

# Lasers: A Futuristic Approach Towards Treating Ankyloglossia - A Systematic Review

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## Abstract:

Ankyloglossia is a distinguished condition and poses a lot of problems which include breathing, feeding and speech difficulties due to the decreased movements of the tongue. It is mainly prevalent in children and young adults. If left untreated, the severity of the condition increases thus impacting on the quality of the patients life.

**Aim:** To assess the efficacy of lasers in the treatment of ankyloglossia.

**Methodology:** A systematic review was performed using MEDLINE,PUBMED,SCI-HUB direct using the MeSH term 'Ankyloglossia and Laser'. According to the PRISMA guidelines the MeSH terms were altered in each search engines.

**Results and Conclusion:** In the available literature, treatment of ankyloglossia, i.e lingual frenectomy, using lasers is more effective than conventional surgical techniques.

**Keywords:** Ankyloglossia, lingual frenectomy, laser.

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## INTRODUCTION:

Ankyloglossia, commonly called tongue tie, is a developmental anomaly where there is abnormal shortening of the lingual frenum which affect children and adults alike. Clinically, it describes instances right from the tongue that is fixed to the floor of the mouth to the extent that the mobility is impaired due to a thick, short lingual frenum. Classification of ankyloglossia is based on the Kotlow's assessment which is as follows: Class I: Mild ankyloglossia -12 to 16mm, Class II : Moderate ankyloglossia - 8 to 11 mm, Class III- Severe ankyloglossia - 3 to 7mm, Class IV- Complete ankyloglossia < 3 mm.[1] Due to this condition, patients experience speech difficulty, it also results in anterior open bite, periodontal problems such as recession of the gingiva and serious problems like dyspnea occurs because of the epiglottis and the larynx displacing forward.[2].

When ankyloglossia is present in a much milder form, with growth it usually resolves on its own. Bias is still prevalent among various specialities doctors with regards to the importance of the condition and its treatment. Depending upon whether symptoms are present or not, usually for asymptomatic individuals, there is spontaneous resolving of the condition. Nevertheless, surgical intervention is required whatever the age of the patient may be, depending on the severity in order to eliminate the consequences of tongue-tie, hence patients need to be educated about the condition and choice of treatments available so as to ensure their consent for the type of treatment they want. [3]

To diagnose and treat ankyloglossia has always been a topic of controversy for many years, among which many of the claim that for diagnosis of the condition, it is based on the lingual frenum length, tongue movement amplitude and membrane fibre thickness which is seen as a heart shaped entity following protrusion of the tongue. [4]

Ankyloglossia in patients manifests multiple problems which range from difficulties in feeding in infants, to speech difficulties and many other serious problems which could have an impact on their social life.[5]

In infants, ankyloglossia is a major cause of concern because of infants facing difficulties in breast feeding which leads to decreased tongue movements, also possible dentofacial problems hence surgical intervention is required. [6]

Depending upon the symptoms and severity of the condition and regardless of the age, there are various choices for treatment, among which frenectomy is done commonly which involves removal of the frenum and is hence necessary for thick frenum, which is observed in a majority of cases. Nowadays laser frenectomy is preferred over conventional surgical techniques, especially for children and adults who are older in age. [7]

Lasers have now replaced conventional surgeries due to various advantages which mainly include a bloodless operative site, less pain, swelling and infection after operation and no suture application is required. [8]

## Objectives:

To assess the efficacy of lasers in the treatment of ankyloglossia.

**MATERIALS AND METHODS USED:**

Many randomized control trials and comparative studies with interventions were included in the study with inclusion and exclusion criteria to get definitive results.

**Eligibility Criteria :**

**Inclusions:**

- i. Studies from 2000-2016 were included to get recent advances in treatment.
- ii. Full text articles available were taken
- iii. Studies in English language were taken.
- iv.

**Exclusions:**

- i. Studies including about other types of frenectomy
- ii. Studies including other types of oral pathologies.
- iii. Studies which are in other languages were excluded.
- iv.

