Long-term followup of orthodontic treatment of a patient with maxillary protrusion, severe deep overbite and thumb-sucking

Shigemi Goto, DDS,PhD; Robert L. Boyd, DDS,MEd; Ib Leth Nielsen, DDS; and Tetsuo Iizuka, DDS,PhD

Most growing patients diagnosed as having maxillary protrusion have either dentoalveolar or skeletal protrusion problems; some patients have both. Treatment for these patients commonly includes control of the forward growth of the maxilla while allowing the mandible to grow forward to correct the jaw disharmony.[1] Then extraction of premolars and tooth movement with fixed appliances can be used to achieve satisfactory alignment and occlusion.

Maxillary dental, skeletal or combination skeletal-dental protrusion is often found in patients who have long-standing habits, such as thumb-sucking, lip biting or tongue thrusting.[2-6] In such patients, the correction of the habit should be accomplished prior to the correction of jaw disharmony because these habits may interfere with the treatment progress. Frequently the total elimination of these habits is difficult because they have become ingrained into the patient's behavior over a long period of time and may even be related to psychological problems.[2,5-8]

When permanent teeth are extracted as part of the orthodontic treatment for maxillary protrusion, the decision to extract is usually based on cephalometric and clinical data.[1] Careful consideration of the patient's level of cooperation in orthodontic treatment and the expected stability of the posttreatment occlusion are also factors which should be considered. Although the first premolars are the teeth most commonly extracted to gain space for the correction of overjet and crowding in the anterior region, extraction of molars, incisors or other teeth[9-16] may also be considered.

There have been no case reports in the literature

Abstract

Oral habits should be of primary clinical concern to orthodontists because they may cause malocclusion, and/or interfere with treatment progress. Generally habit control should be achieved prior to correction of the malocclusion in an effort to remove any etiological factors in development and maintenance of the malocclusion. It is also important for the clinician to understand that habit-breaking treatment may require an extended treatment time because habits may have been present for long periods of time and may be related to underlying psychological problems.

The present report documents the treatment of maxillary protrusion in a patient in which a thumb-sucking habit had persisted from infancy until almost age 12. Elimination of the habit was accomplished prior to correcting the malocclusion and for stability of the result. Orthodontic treatment consisted of extracting two maxillary premolars followed by full treatment with fixed appliances. Long-term postretention records show good stability of the corrected malocclusion.

Key Words

Habit • Finger-sucking • Maxillary protrusion • Deep overbite • Extraction

Submitted and accepted for publication: June 1993

Angle Orthod 1994;64(1):7-12

Figure 1A-B
Pretreatment facial photographs. The upper lip was protrusive and strain was present on the mentalis muscle.


Figure 1A


Figure 1B

Figure 2
Pretreatment panoramic radiograph.

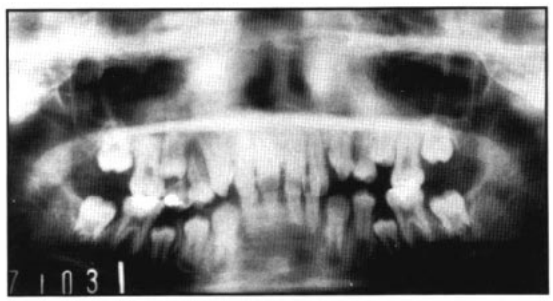
Figure 2


Figure 3A


Figure 3B


Figure 3C

Figure 3A-E
Pretreatment intraoral photographs. The overjet was 12 mm and the deep overbite was severe.

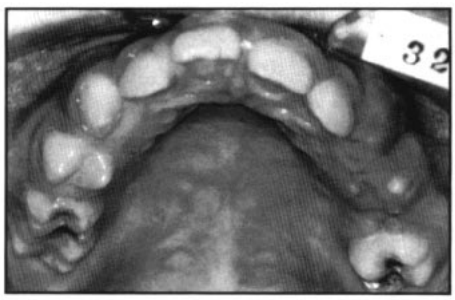
Figure 3D

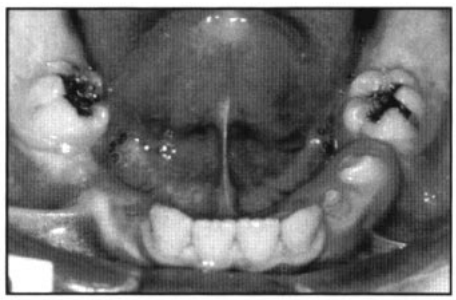
Figure 3E

of patients who had completed orthodontic treatment requiring the extraction of maxillary first premolars for maxillary protrusion and who also had a severe deep overbite and a long-term thumb-sucking habit. This case report presents just such a case and discusses the timing of the correction of the thumb-sucking habit with orthodontic treatment of the malocclusion. Both the short- and long-term retention of this treatment are shown.

