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MANAGEMENT OF ANKYLOGLOSSIA: COMPARISON OF PRE-SUTURING SCALPEL TECHNIQUE, ELECTROSURGERY AND DIODE LASER METHODS

Objective:

To compare various novel surgical techniques for management of Kotlow's Class III and IV ankyloglossia, in terms of intra-operative bleeding, postoperative pain and satisfaction of the patients.

Material and Methods:

Patients older than the age of 15 years, with ankyloglossia ready for the surgical procedure were enrolled in the study. All Ankyloglossia was managed by a frenectomy procedure using a pre-suturing scalpel method (group A); frenectomy procedure using electrocautry (group B) or frenectomy with Diode laser without suture (group C) from January 2012 to June 2014. These three techniques were compared in order to assess intra-operative bleeding, postoperative pain and satisfaction of the patients towards these techniques.

Results:

Total of 16 patients with ankyloglossia was operated during the study period. Out of sixteen, seven patients were in group A, five in group B and four in group C. There was no significant bleeding during surgery in all the cases. Post-operative visual analog scale (VAS) was highest in group B at 24 and 48 hours during speaking. (Mean VAS= 6.4 with S.D.0.82 and 6.0 with S.D 0.7). Patients' satisfaction was higher towards laser.

Conclusion:

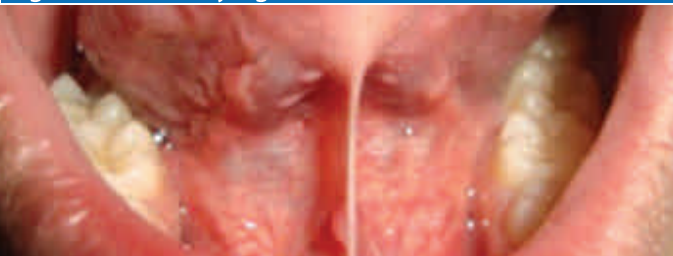
For management of ankyloglossia, a frenectomy procedure using a pre-suturing scalpel method; frenectomy procedure using electrocautry or frenectomy with Diode laser without suture can be performed safely without significant bleeding with minimal pain and greater patients' satisfaction.

Key words: Ankyloglossia, Lingual frenectomy, Electrocautry, Diode laser

INTRODUCTION:

Ankyloglossia, or tongue-tie, is a developmental anomaly characterized by an abnormally short and anteriorly positioned lingual frenum that results in severely restricted tongue movements and impaired speech. Occasionally, the abnormal lingual frenum connects the tip of the tongue to the anterior lingual gingiva [Fig 1], resulting in tension of the gingival tissue leading to local gingival and periodontal disease in the region of the frenal attachment. Tongue-tie can be symptomatic or asymptomatic. Signs of symptomatic tongue-tie includes a notched or heart shaped tongue tip, a flattened or square-shaped tongue tip when the tongue is extruded, inability to move the tongue sideways and to touch the roof of the mouth or extend beyond the lips or cannot be protruded beyond lower incisor teeth. The severity of ankyloglossia is variable and ranges from a slight but abnormal attachment of frenum restricting tongue movement (partial ankyloglossia) to a condition with the tongue fixed to the floor of the mouth completely (complete ankyloglossia). Furthermore, it should be also emphasized that a short frenum is not always tight or fibrotic; in fact, despite the reduced length of the lingual frenum, the elasticity of the floor of the mouth may still allow a normal mobility of the tongue thus making the frenectomy unnecessary.¹

Fig 1: Class III ankyloglossia



Kotlow² has classified severity of ankyloglossia on the basis of length of the "free tongue" (Table 1). Free tongue is defined as the length of the tongue from the insertion of the lingual frenum into the ventral surface of the tongue to the tip of the tongue.

