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## ORTHODONTIC TREATMENT OF A HIGH ANGLE CLASS II MALOCCLUSION THAT REQUIRED AN ORTHOGNATHIC SURGICAL PROCEDURE

### INTRODUCTION

A common finding in a high angle Class II malocclusion is that the maxillary incisors are in correct position relative to cranial base but the facial profile is recessive. This case report shows one treatment approach that can be used to correct this type of problem.

### HISTORY AND ETIOLOGY

The patient was a 45 year 3 month old white female with a medical history of mitral valve prolapse. Dental history revealed no prior orthodontic treatment and regular dental care. She had a Class II malocclusion with a recessive lower jaw. Her chief concerns were her "protruding teeth and facial appearance when smiling". Primary etiology is believed to be heredity.

### DIAGNOSIS

The facial photographs (Fig.1) demonstrate a "full" facial profile and recessive lower jaw. The dental casts (Fig. 2) exhibit an Angle's Class II malocclusion with 7.5mm of overjet and 9mm of mandibular anterior crowding. All third molars are missing. There is a moderate curve of Spee. The panoramic radiograph (Fig. 3) reveals no dental pathology. All teeth are present except the third molars.

The cephalogram and its tracing (Figs. 4A, 4B) illustrate an ANB angle of  $9^{\circ}$ . The SNB angle of  $70^{\circ}$  confirms a recessive mandible. The FMA is  $38^{\circ}$ . The .55 facial height index of Horn<sup>1</sup> is a confirmation of an



Fig. 1. Pretreatment facial photographs

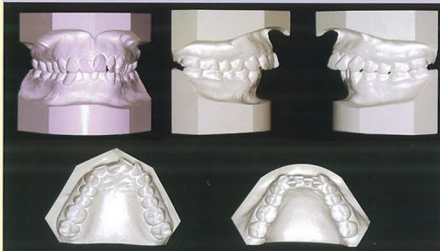


Fig. 2. Pretreatment dental casts



Fig. 3. Pretreatment panoramic radiograph



Fig. 4A. Pretreatment cephalometric radiograph

imbalance of anterior and posterior facial height. The IMPA angle of  $86^\circ$  reflects an acceptable inclination of the mandibular incisors. The Z angle<sup>2</sup> of  $67^\circ$  confirms a retruded soft tissue overlay, and a Wits<sup>3,4</sup> measurement of 8mm reflects alveolar imbalance.

#### TREATMENT OBJECTIVES

1. Obtain a normal profile line to nose relationship and a normal Z angle 2
2. Reduce overjet and dental crowding
3. Obtain normal canine and incisal guidance
4. Increase mandibular anterior projection

#### TREATMENT ALTERNATIVES

1. Extract the maxillary 1<sup>st</sup> premolars and mandibular 1<sup>st</sup> premolars to correct the overjet and crowding. This option would not correct the recessive lower jaw and could have a deleterious effect on the facial profile
2. Extraction of the maxillary 2<sup>nd</sup> premolars and the mandibular 1<sup>st</sup> premolars and a mandibular advancement with a genioplasty to increase lower anterior projection. This option would provide an ideal result.

#### TREATMENT PLAN

When orthodontic treatment without surgical correction is planned, the diagnosis is predicated on the pretreatment position and the desired final position of the mandibular incisors. Merrifield's total space analysis<sup>5,6</sup> should be used to determine space requirements. When surgical intervention is included as part of the treatment, several analyses are used to arrive at guidelines

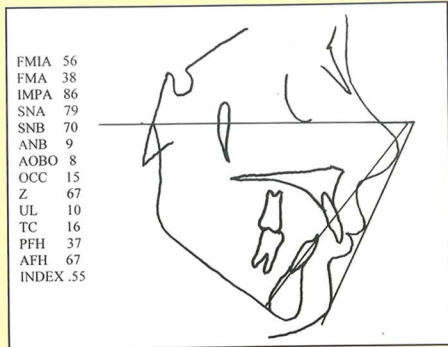


Fig. 4B. Pretreatment cephalometric tracing

for the position of the jaw bones both vertically and horizontally in order to provide a pleasing and harmonious face.

McNamara's Nasion Frankfort perpendicular<sup>7</sup> is used as a guideline to determine the placement of the maxilla and the maxillary incisors in the horizontal plane. The maxilla should be positioned so point A closely approximates this line and the maxillary incisor is 5 mm plus or minus 2 mm anterior to this line (Fig.5). The maxillary incisor should be placed at approximately  $110^\circ$  to the palatal plane.

