

Jaw Movement Recordings in Cases of Open Bite with Tongue Thrust

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Recordings of jaw movements can be effective tools in assessing temporomandibular dysfunction.¹⁻⁶ In normal function, jaw movements show a straight opening-closing path and a symmetrical border path (Figs. 1-3). Chewing movements are recorded as smooth, rhythmic cycles, guided along the lateral-excursion border movements on each working side and converging on intercuspal position (ICP).^{1,7} In cases with TMD, on the other hand, recorded jaw movements may show winding patterns, side shifts to the right or left, or limited opening-closing paths.⁸⁻¹¹

In a patient with an abnormal swallowing

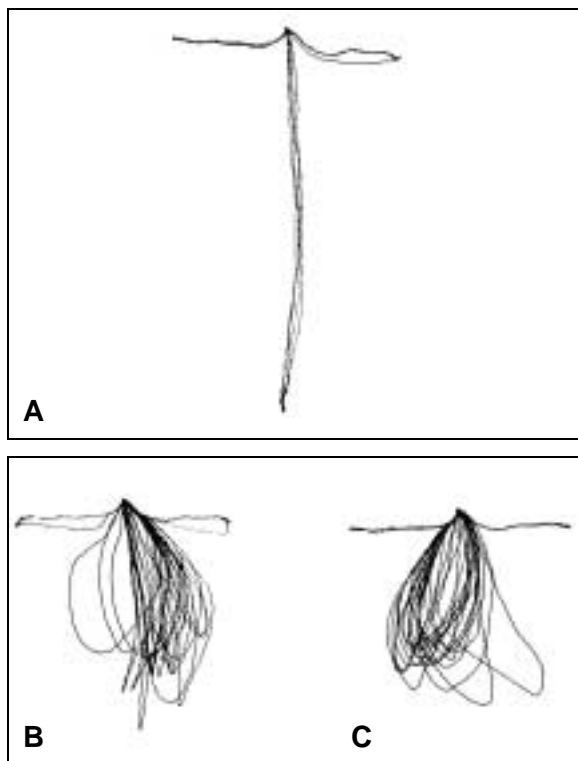


Fig. 1 Normal jaw movements in frontal plane. A. Border. B. Chewing, left side. C. Chewing, right side.

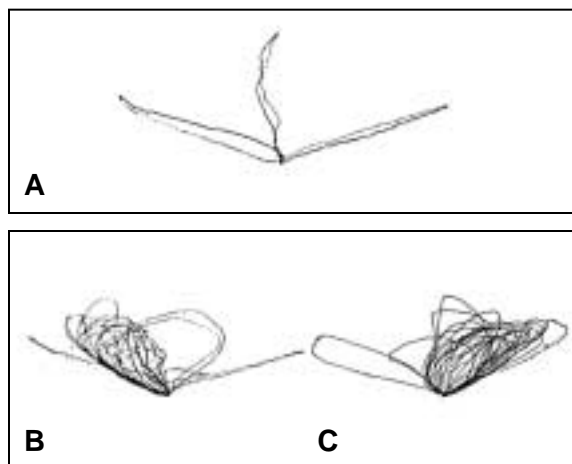


Fig. 2 Normal jaw movements in horizontal plane. A. Border. B. Chewing, left side. C. Chewing, right side.

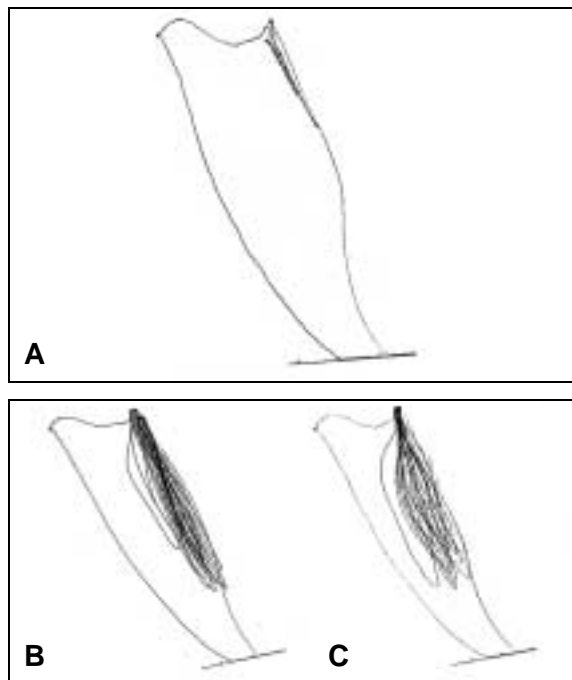


Fig. 3 Normal jaw movements in sagittal plane. A. Border. B. Chewing, left side. C. Chewing, right side.

