility of the cheeks, lips, and tongue.[1] A lingual frenulum is a fold of mucous membranes on the underside of the tongue that extends from the floor of the mouth to the midline.[2] It is typically composed of mucosa, fibrous connective tissue, and, on rare occasions, superior fibers of the genioglossus muscle.[3] Wallace coined the term ankyloglossia in the 1960s when he first described tongue tie as "a condition in which the tip of the tongue cannot be protruded beyond the lower incisor teeth due to small frenulum linguae, often containing scar tissue."[1] Depending on the degree and severity of the attachment, the tongue tie can be either partial or complete, while depending on the position, it can either be anterior or posterior. "Tongue tie," complete or partial ankyloglossia, is the restriction of mobility of the tongue due to a short or thickened lingual frenulum. Complete ankyloglossia, with the tongue unable to protrude past the alveolar ridge or to move laterally, is uncommon but, when present, requires frenuloplasty. The term anterior ankyloglossia is used for examples in which the attachment of the frenum extends toward the tip of the tongue. Posterior ankyloglossia is often more difficult to appreciate, being caused by short submucosal collagen fibers in the posterior midline floor of the mouth that prevents full tongue motion.[4]

The popular line of treatment for ankyloglossia is its surgical management by carefully releasing the attachment between the lingual frenulum and the tongue. This is either carried out using the conventional scalpel technique or through the newer, advanced laser-assisted methods. In this article, we aim to describe a non-syndromic patient's case of ankyloglossia and how it was treated with laser-assisted surgery as opposed to the conventional scalpel method and its advantages over the same in terms of the procedure being less invasive with minimum to no pain and bleeding and better healing postoperatively.

CASE REPORT

A 17-year-old male patient reported at our OPD in the Department of Periodontia and Community Dentistry at the Ziauddin Ahmad Dental College, Aligarh Muslim University, with the chief complaint of restricted tongue mobility, due to which he could not pronounce certain words clearly. The subject's skeletal growth appeared to be delayed in comparison to individuals of similar age, but his cognitive development was within expected norms. A thorough intraoral evaluation revealed a short lingual frenulum was responsible for his speech problem. Along with limited tongue protrusion, the patient could not raise his tongue to touch the palate (Figure 1 and 2). A diagnosis of class III ankyloglossia according to Kotlow's classification 1999[3] (Table 1) was made, as the length of the free tongue was 7 mm. Hazelbaker's score of 9 was assigned as tongue movement is more complex than just simple protrusion. Hence, Hazelbaker's assessment criteria[5] (Table 2) include functional as well as appearance characteristics of the tongue in cases of ankyloglossia. On evaluation, the dental arches were also found to be narrow with severe malpositioning of teeth, with several retained deciduous teeth and carious teeth 31, 36, and 37. An OPG showed multiple impacted teeth (Figure 3).

The patient's mouth opening was relatively less, along with lingually placed lower incisors. There was no history of ankyloglossia in the patient's family, and medical history was also insignificant. The patient was referred to the Department of Orthodontics and the Department of Restorative Dentistry for the management of malocclusion and caries, respectively. After the diagnosis of ankyloglossia was confirmed, the patient's parents/guardians were informed of his clinical condition, its associated complications, and all the treatment modalities available for his condition. After close consideration, a frenotomy of the lingual frenum was planned. As the patient was apprehensive about the use of a scalpel, it was decided to manage his ankyloglossia by using a diode laser against the conventional scalpel technique.

Verbal and written consent was obtained from the patient's parents/guardians before the procedure. The recommended safety measures were taken for the operator, assistant and patient by wearing protective goggles. After spraying topical anaesthetic solution (lidocaine spray 15%), laser-assisted lingual frenectomy using GaAs super pulsed laser at 980nm wavelength was used to excise the lingual frenulum. A 400µm fiber-optic wire tip was stripped and initiated, and the diode laser with an average power of 3W in pulsed mode was applied in a contact mode in brushing stroke from the apex of the lingual frenulum to the base for excising the tissue. The operative area was continuously damped with wet gauze to prevent thermal damage to

Figure 1. Pre-operative image showing difficulty in raising the tongue to touch the palate.

Figure 2. Pre-operative image showing limited tongue protrusion.

Table 1. Kotlow's Classification of Ankyloglossia (based on length of free tongue)[3]

Classification of ankyloglossia		Length of free tongue
Clinically acceptable, normal range of free tongue		>16mm
Class I	Mild ankyloglossia	12-16mm
Class II	Moderate ankyloglossia	8-11mm
Class III	Severe ankyloglossia	3-7mm
Class IV	Complete ankyloglossia	<3mm

*Courtesy Dr. L Kotlow, Specialist Paediatric Dentist, Albany, New York, USA.

