A Prospective Study of Twin Block Appliance Therapy in Children with Class II Division1 Malocclusions Assessed by MRI, 3D-Cephalometry and Muscle Testing

A thesis submitted for the degree of Doctor of Philosophy by

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Functional appliances have been used to correct skeletal Class II malocclusions by repositioning the mandible anteriorly, with favourable changes around the temporomandibular joint (TMJ) being reported. Stimulation of lateral pterygoid activity leading to increased condylar growth at its muscular attachment has been proposed as a mandibular growth controlling mechanism. Varying degrees of skeletal and dento-alveolar change have been noted and the response to functional appliance therapy remains controversial.

Seventy-one children with Class II division 1 malocclusions were investigated over a period of six months. Thirty-four children were treated with Clark Twin Block appliances (CTB) while 37 children received no treatment and served as controls. The main objective of this study was to assess changes in the dento-facial structures, including the TMJ, between the experimental and control groups. Hard and soft tissue changes in the TMJ were investigated using Magnetic Resonance Imaging (MRI). Three-dimensional cephalometry was used to assess skeletal and dento-alveolar changes. Adaptation of protrusive musculature was also assessed.

CTB therapy was associated with significant reductions in overbite and overjet, correction of Class II canine and molar relationships, and an increase in the range of mandibular movement. The correction of the malocclusions included a combination of dento-alveolar changes, demonstrated by upper incisor retroclination and lower incisor proclination, as well as skeletal changes demonstrated by anterior downward rotation of the maxilla, increased mandibular length and gonial angle. The condylar head that was positioned anteriorly on the crest of the articular eminence when the CTB was inserted had repositioned back into the articular fossa with a normal disc-condyle relationship after six months of treatment. However, the position of the condyle was more anteriorly positioned in the fossa. Fatiguing of the protrusive musculature did not change this corrected mandibular position. A reduction in condylar axial
angle and an increase in maximum protrusive force found in the controls could not be demonstrated in the CTB group. It is hypothesised that condylar and muscular growth were modified by CTB therapy. Treatment with the CTB had neither positive nor negative effects on the condition of disc displacement.