

What are the best materials to use for the first arch wire in orthodontic treatment?

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A Commentary on

Wang Y, Liu C, Jian F, McIntyre GT, Millett DT, Hickman J, Lai W.

Initial arch wires used in orthodontic treatment with fixed appliances. *Cochrane Database Syst Rev* 2018; **7**: CD007859. DOI: 10.1002/14651858.CD007859.pub4.

Cochrane Reviews are regularly updated as new evidence emerges and in response to feedback, the Cochrane Library (www.thecochranelibrary.com) should be consulted for the most recent version of the review.

Abstract

Data sources Six electronic databases/registries including Medline, Cochrane Central Register of Controlled Trials (CENTRAL), Cochrane Oral Health's Trials Register, Embase, World Health Organization International Clinical Trials Registry Platform and The US National Institutes of Health Trials Registry (ClinicalTrials.gov) were searched up to October 2017. No restrictions of language or publication date were set.

Study selection Only randomised controlled trials (RCTs) assessing the efficiency of initial arch wires to align teeth with fixed orthodontic braces in either or both upper and lower arches.

Data extraction and synthesis Two reviewers abstracted data independently. Risk of bias was assessed using the Cochrane Collaboration Risk of Bias tool. Rate of alignment was considered the main outcome. Root resorption and pain level were considered adverse effects. Meta-analysis was performed when possible.

Results Twelve RCTs involving 799 participants were included. Three studies were judged at high RoB, six were unclear and three were at low RoB. There was insufficient evidence to determine if there is a difference in the alignment rate between Multistrand stainless steel (MSS) and superelastic nickel-titanium (SNT) arch wires (mean difference (MD) -7.5 mm per month, 95% confidence interval (CI) -26.27 to 11.27; one study), between MSS and thermoplastic NiTi (TNT) arch wires, between conventional Niti (CNT) and TNT arch wires, between CNT and TNT arch wires and between SNT and TNT arch wires. In regards to pain level only two comparisons were assessed (MSS vs. SNT and SNT vs. TNT). The first one did not show meaningful differences while in the second insufficient evidence was identified.

Conclusions In general terms there is insufficient evidence that any particular material is clinically superior to any other in regards to alignment rate, pain or root resorption.

Commentary

Patients seek faster orthodontic treatment times whenever possible. Historically multistranded SS wires were initially used

Practice point

Continue using whatever initial level and alignment we currently employ as at present there is no strong evidence to change.

followed by a progressive sequence of SS archwire from round dimensions (0.14, 016, 018 or 0.20), followed by rectangular arch wires also from SS (0.16*0.22, 0.17*0.25 or 0.0.19*0.25). Multiple loops of decreased complexity were bent in those wires to produce desired tooth movements with reduced pressure on the PDL to minimise associated pain. In the 70s new metal alloys (titanium-molibdenium, nickel titanium, etc) started to be offered that were supposed to overcome the limitations of SS arch wires. Claims were made that these new alloys were gentler on the PDL and produced more efficient tooth movement over longer time ranges. The present systematic review assesses the available evidence in this regard. It is an update of previous 2010 Cochrane Review.

Only initial arch wires meant to produce initial levelling and alignment were considered. The efficiency of these arch wires or others not considered in space closure, if indicated, and finishing were not considered. Although several comparisons were identified (six to be exact) in most of the cases the available evidence was insufficient to conclude anything. In the few comparisons where some evidence was identified it was of low (alignment rate) to moderate (pain) level. Hence, the findings need to be considered with caution as future studies may change the estimate of the effect, especially for alignment rate.

The implications to clinical practice are not decisive. It seems that based on what we know today the selection of initial arch wire is up to the clinicians, based on factors other than efficiency. No assessed arch wire alloy has demonstrated so far clinically meaningful increased efficiency. Hence, clinicians should be careful in considering these alloys as they come with a premium cost and so far not necessarily a proven efficiency. Having stated this, a reason to consider one of the newer alloys compared to the SS options is the larger recovery time frame. This means that they do not have to be changed every three to four weeks as the older alignment wires were. The savings in number of appointments (with the associated office savings) may outweigh the initial arch wire cost differences. This was not assessed in most of the included studies but in those that it was done, no clinically relevant differences were noted at 8, 12 and 16 weeks. In summary, for the initial 12 weeks of orthodontic level and alignment there is not a winner among the considered arch wires.

GRADE rating



In an era where patient-oriented outcomes are key, consideration of the two assessed variables (pain and root resorption), data were only reported for pain, although only in two of the twelve studies. Moderate level of evidence does not suggest differences between multistrand stainless steel vs. superelastic NiTi arch wires. No data were reported whatsoever for root resorption. In summary, again no specific arch wire is a winner from the patient's point of view.

The final take-home message is that we should keep using whatever initial level and alignment we currently use as there is not strong evidence to change it, but at the same time realise

that some may be paying a premium for a product that is not necessarily delivering what is expected. This is likely translated into higher treatment costs for the patients and in an era of increasing competition this may be an area where some bucks can be saved for the mutual benefit of patients and providers. Nevertheless future research may discredit the conclusions of this well conducted systematic review and this personal opinion.

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Evidence-Based Dentistry (2019) **20**, 58-59. doi: 10.1038/s41432-019-0022-9