History

The patient was an 11 year 8 month old boy whose chief complaint was upper protrusion. Although his mother had a simlar malocclusion, no one else in the immediate family had a similar problem. This patient also had an aggresive thumb-sucking habit present since infancy.

Clinical examination

The facial photographs (Figure 1A-B) showed maxillary protrusion and mandibular retrognathism. There was also mentalis muscle strain when the lips were closed.

The panoramic X-ray appeared normal (Figure 2).The intraoral photographs (Figure 3A-E) showed maxillary dentoalveolar protrusion with 12 mm overjet and a severe deep overbite. The premolars had started to erupt because of early loss of the primary molars.

There was 4.5 mm spacing on the maxillary arch due to the unerupted canines. The maxillary dental midline had shifted 2 mm to the left of the skeletal midline (Figure 3). Using Ootsubo's chart as a standard,[17] this patient was found to be two standard deviations positive for maxillary coronal arch length. All tooth sizes were normal.

The lateral cephalometric radiograph showed flaring of the maxillary and mandibular incisors, a deep overbite, 12 mm overjet, a low mandibular plane angle and normal anterior-posterior relationships. The maxillary molars were diagnosed as being in mesioversion because Ptm'-Ms was larger by more than one standarddeviation and A'-Ms' was smaller by more than one standard deviation (Figure 4).[18,19]

	11y 8m	13y 7m	15y 8m	19y10m
N-S	69.0	70.5	71.0	71.5
N-Me	111.0	122.5	123.5	124.0
A'-Ptm'	48.0	47.5	47.0	47.0
Is-Is'	28.5	32.0	31.5	32.5
Mo-Ms	20.5	25.0	26.0	26.0
Gn-Cd	103.0	112.0	112.5	112.5
Pog'-Go	69.0	74.0	77.0	77.0
Cd-Go	50.0	56.0	57.5	59.0
Ii-Ii'	39.0	40.5	41.0	41.5
Mo-Mi	26.0	30.0	32.0	32.5
SNA	81.0	80.5	79.0	78.5
SNB	76.5	77.0	76.0	75.5
ANB	4.5	3.5	3.0	3.0
U-1 to SN	122.0	115.0	107.0	104.0
L-1 to Mand.	106.0	107.5	106.5	108.0
Y-Axis (SN)	68.0	70.0	70.5	70.5
FMA	23.0	26.5	24.5	22.5
FMIA	51.0	46.0	49.0	49.5

Figure 4

Figure 5

Figure 4
Cephalometric measurements pretreatment (11 yrs 8 mos); at the start of fixed appliance therapy (13 yrs 7 mos); posttreatment (15 yrs 8 mos); and postretention (19 yrs 10 mos).

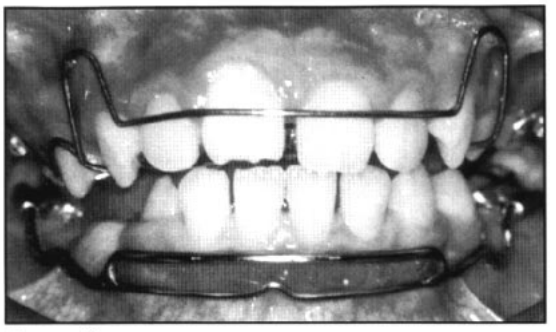

Figure 6

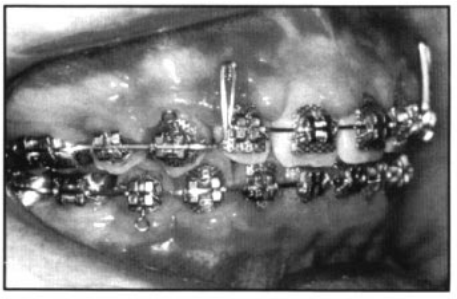

Figure 7A

Figure 7B

Figure 7C

Diagnosis

The overall diagnosis for this patient was Class II div. 1 with maxillary dentoalveolar protrusion and severe deep bite and a long-standing thumb-sucking habit.

