T he patient presented as a healthy almost 13-year-old female of mixed Tunisian & German heritages 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 more prominent on the right side (Fig. 1, B). A slight gingival display was evident on the maxillary right central incisors 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).

Occlusal classification

Edward H. Angle played a major role in developing a concept of occlusion in the natural dentition. His postulate was that the mandibular molars should occlude in the buccal groove of the maxillary molars. Given that molar relationships, 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 its definitions of Class I, II and III malocclusions established the basis for orthodontic terminology. He further delineated his classifications by dividing them into subdivisions (according to maxillary incisor inclination) and sub-classifications (according to specific types of asymmetric molar relationships). I have since the turn of the 20th century been 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 in the US showed that 22 taught their residents that subdivision refers to the present malocclusion as Angle Class I, II, Division 1 subdivision right, and not as Class II, Division 2 subdivision left. Two months later bands were placed on the lower first 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, J) than the molar and canine asymmetry (Fig. 1, E, G) due to the expression of the lateral incisor inclination and sub-classifications.

Subdivision cases with midline discrepancy expressed as a deviation of the mandibular midline relative to the facial midline. Class II relationships are defined by Angle as the “line of occlusion”, established the basis for orthodontic terminology. He further delineated his classifications by dividing them into subdivisions (according to maxillary incisor inclination) and sub-classifications (according to specific types of asymmetric molar relationships). I have since the turn of the 20th century been 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 in the US showed that 22 taught their residents that subdivision refers to the present malocclusion as Angle Class I, II, Division 1 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 ideal intercuspation and 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 of 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 outer 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 bonded to all premolars, incisors and canines (Fig. 2, B, F, Fig. 3, B, D). An anterior bite plate was delivered to prevent shearing off the mandibular incisor brackets (Fig. 2, B, F, Fig. 3, I). 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 extrusion and incisor intrusion. After four months of leveling, initially with 0.016” nitirod wires until rotations were corrected, followed by 0.016” elastics were used on the right side to ensure 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 intercuspidation and coinciding midlines. Mini-tubes were bonded to the mesiobuccal cusps of the mandibular second molars after 18 months (Fig. 2, G, H, L).
Extraoral evaluation revealed well balanced facial proportions with harmonious lip curls and improved mento-labial fold (Fig. 3, A-C). Full smile was associated with minimal gingival display (Fig. 3, B&D).

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

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. About 50% of this variation can be explained by post-retention reduction in the inter-canine distance. A proven approach to maintain the mandibular incisor alignment is to adopt a thin wire of size about 0.032" passively to the lingual surfaces of the mandibular anterior teeth, and to bond it only to the canine and first premolar. Follow-up examinations demonstrate no risk of caries and periodontal disease associated with such retainers, despite a tendency for calculus build-up along the wire, and hardly any risk of distortion of the bonded segment. 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 median segment may not be unusual 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 pretreatment arch form is maintained. For this reason, the need for mandibular retention was limited to the anterior segment in this patient, and the strategy selected was to bond a thin spiral wire only to the canines (Fig. 4, I).

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 a key to stability of deep bite correction is the establishment of perfect Class I canine relationships, an acceptable intercircular angle, and maintenance of incisor contact through long-term use of a bonded canine-to-canine retainer in the mandible (Fig. 5). For those reasons, particular retention strategies in the maxilla, such as use of an anterior bite plate, were not advised for the present patient. Instead, a routine retention strategy with a vacuum formed retainer for full time wear the first six months and a gradual reduction in wear during the following year and a half was elected.

Conclusions

Adolescent patients with Angle Class II, division 2 subdivision malocclusions associated with minimal arch length deficiency in the mandible can be treated successfully with a non-extraction approach using a unilaterial cross cusp headgear followed by multi-bonded fixed appliances. The class II correction is likely to be stable provided an ideal intercuspation is established, and maintenance of a fixed mandibular canine-to-canine retainer made of thick spiral wire bonded only to the canines is likely to maintain the inter-canine 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


Figure legends

Fig. 1: Pretreatment records demonstrating Class II, division 2 subdivision malocclusion associated with slightly increased ANB angle, a low mandibular plane angle, retroclined maxillary incisors, and retruded but normally inclined mandibular incisors (D).
Fig. 2: Intraoral initial and progress photos demonstrating effect of unilateral HG for Class II correction (A,C) use of anterior bite plate during initial leveling of deep bite (E,F), and use of full size rectangular wires following successful leveling (G,H).
Fig. 3: Intraoral initial and progress photos in occlusal view demonstrating design of anterior bite plate used during initial leveling (C), and bonding of mandibular second molars (F).
Fig. 4: Posttreatment records demonstrating excellent occlusal results with perfect intercuspation (E-G), slightly overcorrected overbite (F), well aligned facial proportions (A-D), ideal incisor positions and inclinations with appropriate intercircular angle (H), and adequate root parallelism (R).
Fig. 5: Lateral cephalograms and study models in lateral and occlusal view made before (A,E,I) and after (B,F,J) treatment as well as at 6 months (C,G,K), 1 year (D,H,L,M), 2 years (D,H,L,K) follow-up of patient with stable correction of severe Class II subdivision malocclusion is established, and maintenance of a fixed mandibular canine-to-canine retainer made of thick spiral wire bonded only to the canines is likely to maintain the inter-canine 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.