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Fig. 4 Case 1. 25-year-old female patient with unilateral posterior open bite.

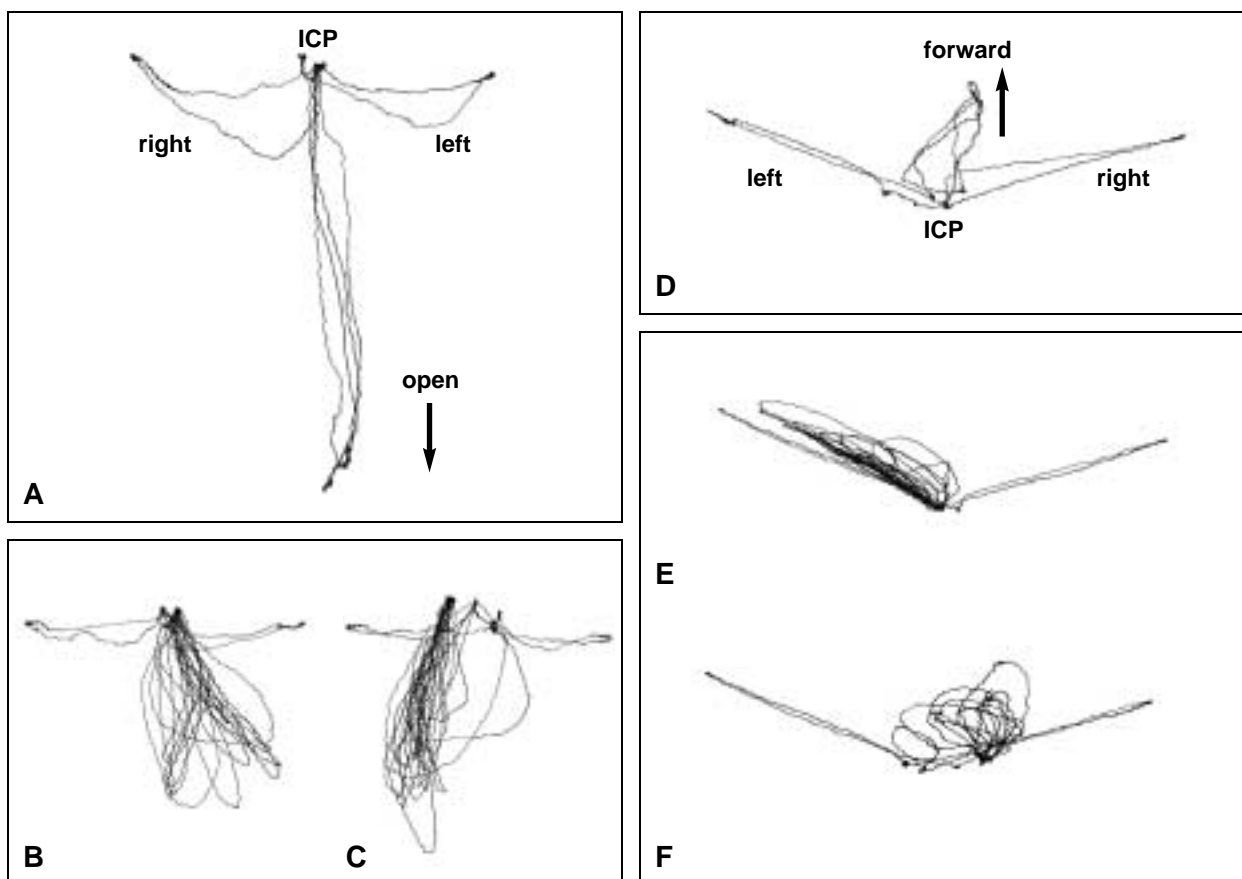


Fig. 5 Case 1. Jaw movement recordings with unilateral posterior open bite. A. Border movement, frontal plane. B. Chewing movement, frontal plane, left side. C. Chewing movement, frontal plane, right side. D. Border movement, horizontal plane. E. Chewing movement, horizontal plane, left side. F. Chewing movement, horizontal plane, right side.

