

Case Report

Occlusal guidance for unilateral scissors bite in primary dentition: A case report

Sachiko Hayashi-Sakai, Jun-ichi Watanabe, Yo Taguchi and Tadashi Noda

Division of Pediatric Dentistry, Department of Oral Health Science, Course for Oral Life Science, Niigata University Graduate School of Medical and Dental Sciences
2-5274 Gakkocho-dori, Niigata 951-8514, JAPAN

Abstract A scissors bite is one of the more unusual malocclusions in primary dentition. The purpose of this report is to describe the unilateral scissors bite in primary dentition and the treatment outcome following the use of constriction appliances. A 5-year, 5-month-old boy developed a scissors bite in the left molar region due to the extended width of the maxillary dental arch. Two types of appliances were used to reduce the width of the maxillary dental arch; one was a removable type modified from a conventional expansion plate, and the other was a fixed type modified from a quad-helix appliance. The left maxillary primary molars were able to bite normally after the treatment using both appliances. As a result, the left first molars also could be guided to a normal occlusion and prevented from becoming a scissors bite. We suggest that improvement of the scissors bite in the primary dentition stage can prevent subsequent malocclusions in permanent dentition.

Key words

Constriction appliances,
Occlusal guidance,
Primary dentition,
Scissors bite

Introduction

Malocclusion in the primary dentition period is often encountered¹⁻³. Recently, the concern of Japanese guardians about malocclusion has been increasing in pediatric dental clinical practice⁴. The prevalence rate of anterior crossbite is relatively high in Japanese children, and the method of making an early diagnosis and/or treatment has been well discussed^{5,6}. The next most frequent malocclusion in the primary dentition period is caused by oral habits such as finger sucking or tongue thrust; they induce maxillary protrusion and anterior open bite. Occlusal guidance, i.e., early intervention for these malocclusions, may lead to successful craniofacial development, which involves the establishment of a harmonized occlusion in permanent dentition⁷.

According to our survey of the literature, however, there have been very few detailed reports of clinical treatment techniques for scissors bite

in the primary dentition period^{3,8,9}, and its causes have remained unclear. Nagai *et al.*⁸ described the treatment of maxillary protrusion caused by oral habits and a case of scissors bite that developed during treatment. Ishitani *et al.*⁹ reported two cases of scissors bite with anterior edge-to-edge occlusion and anterior cross bite. Although they described clinical treatment techniques, their scissors bite cases were accompanied by other malocclusions. The present report describes an unusual case of severe unilateral scissors bite in primary dentition where there was no other malocclusion and the clinical treatment technique based on a constriction method using appliances modified and designed by authors that had a successful therapeutic effect.

Case Report

A 5-year, 5-month-old Japanese boy was brought to the Pediatric Dental Clinic of Niigata University Medical and Dental Hospital with the complaint of an eating disorder. His mother noticed that his eating time was longer than that of his fraternal twin