Tab. 1: Morphological classification of Ankyloglossia:

Clinically accepted normal length of free tongue: ≥ 16 mm	
Class I	Mild ankyloglossia: length of free tongue: 12-16mm
Class II	Moderate ankyloglossia: length of free tongue: 8-11mm
Class III	Severe ankyloglossia: length of free tongue 3-7mm
Class IV	Complete ankyloglossia: length of free tongue less than 3mm

If the anomaly is relatively severe and generates mechanical limitations and functional challenges, surgical reduction of the frenum is indicated, followed by speech therapy for an immediate rehabilitation of the lingual muscle.³ The three techniques of the surgery viz: a frenectomy using a presuturing scalpel method; frenectomy using electrocautry and frenectomy with Diode laser without suture were compared here. The aim of the study is to compare various novel surgical techniques for management of Kotlow's Class III and IV ankyloglossia, in terms of intra-operative bleeding, postoperative pain and satisfaction of the patients.

MATERIAL AND METHODS:

Patients older than the age of 15 years, with tongue tie ready for the surgical procedure were enrolled in the study. The study was conducted in 3 clinics of Kathmandu, Nepal from January 2012 to June 2014 by the same surgeon. Prior to surgery, all the patients were explained about the three different surgical techniques and informed consent was taken. The technique to be used was decided on patients' choice. The patients were then educated about the use of the visual analog scale (VAS).

The cases were divided into three groups: Group A- who underwent surgery using conventional scalpel technique, second Group B- using electrocautry and third Group C- using Diode laser. We compared three groups in order to assess intra-operative bleeding, postoperative pain and satisfaction of the patients among the groups. All these three techniques were performed in local anesthesia.

Local anesthesia procedure:

The patient was advised to rinse the mouth with 10 ml 0.2% Chlorhexidine mouthwash before commencement of surgical procedure. A topical 15% Xylocaine spray was applied to the floor of oral cavity following which 1 ml of Xylocaine with 1:80,000 adrenaline solution was infiltrated locally at ventral surface of tongue and floor of the mouth and toward the genoid tubercle on the lingual aspect of mandible for group A and B. For group C, 0.6 ml of Xylocaine with 1:80,000 adrenaline solutions was infiltrated in the frenum directly.

Group A: Presuturing scalpel technique:

A retraction suture (3-0 silk) was placed at the tip of the tongue to facilitate retraction and visibility in the area of the operating field. Following this, two different set of sutures were planned. The first set included 2-4 simple interrupted sutures placed in a vertical line extending from the tip of the tongue to the base of the frenum. The next set included 2-3 simple interrupted sutures, location being placed anterior and parallel to the previous line of sutures on the lingual frenum in a vertical line [Fig 2]. In this case, both first and second set of sutures included only two interrupted sutures. Suturing was done cautiously so as to prevent tying of Wharton's duct, an opening of the submandibular gland. The frenum was held with hemostat between two vertical rows of sutures then with surgical scalpel blade No 15, frenum was severed carefully. Presuturing of frenum before severing prevented excessive opening of diamond shape wound and provided greater hemostatis [Fig 3].



Fig. 2: Presuturing technique



Fig. 3: Frenectomy with sutures

Following this tongue was checked for any muscle tension, if any it was relieved by carrying blunt dissection in floor of the mouth. Patient was instructed to assess freeness of tongue through protruding and sweeping upper and lower lip and corner of the mouth without much straining. An accessory suture was placed in the floor of the mouth in the area where blunt dissection was carried out.

Group B: Frenectomy using Electrocautery

The tongue was held upwards with a piece of gauze and frenum was exposed. With a monopolar electrocautry in cutting- coagulation mode, frenum was cut slowly up to

the posterior attachment at the ventral surface of tongue. The freeness of tongue was assessed.



