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# An Evidence based Decision Analysis for Criteria for Selection of Post Endodontic Restoration

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**Abstract**

Teeth that are affected by caries, multiple repeat restorations and/or fracture are advised Endodontic therapy. Structurally weakened teeth, are often further weakened by the endodontic procedures that are designed to ensure optimal access and restorative procedures necessary to rebuild the lost tooth structure. Loss of dentinal fluid tends to alter the properties of the tooth. Therefore, it is considered that endodontically treated teeth are weaker and tend to have a lower prognosis compared to natural teeth. They require special considerations in context to the final restoration, especially in cases of extensive loss of tooth structure. The special needs are to be fulfilled to attain both adequate retention for the final restoration and provide maximum resistance to tooth fracture as well. Retention and resistance features for the final restoration are collectively termed anchorage. Ensuring optimal anchorage while maintaining adequate root strength for particular clinical situation can be challenging and the problems encountered have resulted in the development of many different materials and techniques. This decision tree analysis focuses on the various options available of restoring Endodontically treated teeth and will thereby help the clinician in the decision making process.

## INTRODUCTION

Despite the abundance of literature on this topic, much controversy remains, particularly in the area of post Endodontic restoration . New concepts that require further analysis are rapidly used, before widespread acceptance can be recommended. Definitive clinical research such as randomized controlled clinical trials is lacking in this aspect, there are a few significant retrospective analyses of survival as well as failure of endodontically treated teeth, along with some key laboratory studies, that have identified the major factors that affect overall prognosis. Although the vast majority of in vitro studies have compared different types of posts, core materials and luting cements, these are considered of far less importance than the amount and quality of the remaining coronal tooth structure (1,2). Although there are many new materials available for the restoration of pulpless teeth, the prognosis of these teeth relies primarily on the application of sound biomechanical principles rather than on the materials used for restorations (3).

The purpose of this article is to review the current principles for restoring endodontically treated teeth, based on the best evidence available.

Endodontically treated teeth are weakened due to decreased or altered tooth structure attributed to:

- caries and/or previous restorations
- fracture or trauma
- Endodontic access and instrumentation
- decreased moisture

This weakness is directly correlated to the quality and quantity of lost dentine.

### Criteria for post selection

Posts helps reinforce the remaining coronal tooth structure but post preparation can significantly weaken the root. Unrealistic expectations using large, wide posts in severely compromised teeth with little or no residual crown structure will fail for a variety of reasons but typically by catastrophic root fracture.

This causes patient dissatisfaction, particularly if used they are used as the foundation for crowns, bridges or other rehabilitation. Without providing adequate circumferential tooth structure, occlusal forces get directed internally towards the root therefore creating a wedge effect and increasing the likelihood of root fracture. Other consequences of lack of ferrule include cement fatigue and post loosening due to decementation.

The Consequences of Inadequate Ferrule includes:

- Root fracture
- Decementation of the post due to cement failure
- Post fracture

Since posts are frequently are said to cause root fracture, their use is under significant current debate and there is a definite trend set to reduce post usage. Without clear guidelines from definitive research, specific factors for the individual tooth and clinical situation require careful consideration. The decision regarding the need for a post will depend on a) the size and position of the tooth in the arch, b) the amount of coronal tooth structure remaining, c) the functional requirements of the tooth, and d) the canal configuration (4). While recognizing the inherent tendency

of posts to weaken the root, they are still indicated for the majority of single or double-rooted bicuspid and anterior teeth that are to receive a crown (3). They provide retention for the core restoration and can contribute to the reinforcement of endodontically treated teeth by supporting remaining coronal tooth structure (5).

I. Anterior Teeth

If placement of a crown is not necessary for esthetic or functional reasons, then it is unnecessary to place a post in the tooth. There is an increased potential for weakening of the root due post preparation.Anterior teeth with minimal access restoration and no post and crown provided is said to have greater resistance to fracture under cyclic loading in vitro in comparison to crowned teeth with post-core restorations (6,7,8). Bonded composite restorations are appropriate for such clinical situations. Intra-coronal and/or extra- coronal bleaching can be considered for the relatively sound, but discoloured anterior tooth to prevent extra-coronal tooth preparation. The risk of resorption due caused due to intracoronal bleaching can be prevented by placing a layer of resin modified glass ionomer restoration at the base of the pulp chamber which hence prevents leakage to the periodontal ligament.

