Relating the Incisors to Points A and B in Cephalometric, Model, and Clinical Analysis

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The ability to determine the anteroposterior position of a patient's incisors from either clinical examination or model analysis could be highly useful in forming an initial diagnosis before the cephalometric tracing is available. Such a technique would also be helpful during treatment, when brackets can mask the true positions of the teeth and lips.

Valenzuela and Madsen have previously observed that Downs's points A and B and the functional occlusal plane can be identified on study casts.[1] The same authors developed a method of determining the positions of the incisors and the skeletal relationship of the jaws, using the A-B line and applying the Wits appraisal to the study casts through a transparent millimeter grid.

It can been seen on headfilms that in cases of excessive prominence or flattening of the chin, the A-B line relates more closely to the incisors than does the A-Po line, which tends to follow the forward or backward configuration of the chin. Therefore, using A-B rather than A-Po as a diagnostic guide can prevent excessive advancement or retraction of the incisors during treatment (Fig. 1).

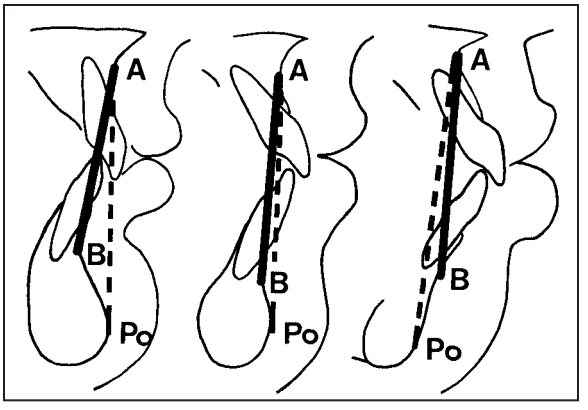

Fig. 1 A-B line is more accurate than A-Po line in determining incisor position in cases where chin is prominent or recessive.

Because the measurements of Valenzuela and Madsen are related to the incisal edges of the incisors, the jaws must be separated to visualize the relationship. We determined that if the mea-

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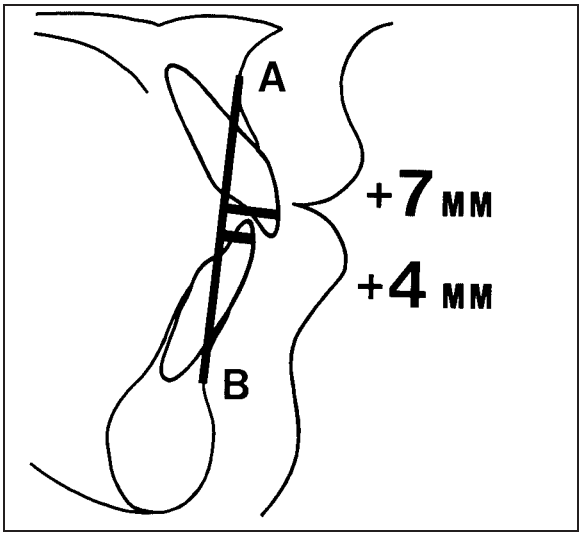

Fig. 2 Normal distances from labial surfaces of maxillary and mandibular incisors to cephalometric (osseous) A-B line: 7mm and 4mm, respectively.

surements could be related to the labial surfaces of the incisors, the diagnosis could be made with the teeth in occlusion. The following study was devised to calculate normal values.

Measuring Incisor Position on Cephalograms

The sample consisted of lateral cephalograms of 85 male and female subjects between 8 and 18 years old. Each patient had a Class I molar occlusion, a harmonious profile, normal lip closure, and a good overbite and overjet. Previous cephalometric studies of the sample indicated that the mean distances of the maxillary and mandibular incisors to A-Po were 5mm and 2mm, respectively, and the mean interincisal angle was 129°.[2,3]

To determine the position of the incisors, a line was drawn between points A and B, and the distances to this line from the incisal third of the maxillary and mandibular incisors' labial surfaces were measured (Fig. 2). In the sample of subjects with good occlusions, the mean distances from the labial surfaces of the maxillary and mandibular incisors to the cephalometric (osseous) A-B line were 7mm and 4mm, respectively.