Fig. 4: Frenectomy using Electrocautery

Group C: Frenectomy using Diode laser

Tongue was raised with the thumb and index finger to expose the frenum. The diode laser (BIOLASE) was applied in a contact mode with focused beam for excision of the tissue. The tip of laser was moved from up to down in brushing method excising it slowly and continuously mopping with wet gauge preventing excessive thermal damage to the excised tissue. The procedure continued up to the posterior attachment of frenum on the ventral surface of the tongue. [Fig 5]



Fig. 5: Frenectomy using Diode laser

Post-operative instruction

Patients were prescribed Amoxicillin 500 mg for 5 days and analgesics if required. They were also advised to use 0.2% Chlorhexidine twice daily for 2 weeks. Postoperative instructions were given which included sucking of ice chips during first 24 hours, performance of postoperative tongue exercises after first 24 hours, and avoidance of any hot, hard or spicy food stuff. Postoperative tongue exercise included touching of tongue to the palatine rugae while keeping mouth opened, rolling tongue side to side touching corner of the mouth, stretching of the tongue with a protrusive action. Patients were instructed to continue this exercise 3-4 times daily for 2 min until the incision healed. Sutures in group A patients were removed 1-week after surgery.

Statistical analysis:

The grade of pain was assessed using a 10 cm visual analog scale (VAS), which ranges from 0 (no pain) to 10 (most severe pain). The pain grade during resting periods (rVAS) and during speaking (sVAS) was assessed at 4,24,48 hour postoperatively, and then on 7th post-operative day. Each patient was questioned regarding their overall satisfaction on 7th day of surgery according to Likert scale. (1=Strongly unsatisfied; 2= Unsatisfied; 3= Neither 4= Satisfied; 5= Strongly satisfied). Results were presented as the Mean $\pm$ standard deviation.

RESULTS:

Total of 16 patients with tongue tie were operated during the study period. The age ranges from 16 years to 32 years with 10 male and 6 female patients. Out of sixteen, seven patients were in group A, five in group B and four in group C. There was no significant bleeding in all the cases. Average VAS at 4 hour, 24 hour, 48 hour and on 7th postoperative day during resting and during speaking were shown in table 2 and 3. The satisfaction score was shown in figure 6.

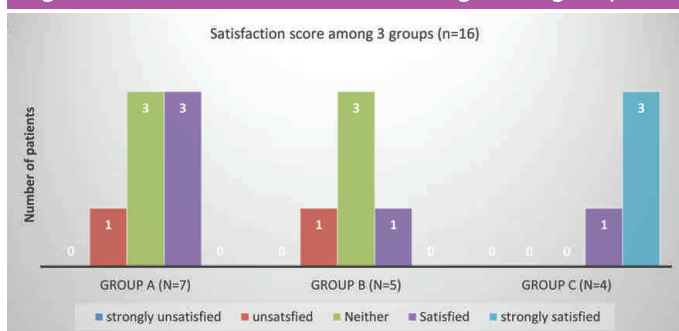
Tab. 2: Average VAS during resting at 4 hour, 24 hour, 48 hour and on 7th postoperative day

Average rVAS	Group A	Group B	Group C
VAS at 4 hour	0.57	0.8	1.5
VAS at 24 hour	2	4.4	1.75
VAS at 48 hour	2.14	4.4	1
VAS on 7th day	1.28	3	1.5

Tab. 3: Average VAS during speaking at 4 hour, 24 hour, 48 hour and on 7th postoperative day

Average sVAS	Group A	Group B	Group C
VAS at 4 hour	0.57	1	1.8
VAS at 24 hour	3	6.4	2.75
VAS at 48 hour	3.24	6.0	2
VAS on 7th day	1.28	3	1.5

Fig. 6: Satisfaction scale result among three groups



DISCUSSION:

The lingual frenum is a mucosal fold that connects the ventral surface of the tongue to the floor of the mouth and to the mandibular bone. When the frenum is thick and very tight and/or its place of insertion limits the mobility of the tongue, it can result in ankyloglossia (Greek "ankylos" which means tied and "glossa" which means tongue).⁴

