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Condylar position in children with functional posterior crossbites: before and after crossbite correction*

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Abstract

The purpose of this project was to determine whether functional posterior crossbites in children influence the position of the mandibular condyle and assess the effect of crossbite correction on condylar position. Ten children from four to nine years of age with functional posterior crossbites were treated by maxillary expansion. Standardized transcranial temporomandibular joint radiographs were taken prior to treatment and following crossbite correction. Pretreatment radiographs were taken with the child's teeth occluded in the crossbite relationship. Post treatment radiographs were made with the teeth in centric occlusion. Prior to treatment, there were significant differences in the horizontal and vertical joint space measurements between the crossbite and noncrossbite sides. There were no significant differences between the two sides following crossbite correction.

Introduction

Posterior crossbites have been reported to occur in approximately seven percent of children.[1] They are not self correcting and if untreated, the permanent molars and premolars are likely to erupt in crossbite.[1] Early crossbite correction is thought to enhance normal jaw growth and permanent tooth eruption.[1-6]

Functional posterior crossbites appear as unilateral lingual crossbites with a mandibular deviation upon closure.[6] These crossbites are significant in that a

deflective occlusal contact may prevent terminal closure of the mandible along the centric relation arc.[7,8] The resulting displacement of the condyle may destroy the equilibrium between form and function and may be a factor in the development of TMJ disorders.[2,3,4,7] Condylar displacement has been associated with temporomandibular joint disorders in adults.[9-13] The deviated closure pattern in a child could interfere with condylar growth and development and eventually lead to temporomandibular joint problems.

There appears to be little information available concerning the possible effect of posterior crossbites on the temporomandibular joint in children. The purpose of this study was to determine whether functional posterior crossbites in children influence the position of the mandibular condyle and assess the effect of crossbite correction on condylar position.

Methods and Materials

Ten children, five males and five females, between four and nine years of age were selected for treatment. All the children were patients in the Medical College of Georgia School of Dentistry pedodontic clinic and were selected on the basis of their need for crossbite correction and parental consent. None of the children had any significant findings in the medical history or any history of a temporomandibular joint problem. Each child had a functional posterior crossbite associated with a mandibular deviation due to occlusal interference during closure.[6] All necessary restorative and preventive services were completed prior to correcting the crossbites. The crossbites were treated by expansion of the maxilla with either a w-arch or Porter appliance.[14,15]

Right and left lateral transcranial temporomandibular joint radiographs were taken on each patient prior to treatment and again immediately following crossbite correction.

A head positioner was used to provide standardization of the films and allow for their replication (Figure 1).[16,17]

All films were taken at 55 KVP and 10 ma at a 48/60 second exposure time. Pretreatment radiographs were taken with the child's teeth occluded in the crossbite relationship. Post treatment radiographs were made with the teeth in centric occlusion.

Each film was assigned a code number. The radiographs were read by four observers without knowledge as to the identity of the patient, side, or pre- or post-treatment condition. All radiographs were read in a darkened room using a view box and a mask trimmed to block out peripheral structures and enhance the visibility of the temporomandibular joint.

Condylar position was determined by the radiographic dimensions of the joint space.[18,19,20] The horizontal distance was considered to be the shortest distance from the anterior surface of the condyle to the posterior slope of the eminence. The vertical distance was considered as the shortest distance from the superior surface of the condyle to the roof of the glenoid fossa (Figure 2).

Measurements were made with a sharp Boley gauge to the nearest 0.1 mm. The data were subjected to analyses by a T-test.

Figure 1. Child in head positioner for temporomandibular joint radiograph.

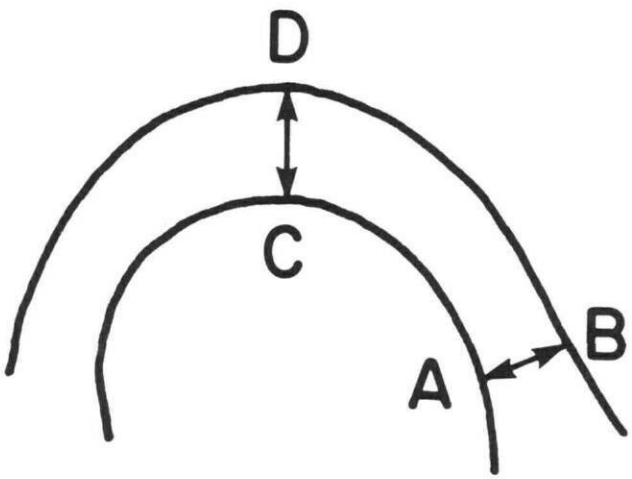

Figure 2. Horizontal measurement (A-B)
Vertical measurement (C-D)