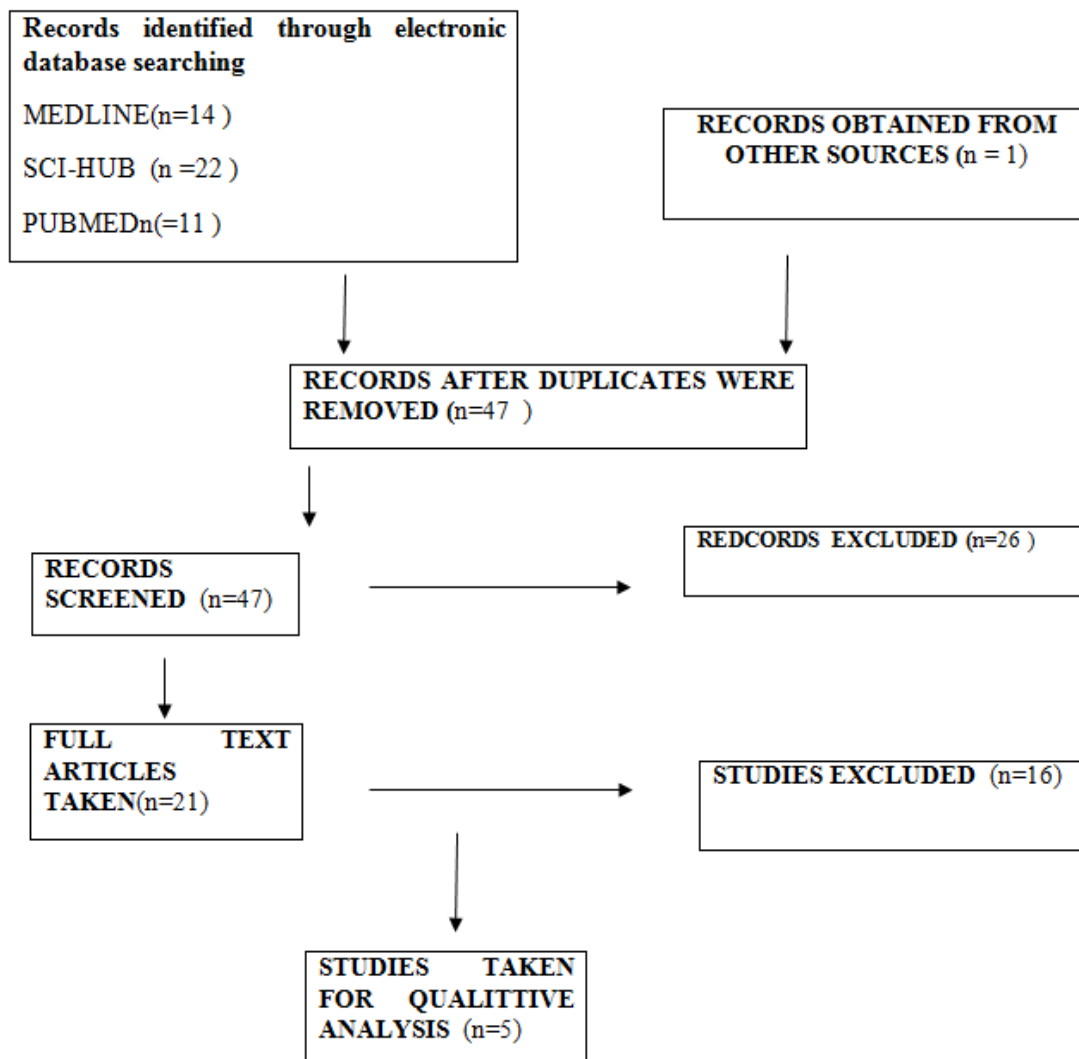
**Search strategy:**

Published results on treatment of ankyloglossia by using lasers and conventional surgical techniques which includes original articles and research papers which includes original articles and research papers in databases such as PUBMED Central, MEDLINE, SCI-HUB were taken into study for review in June 2019. A literature search to collect relevant data was performed using MeSH terms 'Ankyloglossia and Laser'. According to the PRISMA guidelines the MeSH terms were altered in each search engines with the results too many or too less.

