

Evaluation of skeletal and dental changes in Class II patients treated with Frankel appliance.

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Evaluation of skeletal and dental changes in Class II patients treated with Frankel appliance.

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Abstract

The aim of the present article is to assess the treatment results of Class II, Division 1 patients with mandibular retrusion using the Frankel appliance. Several studies demonstrated that the FR appliance produced no significant changes in the maxillary development and a statistically significant increase in the mandibular length. An improvement of the maxillo-mandibular relationship and a significant increase in lower anterior face height (LAFH) were also observed. The results have shown that FR 2 treatment induced a greater vertical development of the mandibular molars, reduced the overjet and overbite, produced an improvement in the molar relationship, retrusion and palatal tipping of the maxillary incisors and labial inclination of the lower incisors. In conclusion the main effects of the Frankel appliance in the correction of Class II malocclusions are primarily dento-alveolar, with a smaller but significant skeletal mandibular effect.

Introduction

Class II malocclusion is a common condition and it is important to recognize whether the etiology of malocclusion is dental, skeletal or combined. The problem can be mandibular retrusion, maxillary protrusion, mandibular dentoalveolar retrusion, maxillary dentoalveolar protrusion or a combination of them [1]. The most frequent skeletal problem in Class II patients is a mandibular retrognathia. This implies that an appliance with an evident aptitude to produce significant mandibular growth would be an important tool of clinician's armamentarium [2].

Among functional appliances, one of the most approved is the function regulator (FR 2) of Frankel. Rolf Frankel developed this appliance as an orthopedic exercise device projected to reeducate the neuromuscular system of the orofacial complex. Function of Frankel is based on orthopedic action that consider muscle exercise as an important factor in bone development [3]. The vestibular shields of Frankel appliance extend the orofacial capsule and induce an anterior functional shift of the mandible [4]. FR 2 is used to eliminate functional disorders that can

interfere with normal growth by aggravating incorrect postural behavior of the orofacial musculature and inadequate space conditions in the oral cavity. Correction of class II malocclusion is obtained with the Frankel 2 by advancing the jaw with muscular training. [5,6]

Methods

Our review is carried out through the electronic database Pubmed, using specific keywords : Frankel 2 appliance, Class II malocclusion, skeletal growth, dentoalveolar structures. The period considered was from 1981 to 2017.

Discussion

Studies of the effects of FR 2 in the treatment of Class II patients have evidenced an increased condyle growth, majority mandibular growth development, an absence of maxillary growth changes, an increment in lower anterior face height (LAFH), palatal tipping of the maxillary incisors, labial tipping of the mandibular incisors, and a greater vertical development of the mandibular molars compared with control groups untreated [3,7,8].

A lot of article demonstrated no statistically important influence on maxillary development and changes in maxillary position and length [2,3,4]. Most of the studies have not found significant changes in SNA angle between pre-treatment and post-treatment patients treated with FR-2. [6] Chadwick et al. used the parameters SNA, maxillary length and N perpendicular to point A, for evaluating maxillary growth, all evidenced a trend for reduction antero-posterior maxillary development in patients after functional regulator treatment, but the authors did not consider this changes clinically significant [9].

Despite several studies argued that the use of FR2 in Class II malocclusion determined a mandibular growth increase [4,10], others did not show statistically significant difference in mandibular length or they stated that mandibular length cannot be changed [3,9]. A systematic review and meta-analysis of studies on the mandibular skeletal effects of the FR-2 appliance in growing patients with

a Class II malocclusion demonstrated a significant increment of mandibular total length and mandibular ramus height. The investigation also recognized many limitations of the published articles [11]. Rodrigues et al. observed that mandibular development was influenced positively by using FR-2 and they found statistically significant differences in mandibular length (Co-Gn), Ar-Gn and Go-Gn measurements. The authors did not evidence important changes in the SNB angle between control and treated group [2].

Many authors reported a significant reduction in the angular maxillo-mandibular ANB, only few studies have not found important changes of ANB between patients treated with FR 2 and control groups. A significant decrease in the ANB angle improve the skeletal intermaxillary and occlusal relationship [3, 13].

Several studies have shown that FR 2 produced an augmentation in LAFH. This increase could be the consequence of posterior bite opening due to mandibular protrusion as induced by the construction bite [3]. Frankel appliance therapy has been recommended for patients with short lower anterior facial height, inducing to more bite opening and desired facial esthetics [10].

Many authors found a statistically significant palatal tipping and a decrease in protrusion of the maxillary incisors after the therapy with Frankel appliance. The uprighting of the maxillary incisors can be convenient in patients with very increased overjet and accentuated labial tipping of the maxillary incisors, typical of Class II division 1 malocclusions [3]. Upper molar eruption did not appear to be inhibited by the Frankel appliance [2].

Some articles sustained that clinical crown of lower anterior teeth tend to increase throughout the years after the mandibular advancement treatment by using functional devices [1]. The incisor mandibular plane angle (IMPA) increase after Frankel appliance treatment [12]. Probably the most important mandibular dentoalveolar change is the extrusion of the mandibular molars, an important factor to improve the deep overbite and the curve of Spee [2,3]. The treatment success of a Class II malocclusion is based on the correction of the overjet and molar relationship. Several studies evidenced that overjet correction derived primarily from dental changes: retraction of the maxillary incisors and protraction of the mandibular incisors. [8] Many authors have not found notable changes of overbite [7].

Some clinicians studied arch width development in Class II patients undergoing Frankel treatment. The results evidenced that Frankel appliance determined

an expansion of the maxillary and mandibular dental arches, occlusal arch width increased more in the premolar and molar regions in the maxilla and in the premolar region in the mandible [14, 15].

Conclusion(s)

Most of the studies revealed that Frankel appliance does not produce clinically significant skeletal changes. The results of the effects on mandibular growth using FR therapy are rather controversial. FR-2 basically affects dentoalveolar structures.

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