Original Article
Journal of Pierre Fauchard Academy (India Section), *Vol 32(1-2), DOI: 10.18311/jpfa/2018/21454, March - June 2018 p. 16-20* *ISSN (Print) : 0970-2199* *ISSN (Online) : 2405-772X*

Evaluation of Malocclusion Traits Associated with Ankyloglossia: A Pilot Study

Javed Sodawala, Surbhi Sharad Agrawal*, Sumit Gandhi, Shaheen Hamdani and Shabana Nazmeen

Department of Orthodontics and Dentofacial Orthopaedics, Rungta College Of Dental Science and Research, Bhilai, Chhattisgarh, India; surbhi.agrawal07@gmail.com

Abstract

Context: Although the role of ankyloglossia as an etiologic factor in the development of the malocclusion is well established, the guidelines for its clinical examination are still not clear especially in adult subjects. **Aim:** The aim of the study was to evaluate dento-skeletal characteristics in patients with ankyloglossia and to correlate ankyloglossia with various malocclusion traits. **Settings and Design:** Descriptive cross-sectional study. **Materials and Methods:** Fifty patients were divided into two groups using Kotlow's method: without ankyloglossia (group WA) and ankyloglossia (group A). Five skeletal characteristics- SNA, SNB, ANB, GoGn-SN and five dental characteristics - Class of malocclusion, crowding, spacing, overjet and overbite were assessed. **Statistical analysis used:** Independent *t* test was used to compare skeletal and dental characteristics between group WA and A. Pearson correlation coefficient was used to determine interrelationship between ankyloglossia and skeletal and dental characteristics. The level of significance was set at .05. **Results:** There were statistically significant differences between group WA and group A with respect to SNA, SNB and overjet ($P<0.05$). Also, a significant positive correlation was seen between ankyloglossia and Class of malocclusion. ($r=0.501$, $P<0.05$). **Conclusions:** This study suggests patients with ankyloglossia have increased overjet with more retrognathic maxilla and mandible as compared to patients without ankyloglossia.

Keywords: Ankyloglossia, Kotlow's Method, Maloccusion

Key Messages: The outcome of the study will help the clinician to asses various dento-skeletal characteristics in patients with ankyloglossia.

1. Introduction

The principal role of the frenulum is to maintain harmonious relationship among developing bones, tongue and lip musculature during intra-uterine life and also limit movement of lips, cheek and tongue[1,2]. Abnormal frenal attachment may disturb the movement of the aforementioned structures, thus affecting the position of jaws and arrangement of dentition[3].

A short and thick frenulum attachment restricts tongue movements and results in ankyloglossia[1]. The incidence of ankyloglossia among new-borns is about 5%, and it affect males three times more than females (3:1 ratio)[4]. Ankyloglossia may cause clinical consequences such as infantile breastfeeding difficulties, speech disorders, limited tongue movement, and orthodontic anomalies[5]. A lowered tongue posture due to ankyloglossia causes forward and downward pressure to the mandible leading to diversity in facial development[4]. The forward thrusting of tongue against the anterior body of the mandible as a result of restricted tongue mobility is also one of the contributing factor causing malocclusion[6].

To better understand the growth and development of craniofacial structures and factors causing malocclusions,

*Author for correspondence

it is essential to understand relationship between tongue posture and craniofacial structures. Though the size and shape of mandible is genetically predetermined, numerous physiologic, pathologic, and mechanical factors influence its growth[4–7]. Therefore, the aim of this study was to evaluate dento-skeletal characteristics in patients with ankyloglossia and to correlate it with various malocclusion traits.

2. Subjects and Methods

The study sample consisted of 50 patients of age ranging from 10 to 30 years seeking orthodontic treatment using convenience sampling technique. An approval for conducting this study was taken from the Institutional Ethical Committee of concerned institute. A verbal and written informed consent was obtained from parents and patients before commencement of the study. Patients with full complement of permanent dentition, healthy systemic condition, without previous history of orthodontic treatment and any craniofacial abnormalities were included in the study.

Demographic data such as name, age and gender were recorded. The patients then were divided into two groups: without ankyloglossia (group WA) and ankyloglossia (group A). Kotlow's method was used for evaluating ankyloglossia by measuring free tongue length[8,9]. It is the length between tongue's tip and lingual frenum attachment point.

Free tongue length measurement less than 16mm is considered as ankyloglossia. The grading of ankyloglossia were: Class I: mild ankyloglossia (12 to 16 mm), Class II: moderate ankyloglossia (7 to 12 mm), Class III: severe ankyloglossia (3 to 7 mm) and Class IV: complete ankyloglossia (<3 mm)[10]. Skeletal characteristics such as SNA, SNB, ANB, and GoGn-SN were measured using lateral cephalogram. Dental characteristics such as Angle's Class of malocclusion, crowding, spacing, overjet and overbite were clinically assessed and measured.

