

**ARTICLE TITLE AND  
BIBLIOGRAPHIC  
INFORMATION**

Root canal posts for the restoration of root filled teeth.

Bolla et al.

Cochrane Database Syst Rev Jan 2007;24(1):CD004623.

**REVIEWER**

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**PURPOSE/QUESTION**

What is the failure rate of fiber posts compared to metal posts?

**SOURCE OF FUNDING**

Internal support from the Laboratoire Surface Interface en Odontologie (LASIO), France. There were no external sources of funding.

**TYPE OF STUDY/DESIGN**

Systematic review

**LEVEL OF EVIDENCE**

Level 2: Limited-quality, patient-oriented evidence

**STRENGTH OF  
RECOMMENDATION GRADE**

Grade B: Inconsistent or limited-quality patient-oriented evidence

**Carbon Fiber Posts may Have Fewer Failures Than Metal Posts**

**SUMMARY**

**Selection Criteria**

The authors searched MEDLINE, EMBASE, CENTRAL, and Scopus electronic databases through 2004 for eligible articles. The authors also searched International Association for Dental Research conference proceedings and abstracts from 1996-2004 and contacted manufacturers and other known experts to identify unpublished studies. Studies had to be randomized or quasi-randomized clinical trials (RCT) evaluating failures of endodontically-treated permanent teeth with different post types. This systematic review included one clinical study related to answering the primary objective, and this study involved 200 patients, 100 receiving a fiber post and 100 receiving a cast metal post. A second clinical study was included as related to a secondary objective and that study involved 117 patients, with 60 receiving a composite resin restoration as the definitive treatment after placement of a fiber post and 57 receiving a complete coverage metal ceramic crown as the definitive treatment after a fiber post had been placed.

**Key Study Factor**

The primary treatment of interest was the type of post used, metal versus non-metal. A secondary interest was the prosthetic status of the tooth, carbon fiber post followed by a composite resin restoration versus a carbon fiber post followed by a metal ceramic crown.

**Main Outcome Measure**

The main measure used to evaluate treatment effectiveness for the primary objective (metal versus non-metal post) and the secondary objective (composite resin definitive restoration versus metal ceramic crown) was post failure.

**Main Results**

Regarding the study addressing the primary objective, the fiber post resulted in fewer failures (0/97) than the conventional cast post and core system (9/98) after 4 years of clinical service. The risk ratio (RR) = 0.05, and there was a 95% confidence interval (CI) of 0.00 to 0.90. This study was judged to be at high risk of bias. Root fracture was the only failure encountered in the cast post and core group.

**Conclusions**

The results suggest fiber posts may be more successful than cast metal posts, but there were not enough RCTs to warrant a definitive recommendation.

**COMMENTARY AND ANALYSIS**

This is a well-designed and executed systematic review. The literature was appropriately searched using the authors' experience and external

individuals with search expertise to find randomized or quasi-randomized clinical trials using parallel group and split-mouth designs. However, MESH words were not identified in the review. Three studies were determined to be eligible, but two provided insufficient information, so the authors of the systematic review contacted the clinical study authors to obtain more information. One of the authors responded with additional information and the other did not, resulting in the inclusion of two studies. Unfortunately, only one study was available to answer the primary objective of comparing metal and non-metal posts, and only one study was available to answer the secondary objective related to the prosthetic condition of the definitively restored tooth after placement of a fiber post. The randomized clinical trial (RCT) inclusion criteria eliminated most of the studies containing clinical data related to the performance of fiber posts. There would have been more studies available had the inclusion criteria not been limited to RCTs, although this alteration would have lowered the scientific quality of the systematic review. I could not locate a specific description of exclusion criteria.

The one RCT<sup>1</sup> related to the primary objective indicated there were no post failures with carbon fiber posts, whereas 9 of 98 cast metal posts failed. However, this included study described some of the tooth preparation details used with the carbon fiber posts, such as length, but did not describe post diameter, the amount of ferrule used, and the amount of tooth structure remaining (walls of the tooth remaining). Additionally, there was no description related to the characteristics of the tooth preparations used with the cast metal posts.

Another recent systematic review<sup>2</sup> of post and core materials and systems included 10 studies and provided two different conclusions regarding fiber posts, depending on the type of metal post to which the fiber post was compared. One conclusion of this new systematic review was based on the same RCT<sup>1</sup> as one that was included in the Bolla systematic review, and the conclusion indicated that carbon fiber posts are significantly better than precious alloy *cast* posts. However, based on this same RCT,<sup>1</sup> the Bolla systematic review concluded there was weak evidence that carbon fiber posts have fewer failures than metal posts. The other conclusion of this new systematic review was also based on an RCT,<sup>3</sup> and the conclusion was that carbon fiber posts are significantly worse than precious alloy metal posts. This RCT<sup>3</sup> was not included in the Bolla review because it was non-randomized. It is interesting to note the differences between the two RCTs<sup>1,3</sup> upon which the two different conclusions were based in the newer systematic review.<sup>2</sup> The first RCT<sup>1</sup> had a mean study length of 3.8 years, whereas the second RCT<sup>3</sup> had a mean study length of 7.3 years, lending more potential credibility to the longer study length. However, the sample size of the second RCT<sup>3</sup> was very small (14 of the 16 fiber posts initially placed were followed for the

length of the study) compared to the first RCT.<sup>1</sup> These varying study characteristics confound the possibility of comparing the two RCTs. Neither of the RCTs provided complete information regarding the characteristics of the tooth preparations, the number of remaining walls, and ferrule dimensions for both the fiber posts and the control posts.

Reviewing the failure of carbon fiber posts in 12 clinical studies provides an interesting perspective into the challenges associated with drawing definitive clinical conclusions regarding fiber posts based on the available data. These 12 studies exhibit a wide failure range from zero after a mean postplacement time of 2.7 years<sup>4</sup> to a high of 35% after a mean postplacement time of 6.7 years.<sup>5</sup> Other reported failure rates were: 1.73% after 3 to 4 years,<sup>6</sup> 3% after a mean time of 2.3 years,<sup>7</sup> 2.8% after a mean time of 3.8 years,<sup>8</sup> 5% after a mean time of 3.8 years,<sup>1</sup> 7.2% after 7 to 11 years,<sup>9</sup> 7.7% after a mean time of 2.3 years<sup>10</sup>, 10% after a mean time of 7.2 years,<sup>11</sup> 10% after 1 to 5 years,<sup>12</sup> 6.5% after 1 to 3 years,<sup>13</sup> and 28.5% after a mean time of 7.3 years.<sup>3</sup> The variations in these data support the need for long-term randomized clinical trials comparing carbon fiber posts with traditional cast metal and prefabricated metal posts. There is also a need to determine the effect of post length, post diameter, amount of remaining tooth structure, and ferrule dimensions on the success of carbon fiber posts compared to metal posts. Both of these needs were appropriately pointed out in the Bolla systematic review.

The authors concluded in the current systematic review that more RCTs are needed before any substantive recommendations can be made to clinicians regarding the use of carbon fiber posts and their long-term clinical performance. This conclusion is scientifically justifiable since they only found one RCT in their search process.

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