Class II, Division 2 Subdivision Malocclusion: Diagnosis, Treatment and Retention

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CASE STUDY

The patient presented as a healthy 13-year-old female of mixed Tunisian & German heritage with a history of no significant medical problems. Her oral hygiene was good and her dental health excellent. Her chief concerns were for the irregularity of the maxillary incisors and the deep bite.

Diagnostic summary

Extraoral evaluation revealed a well-balanced face with competent lips, prominent nose and chin, and slightly increased mento-labial fold. The lips were retrusive relative to Ricketts’ E-line, but nicely curved and well-related to each other (Fig. 1, B). A slight gingival display was evident on the maxillary right central incisor on full smile (Fig. 1, C) due to uneven gingival margins on the central incisors (Fig. 1, L) with upper midline coinciding with the facial midline (Fig. 1, A).

Model analysis showed almost full Class II molar and canine relationships on the right side (Fig. 1, E) and almost perfect Class I relationships on the left side (Fig. 1, G), with the lower midline deviated 2.0 mm to the right of the upper midline (Fig. 1, L). The overbite was 8.0 mm without signs of palatal impingement, while overjet was only 3.0 mm due to the retruded maxillary central incisors (Fig. 1, E&G). No space deficiency was observed in either arch (Fig. 1, H&I).

Cephalometric evaluation indicated a slightly increased ANB angle, a low mandibular plane angle, retroclined maxillary incisors (relative to SN), and retired (relative to the A-P line) but normally inclined (relative to MP) mandibular incisors and increased interincisal angle (Fig. 1, D).

Radiographic examination revealed normal morphology without signs of pathology and presence of all 3rd molar buds (Fig. 1, F).

Occlusal classification

Edward H. Angle played a major role in developing a concept of occlusion in the natural dentition. His postulate was that the mesiobuccal cusps of the maxillary molars should occlude in the bucal groove of the mandibular molars. Given that molar relationship, and that the teeth in each arch are arranged on a smoothly curving line – defined by Angle as the “line of occlusion” – the occlusion would be normal. That brilliant simplification made more than a 100 years ago has been proven correct, provided no aberrations in size and shape of the teeth, and his definitions of Class I, II and III malocclusions established the basis for orthodontic terminology. He further delineated his classifications by dividing them into divisions (according to maxillary incisor inclination) and subdivisions (according to specific types of asymmetric molar relationship). I II has since the turn of the 20th century become customary for orthodontists to follow Angle’s teaching when classifying malocclusions. He states on page 40 of his original publication that “In the subdivision of the First Division one of the lateral halves only is in distal occlusion, the relation of the other lateral half of the lower arch being normal”. Although he clearly states that a subdivision is the occurrence of a unilateral malocclusion, with one normal and one abnormal side, he neglects to specify whether the subdivision is the normal or the abnormal side. Despite this, 34 surveys returned from a total of 54 submitted to orthodontic department chairs in the US showed that 22 taught their residents that subdivision refers to the Class II side while eight taught that it refers to the Class I side, and that three taught neither meaning.1 One chair responded that despite supporting the Class II side definition, several faculty members in the department disagreed.2 Before the controversy is resolved, Angle’s original definition should be followed, classifying the present malocclusion as Angle Class II, Division 2 subdivision, not as Class II, Division 2 subdivision right and, not as Class II, Division 2 subdivision left.

Treatment objectives

Our objectives were to level and align the dental arches, to establish bilateral Class I canine relationships with normal overjet and overbite, and to place the dentition in positions conducive to optimal esthetics and minimal need for long-term retention.

Treatment alternatives

In Class I and Class II malocclusions the extraction decision is typically based on the mandibular dentition, and made according to a combined evaluation of arch length deficiency and incisor position. One reason is that the option of perimeter gain through distal molar movement is very limited in the mandible. Another is that lateral expansion in the absence of transverse discrepancies is likely to represent a significant relapse liability, as clearly demonstrated already in 1944 by Tweed when conducting a follow-up examination of non-extraction patients treated according to the expansion philosophy of the time.3 The relatively recent introduction of self-ligating brackets, incorrectly referred to by some as friction free despite the fact that they generate the same friction as any conventional bracket,4 combined with super-elastic arch wires with broad arch forms, has had the unfortunate effect of revitalizing the un-biologic concept of bimaxillary expansion for correction of arch length deficiency.

Subdivision cases with mandible discrepancy expressed as a deviation of the mandibular molar relative to the facial midline is typically treated with extraction of one mandibular premolar on the Class I side, allowing molar correction concomitant with canine retraction to a Class II relationship. Extraction of two maxillary premolars will allow finishing to bilateral Class I canine relationships with coinciding facial and dental midlines.

