대한치과교정학회지 : 제 2 권, 제 1 호
J. K. A. O. : Vol. 2, No. 1, Dec., 1971

A STUDY ON THE RELATIONSHIP BETWEEN TONGUE FUNCTION AND MALOCCLUSION

Mi Dae Lee, D.D.S.

Dept. of Orthodontics, Graduate School, Seoul National University

Director : *Assist. Prof.* **Hi Won Cho**, D.D.S., M.S.D., Ph.D.

舌機能과 不正咬合의 相關關係에 關한 硏究

서울大學校 大學院 齒醫學科 矯正學 專攻

(指導 : 趙 喜 源 助敎授)

李 美 代

》 國文抄錄 《

不正咬合과 口腔領域의 惡習慣과의 關係를 究明해 보고자 本 著者는 口內 惡習中 비교적 發生頻度가 높으며 不正咬合에 미치는 影響이 크다고 생각되는 tongue-thrusting에 對한 다음과 같은 一連의 調査를 施行하였다.

1. Tongue-thrusting의 頻度와 不正咬合의 類型과의 關係를 調査하였다.
2. 서울大學校 齒科大學 附屬病院에 來院한 263名의 不正咬合 患者로 부터 tongue-thrusting의 有無, 受乳方法, 口內惡習 및 上氣道病變狀態를 觀察하였다.

結果는 다음과 같았다.

1. 15歲 乃至 17歲 男學生 1,356名中 tongue-thrusting을 보인 사람은 12.7%였다.
2. Angle氏 三級 不正咬合이 tongue-thrust swallowing과 가장 密接한 關係가 있었다.
3. 人工 受乳가 tongue-thrust swallowing의 原因이 된다는 明確한 根據는 없었다.
4. 上氣道의 慢性 病變은 tongue-thrust swallowing과 無關하였다.

INTRODUCTION

The muscle groups primarily related to malocclusion are those of the tongue, of facial expressions, and of the palate and pharynx.

In diagnosis and treatment planning, the influence of the soft tissue upon the denture

* 本 論文의 要旨는 1971年 11月 15日 第4回 大韓齒科矯正學會 學術大會에서 發表되었음.

must be carefully considered and investigated. A review of the literature revealed that tongue-thrusting had been of some concern for many years. It was not until the 19th century that dentists began to consider the influence of soft tissue on malocclusion in treatment and diagnosis.

In 1859, Bridgeman[1] introduced the "Lateral pressure theory". C. S. Tomes stated that muscle functions were related to the arch shape. However, using the electric technique to indicate the relationships between arch shape and influenece of the soft tissue, Winders[2] concluded that "there is not the balance of the musculature between the buccal and the lingual sides of the dentition. The position of the teeth is dictated primarily by the skeletal base, and only in extreme changes in pressure, as incurred in thumb sucking, macroglossia, progressive muscular dystrophy, etc., can a change in the position of the teeth be expected." Lear and Moorees[3] described that there was no definite proof which the balance between the buccal and the lingual functions determined the arch form. Straub[4] wrote that improper bottle feeding of infants was an important etiologic factor of malocclusion.

Moyers[5] investigated functional movements of the orofacial musculature using the electromyography and stated that "Certain habits serve as stimuli to normal growth of the jaws, for example, normal lip action and proper mastication. And bottle-fed babies more frequently display undesirable sucking habits. And tongue-thrust swallowing is a residuum of thumb-sucking." According to the British idea by Hovel[6], some orthodontists who studied the cephalometrics insisted that malocclusion was due to endogenic facial morphology in the vast majority of cases, but Ballard and Rix had come to the conclusion that it was the soft tissue patterning which was responsible for dental arch form relative to dental base.

Graber[7] described in Class Ⅱ malocclusion, because the lower lip is redundant and often hypofunctional, the oral seal is thus effected by the tongue and the lip. According to Tulley[8], it is better to put emphasis on the morphology of the skeletal and soft tissue structure which demand abnormal posture and activity, rather than on the more transient and rapid movement of the tongue in speech and deglutition.

The conflicting opinions and reports concerning incidences, etiology and diagnosis of tongue thrust demonstrate the necessity of objective research in this area.

This report contains two kinds of procedure. The data that presents relationship between the types of malocclusion and tongue-thrust swallowing was obtained from "S" high school. The data that shows the relationship of such factors as bottle-fed, breast-fed, thumb-or finger-sucking, frequent sore throat, and mouth-breathing to tongue-thrusting was from the patients who came to the Dept. of Orthodontics, Infirmary of Dental College S. N. U..

