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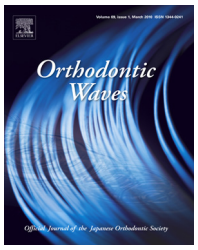

Research paper

Evaluation of effects of activator treatment on mandibular growth by analyzing components of condylar growth and mandibular rotation

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ABSTRACT

Purpose: The objective of this study is to clarify the effects of activator treatment on mandibular growth in relation to condylar growth and total rotation of the mandible, and to investigate the relationships between the treatment responses and pretreatment facial morphology.

Materials and methods: Thirty Japanese girls with Class II division 1 malocclusion treated with activator were examined. Mean age at the start of treatment was 9.6 ± 1.6 years. Mean treatment duration was 19 ± 4 months. Lateral cephalograms obtained before and after treatment were used to analyze skeletal changes during treatment. Regional superimposition analysis was performed to evaluate activator effects by decomposing the mandibular growth into condylar growth and mandibular total rotation.

Results: The changes in intermaxillary relationships were significantly correlated with vertical condylar growth and mandibular total rotation ($P < 0.05$ and $P < 0.01$). The changes in the forward displacement of the mandible were significantly correlated with sagittal condylar growth and mandibular total rotation ($P < 0.05$ and $P < 0.01$). Vertical condylar growth and mandibular total rotation were significantly correlated with pretreatment mandibular morphology ($P < 0.05$ and $P < 0.01$).

Conclusion: Both the sagittal condylar growth and counterclockwise mandibular total rotation attributed to activator treatment contribute to forward displacement of the mandible. The activator effects are expected greater in patients with flat mandibular plane, small gonial angle, backwardly inclined mandibular ramus and long posterior facial height.

1. Introduction

When a growing patient is diagnosed with Class II malocclusion with a retrognathic mandible, the treatment plan first aims to change the amount and direction of mandibular growth using functional appliances [1]. Numerous reports have demonstrated favorable effects of functional appliances on mandibular growth in the treatment of Class II malocclusion [2–8]. Some systematic reviews [9,10] focused on the significant effects of functional appliances on mandibular growth. While studies have shown that functional appliance treatment can alter the growth of the mandible, it has been reported that the effects on growth are unpredictable [11,12]

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and whether functional appliances produce meaningful skeletal improvement in anterior-posterior chin position remains questionable [11,13,14].

Mandibular growth consists of a periosteal growth of cortical bone and an endochondral growth of the condyle. Active mandibular growth occurs in the condyle [15]. It has been suggested that mandibular morphology derived from periosteal growth is attributed to condylar growth [16,17]. Björk [15] reported that ramus height is increased, mandibular body is curved and gonial angle is small in vertical condylar growth, whereas ramus height is short, mandibular body is little curved, and gonial angle is large in sagittal condylar growth. It is possible that in the treatment of Class II malocclusion with a retrognathic mandible both of growth at the condyle and changes in mandibular morphology are related to improvements in sagittal jaw relationships. Therefore, to better understand the effects of functional appliances, it would be helpful to evaluate the effects on mandibular growth by separating growth at the condyle and change in mandibular morphology. Using a method based on Björk and Skieller [18], Haralabakis et al. [19] compared the effects of activator and cervical headgear by dividing treatment changes into four components: maxillary growth, mandibular translation (condylar growth), mandibular molar movement, and mandibular total rotation, which represents the rotation of the mandibular corpus during growth. However, it remains unknown how condylar growth and mandibular total rotation relate to jaw relationship changes in treatment using functional appliances. In addition, individually different direction, magnitude and timing of growth lead to variability in treatment response [20,21].

The objective of this study was to clarify the effects of activator treatment on mandibular growth in relation to condylar growth and mandibular total rotation, and to investigate the relationships between treatment responses and pretreatment facial morphology.

2. Materials and methods

2.1. *Subjects*

Thirty Japanese girls with Class II division 1 malocclusion were examined. All subjects showed overjet of greater than 5 mm,

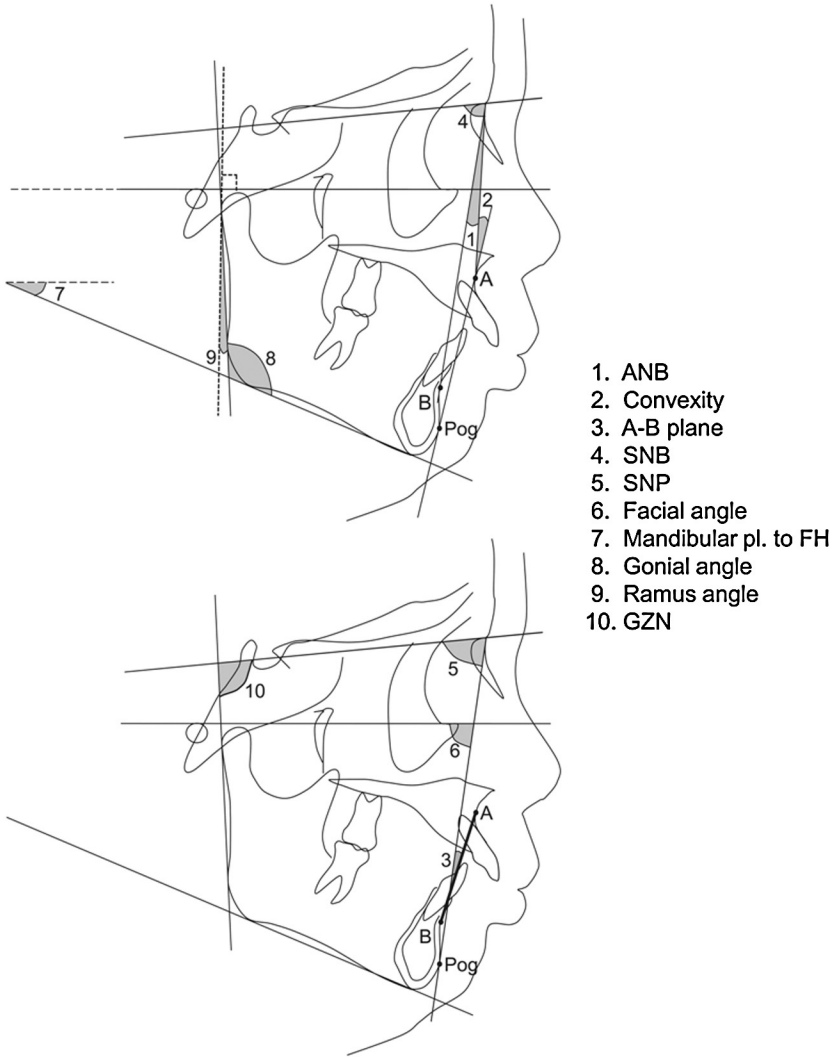

Fig. 1 – Cephalometric angular measurements.