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ORIGINAL ARTICLE

# Treatment of Ankyloglossia using Diode Laser: A Case Series

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## ABSTRACT

**Background:** Ankyloglossia leads to a wide variety of speech and periodontal problems. Among various treatment modalities used for lingual frenectomy, diode lasers provide excellent wound sterilization along with hemostasis and reduced postoperative pain. The present study was carried out to evaluate the effectiveness of laser in the treatment of ankyloglossia.

**Materials and methods:** A total of 10 patients with class II and III ankyloglossia were treated using diode lasers. Patients were recalled after 1 week, 1, and 3 months to check for postoperative discomfort, healing. Clinical measurements evaluated at baseline and 3 months postoperatively were protrusion of tongue, plaque index, and papillary bleeding index.

**Results:** At 3 months postoperatively, mean protrusion of tongue significantly improved from 7.20 to 11.10 mm. There was a significant improvement in plaque and papillary bleeding index postsurgically.

**Conclusion:** Laser-assisted lingual frenectomy is very easy to perform. In the present study, the patients hardly noticed any discomfort and there was absolutely no bleeding. The frenum was completely eliminated and the patients could protrude their tongue up to 10 to 12 mm.

**Keywords:** Ankyloglossia, Diode lasers, Lingual frenectomy.

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## INTRODUCTION

In 1950, Miller[1] defined a frenum as "a membranous fold which joined two parts and restricts the individual movement of each". Partial ankyloglossia refers to congenital shortness of the lingual frenum or a frenal attachment extending to the tip of the tongue, binding the tongue to the floor of mouth and restricting its extension.[2,3] Ankyloglossia is diagnosed in 3.2% of pediatric patients[4] and occurs in 2 to 3 of every 10,000 adults.[5] It is more common in boys than girls.[5]

Ankyloglossia is usually defined based on the inability to extend the tip of the tongue beyond the vermillion border of the lips or a line joining the lip commissures, along with speech impairement.[6] It is classified based on "free tongue". Free tongue is defined as the length from the insertion of the lingual frenum into the base of the tongue to the tip of the tongue.[7]

Based on the length of free tongue, five categories can be distinguished, which are as follows[7]:

Clinically acceptable normal, greater than 16 mm
*Class I*: Mild ankyloglossia: 12 to 16 mm
*Class II*: Moderate ankyloglossia: 8 to 11 mm
*Class III*: Severe ankyloglossia: 3 to 7 mm
*Class IV*: Complete ankyloglossia: Less than 3 mm

Due to restricted movements, patients exhibit speech difficulties in pronunciation of certain consonants and diphthongs.[3] Speech defects include defects in the letters t, d, n, and l, in sounds and words, such as ta, te, time, water, and cat, and general unintelligibility of speech.[2] Ankyloglossia has also been associated with midline diastema, oral motor dysfunction,[8] and gingival recession.[9] Ankyloglossia may also contribute to the development of anterior open bite due to the inability to raise the tongue to roof of mouth, which prevents the development of a normal swallowing pattern. Some authors have also claimed that some ankyloglossia cases can be associated with upward and forward displacement of the epiglottis and larynx, resulting in various degrees of dyspnoea.

Pioneers in the field of Periodontology and maxillofacial surgery have suggested many techniques to manage patients with ankyloglossia. Techniques include the use of a surgical blade, bipolar diathermy, and lasers. Diode lasers have wavelengths ranging from 655 to 980 nm. They provide excellent wound sterilization along with hemostasis and reduced postoperative pain.[10,11]

Considering the variety of advantages of soft tissue lasers for the treatment of lingual frenectomy, the present

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case series study was carried out to evaluate the effectiveness of laser in the treatment of ankyloglossia.

## MATERIALS AND METHODS

A total of 10 patients with mean age of 20.5 years and age from 17 to 25 years with presence of partial or complete ankyloglossia were selected for the present case study.

Patients with systemic diseases associated with wound healing problems or disturbed wound healing, such as that occurs in diabetes, autoimmune diseases, and smoking. History of periodontal surgery in selected area was excluded from the study.

Before initiating this study, the purpose and diagnostic procedure of this clinical trial were explained to the patients and provided verbal informed consent to participate in the study. The study protocol was first approved by the research and ethical committee of Datta Meghe Institute of Medical Sciences, Sawangi (Meghe), Wardha.

Clinical measurements recorded at baseline (on the day of surgery) and 3 months postoperatively were Plaque Index[12] as an expression of the level of localized mouth supragingival plaque accumulation to evaluate patients' oral hygiene and papillary bleeding index[13] to assess gingival inflammation.

Patients were recalled at 1 week and 1 month postoperatively to assess discomfort, pain, and bleeding caused because of surgical procedure.

## SURGICAL PROCEDURE

### Laser Frenectomy

After induction of local anesthesia (2% lidocaine, epinephrine 1:100,000) tongue was retracted with a mouth mirror. An initiated tip of 300 µm was used at a 2.75-W pulse interval, 1.0 ms, and pulse length 1.0 ms, with an average power of 1.37 W in a pulsed mode (Fig. 1). The tip was initiated by firing it at 1.4 W in continuous mode and allowing it to dip into the initiator device, which is a piece of cork. The tip was moved from the apex of frenum to the base in a brushing stroke, cutting the frenum. The attachment of the frenum to the alveolar ridge was also excised to prevent any further tension on the gingiva. After excision, the area was cleaned. Tongue movement was checked by protrusion to assess complete elimination of the frenum. No suturing was done; the patients were prescribed analgesics and were recalled after 1 week, 1, and 3 months. The following exercises were advised to all patients: (i) Stretch the tongue up toward the nose, then down toward the chin and repeat, (ii) open the mouth widely and touch the big front teeth with the tongue with mouth still open, (iii) shut the mouth and poke it into left and right cheek to make a lump: For 3–5 minute bursts, once or twice daily for 3 or 4 weeks postoperatively.


