

Case Report

Anterior crossbite treatment by a removable orthodontic appliance in a patient with severely decayed molars: A case report

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Abstract A 10-year-old boy was referred to our pediatric dentistry clinic with complaints of anterior crossbite and crowding in the maxillary dentition. Most of his molars were severely decayed and the level of his oral hygiene was very poor. A removable orthodontic appliance was used to correct his anterior crossbite. The use of this appliance enabled us to treat the patient's severely decayed molars and improve the poor level of his oral hygiene simultaneously.

Key words

Anterior crossbite,
Decayed molars,
Dental health instruction,
Oral hygiene,
Removable orthodontic appliance

Introduction

Anterior crossbite is corrected by the use of a fixed orthodontic appliance such as a lingual arch and a multi-bracket appliance or the use of a removable orthodontic appliance such as an activator. A fixed appliance can be adjusted easily and does not require much cooperation by the patient. A strict management for improving oral hygiene level is essential, however, because the presence of a fixed appliance makes tooth cleaning more difficult and facilitates the build-up of plaque, especially between the bracket and gingival margin¹. Healthy and non-decayed molars as anchorage teeth of a fixed appliance are also needed. On the other hand, semierupted molars or even severely decayed molars can be used as anchorage teeth for a removable orthodontic appliance attached with an orthodontic clasp such as Adams clasp or Delta clasp, an appliance that is particularly useful for treatment of children in the mixed dentition². Therefore, caries treatment and oral hygiene instruction can be performed simultaneously during orthodontic treatment using a removable appliance. However,

a removable appliance requires complete patient cooperation^{3,4}. That is, the effectiveness of treatment using a removable appliance is dependent on whether the patient uses the appliance continuously.

In this case, we were able to simultaneously treat the patient's severely decayed molars and improve the poor level of his oral hygiene while correcting his anterior crossbite by using of a removable orthodontic appliance.

Case Report

A 10-year-old boy was referred to our pediatric dentistry clinic with chief complaints of anterior crossbite and crowding in the maxillary dentition. Although the patient had been aware of anterior crossbite since his primary dentition stage, he had not had any treatment for the crossbite. His older brother also had anterior crossbite, and the crossbite had been corrected in our clinic. He was not able to come to be treated frequently because he lived far from our clinic. Furthermore, he and his parents desired to be treated for improving his chief complaints.

Intraoral examination showed that the patient had a Class III molar relationship on the right and left sides (Figure 1). Mandibular arch length

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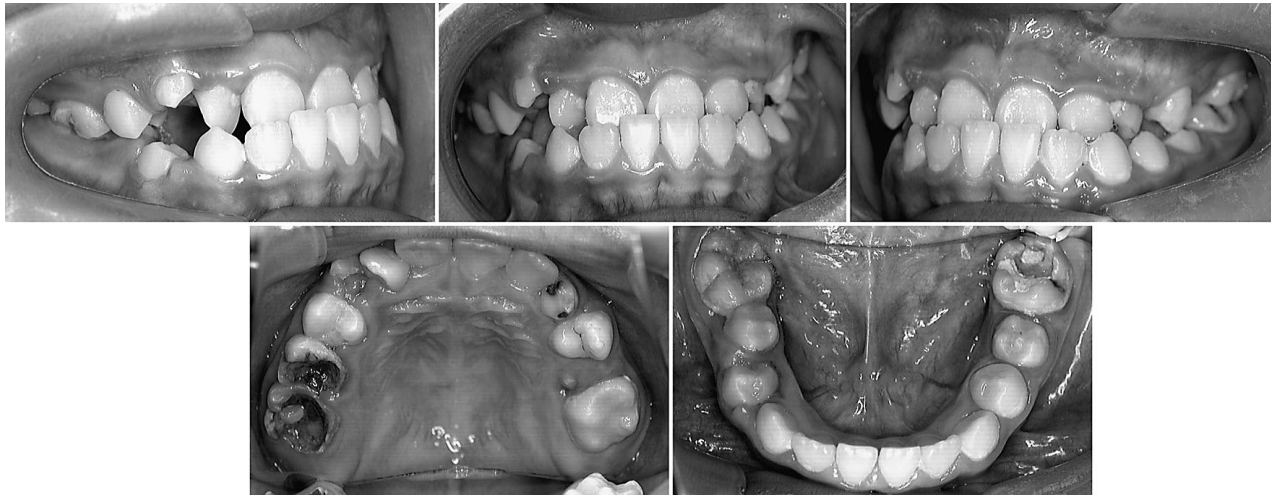