In this patient the relative midline discrepancy was considerably smaller (Fig. 1, I) than the molar and canine asymmetry (Fig. 1, E&G) due to the expression of the malalignment in the maxillary anterior segment (Fig. 1, H). Since the need for mandibular molar correction was considered minimal, we decided not to perform any premolar extractions in the mandibular arch. As opposed to the mandible, several mechanical alternatives are available for distalization of the posterior segments in the maxilla. We therefore agreed on a non-extraction approach also in the maxillary arch.

Treatment progress

Treatment was initiated with unilateral cervical headgear, adjusted with a long upper bow on the Class II side. The patient was compliant and used the appliance for 12 hours/day. Class I molar relationship was established on the right side after about four months (Fig. 2, C), with a super Class I relationship on the left side. Two months later bands were placed on the lower first molars and multi-bonded appliances with MBT prescription and 0.022” bracket slots were bonded to all premolars, incisors and canines (Fig. 2, B&F, Fig. 3, C&D). An anterior bite plate was delivered to prevent shearing off the mandibular incisor brackets (Fig. 2, B&F, Fig. 3, D). This approach was preferred over bite raisers on the occlusal surfaces of the molars to facilitate evaluation of the leveling progress and to take advantage of any molar expansion and incisor intrusion. After four months of leveling, initially with 0.016” nickel wires until rotations were corrected, followed by 0.016” and 0.020” SS wires with customized arch forms to insure minimal expansion of the lateral segments, 0.019” x 0.025” SS wires were placed. Elastic chains were used to close any interdental spaces, while Class II elastics were used on the right side to establish perfect occlusion and coinciding midlines. Minutiae were bonded to the mesiobuccal cusps of the mandibular second molars after 18 months (Fig. 2, G;
Fig. 3,F) to allow perfect alignment and slight intrusion, aiming at facilitating ideal "stabilized" molar relationships.6 The fixed appliances were removed after 23 months.

Cephalometric evaluation indicated ideal incisor positions and inclinations, with appropriate interincisal angle. Radiographic examination revealed adequate root parallelism and potential for 3rd molar eruption.

Treatment results

Excellent occlusal results were established by coinciding midlines, while the interpremolar distance remained unchanged. While the interpremolar distance was 5.4 mm at the beginning of treatment, it remained unchanged. In addition, the inter-canine distance declined from 24.5 mm at the beginning of treatment to 21.5 mm at the end of treatment.

Retention

Follow-up evaluations demonstrate that the average orthodontic patient demonstrates relapse of alignment in the mandibular anterior segment long-term post-retention, with extreme responses ranging from 0 to almost 10 mm, regardless of initial irregularity and extraction approach, and despite excellent occlusal results with aims at avoiding undue expansion.5 About 50% of this variation can be explained by post-retention reduction in the incisal overbite distance.6 A proven approach to maintain the mandibular incisor alignment is to adapt a thick wire of size about 0.032" passively to the lingual surfaces of the mandibular anterior teeth, and to bond it only to the canine segment. If the bonded segment is too small, the intercuspation is often unstable. Another commonly used approach is to bond a flexible spiral wire of size about 0.019" to all six mandibular anterior teeth.9,10 However, although the reason is not fully understood, distortion of the wires has been noted following long-term use of such retainers.10 In addition, individual bond failures may go unnoticed. Malalignment of the mandibular posterior teeth is rarely observed provided the intercanine distance is maintained.

Long-term follow-up examinations have demonstrated that the intercuspation is maintained in the average orthodontic patient following successful Class II correction.11 However, maintenance of overbite correction has been shown to represent a challenge.12 It may be speculated that the stability of deep bite correction is establishment of perfect Class I canine relationships, an acceptable intercuspation, and maintenance of incisor contact angle, and to bond a thick wire to the lingual surfaces of the mandibular anterior teeth.12 It may be speculated that the stability of deep bite correction is establishment of perfect Class I canine relationships, an acceptable intercuspation, and maintenance of incisor contact angle. For this reason, the need for mandibular retraction was limited to the anterior segment in this patient, and the strategy selected was to bond a thick wire spiral wire only to the canines (Fig. 4J). For this reason, the need for mandibular retraction was limited to the anterior segment in this patient, and the strategy selected was to bond a thick wire spiral wire only to the canines (Fig. 4J).

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Conclusions

Adolescent patients with Angle Class II, division 2 subdivision malocclusions associated with slightly increased ANB angle, a low mandibular plane angle, retroclined maxillary incisors, and retruded but normally inclined mandibular incisors (D), therefore, an ideal intercuspation is established, and the intercanine distance and the mandibular incisor position and indirectly prevent relapse of the deep bite. This retainer can be worn for a long period of time without risk of iatrogenic effects.

References

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