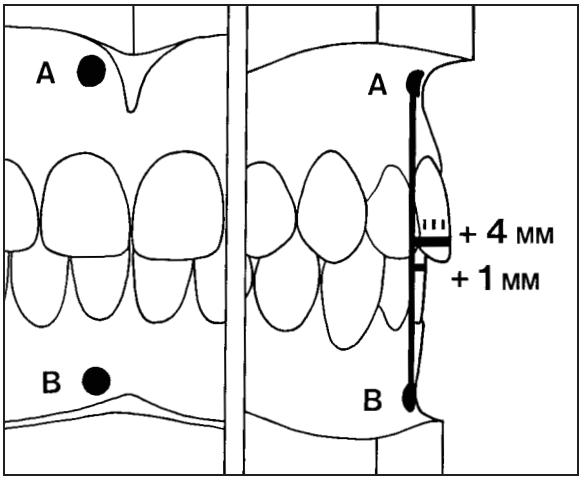

Fig. 3 Apical points A and B marked on study casts. Normal distances from labial surfaces of maxillary and mandibular incisors to gingival A-B line: 4mm and 1mm, respectively.

In a patient with either a prominent or recessive pogonion, the positions of the incisors can be determined cephalometrically by drawing a line between points A and B and measuring the distances from the incisal third of the labial surfaces of the maxillary and mandibular incisors to this line, using the norms of 7mm and 4mm.

Measuring Incisor Position on Study Casts

To determine the average position of the incisors relative to the gingival A-B line on study casts, we used a second sample of 43 patients of both sexes, ages 7 to 20. The normal distances from gingival points A and B to the labial surfaces of the maxillary and mandibular central incisors on the casts were found to be 4mm and 1mm, respectively (Fig. 3).

In model analysis of incisor positions, gingival points A and B are drawn with a pencil as two round marks, 3mm in diameter, near the apices of the left or right maxillary and mandibular central incisors at the point of greatest concavity (Fig. 3). The study casts are held in occlusion with one hand and viewed laterally through a transparent millimeter grid—either the round millimeter grid screen from a Korkhaus diagnostic orthometer kit* or a transparent photocopy of

millimeter-ruled paper. The grid is held with the other hand so that the labial contour of the incisors is highlighted against a dark background (Fig. 4).

The transparency is placed with a main centimeter line over gingival points A and B, and the line of occlusion is held vertically so that the A-B line is horizontal to the eye of the observer. If the distance between the perpendicular line and the incisal third of the labial surface of the maxillary incisor is more than 4mm, the incisor is protrusive; if it is less than 4mm, the incisor is retrusive. Mandibular incisor protrusion is measured similarly, using gingival point B and the norm of 1mm.

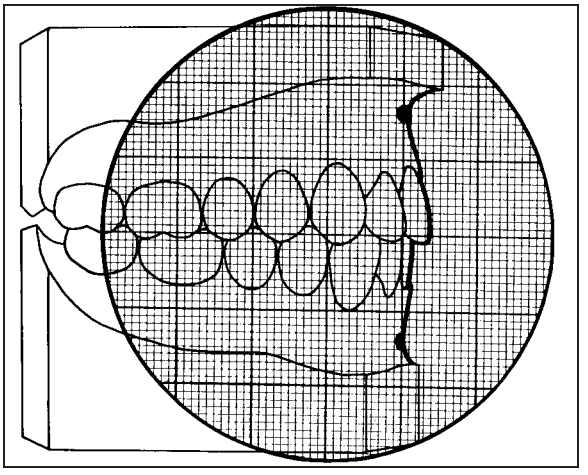

Fig. 4 Incisal contours and marks of points A and B viewed through transparent millimeter grid.