It usually affects male more than females in a 3:1 ratio.⁵ It occurs in newborns with an incidence of about 5%, more frequently as an isolated event and sometimes associated with malformative syndromes (Simpson-Golabi-Behemel Syndrome, Optiz Syndrome, Beckwith-Wiedemann Syndrome, Orofacial-digital Syndrome; cleft palate).⁵ The prevalence of ankyloglossia reported in the literature varies from 0.1% to 10.7%. The prevalence is also higher in studies⁶ investigating neonates (1.72% to 10.7%) than in studies⁷ investigating children, adolescents, or adults (0.1% to 2.08%). It can be speculated that some milder forms of ankyloglossia may resolve with growth, explaining this age-related difference. Due to lack of awareness of this condition, most of the people do not

undergo treatment. Similarly almost all type of ankyloglossia doesnot require surgical intervention. Kotlow had described nine structural guidelines to determine the need for surgical management of lingual frenulum.²

1. If the tip of tongue clefts during the act of protrusion
2. If the tip of the tongue is not able to sweep the upper and lower lips easily, without straining
3. If retrusion of tongue , blanches the tissue lingual to anterior teeth
4. If tongue places excessive forces on mandibular anterior teeth
5. If frenum interferes with normal deglutition process
6. If the frenum creates diastema between mandibular central incisors
7. If the child experiences speech difficulty due to limited tongue movement
8. If infants, shows abrasion at underside of the tongue, and
9. If the frenum prevents infant from attaching to mother's nipple during nursing

In this study we have compared three surgical techniques viz: a frenectomy procedure using a presuturing scalpel method; frenectomy procedure using electrocautry and frenectomy with Diode laser without suture in terms of intra-operative bleeding, post-operative pain and patients' satisfaction. All the three techniques are popular and well established nowadays in Nepal and have their own advantages and disadvantages.

Pre suturing technique have advantage over other techniques like it provides excellent hemostasis, no opening of greater wound and appropriate primary wound closure.^{8,9} Electrocautry offers the advantage of minimal time consumption and bloodless field during the surgical procedure, with no requirement of sutures; but it cannot be used on patients with poorly shielded pacemakers, cannot be used near inflammable gases and the odor of burning tissue is present if high volume suction is not used.^{10,11} The initial cost of the laser and electrocautry equipment is far greater than the cost of a scalpel.

Laser technique is considered as an excellent alternative to traditional surgery for lingual frenectomy¹. It is simple and rapid to perform, well accepted and tolerated by patients^{12,13}, requires minimal anaesthesia, bloodless field with an asymptomatic postoperative period without relapse. In our study among these three novel techniques, minimum intra-operative bleeding was present in group A but was not statistically significant. None of the case of group B and C had bleeding. Patients felt pain more in Group B (electrocautry technique), VAS was high in both resting and speaking specially during first 24 and 48 hours. The VAS was not beyond 5 except in electrosurgery during speaking. It might be due to thermal injury of the tissue. VAS was low at first 4 hour in all three techniques which may be because of remaining local effect of xylocaine. The satisfaction score was less in group A, which might be due to longer surgical

procedure and need of 2nd appointment for suture removal. Out of seven patients of group A, one was unsatisfied, 3 were neutral and 3 were satisfied. Similarly among five, 1 was unsatisfied, 3 were neutral and 1 was satisfied in group B. However, three were highly satisfied with laser technique in Group C. It might be because of short duration of surgery with less pain and no bleeding with minimal xylocaine infiltration locally. The statistical calculation for the significance is not applicable due to very less sample size, which is the limitation of the study. Lingual frenectomy in adult is not too common. Further study including children posted for frenectomy under general anaesthesia could be included so that sample size will be adequate.

CONCLUSION:

For the management of ankyloglossia a frenectomy procedure using a pre-suturing scalpel method; frenectomy procedure using electrocautry or frenectomy with Diode laser without suture can be performed safely without significant bleeding. From the patients' perspective, laser frenectomy gives greater satisfaction and frenectomy procedure using electrocautry causes relatively higher post-operative pain more during speaking on second and third post-operative day.

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