

A Corrected Cephalometric Tracing Technique for Diagnosis of Anterior Crossbite with Functional Shift

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Lateral cephalograms are generally taken with the patient's mandible in a retruded position (centric relation), rather than habitual occlusion (centric occlusion).¹ CR is the position in which the condyles are located most anterosuperiorly in the mandibular fossa; CO is the position in which the teeth are in maximum intercuspation.²

Normally, CO is within 1.5mm of CR.² Some Class III or pseudo-Class III malocclusions, however, have significant CO-CR discrepancies. This is because in CO, a functional forward shift of the mandible is required to avoid incisal interferences. The anterior teeth are in crossbite, and the Class III malocclusion looks worse than it actually is. In CR, without the functional shift, the incisors are often edge-to-edge, and the mandible has to rotate downward and backward. This causes a posterior open bite, making the Class III malocclusion look less severe than it actually is. In such cases, a lateral cephalogram taken in either CO or CR will not reveal the true mandibular position and may result in misdiagnosis of the maxillomandibular relationship.

The present article describes a cephalometric tracing technique that can accurately diagnose a Class III malocclusion with anterior crossbite and functional shift.

Procedure

Pretreatment orthodontic records of a 12-year-old male are used to demonstrate the tracing technique. This patient presented with a Class III malocclusion and anterior crossbite in CO, a 4mm functional shift from CR to CO, and severe crowding (Fig. 1). The overbite was 5mm, and the overjet -3mm.

Lateral cephalograms were taken in both

CO and CR (Fig. 2A,C). In CR, the anterior teeth were edge-to-edge, and there was a 3mm open bite between the maxillary and mandibular first molars. The tracing procedure is as follows:

1. Trace the lateral cephalogram taken in CR, including the crowns of the maxillary and mandibular canines and posterior teeth (Fig. 2D).
2. Place a second sheet of acetate over the first tracing, and draw only the mandibular structures in red (Fig. 3). Cut out the second tracing with a scissor.
3. Superimpose the mandibular cutout on the original tracing, and rotate it counterclockwise around the center of the condylar head until the posterior teeth are in contact (Fig. 4). Secure the mandibular cutout to the first tracing with transparent tape.
4. Place a third sheet of acetate over the first tracing and the cutout. Make a final tracing, in red, that incorporates the mandibular cutout in the corrected position and everything except the mandible from the original tracing (Fig. 5).
5. Perform the cephalometric analysis on the final (corrected) tracing (Table 1).

Discussion

One of the most difficult decisions for the orthodontist is whether a patient with a significant skeletal discrepancy can be treated without surgery. In borderline surgical cases, if the degree of skeletal discrepancy is not accurately diagnosed in the beginning, it will be impossible to develop a proper treatment plan.

In the present case, the mandible postured forward in CO, creating a significant skeletal discrepancy (ANB -2.5°). In CR, only a mild skeletal Class III would have been diagnosed (ANB $+5^\circ$); there was a significant posterior open bite,

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Fig. 1 Male patient age 12 years, 9 months, before orthodontic treatment (photographs taken in CO).

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Fig. 2 A. Lateral cephalogram taken in CO. B. Cephalometric tracing in CO. C. Lateral cephalogram taken in CR. D. Cephalometric tracing in CR.



Fig. 3 Mandibular tracing made in red on second sheet of acetate and cut out with scissor.

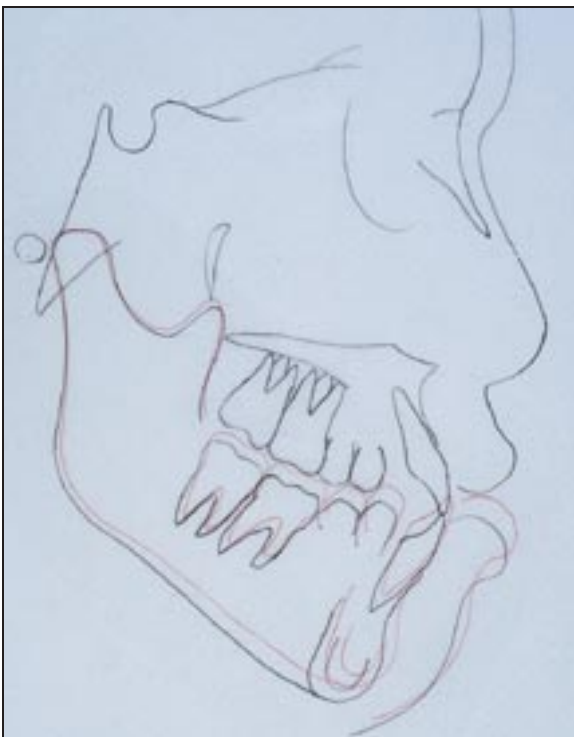


Fig. 4 Mandibular cutout (red) superimposed on original tracing and rotated counterclockwise to close posterior open bite.

and the mandibular plane angle was 2° greater than in CO. It is evident that neither cephalometric analysis showed the true relationship between the jaws.

After the cephalometric tracing taken in CR was corrected, the analysis showed a moderate skeletal Class III (ANB -1°), which reflected the true maxillomandibular skeletal relationship. A treatment plan was then formulated to extract all

TABLE 1
CEPHALOMETRIC ANALYSIS

	CO	CR	Corrected CR
SNA	80°	80°	80°
SNB	82.5°	79.5°	81°
ANB	-2.5°	0.5°	-1.0°
GoGn-SN	39°	41°	39°



Fig. 5 Final (corrected) tracing.

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four first premolars and to relieve the crowding and incisal interferences with orthodontic tooth movement. The patient and his parents were informed that orthognathic surgery might be needed if any significant sagittal mandibular growth took place in the future. After one year of orthodontic treatment, the results are promising (Fig. 6).

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Fig. 6 Patient after extraction of maxillary and mandibular first premolars and one year of orthodontic treatment.