EFFECT OF MINISCREW IMPLANT SUPPORTED INTRUSION ON MANDIBULAR ROTATION IN A GROUP OF CHILDREN

Thesis

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INTRODUCTION

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Throughout the history of orthodontics, skeletal open bite in growing children has been considered one of the most difficult and challenging malocclusions, not only to treat but also to maintain. The complexity of this malocclusion is usually attributed to its multifactorial nature, where combinations of skeletal, dental, and sometimes functional factors interact. It is often the outcome of a vertical growth pattern, where the downward descend of the posterior maxillary segment results in clockwise rotation of the mandible and swinging of the chin downward and backward.

Several morphological features distinguishing patients with a vertical growth tendency have been documented. These characteristics include: distal condylar inclination, short ramus, antegonial notching, obtuse gonial angle, excessive posterior maxillary height, thin and long symphysis, long anterior facial height, short posterior facial height, steep mandibular plane, divergent occlusal planes, acute interincisal angulation, anteriorly tipped –up palatal plane, as well as extruded molars.

The golden key to solving the problem of skeletal open bite is thus, to control or even intrude the posterior dentoalveolar region. Many treatment modalities to achieve posterior segment intrusion have been proposed such as, high pull head gear, vertical pull chin cup, posterior bite blocks, bite blocks augmented with repelling magnets or with springs, and finally functional appliances which are specifically designed and fabricated with posterior bite blocks to accomplish posterior segment intrusion. However, some more severe cases still called for orthognathic surgeries later in life. Unfortunately, the former treatment options are not without pitfalls. Most of these systems are limited by a number of factors, including the patients' compliance, the relative number of dental anchorage units available, allergy, and unfavorable reactionary tooth movements.

In recent years, numerous publications have introduced novel ways of reinforcing anchorage using a variety of devices temporarily anchored in bone and

were collectively named skeletal anchorage systems (SAS).[90] The use of such skeletal anchorage systems, is now growing in popularity because of their ability to provide absolute anchorage, lack of patients' compliance, their relatively small size offering a versatility of insertion sites, ease of insertion and removal, ability to be immediately loaded, as well as their few complications and low cost.

Concurrently, the use of such devices has expanded the boundaries of orthodontic treatment, where they are now heavily applied to many clinical situations, including anterior segment retraction, mesial / distal movement of multiple posterior teeth, anterior teeth intrusion, posterior teeth intrusion, intermaxillary traction as well as orthopaedic traction.

Despite the fact that many reports have been published regarding the successful use of SAS in the treatment of skeletal open bites, data concerning their use in children, and to a lesser extent in adolescents, is still scarce. Consequently, the present study was undertaken to investigate the use of miniscrews as anchorage units for intruding maxillary posterior teeth in children and subsequent effect on mandibular rotation in children with skeletal open bite.

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REVIEW OF LITERATURE

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I. Characteristics of skeletal open bite

A variety of clinical and cephalometric characteristics for the skeletal open bite malocclusion have been tackled in the literature. A profound knowledge of the skeletal open bite morphology and etiology, greatly reduces the risk of misdiagnosis, allows for better chances for prevention and high lightens the mode of correction as well as that of the retention required.

Fields et al. (1984), studied the vertical facial morphology in long-faced children and adults and deduced that there was a tendency for having a greater posterior upper and lower dental heights in those subjects. Besides, a large gonial angle, increased mandibular plane angle to cranial base, and an increased mandibulo-palatal plane angle were also considered among the main characteristic features.

Ross et al. (1990), illustrated some of the clinical characteristics of skeletal open bite. It was declared that patients with high mandibular plane angle have narrow arch width with high arched palate and tendencies towards posterior cross bite. Posterior teeth of such patients often have excessive labial crown inclination with functionally long lingual cusps. A steeper occlusal plane to other cranial structures is always manifested.

Haralabakis et al. (1994), made use of lateral cephalograms for the identification of skeletal open bite characteristics. It was deduced that hyper divergent subjects are characterized by greater facial height, greater anterior maxillary and mandibular heights. Increased posterior maxillary height was also evident, together with a high mandibular plane angle, which greatly contributed to the development of the skeletal open bite.

Gurton et al. (2004) compared the parameters of skeletal to dentoalveolar open bites. Skeletal open bites tend to show more molar and incisor eruption

than do dental open bites. It has been mentioned that a steep mandibular plane, an obtuse gonial angle, increased lower facial height, and counter clockwise rotation of the palatal plane were the significant parameters of skeletal anterior open bites. On the other hand, parameters of dentoalveolar open bites were divergent maxillary and mandibular occlusal planes, mesial inclination of the posterior teeth, and lack of a normal curve of Spee in the lower arch.

Nanda (2005), defined open bite as being an occlusal characteristic, where the upper and lower teeth are not in contact and vertical overlap doesn't exist. The associated skeletal and dental characteristics were described as increased gonial angle, excessive maxillary height, thin and long symphysis, long anterior facial height, short posterior facial height, steep mandibular plane, and extruded molars. It was further pointed out that, the soft tissue features parallel those of the hard tissue, in addition to a large interlabial gap.

Martina et al. (2005) claimed that there was a correlation between the vertical craniofacial features and the posterior dentoalveolar height. This hypothesis was tested cephalometrically and it was found that the length of the anterior lower facial height had a positive influence on the amount of molar dentoalveolar heights. Moreover, the molar dentoalveolar heights were negatively influenced from the divergence of the jaws as indicated by the mandibulopalatal plane angle.

Cinsar et al. (2007), described some of the cephalometric and morphological features of skeletal open bite as, large anterior dentoalveolar height in both jaws, increased total and lower anterior facial height, decreased posterior facial height, backward rotation of the maxillomandibular skeleton, Class II tendency, downward rotation of the posterior portion of the palatal plane, increased gonial angle, high mandibular plane angle, divergent cephalometric planes, narrow maxillary arch, and marked antegonial notching.

Arat et al. (2008), attempted to emphasize the inconsistencies in the differential diagnosis of skeletal open bite malocclusions. Visual and

cephalometric judgements of 77 patients with skeletal open bites were compared. The visual judgement criteria taken into consideration were the length and width of the symphysis, the antegonial notching, the gonial angle, the lower facial height, soft tissue profile, nasopharyngeal airway deficiency, as well as the functional characteristics of the patient including thumb sucking habits, tongue and lip posture and mouth breathing. Accordingly, the sample was visually classified as belonging to one of the three groups; morphogenetic, functional, or a combination. The same sample was again cephalometrically evaluated and classified according to the mandibular plane angle into; hyper divergent, normodivergent, or hypodivergent. A weak level of agreement was found between the two assessment methods, where more than half of the cases cephalometrically evaluated as hyper divergent, were visually classified as functional. Consequently, cephalometric judgement alone can't be considered an adequate diagnostic tool for skeletal open bite determination.

II. Treatment of skeletal open bite

The main etiologic factor leading to a skeletal open bite was found to be the excessive alveolar growth and eruption of posterior teeth. It has also been suggested that, the palatal plane being tipped down posteriorly, resulted in the maxillary molars being located in a more inferior position acting as a fulcrum with the mandibular teeth leading to the downward and backward rotation of the mandible with an increase in the lower facial height and mandibular plane angle ***(Nanda 1988,1990).*** *Thus, it would be wise to attempt to control the downward growth of the posterior segment through molar intrusion, in an attempt to produce true mandibular rotation and therefore treat the skeletal open bite malocclusion* ***(LaHaye et al. 2006).***