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Case Report

Temporary tongue thrust: failure during orthodontic treatment

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This report presents the case of a 25-year-old male patient who sought orthodontic treatment. Oral examination revealed an Angle Class I relation, with a bimaxillary dento-alveolar protrusion, evidence of anterior crowding, and a large overbite and overjet. Radiographic examination revealed a skeletal Class I occlusion. During the distal movement of the canines, occlusal interferences between the canines occurred and the commencement of a tongue thrust was observed. After correction of the applied forces, the canine movement was completed and the habit was no longer detectable. The incident indicates that an unusual oral habit suspiciously occurring during treatment should lead to an immediate reconsideration of the orthodontic treatment strategy.
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Introduction

Tongue thrust or reverse swallowing occurs when portions of the tongue rest or press against the teeth during swallow. It is recognisable at all ages, particularly in children under 10 years of age,[1] and in the elderly.[2] Its clinical manifestation is a forward placement of the tongue during swallow and speech,[3] and cases range in severity from those that bring the tongue into an anterior position to those that cause anterior open bite, both of which are uncommon in the patient with a deep bite.

Together with an active contraction of the lips, an anterior placement of the tongue is exhibited in an infant during its swallow, and is considered a normal process. After the eruption of deciduous molars, a persistence of placing the tongue anteriorly during swallow is considered atypical. Ankyloglossia retains the infantile swallow in an adult[4] and contributes to open bite.[5] Proffit,[3] in reports on tongue thrust in young children with a reasonably normal occlusion and in individuals of any age with displaced incisors, notes that the former represents only a transitional stage in normal physiological maturation, while the latter is an adaptation to the space between the teeth.

As well as being one of the causes of open bite, tongue thrust, by means of a complex mechanism,[6] can produce proclination of both maxillary and mandibular incisors,[7] and some functional disturbances of mastication.[2]

Several methods have been utilised to correct tongue thrust in order to achieve fully the aims of orthodontic treatment. Despite many contradictions as to its effectiveness,[8,9] correction of this abnormal behaviour is believed to help stablise the occlusion after orthodontic treatment.[10–12] However, orthodontic treatment sometimes leads to the tongue-thrust habit, because of occlusal

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Figure 2a to h. Pretreatment intra-oral views.

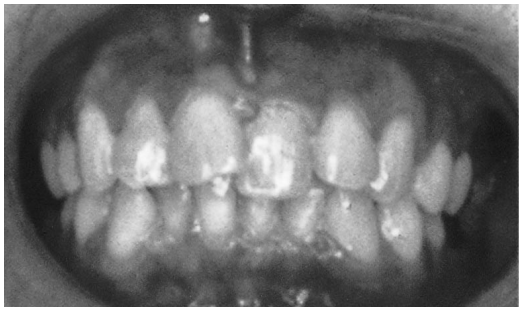

Figure 2b.

Figure 1a. Pretreatment facial frontal view.

Figure 1b. Pretreatment facial lateral view.

Figure 2f.

interferences unintentionally occurring during treatment.[13] Hence, it is the purpose of this report to reveal an iatrogenic temporary tongue-thrust observed during a particular orthodontic treatment, and to document the aetiology, progression and correction of the problem.

Clinical examination

A 25-year-old male patient presented at an orthodontic clinic for treatment. He had a symmetrical face, a convex profile, and a favourable soft tissue profile (Figures 1a and b). The overbite was 5.0 mm and the average value of the overjet was 5.5 mm (5.0 mm on the left and 6.0 mm on the right). There was mild crowding in both the maxillary and mandibular arches (Figures 2 a to h), the tooth-mass discrepancies being -4.50 and -5.7 mm, respectively.

Radiographic examination

The cephalometric analysis (Stage 1 in Table I, and Figure 3) demonstrated a skeletal Class I malocclusion with a bimaxillary dento-alveolar protrusion and a mandibular plane angle of 28 degrees, indicating a normal bite. The patient's soft tissue profile was satisfactory.

Treatment aims

The treatment objectives focused on elimination of the crowding, correction of the axial inclination of the mandibular anterior teeth, improvement of the overbite and overjet, and establishment of a molar and canine Class I occlusion.