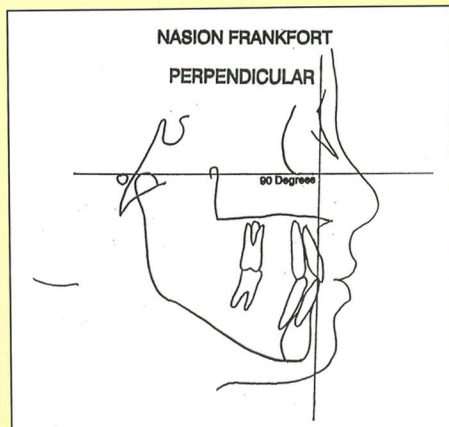


Fig. 5. McNamara's Nasion Frankfort Perpendicular

The skeletal position of the mandible can be checked with the Delaire analysis<sup>8</sup> which uses a reference line drawn from FM point (frontal and maxillary bone intersection) connected to the posterior clinoid process and from this point to menton. This angular measurement should be 85° to 90° degrees. (Fig. 6) Also, with a line drawn perpendicular to this line, a vertical assessment can be made by measuring the upper facial height from nasion to ANS and lower facial height from ANS to menton. The distance between ANS and nasion should be 45% of the total facial height, and the measurement from ANS to menton along this line should be 55% of the total facial height. To determine the ideal facial height .45 can be divided into the nasion-ANS distance. This is the total “hard tissue” height that is ideal for a patient. This measurement gives guidelines as to whether to open or close a patient vertically.

In any surgical treatment plan, a soft tissue evaluation is necessary. Variations in the soft tissue that covers the face can produce misleading conclusions if diagnosis and treatment planning are based on skeletal measurements alone. With the Legan-Burstone<sup>9</sup> soft tissue analysis the horizontal and vertical soft tissue of the mandible can be evaluated (Fig. 7). The SN line is reconstructed 7° upward from its original position. A perpendicular is drawn from soft tissue glabella to this line. Soft tissue pogonion should closely approximate this line. Vertical soft tissue proportions can be checked by drawing a line perpendicular from glabella to soft tissue nasal point and from subnasal point to menton. The ratio of this distance should be 1 to 1. Another helpful soft tissue evaluation is Merrifield’s Z angle<sup>2</sup> and the interrelationship of the profile line to the middle of the nose. The profile line should intersect the nose at the anterior aspect of the nares and when measured to Frankfort horizontal should make a Z angle of 78° (Fig. 8). In the patient the maxillary incisors and point A were almost in correct position according to McNamara (Fig. 9). The decision to treat the dentition with maxillary second, mandibular first premolar extractions in preparation for mandibular advancement surgery was made. This extraction pattern would not allow retraction of the maxillary incisors, would reduce the curve of Spee and eliminate the dental crowding.

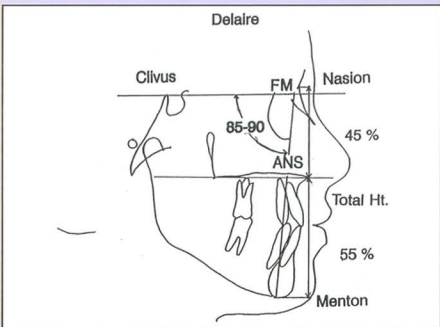


Fig. 6. Delaire Analysis

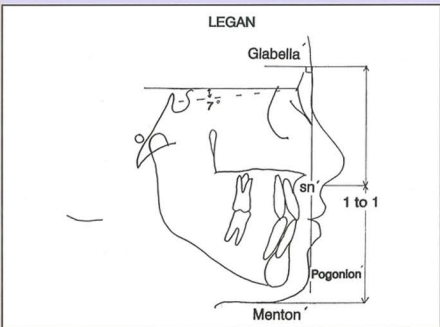


Fig. 7. Legan-Burstone Analysis

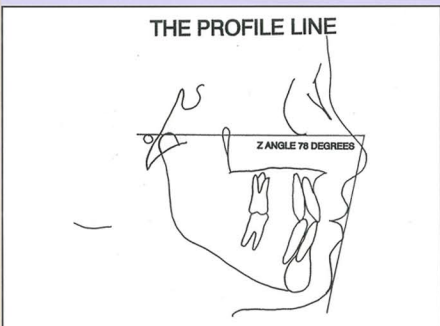


Fig. 8. Profile Line and Z angle

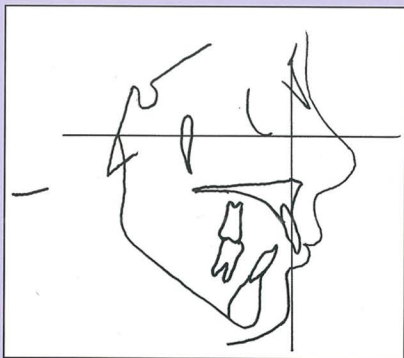


Fig. 9. Pretreatment McNamara tracing shows Point A and the Maxilla in correct position

### TREATMENT PROGRESS

All teeth were sequentially banded or bonded with a .022 standard nontorqued, nonangulated edgewise brackets. The 10-2 extraction syllabus was followed. As treatment progressed, 'black triangles'<sup>11, 12, 13</sup> became noticeable in the maxillary arch. The maxillary anterior teeth were interproximally recontoured to move the contacts towards the gingiva. As this procedure was being accomplished, it was necessary to rebond several anterior teeth and to make closing arches to further close maxillary space created by reshaping the incisors.