habit, the tongue may be thrust forward between the teeth, so that the jaws do not clench tightly together.¹²⁻¹⁶ Tongue thrusting can cause anterior or posterior open bite and can also undermine an orthodontic correction.¹⁷⁻¹⁹ The recording of jaw movements in malocclusions associated with tongue thrust could help determine the relationship between tongue activity and jaw function, as demonstrated in the following typical cases of open bite with tongue thrust.

Case 1

A 25-year-old female presented with the chief complaint of an unstable occlusion on the right side, facial asymmetry, and spacing in the lower arch. She had an extreme unilateral posterior open bite, a crossbite on both sides, and an edge-to-edge anterior bite (Fig. 4). Four premolars had been extracted several years previously due to severe decay. The patient had a unilateral tongue-thrusting habit in which the tongue pushed out against the right posterior teeth during swallowing. Functional examination revealed a minor click in the left TMJ on maximum opening, but the patient did not perceive any symptoms of dysfunction.

When the patient's jaw movements were recorded with a mandibular tracking device^{20,21} (Visitrainer Model 3*), the left and right lateral excursions were displayed as zigzag paths, with two complex apices at ICP (Fig. 5). Opening-closing and forward movements were shifted to the left near maximum opening, indicating that the left condyle was restricted in the fossa, as confirmed by the palpation of both condyles. In the horizontal plane, the chewing movements on the right side were irregular, and in fact were perceived by the patient to be inadequate for mastication. The terminal points for chewing movements were shifted to the right from ICP in the horizontal and frontal planes.

Compared with a normal occlusion,^{6,7} a unilateral open bite seems to be a combination of two abnormal muscle functions: tongue thrust

and disturbed jaw movements. The morphological changes induced by this patient's tongue thrust may have adversely affected her chewing movements on the right side, leading her to chew on her preferred left side, which in turn caused the left TMJ to become overloaded and dysfunctional.^{22,23}

Case 2

A 23-year-old female presented with the chief complaint of anterior open bite, unstable posterior occlusion, and difficulty of biting down with the posterior and anterior teeth. She had a severe open bite, anterior protrusion, a buccal crossbite in the premolar region, and a Class II molar relationship (Fig. 6). She complained of pain and fatigue in the right TMJ. Functional examination revealed small, flat condyles on both sides as a result of degenerative joint disease.

Recordings of jaw movements before treatment showed lateral and forward border movements guided by the posterior teeth (Fig. 7). These paths were nearly smooth in both planes, however, without the right condylar dysfunction noted by the patient. Chewing movements had better rhythmic and circular motion on the left working side, which was favored by the patient. On the right side, chewing movements showed gliding tooth contacts along opposite lateral border movements from the working side in the frontal plane, and a forward terminal position relative to ICP in the sagittal plane.

After extraction of the upper premolars, the patient was treated with fixed appliances for 29 months (Fig. 8). After treatment, the lateral and forward border movements demonstrated a shift to anterior guidance (Fig. 9). ICP showed a more stable apex in the sagittal plane. The chewing cycle was traced with a good rhythmic, circular motion and gliding tooth contacts along the lateral border movements, and was concentrated at the apex of ICP. Lateral border movements showed an obtuse apex, however, which is not associated with a stable ICP. This seems to have been caused by the tongue thrusting between the teeth during jaw movements.

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Fig. 6 Case 2. 23-year-old female patient with anterior open bite before treatment.