Received on February 16, 2007

Accepted on August 23, 2007

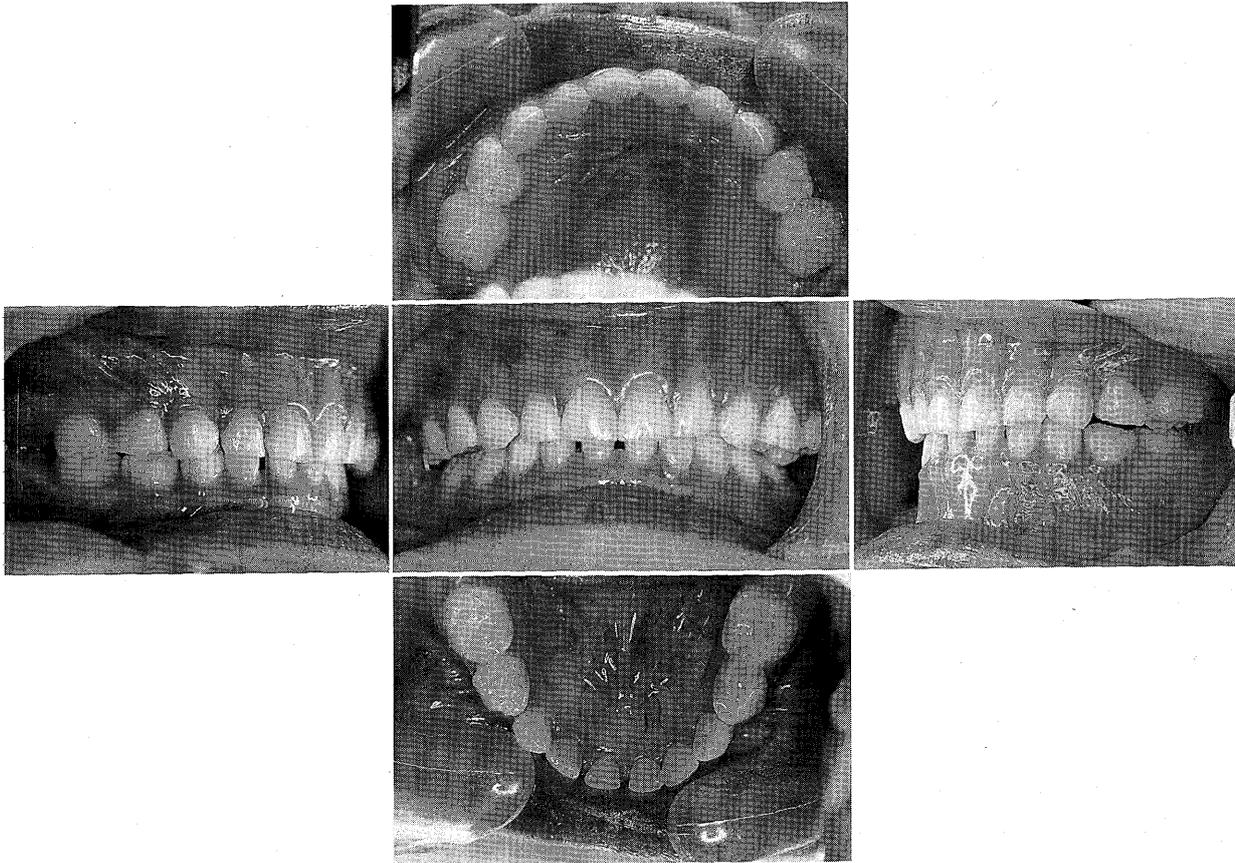


Fig. 1 Pre-treatment clinical intraoral views at 5 years, 5 months

brother. When he was first brought to a private dental clinic, his malocclusion was pointed out and treatment was recommended. His mother worried about the necessity of the malocclusion treatment, and he was brought to our clinic. There was no relevant medical or family history of systemic or dental abnormalities. Clinical examination showed normal age-appropriate development of his face and dentition except for the severe scissors bite in the left molar region, which allowed no occlusal contact between the opposite teeth (Fig. 1). He had no oral habits, abnormally tongue position and/or mouth-breathing, and all primary teeth were free of caries. Terminal planes¹⁰ on the unaffected side were of the distal step type. The patient's fraternal twin brother had normal occlusion.

Frontal cephalogram examination

The width of the inter-cervical line of the primary second molars on the maxilla (cMoU) and mandible (cMoL) (Fig. 2) were measured for comparison with those of the cephalometric standards in Japanese

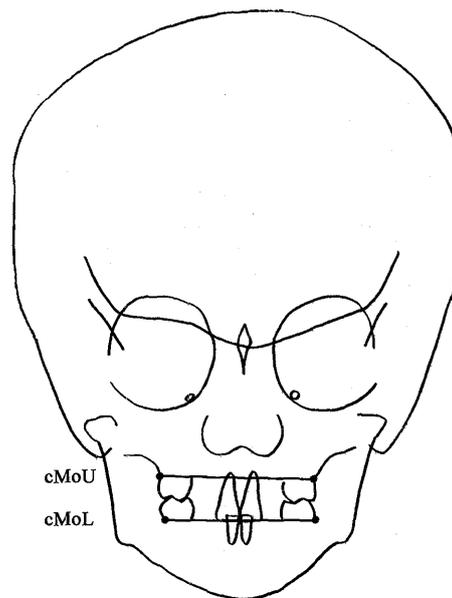


Fig. 2 Inspection items of a frontal cephalogram examination
 cMoU: The width of the inter-cervical line of primary molars on the maxilla
 cMoL: The width of the inter-cervical line of primary molars on the mandible