If a crown is required due to extensive loss of tooth structure, then a post is advisable for anterior teeth, due to the shearing forces that act upon it alongside their narrow tooth dimensions. Extra-coronal crown preparation combined with endodontic access preparation tends to weaken the cervical area of anterior teeth. The remaining amount of tooth structure and functional demands of the tooth will determine the absolute need. A large, bulky anterior teeth with minimal access preparation may not always require a post placement. If in doubt, it is better to complete the crown preparation first to therefore allow complete assessment of the remaining tooth structure. In situations where the strength of the remaining tooth structure is borderline, then a post is indicated (4) (Fig. 1).

II. Posterior Teeth

Crowns or cusp coverage is recommended for posterior teeth since these have high chances of tooth fracture. The coronal-radicular restorative needs however differ when we compare molars and premolars.

(1) Molars

Molar teeth do not necessarily require a post unless there has been significant loss of tooth structure. A core buildup with silver amalgam utilizing the pulp chamber, and possible 2 mm canal extensions, has proved very effective in vitro and in vivo (9,10). The anchorage that is provided by a core utilizing the pulp chamber is considerable and posts should therefore be avoided in these situations. Bonded composite is considered to be equally effective in providing optimal polymerization in deeper layers by use of either incremental or bulk insertion of a photo-polymerized composite or an auto-cured composite core restoration. Adequate mechanical retention continues to be necessary in the current adhesives available. Both amalgam and bonded composite cores require a minimum of 1.5-2 mm height of ferrule after crown preparation. For single crowns, some relaxation of the ferrule rule can be applied in the interproximal aspect where previous proximal restorations extend gingivally, as long as the core restoration provides anchorage, the proximal margins are placed on sound tooth structure, and the facial and lingual tooth surfaces provide optimal ferrule (11). Core buildup without a post, has been standard teaching for molar teeth for many years and has been extremely successful. In situations, with less than 2/3rds of tooth structure remaining, clinicians advise endocrown/overlay thus preserving the root canal space and preventing the use of posts. It is not recommended for maxillary premolars due to the limited dimensions of the pulp chamber and root canals since it does not provide space for the adequate bulk of material to prevent fracture.

The placement of pins in endodontically treated teeth is not advised since it causes stress cracks during placement. Existing sound pinned restorations can be incorporated into the core restoration. In the absence of a pulp chamber, a post may be required; however, this usually suggests that there is minimal tooth structure remaining and that the prognosis for the tooth is poor. An optimal circumferential ferrule is therefore essential for post endodontic restoration to last. Generally the largest, straightest canal is utilized for the post placement. The palatal of maxillary molars and the distal of mandibular molars are preferred since these are the largest of the canals in posterior teeth. Post space preparation is contraindicated in the curved, narrow mesial canals of mandibular molars and the mesiobuccal canals of maxillary molars (12) (fig. 1).

(2)Premolars

Posts are generally considered necessary for Premolar teeth due to the presence of smaller diameter and the high shear stresses acting upon them, particularly for steep-cusped maxillary teeth (13,14). These are a common site of endodontically treated tooth failure, therefore representing a unique sub-group with a high prevalence of failure. Without extra-coronal support these are prone to cusp or root fractures. Similar to anterior teeth, the slender cervical circumference and concave mesial anatomy is greatly weakened through the combination of extra-coronal tooth preparation and access preparation. Placement of a post with the core becomes necessary for adequate anchorage in these teeth. Minimal enlargement and shaping of the canal is advised during post space preparation due to their anatomical considerations including thin mesio-distal dimensions and proximal root invaginations (15).

Mandibular bicuspids are similar to small molar teeth with short crowns and decreased cusp although inclination. They tend to receive more vertical forces and less shearing forces. The need for extra-coronal support will be based on the amount of tooth structure loss and their anticipated functional forces. If a crown is required, the need for a post will be based on the amount of peripheral sound dentine remaining after crown preparation. Those with a large pulp chamber may be adequately restored with a core alone. Steep-cusped teeth with increased function and teeth that act as abutments will require a post (16) (fig. 1).