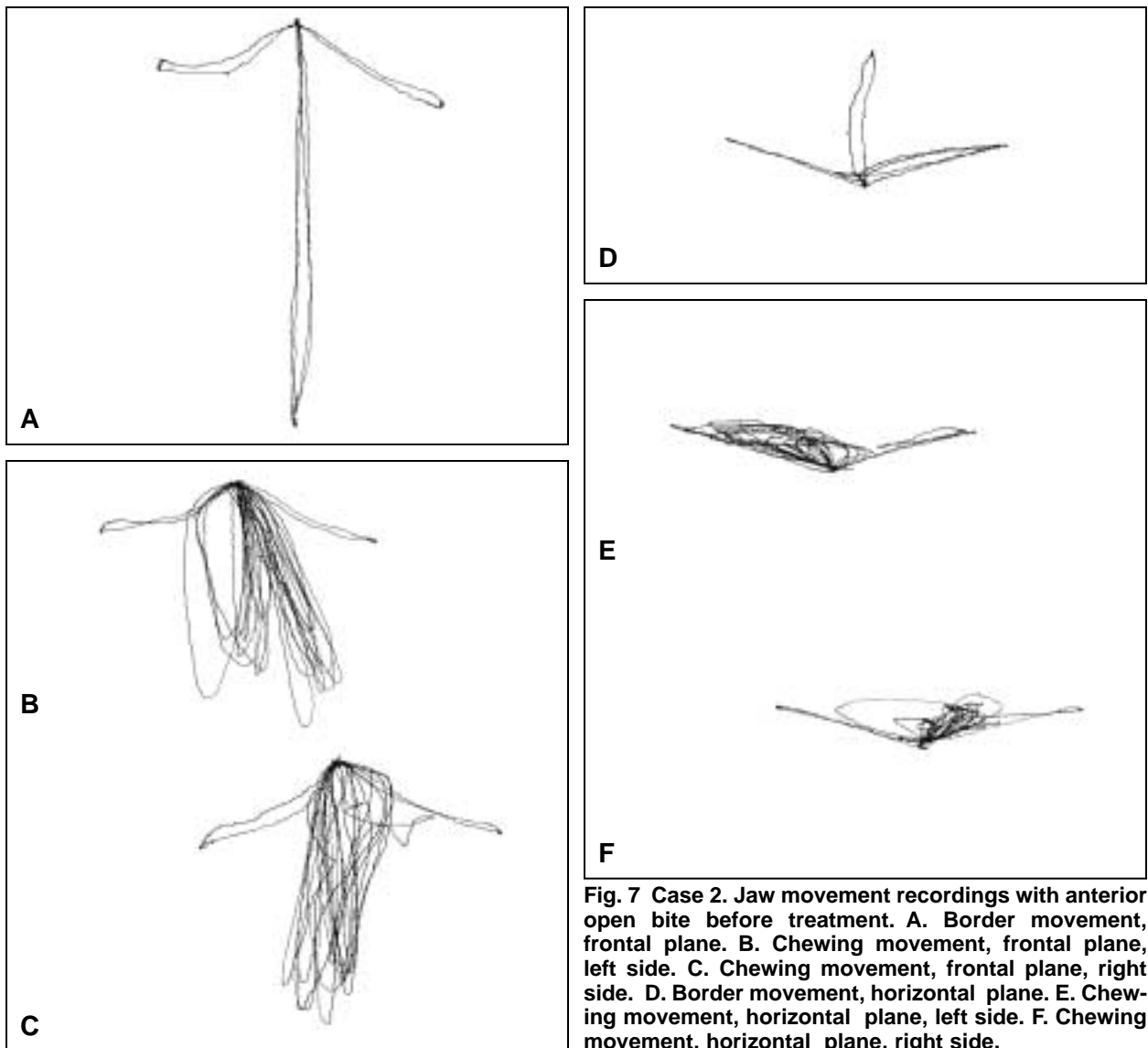


Fig. 7 Case 2. Jaw movement recordings with anterior open bite before treatment. A. Border movement, frontal plane. B. Chewing movement, frontal plane, left side. C. Chewing movement, frontal plane, right side. D. Border movement, horizontal plane. E. Chewing movement, horizontal plane, left side. F. Chewing movement, horizontal plane, right side.



Fig. 8 Case 2. After orthodontic treatment.