Table 1 Comparison of inspection items on frontal cephalograms and dentition models before and after treatment

		Before treatment	Mean \pm SD	After treatment	Differences
Radiographic cephalograms					
cMoUR-cMoUL	maxilla	54.85	52.4 \pm 2.15	51.30	-3.55
cMoLR-cMoLL	mandible	48.70	50.0 \pm 1.92	48.90	0.20
Dentition models					
Arch width					
C _C -C _C	maxilla	32.30	31.28 \pm 1.93	31.95	-0.35
	mandible	24.50	23.91 \pm 1.65	24.60	0.10
C _L -C _L	maxilla	26.00	25.51 \pm 1.84	26.10	0.10
	mandible	19.60	19.82 \pm 1.34	20.35	0.75
E-E	maxilla	51.10	47.60 \pm 2.84	47.30	-3.80
	mandible	38.00	39.61 \pm 2.41	38.20	0.20
E _L -E _L	maxilla	34.15	31.16 \pm 2.31	32.30	-1.85
	mandible	28.55	29.65 \pm 1.72	29.55	1.00
Arch length					
A-C _C	maxilla	7.40	8.20 \pm 1.05	7.25	-0.15
	mandible	5.75	4.97 \pm 0.83	6.20	0.45
A-E _D	maxilla	26.40	29.06 \pm 1.53	28.15	1.75
	mandible	27.80	26.41 \pm 1.50	27.65	-0.15

(mm)

cMoUR-cMoUL: The width of the inter-cervical line of primary molars on the maxilla

cMoLR-cMoLL: The width of the inter-cervical line of primary molars on the mandible

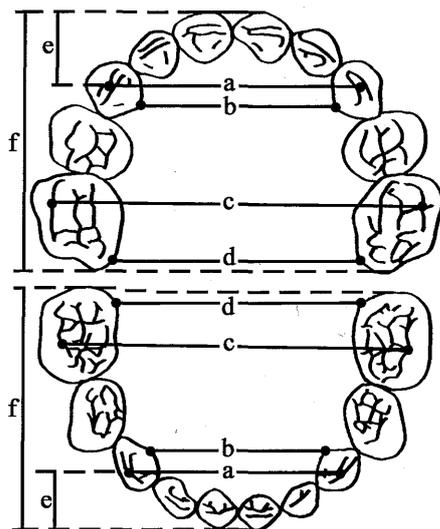
C_C-C_C: The arch width inter cusp of primary canines, C_L-C_L: Inter-palatal/lingual cervical line of primary caninesE-E: Inter-buccal groove of primary second molars, E_L-E_L: Inter-palatal/lingual cervical line of primary second molarsA-C_C: The arch length of inter labial surfaces of primary central incisors to the tips of the primary caninesA-E_D: Inter-labial surfaces of primary central incisors to the distal surfaces of primary second molars

Fig. 3 Inspection items of the study model examination

- a: The arch width inter cusp of primary canines (C_C-C_C)
 b: Inter-palatal/lingual cervical line of primary canines (C_L-C_L)
 c: Inter-buccal groove of primary second molars (E-E)
 d: Inter-palatal/lingual cervical line of primary second molars (E_L-E_L)
 e: The arch length of inter labial surfaces of primary central incisors to the tips of the primary canines (A-C_C)
 f: Inter-labial surfaces of primary central incisors to the distal surfaces of primary second molars (A-E_D)

children with clinically normal occlusion¹¹). The cMoU in the present case was remarkably larger than cephalometric standard, i.e., beyond the mean plus the standard deviation (Table 1).

Study models examination

The arch width and length between the primary canines and second molars (Fig. 3) were measured for comparison with the standard values in Japanese children with normal primary occlusion¹²). The following three inspection items on the maxilla were revealed to exceed the mean plus the standard deviation: the arch width of the inter-buccal groove of the primary second molars (E-E), the inter-palatal cervical line of the primary second molars (E_L-E_L), and the arch length between inter-labial surfaces of the primary central incisors and inter-distal surfaces of the primary second molars (A-E_D) (Table 1). Other inspection items for the maxilla and mandible were within the range of the mean plus standard deviation. The overbite was 2.8 mm and the overjet was 2.0 mm.

