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Root canal posts for the restoration of root filled teeth

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INTRODUCTION: The restoration of root filled teeth remains a major concern in dentistry[1]. Endodontic therapy is primarily performed on teeth with clinical crowns previously damaged by caries, previous restorative failure, or fractures[2]. Moreover decay and trauma may often induce an extensive loss of tooth structure. When a large amount of the clinical crown has been lost to damage, it is often impossible to achieve sufficient anchorage of a restoration in the remaining dentin. Thus, endodontically treated teeth with important tooth structure loss have to be restored with a root canal post and a core as foundation for the final restoration. The coronal prosthetic core can be built thanks to the presence of the post. However, the post and core systems do not strengthen the root, but rather serve to improve retention of the final restoration[3].

Once it has been decided to use a post system in restoring endodontically treated teeth, countless post designs and techniques are available[4].

Some authors recommend the use of cast post and core systems as a foundation for the reconstruction of endodontically treated teeth whereas some others prefer using non-metallic posts. To date, there is only one meta-analysis in this area that takes into account both in-vitro and in-vivo studies on anterior single-rooted teeth. We attempted to track down all clinical studies irrespective of tooth type (anterior and posterior teeth). This review compares the failure rates of different types of post and core systems currently used so that clinicians can be better informed.

MATERIALS AND METHODS: The primary objective of this study was to compare the clinical failure rate of different types of posts used for the restoration of endodontically treated teeth. Differences in the failure rate for the different post and core categories has been evaluated regarding:

- The tooth type and its location.
- The prosthetic status of the tooth.
- The presence of ferrule effect according to the margins of crown.
- The type of alloy in the case of metallic posts.
- The presence of diaphragm if cast posts are used.

Randomised or quasi-randomised clinical trials (with a minimum duration of 6 months) such as parallel group design and split-mouth design were considered for this literature review.

The type of participants was chosen as follow: patients with permanent teeth endodontically treated by a dental practitioner in hospital or private practice. For these teeth, a root canal post had been clearly indicated as the means of retention for the final restoration.

This review dealt with three categories of post:

- I: passive metallic custom-cast posts and cores.
- II: 2-element system comprising a commercial active or passive pre-shaped metallic post and a core built up from amalgam, glass-ionomer cement, resin-modified glass ionomer or composite resin.
- III: 2-element system comprising a commercial pre-shaped non-metallic post and a composite resin, a glass-ionomer cement or a resin-modified glass-ionomer core.

Studies using zinc phosphate, zinc polycarboxylate, glass ionomer and resin as luting cements for posts were included.

Studies where post and core systems have been used with different prosthetic status were included.

Studies where failures of endodontically treatment were considered were to be excluded.

The failure rate of different post and core systems has been assessed by clinical and radiographic examinations. Technical failures included: loss of retention, post fracture and root fracture.

The survival time for different types of post and core systems was assessed.

In order to find relevant studies meeting the inclusion criteria;

(1) Electronic searches of the Cochrane Oral Health Group's Trials Register, the Cochrane Central Register of Controlled Trials (CENTRAL) in The Cochrane Library, MEDLINE, EMBASE, SCIsearch, Ovid based on a predetermined keyword list have been done.

(2) Searches of reference lists from articles and reviews for additional relevant articles have been done.

(3) Dental conference proceedings have been looked trough and congress members have been contacted to track down any unpublished studies.
(4) Manufacturers, researchers and experts known to be involved in the field have been contacted in an effort to trace unpublished studies or published studies not found.
The search attempted to track down all relevant studies irrespective of language. Non-English papers have been translated.

Two persons independently examined the title, keywords and abstract of reports identified from electronic searching for evidence of three criteria:
(a) It is a randomised or quasi-randomised clinical trial.
(b) It involves the use of one post system compared to another or the use of one post system in different clinical situations.
(c) Failures are assessed only on endodontically treated permanent teeth after root canal post cementation.
If the report fulfilled these three criteria or if one or both reviewers were not able to assess this from the title, keywords or abstract then the full article has been obtained.
Screening of full-text articles, decision about eligibility and data extraction have been carried out independently by three reviewers. Any disagreement between the three reviewers has been resolved by discussion with a fourth reviewer.
When authors have published several articles concerning the same study, only the last was taken into account.
The authors have been contacted for additional information if necessary.

The methodological quality of included studies has been assessed using the criteria described in the Cochrane Reviewers' Handbook 4.1.5 (Clarke 2002) concerning allocation concealment. A quality assessment has been carried out for all studies fulfilling the inclusion criteria.

RESULTS: The keyword searching through the different databases highlighted a total of 3668 articles. Of these, 3628 were excluded regarding title or abstract. From the 40 collected studies, 27 were excluded from further analysis:

- 12 articles did not fulfil our inclusion criteria.
- 15 others were about the following of one group of participants.

The 13 articles left (to be included in the meta-analysis) were:

- Controlled clinical trials: 9 articles
- Randomised clinical trials: 4 studies

The comparison of the failure rate between cast posts and fibre posts did not show any significative difference, neither did the comparison of the failure rate between cast posts and metallic prefabricated posts.
The results showed higher failure rate on anterior teeth regardless to the post type (cast posts or fibre posts). The failure rate was also higher when the tooth was part of a partial denture (fixed or removable).
No significative difference was shown regarding the tooth location.

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