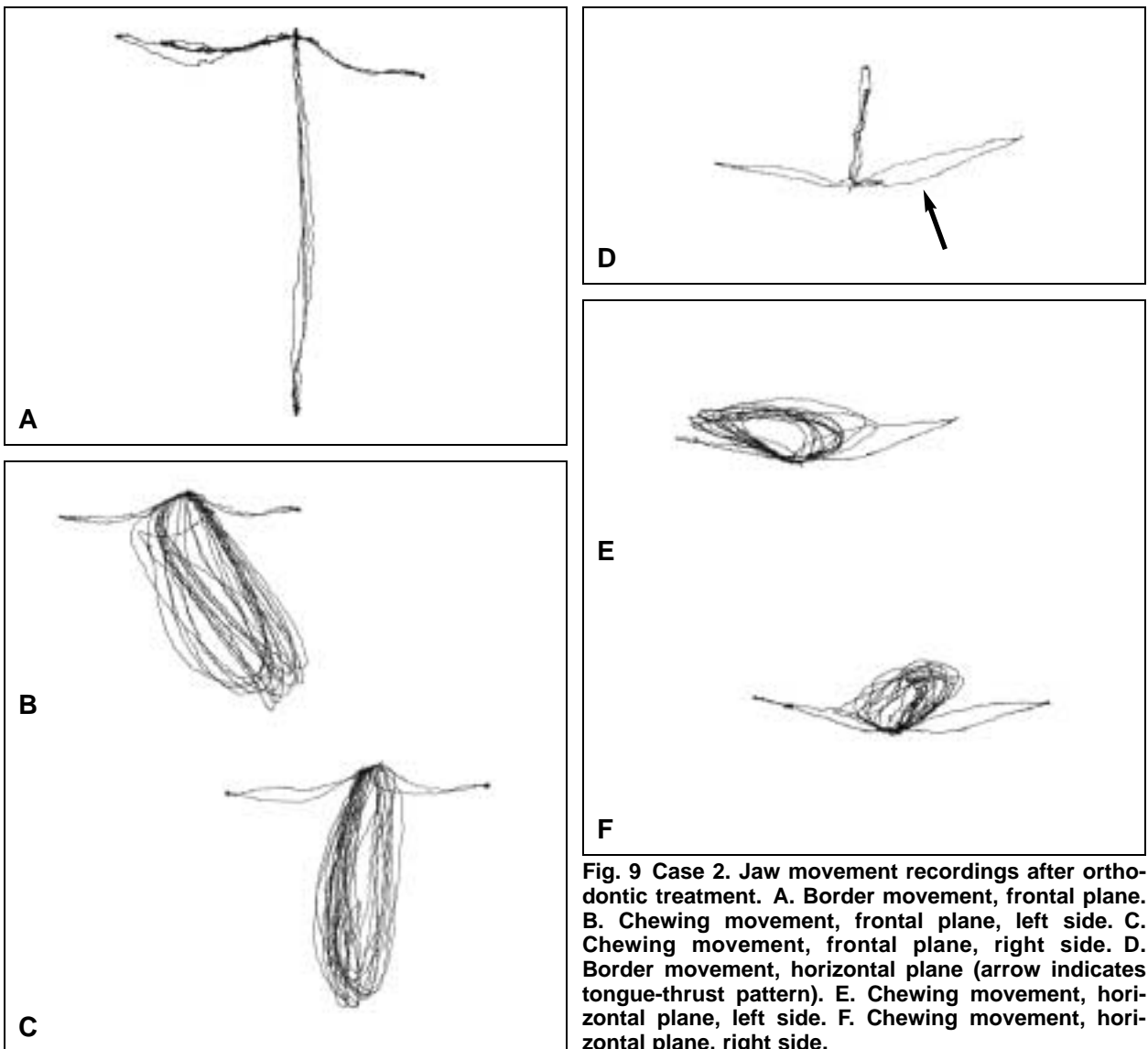


Fig. 9 Case 2. Jaw movement recordings after orthodontic treatment. A. Border movement, frontal plane. B. Chewing movement, frontal plane, left side. C. Chewing movement, frontal plane, right side. D. Border movement, horizontal plane (arrow indicates tongue-thrust pattern). E. Chewing movement, horizontal plane, left side. F. Chewing movement, horizontal plane, right side.

Conclusion

The complexity of jaw movements displayed in these typical open-bite cases suggests the need to assess recordings of each patient for characteristic patterns of dysfunction.

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