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Case Report

Correction of morphological and positional asymmetry in early mixed dentition with functional unilateral crossbite

ABSTRACT

Unilateral posterior crossbite with functional mandibular shift occurs as a sequelae of constricted maxillary arch, which is usually seen in children between 3 and 12 years of age. Early treatment of this condition helps prevent facial asymmetry, proper functioning of temporomandibular joint, masticatory muscle, and proper development of dentition. Functional unilateral posterior crossbite correction using fan-shaped expander can provide differential expansion. Fan-shaped expander was used in a patient with constricted maxilla having functional unilateral posterior crossbite with asymmetric condylar position and led to the development of favorable differential expansion and correction of asymmetry.

Keywords: Differential expansion, functional mandibular shift, unilateral crossbite

INTRODUCTION

Children with functional unilateral posterior crossbite have buccal segment teeth in crossbite on the one side, asymmetrically positioned condyles, and asymmetric muscle function.[1,2] Posterior crossbite in developing dentition usually exhibits lateral mandibular shift toward crossbite side from centric relation to intercuspal position. This rotational lateral shift of the mandible occurs often due to occlusal interferences on closure as there was reduced transverse width in the maxilla with that of the mandible.[1]

Most of the cases that exhibited functional mandibular shift have less rate of spontaneous correction.[3] This functional shift if left untreated at early age will lead to permanent skeletal and facial asymmetry. Therefore, early crossbite correction normalizes the development of occlusion and growth, eliminates the morphological and positional shift in the condyle, and also eliminates the orofacial muscular strain.[2]

Patients with narrow maxilla who require differential expansion can be treated with fan-shaped expander with spider screw to help in more of anterior expansion.[4-6] Fan-shaped expander produces more of anterior expansion, especially in cleft lip and palate cases where more anterior expansion is needed.[7]

This case report describes a case treated with spider screw developed by Schellino *et al*., who presented with unilateral crossbite due to functional shift and positional asymmetry.[4]

CASE REPORT

A 10-year-old female presented with mild jaw deviation and position of upper canine and first deciduous molar

K. Preethi, B. K. Rajkumar, S. Nagalakshmi, K. R. Rameshkumar

Department of Orthodontics and Dentofacial Orthopaedics, Vivekanandha Dental College and Hospital for Women, Tiruchengode, Tamil Nadu, India

Address for correspondence: Dr. K. Preethi, Department of Orthodontics and Dentofacial Orthopaedics, Vivekanandha Dental College and Hospital for Women, Tiruchengode, Namakkal, Tamil Nadu, India.
E-mail: preethi.orchid@gmail.com

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in crossbite on the left side. She had a straight profile, prominent chin with mild deviation, and obtuse nasolabial angle with average lower anterior facial height [Figure 1].

On intraoral examination, she had a mixed dentition with maxillary transverse discrepancy in the left buccal segment and had reduced intercanine width. She exhibited a Class I molar relation on the right and end-on relation on the left. There was a lateral mandibular functional shift on closure of the mandible and exhibited a lower midline shift of 3 mm toward the left [Figure 2].

The panoramic radiograph revealed erupting 12, 22 with normal temporomandibular joint and all the tooth buds of the permanent teeth present [Figure 3]. Cephalometric analysis showed retrognathic maxilla with Class III skeletal pattern, average lower incisor position, occlusal plane in average inclination, proclined upper incisor, and average lower incisor. The patient had obtuse nasolabial angle with average upper lip position [Figure 4 and Table 1]. Cervical vertebral maturation was at stage 2, suggesting 65%–85% growth left [Figure 4].

The transverse cephalometric analysis showed asymmetry in the mandible; Grummons analysis was done to compare the linear measurement from gonial and antegonial to median sagittal reference plane which showed reduced measurement on the right when compared to the left. Midline deviation in the lower was 3 mm to the left [Figure 5 and Table 2].

The treatment objectives were to maintain facial profile and resolve the unilateral transverse discrepancy with posterior crossbite in relation to 63, 64 correct midline deviation and functional mandibular shift.

