Soft Tissue Effects of Twin Block and Herbst Functional Appliances: A Systematic Review

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ABSTRACT

In growing patients, it is possible to correct a Class II malocclusion due to skeletal mandibular retrognathia with fixed and removable functional orthodontic appliances. The aim of this study is to evaluate facial soft tissue changes after the use of Twin Block (TB) and Herbst appliance in Class II division 1 malocclusion cases and compare them using a systematic review of the literature. A computerized research of international literature has been conducted using the principal medical electronic databases (PubMed, Lilacs and Scopus) with the keywords: Twin Block, Herbst, Class II Malocclusion, Orthodontic Functional Appliances, Soft Tissue and Facial Changes. 5 articles respected the inclusion criteria and were included in the systematic review, 1 is a case control group study that compared soft tissue effects of Twin Block and Herbst appliances, the ress systemic reviews about dental, skeletal and soft tissues effects of fixed and removable functional appliances from where the information of Twin Block and Herbst was extracted and compared. Both resulted to assess an improvement of facial balance and aesthetics. Controversial results were found on retrusion of the upper lip rather than to the protrusion of the lower lip and position of soft tissue menton. The magnitude of the changes may not be perceived as clinically significant due to the method of measurement. Three dimensional quantification of the soft tissue changes is required to overcome current limitations in understanding of the soft tissue changes obtained with the use of TB and Herbst functional appliances.

INTRODUCTION

Class II malocclusion occurs in about one third of the population and it may lead patients to negative feelings of self image and self-esteem due to the increased overjet and unfavourable profile. Thus, the orthodontic treatment of these malocclusions should ideally solve the dentoskeletal disharmony in order to obtain a facial aesthetic improvement. Various factors can contribute to the development of Class II malocclusion and their differential diagnosis can help in the selection of the most appropriate treatment approach. Among these factors, mandibular retrognathism shows a prevailing frequency. In these cases, functional appliance therapy is a commonly used treatment protocol for growing Class II patients.

Functional treatment can be carried out either with removable functional appliances (RFAs) or with fixed functional appliances (FFAs). An essential difference between them is that fixed functional appliances have do not requiring patient compliance, which can strongly influence the effectiveness of functional treatment. Twin Block (TB) and Herbst appliances are among the most popular functional appliances. TB is a removable appliance and is the most preferred functional appliance in UK, Herbst is a fixed functional appliance and is most commonly used in the USA. There are few studies concerning the soft tissue effects of Herbst appliance in the literature and soft tissue evaluation was performed with only few measurements. Soft tissue changes after TB appliance treatment were evaluated in greater detail relative to Herbst appliance. Dentoskeletal effects of these appliances were compared in two studies and soft tissue effects were compared in one study.

The objective of the present systematic review was to evaluate and compare facial soft tissue changes by using lateral cephalograms after the use of the Twin Block and Herbst appliances in Class II division 1 malocclusion cases.

METHODS

A computerized research of international literature has been conducted using the principal medical electronic databases: PubMed (Medline), Lilacs and Scopus. The following keywords were used and adapted according to the database rules: Twin Block, Herbst, Class II Malocclusion, Orthodontic Functional Appliances, Soft Tissue and Facial Changes. All articles reporting on the topic till may 2019 were included. No restrictions of time and languages have been fixed. The results have been filtered and valued following our eligibility criteria and then organized following the PRISMA method. The inclusion criteria were chosen to initially select potential articles from the published abstract results: human clinical trials; facial
soft tissue changes; functional appliances to correct Class II division 1 malocclusions; nonsyndromic or medical compromised patients; no individual case reports or series of cases; no surgical intervention and with groups of patients in active growing stage. Craniofacial growth was considered important to factor out in order to accurately assess the true magnitude of the soft tissue changes. All the article abstracts that appeared to meet these inclusion criteria were selected and finally included in the systematic review.