Fig. 1 Pre-treatment intraoral photographs

Table 1 Cephalometric analysis

	Pre-treatment (10Y11M)	Mean ± 1 S.D.	Post-treatment (12Y9M)	Mean ± 1 S.D.	Retention (13Y7M)	Mean ± 1 S.D.
Angular measurement (degree)						
Mandibular plane to FH	40.1	29.03 ± 5.27	40.9	27.58 ± 4.89	38.7	27.58 ± 4.89
Y-axis	66.0	63.31 ± 3.86	66.5	63.21 ± 3.42	66.6	63.21 ± 3.42
L-1 to Mandibular	84.4	94.27 ± 5.45	81.6	95.64 ± 5.21	82.2	95.64 ± 5.21
SNA	83.3	80.69 ± 3.40	83.5	81.64 ± 2.88	83.8	81.64 ± 2.88
SNB	81.3	76.66 ± 3.05	81.7	78.36 ± 3.12	81.9	78.36 ± 3.12
U-1 to SN	106.7	105.29 ± 6.55	117.6	107.65 ± 7.12	117.7	107.65 ± 7.12
Gonial angle	138.0	126.22 ± 4.62	139.0	122.55 ± 5.40	141.4	122.55 ± 5.40
Linear measurement (mm)						
Ptm'-A'	48.8	48.50 ± 2.43	49.0	50.98 ± 2.43	51.5	50.98 ± 2.43
Me-Go	68.4	68.39 ± 3.90	72.6	74.86 ± 4.38	72.8	74.86 ± 4.38
G-Ar	42.9	45.76 ± 3.00	43.5	48.96 ± 4.11	48.1	48.96 ± 4.11
Over jet	-1.7	—	1.9	—	1.7	—
Over bite	2.5	—	1.5	—	1.3	—

discrepancy was +1.5 mm. The mandible of this patient was able to make a construction bite and a Class I molar relationship by retraction. Furthermore, premature contact in anterior teeth was found when the patient closed his mouth. The mandible was guided protrusively by this premature contact. Two first permanent molars and a primary molar were severely decayed (Figure 1). The maxillary right first molar and the mandibular left molar required pulp therapy. The level of the patient's oral hygiene was very poor; dental plaque and calculus were present in most of his teeth and swelling was found all over the gingiva.

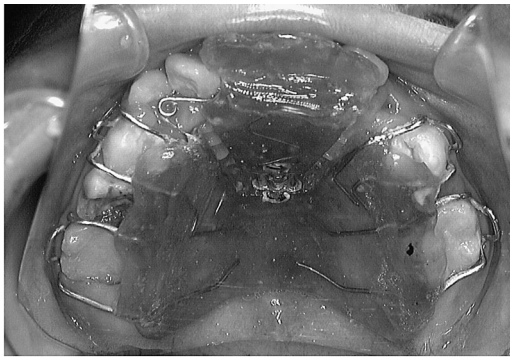
The patient had a skeletal Class III pattern with maxillary normal position (SNA = 83.3°) and mandibular protrusion (SNB = 81.3°). The mandibular plane angle to FH plane (40.1°) and the gonial angle (138.0°) were larger than a range of 1 S.D. limits. The mandibular incisors were retroclined relative to the mandibular plane (L-1 to Mandibular = 84.4°) (Table 1)⁵.