The treatment plan was to bring more of anterior expansion rather than posterior since the unilateral crossbite was present only in relation to 63 and 64. We planned to use a



Figure 1: Pretreatment extraoral photographs

Table 1: Lateral cephalometric comparison between pre- and post-treatment

Measurements	Pretreatment values	Posttreatment values
SNA (°)	77	76
SNB (°)	78	75
ANB (°)	−1	1
Facial axis (°)	3	2
GoGn to SN (°)	32	33
Upper incisors to NA (°)	33	35
IMPA (°)	92	93
Occlusal plane to SN (°)	12	14
Maxillary length (mm)	73	80
Mandibular length (mm)	95	102
LAFH (mm)	59	63
Nasolabial angle (°)	116	112
Cant of upper lip (°)	14	11
J angle (°)	84	80
Pn to mandibular plane (°)	58	54



Figure 2: Pretreatment intraoral photographs

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fan-shaped rapid maxillary expansion (RME) for crossbite correction. A fan-shaped expander with arms at acute angle mesially inclined was designed which produces more anterior expansion with increase in intercanine width and avoided expansion and tipping of the posterior teeth [Figure 6].

The appliance was activated one-fourth twice per day till we achieved expansion with slight overcorrection in the maxillary deciduous molar cusp in the intermaxillary deciduous molar region on both sides. After 1½ months, midline diastema was evident and sufficient expansion was achieved. Intercanine expansion of 7 mm was obtained [Figure 7 and Table 3]. After that, self-cure acrylic was used to block the housing for stabilizing the correction achieved. The midlines were coinciding and functional shift of the mandible was also corrected [Figure 8]. After 3 months of passive maintenance with the same appliance, impression was made and W arch was inserted [Figure 9]. The patient was fixed with w arch for 1 year 9 months to maintain the correction achieved.

The posttreatment lateral cephalogram (1 year after the expansion) [Figure 10 and Table 1] showed that maxilla and mandible were in Class I relationship, as the crossbite correction has prevented the developing skeletal Class III and there was only minimal change in lower anterior facial height. The transverse cephalometric analysis reported showed coinciding midline and symmetrical condylar position [Figure 11 and Table 2]. Clinically, the patient had no functional unilateral posterior crossbite corrected and midlines were coinciding, with no jaw asymmetry being seen [Figures 12 and 13].

DISCUSSION

Unilateral posterior crossbite with bilaterally constricted maxillary arch can be treated in different modalities such as grinding, quad helix, expansion plates, and also rapid

Table 2: Posteroanterior cephalometric comparison between pre- and post-treatment

Measurements	Right (mm)	Left (mm)	Right (mm)	Left (mm)
MSR to CC	41	45	46	46
MSR to MX6	25	26	27	26
MSR to MD6	23	28	27	25
MSR to J	29	30	30	30
MSR to AG	31	39	37	36
MSR to G	34	41	40	40

CC: Condylion axis, MSR: Midsagittal reference at crista Galli, AG: Antegonial notch, G: Gonion, MX6: Maxillary first molar, MD6: Mandibular first molar, J: Jugal process