Wits Analysis

For the Wits appraisal of the first sample, the cephalometric method of Jenkins was used, in which a perpendicular is dropped from point A to the functional occlusal plane (A-O) and extended to the level of point B.[4-6] The distance from point B to this perpendicular is then used to establish the AO-OB intermaxillary relationship. The mean distance between point B and the perpendicular from point A to the functional occlusal plane was –1mm.

Wits analysis of the study casts from the second sample resulted in a distance of 0mm from gingival point B to the perpendicular from gingival point A to the functional occlusal plane. This means that the perpendiculars from gingival points A and B to the occlusal plane are coincident, and that the gingival A-B line is also perpendicular to the functional occlusal plane. Consequently, the position of the incisors can be analyzed independent of the anteroposterior jaw relationship, using the same norms of 4mm and 1mm.

To apply the Wits analysis to a set of study casts, the transparent millimeter grid is placed against the occluding casts so that a main horizontal centimeter line coincides with the functional occlusal plane and a main perpendicular line passes through gingival point A. If gingival point B falls behind the vertical line, a diagnosis of skeletal Class II is made; if point B is ahead of the line, a Class III jaw relationship exists (Fig. 5).

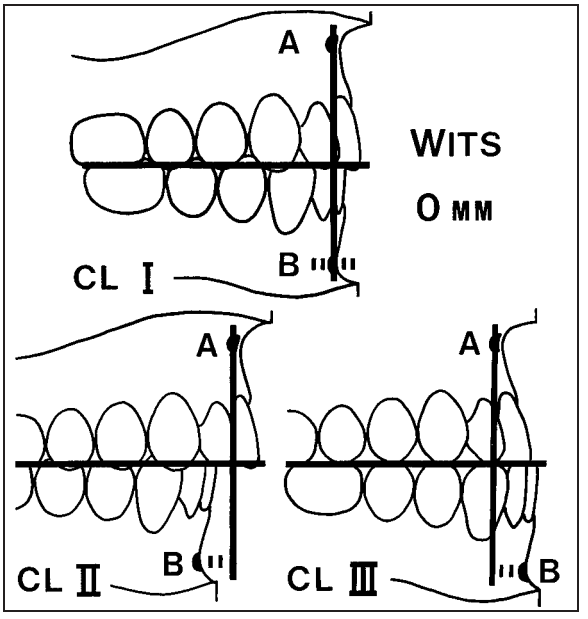

Fig. 5 In Wits appraisal of study casts, normal distance of gingival point B to perpendicular from gingival point A to functional occlusal plane is 0mm.

*Dentaurum, Inc., 10 Pheasant Run, Newtown, PA 18940.

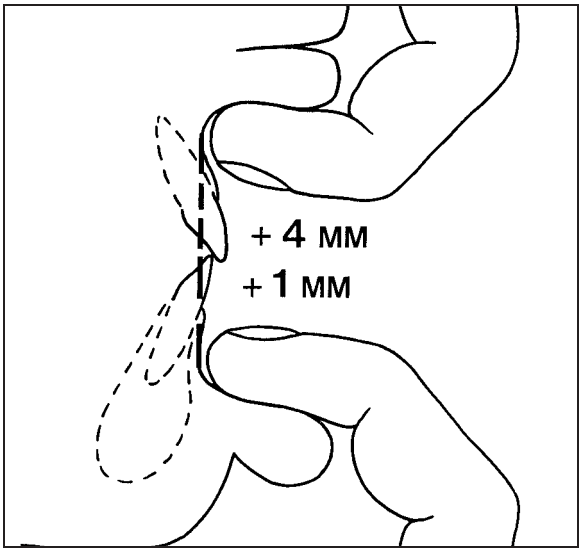

Fig. 6 Clinical determination of incisor positions relative to gingival A-B line. Normal distances are 4mm for maxillary incisor and 1mm for mandibular incisor.