**RESULTS:**

The search yielded 47 articles and 5 full text articles were independently assessed among these eligible articles. Three tables were included , figure 1 shows flow diagram of the reports identified ,screened , assesed for eligibility ,excluded and included for the review

**FIGURE 1** SHOWING THE NUMBER OF DATAS INCLUDED AND STUDIES TAKEN FOR QUALITATIVE ANALYSIS.



**TABLE 1- CHARACTERISTICS OF INTERVENTIONS IN THE STUDY**

S.NO	AUTHOR NAME	YEAR	SAMPLE SIZE	VOLUNTEER CHARACTERISTICS	DURATION	INTERVENTIONS
1	Atishkumar Gujrathi et al.[9]	2016	54	Patients having Kotlow's Class I and Class III ankyloglossia ; Age: 1-12 years	2 years	Group A- Lingual frenectomy done by conventional scalpel technique. Group B- Lingual frenectomy done by bipolar cautery Group C- Lingual frenectomy done by CO2 laser
2	Dr Ameena Pradhan [10]	2014	16	Patients having Class III and Class IV ankyloglossia ; Age- 16-32 years ; 10 male patients and 6 female patients.	2 years	Group A- Lingual frenectomy done by using pre- suturing scalpel method. Group B- Lingual frenectomy done by using electrocautery. Group C- Lingual frenectomy done by using a diode laser.
3	Bhawana Pawar et al[11]	2016	10	Patients having Class IV Ankyloglossia ; Age : 25-35 years	1 month	Group A- Lingual frenectomy done by using scalpel. Group B-Lingual frenectomy done by using diode laser.
4	K. Butchi Babu et al[12]	2014	10	Ten healthy patients who had Class IV ankyloglossia ; 5 patients each in the control and trial group respectively.	1 week	Group I- Lingual frenectomy done using scalpel. Group II- Lingual frenectomy done by using diode laser.
5	Mutan Hamdi Aras et al..[13]	2010	16	Patients who had complaints of tongue mobility , 8 male patients and 8 female patients ; Age: 18-27 years.	1 week	Group I- Lingual frenectomy done by using diode laser. Group II- Lingual frenectomy using Er:YAG laser.

Table 1 denotes the information of the final included articles such as the author name, number of patients who volunteered, volunteer characteristics , study duration and their age and gender. The duration of the study from the pre –surgical procedures till the final results were obtained is also mentioned . The study was conducted as a multiple-group study consisting of control group in them. The informations on the conditions for each groups are described here.

Table 2 results denotes that there is better patient perception of pain according to Atishkumar Gujrathi et al

(2016)[9] and K . Butchi Babu et al (2014) [12] after lingual frenectomy is done by lasers while according to Dr Ameena Pradhan (2014)[10] lingual frenectomy by laser gave high satisfaction with less pain and no bleeding in significant amounts. According to Dr. Bhawana Pawar et al(2016)[11], lingual frenectomy by laser provided better acceptance among patients and comfort post operation whereas Mutan Hamdi Aras et al(2010) [13]stated that Er:YAG laser has more advantage than other types of lasers based on local anaesthesia requirements.

