

Cast or fiber posts a summary of evidence from vitro studies

Abstracted from

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Question: In endodontically treated teeth are fibre posts more fracture resistant than cast posts?

Data sources Medline, the Cochrane Controlled Trials Register, China National Knowledge Infrastructure and China Biology Medicine disc were searched.

Study selection Only randomised studies were included.

Data extraction and synthesis Data were independently extracted. Standardised mean differences were combined and analysed using meta-analysis.

Results Thirteen studies were included; premolars were used as specimens in six studies, central incisors in five studies and canines in three articles. There was considerable variation in both alloy and fibre materials used between studies. The standardised mean difference of the combined data was 0.64 (95% confidence interval, 0.08–1.20; $P < .001$), indicating that the cast post group displayed significantly higher fracture resistance than the fibre post group.

Conclusions On the basis of the current best available evidence, we concluded that cast posts had higher fracture resistance than fibre posts.

Commentary

Posts are indicated on endodontically treated teeth with significant coronal tooth loss due to caries or trauma. The purpose of the post is to maximise retention of the core component for the final dental restoration, be it a direct filling material or an indirect cast crown. However, preparing the root canal system for a post causes further loss of the tooth structure, making the remaining tooth structure more susceptible to fracture. Therefore, the ideal post minimises the risk of fracture of the supporting tooth structure caused by the forces of oral function. It is hypothesised that fibre-post-retained dental restorations are more fracture-resistant than conventional cast posts because the former's flexibility and toughness are similar to dentin.¹

The objective of Zhou and Wang's article is to systematically review the current literature which compares the fracture strength of extracted human teeth restored with either a fibre-post or a cast-post retained restoration and carry out a meta-analysis.² The review includes only in vitro studies where extracted human teeth samples were randomised into either group. However, this is not a review of randomised control (clinical) trials as implied by the authors. Rather, this is a review of articles where extracted human teeth were randomised prior to strength testing on a lab bench whose results are extrapolated to the clinical context. Lab bench studies are on the lowest rung of the standard hierarchy of valid clinical evidence. This is for good reasons, as bench top studies often cannot accurately mimic the clinical context, thus making their use for clinical decision making limited at best.

The review's meta-analysis infers a statistical difference, with a standardised mean difference (SMD) effect size of 0.64 [95% CI, 0.08-1.2] favouring fibre posts. The small cumulative sample size ($N=123$ in each group) from 15 studies (cited in the 13 included papers) is reflected in the SMD's relatively large confidence interval. Although the difference is statistically significant, the question is whether an SMD of 0.08-1.2 is clinically relevant.

Summary SMD effect size estimates are used for continuous data when the way the outcome is measured varies among the studies. Although the SMD indicates the direction of the effect size (ie, favours option A over option B), it is difficult to interpret the significance of the SMD's magnitude in the clinical context (ie, how much better is option A over option B).³ As a rule of thumb, an SMD of 0.2 indicates a small clinical difference, an SMD of 0.5 a moderate difference, and an SMD of 0.8 a large difference.³

In this review, the SMD summary estimated infers a moderate to large clinical difference in the fracture resistance in favour of fibre posts over cast posts. However, the limits of the confidence inter-

val are well below and above small and large magnitude effects respectively. In order to reduce the effect of heterogeneity in the meta-analysis, the authors claim they 'removed 2 articles with opposite results' and updated the SMD to 0.9 [95%CI 0.7-1.25], based on 13 of the original 15 included studies. The revised estimate and confidence intervals impressively hover around the large magnitude effect threshold. However, looking at the forest plots (Fig. 2 and 3), one can see that the authors did not remove the extreme studies of opposites sides,^{4,5} but instead removed the only two studies that statistically favoured the cast posts.^{4,6} Therefore, the updated SMD of 0.9 is not an accurate reflection of the data and is heavily biased in favour of fiber posts.

One suspects that if the two extreme studies were removed, the adjusted SMD would be smaller with a confidence interval that crosses the point of no difference (SMD=0). Such an interpretation is consistent with many clinical studies.^{7,9} Fokkinga *et al.* followed 257 patients with post-restoration over 17 years and concluded that the clinical survival of post-and-core restoration had little to do with the post-and-core design and more to do with the preservation of natural tooth structure.¹⁰ Therefore, the choice between different post systems should not depend on the material used but on the clinical context of the tooth in question.

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