Figure 3: Pretreatment orthopantomograph

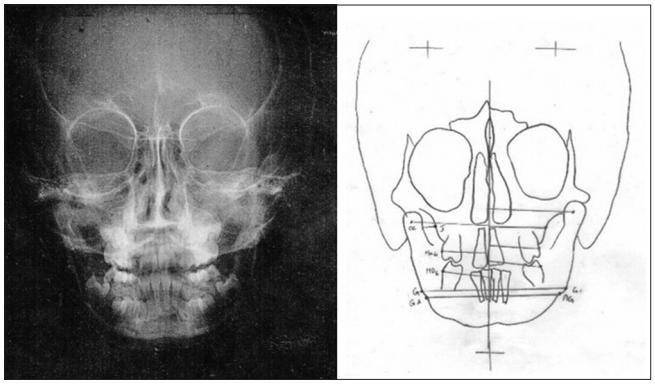


Figure 5: Pretreatment posteroanterior cephalograph and its tracing

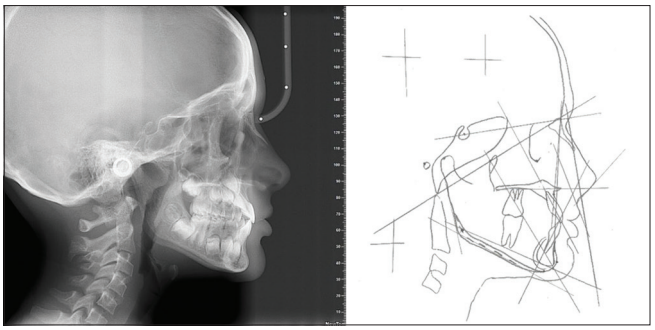


Figure 4: Pretreatment lateral cephalograph and its tracing



Figure 6: Fan-shaped maxillary expander

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Table 3: Transverse width of maxillary arch at pretreatment, after expansion, and postretention

Transverse width	Pretreatment (mm)	After expansion (mm)	After 1 year of expansion (mm)
Interdeciduous canine width	31	38	37
Interdeciduous first molar width	37	42	40
Interdeciduous second molar width	39	43	42
Interpermanent molar width	46	48	46

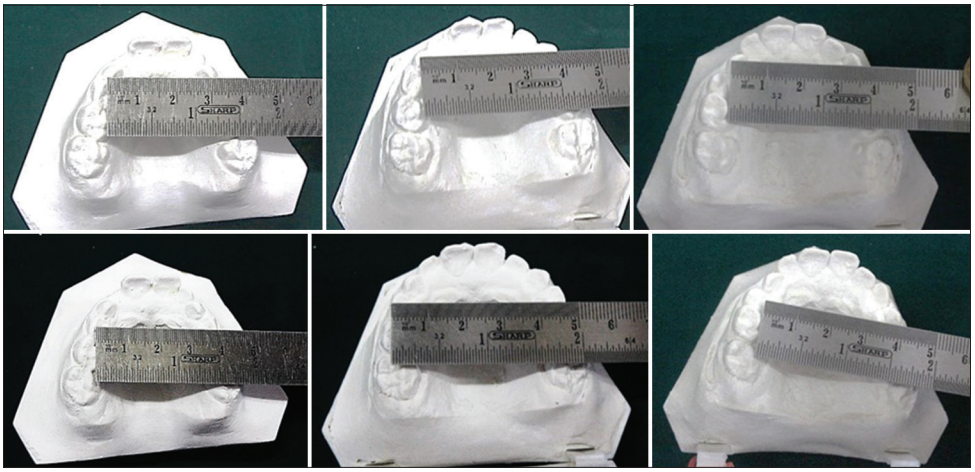


Figure 7: Interdeciduous canine width (above) – pretreatment, after expansion and after 1 year of expansion. Interdeciduous first molar width (below) – pretreatment, after expansion and after 1 year of expansion

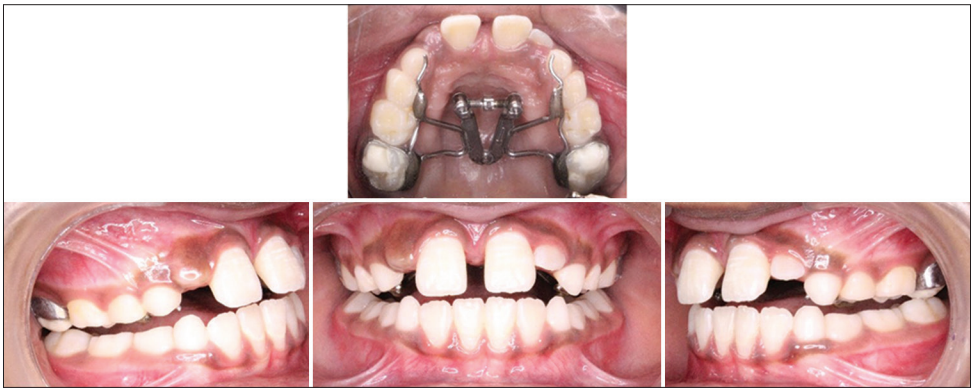


Figure 8: After expansion using fan-shaped expander showing posterior crossbite correction in left side with midline diastema appearance



Figure 9: W-arch for retention



Figure 10: After 1 year of expansion, lateral cephalograph and orthopantomograph

palatal expander. Most of the traditional expander causes more expansion at posterior region.[8] As this patient required differential maxillary expansion in the anterior region, the fan-shaped expander which is most widely used in cases of cleft palate was used in this case.[7] Expansion achieved using

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fan-shaped expander in the cleft palate cases showed greater anterior maxillary expansion than that of conventional rapid palatal expanders.