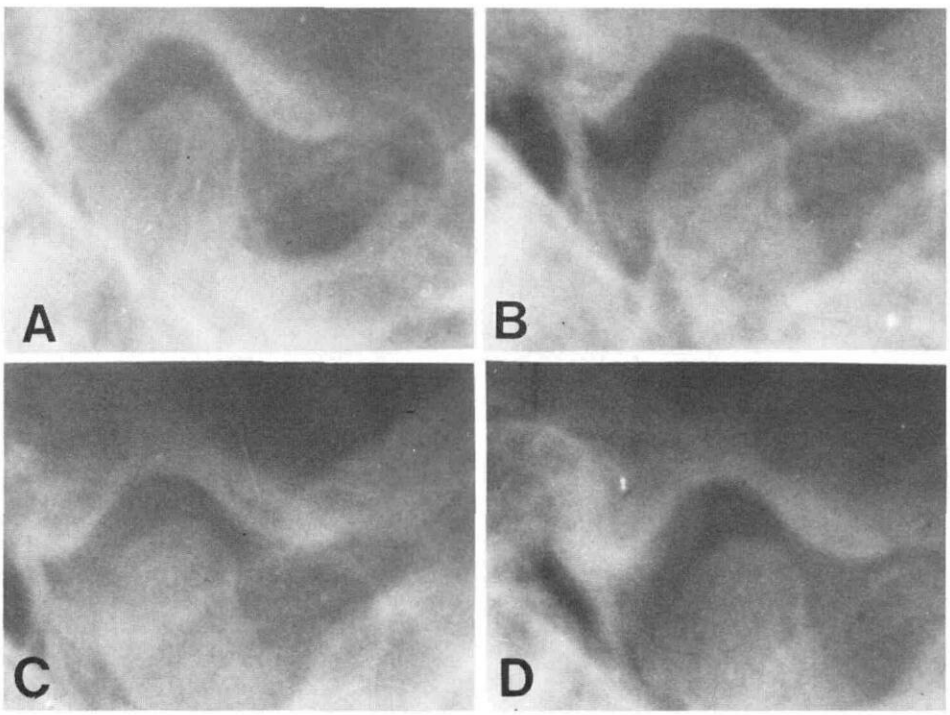

Figure 3. The child's pre and post treatment temporomandibular joint films.

A. Crossbite side; pre correction
B. Noncrossbite side; pre correction
C. Previous crossbite side; post correction
D. Noncrossbite side; post correction

The horizontal and vertical joint space measurements are shorter on the crossbite side (A) than on the noncrossbite side (B) suggesting superior displacement of the condyle on the crossbite side and inferior displacement on the side opposite the crossbite. The measurements on the sides are similar following crossbite correction (C-D).

Results

All of the crossbites were satisfactorily corrected and the mandibular shifts eliminated. The active treatment time necessary to correct the crossbites ranged from four to 14 weeks. Typical post-treatment temporomandibular joint radiographs are shown in Figure 3.

The results are summarized in Table 1.

Prior to treatment, the mean vertical measurement on the crossbite side was 3.1 mm compared to 3.8 mm on the noncrossbite side. The mean horizontal measurement was 1.7 mm on the crossbite side and 2.1 mm on the noncrossbite side. The differences between the two sides were statistically significant ($p < .05$).

Following crossbite correction, the mean vertical measurement on each side was 3.4 mm. The mean horizontal measurement on the previous crossbite side was 1.7 mm compared to 1.8 mm on the noncrossbite side. There were no statistically significant differences between the sides following treatment.

Considering the changes occurring on each side, the mean vertical measurement on the crossbite side increased from 3.1 mm to 3.4 mm while the mean horizontal measurement remained 1.7 mm following crossbite correction. On the noncrossbite side, the mean vertical measurement decreased from 3.8 mm to 3.4 mm and the mean horizontal measurement decreased from 2.1 mm to 1.8 mm as a result of treatment. The vertical increase on the crossbite side and the horizontal and vertical decreases on the noncrossbite side were statistically significant ($p < .05$).

Table 1. Statistically significant differences were found between the following measurements: ($p < .05$)

A. Pretreatment vertical on crossbite side versus pretreatment vertical on noncrossbite side

B. Pretreatment horizontal on crossbite side versus pretreatment horizontal on noncrossbite side

C. Pretreatment vertical on crossbite side versus post treatment vertical on crossbite side

D. Pretreatment vertical on noncrossbite side versus post treatment vertical on noncrossbite side

E. Pretreatment horizontal on noncrossbite side versus post treatment horizontal on noncrossbite side

Mean vertical and horizontal joint space measurements

	Vertical (mm ± s.d.)		Horizontal (mm ± s.d.)	
Condition	Crossbite	Noncrossbite	Crossbite	Noncrossbite
Pretreatment	3.1 ± 0.7	3.8 ± 0.5	1.7 ± 0.3	2.1 ± 0.4
Post Treatment	3.4 ± 0.6	3.4 ± 0.8	1.7 ± 0.3	1.8 ± 0.4