Dental casts were made at every appointment until the teeth could be hand articulated in Class I centric occlusion. At this juncture progress records were taken. The presurgical panoramic radiograph (Fig. 10) shows all roots are parallel and the curve of Spee has been reduced. The presurgical cephalometric radiograph and its tracing (Fig. 11A, Fig. 11B) show an IMPA angle of 83°. The FMA angle decreased to 35°. Both the soft tissue analysis of Legan and Burstone (Fig. 12) and the Delaire analysis (Fig. 13) showed that vertical height could be increased and the mandible advanced. The Z angle was 67° and profile line to nose was less than ideal according to Merrifield (Fig. 14) but would be improved if the mandible were advanced. The patient advancement would not agree to the genioplasty because her insurance would not approve it.



Fig. 10. Presurgical panoramic radiograph



Fig. 11A. Presurgical cephalometric radiograph

FMIA	62
FMA	35
IMPA	83
SNA	79
SNB	70
ANB	9
AOBO	12
OCC	11
Z	66
UL	9
TC	15
PFH	37
AFH	73
INDEX	50



Fig. 11B. Presurgical cephalometric tracing

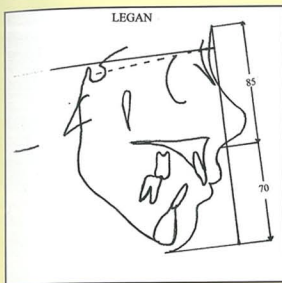


Fig. 12. Presurgical Legan-Burstone soft tissue analysis

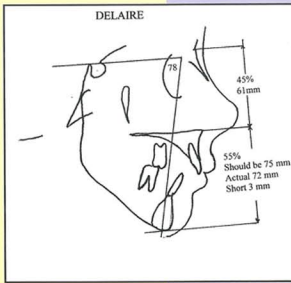


Fig. 13. Presurgical Delaire Analysis

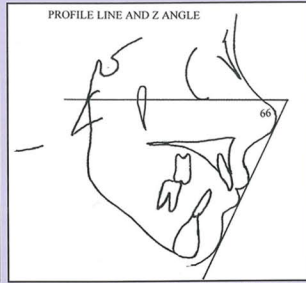


Fig. 14. Presurgical profile line and Z angle

### TREATMENT RESULTS

The posttreatment facial photographs (Fig. 15) illustrate a marked improvement in the facial profile on smiling. The profile line intersects the middle of the nose. The chin projection is acceptable. The posttreatment dental casts (Fig. 16) exhibit a Class I occlusion with normal overjet, overbite, canine and incisal guidance. The posttreatment panoramic radiograph (Fig. 17) ex-

hibits no pathology. The posttreatment cephalometric radiograph and its tracing (Figs. 18A, 18B) illustrate the changes that were achieved with treatment. The mandibular incisors were uprighted over basal bone to an IMPA angle of  $84^\circ$ . The FMA angle decreased to  $34^\circ$ . The composite cephalometric tracings illustrate the changes achieved (Fig. 19). A Maxillary Hawley and a lower bonded retainer were placed. Total treatment time was 17 months.



Fig. 15. Posttreatment facial photographs



Fig. 16. Posttreatment dental casts



Fig. 17. Posttreatment panoramic radiograph



Fig. 18A. Posttreatment cephalometric radiograph

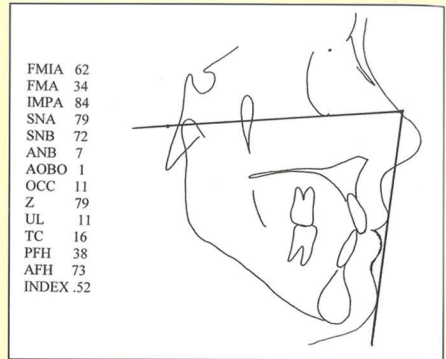


Fig. 18B. Posttreatment cephalometric tracing

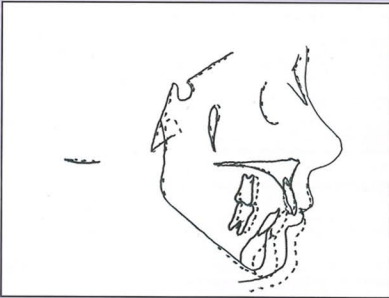


Fig. 19. Composite tracings

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