3. Statistical Analysis

Data was gathered and analysed using the Statistical Package for Social Sciences Version 18.0 (SPSS Inc., Chicago, Illinois, USA). The distribution of sample according to Class of ankyloglossia and malocclusion was expressed as percentages. Independent *t* test was used to compare skeletal and dental characteristics among group WA and A. Pearson correlation coefficient was used to find association among ankylossia and dento-skeletal characteristics. The level of significance was set at .05.

4. Results

The mean age of group WA and A was 17.88 ± 3.6 years and 18.08 ± 3.9 years, respectively (Table 1).

Table 1: Descriptive statistics of sample regarding age

Groups	N	Age in yrs (Mean ± SD)
Group WA	25	17.88 ± 3.6
Group A	25	18.08 ± 3.9
Total	50	18.08 ± 3.71

In group A, 32% patients had mild, 20% had moderate and 48% had severe ankyloglossia (Table 2).

Table 2: Distribution of sample according to Class of ankyloglossia

Group A	Class of ankyloglossia				Total
	I	II	III	IV	
Total	8 (32%)	5 (20%)	12 (48%)	0	25

In group A, 60% of the patients belonged to Class I and 40% to Class II malocclusion whereas in group WA, 56% of patient belongs to Class I, 40% to Class II and 4% to Class III malocclusion (Table 3).

Table 3: Distribution of sample according to Class of malocclusion

Groups	Class of malocclusion			Total
	I	II	III	
Group WA	14 (56%)	10 (40%)	1 (4%)	25
Group A	15 (60%)	10 (40%)	0	25

Tables 4 and 5 compares the skeletal and dental characteristics between group WA and A. Statistically significant difference was found between group WA and A with respect to overjet (P=.018), SNA (P=.008), and SNB (P=.007).

Table 4: Comparison of skeletal characteristics among sample with and without ankyloglossia

Skeletal Characteristics	Group	N	Mean	SD	t	P value
SNA	WA	25	84.377	4.3979	-2.773	.008*
	A	25	81.160	3.6592		
SNB	WA	25	80.000	4.5254	-2.838	.007*
	A	25	76.800	3.4278		
ANB	WA	25	4.269	1.4299	0.190	.850
	A	25	4.360	1.9553		
GoGn-SN	WA	25	30.384	5.6926	0.448	.656
	A	25	31.040	4.6946		

*P< .05 significant difference

Table 5: Comparison of dental characteristics among sample with and without ankyloglossia

Dental Characteristics	Group	N	Mean	SD	t	P value
Overjet	WA	25	4.076	2.2076	2.455	.018*
	A	25	6.120	3.5976		
Overbite	WA	25	3.423	2.4847	0.125	.901
	A	25	3.508	2.3738		
Spacing	WA	25	1.000	2.0445	-1.380	.174
	A	25	.360	1.1135		
Crowding	WA	25	2.692	2.4457	1.193	.238
	A	25	3.640	3.1902		

*P< .05 significant difference

Tables 6 and 7 shows correlation among ankyloglossia, skeletal and dental characteristics using Pearson correlation coefficient. Among skeletal characteristics, highest negative correlation was seen between ankyloglossia and SNA (Table 6). Among dental characteristics, highest positive correlation was seen between ankyloglossia and Class of malocclusion while highest negative correlation was seen between ankyloglossia and crowding (Table 7). A significant positive correlation (r=0.501, P= .011) was seen between ankyloglossia and Class of malocclusion.

5. Discussion

The size, position, structure, and function of the tongue plays an important role in the etiology of malocclusion[10].

Table 6: Comparison of ankyloglossia and skeletal characteristics using Pearson correlation coefficient

Skeletal Characteristics	SNA		SNB		ANB		GoGn-SN	
	r	P	r	P	r	P	r	P
Ankyloglossia	-0.35	.086	-0.341	.095	-0.058	.783	-0.021	.919

Table 7: Comparison of ankyloglossia and dental characteristics using Pearson correlation coefficient

Dental characteristics	Class		Overjet		overbite		Spacing		Crowding	
	r	P	r	P	r	P	r	P	r	P
Ankyloglossia	0.501	.011*	0.084	.689	0.005	.98	0.065	.758	-0.335	.101

*P< .05 significant difference

Many hypothesis have been proposed to better understand the causes of malocclusion. Moss and Rankow[11] in their functional matrix hypothesis explained that musculature and other soft tissues influence the growth of bone and other hard tissues to the point that skeletal genomes are rendered redundant. Hence, we can say that tongue, which is a part of soft tissue system, can modulate the growth of hard tissues such as maxilla and mandible[4]. The balance between tongue and buccinator muscle is accountable for normal growth of the maxillary and mandibular arch shape and width[12,13].

The cause and effect relationship between lingual frenum and skeletal malocclusion has not been explored much; the tongue is composed entirely of musculature and devoid of fixed landmarks. And hence, observed and impressionistic judgements have continued to influence the description of lingual morphology instead of quantitative data[5,14]. Various methods have been proposed to evaluate ankyloglossia. But most of the above proposed methods comprised of more than one criteria for evaluation of ankyloglossia and were inconvenient for practical use. This study relied on Kotlow's classification of ankyloglossia for diagnosis and grading of ankyloglossia because of its simplicity and ease of use.

