TREATMENT OF A CLASS II MALOCCLUSION WITH BILATERALLY IMPACTED CANINES: A CASE REPORT

Aim: This article describes the treatment of a patient with a Class II malocclusion and bilaterally impacted canines using a Jasper jumper appliance. An unfavorable side effect of the appliance became a benefit as part of the treatment. Methods: Treatment objectives were to erupt the impacted canines, expand the decreased intermolar width, and obtain a well-balanced profile, with a Class I occlusion. The widening effect of this appliance on the maxillary molars was expected to help increase the intermolar distance. Results: Favorable changes were noted, both in the occlusion and in the profile. Class I canine and molar relationships with ideal overjet and overbite were achieved. Overbite and overjet were decreased by a combination of retrusion and extrusion of the maxillary incisors, and protrusion and intrusion of the mandibular incisors. The maxillary canines were erupted successfully, with healthy gingival tissue. The crossbite in the right posterior segment was corrected as a result of the increase in the intermolar distance. Conclusion: The results gained were primarily dentoalveolar, rather than skeletal. There has been an improvement in the occlusion and esthetics. World J Orthod 2006;7:399–405.

The Jasper jumper (American Orthodontics, Sheboygan, WI, USA) is a fixed functional appliance that keeps the mandible in a protruded position by applying continuous light forces. It is also capable of moving single teeth, groups of teeth, or an entire arch. Similar to other fixed functional appliances, the Jasper jumper has some advantages and disadvantages for dentofacial structures, depending on its use.1 Earlier studies have revealed the results gained by the appliance; however, there is still some debate about the amount of skeletal versus dentoalveolar change.2–4

The following case report describes the treatment of a patient with a Class II malocclusion and bilaterally impacted canines using cantilever mechanics and a Jasper jumper appliance. A normally unfavorable side effect of the appliance, expansion of the maxillary molars, was used in this case as a beneficial part of the treatment.

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CASE REPORT

Diagnosis and etiology

A girl, 15 years of age, was referred to the Department of Orthodontics of Yeditepe University with the chief complaint of persistent primary maxillary canines. Clinically, the patient’s facial profile was slightly convex, with competent and full lips (Fig 1). The intraoral examination showed a bilateral Class II molar relationship. In the maxillary arch, there was no significant crowding with the persistent primary canines, whereas mild crowding was present in the mandibular arch. Intermolar width was decreased in the maxilla. Overbite and overjet measured 3 and 4.5 mm, respectively. Dental midlines were coincident with each other and with the facial midline (Fig 2).

The panoramic radiograph showed that all teeth were present, including developing third molars. Both impacted maxillary canines had well-developed roots and were mesioangulated approximating the roots of the lateral incisors. The right canine was impacted at the level of the apex of the lateral incisor, whereas the left one was impacted at the level of half the root length of the left lateral incisor (Fig 3). The occlusal radiograph confirmed that the impacted canines were positioned palatally (Fig 4).
Cephalometric analysis revealed a mild skeletal Class II sagittal discrepancy, due to mandibular deficiency and a decreased lower anterior facial height.

Treatment objectives

Due to the overall analysis, treatment objectives for this patient were to extract the primary canines, erupt the impacted canines, align both maxillary and mandibular arches, expand the decreased maxillary intermolar width, and obtain a well-balanced profile and Class I occlusion. To achieve these goals and advance the mandible, a Class II fixed functional appliance was selected. The widening effect of the Jasper jumper appliance on the maxillary molars was expected to help increase the intermolar distance.

Since the impacted right canine was positioned higher and was more severely angulated than the left canine, the treatment plan included the surgical exposure and forced eruption of this tooth. The impacted left canine was expected to erupt spontaneously after the extraction of the primary canine.

Treatment progress

After a transpalatal arch and 0.018-inch standard edgewise appliance were placed, the patient was referred for the extractions of the maxillary primary canines. In the maxillary arch, while leveling with 0.014-inch and 0.016-inch nickel-titanium archwires, passive open-coil springs were used to preserve the extraction spaces. A 0.016 × 0.022-inch stainless steel passive archwire was then placed, after which the impacted right canine was surgically exposed with the help of a mucoperiostal flap. A button was bonded and lightly tied to the passive archwire by means of elastic thread, which was fastened to a ligature wire.

Fig 3 (above) Pretreatment panoramic radiograph.

Fig 4 (right) Pretreatment occlusal radiograph.
braided from the button. After the tissues had healed and stitches were removed, a ballista spring\(^5\) was bent from 0.016-inch stainless steel round wire and applied through the auxiliary tube of the right molar band. This spring exerted light extrusive force and was employed for the forced eruption of the impacted tooth. The transpalatal arch prevented the adjacent teeth from intruding and tipping palatally, which would result from the opposing force caused by the canine. After 3.5 months, sufficient crown length was available to place the brackets on both canine teeth. At this stage, the transpalatal arch was removed and a secondary leveling was initiated in the maxillary arch.

After leveling, 0.017 × 0.025-inch stainless steel archwires were inserted and cinched back in the maxillary and mandibular arches. In the mandibular arch, 0.018 × 0.025-inch and 0.022 × 0.028-inch cross tubes (480-000-00; Dentaurum, Ispringen, Germany) were crimped to the distal of the canine brackets. Jasper jumpers were placed on 0.017 × 0.025-inch stainless steel sectional arches, which were connected to the mandibular continuous archwire with 0.018 × 0.025-inch and 0.022 × 0.028-inch cross tubes. The anterior tip of the sectional arch was adjusted to pass approximately 1 crown length under the cementoenamel junction of the canine (Fig 5). The Jasper jumper mechanics were applied to the mandibular arch through sectional arches, which were inserted between the auxiliary tubes of the mandibular molar bands and the cross tubes.

