

Original Article

Effect of Tongue Thrust Swallowing on Position of Anterior Teeth

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Abstract

Background and aims. There is no consensus about the effect of tongue thrusting on incisor position. The purpose of this study was to evaluate the position of anterior teeth in growing children with tongue thrust swallowing.

Materials and methods. In the present study 193 subjects with an age range of 9 to 13 years participated. All the patients were examined by a trained investigator and those having tongue thrust swallowing were selected and the position of their anterior teeth was compared with a control group consisting of 36 subjects with normal occlusion. Data was analyzed by independent sample *t*-test.

Results. Among the 193 students who were examined in this study, 10 cases (5%) were diagnosed to be tongue thrusters. Overjet was significantly increased in tongue thrust individuals ($P < 0.05$), while the other variables were not statistically different from the controls ($P > 0.05$).

Conclusion. The results indicated that tongue thrust may have an environmental effect on dentofacial structures. Considering the high incidence of tongue thrust in orthodontic patients, it is suggested that dental practitioners observe patients of all ages and those in all stages of orthodontic treatment for evidence of tongue thrust swallowing.

Key words: tongue thrust, incisor teeth, overjet, overbite, cephalometry.

Introduction

The relationship between form and function of the stomatognathic system has been evaluated by many investigators. It has been suggested that the size,¹⁻⁵ function⁶⁻⁸ and posture⁹⁻¹¹ of the tongue might have some effects on the surrounding oral environment. However, it has long been debated whether tongue function would lead to malocclusion or it merely adapts to local changes of occlusion.^{2,12-14}

Although some investigators consider the size and dysfunction of the tongue as essential etiological factors in the development of malocclusion,^{11,15-17} others believe that tongue thrust swallowing should be considered a result rather than the cause of malocclusion.^{9,18,19} Their rationale is that in the presence of overjet or open bite, it is difficult to seal off the front of the mouth during swallowing. According to Proffit¹⁰ the tongue thrusts forward to gain anterior valve function in order to prevent the

escape of food or liquids. However, the reverse is not always true. A tongue thrust swallowing is often present in children with good anterior occlusion.

A wide range of tongue thrust incidence has been reported in the literature. Tulley²⁰ reported an incidence of 2.7%, while Bell and Hale²¹ found 74% of children in grades 1 through 3 to be tongue thrusters. It has been shown that the incidence of tongue thrusting is higher than normal in subjects with open bite or overjet malocclusions.^{22,23} Tongue thrust swallowing has been assumed to be a contributing factor in the relapse of treatment results.^{22,24,25} Many research studies have pointed out that a significant percentage of relapse after orthodontic treatment might be related to orofacial muscle imbalance and deviated swallowing. Fotis et al²⁶ observed that a dental relapse as a result of skeletal relapse is seen only in cases in which normal perioral function, including normal lip closure and absence of tongue thrust swallowing has not been established after orthodontic treatment. Ozbek et al²⁷ reported that in patients with excellent retention of maxillary expansion, the tongue may spontaneously position itself closer to the palatal roof, thus counteracting buccal pressure.

The effect of tongue thrust on dental and skeletal morphology has been evaluated in several studies. It has been demonstrated that protrusive tongue activity (tongue thrust) during swallowing might result in labial inclination of incisors, open bite and spacing problems in some cases.^{6,28} Overstake²⁸ concluded that there is a functional relationship between deviated swallowing and open bite as well as overjet. However, some authors believe that the total duration of swallowing in a normal subject is too short to produce morphological changes.¹⁰ There is no consensus about the effect of tongue thrusting on incisor position and the influence is not quite clear in growing children. The purpose of this study was to evaluate the position of anterior teeth in growing children with tongue thrust swallowing.

Materials and Methods

Of 526 subjects who were referred to the Department of Orthodontics at Mashad Faculty of Dentistry, 193 children (99 girls, 94 boys) were selected and evaluated for evidence of tongue thrust swallowing. Inclusion criteria consisted of patients with an age range of 9 to 13 years, Angle class I occlusion, and complete eruption of upper and lower incisors. Individuals with craniofacial deformities as well as subjects who had undergone orthodontic treatment and those having oral habits were excluded from the

study. Informed consent was obtained from the parents of the subjects after a brief explanation of the study.

All the patients were examined by a trained investigator and those having tongue thrust swallowing were selected and anterior teeth positions were compared with a control group consisting of 36 subjects (18 girls, 18 boys, average age 11.2 ± 2.1 years) with Angle class I occlusion, normal overjet and overbite, and normal sagittal and vertical skeletal relationships. None of the controls had any soft tissue abnormality or respiratory problems.