Treatment plan

The goals of orthodontic treatment were to first correct the thumb-sucking habit and then open the bite, reduce maxillary dental protrusion, and align the incisors. To correct the thumb-sucking habit, the patient received counseling to make him conscious of his habit. He was informed that it could be harmful to the development of his bite and would interfere with a satisfactory orthodontic result. A plaster model of his right thumb (Figure 5), was used to show the patient that there were also changes in his skin from the habit.

The bite was opened with a removable bite plate and cervical headgear which was also used as anchorage to retract the maxillary incisors and retard forward growth of the maxilla. Two maxillary first premolars were extracted to provide space to retract the incisors. A lip bumper was used on the lower arch to maximize anchorage during bite opening and leveling. Arch alignment was accomplished with edgewise appliances on both arches.

The cervical headgear, maxillary bite plate and mandibular lip bumper were used for 18 months. Treatment time for this phase was longer than expected because of poor cooperation with the headgear (Figure 6). At the end of Phase 1, the maxillary first premolars were extracted and a full edgewise appliance was placed. The maxillary anterior teeth were retracted with a rectangular looped archwire (Figure 7A-C).

The active treatment period totaled 3 years and 8 months. After removal of the appliance, removable Hawley retainers were placed.

Treatment results

The plaster model of the patient's thumb (Figure 5) was useful as a motivational tool. Because of

Figure 5
Plaster model of the patient's thumb, showing signs of thumb-sucking.

Figure 6
Cervical headgear and a bite plate was used in the upper arch, a lip bumper in the lower.

Figure 7A-C
Intraoral photos following space closure, the extraction of the two upper premolars, and lingual retraction.

Figure 8A-B
Posttreatment facial photographs. The upper lip protrusion and mentalis muscle strain are no longer present.

Figure 9
Posttreatment panoramic radiograph.

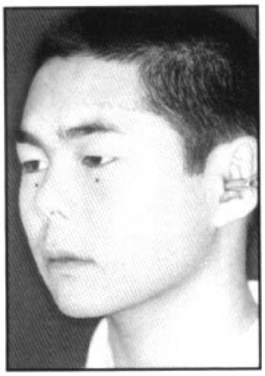

Figure 8A

Figure 8B

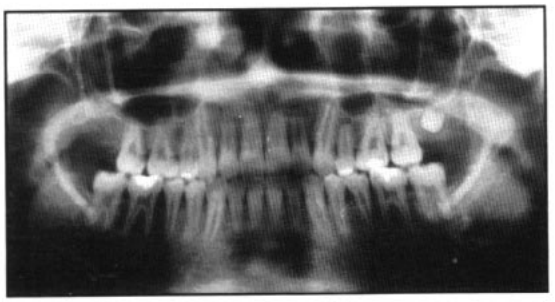

Figure 9

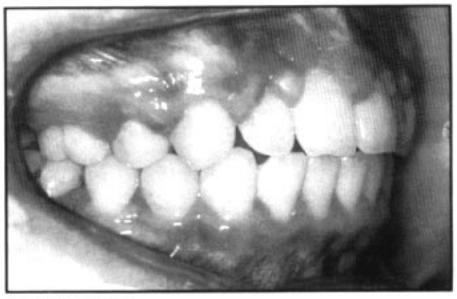

Figure 10A

Figure 10B

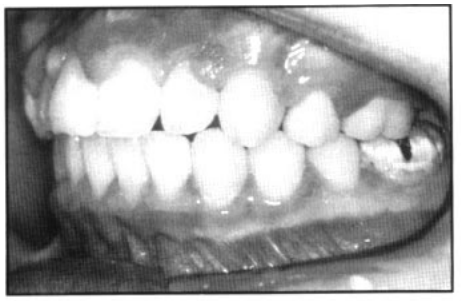

Figure 10C

Figure 10A-E
Intraoral photos taken the day of debonding show overcorrection of the deep bite. Gingivitis was still present in the anterior areas.

