

# Fixed or removable function appliances for Class II malocclusions

**Abstracted from**

**Pacha MM, Fleming PS, Johal A.**

A comparison of the efficacy of fixed versus removable functional appliances in children with Class II malocclusion: A systematic review. *Eur J Orthod* 2015; pii: cjv086. [Epub ahead of print]

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**Question: Are fixed functional appliances as effective as removable functional appliances in correcting Class II malocclusions?**

**Data sources** Embase, Cochrane Central Register of Controlled Trials, Medline (Pubmed), Web of Science, Google Scholar, Scopus, LILACS database and bibliographies of clinical trials encountered during search. There was no restriction on language or date during search.

**Study selection** Randomised Controlled Trials (RCTs) and Controlled Clinical Trials (CCT) in patients with Class II malocclusions that compared at least one fixed functional appliance with at least one removable functional appliance (RFA) in children below 16 years of age. Primary outcomes were clinical and lateral cephalometric measurements and the duration of treatment. Secondary outcomes included patient experiences of treatment, quality of life measures and harms arising during treatment as well as costs of both treatments.

**Data extraction and synthesis** The titles and abstracts of all studies identified through the search were assessed independently and in duplicate by two review authors. Disagreements about included studies were resolved through discussion with the third author. Heterogeneity was assessed using customised forms and risk of bias using a Cochrane Collaboration tool. A meta-analysis was planned for studies at low risk of bias with similar comparisons reporting the same outcome.

**Results** Two RCTs and two CCTs that met the inclusion/exclusion criteria were included in the final analysis. Risk of bias assessment indicated three trials were at high risk while one was unclear. Consequently, the included trials were deemed to be inappropriate for meta-analysis (MA).

Two studies with 282 participants evaluated Twin Block with fixed Herbst appliance and reported significant improvements in anterior-posterior skeletal discrepancy, mandibular length and reduction of overjet with both appliances. While one study reported significantly shorter treatment duration in Herbst appliance, the other study did not find any difference. Herbst appliance had better compliance, less dropouts but more emergency visits.

One trial that compared activator appliance with Twin Force Bite Corrector found significantly shorter time with the fixed appliance. However, effective length and sagittal positioning of the mandible was not different between the groups.

One trial comparing activator with Forsus FRZ reported enhanced mandibular growth and restrained maxillary growth with both the appliances. While activator appliance was associated with increased posterior facial height, Forsus significantly rotated the occlusal plane.

**Conclusions** Limited available evidence indicates that both fixed

and removable functional appliances are effective in reducing overjet in growing children. However, there is insufficient evidence to differentiate between the two types with respect to biological (skeletal and dental) effects or patient experiences.

**Commentary**

This review addresses a clearly focused question: are fixed functional appliances as effective as removable functional appliances in correcting Class II malocclusions in children less than 16 years of age? The primary outcomes considered were clinical and cephalometric measurements and treatment duration; secondary outcomes were patient experience, harms and costs of both treatments. Since this was primarily a question evaluating therapy, the authors correctly included only randomised controlled trials (RCTs) or Controlled Clinical Trials (CCTs) in their search and analysis.

The authors increased the risk of missing potentially important studies by not including wildcards in search terms as well as omitting important literature sources (*metaRegister of Controlled Trials, German National Library of Medicine, Bibliografia Brasileira de Odontologia and unpublished studies. Not looking at conference abstracts is an additional concern.*<sup>1</sup>

There was no information on the inter-examiner agreement (kappa score) between the two authors involved in study selection and risk of bias assessment. The authors assessed the RoB by following Cochrane Handbook guidelines published in 2008. The Handbook has been updated twice since, and it would have been more appropriate for the authors to use the current edition (2011).

Another important limitation is that the authors have used the RoB assessment tool designed for randomised trials to evaluate the two controlled clinical trials as well. This is incorrect because these study designs are not equivalent and specific tools are available for assessing RoB in non-randomised studies including The Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) assessment tool as well as Downs and Black instrument.

Variability in the participants, interventions and outcomes studied may be described as clinical heterogeneity; variability in study design and risk of bias may be described as methodological heterogeneity; and variability in the intervention effects being evaluated in the different studies is known as statistical heterogeneity, and is a consequence of clinical or methodological diversity, or both, among the studies.

The authors' rationale not to do MA because the included trials suffered from methodological heterogeneity (study design

and risk of bias) is inconsistent with the Cochrane Handbook recommendations 'Significant statistical heterogeneity arising from methodological diversity does not necessarily suggest that the true intervention effect varies.'<sup>2</sup> Given the scope of the review evaluating any fixed vs any removable appliance in correcting class II malocclusions, clinical heterogeneity is expected. Given that statistical and methodological heterogeneity contribute to statistical heterogeneity, the authors should have performed a statistical test for heterogeneity and presented meta-analysis of primary outcomes. This is also supported by the fact that consistent trends were observed across studies with the use of fixed or removable functional appliances: significant improvement in anterior-posterior skeletal discrepancy and soft tissue profile, increase in mandibular length and a significant reduction in overjet. The overall treatment duration was not significantly different even though functional phase with fixed appliance was shorter.

Even though the quality of available evidence is low, doing a MA would have significantly enhanced the quality of the review.

### Practice points

- There is low quality evidence from clinical trials that indicate removable functional appliances are as effective as fixed functional appliances in treating Class II malocclusions among growing children
- When patient compliance is an issue, fixed functional appliance can be a preferred option.

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2. Higgins JPT, Green S (editors). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0 [updated March 2011]. The Cochrane Collaboration, 2011; Chapter 9: Analysing data and undertaking meta-analyses; 9.5 Heterogeneity.

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