RESULTS AND DISCUSSION

The updated electronic search of all databases resulted in 127 references. After duplicates were removed, 91 references were left. 78 articles were excluded because the topic was not pertinent or because they were not satisfied the inclusion criteria. The remaining eligible 13 articles were entirely read, and 8 of them were excluded. 5 studies fulfilled the final inclusion criteria and were included in the review. Only 1 article with a case-control groups study compared the soft tissues effect of Twin Block and Herbst appliances, the others were systematic reviews about dental, skeletal and soft tissues effects of fixed and removable functional appliances from where the information of Twin Block and Herbst was extracted and compared.

This review of the literature aims to analyze and compare the soft tissue profile changes produced by the TB and Hebst appliances in patients with Class II division 1 malocclusions. Despite the extensive number of published studies regarding the skeletal and dental effects produced, only a few studies evaluated the soft tissue profile changes in patients with Class II division 1 malocclusion with mandibular retrognathia. The patients were divided into three groups. Forty patients were randomly allocated to one of two functional appliance treatment groups. The first group comprised 11 girls and 9 boys (mean age 12.74 years) treated with the Herbst appliance. The second group comprised 10 girls and 10 boys (mean age 13.0 years) who received treatment with Twin Block appliance. The untreated control group included 9 girls and 11 boys with a mean age of 12.17 years. They used the pre-treatment and post-treatment cephalograms to evaluate soft tissue changes without any fixed concomitant orthodontic appliance therapy.

It was observed statistically significant soft tissue changes after TB and Herbst appliance therapy, compared to untreated control sample and that the effects of Herbst and TB treatment on the soft tissue profile were similar; they both significantly changed and improve the soft tissue profile. Especially greater advancement of soft tissue pogonion and lower lip were observed in TB group. This study was in agreement with others authors that reported a decrease in soft tissue convexity after Herbst and TB therapies.

In reverse, most of the authors report the improvement of the profile to be mainly due to the retrusion of the upper lip, rather than to the protrusion of the lower lip. However, all the studies assessing this outcome reported controversial results based on the low quality primary studies; hence, this evidence has to be considered insufficient.

Flores Mir et al. in a systematic review on the soft tissue changes with fixed functional appliances in class II division 1 malocclusion stated that the statistical changes and improvement in the soft tissue profile were not the product of a more forward position of the lower lip and soft tissue menton but more likely a retrusion of the upper lip. Unfortunately the magnitude of the changes may not be perceived as clinically significant due to the method of measurement.

One of the biggest differences between Herbst and TB appliances is the headgear effect in superior arch of the Herbst. In fact it leads to the opening of nasolabial angle due to the important effect of dental and partly skeletal distalization on superior arch.

In patients with a nasolabial angle already opened and where you want to get only a mandibular advancement without a retraction of the upper arch of the use of Twin block meets better your needs. Soft tissue effects of Twin Block therapy were studied in detail with different analyses and imaging systems. Anterior and inferior movement of chin, forward
of the lower lip and soft tissue menton. Â

On the other side, improvement produced by fixed functional appliances seem to restrict the forward movement of the upper lips. No change in the anteroposterior position of the lower lip and soft tissue menton was found.

Next studies should evaluate the effects of the functional appliances, in isolation, minimizing the effects of confounding concurrent use of fixed appliances by undertaking analysis at baseline, at completion of the functional phase and at the completion of straight wire treatment.

Morevore, a detailed esthetic judgment of the face should be carried out using the patient's frontal face view during conversation, with their facial expressions and smiling. Â Due to the superimposition of the hard tissues, conventional cephalometric analyses are considered not adequately capable to detect the soft tissue structure, so the results regarding the soft tissues effects might have been underestimated. In light of this, where possible, a future clinical trials should use stereophotogrammetry or laser surface scanner that may likely overcome these limitations and which is considered a reliable, non invasive and free of radiation technique for assessing facial form.

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