The results in this study depicted that 48% of patient had severe grade of ankyloglossia [Table 2]. The majority of ankyloglossia patients presented with Class I malocclusion (60%) followed by Class II (40%) [Table 3]. A negative correlation was found between ankyloglossia and skeletal characteristics such as SNA, SNB, ANB, and GoGn-SN. Positive correlation was found between ankyloglossia and dental characteristics like overjet, overbite and spacing and negative correlation was found between ankyloglossia and crowding. Positive correlation between Angle's Class of malocclusion and ankyloglossia was statistically Significant [Table 7]. Srinivasan and Chitharanjan[10] Change in their study, concluded to found out overbite reduction is not seen in severe ankyloglossia whereas Sepet el al.[15] found no relation of crowding of mandibular incisor and occlusion type with ankyloglossia.

Another important finding of our study was statistically significant difference in both the groups with respect to SNA, SNB and overjet. In this study, majority of patients showed skeletal Class II pattern with retrognathic maxilla and mandible with increased overjet. This was contradictory to the study by Jang et al.[5] where ankyloglossia was more common in Class III skeletal malocclusion. This could be due to high prevalence of Class III malocclusion in Korean population.

The role of ankyloglossia as an etiologic factor in the development of the malocclusion is well established, but the guidelines for its clinical examination are still not clear especially in adult patients. The present study did not analyse functional movements of tongue like lift, extension, lateralisation and peristalsis. Future studies should also evaluate long term effect of lingual frenectomy on craniofacial structures of growing individuals.

6. Conclusion

It was found that patients with ankyloglossia had increased overjet with more retrognathic maxilla and mandible as compared to patients without ankyloglossia. A negative correlation was found between ankyloglossia and skeletal characteristics like SNA, SNB, ANB, and GoGn-SN and dental characteristics like overjet, overbite and spacing while negative correlation was found between ankyloglossia and crowding. Also, a significant positive correlation (r=0.501, P=.011) was seen between free tongue length and dental malocclusion.

7. References

1. Olivi G, Signore A, Olivi M, Genovese MD. Lingual frenectomy: Functional evaluation and new therapeutical approach. Eur J Dent. 2012;13:101–106.
2. Northcutt ME. The lingual frenum. J Clin Orthod. 2009;43(9):557–655. PMid:19904047
3. Segan LM, Stephenson S, Dawes M. Feldman. Prevalence, diagnosis, and treatment of ankyloglossia. Methodologic review. Can Fam Physician. 2007;53:1027–1033.
4. Kloars T. Familial ankyloglossia (tongue tie). Int J Pediatr Otorhinolaryng. 2007;71:1321–1324. https://doi.org/10.1016/j.ijporl.2007.05.018. PMid:17588677
5. Jang SJ, Cha BK, Ngan P, Choi DS, Lee SK, Jang I. Relationship between the lingual frenulum and craniofacial morphology in adults. Am J Dentofacial Orthop. 2011;139:e361–e367. https://doi.org/10.1016/j.ajodo.2009.07.017. PMid:21435544
6. Defabianis P. Ankyloglossia and its influence on maxillary and mandibular development. (A seven year follow-up case report). Funct Orthod 2000;17:25–33. PMid:11307269
7. Meenakshi S, Jagannathan N. Assessment of lingual frenulum lengths in skeletal malocclusion. J Clin Diagn Res. 2014;8:202–204. PMid:24783137. PMCid:PMC4003643
8. Kotlow LA. Ankyloglossia (tongue-tie): A diagnostic and treatment quandary. Quintessence Int. 1999;30(4):259–262. PMid:10635253

9. Kotlow LA. Oral diagnosis of oral frenum attachments in neonates and infants: Evaluation and treatment of the maxillary and lingual frenum using the Erbium: YAG laser. Journal Pediatric Dental Care. 2004;10(3):11–13.
10. Srinivasan B, Chitharanjan AB. Skeletal and dental characteristics in subjects with ankyloglossia. Prog Orthod. 2013;14:1–7. https://doi.org/10.1186/2196-1042-14-44. PMid:24326143. PMCid:PMC4384905
11. Moss ML, Rankow RM. The role of the functional matrix in mandibular growth. Angle Orthod. 1968;38:95–103. PMid:5239131
12. Pompéiaa LE, Ilinskya RS, Ortolania CL, Júnior KF. Ankyloglossia and its influence on growth and development of the stomatognathic system. Rev Paul Pediatr. 2017;35(2):216–221
13. Proffit WR. Equilibrium theory revisited: factors influencing position of the teeth. Angle Orthod. 1978;48:175–186. PMid:280125
14. Fletcher SG, Meldrum JR. Lingual function and relative length of the lingual frenulum. J Speech Hear Res. 1968;11:382–390. https://doi.org/10.1044/jshr.1102.382
15. Sepet E, Yildiz C, Erdem AP, Ikikarakayali G, Gorken FN, Kuru S. Relationship between mandibular incisor irregularity and type of occlusion in ankyloglossia. Oral Health Prev Dent. 2015;13:59–63. PMid:24914432