PROCEDURES

1. Survey of Students

   In this investigation, 1,356 fifteen to seventeen-years-old high school boys were examined.

We made the decision of tongue thrust as follows: Upon giving the command "Swallow!" the observer slightly parted the lips with a hand and observed the movement of the tongue. This procedure was repeated enough times to assure the examination.

Tongue-thrust swallowing was defined as a condition in which the tongue makes contact with any teeth, or the tongue goes forward enough to have the tip placed either interdentally or under the upper incisal edge.

The data obtained in these categories were treated statistically, using percentages to describe the incidence of tongue-thrust swallowing, and Chi-square designs, to compare the results of each other category with the criterion of tongue thrust swallowing.

2. In conjunction with this survey, 263 orthodontic patients who came to Dept. of Orthodontics, Infirmary of Dental College, S. N. U. were examined. The patients were checked about the following items.

1) Whether the patients belong to tongue-thrust swallower or not
2) Kinds of feeding method when the patients were suckling infant; breast-fed or bottle-fed
3) Abnormal sucking habits
4) Upper respiratory problems; mouth breathing, enlarged tonsil and frequently inflammed tonsil.

RESULTS

Table 1. Survey of students

	Normal occlusion	Class Ⅰ malocclusion	Class Ⅱ malocclusion	Class Ⅲ malocclusion	Total
Total number	609	584	66	97	1356
Number of tongue-thrust swallowers	43	72	12	45	172
Percentage	7	12	18	46	12.7

Chi-square test

Variable	Significancy
Class Ⅰ malocclusion and tongue-thrust swallowers vs. normal occlusion and tongue-thrust swallowers	non-sig.
Class Ⅱ malocclusion and tongue-thrust swallowers vs. normal occlusion and tongue-thrust swallowers	sig.
Class Ⅲ malocclusion and tongue-thrust swallowers vs. normal occlusion and tongue-thrust swallowers	sig.

Table Ⅱ. Relationship of various factors listed among with tongue-thrust syndromes

	Bottle-fed		Breast-fed		Abnormal sucking habit		Upper resp. problems		Total	
	No	%	No	%	No	%	No	%	No	%
Lee	18	17.4	80	82.6	42	43.0	37	38.8	98	38
Andersen[9]	44	91.7	4	8.3	26	54.2	16	33.3	48	

Table Ⅲ. Relationship of various factors listed among without tongue-thrust syndromes.

	Bottle-fed		Breast-fed		Abnormal sucking habit		Upper resp. problems		Total	
	No	%	No	%	No	%	No	%	No	%
Lee	25	12.2	140	84.8	50	30.3	52	31.3	165	62
Andersen[9]	218	82.6	46	17.4	66	25	97	36.7	264	

DISCUSSION

Tulley classified tongue-thrust as follows;

1) Tongue-thrust as a habit
2) Tongue-thrust which is possible endogenous or innate
3) Tongue-thrust as an adaptive behavior
4) Pathologic and grossly abnormal tongue problems

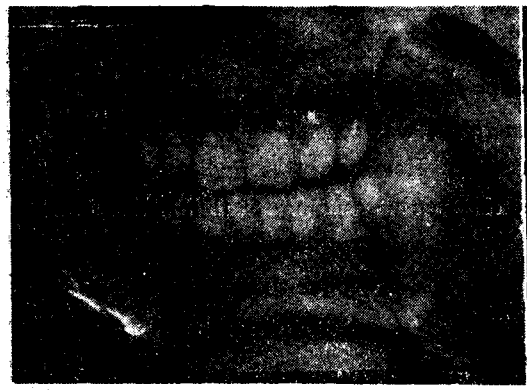
In this study of the 1356 high school boys between the age of 15 to 17, 172 showed the tongue-thrust swallowing (12.7%) and the school boys who have tongue-thrust habit with normal occlusion are 45(7%). Chi-square test presented that Class Ⅱ and Class Ⅲ malocclusions were related with tongue-thrust swallowing.

As by far most common references on oral habit, tongue-thrusting is associated with Class Ⅱ division 1 malocclusion, Class Ⅲ malocclusion and open bite. According to Straub[4], the abnormnl swallowing habit is definitely one of the causes of severe Class Ⅲ malocclusion. He described that abnormal swallowing causes a complete collapse of the maxilla, and adverse growth of mandible is caused by the masticating pressure of a complete cross-bite on upper jaw.

Graber[7] stated that, in Class Ⅲ malocclusion, the lower lip is redundant and often hypofunctional, and the tongue lies low in the mouth but the tip reaches up and contacts the vermilion border of the upper lip as it drops partly behind the lower incisors. The oral seal is thus caused by tongue and upper lip. In Class Ⅱ malocclusion, it is important to note that although the tongue-thrust does protrude the upper anterior teeth, there are many cases in which the tongue in retraction has a tendency to pull the lower anterior teeth.