Measuring Incisor Position in the Mouth

Incisor position can also be measured during the oral examination by reclining the patient and separating the upper and lower lips with both hands while keeping the fingertips close to gingival points A and B (Fig. 6). With the imagined A-B line horizontal to the eyes of the clinician, it is then possible to estimate the distance of the labial surface of the mandibular incisor above this line (norm = 1mm). The examination is usually done in occlusion, but in cases of deep bite, the jaws should be separated slightly for a clearer view of the mandibular incisors. Protrusion of the maxillary incisor (norm = 4mm) can be assessed by measuring the overjet between the labial surfaces of the mandibular and maxillary incisors (norm = 3mm), using the millimeter scale of a Korkhaus bow divider.*

Discussion

The cephalometric norms of 7mm and 4mm for the distances of the maxillary and mandibular incisors to the cephalometric (osseous) A-B line found in the present study can be considered equivalent to the norms of 5mm and 2mm to A-Po found in earlier research,[7] because they are based on the same sample. Diagnostically, these norms will produce the same result, except in cases of excessive prominence or flattening of the chin. Using the cephalometric A-B line will prevent undesirable advancement or retraction of the incisors.

Clinical diagnosis of incisor protrusion can easily be made by separating the lips, but the Wits appraisal is impractical at the chair because it is difficult to retract the lips and cheeks at the same time. It is more accurate to observe the position of the lips (which cover points A and B) relative to the lateral aspect of the face using the "facial square" method of Madsen and Paniagua.[7] A plastic right triangle is placed over the side of the face so that one point of the triangle is at tragion (the superior margin of the tragus of the ear) and the right angle is at subnasale (Figs. 7,8). The descending perpendicular is then used to determine the position of the mentolabial sulcus. In a Class I skeletal relationship, the sulcus lies on or near the perpendicular, while soft-tissue pogonion is 3mm ahead of the perpendicular. The anteroposterior relationship of mentolabial sulcus to subnasale can be measured more exactly on the headfilm, where porion (the cephalometric equivalent of tragion) lies 3mm above the center of the ear rod.