The patient was seen every 4 weeks and the appliances were activated every 8 weeks. Six months later, Class I canine and molar relationships had been achieved and the Jasper jumper appliance was removed.

During the finishing stage, intermaxillary mandibular Class II elastics were used. The patient’s total active treatment time was 29 months. After completion of active treatment, bonded lingual retainers were used for permanent retention of the maxillary and mandibular arches.

**Treatment results**

Favorable changes were noted in both the occlusion and the profile of the patient (Fig 6). There was an improvement in the occlusion and the esthetics with the eruption of the impacted maxillary canines. A healthy zone of attached gingiva and ideal bone height were present around the maxillary canines at the end of the treatment. A Class I canine and molar relationship with ideal overjet and overbite was achieved. Overbite and overjet decreased through a combination of retraction and extrusion of the maxillary incisors, and protrusion and intrusion of the mandibular incisors. The crossbite in the right posterior segment was corrected as a result of the increase in the intermolar distance (Fig 7).

The posttreatment panoramic radiograph reveals that the roots of the maxillary and mandibular teeth are parallel (Fig 8). A comparison of the pretreatment and posttreatment cephalograms shows that the changes are mostly dentoalveolar,
rather than skeletal (Fig 9). There has been a slight decrease in both the SNA and SNB angles (1 degree), and no difference was detected in the ANB angle. The maxillary incisors retruded by 1.5 degrees, whereas the mandibular incisors protruded by 3 degrees. The dentoalveolar changes that occurred as a result of the correction of the deep bite and the forward displacement of the mandibular arch resulted in a clockwise rotation of the mandible. This downward and backward displacement of the mandible produced an increase in the mandibular anterior facial height of the patient.

The soft tissue profile also improved significantly as a result of the changes that took place in the dentoskeletal structures. The mentolabial sulcus was less evident at the end of treatment.

DISCUSSION

Jasper jumper mechanics are a valuable tool for treating Class II malocclusions. Although the clinical effectiveness has been proven by previous studies, treatment results may differ depending on how the mechanics are applied, duration of treatment, and the growth stage of the patient. These factors may cause the resulting changes to vary from skeletal to dentoalveolar.

In the present case, a late adolescent patient who was at the end of her post-
pubertal growth period was treated with fixed functional appliances. Earlier studies have shown that as the age of the patient increases, the changes that take place shift from skeletal to dentoalveolar. Cephalometric analysis supports this hypothesis by revealing that Class II correction was achieved mostly through dentoalveolar changes. Thus, the treatment benefited from the minimal residual growth and resulted in minimal relapse due to growth, which can occur with post-treatment dentoskeletal changes.

The Jasper jumper was used with sectional arches to prevent or minimize the unfavorable mandibular incisor protrusion. To change the force vector on the anterior segment, sectional arches were used so that the force will pass as near as possible to the center of resistance of the mandibular dentoalveolar arch.

Another unfavorable effect of the Jasper Jumper is that it tips the maxillary molars buccally, unless prevented by a transpalatal arch. With this patient, the transpalatal arch was deliberately removed before placement of the appliance to benefit from this effect. At the end of functional therapy, sufficient intermolar distance had been obtained and the right posterior crossbite was corrected.

Other dentoalveolar changes helped achieve a Class I occlusion. The correction of the overjet was achieved by a combination of retrusion and extrusion of the maxillary incisors and protrusion and intrusion of the mandibular incisors. These tipping movements also provided the ideal overbite. Previous Jasper jumper studies have shown significant decrease in overbite and overjet.
As noted previously, the changes in the maxillary and mandibular dentoalveolar arches, which produced an opening rotation of the occlusal plane, caused a clockwise rotation of the mandible. This downward and backward displacement of the mandible increased the lower anterior facial height.

Soft tissue parameters show that the Jasper jumper appliance favorably affected the profile. As a result of the overjet reduction, the upper lip moved back and the lower lip no longer rested lingual to the maxillary incisors. The mandibular incisors, which were proclined, supported the lower lip. Earlier studies that show profile improvement through an increased convexity angle support the present treatment results.10,11

In the case of impacted maxillary canines, surgical intervention is usually needed, in collaboration with orthodontic treatment. Many techniques and procedures have been described.5,12–14 Palatal traction with the use of ballista springs attached on the buccal surface of the posterior teeth, utilizing the transpalatal arch as anchorage, provides controlled movement of the uncovered impacted canines. This system reduces the surgical trauma, ensures the anchorage of the appliance, and preserves the esthetic appearance of the patient. In addition, this type of spring provides a low deflection rate and a large range of activation.5

CONCLUSION

When formulating a treatment plan, the appliance choice should be based on the proper diagnosis of all aspects of the malocclusion. It is important for the clinician to be familiar with the appliances used, including the possible benefits and limitations. In this case, the authors used an unfavorable side effect of the Jasper jumper appliance to the patient’s benefit.

The patient and her family were pleased with the improved facial profile and esthetics. With the eruption of the impacted maxillary canines, there has been an improvement in the occlusion and smile esthetics of the patient. Due to the age of the patient, the results gained were mostly dentoalveolar, rather than skeletal.

REFERENCES