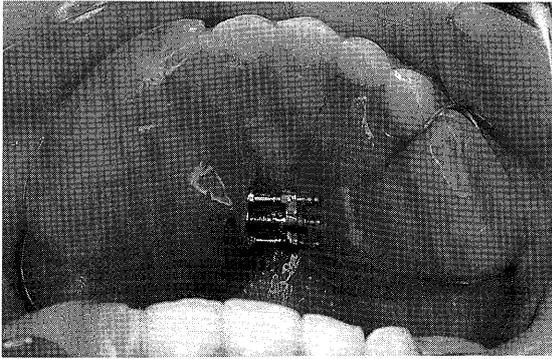


Fig. 4 The modified removable type appliance for constricting is shown at 5 years, 5 months old

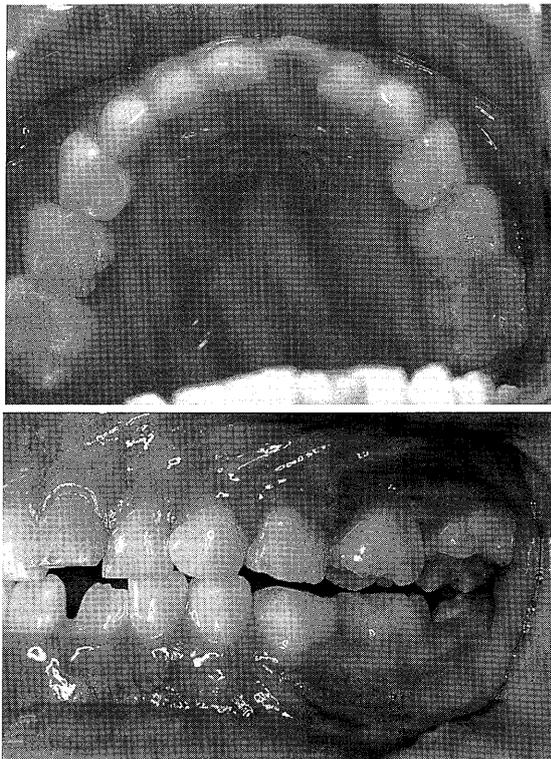


Fig. 5 Clinical intraoral view at 6 years, 2 months

Treatment

For occlusal guidance, the authors designed and used a removable type appliance for reducing the maxillary dental arch width. To provide a constrictive effect, a conventional expansion screw was modified to give reverse rotation (Fig. 4). The working model of the maxilla was cut into two portions at the middle. The two portions were trimmed carefully at the cutting planes to reduce the arch width until

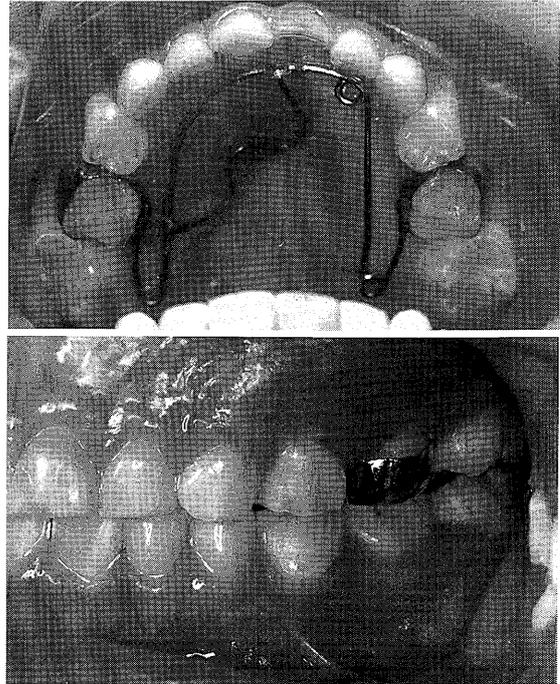


Fig. 6 Two months after using the modified fixed type appliance for constricting; patient was 6 years, 4 months old

the expected one after treatment was obtained. The extent of trimming was set out to exceed a little to allow over-collection. Then the trimmed portions were glued and a removable appliance was made using the expansion screw (Ortho Dentaureum Co., #600-500) in a conventional method. Ultimately, the fabricated appliance was returned to the master model and set adjust by opening the expansion screw. It was expected that by covering the occlusal surfaces the maxillary left primary first and second molars would move toward the palatal side smoothly. The working model of the maxilla was divided into two at median line and it was trimmed a little more than the expected move value. Then the working models were glued and a removable type appliance was made using a closed expansion screw in conventional method. Ultimately, open value of the expansion screw was adjusted on master model. In order to raise the occlusal vertical dimension and to anchor the unaffected teeth at the same time, the appliance covered the occlusal surfaces between the right primary lateral incisor and the second molar. The authors directed the patient's mother to ensure that the boy use this appliance all day long except at meals and when brushing his teeth and exercising, and to give the screw a one-quarter reverse turn