Treatment plan

To resolve the anterior crowding in both arches and to improve the patient's profile, all first premolars were planned for extraction and the Edgewise appliance was then selected. In addition, the remaining spaces would be abolished by retracting all anterior teeth. A Nance holding arch, together with a medium-pull headgear (150 gf. on each side), was to be utilised to prevent anterior movement of the molars that were to function as anchor units.

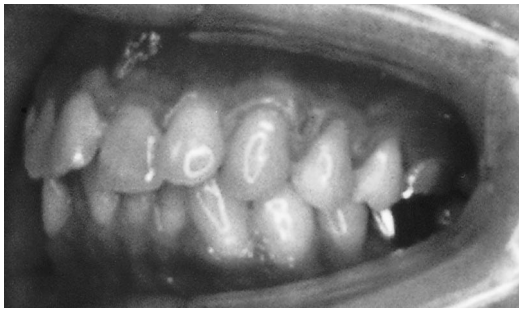

Figure 2c.

Figure 2d.

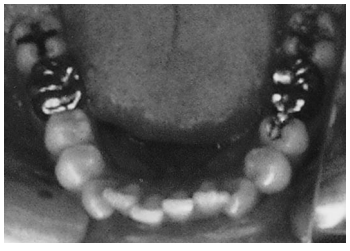

Figure 2e.

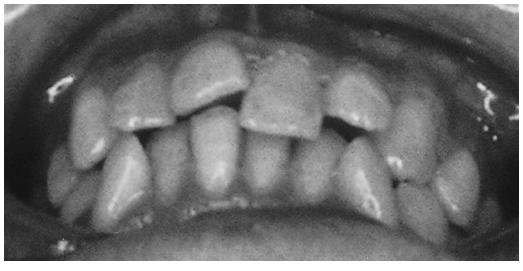

Figure 2g.

Figure 2h.

Treatment progress

The maxillary first molars were banded and Nance arches were fitted. The patient was instructed to wear headgear at least 14 hours a day. After the premolars had been removed, fully adjusted brackets with a 0.022" x 0.028" slot were placed on all teeth, except the incisors and maxillary first molars. A levelling phase in both arches was carried out using 0.016" round and 0.016" x 0.022"super-elastic nickel-titanium (NiTi) archwires, respectively.

Upon completion of the initial phase, the 0.016" x 0.022" archwires were electrically heated and then used in the canine distalising phase. An elastic chain exerting 100 gf. was used initially to retract the canine teeth in both arches. Four months after the distal movement of the canines, occlusal interferences between the canines were observed (Figures 4a to d). In addition, some spaces between the mandibular anterior teeth occurred, implying an involuntary tongue-thrust swallow in the patient. Diagnostic models taken at this stage revealed lingually tipped maxillary canines and a reduction in the inter-canine width in the maxillary arch. The spacing between the canines and second premolars in maxilla and mandible was approximately 2.0 and 1.5 mm, respectively. An analysis of the cephalometric radiograph taken at Stage 2 (Table I and Figure 5), revealed that the patient's mandibular plane angle had increased to 32 degrees, indicating an open-bite tendency.

As soon as the occlusal interferences and tongue thrust in the patient were detected, the force system was modified to correct the occlusion. J-hook headgear (Figure 6) was selected to speed the retraction of the maxillary teeth, and to recover the lingually tipped canine and to help increase the maxillary inter-canine width. The maxillary archwire was changed to 0.016" x 0.022" stainless steel. In the mandibular arch, distalisation of canines was temporarily ceased. Concomitantly, the patient was instructed in the correct method of swallowing and was urged not to put his tongue anteriorly whenever possible.

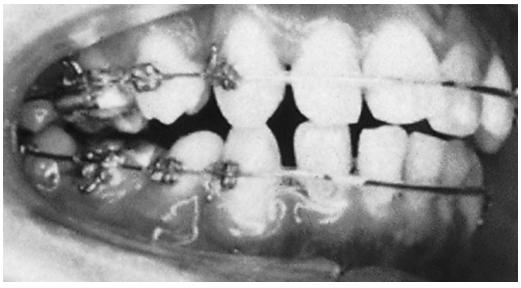

Figure 4a. Right lateral intra-oral view at the stage when the tongue thrust was observed.