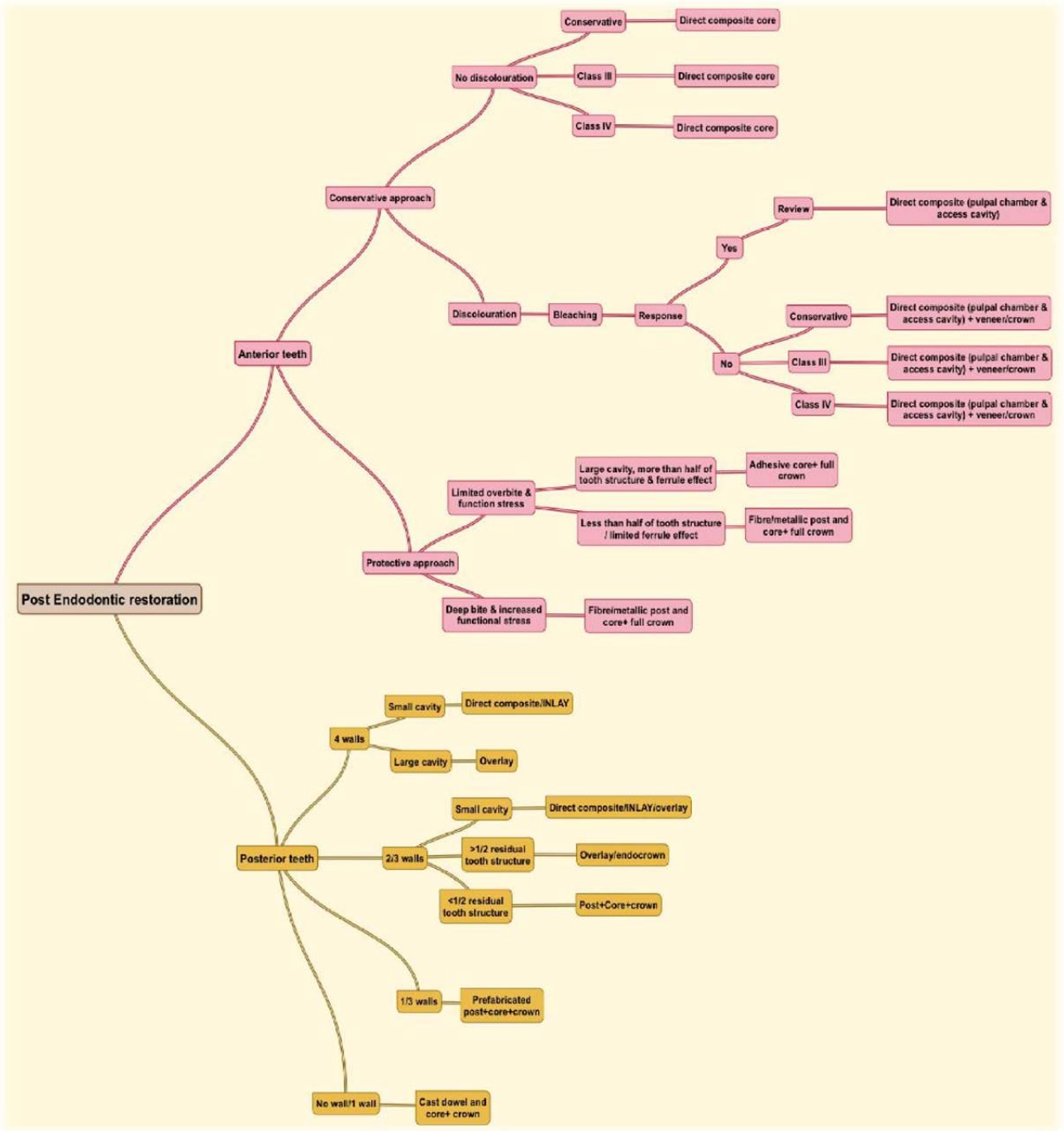


**Figure 1**: Decision tree analysis for Criteria for selection of Post Endodontic restoration

## DISCUSSION

Comprehensive treatment planning often involves decisions concerning the need for, and advisability of endodontic treatment (initial or retreatment) within the overall clinical picture for the patient. Endodontic treatment is a significant investment, particularly for a tooth that will require a core and crown. Therefore the overall situation must be assessed to ensure a good long- term prognosis. Approaching this decision with a systematic approach can help simplify a sometimes complex issue.

## CONCLUSION

Restoration of teeth after endodontic treatment is becoming an integral part of the restorative practice in dentistry. Pulpless teeth require restorations that both conserve and protect remaining tooth structure. Clinical success depends on application of sound biomechanical principles for the specific tooth and clinical situation.

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