**TABLE 2- CHARACTERISTICS OF OUTCOME AND EFFECTIVE MEASURES**

S.NO.	AUTHOR NAME	YEAR	EFFECT MEASURES	REGIMEN DOSE	MEASUREMENT PARAMETER	OUTCOME/ RESULT
1	Atishkumar Gujrathi et al.[9]	2016	Primary outcome-reduced post operative pain	<b>Group A-</b> Local anaesthesia with 2% lignocaine hydrochloride followed by giving incisions at the vestibule bound by haemostat. <b>Group B-</b> Incision done by Bipolar electrode . <b>Group C-</b> CO2 laser used in a constant motion after raising the tongue.	VAS (Visual Analog Scale ) for pain analysis after operation.	After 1 month, patient showed better perception of pain when lingual frenectomy was done by CO2 laser .
2	Dr Ameena Pradhan[10]	2014	Primary outcome- No significant amount of bleeding, minimal pain and high patient satisfaction.	<b>Group A-</b> Topical anaesthesia (15% xylocaine spray) applied followed by retraction suturing and severing the frenum with scalpel blade no .15 and then accessory suture is placed. <b>Group B-</b> Lingual frenum removed by monopolar cautery . <b>Group C-</b> Lingual frenectomy done by using BIOLASE (diode ) laser after raising the tongue followed by laser tip movement by brushing method.	Visual Analog Scale (VAS) for pain assessment after operation.	After 2 years , there was high patient satisfaction with no significant amount of bleeding and pain was minimal when lingual frenectomy was done by diode laser.
3	Bhawana Pawar et al.[11]	2016	Primary outcome- Patient's post operative comfort is better.	<b>Group A-</b> 2% Lignocaine hydrochloride infiltration followed by heamostat insertion and incision . Primary suture closure is done by (3-0) silk suture. <b>Group B-</b> Topical 2% gel pulse mode 1.2 W diode laser used followed by tip movement in brushing stroke to cut the frenum. Speech was then recorded on video for both the groups before the surgery for each patient.	Numeric Rating Scale for pain assessment and Speech Scale (by Sheryl Gottwald ) for speech analysis.	After 1 month, there is better speech, acceptance and post operative comfort among the patients.
4	K. Butchi Babu et al.[12]	2014	Primary outcome- better perception of pain and normal functioning of the oral cavity.	<b>Group I-</b> 2% Lignocaine hydrochloride administered followed by excision of lingual frenum which was then closed by (3-0) mersilk suture. <b>Group II-</b> Few drops of local anaesthesia applied followed by using PICASO (diode) laser in continuous mode .	Visual Analog Scale (VAS) for pain assessment.	At 1 week , patients perception of pain and normal functioning of oral cavity is better with lingual frenectomy done by diode laser.
5	Mutan Hamdi Aras et al.[13]	2010	Primary outcome- Less pain after surgery, normal functioning of oral cavity and no significant amount of bleeding.	<b>Group I-</b> Topical anaesthesia applied (2 ml articaine hydrochloride ) followed by diode laser incision. <b>Group II-</b> Topical anaesthesia is applied followed by Er:YAG laser incision.	5 – Point Likert – type scale for speech analysis . 7- Point Likert – type scale for pain analysis.	After 1 week, patients who underwent lingual frenectomy with Er:YAG laser had no bleeding in significant amounts or ,after 3 hrs, post operative pain reported. Since no local anaesthesia is required for Er: YAG laser, it has more advantage.

**TABLE 3- CHARACTERISTICS OF BIAS IN DIFFERENT STUDIES TAKEN FOR REVIEW**

S.No.	Author Name	Random Sequence Generation	Allocation Concealment	Blinding Of Outcome	Incomplete Outcome	Selective Bias	Other Bias
1	Atishkumar Gujrathi et al[9]	++	+	+	+	+	++
2	Dr Ameena Pradhan[10]	++	++	?	++	+	+
3	Bhawana Pawar et al[11]	++	++	?	+	+	?
4	K. Butchi Babu et al[12]	++	++	+	+	+	+
5	Mutan Hamdi Aras et al[13]	++	?	++	++	+	++

+: indicates low risk of bias      ++:indicates high risk of bias      ?:indicates unknown/unclear

Table 3 denotes that the studies conducted by Atishkumar Gujrathi et al and K.Butchi Babu et al shows a relatively low risk of bias as compared to Mutan Hamdi Aras et al whose studies show a relatively higher risk of bias and includes many unknown factors thus making it more difficult to conclude the results. The study done by Dr Ameena Pradhan and Bhawana Pawar et al had moderate risk of bias. It is thus important to take these values into consideration as the reliability of the result depends on there being a low risk of bias in the said studies.

