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Sagittal First

Using the Carriere Motion appliance to treat Class II and III patients

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When Dr Edward Angle first classified malocclusions for orthodontic treatment, he created the categories of Class I, Class II and Class III, the principal categories by which cases are still identified today. In basing his classification system on this one dimension—the sagittal dimension—Angle confirmed the sagittal relationship as being of primary importance and the one most critical and, indeed, most difficult to correct.

The Carriere Motion appliance (Henry Schein Orthodontics) is a technology that first addresses the patient’s sagittal dimension to establish a Class I platform prior to comprehensive orthodontic treatment. This is accomplished usually within the initial three months of treatment. We call this protocol Sagittal First. Sagittal First eliminates competing force vectors inherent in traditional methodologies when traction is employed concurrent with fixed appliance treatment. After establishing a Class I platform in the buccal segments (intercuspation of the molars, premolars and canines), the clinician finishes therapy with Carriere SLX brackets (Henry Schein Orthodontics) or another finishing appliance of choice, including Invisalign (Align Technology) if appropriate. Employing the Sagittal First approach using the Carriere Motion appliance makes achieving high-quality finishes easier and simpler.

The purpose of this article is to demonstrate application of the Sagittal First concept using the Carriere Motion appliance to treat Class II and III patients. The following two cases offer typical examples of the types of difficult sagittal corrections the appliance can address.

**Case 1**

Diagnosis and treatment plan

A 23-year-old female patient presented for treatment exhibiting a moderate Class III malocclusion with a negative overjet, proclined lower lip with a flat supramentale, open bite and crowding in the lower arch (Figs. 1a–h). The treatment plan was to distalise the mandibular dentition into a Class I occlusion (Sagittal First) using the Carriere Motion Class III appliance, then generate space to alleviate the lower arch crowding and close the bite, utilising light-force archwires in a passive, self-ligating (PSL) system. While tongue trainers would be bonded in conjunction with the fixed appliances later in treatment, the patient would also engage in tongue training exercises to correct her improper tongue positioning, especially while swallowing. Incorrect tongue positioning can compromise a satisfactory result. Bite closing would be accomplished by action of the archwires in the PSL brackets, not by use of any vertical elastics. Vertical elastics would be employed only during the finishing phase of treatment. In this way, gentle...
forces would be acting on the roots, minimising stress to the periodontal ligament.

Treatment sequence
Motion Class III appliance bonded
Treatment commenced with the Motion Class III appliance bonded directly to the mandibular canines and first molars with 6 oz, ¼ in. intra-oral elastics, engaged for Class III traction to molar tubes bonded to the maxillary second molars (Figs. 2a–c). An Essix 0.04 in. vacuum-formed retainer (DENTSPLY Raintree Essix) was employed in the upper arch for maximum anchorage.

Three months: Class I platform achieved
By three months, the sagittal aspect had been corrected to the occlusal lock of the Class I platform (Sagittal First) with the anti-clockwise movement of the mandibular occlusal plane (Figs. 3a–c). The mandibular canines had extruded slightly. Some extrusion of canines is a positive sign of the anti-clockwise rotation of the mandibular posterior occlusal plane that promotes better positioning of the mandible in relation to the maxilla—a direct effect of the appliance. The Motion appliance was removed and tongue trainers were bonded to the lingual aspects of the mandibular incisors to continue to train the tongue to position itself properly in the oral cavity, specifically during swallowing and mastication. Concurrent with the tongue trainers, Carriere SLX 0.022 in. PSL brackets were bonded. Treatment followed the Carriere System archwire sequence. The archwires were all thermally activated wires with lower transformation temperatures chosen as archwire sizes increased to limit forces on the periodontium.

Wire sequence:
1. 0.014 in. Cu Niti (Henry Schein Orthodontics; 27 °C)
2. 0.014 × 0.025 in. Cu Niti (27 °C)
3. 0.017 × 0.025 in. Cu Niti (35 °C)
4. 0.019 × 0.025 in. Cu Niti (35 °C).

When the upper 0.019 × 0.025 in. archwires were engaged, three links of power chain were run bilaterally from the second premolar to the first premolar and from the first premolar to a crimpable hook attached to the wire distal to the lateral incisor to retract the anterior segment, bringing it into the final desired position (Figs. 4a–c).

