A systematic review of clinical trials of aligning archwires

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CRD summary
This review concluded that there was insufficient data to make clear recommendations regarding the most effective archwire for alignment in orthodontic treatment. Despite methodological deficiencies (particularly selection bias) the authors' conclusions appear to reflect the limited evidence presented.

Authors' objectives
To investigate the efficacy of archwires used in the alignment stage of orthodontic treatment.

Searching
Published trials were identified through a search of MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials (CENTRAL) and Cochrane Meta-register of Controlled Trials to July 2008. Reference lists of included studies were searched. Search terms were reported.

Study selection
Controlled clinical trials of fixed orthodontic appliances in children and adults who had aligning and/or levelling archwires used as part of orthodontic treatment were eligible for inclusion. Trials were required to report an objective measurement of alignment/irregularity to be included; two trials used digitised reflex microscope, one used a reflex metrograph and one used digital callipers.

Included studies compared one type of archwire to another. Intervention archwires compared either a multistranded stainless steel wire, a nickel titanium archwire or different types of nickel titanium archwires. Length of trials ranged from 34 to 57.5 days. Sample size in the included trials ranged from 15 to 123 patients or 15-158 archwires. Average age of patients was reported in two trials and ranged from 15.2 to 17.3 years.

The authors did not state how the studies were selected for the review.

Assessment of study quality
Methodological quality was assessed by two independent reviewers using a 12-item scale that evaluated randomisation, allocation concealment, blinding, sample size calculation, baseline similarity of treatment groups, reporting of results and intention-to-treat analysis. Full details of checklist items and their application to the included studies were reported. Studies that scored 6 or more out of a maximum possible 12 points were considered to be at low risk of bias. Disagreements were resolved by consensus.

Data extraction
Two independent reviewers extracted data from studies considered to be at low risk of bias into standard extraction forms. Disagreements were resolved by consensus. Outcomes extracted included which teeth were measured, how measurement took place, what was measured post-intervention and method of measurement. The alignment achieved with each archwire was measured according to the assessment of alignment that yielded three possibilities: change in total irregularity, change in contact point movement and duration to achieve 2mm irregularity index.

Methods of synthesis
The studies were combined using a narrative synthesis supported by tables.

Results of the review
Four RCTs (n=384) were included in the review. Overall study quality was average; one study scored 7 and three studies scored 6.

Outcome data were able to be extracted from only two trials. One trial (n=40) measured mean movement of contact points with respect to palatal rugae where the mean movement was 1.7 (standard deviation 1.15) in the 0.016 Titanol...
group compared to a mean of 1.42 (standard deviation 0.79) in the 0.016 NiTi group. The other trial (n=112) measured mean change in total irregularity in a three-arm trial and found a mean change of 2.54 in the 0.016x0.022 active martensitic NiTi group, 2.58 in the 0.0155 multistranded stainless steel group and 2.65 in the 0.016x0.022 active martensitic NiTi group (graded force).

Authors’ conclusions
There was insufficient data to make clear recommendations regarding the most effective archwire for the alignment stage of orthodontic treatment.

CRD commentary
This review addressed a clear question in terms of participants, interventions and study design. It did not address comparison groups or predefine outcomes; this may have led to subjective decisions regarding inclusion. Relevant databases were searched and search terms were reported. It appeared that no attempts were made to identify unpublished studies. It was unclear whether language limitations were applied. Publication bias was not considered in the report. Suitable methods to minimise risk of reviewer error and bias were reported for data extraction and validity assessment, but not for study selection. The decision to present included studies narratively and not to pool studies in a meta-analysis was appropriate given the heterogeneity between studies.

It was unclear which trials were used to draw conclusions; the authors reported that four trials were included, but the discussion reported narrative results for six trials and included two that were considered poor quality and not included in the data extraction process. The authors stated that trials were required to report an objective measurement of alignment; only two of the four included studies reported any outcomes.

The authors recognised some of the limitations of the review (particularly in terms of validity assessment) and the poor reporting and average quality of included studies. Despite the methodological deficiencies the conclusions appear to reflect the evidence presented.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that good-quality randomised controlled trials that used standardised appliances and valid, reproducible, quick and well-recognised assessment of alignment were required.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.