Figure 4b. Centre intra-oral view at the stage when the tongue thrust was observed.

Table I. Numerical data of cephalometric analyses in the patient, in comparison with the norms. (All values are expressed in degrees, unless specified.)

Value	Mean + S.D.	Stage 1	Stage 2	Stage 3
Facial axis	85.07 ± 5.76	86.0	85.0	85.0
Facial convexity	5.6 ± 4.33	7.0	12.0	11.0
A-B plane	-5.10 ± 3.28	-6.0	-6.0	-5.0
Mandibular plane to FH plane	26.25 ± 6.34	28.0	32.0	31.0
Y-axis	65.71 ± 3.27	60.0	64.0	62.0
Occlusal plane	9.52 ± 4.01	8.0	9.0	7.5
Interincisal	129.66 ± 8.99	124.0	136.0	123.0
LI to Occlusal plane	21.69 ± 6.03	31.0	27.0	29.0
LI to mandibular plane	94.67 ± 7.21	101.0	94.0	95.5
UI to A-P plane (mm)	7.86 ± 2.31	13.0	11.5	10.0
FH to SN plane	5.98 ± 3.35	9.5	9.5	9.5
SNA	81.82 ± 3.09	80.5	80.5	80.5
SNB	78.61 ± 3.14	77.0	76.0	76.0
ANB	3.28 ± 2.66	2.5	3.5	3.5
UI to N-P plane (mm)	9.91 ± 2.78	15.0	15.0	15.0
UI to FH plane	108.94 ± 5.62	109.0	99.5	110.0
UI to SN plane	103.06 ± 5.53	99.5	90.0	100.5

Stage 1: initial stage. Stage 2: tongue thrust observable stage. Stage 3: present stage.

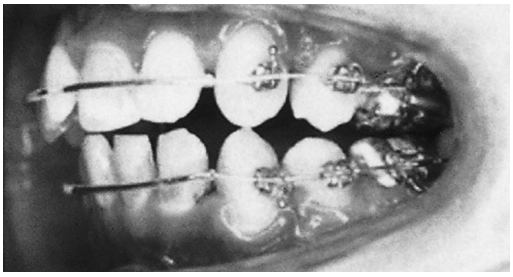

Figure 4c. Left lateral intra-oral view at the stage when the tongue thrust was observed.

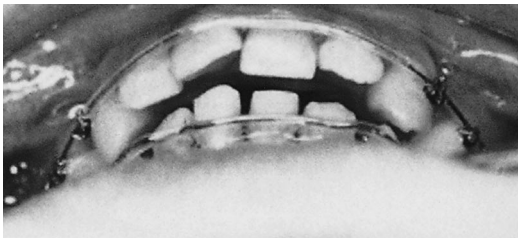

Figure 4d. Frontal view showing the effect of the tongue thrust.

Figure 3. Pretreatment lateral cephalogram.

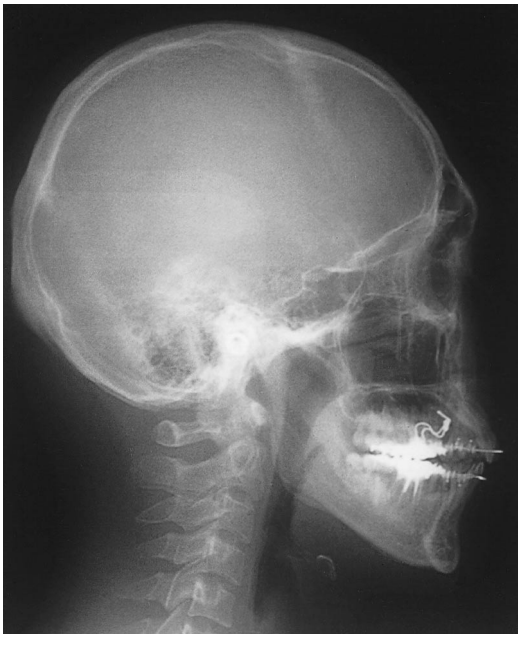

Figure 5. Lateral cephalogram at the stage when the tongue thrust was observed.