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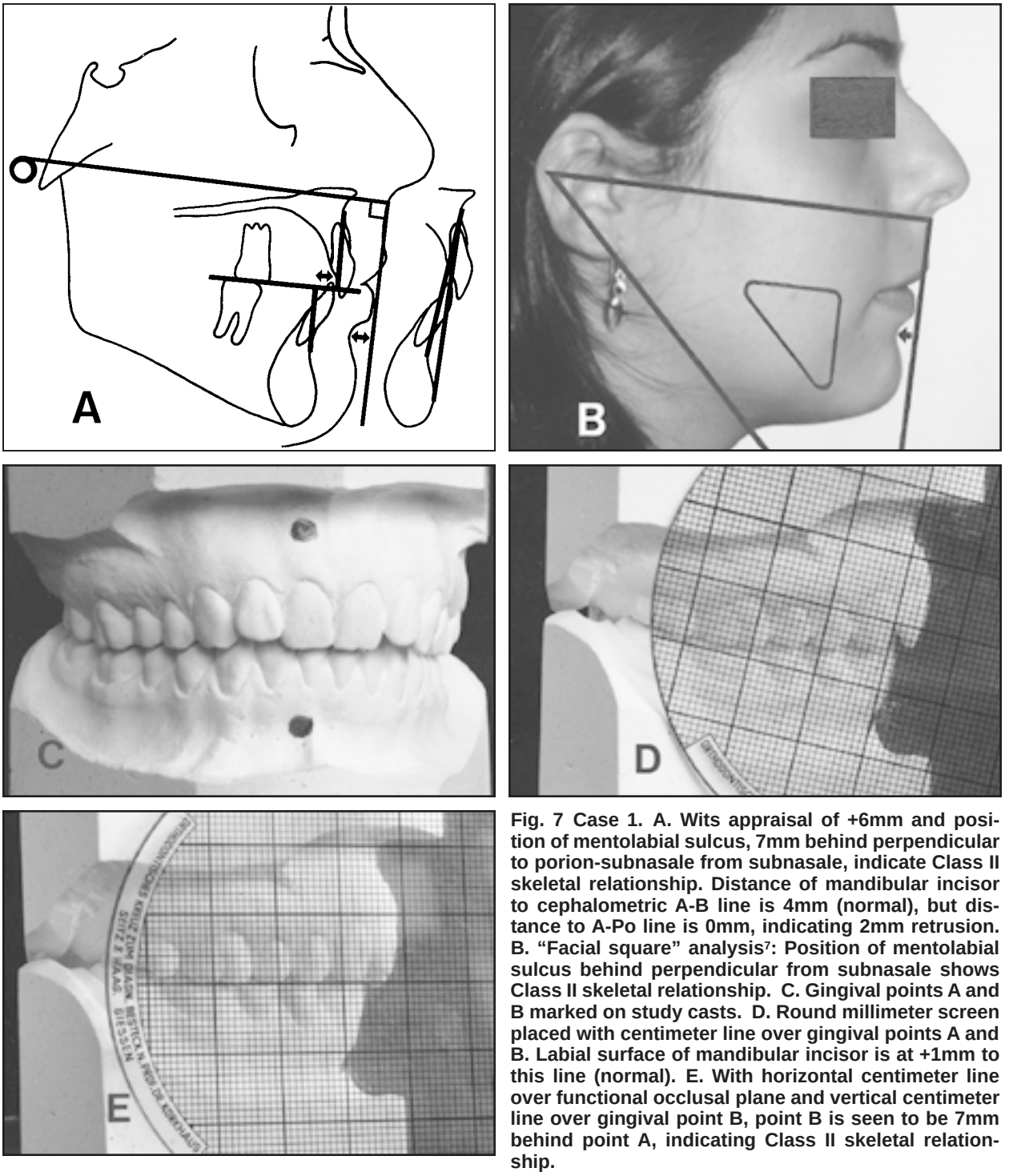

Fig. 7 Case 1. A. Wits appraisal of +6mm and position of mentolabial sulcus, 7mm behind perpendicular to porion-subnasale from subnasale, indicate Class II skeletal relationship. Distance of mandibular incisor to cephalometric A-B line is 4mm (normal), but distance to A-Po line is 0mm, indicating 2mm retrusion. B. "Facial square" analysis[7]: Position of mentolabial sulcus behind perpendicular from subnasale shows Class II skeletal relationship. C. Gingival points A and B marked on study casts. D. Round millimeter screen placed with centimeter line over gingival points A and B. Labial surface of mandibular incisor is at +1mm to this line (normal). E. With horizontal centimeter line over functional occlusal plane and vertical centimeter line over gingival point B, point B is seen to be 7mm behind point A, indicating Class II skeletal relationship.