Data on tongue thrust swallowing was obtained at the time of clinical examination. In order to examine the presence of tongue thrusting, the patients were asked to swallow their saliva three times during the same visit. When in doubt, another swallow was requested until the dentist was satisfied with his judgment. Tongue thrust was defined as protrusion of the tongue between upper and lower incisors or cuspids during swallowing.

Measurements

The usual orthodontic documentation, including dental casts and cephalometric radiographs, were obtained for the subjects. The records of control subjects were available in the archives of the Orthodontics Department. Overjet and overbite were measured to the nearest 0.1 mm directly from the dental casts using calipers. The casts were trimmed using a wax recording of subject's bite at the time of examination. Overjet was measured in millimeters as the difference between the incisal edge of the most proclined upper anterior tooth and the corresponding point on the labial surface of the mandibular incisor. To measure overbite, the incisal edges of upper anterior teeth were marked on the labial surface of lower anterior teeth and the distance between the incisal edges of lower incisors to the mark gave overbite in mm.

Radiographs were obtained in NHP at the Radiology Center of Mashhad Faculty of Dentistry. The subjects were asked to keep their teeth in centric occlusion with the lips relaxed. Patients were instructed to hold their breath and not to swallow while the radiographs were taken. The cephalograms were traced by one investigator and the accuracy of landmark identification was confirmed by another investigator. To minimize the error caused by head positioning, the midline of double contour bilateral structures was drawn. Three angular variables were measured to the nearest 0.5° on these tracings. The reference points and lines used in the cephalometric

increased electrical activity of the genioglossus muscle and the prolonged duration of swallowing in these subjects.⁶

The effect of tongue thrust on dentofacial development depends on several factors: the frequency of swallowing or how often the tongue exerts force on the teeth, the severity of the force exerted on the teeth, the counteraction of these factors by other muscular structures such as the lips, the resistance of dentoalveolar structures to displacement, and finally the resting posture of the tongue when no swallowing is occurring.³¹ The duration of swallowing has been reported in many previous studies. In an electromyographic investigation by Findlay and Kilpatrick³² the average swallowing time was found to be about 2 seconds. Sonies et al³³ reported that the duration of swallowing was between 1.7 and 3.4 seconds for swallowing saliva. In a study carried out by Ichida et al³⁴ the duration of lingual-palatal contact during saliva swallowing ranged from 1.1 to 2.9 seconds. It should be noted that tongue tip protrusion is sometimes associated with a low forward posture of the tongue. Even if the amount of force is very low, this can influence tooth position horizontally or vertically since the duration of force is long. It has been demonstrated that prolonged low tongue position during the growth period in children may result in excessive molar eruption causing a clockwise rotation of the mandible, a disproportionate increase in lower anterior face height, retrognathia and open bite. A low tongue position may also prevent lateral expansion and anterior development of maxilla.^{2,35}

Although most of the variables evaluated in this study were not significantly different between normal subjects and tongue thrust individuals, the limitations of the study should be considered. The sample size in the tongue thrust group was relatively small. In addition, the large standard deviation of variables must be considered. This large variation in the value of each variable may be due to differences in duration, intensity or frequency of tongue thrust swallowing in different subjects.

It is important for orthodontists to understand the effect of tongue function in the correction of malocclusion and stability after treatment. It has been reported that tongue thrust may be initiated during orthodontic treatment, especially when treatment creates temporary open spaces or interferences with intercuspation or reduces tongue space.³⁶ Cheng et al³¹ proposed that all tongue dysfunctions should be corrected if long-term stability of treatment results is desirable. Myofunctional therapy is often indicated for correction of tongue thrust swallowing. It has been

demonstrated that both myofunctional therapy and crib therapy are successful in correction of tongue thrust swallowing.^{6,37,38} However, Subtelny¹⁹ did not find any benefit for tongue thrust treatment.

Using a standard procedure, tongue thrust assessment can be achieved simply by practitioners, parents or teachers. With respect to the high incidence of tongue thrust in orthodontic patients, and considering the possible relationship between deviated swallowing and dentofacial morphology, it is suggested that dentists observe patients of all ages for evidence of tongue thrust swallowing.

Conclusion

The results of the present study showed that tongue thrust may have an environmental effect on dentofacial structures. Considering the high incidence of tongue thrust in orthodontic patients, it is suggested that dental practitioners observe patients of all ages and those in all stages of orthodontic treatment for evidence of tongue thrust swallowing.

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