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# Are there differences in treatment effects between labial and lingual fixed orthodontic appliances? A systematic review and meta-analysis

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## Abstract

**Background:** An evaluation is made of possible differences in treatment effects between labial and lingual fixed appliances.

**Methods:** A comprehensive search was made of the PubMed-Medline, Cochrane Library and LILACS databases, with an additional manual search covering the period up until April 2017. There were no restrictions in terms of year of publication or language. Agreement between the authors was quantified by the Cohen kappa statistic. A random-effect model was applied to calculate weighted mean differences with 95% confidence intervals.

**Results:** A total of 249 patients corresponding to four eligible studies were included in the systematic review. Among the six angles and distances entered in the meta-analysis, a tendency was observed in lingual appliances to increase the interincisal angle (95% CI  $-0.80$ - $8.99$ ;  $p = 0.101$ ) and reduce the angle between the major axis of upper central incisor and the sellar-nasion plane - though statistical significance was not reached (95% CI  $-5.75$ - $0.32$ ;  $p = 0.079$ ).

**Conclusion:** The results obtained indicate that treatment with lingual appliances favors incisor tipping by exerting lingual crown torque, but there are no differences in cephalometric values between labial and lingual fixed appliances. Because of the small number of included studies, the results of this meta-analysis should be interpreted with caution. Future research should focus on the generation of a consensus document allowing selection of the type of orthodontic approach not only conditioned to the esthetic requirements of the patient but also considering the characteristics of the malocclusion. On the other hand, standardized international guidelines are lacking; the measurements of angles and distances therefore have to be unified with a view to future investigations.

**Keywords:** Orthodontics, Cephalometric, Clinical outcome, Lingual orthodontics, Labial orthodontics, Treatment

## Background

Lingual orthodontics were introduced over three decades ago [1], and in recent years the demand and thus provision of lingual orthodontic treatments have increased among patients seeking improved esthetic effects [2]. A number of recent studies [3, 4] have attempted to establish the advantages and inconveniences of lingual orthodontic appliances versus labial appliances.

Cephalometric analysis is used to study the craniofacial structures of the patient, and its results have an impact on treatment planning. Cephalometry is not a direct method for diagnosing the patient conditions, yet it offers details on the craniofacial structures of the patient and thus yields diagnostic information that is helpful in defining the orthodontic treatment strategy [5]. With the advent of the computer age and our ever changing technological environment, digital imaging systems are becoming increasingly more popular than conventional film-based radiography. It is now possible to perform cephalometric tracing both through the use of digitizers and directly on screen-displayed digital

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