But Tulley[8] described that the resting posture of the tongue is more important that its functionl movements. In the type of deglutition in which there is a tongue-thrust and an excessive circumoral contraction of the labial musculature, in cases where the lips are "incompetent", the tongue comes forward to complete the anterior oral seal.

This tongue-thrust swallowing can change quite dramatically, if orthodontic treatment place the labial segment in good relationship so that the lower lip can seal on the labial surfaces of the upper incisor teeth. Slight anterior open bite can be incurred by simple tongue-thrust or mouth breathing.



Tongue-thrust swallowing with normal occlusiosn

Tongue-thrust swallowing with Class I malocclusion

Tongue-thrust swallowing with Class II div. 1 malocclusion

Tongue-thrusting swallowing with Class III malocclusion

Tongue-thrust swallowing with anterior open bite

Fig. I. Tongue position and various types of occlusion

A comparison of Table Ⅱ and Table Ⅲ shows very low percentage of bottle-feds both in tongue-thrusters and in non-tongue-thrusters in Korean. Although the percentage is higher among the tongue-thrusters, the difference between the two is rather low (2.2%). This indicates that bottle-feeding does not appear to be a significant etiological factor in the production of tongue-thrust syndrome.

It is noted that the percentages of most of the factors which might be termed undesirable are higher among the group with the tongue-thrust syndrome. The difference was 13% at the comparison of the subject in two groups that had the history of abnormal sucking habit. Showing less difference than the Americans was considered to be the result that most of the Korean infants have taken breast-fed. However, this finding lends support to Moyers'[5] statement that tongue-thrusting is often a residuum of thumb-sucking.

It will be also noted that these figures do not seem to bear out Moyers' claim that tonsilitis may be a causative factor in the production of tongue-thrust syndrome.

CONCLUSION

Recent literatures have called attention to the relationship between tooth position and abnormal tongue function during swallowing. But it is not certainly known about etiology of the tongue-thrust swallowing.

In this study following was found;

* Of 1356 high school boys between the age of 15 to 17 years, 172 (12.7%) demonstrated tongue-thrust swallowing.
* Class Ⅲ malocclusions were most closely related to tongue-thrust swallowing.
* The bottle-feeding was not the major etiological factor in the production of tongue-thrust syndome.
* It was appeared that abnormal sucking habits seemed to influence on tongue-thrust swallowing.
* Tonsilitis appeared not to be related with tongue-thrust swallowing.

=ACKNOWLEDGEMENT=

The author wishes to thank Prof. Chong Duck You, Prof. of Anatomical Dept., Assist. Prof. Hi Won Cho, Chief of Ortho. Dept., and Assist. Prof. Cheoung Hoon Suh in Dept. of Orth., College of Dentistry, S.N.U., for their advise in this study, and thank our colleagues in Ortho. Dept., S.N.U., for their helpful cooperation.

REFERENCES

1) Bridgeman, M.: Lateral pressure, Tr. Odont. Soc. London, p. 160, 1859.
2) Winders, R. V.: A study in the development of an elastic technique to measure the forces exerted on the dentition by the perioral and lingual musculature, Am. J. Orthodont. 42 : 645-657, 1956.

3) Lear, C.S.C. and Moorees, C.F.A. : Bucco-lingual muscle force and dental arch form, Am. J. Orthodont. 56 : 379-393, 1969.
4) Straub, Walter J.: Malfunction of the tongue. Part II. The abnormal swallowing habit: Its causes, effects, and results in relation to orthodontic treatment and speech therapy, Am. J. Orthodont. 47:596-617, 1961.
5) Moyers, Robert E.: Etiology of malocclusion, Handbook of Orthodontics, Chicago, 1969, Yearbook medical publishers, inc. p.143-150.
6) Hovell, J.H.: The relationship of the oro-facial musculature. Current British Thought. In Kraus, B.S., and Riedel, R.A. (editors). Vistas in Orthodontics, Philadelphia, 1962, Lea &Febiger, 328-345.
7) Graber, T.M.: Malocclusion: Extrinsic or general factors, Orthodontics, principles and practice, Philadelphia and London, 1966, p. 287-323.
8) Tulley, W.J.: A critical appraisal of tongue-thrusting, Am. J. Orthodont. 55: 640-650, 1969.
9) Andersen, Wynn S.: The relationship of the Tongue-Thrust syndrome to maturation and other factors, Am.J. Orthodont. 49:276, 1963.