Fourteen months: Sagittal and fixed appliance treatment complete
With three months of sagittal treatment and 11 months of fixed appliance treatment, the case was finished to a satisfactory result (Figs. 5a–f). The final cephalometric radiographs and dental panoramic tomograms highlight the positioning and health of the roots, a positive sign that these appliances respect the periodontium.
Figs. 6a–e: Initial situation: lateral facial view of the patient (a), intra-oral views (b–d), cephalometric radiograph (e).

Figs. 7a–c: Situation after one month of correction with the Sagittal First approach.

Figs. 8a–c: Situation after three months of correction: Class I had been achieved.

Figs. 9a–c: Situation after seven months of treatment: 0.019 x 0.025 in. archwire was engaged with power chain to retract the anterior segment and bring it into the final desired position.

Figs. 10a–c: Final situation after 11 months of treatment.

Figs. 11a–g: Comparison of pre- and post-treatment situations. Cephalometric radiographs: initial situation (a), after three months of correction—Class I had been achieved (b), final result (c). Lateral facial view of the patient: initial situation (d), post-treatment situation (e). Post-treatment intra-oral situation: buccal view of mandibular forward movement (f), central view of mandibular forward movement (g).
After treatment, the patient was able to protrude her mandible beyond her maxilla.

Case 2
Diagnosis and treatment plan
A 27-year-old female patient presented for treatment exhibiting a Class II, Division 1, malocclusion with a severely protrusive maxilla and a severely retrusive mandible (Figs. 6a–e). The patient had had previous orthodontic treatment with extraction of the mandibular premolars. In consultation with other orthodontists, orthognathic surgery was recommended, which she wanted to avoid. The treatment plan was to reposition the mandible forward, placing the case into a Class I occlusion (Sagittal First) using the Carriere Motion Clear Class II appliance, then complete treatment utilizing light-force archwires in a PSL system. The Motion Clear appliance is the latest addition to the family of Motion appliances, designed for the patient with high aesthetic demands.

Treatment sequence
Motion Clear Class II appliance bonded
Treatment commenced with the Motion Clear Class II appliance bonded directly to the maxillary canines and first molars with 0.025–0.025 in. intra-oral elastics for the first month and 0.022–0.025 in. for the second and third months, engaged for Class II traction to molar tubes bonded to the mandibular second molars. An Essix 0.04 in. vacuum-formed retainer was employed in the lower arch for maximum anchorage.

Three months: Class I platform achieved
By the end of the first month of sagittal correction, there was already evidence of some repositioning of the maxillary first molars and movement of the buccal segment (molars, premolars, and canines) toward a Class I occlusion (Figs. 7a–c). Space was also beginning to open between the maxillary incisors. After three months of sagittal correction, the occlusal lock of the Class I platform had been accomplished (Sagittal First) and the case was ready to progress to the next stage (Figs. 8a–d). The Motion appliance was removed. While it would have been easy to finish this case with Invisalign, the patient chose fixed appliances, so Carriere SLX 0.022 in. PSL brackets were bonded. Treatment followed the wire sequence stated in Case 1.

The first wire, a 0.014 in. round Cu Niti wire, corrected the rotation of the incisors. With the 0.014 × 0.025 in. Cu Niti wire, power chain was used to close the spaces between the incisors. After these spaces had been closed, the 0.021 × 0.025 in. Cu Niti wire began torque control with the final archwire, the 0.019 × 0.025 in. Cu Niti wire, to finalise the axial angulations of the anterior teeth. When the upper 0.019 × 0.025 in. arch wire was engaged, three links of power chain were run bilaterally from the second premolar to the first premolar and from the first premolar to a crimpable hook attached to the wire distal to the lateral incisor to retract the anterior segment, bringing it into the final desired position (Figs. 9a–c).

Eleven months: Sagittal and fixed appliance treatment complete
With three months of sagittal treatment and eight months of fixed appliance treatment, the case was finished to a harmonious occlusal and facial result (Figs. 10a–c). The result exhibited excellent repositioning of the mandible, held in position by the occlusal lock of the Class I platform (intercuspation of the molars, premolars and canines). The mandibular repositioning was obviously not a result of growth in a 27-year-old woman, but the result of balancing the structures of the temporomandibular joints, repositioning the mandible in the temporomandibular space. Prior to treatment, she could not protrude her mandible even to position her mandibular anterior teeth into the lingual aspect of her maxillary anterior teeth. For this patient, the mandibular repositioning effected a dramatic, positive change in her facial profile to create a beautiful symmetry (Figs. 11a–g). Figures 12 to 14 illustrate this repositioning. An indication of the extent of this movement is the fact that, after treatment, the patient was able to protrude her mandible beyond her maxilla.