Little correction of the movement was observed four months later. Hence, a NiTi closed coil spring (100 g) was used. One month later, the retraction of the maxillary canines was achieved, and that of the mandibular canine was then performed using a NiTi closed coil spring (100 g) and the same archwire. Subsequent clinical observation and inquiry found no indication of the tongue-thrust swallow habit.

A retraction of maxillary anterior teeth is planned and at the time of writing, no spaces between the mandibular teeth have been observed and a complete overbite has been established (Figures 7a to d).

The cephalometric analysis (Table I and Figure 8) at Stage 3 shows a reduction of the mandibular plane angle when compared with that in Stage 2. When the patient comes for orthodontic treatment, he is always questioned and checked whether his habit still exists. Careful inspection indicates that the habit has been abolished.

Discussion

A significant difference between the speeds of retraction of the maxillary and mandibular canines, as well as malposition of the maxillary canines, were considered to be the causes of the canine interferences. After the canine interferences had been observed, the retraction force was immediately altered in the belief that the speed of the retraction phase could be increased, thereby causing minimum trauma to the teeth and an immediate termination of the patient's tongue-thrust swallow. The speed of tooth movement in the maxilla may have been too slow and/or that in the mandible too fast so that an edge-to-edge relation of maxillary and mandibular canines was affected. Because of the

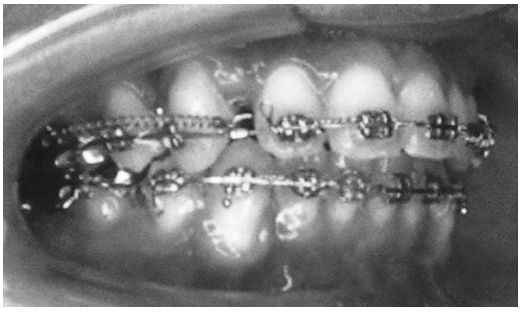

Figure 7a. Right lateral intra-oral view at the time of reporting the case.

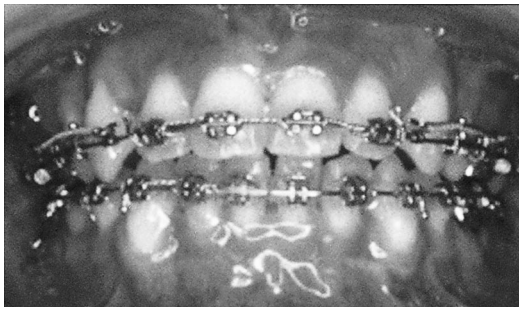

Figure 7b. Centre intra-oral view at the time of reporting the case.

Figure 8. Lateral cephalogram at the time of reporting the case.

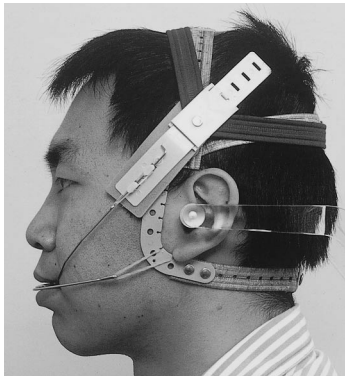

Figure 6. Lateral facial view showing a medium-pull headgear associated with a J-hook.

inherent structure of an elastic chain, force is fully applied to a tooth at the time of application and decreases with the passage of time.[14,15] The appliance used[18] caused the maxillary canine width to reduce, probably because a low-stiffness archwire was used[16] in conjunction with the applied forces. This could have caused the apices of the maxillary canines to contact cortical bone, thereby reducing the rate of tooth movement.[17, 21]

In this case, finishing the canine retraction phase took about nine months, four of which resulted in little progress. This indicated that the tipping effect, in spite of an application of only a 100 g force, was induced to the canines and that it eventually initiated a transient cessation of retraction. Because the remaining spaces between the canines and the second premolars were small, a nickel-titanium closed coil spring was utilised to move the canines rapidly, as it produces a constant, continuous and light force,[20,21] and its usage is reliant on an orthodontist, not the patient.