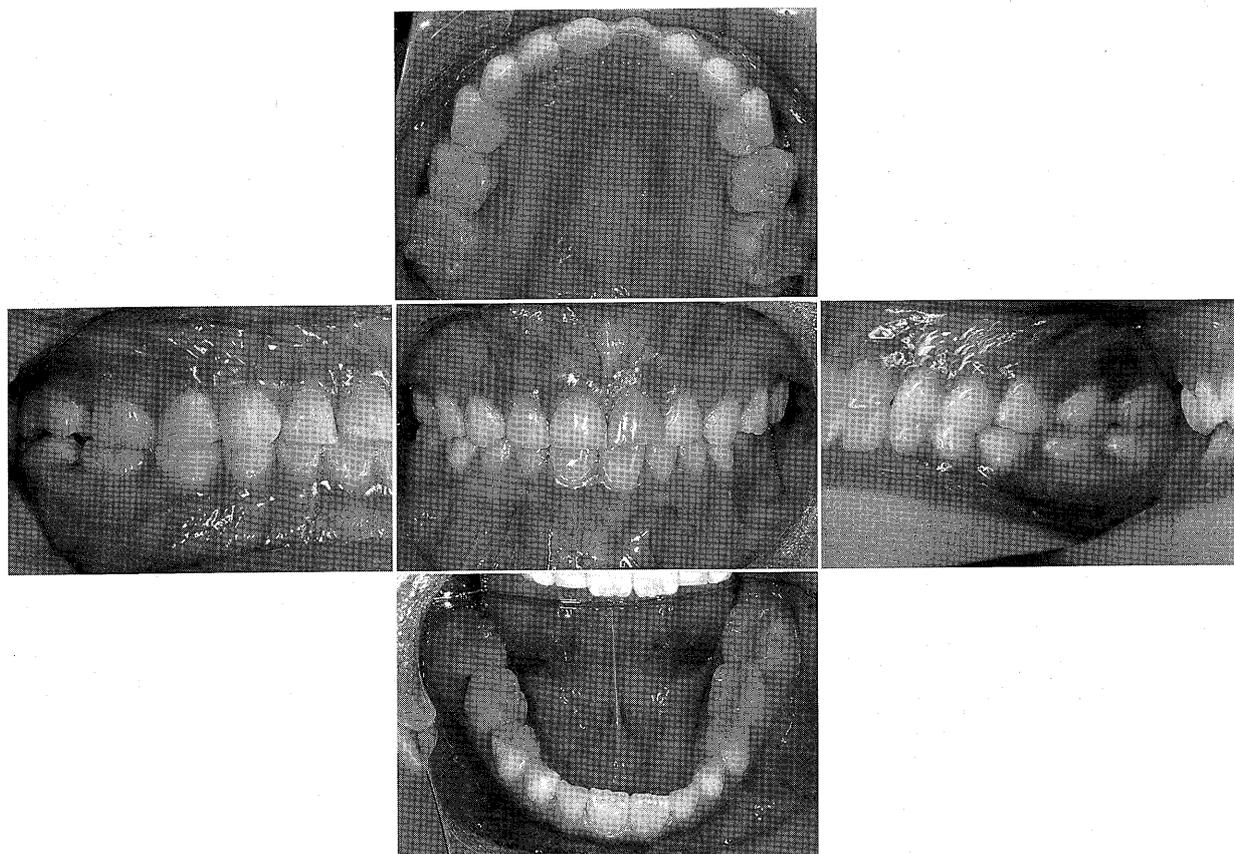


Fig. 7 Post-treatment clinical intraoral view at 6 years, 8 months

(0.1 mm) each week. During periodic examination, the period of the screw turn was gradually shortened from once a week to every 4 days.