In the maxilla, arch width (C_L-C_L) (26.70 mm) was larger than a range of 1 S.D. limits. In the mandible, arch width (6-6) (34.78 mm) was smaller than a range of 1 S.D. limits. And arch length (1-6) (37.41 mm) was larger than a range of 1 S.D.

Table 2 Cast model analysis

		Pre-treatment (10Y11M)	Post-treatment (12Y9M)	Retention (13Y7M)	Mean \pm 1 S.D.
Maxilla	Arch width				
	C _L -C _L	26.70	—	—	24.93 \pm 1.42
	3-3	—	38.79	38.92	37.92 \pm 2.68
	6-6	44.45	45.78	45.53	46.41 \pm 3.57
	Basal arch width	49.28	49.28	49.84	49.48 \pm 3.89
	Arch length				
	1-6	38.56	42.08	42.11	37.47 \pm 3.00
	Basal arch length	33.82	37.05	36.98	31.78 \pm 3.08
Mandible	Arch width				
	3-3	29.25	29.30	29.31	28.82 \pm 2.99
	6-6	34.78	37.31	37.01	39.04 \pm 3.54
	Basal arch width	—	43.96	43.58	41.78 \pm 2.92
	Arch length				
	1-6	37.41	36.28	36.35	33.52 \pm 3.03
	Basal arch length	32.15	33.25	33.20	31.12 \pm 2.83

(A)



(B)

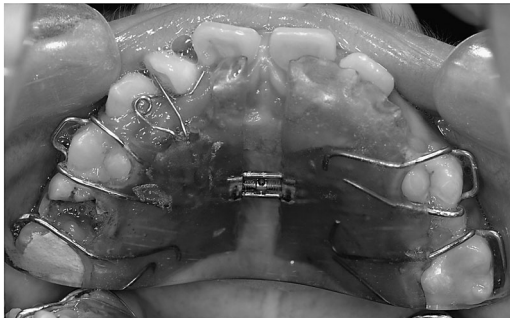


Fig. 2 Photographs of the removable orthodontic appliance equipped with an anterior expansion screw (A) and another removable orthodontic appliance equipped with a lateral expansion screw (B)

limits (Table 2)^{6,7}.

Based on the results of these examinations, the patient was diagnosed as having skeletal Class III malocclusion with functional anterior crossbite.

Taking his chief complaint and inconvenience of

visiting our clinic into consideration, we decided to treat his severely decayed molars and improve the poor level of his oral hygiene while correcting his anterior crossbite simultaneously.

As the first step of the treatment procedure to improve anterior crossbite, it was impossible to use a fixed orthodontic appliance because there were no healthy and non-decayed molars that could be used as anchorage teeth of the appliance. It was also likely that the use of a fixed appliance would worsen the level of his oral hygiene. We therefore decided to use a removable orthodontic appliance to improve crossbite in this case. By using a removable appliance, we hoped that we would be able to simultaneously treat the decayed molars and instruct the patient how to improve the poor level of his oral hygiene while treating his crossbite.

A removable orthodontic appliance equipped with an anterior expansion screw was placed in the maxillary dentition of the patient (Figure 2A). A chin cup was also used to improve the direction of the growth of the mandible. As the appliance therapy proceeded, treatment of severely decayed molars was performed. The maxillary right and mandibular left first permanent molars were restored with stainless steel crowns following pulpectomies and root canal fillings, and the maxillary right second primary molar was extracted. Another first permanent molar was restored with composite resin. Simultaneously, continuous instruction on dental health as well as assessment of oral hygiene and