Discussion

Radiographic measurements of the temporomandibular joint space indicate that functional posterior crossbites in children influence the position of the mandibular condyle. Prior to crossbite correction, both vertical and horizontal joint space measurements were found to be significantly shorter on the crossbite side than on the noncrossbite side. This suggests that the condyle may be displaced superiorly on the crossbite side and inferiorly on the noncrossbite side. The joint space measurements were not significantly different between the two sides after crossbite correction. Apparently, crossbite correction allows the condyles to assume essentially bilaterally symmetrical positions.

There does not appear to be any information available describing the normal condylar position in children but bilateral condylar symmetry has been associated with the absence of clinical symptoms in adults.[9,17] Bilateral condylar asymmetry in adults has been associated with disc derangement, temporomandibular joint pain and muscle spasm.[9-13]

None of the children in this study had any history of a temporomandibular joint problem. However, young children have years of condylar growth remaining and the condylar asymmetry could possibly interfere with normal growth and development.

Conclusion

This study suggests that functional posterior crossbites in children should be corrected as early as possible to promote bilateral condylar symmetry and enhance normal growth and development. Further studies should be undertaken to investigate normal condylar position in children and the effect of posterior crossbites on condylar growth and development.

References

1. Kuntin, G. and Hawes, R. R.: "Posterior Crossbites in the Deciduous and Mixed Dentition," *Am Journ Ortho,* 56:491-504, 1969.
2. Chaconas, S. F.: "Preventive Orthodontics: When and Why," *J Prevent Dent,* 5:30-36, 1978.

3. Cheney, E. A.: "Indications and Methods for the Interception of the Functional Crossbites and Interlockings," *Dent Clin No Am,* 385-402, July, 1959.
4. Popovich, F.: "Preventive and Interceptive Orthodontics," *J Canad Dent Assoc,* 28:95-106, 1962.
5. McDonald, R. E. and Avery, D. R.: *Dentistry for the Child and Adolescent,* 3rd ed. St. Louis: C. V. Mosby Co., pp. 432-434, 1978.
6. Sim, F. M.: *Minor Tooth Movement in Children,* 2nd ed. St. Louis: C. V. Mosby Co., pp. 272-301, 1977.
7. White, G. E.: "The Temporomandibular Joint in Pedodontics," *Journ of Pedo,* 1:172-176, 1977.
8. Ricketts, R. M.: "Laminography in the Diagnosis of Temporomandibular Joint Disorders," *J Am Dent Assoc,* 46:620-648, 1953.
9. Weinberg, L. A.: "Correction of Temporomandibular Dysfunction with Radiographic Tracings," *J Prosthet Dent,* 28:519-539, 1972.
10. Weinberg, L. A.: "Superior Condylar Displacement: Its Diagnosis and Treatment," *J Prosthet Dent,* 34:59-76, 1975.
11. Weinberg, L. A.: "Anterior Condylar Displacement: Its Diagnosis and Treatment," *J Prosthet Dent,* 34:195-207.
12. Weinberg, L. A.: "Posterior Bilateral Condylar Displacement: Its Diagnosis and Treatment," *J Prosthet Dent,* 36:426-439, 1976.
13. Weinberg, L. A.: "Posterior Unilateral Condylar Displacement: Its Diagnosis and Treatment," *J Prosthet Dent,* 37:559-569, 1977.
14. Myers, D. R.: "The Diagnosis and Treatment of Functional Posterior Crossbites in the Primary and Early Mixed Dentition," *Chron Omaha Dist Dent Soc,* 33:183-184, 1970.
15. Harberson, V. A. and Myers, D. R.: "Midpalatal suture opening during functional posterior crossbite correction," *Am Journ Ortho,* 74:310-313, 1978.
16. Weinberg, L. A.: "Techniques for temporomandibular joint radiographs," *J Prosthet Dent,* 28:284-308, 1972.
17. Mikhail, M. G. and Rosen, H.: "The Validity of Temporomandibular Joint Radiographs Using the Head Positioner," *J Prosthet Dent,* 42:441-446, 1979.
18. Weinberg, L. A.: "An Evaluation of Duplicability of Temporomandibular Joint Radiographs," *J Prosthet Dent,* 24:512-541, 1970.
19. Weinberg, L. A.: "What We Really See in a TMJ Radiograph," *J Prosthet Dent,* 30:898-913, 1973.
20. Williamson, E. H.: "Laminographic Study of Mandibular Condyle Position when Recording Centric Relation," *Journ of Prosthet Dent,* 39:561-564, 1978.