Although the maxillary left primary first molar was sufficiently moved to the palatal side after 8 months, the mesiopalatal cusp of the adjacent second molar merely contacted the mesiobuccal cusp of the opposing second molar (Fig. 5). Unstable occlusion was also detected due to the use of the appliance over a long term. Furthermore, the maxillary left permanent first molar was progressing toward eruption with a tendency to have a scissors bite like the left primary molars. Unfortunately, the maxillary left primary central incisor was moved to the labial side with discoloration because it had been injured twice in this term.

In order to improve the above conditions, a fixed appliance with double loops and a slight resin valve for anchorage was modified from a quad-helix appliance. The new appliance was activated and adjusted once a month for 2 months. As a result, the maxillary left primary second molar moved

sufficiently to the palatal side, and the scissors bite was corrected (Fig. 6). The maxillary left primary molars gained sufficient occlusal contact with the opposing molars. In addition, the maxillary left permanent first molar, which was tending toward a scissors bite, also began to be led to a normal bite by suitable occlusion of the neighboring teeth. After the second appliance was used for the next 2 months without activating, a lingual arch was inserted as a retainer. The mobility and the attached gingival level were normal in all affected teeth.

Evaluation of treatment

When the patient finished using the retainer at the age of 6 years and 10 months (Fig. 7), a frontal cephalogram and study models were taken and examined again to evaluate the treatment. Measurements of the same inspection items were made as described earlier in methods and compared to their pretreatment values. The most significant change was recognized in the arch width of the inter-buccal groove of the maxillary primary second molars

(E-E), which was reduced to 47.3 mm; the difference between pre- and post-treatment values was 3.8 mm (-7.4%). After the improvements, data from other inspections of all items exceeded the mean plus the standard deviation and now lay within the standard ranges of normal primary dentition. The width of the inter-cervical line of primary molars on the maxilla (cMoU), the arch width of the inter-palatal cervical line of the maxillary primary second molars (E_L-E_L), were reduced by 3.55 mm (-6.4%), 1.85 mm (-5.4%), respectively, and the arch length of the inter-labial surfaces of the maxillary primary central incisors to the distal surfaces of the maxillary primary second molars ($A-E_D$) were increased by 1.75 mm (6.6%) (Table 1). The overbite was slightly reduced to 2.2 mm, but the overjet was unchanged at 2.0 mm. His mother stated subjectively that his eating time became shorter and almost same as that of his twin.

Discussion

Sim¹⁾ classifies scissors bite as a unilateral buccal crossbite in the category of posterior crossbites. A buccal crossbite with a whole segment of the upper teeth outside the lower arch is particularly termed a scissors bite¹³⁾. The cause of a posterior crossbite includes scissors bite may not be possible to determine with any great degree of accuracy¹⁾. McDonald infers that some crossbite may be of muscular origin and suggests that unequal tongue forces or abnormally low tongue positions, such as those seen in mouth-breathing children, may be causative factors¹⁴⁾. Barnett says that skeletal posterior crossbite may be accompanied by a high palatal vault, often secondary to nasal obstruction and mouth breathing occasionally⁷⁾. The present case had no oral habit and above abnormal findings. A scissors bite generally occurs when the maxillary dental arch width is excessively broad compared to the mandibular arch, and it usually reflects an underlying skeletal mismatch¹⁵⁾.

Generally, a scissors bite in primary dentition occurs at almost the same frequency as it does in mixed dentition or permanent dentition^{2,3)}. Proffit²⁾ reported that a scissors bite was detected in only 0.4–1.0% of children with mixed dentition and in 1.0–1.6% with permanent dentition. On the other hand, Kisling *et al.*³⁾ reported that the prevalence rate of scissors bite in primary dentition was approximately 1.6%, and that left-side scissors bite in males

was 0.7% in 3-year-old children. There is a broad consensus that posterior crossbites including scissors bites should be treated as soon as possible^{1,7,15,16)}. Even a mild scissors bite may cause severe occlusal dysfunction¹⁵⁾. A complete unilateral scissors bite can be treated using removable or fixed appliances by expansion of the mandibular dental arch and possibly some constriction of the maxillary dental arch¹⁴⁾. In the present case, since the mandibular dental arch was normal and the maxillary dental arch width was extended, the scissors bite was treated by constriction of the maxillary dental arch.