Table 2. Hazelbaker's assessment tool regarding function and appearance of the tongue in cases with ankyloglossia[5]

Function items	Appearance items
1. Lateralization 2=complete 1=body of tongue, but not tongue tip 0=none	**1. Appearance of tongue when lifted** 2=round or square 1=slight cleft in tip apparent 0=heart-shaped
2. Lift of tongue 2=tip to mid-mouth 1=only edges to mid-mouth 0=tip stays at alveolar ridge or tip rises only to mid-mouth with jaw closure	**2. Elasticity of frenulum** 2=very elastic 1=moderately elastic 0=little or no elasticity
3. Extension of tongue 2=tip over lower lip 1=tip over lower gum only 0=neither of the above or anterior or mid-tongue humps	**3. Length of lingual frenulum when tongue lifted** 2=>1cm or embedded in tongue 1=1 cm 0=<1 cm
4. Spread of anterior tongue 2=complete 1=moderate or partial 0=little or none	**4. Attachment of lingual frenulum to tongue** 2=posterior to tip 1=at tip 0=notched
5. Cupping of tongue 2=entire edge, firm cup 1=side edges only, moderate cup 0=poor or no cup	**5. Attachment of lingual frenulum to inferior alveolar ridge** 2=attached to floor of mouth or well below ridge 1=attached just below ridge 0=attached at ridge
6. Peristalis 2=complete anterior to posterior (originates at tip) 1=partial: originating posterior to tip 0=none or reverse peristalsis	
7. Snap-back 2=none 1=periodic 0=frequent or with each suck	
Scoring 14=perfect score (regardless of appearance item score) 11=acceptable if appearance item score is 10 <11=function impaired; frenotomy should be considered if management fails Frenotomy is necessary if function score is <11 and appearance score is <8	

*Courtesy Dr. Alison K. Hazelbaker, who authored the Assessment Tool for Lingual Frenulum Function (ATLFF) Pacific Oaks College, Pasadena, California, USA, 1993

Figure 3. OPG showing multiple impacted teeth along with several carious and retained deciduous teeth.

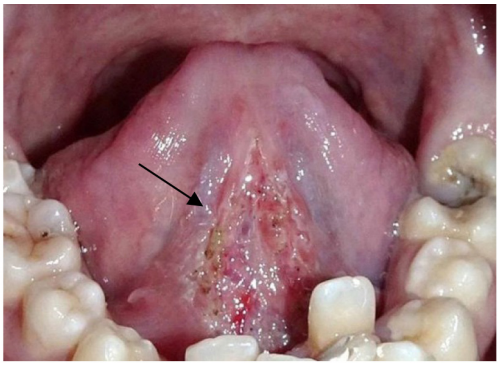

Figure 4. Immediate post-operative image showing rhomboidal shape surgical area after laser-assisted excision of lingual frenulum.

the underlying soft tissues. After the excision of the lingual frenulum, a rhomboidal-shaped surgical area was seen (Figure 4). The entire procedure was painless and encountered no bleeding.

Immediately after surgery, an increase in lingual mobility was appreciated (Figure 5). The patient was discharged after giving post-operative instructions. The following tongue exercises were advised to the patient: i) Stretch the tongue upward towards the nose, then down towards the chin and repeat, ii) Open the mouth widely and elevate the tip of the tongue to touch the upper central incisors and anterior palate iii) Close the mouth and do sideways movement of the tongue

Figure 5. Immediate post-operative image showing increase in lingual mobility during protrusion.

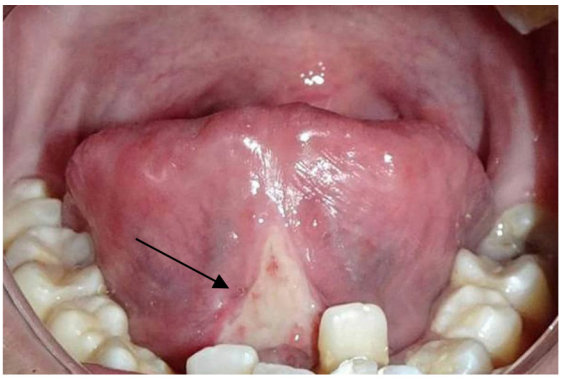

Figure 6. One-week post-operative image showing uneventful healing.

poking into either of the cheeks to make a lump: for 3 to 5-minute bursts, twice or thrice daily for 3 or 4 weeks postoperatively. The patient was immediately referred to the speech therapist to correct speech defects. The patient was evaluated after one week (Figure 6). The healing was uneventful, without any pain and discomfort, as reported by the patient, along with improved speech.

