

The Dilemma in Label of Cause and Effect: Controversies in Etiology of Malocclusion

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ABSTRACT

'Orthodontic Controversy' proves to be different. They are immortal. They may seem like a good idea; however, it remains to be seen whether or not it will serve to bring us any closer to the ideal of "evidence-based" rather than "Opinion based" orthodontics. In the etiology of malocclusion, the age-old controversy is whether tongue thrust causes anterior open bite or the former is the effect of the latter. Similarly, the role of third molar is inconclusive for the lower incisor crowding.

Keywords: Malocclusion, orthodontic controversy, dilemma.

INTRODUCTION

The diversity of opinions among different authors also bought along a cascade of conflicts which led to the development of a series of controversies in the field of orthodontics.

Controversy is a state of prolonged public dispute or debate, usually concerning a matter of opinion. A 'Controversy' features an active and honest difference of Opinion where as an 'Orthodontic Controversy' proves to be different. They never die, they never fade away; they are immortal. They may seem like a good idea; however, it remains to be seen whether or not it will serve to bring us any closer to the ideal of "evidence-based" orthodontics.

TONGUE-THRUST AND OPEN BITE

Age long controversy what came first the anterior open bite or the tongue thrust?

Is Tongue the Culprit???

The relationship between form and function of the stomatognathic system has been evaluated by many investigators. It has been suggested that the size, function and posture 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.

Proffit, Hansen ML, Lauder R, Muhl ZF, Schwestka Polly R, Engelke W, Hoch G considered the size and dysfunction of the tongue as essential etiological factors in the development of malocclusion whereas, others such as Karacay S, Akin E, Milne IM, Subtelny JD believe that tongue thrust swallowing should be considered a result rather than the cause of malocclusion.

Tongue thrust is a defined as a condition in which the tongue makes contact with any teeth anterior to the molars during swallowing. Tongue thrust is an oral habit pattern related to the persistence of an infantile swallow pattern during childhood and adolescence and thereby produces an open bite and protrusion of the anterior tooth segments.

Tulley¹ (1969) states tongue thrust as the forward movement of the tongue tip between the teeth to meet the lower lip during deglutition and in sounds of speech, so that the tongue becomes interdental. Waiter Straub² concluded that swallowing may cause malocclusion or prevent successful orthodontic treatment, and he recommended a training procedure designed

to modify patient's swallowing called tongue thrust or myofunctional therapy.

Mason and Profitt³(1974) stated that correction of the malocclusion will usually result in a disappearance of the tongue thrust swallowing pattern without any particular therapy directed at the tongue thrust.

Profitt⁴ (1972) indicated that individuals who place the tongue tip forward when they swallow do not have more tongue force against teeth than those who keep tongue tip back. In fact, tongue force may be lower. The term tongue thrust is a misnomer, since it implies that the tongue is forcefully thrust forward.

Swallowing is not learned behavior, but integrated and controlled physiologically hence cannot be considered a habit. It's tempting to blame tongue-thrust as a cause for open bite, since these individuals keep their tongue between the anterior teeth when they swallow.

The mature adult swallow pattern appears in some normal children as early as age 3, but not present in majority until about age 6 & is never achieved in 10-15% of a typical population. Sometimes children & adults who place their tongue between anterior teeth are spoken of as having a retained infantile swallow which is clearly incorrect, since only brain damaged children retain a truly infantile swallow in which posterior part of the tongue has little or no role.

Since coordinated movements of the posterior tongue and elevation of the mandible tend to develop before protrusion of the tongue tip between the incisor teeth disappears, what is called "tongue thrusting" in young children is often a normal transitional stage in swallowing. During the transition from an infantile to a mature swallow, a child can be expected to pass through a stage in which the swallow is characterized by muscular activity to bring the lips together, separation of the posterior teeth, and forward protrusion of the tongue between the teeth. This is also a description of the classic tongue thrust swallow. A

delay in the normal swallow transition can be expected when a child has a sucking habit.

When there is an anterior open bite and/or upper incisor protrusion, as often occurs from sucking habits, it is more difficult to seal off the front of the mouth during swallowing to prevent food or liquids from escaping. Bringing the lips together and placing the tongue between the separated anterior teeth is a successful manoeuvre to close off the front of the mouth and form an anterior seal. In other words, a tongue thrust swallow is a useful physiologic adaptation if you have an open bite, which is why an individual with an open bite also has a tongue thrust swallow. The reverse is not true—a tongue thrust swallow is often present in children with good anterior occlusion. After a sucking habit stops, the anterior open bite tends to close spontaneously, but the position of the tongue between the anterior teeth persists for a while as the open bite closes. Until the open bite disappears, an anterior seal by the tongue tip remains necessary.