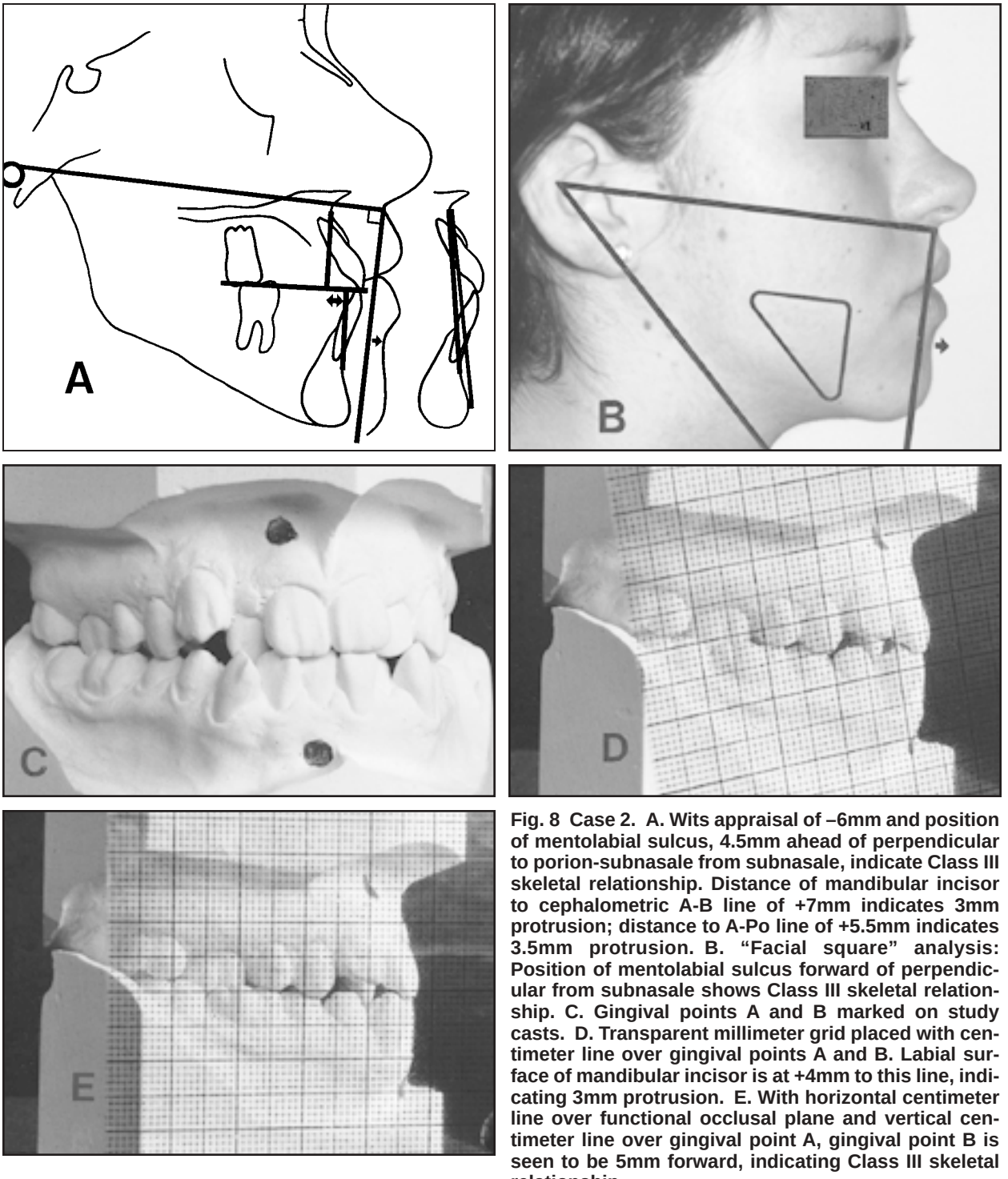

Fig. 8 Case 2. A. Wits appraisal of –6mm and position of mentolabial sulcus, 4.5mm ahead of perpendicular to porion-subnasale from subnasale, indicate Class III skeletal relationship. Distance of mandibular incisor to cephalometric A-B line of +7mm indicates 3mm protrusion; distance to A-Po line of +5.5mm indicates 3.5mm protrusion. B. "Facial square" analysis: Position of mentolabial sulcus forward of perpendicular from subnasale shows Class III skeletal relationship. C. Gingival points A and B marked on study casts. D. Transparent millimeter grid placed with centimeter line over gingival points A and B. Labial surface of mandibular incisor is at +4mm to this line, indicating 3mm protrusion. E. With horizontal centimeter line over functional occlusal plane and vertical centimeter line over gingival point A, gingival point B is seen to be 5mm forward, indicating Class III skeletal relationship.