Despite a report suggesting a distant link with dental malocclusion,[1] a tongue-thrust swallow is associated with an anterior open bite and some articulation disorders.[22]

Treatment of a tongue thrust is so complicated that some clinicians even use hypnosis,[23] a therapy that may be worth performing since it is reported to help gain dental stability after orthodontic treatment.[9] In this case, however, the force system was modified in order to ensure rapid termination of the canine retraction phase, for fear that the situation would worsen. After elimination of the occlusal interferences, the patient did not reveal, voluntarily or involuntarily, this unusual habit.

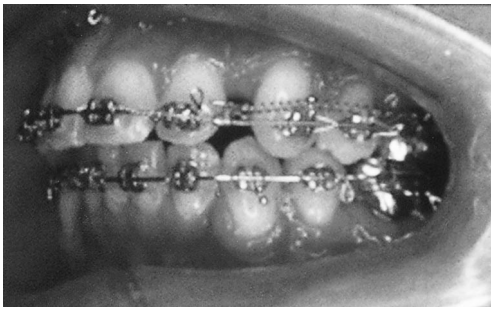

Figure 7c. Left intra-oral view at the time of reporting the case.

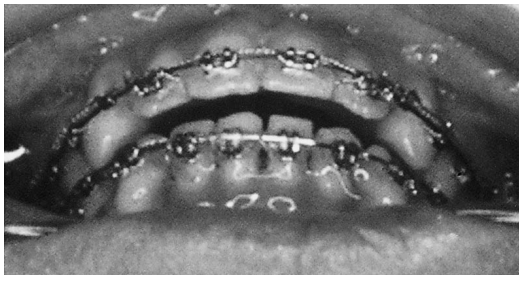

Figure 7d. Frontal view at the time of reporting the case.

Temporary tongue thrust shown in this case is a classic example of an iatrogenic problem induced both in teeth and in their surrounding structures. Unlike that in patients who habitually put their tongue forward during swallow, the temporary tongue-thrust habit observed in this patient caused, if anything, minimal subsequent malocclusion. Since the patient correctly swallowed prior to orthodontic treatment, there was no need to correct or to instruct him in a proper method of swallow. However, it was necessary to solve the problems of canine interference, molar extrusion and anterior open bite caused by the habit.

The open bite observed in this patient was caused by a failure to prevent canine interferences, and even though the orthodontic mechanics had been altered after it was first observed, it lasted four months longer because the first corrective method was still incorrect. Eventually, the cephalometric analyses showed that the orthodontic correction had caused an elongation of anterior teeth and an increase in vertical facial height. Had the analyses, orthodontic treatment plan, the selected mechanics and the inspection of the patient been more carefully performed, the complications would not have been initiated. The problems shown in this study may alert clinicians to be more careful during orthodontic treatment.

Conclusion

This study demonstrated an iatrogenic incidence of transient tongue-thrust swallowing during the canine retraction phase of an orthodontic therapy and that when this was realised, a direct and rapid removal of the cause of the problem was an effective means to recover the normal situation of the patient. Reconsideration of the force system, a rapid retraction of canines and a recommendation to the patient of a correct swallow pattern contributed to the successful elimination of both the canine interferences and the unexpected habit.

Acknowledgment

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Editor's note

This case report demonstrates yet another example of how occlusal anomalies, including those that arise during orthodontic treatment, can induce a tongue thrust, although in this case, temporarily. Further, it shows that once the anomaly is corrected, the tongue thrust disappears. It serves as a reminder to orthodontists who alter an occlusal arrangement that is in harmony with the temporomandibular joint to make certain that it and any other indication of disturbance of this joint is corrected prior to the retention period. This critical feature has been dealt with in the March 1993 issue of the *Australian Orthodontic Journal* (Volume 12 No.4, pages 246-9).