The modern viewpoint is, in short, that tongue thrust swallowing is seen primarily in two circumstances: in younger children with reasonably normal occlusion, in whom it represents only a transitional stage in normal physiologic maturation; and in individuals of any age with displaced incisors, in whom it is an adaptation to the space between the teeth. The presence of overjet (often) and anterior open bite (nearly always) conditions a child or adult to place the tongue between the anterior teeth. A tongue thrust swallow therefore should be considered the result of displaced incisors, not the cause. It follows, of course, that correcting the tooth position should cause a change in swallow pattern, and this usually happens. It is neither necessary nor desirable to try to teach the patient to swallow differently before beginning orthodontic treatment. This is not to say that the tongue has no etiologic role in the development of open bite malocclusion.

From equilibrium theory, light but sustained pressure by the tongue against the teeth would be expected to have significant effects. Tongue thrust swallowing simply has too short a duration to have an impact on tooth position. Pressure by the tongue against the teeth during a typical swallow lasts for approximately 1 second.

Typically, an individual swallows about 800 times per day while awake but has only a few swallows per hour while asleep. The total per day therefore is usually under 1000.

On the other hand, if a patient has a forward resting posture of the tongue, the duration of this pressure, even if very light, could affect tooth position, vertically or horizontally. Tongue tip protrusion during swallowing is sometimes associated with a forward tongue posture. If the position from which tongue movements start is different from normal, so that the pattern of resting pressures is different, there is likely to be an effect on the teeth, whereas if the postural position is normal, the tongue thrust swallow has no clinical significance.

Perhaps this point can best be put in perspective by comparing the number of children who have an anterior open bite malocclusion with the number of children of the same age reported to have a tongue thrust swallow. As reported, at every age above 6, the number of children reported to have a tongue thrust swallow is about 10 times greater than the number reported to have an anterior open bite. Thus there is no reason to believe that a tongue thrust swallow always implies an altered rest position and will lead to malocclusion. In a child who has an open bite, tongue posture may be a factor, but the swallow itself is not.

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

Tulley⁵(1970) reported an incidence of 2.7%, while Bell and Hale⁶ 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.

Tongue thrust swallowing has been assumed to be a contributing factor in the relapse of treatment results. 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.

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 case.

Overstake⁷ (1975) 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. There is no consensus about the effect of tongue thrusting on incisor position and the influence is not quite clear in growing children.

Hanson et al⁸(1982) reported that the deleterious forces of the tongue result in excessive eruption of posterior teeth, open bite or overjet. There were no significant differences in overbite, upper incisor inclination, lower incisor inclination, and interincisal angle between the groups of this study.

Alexander and Sudha⁹(1997) reported a significant increase in proclination of upper anterior teeth in tongue thrust individuals.

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.

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.

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.

Cheng et al (2002)¹⁰ 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.

CONCLUSION

- The 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.

- Extensive reviews of the literature show no conclusive relationship between tongue function and anterior open bite.

THIRD MOLARS AND LOWER INCISOR IMBRICATION

Third molars are usually considered as vestigial organs which may be reserves for mutilated dentition.

THE PRESENT CONTROVERSY

The role that mandibular third molars play in lower anterior crowding has provoked much speculation in the dental literature. As a result of such opinions, the removal versus the preservation of third molars became the subject of contention in dental circles. The differing views ranged between extremes, and can be expressed in two different statements:

- a) Third molars should be removed even on a prophylactic basis, because they are frequently associated with future orthodontic and periodontal complications as well as other pathologic conditions.
- b) There is no scientific evidence of a cause and effect relationship between the presence of third molars and orthodontic and periodontal problems.

Prediction of Third Molar Position

So where is our dilemma?

Clinicians should be able to predict the ultimate disposition of these teeth from the available information at age 7 to 10 years! In this regard there are two variables that need to be determined:

1. Predicting the future availability of space for third molars
2. Predicting the changes in the angulation of the third molars and their impaction.

Prediction of Space Availability for Third Molar Eruption

Ricketts¹¹ et al in 1976 examined 200 skulls with complete dentitions and determined the relationship of the mandibular third molars to the anatomy of the ramus using cephalometric head films, taken as early as 8 or 9 years of age, for

predicting the dimension at adulthood of the distance from Xi point to the distal aspect of the second molar along the occlusal plane. If the predicted distance is 30 mm or greater, it would indicate that sufficient space for the third molars is available (Figure 1). On the other hand, if the predicted distance is 20 mm or less, the space is considered inadequate.

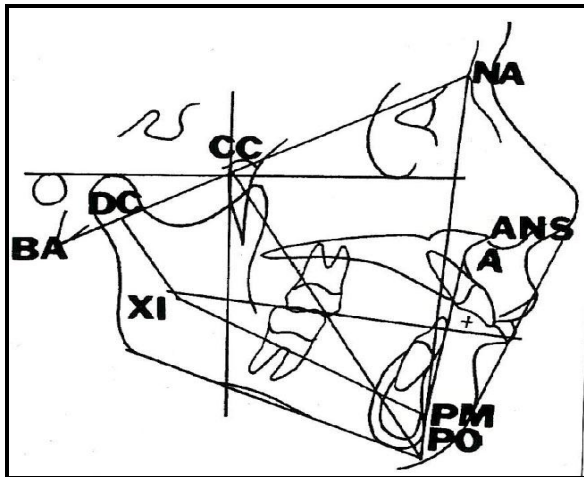


Figure 1: Prediction of Space Availability for Third Molar Eruption

Olive R and Basford K¹² in 1981 examined the reproducibility of Rickett's estimates and also calculated the space width ratio, which is the ratio of the distance from the lower second molar to the ramus divided by the mesiodistal width of the third molar. They estimated that a ratio of less than 120% will indicate a high probability of impaction. They also concluded that at present, prediction of impaction or eruption, based on the distance between Xi point to the lower second molar or using the space width ratio, are not sufficiently reliable.