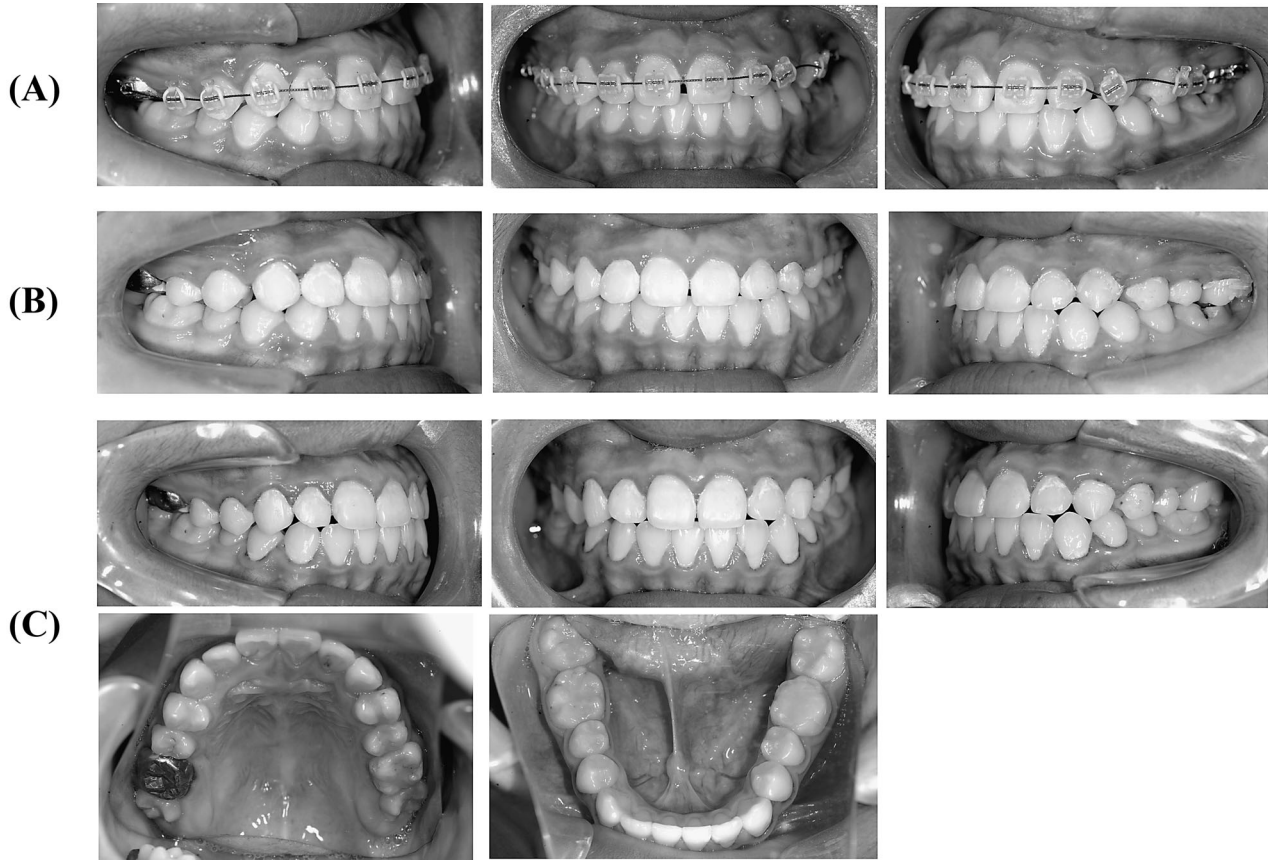


Fig. 3 Intraoral photographs: (A) during treatment by a multi-bracket orthodontic appliance; (B) the time of the removal of a multi-bracket orthodontic appliance; (C) 10 months after the removal of a multi-bracket orthodontic appliance

professional teeth cleaning were performed every time the patient visited our clinic.