The present case has been followed for 1 year and 2 months. Although a retaining period has been controversial, it is roughly considered in permanent dentition that a retaining period should be performed as long as that of orthodontic movement. However, in the present case, his retaining period could finish relatively short-term because his posterior occlusion was stabilized after active occlusal guidance. Further study on retaining period after treatment of scissors bite in primary teeth period is necessary. The left primary molars have fulfilled their functions sufficiently without any discomfort and remain in occlusion. After treatment, the patient's eating time was improved. If no treatment had been given for the scissors bite, unsuitable growth and asymmetric development would have occurred in the oro-facial region, and dysfunctional occlusion might have developed in the mixed or permanent dentitions.

In addition, the maxillary left first molar, which showed a tendency toward a scissors bite, was led to become a normal bite after suitable occlusion of the left primary molars was achieved. We surmise that occlusal guidance in the left primary molars produced sufficient vertical space for the erupting maxillary left permanent first molar and that the inclination of the first molar changed spontaneously to the normal eruptive direction by buccal muscle and tongue pressure.

In summary, occlusal guidance for a scissors bite in primary dentition is important, and improvement of occlusion in this stage can prevent subsequent malocclusions in permanent dentition. The patient has been kept under periodic examination to date, in order to monitor the progress of change to permanent dentition.

References

- 1) Sim, J.M.: Minor Tooth Movement in Children. 2nd

- ed. CV Mosby Co., St. Louis, 1977, pp.272–301.
- 2) Proffit, W.R.: Contemporary Orthodontics. 1st ed. CV Mosby Co., St. Louis, 1986, pp.2–13.
 - 3) Kislring, E. and Krebs, G.: Patterns of occlusion in 3-year-old Danish children. *Community Dent Oral Epidemiol* **4**: 152–159, 1976.
 - 4) Noda, T., Takagi, M., Hayashi-Sakai, S. and Taguchi, Y.: Eruption disturbances in Japanese children and adolescents. *Ped Dent J* **16**: 50–56, 2006.
 - 5) Tanabe, Y., Taguchi, Y. and Noda, T.: Relationship between cranial base structure and maxillofacial components in children aged 3–5 years. *Eur J Orthod* **24**: 175–181, 2002.
 - 6) Shimomura, J., Tanabe, Y., Taguchi, Y., Shimooka, S. and Noda, T.: Anterior crossbite in the primary dentition: proposal for a new analytical method in children. *Odontology* **93**: 56–60, 2005.
 - 7) Barnett, E.M.: Pediatric Occlusal Therapy. 1st ed. CV Mosby Co., St. Louis, 1974, pp.49–92.
 - 8) Nagai, H., Hoshi, M., Ide, M. and Oomori, I.: Treatment of maxillary protrusion and scissors bite using removable appliances: report of a case. *Jpn J Ped Dent* **37**: 852–863, 1999. (In Japanese)
 - 9) Ishitani, N., Masumoto, Y., Yoshihara, T., Yamasaki, Y. and Nakata, M.: Early treatments of scissors bite in primary dentition: two cases report. *Jpn J Ped Dent* **42**: 549–560, 2004. (In Japanese)
 - 10) Arya, B.S.: Prediction of first molar occlusion. *Am J Orth* **63**: 610–621, 1973.
 - 11) Japanese Society of Pediatric Dentistry: A study on the cephalometric standards of Japanese children. *Jpn J Ped Dent* **33**: 659–696, 1995. (In Japanese)
 - 12) Japanese Society of Pediatric Dentistry: Research concerning the sizes of the primary tooth crown, primary dental arch and condition of primary occlusions of the Japanese. *Jpn J Ped Dent* **31**: 375–388, 1993. (In Japanese)
 - 13) Howat, A.P., Capp, N.J. and Barrett, N.V.: A Colour Atlas of Occlusion & Malocclusion. Wolfe, London, 1991, pp.74–109.
 - 14) McDoanld, M.L.: Vistas in Orthodontics. Lea & Febiger, Philadelphia, 1962, pp.85–98.
 - 15) Houston, W.J.B. and Tulley, W.J.: A Textbook of Orthodontics. 1st ed. Wright, Bristol, 1986, pp.154–163.
 - 16) Joondeph, M.R.: An Atlas of Pedodontics. 2nd ed. WB Saunders Co., Philadelphia, 1981, pp.296–366.