Little evidence to guide initial arch wire choice for fixed appliance therapy

Abstracted from

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A systematic review and meta-analysis of experimental clinical evidence on initial aligning archwires and archwire sequences. *Orthod Craniofac Res* 2014; **17**: 197–215. doi: 10.1111/ocr.12048. [Epub ahead of print] PubMed PMID: 24889143.

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Question: What is the most effective archwire sequence for fixed appliance orthodontic treatment?

Data sources Medline, Cochrane Library, Biomed Central, BBO including LILACS, Ind Med, Scielo, Clinical trials.gov, Conference paper Index, Digital Dissertations, German National Library of Medicine (ZB MED), Google Scholar, ISI Web of Knowledge, metaRegister of Controlled Trials, OpenSIGLE, Scirus.

Study selection Two reviewers independently selected studies. Only randomised controlled trials (RCTs) and quasi-RCTs of parallel or split-mouth design were considered.

Data extraction and synthesis Data abstraction and risk of bias assessment were carried out independently by two reviewers. Data were considered suitable for pooling if similar interventions were used in the same way and similar outcomes were reported. A random-effects model was used.

Results Sixteen studies involving 1108 patients were included. Thirteen trials (863 patients) considered initial archwires assessing cross-section of archwires, ion implantation of archwires and archwire materials.

A meta-analysis of two trials found slightly greater irregularity correction with an austenitic-active nickel-titanium (NiTi) compared with a martensitic-stabilised NiTi archwire (corresponding to MD: 1.11 mm, 95% CI: 0.38 to 2.61).

Four trials (394 patients) considered archwire sequences. A meta-analysis of two trials found it took patients treated with a sequence of martensitic-active copper-nickel-titanium (CuNiTi) slightly longer to reach the working archwire (MD: 0.54 months, 95% CI: -0.87 to 1.95; $p = 0.45$) compared with a martensitic-stabilised NiTi sequence. However, patients treated with a sequence of martensitic-active CuNiTi archwires reported general greater pain intensity on the Likert scale four hours and one day after placement of each archwire, compared with a martensitic-stabilised NiTi sequence.

Conclusions There are insufficient data at present to make recommendations for the use of any available archwire type regarding effectiveness, efficacy, treatment outcome or potential side effects. The meta-analyses conducted are limited by the small number of trials and methodological issues and must therefore be subsequently confirmed.

Commentary

Clinicians usually follow with significant interest claims that specific archwires/bracket type combinations are more efficient and effective to solve malocclusions. Time and patient comfort advantages have also been cited.

This submission focuses on the following question: among orthodontic patients, is any specific type or archwire (or archwire sequence) more efficient, effective and/or produces less adverse effects to complete a level and alignment orthodontic phase? The primary outcome was tooth alignment after level and alignment, whilst the secondary outcomes were time to complete alignment or specific treatment goals, number of appointments to complete those goals and pain intensity, among others.

This systematic review with an included small meta-analysis was well conducted, but the quality of evidence included was mostly unclear due to trial conducting or reporting limitations. This comes at no surprise as every individual's malocclusion is inherently different and therefore being able to control all the variables involved during an orthodontic level and alignment phase is an insurmountable task.

Although the authors have to be congratulated for the immense task of synthesising the available evidence, the reality is that the included studies did evaluate very specific archwire or archwire sequences with different outcomes.

As an analogy each included trial did generate a small piece from a 100-piece puzzle. As only 16 RCTs were identified (16 small pieces) we are left with significant 'grey' areas (maybe north of 80% of the big picture). Can we then really expect to come out with clear and concise information to be taken to practice? It seems to me that we can't.

The authors attempted to summarise the clinical relevance of the systematic review/meta-analysis findings at the end of the discussion. They did only suggest that super-elastic NiTi or heat activated NiTi archwires were not better than conventional NiTi to complete alignment and that heat activated NiTi archwires were associated with diminishing pain levels during level and alignment. Other than that there is not enough evidence to support any other claim regarding the use of any available archwire type regarding effectiveness, efficacy, treatment outcome and timing or potential side effects.

We are left after reading this publication almost exactly, knowledge-wise, as we were before reading it. It could be pointed out that it becomes clear that more research is needed, but even this comes as no surprise as it is a common conclusion that almost

always is stated when we are faced with the available evidence to respond to clinically meaningful orthodontic questions.

To finalise I would like to remind the readership that lack of evidence is not synonymous with no difference. The pendulum can go either way when there is lack of evidence.

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Practice points

- Although there appears to be myriad clinical trials about archwire efficiency during leveling and alignment, the reality is that there are so many variables of clinical importance that need to be accounted that no study, regardless of how well it is planned and executed, will be able to singlehandedly answer this important clinical question.
- The available evidence is limited to produce strongly supported conclusions, but it seems that there are no differences among NiTi alloys to successfully complete orthodontic level and alignment. Other factors should be taken into account when selection among the commercially available options.