The crossbite of the patient was improved to edge-to-edge bite 3 weeks after placement of the appliance and was corrected to an acceptable level 7 weeks after placement. Another removable orthodontic appliance, which was equipped with a lateral expansion screw, was placed in the maxillary dentition in order to improve crowding in anterior teeth (Figure 2B). Crowding in anterior teeth of the patient was corrected 3 weeks after placement of the other appliance. The oral hygiene level of the patient improved remarkably, and a multi-bracket appliance was placed to attain greater precision of teeth movement (Figure 3A). Three months later, a multi-bracket appliance was removed (Figure 3B). Removable wrap-around type retainer and fixed type retainer (canine to canine) were used for retention in the maxillary dental arch for 10 months. Figure 3C shows intraoral appearances 10 months after the removal of a multi-bracket appliance.

— Pre-treatment (10Y11M)
 Post-treatment (12Y9M)
 - - - - Retention (13Y7M)

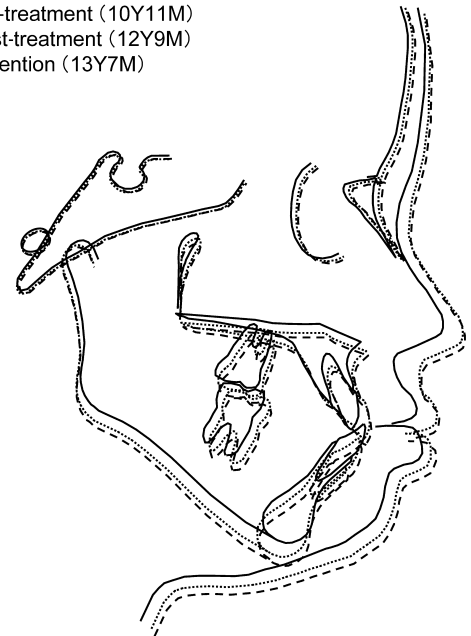


Fig. 4 Superimposition of pre-treatment, post-treatment and retention cephalometric tracings on the SN plane registered at S

The cephalometric superimposition indicates some changes in the facial profile and slight skeletal changes in both jaws (Figure 4).

Discussion

We were able to simultaneously treat the patient's severely decayed molars and improve the poor level of his oral hygiene while correcting his anterior crossbite. In this case, we were able to make the most of the merit of a removal orthodontic appliance.

A fixed orthodontic appliance such as a lingual arch and a multi-bracket appliance or a removable orthodontic appliance such as an activator is used to correct anterior crossbite. In this case, however, we were not able to use a fixed appliance, because the molars were severely decayed and required treatment as soon as possible. We also had to try to improve the poor level of his oral hygiene by motivating him to keep his oral cavity clean and instructing him on an effective method for cleaning his oral cavity, since he had not performed the customary tooth-brushing on the first visit to our clinic.

There have been some reports of a greater oral hygiene disadvantage in children treated with removable orthodontic appliances than in children treated with fixed orthodontic appliances^{8,9}. Moreover, a removable appliance is not suitable for correction of rotations or closure of large residual spaces¹⁰. A removable appliance also requires complete patient cooperation^{3,4}. However, a removal appliance has several advantages over a fixed appliance: it is more economical, simpler to make, and provides more efficient anchorage¹¹. The fact that the use of a removal appliance enables concomitant treatment of decayed teeth and oral hygiene instruction might also be considered as another advantage of this appliance.

Following correction of anterior crossbite and crowding by the use of two removable appliances, the patient was undergone successive orthodontic treatment by the use of a fixed appliance to attain greater precision of tooth movement. Active cooperation of orthodontic patients is essential for a long treatment period, and maintenance of an adequate standard of oral hygiene is needed¹². In the present case, maintenance of an adequate oral hygiene would have been more difficult if a fixed appliance had first been used instead of a removable appliance, and it would not have been possible to subsequently start treatment using a fixed appliance

if intense dental health instruction had not been given to the patient.

It is normal that treatment of patient's decayed teeth and improving the poor oral hygiene level should be performed preferentially before an orthodontic treatment. Under unavoidable circumstances like this case, however, these treatments and instruction might be performed simultaneously by using of a removable appliance.

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