**DISCUSSION**

This systematic review had conflicting results regarding the efficacy of lasers for treatment of ankyloglossia. Our search had several studies arguing that laser is the effective treatment for ankyloglossia and there were many review articles, comparative studies and randomized control studies and clinical trials regarding this . In the 5 studies taken the results were that the lasers were comparatively more effective treatment for ankyloglossia. Atishkumar Gujrathi et al(2016) had done a prospective randomized clinical trial , i.e a double blind clinical trial, for two years in which he categorized 54 patients, who were children and were of age 1-12 years and had mild to severe ankyloglossia, into three groups based on the following treatment procedures: scalpel surgery,bipolar cautery and CO2 laser respectively.He then assessed the patients on 1<sup>st</sup> post operative day for any signs of inflammation ,7<sup>th</sup> post operative day for healing of wound and after 1 month of operation for wound contractures and Visual Analog Scale(VAS scale) was used for pain assessment when the patients performed any masticatory function. The results showed that patients have better pain perception for CO2 lasers , not only electrocautery ,after the operation. [9]

Dr Ameena Pradhan (2014) had compared many conventional surgical techniques for the 16 patients whom she divided into three groups (Group A-scalpel pre suturing method , Group B-electrocautery method and Group C- diode laser where there is no suture respectively) , aged 16-32 years she included in her study for a period of 2 years , that is , who had mild to severe ankyloglossia with respect to bleeding intra-operatively , pain after operation and patient satisfaction. She also used Visual Analog Scale(VAS scale) for assessing pain during when

the patients speak and rest. The results showed that among the three groups , there was high patient satisfaction , bleeding was not in significant amount and minimal pain in the laser group due to less surgical duration . [10]

Bhawana Pawar et al.(2016) had compared the efficacy of lingual frenectomy between conventional scalpel and by lasers.There were 10 patients enrolled for her study and divided them into two groups (Group A- Lingual frenectomy by scalpel and Group B- Lingual frenectomy by diode laser ). She then used the Speech Scale(by Sherryl Gottwald) for speech analysis for recording the patients speech at baseline and Numeric rating Scale for pain assessment for both the groups after the surgical procedures for 7 days and 1 month respectively. The results showed that there is better speech as per the speech scale after both the surgical procedures but there is better patient comfort after the operation done by using diode laser as per the Numeric Rating Scale assessment for pain.[11]

K Butchi Babu et al(2014) had evaluated the patients’ pain perception along with speech, swallowing and for normal functioning of the oral cavity when lingual frenectomy is done using a conventional scalpel and a diode laser .He took 10 patients who had Class IV ankyloglossia in his study and divided them into two groups (Group I- Scalpel lingual frenectomy and Group II- Diode laser lingual frenectomy) . He then evaluated the patients for pain using the VAS scale after operation for a week.The results showed that among the two groups,there is better pain perception as the pain is less and there is normal functioning of the oral cavity, especially the tongue movements, when the patients were treated by the diode laser [12].

Mutan Hamdi Aras et al(2010) had conducted a study for lingual frenectomy tolerance with respect to local anaesthesia and compared post operative pain when patients are operated by the diode laser and Er:YAG laser for the treatment of ankyloglossia respectively. He took 16 patients aged 18-27 years who had reported complaints of mobility of the tongue and divided them into two groups, the diode laser group and the Er:YAG laser group. He then analysed for functioning of the oral cavity using the 5- point Likert type scale and 7- point Likert type scale for pain respectively.The results showed that there was normal functioning of the oral cavity for both the groups

as there was no significant difference, but pain was experienced by the Er:YAG laser group during first 3 hours alone post surgery. In terms of local anaesthesia, Er:YAG laser is more effective as it does not require anaesthesia administration. [13]

Another such study conducted by *D. De Santis et al* (2013) where he compared between common surgical procedures and laser treatments where used Nd:Yap laser and concluded that with lasers the operation field is bloodless and can be performed speedily, there is reduced bleeding, swelling and post operative pain. [14]

#### CONCLUSION

The study concluded stating that laser-assisted frenectomy provides better postoperative perception of pain than conventional surgical techniques as bleeding is reduced, a sepsis is increased, duration of surgery is less, post operative pain and swelling is decreased. Further studies on laser frenectomy shows that Er:YAG laser is preferred for lingual frenectomy as local anaesthesia is not required. Still, more studies need to be emphasized for use of lasers in the treatment of ankyloglossia on a large scale.

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