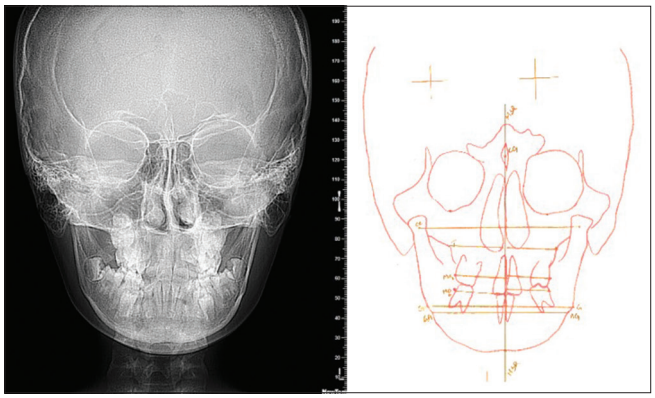


Figure 11: After 1 year of expansion, posteroanterior cephalograph and tracing

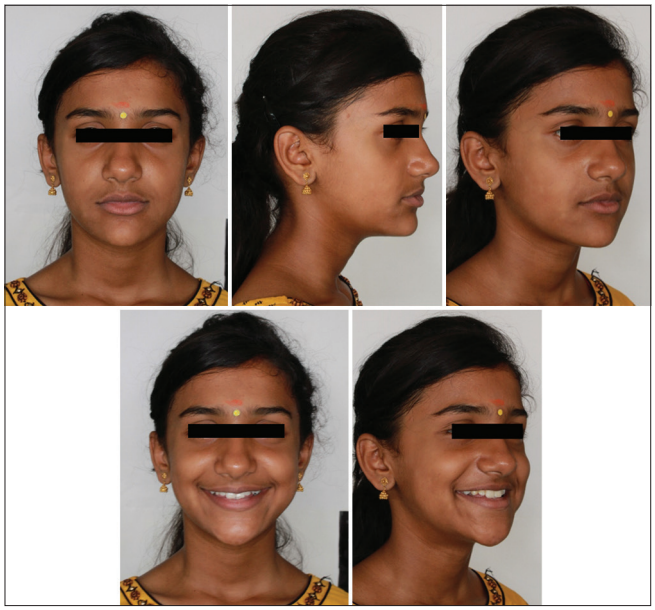


Figure 12: After 1 year of expansion, extraoral photographs

Since the patient showed cervical vertebral maturation index 2, indicating prepubertal stage of skeletal maturation, expansion in this stage would lead to more of skeletal expansion. There were various studies with fan-shaped expander reporting separation of midpalatal suture more in the anterior region than posterior and sutural separation does not mimic with the interarch distances.[4-7]

This fan-shaped expander has reported expansion more in intercanine and interpremolar region, while it restricts intermolar transverse changes which is attributable to the buttressing effect on skeletal structures behind the maxilla because of rotational opening.[8]

In lateral cephalogram assessment, the maxilla showed a downward rotation which reflects on the mandible showing a backward rotation. Hence, ANB angle increased significantly. There was an increase in the lower anterior facial height but not significant which was similar to the results of Doruk *et al.*[7] The vertical dimensional changes were minimal with less extrusion of molars, which indicated that the fan-shaped expander has better control over vertical dimension. Posteroanterior cephalometric assessment showed correction of midline and condylar shift.

CONCLUSION

The fan-shaped RME is a preferred expander in correcting unilateral crossbite in early mixed dentition patients requiring differential expansion. Positional asymmetry of the condyle occurring due to functional shift should be corrected at any early age to normalize the growth of the jaws.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients



Figure 13: After 1 year of expansion, intraoral photographs

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understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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