Figure 10D

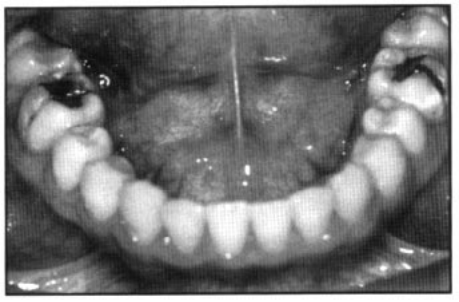

Figure 10E

good compliance in breaking the habit, an additional appliance was unnecessary. In fact, at the first visit after he was shown the plaster model, his mother reported that his thumb-sucking habit had stopped. Thus, the habit was successfully treated by developing in this patient a self-awareness using a model of his right thumb as a baseline for change.

The posttreatment facial photos showed correction of the maxillary lip protrusion and elimination of the golf-ball like strain of the mentalis muscle when the lips were closed (Figure 8A-B).

Overjet and overbite were overcorrected and a Class I canine relationship was achieved. The overbite was overcorrected to an edge-to-edge relationship because of the high relapse potential of the severe deep bite and low mandiblar plane angle of the mandible. The first molar relationship was Class II because only maxillary first premolars had been extracted (Figure 10).

Cephalometric analysis comparing the beginning and the end of the active treament showed that forward maxillary growth was well controlled as the SNA angle was reduced from 81.0° to 79.0°. The anteroposterior discrepancy (ANB angle) was reduced from 4.5° to 3.0°. Although the angulation of the lower incisors did not change, the upper incisors were uprighted from 122.0° to 107.0° using the SN reference line (Figures 4 and 11).

Postretention evaluation

Five years after the completion of the active treatment the cephalometric superimposition (Figure 12) and intraoral photos (Figure 13A-C) showed minimal postretention changes. The overjet and overbite were slightly improved postretention and the intercuspation had also improved. Mild crowding had developed in the mandibular anterior areas.

Discussion

When studied from the psychological aspect persistent finger-sucking habits may be related to