**Fig. 1:** Laser unit used in study

## RESULTS

Ten systemically healthy subjects with a mean age of 20.50 ± 8.15 years (18–25 years), presenting with partial or complete ankyloglossia were included in the present study. Out of these, six patients were having class II (moderate 8–11 mm) and four patients were having class III (severe 3–7 mm) ankyloglossia.

During the course of the study, wound healing was uneventful, patients hardly noticed any discomfort, and there was absolutely no bleeding postoperatively.

In general, patients showed good oral hygiene throughout the study. Baseline full mouth mean plaque index score was 0.94 ± 0.06, which at 3 months, decreased to 0.56 ± 0.28 (Table 1). The differences in plaque index scores when compared with baseline measurements *vs* 3 months postsurgical measurements by using paired t-test, there was a statistically significant decrease in plaque index scores at 3 months. Baseline full mouth mean papillary bleeding index score was 1.72 ± 0.42, which at 3 months, decreased to 0.80 ± 0.26 (Table 1). Papillary bleeding index scores when compared with baseline measurements *vs* 3 months postsurgical measurements by using paired t-test, we observed statistically significant reduction in papillary bleeding index scores at 3 months ($p < 0.05$), indicating satisfactory improvement in gingival condition throughout the study.

At baseline, mean protrusion of tongue was 7.20 mm. At 3 months postoperatively, the frenum was completely eliminated and the patients could protrude their tongue up to 10–12 mm with a mean protrusion of tongue 11.10 mm (Table 2). The difference in the protrusion of tongue at 3 months postoperatively was statistically significant

**Table 1:** Mean plaque (PI) and papillary bleeding index (PBI) scores between baseline and 3 months (MV ± SD)

| *Parameters* | *Baseline* | *3 months* | *Difference* | *p-value* |
|---|---|---|---|---|
| PI | 0.94 ± 0.06 | 0.56 ± 0.28 | 0.38 ± 0.22 | 0.002 S |
| PBI | 1.72 ± 0.42 | 0.80 ± 0.26 | 0.90 ± 0.37 | 0 S |

S: Significant = p <0.05; SD: Standard deviation; MV: Mean value

**Table 2:** Protrusion of tongue at baseline and 3 months postoperatively

| *Patient no.* | *Protrusion of tongue at baseline (mm)* | *Protrusion of tongue at 3 months postoperatively (mm)* |
|---|---|---|
| 1 | 8 | 12 |
| 2 | 4 | 10 |
| 3 | 9 | 12 |
| 4 | 3 | 9 |
| 5 | 11 | 13 |
| 6 | 7 | 10 |
| 7 | 4 | 10 |
| 8 | 8 | 12 |
| 9 | 9 | 12 |
| 10 | 9 | 10 |
| Mean | 7.20 | 11.10 |

**Fig. 2:** Preoperative view

**Fig. 3:** Application of laser

**Fig. 4:** Postoperative view

as compared with baseline. In patients with class III ankyloglossia, after surgery, ankyloglossia was on the higher limit of class II ankyloglossia with a protrusion of tongue in the range of 9–10 mm while as all class II ankyloglossia cases were converted to class I (Figs 2 to 4).

## DISCUSSION

Ankyloglossia is usually defined based on the inability to extend the tip of the tongue beyond the vermillion border of the lips or a line joining the lip commissures, along with speech impairment.[6] The condition is the result of a failure in cellular degeneration leading to a much longer anchor between the floor of the mouth and the tongue.[14] The aim of the present study was to evaluate the effectiveness of laser for the treatment of ankyloglossia.

Laser-assisted lingual frenectomy is very easy to perform. In the present study, the patients hardly noticed any discomfort and there was absolutely no bleeding. The frenum was completely eliminated and the patients could protrude their tongue up to 10 to 12 mm. The excellent hemostasis and absence of postoperative swelling was attributed to increased platelet activation by lasers[15] and sealing of lymphatic vessels.[16] There was no need to sutures, as there is complete hemostasis and improved wound healing. In addition, the laser's sterilization of the surgical wound reduces the need for postoperative care and antibiotics.[4] The patients were advised to undergo speech therapy for correction and improvement of their speech.

Postoperative exercises were advised to patients following tongue-tie surgery. These exercises were not intended to increase muscle strength, but to: (i) Develop new muscle movements, particularly those involving tongue-tip elevation and protrusion, inside and outside of the mouth, (ii) increase kinesthetic awareness of the full range of movements the tongue and lips can perform, (iii) encourage tongue movements related to cleaning the oral cavity, including sweeping the insides of the cheeks, fronts, and backs of the teeth, and licking right around both lips.

## CONCLUSION

This case series clearly shows that diode laser definitely has an advantage over conventional methods of lingual

frenectomy, as it prevents bleeding and swelling and is associated with minimal or no postoperative pain. Thus, use of diode laser in soft tissue surgical procedures can be considered as beneficial and comfortable to the patient.

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