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References

1. Lebrun Y. Tongue thrust, tongue tip position at rest, and sigmatism: a review. J Commun Disord 1985; 18: 305–12.
2. Serfaty V, Nemcovsky CE, Friedlander D, Gazit E. Functional disturbances of the masticatory system in an elderly population group. Cranio 1989; 7: 46–51.
3. Vanarsdall RL Jr, Musich DR. Adult orthodontics: diagnosis and treatment. In: Graber TM, Vanarsdall RL Jr (eds). Orthodontics: current principles and techniques. 3rd edn. St. Louis: Mosby Inc., 2000; 839–915.
4. Proffit WR. The etiology of orthodontic problems. In: Proffit WR, Fields HW (eds). Contemporary Orthodontics. 3rd edn. St. Louis: Mosby Inc., 2000; 113–44.
5. Hasan N. Tongue tie as a cause of deformity of lower central incisor. J Pediatr Surg 1973; 8: 985.
6. Yoshiki K. Tongue-thrust swallowing in severely physically disabled children. Brain Dev 1996; 18: 242–4.
7. Mitchell L. Anterior open bite and posterior open bite. In: Mitchell L, Carter NE (eds). An Introduction to Orthodontics. Reprinted 1st edn. Hong Kong: Oxford University Press, 1998; 122–9.
8. Gommerman SL, Hodge MM. Effects of oral myofunctional therapy on swallowing and sibilant production. Int J Orofacial Myology 1995; 21: 9–22.
9. Cayley AS, Tindall AP, Sampson WJ, Butcher AR. Electropalatographic and cephalometric assessment of myofunctional therapy in open-bite subjects. Aust Orthod J 2000; 16: 23–33.
10. Young LD, Vogel V. The use of cueing and positive practice in the treatment of tongue-thrust swallowing. J Behav Ther Exp Psychiatry 1983; 14: 73–7.
11. Andrianopoulos MV, Hanson ML. Tongue-thrust and the stability of overjet correction. Angle Orthod 1987; 57: 121–35.
12. Joondeph DR. Retention and relapse. In: Graber TM, Vanarsdall RL Jr (eds). Orthodontics: current principles and techniques. 3rd edn. St. Louis: Mosby Inc., 2000; 985–1009.
13. Pedrazzi ME. Treating the open bite. J Gen Orthod 1997; 8: 5–16.
14. Lu TC, Wang WN, Tarng TH, Chen JW. Force decay of elastomeric chain: a serial study. Part II. Am J Orthod Dentofacial Orthop 1993; 104: 373–7.
15. Eliades T, Eliades G, Watts DC. Structural conformation of in vitro and in vivo aged orthodontic elastomeric modules. Eur J Orthod 1999; 21: 649–58.
16. Torrisi L. The NiTi superelastic alloy application to the dentistry field. Biomed Mater Eng 1999; 9: 39–47.
17. Charles CR, Jones ML. Canine retraction with the Edgewise appliance: some problems and solutions. Br J Orthod 1982; 9: 194–202.
18. Mitchell L. Anchorage, tooth movement, and retention. In: Mitchell L, Carter NE (eds). An Introduction to Orthodontics. Reprinted 1st edn. Hong Kong: Oxford University Press, 1998; 146–58.
19. Whitson SW. Bone. In: Ten Cate AR (ed.). Oral histology: development, structure and function. 5th edn. St. Louis: Mosby-Year Book, 1998; 104–27.
20. Samuels RH, Rudge SJ, Mair LH. A comparison of the rate of space closure using a nickel-titanium spring and an elastic module: a clinical study. Am J Orthod Dentofacial Orthop 1993; 103: 464–7.
21. Samuels RH, Rudge SJ, Mair LH. A clinical study of space closure with nickel-titanium closed coil springs and an elastic module. Am J Orthod Dentofacial Orthop 1998; 114: 73–9.
22. Khinda V, Grewal N. Relationship of tongue-thrust swallowing and anterior open bite with articulation disorders: a clinical study. J Indian Soc Pedod Prev Dent 1999; 17: 33–9.
23. Golan HP. Treatment of tongue thrust with hypnosis: two case histories. Am J Clin Hypn 1991; 33: 235–40.