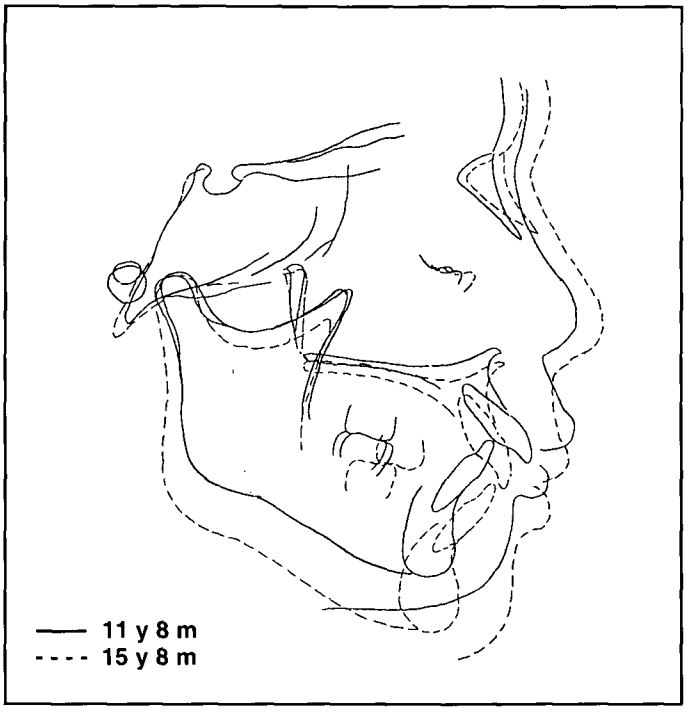

Figure 11

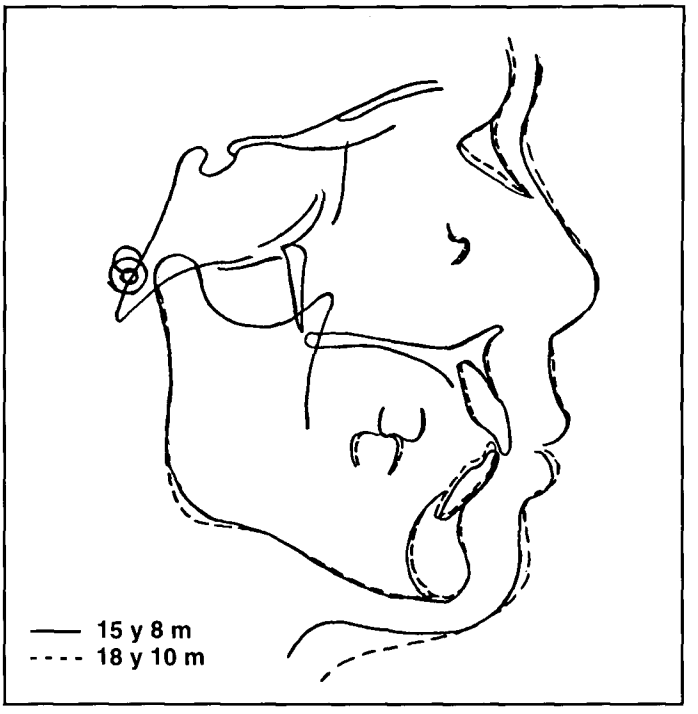

Figure 12

Figure 13A

Figure 13B

Figure 13C

hunger, a need to satisfy a natural sucking instinct, insecurity or even a desire to attract attention.[2,5-7] Most finger-sucking habits usually stop by age 3 or 4 with no influence on the permanent dentition and are generally not dealt with as a separate problem in orthodontic treatment. If, however, the habit continues until the permanent incisors erupt, then the finger-sucking habit may be a direct cause of open bite. The most common dental consequence is for the thumb to push the maxillary incisors labially and the mandibular incisors lingually. The habit also causes a narrowing of the maxillary arch and maxillary dentoalveolar or skeletal protrusion.[2-6,8] However, this patient had a severe deep overbite, which may have been influenced by the loss of posterior dental support from premature loss of primary teeth, or more likely from forward mandibular rotation during growth.

The decision was made not to use any appliances to prevent the thumb-sucking habit because the patient was almost 12 years old and had expressed an understanding of the consequences of his habit as well as a willingness to attempt to control it. Elimination of the thumb-sucking habit was accomplished within weeks after the start of the motivational therapy.

This patient's malocclusion may also have been influenced in part by hereditary factors as his mother had a similar malocclusion. However, the genetic factor was probably intensified by the thumb-sucking habit.

Patients who present with maxillary protrusion can be classfied as having dentoalveolar or skeletal components or a combination of the two. Early treatment is frequently recommended to correct intermaxillary skeletal and dentoalveolar relationships by placing a distal force on the maxilla, typically with a headgear.[1] In this case, cervical headgear and a maxillary biteplate were used in combination as initial appliances. The goal was to correct the maxillary protrusion with the distal

Figure 11
Superimposed pretreatment (11 yrs 8 mos) and posttreatment (15 yrs 8 mos) tracings.

Figure 12
Superimposed posttreatment (15 yrs 8 mos) and postretention (19 yrs 10 mos) tracings.

Figure 13A-C
Postretention intraoral photographs. Five years after active treatment, all esthetic and functional goals have been met. Periodontal tissues are healthy.

force placed by the headgear on the maxillary first molars. Cephalometric analysis (Figure 4) indicated that forward maxillary growth was restrained. The bite plate had the effect of allowing free eruption of the posterior teeth, thereby decreasing the overbite.[20-24] This also allowed the mandible to escape the confining effect of the deep overbite.

In this case, maxillary first premolars were extracted and an edgewise appliance was used to intrude and retract the maxillary incisors as suggested by Kitamura[25] and Niizawa et al.[26] Their criteria for use of this technique in a Class II div. 1 type of malocclusion was for the patient to have moderate to severe overjet, good forward growth of the mandible expected, and good lower arch form, as shown by this patient.

Author Address

Dr. Robert L. Boyd
University of California San Francisco
San Francisco, CA 94143-0348

Shigemi Goto is an Associate Professor in the Department of Orthodontics, School of Dentistry, Aichi-Gakuin University, Nagoya, Japan, and formerly was a Visiting Assistant Professor, Department of Growth and Development, School of Dentistry, University of California, San Francisco, San Francisco, California.

Robert L. Boyd is a Professor and Chair of the Division of Orthodontics, Department of Growth and Development, School of Dentistry, University of California, San Francisco.

Ib Leth Nielsen is a Clinical Professor in the Division of Orthodontics, Department of Growth and Development, School of Dentistry, University of California, San Francisco.

Tetsuo Iizuka is a Professor and Chair of the Department of Orthodontics, School of Dentistry, Aichi-Gakuin University, Nagoya, Japan.

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