Inclination of Third Molars and Their Impaction :

Third molar impaction is one of the clinical problems that the orthodontist may face when considering the management of adolescent patients

Factors responsible for impaction of third molars:-

- 1) The impaction of third molar is associated with vertical component of mandibular growth.
- 2) Patients with large ascending rami.

- 3) The ramus/molar ratio is a significant factor in the impaction of lower third molar.
- 4) High mesial inclination of mandibular third molar crown in the ascending ramus is indicative of the tendency for these teeth to be impacted.
- 5) Retro molar space is inadequate.

Richardson¹³ in 1974 found that in general the original angulation of the occlusal surface of the third molar in relation to the mandibular plane is significantly smaller in those persons in whom third molars have erupted early. But again, this is not of predictive value for the individual patient.

SayselYigit Mustafa et al¹⁴ in 2005 conducted a study to determine the relationship between the inclinations of second and third molars during a 2 to 2.5-year period in patients treated orthodontically both with and without premolar extraction and revealed that mandibular third molars showed an improvement in angulation relative to the occlusal plane in the first premolar extraction group.



Figure 2: Physiologic mesial drift of third molars seen radiographically

Relationship between 3rd molars and incisor crowding:

Pressure from behind theory states that late crowding occurs at about the time third molars erupt. In most individuals, these teeth are impacted because the jaw length did not increase enough to accommodate them via backward remodelling of ramus therefore may be the cause of incisor crowding. Other factors which may cause crowding include

physiologic mesial drift, the anterior component of the force of occlusion on mesially inclined teeth, mesial vectors forward movement of the buccal teeth, with shortening of the arch and an increase in crowding.

Bergstrom and Jensen¹⁵ (1961) concluded more crowding in the quadrant with 3rd molar present than in the quadrant with the third molar missing.

Vego¹⁶ in 1962 concluded arch perimeter decrease was less noticeable in persons without lower 3rd molars with greater degree of crowding in the group with third molar.

Bishara et al^{17,18} (1989 and 1996) studied changes in lower incisor that occur with time in untreated populations between 12 and 25 years and again at 45 years and found that increase in tooth size arch length discrepancy with age. There was a consistent decrease in arch length with age. Changes of 2.7mm in males 3.5mm in females were attributed to a consistent decrease in arch length that occurred with age.

Margaret Richardson¹⁹ in 1992 examined changes in the lower arch crowding in young adults and showed that between the ages of 18 and 21 years, the lower arch is stable in terms of tooth alignment and mesial drift, regardless of third molar status or continuing mandibular growth.

Tufekci E et al²⁰ in 2009 concluded that most orthodontists in the United States and Sweden do believe that erupting lower third molars exert an anterior force; however, they also believe that these teeth "rarely" or "never" cause crowding of the dentition.

These long term studies indicated that the incidence as well as the severity of mandibular incisor crowding increased during adolescents and adulthood in both the normal untreated individuals as well as orthodontic treated patients, after all retention is discontinued.

Studies indicating lack of correlation between mandibular

3rd molar and post retention crowding:

Shanley S. Leo²¹ in 1962 divided subjects into three groups- bilaterally impacted, erupted and congenitally absent mandibular third molars and he found no significant difference between the means of the crowding measurements and angulation measurements in the three groups indicating that mandibular third molars exert little influence on crowding or procumbency of mandibular anterior teeth.

Kaplan²² in 1974 concluded that presence of 3rd molar does not produce a greater degree of lower anterior crowding or rotational relapse after cessation of retention therefore the theory that third molars exert pressure on the teeth mesial to them could not be substantiated.

Southard E. Thomas²³ et al in 1991 concluded that removal of unerupted mandibular third molars does not significantly relieve proximal contact tightness but that simple movement from an upright to a supine posture relieves such tightness dramatically and that extracting these teeth for the exclusive purpose of relieving interdental pressure and thereby preventing mandibular incisor crowding appears to be unwarranted.

CONCLUSIONS

- 1) **First school of thought-** These long term studies indicated that the incidence as well as the severity of mandibular incisor crowding increased during adolescents and adulthood in both the normal untreated individuals as well as orthodontic treated patients, after all retention is discontinued.
- 2) **Second School of thought-** The influence of the third molars on the alignment of the anterior dentition may be controversial, but there is no evidence to incriminate these teeth as being the only or even the major etiologic factor in the post-treatment changes in incisor alignment which suggests that the only relationship between these two phenomena is that

they occur at approximately the same stage of development i.e. in adolescence and early adulthood.

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