DISCUSSION

Ankyloglossia's etiopathogenesis is not well understood. Failure in cellular degeneration of the lingual frenulum results in a much longer attachment between the floor of the mouth and the undersurface of the tongue, resulting in tongue-tie or ankyloglossia. Tongue tie is often associated with a fairly common genetic mutation of the MTHFR gene. This gene controls the production of an enzyme called Methyl-Tetra-Hydro-Folate-Reductase. People with a variant of this gene have a difficult time processing folate or folic acid, which can contribute to other midline defects as well as general health issues.[6] Ankyloglossia, however, occurs at different ages, with specific therapeutic indications for each group. Ankyloglossia has been reported in 2% to 16% of neonates with a male predilection. However, because the tongue normally is short at birth and then grows longer at the tip, the prevalence is much lower in adults.[4] Ankyloglossia is associated with other syndromes, namely, the Pierre Robin Syndrome, the Oral-Facial-Digital Syndrome, Meckel's syndrome, the trisomy 13 syndrome, the Robinow Syndrome, the short rib syndrome, the ATR-X Syndrome, Fraser's Syndrome, the Wiedemann-Beckwith syndrome, van der Woude's syndrome, and the glossopalatine ankylosis syndrome.[5,7,8]

The most important element to evaluate in ankyloglossia is the normal range of movement of the tongue, which comprises the following criteria: The tip of the tongue should not cleft when it is extended outside the mouth and should easily and without effort sweep the lips, no blanching of the tissues should be present upon retrusion of the tongue lingual to the anterior teeth, the lingual frenulum should not create a diastema between mandibular central incisors and should not impede the newborn from adhering to the maternal nipple while feeding. Lastly, children should not have speech impairments as a result of an aberrant lingual frenulum.

The many repercussions of untreated cases of ankyloglossia include feeding problems in babies, malnutrition, and a higher incidence of dental caries due to the limited cleaning action of the tongue as there are restricted sweeping movements, poor swallowing patterns, and inappropriate chewing, all of which can lead to stomach distress, lower midline diastema with/without periodontitis, gingival recession, open bite owning to tongue thrusting and flaring of lower incisors.[9] It may result in ill-fitting dentures in older people. It may also cause psychosomatic stress in older children or adults when their peers or colleagues mock them, and they experience an embarrassing circumstance owing to tongue-tie. The patients usually have difficulty pronouncing words with letters such as "t, d, n, l, s, j, zh, ch, th, dg" and especially "r" due to the difficulty in rolling the tongue.

Ankyloglossia is often asymptomatic, or the problem may disappear with time, or the affected person may learn to adapt to their restricted tongue mobility. However, some people require professional help with their tongue-tie. For the necessary care to be given at the appropriate time, the parents should get formal education for the potential long-term effects of tongue-tie. The clinical relevance and management of ankyloglossia are widely debated among practitioners of many specialties. Depending on the feeding issues, the mechanical restrictions, and the patient's history of speech difficulties causing social anxiety,

the management of ankyloglossia should be taken into consideration at any age to improve the quality of life. Although early correction of ankyloglossia considerably reduces its problems, some specialists advise against doing a frenotomy before the age of 4 to 5 years.

There are different treatment modalities for managing ankyloglossia.[10,11] Traditionally, it was treated by scalpel methods (frenectomy, frenotomy, frenuloplasty, Z-plasty) and electrocautery. The advancement in science and technology has invented many effective, less invasive, less time-consuming laser devices (such as diode lasers, Nd:YAG laser, CO_2 laser, Er,Cr:YSSG laser, Er:YAG laser etc.) which have a broad spectrum of application in different fields of medicine including dentistry.[12,13] Laser-assisted surgery has become popular nowadays due to its fabulous advantages, such as no bleeding due to instant hemostasis without the need for suturing,[14] better visualization of adjacent structures, less discomfort to the patient during and after surgery, comparatively faster healing, decreased wound contraction and scarring due to reduction in fibroblasts, less chance of trauma to adjacent structures (mainly lingual nerve and vessels and the opening of Wharton's duct, while managing ankyloglossia).[15] Moreover, the super pulsed laser has additional advantages of deeper penetration, faster action, and no heat production, thus minimal charring and necrosis of tissue. This eventually results in faster healing with minimal or no postoperative pain and edema. The procedure is carried out without any complications in the majority of cases, though certain challenges that were seen during laser-assisted frenectomy include excessive heat production, which can lead to tissue damage and laser reflection through metallic instruments. Thus to prevent this, continuous irrigation with saline was done, and the use of metallic instruments was limited to when the laser was inactive. The use of antibiotics and analgesics is usually not required, making it more acceptable to the patients. However, there are certain limitations to the use of lasers in intraoral surgery, which should be considered are; the high cost of laser surgery compared to conventional methods, the use of safety precautions during the procedure for the patient, operator, and assistant, and complete knowledge of laser for its safe use such as its physical characteristics and interaction with tissues is essential.

Thus, the use of lasers in periodontic procedures has shown significant benefits for both the patient and the operator in terms of time, efficiency, and post-operative management. This case report highlights the assets of carrying out procedures without using conventional techniques, which significantly decreases the chances of complications during and after the procedure.

CONCLUSION

There is a great controversy among the practitioners of different specialties with different opinions regarding diagnosis, clinical significance, and management of ankyloglossia. Although conventional surgical techniques have shown promising results, they have their disadvantages but laser-assisted surgery being relatively simple and safe, is becoming more acceptable to the patients, and the use of super pulsed laser provides additional benefits in performing the laser surgery.

ETHICAL APPROVAL

Informed consent was taken from patient for publishing of data.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest, financial or otherwise related to this case report.

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