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INDIVIDUAL POSTS AND CORES IN PROSTHODONTICS

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Abstract: The restoration of endodontically treated teeth remains a significant challenge in restorative dentistry and prosthodontics. Extensive loss of coronal tooth structure often necessitates the use of intracanal retention systems to provide adequate support for definitive restorations. Individual posts and cores, also known as custom-made post-and-core restorations, have long been regarded as a reliable treatment option for severely damaged teeth. These restorations are fabricated to fit the unique anatomy of the root canal and residual tooth structure, thereby improving retention, stability, and distribution of functional forces. This article reviews the indications, advantages, disadvantages, materials, fabrication techniques, clinical procedures, and contemporary considerations associated with individual posts and cores in prosthodontic practice.

Keywords: Individual post, custom cast post and core, prosthodontics, endodontically treated teeth, dental restoration.

Introduction

Endodontically treated teeth frequently exhibit significant structural loss due to caries, trauma, previous restorations, or access cavity preparation. Such teeth often require additional reinforcement before receiving definitive prosthetic restorations. Posts are commonly used to retain core materials within the root canal, while the core serves as a foundation for the final crown restoration.

Among various post systems available today, individual or custom-made posts and cores continue to play an important role in restorative dentistry. Unlike prefabricated posts, custom posts and cores are specifically designed to match the morphology of the prepared root canal. This adaptation provides superior retention and stability, particularly in teeth with irregular canal anatomy or extensive coronal destruction.

The purpose of this article is to discuss the principles, indications, fabrication methods, advantages, disadvantages, and clinical applications of individual posts and cores.

Historical Development

The concept of using intracanal retainers dates back to the eighteenth century when wooden and metallic dowels were inserted into root canals to support artificial crowns. Over time, improvements in dental materials and casting techniques led to the development of custom cast posts and cores.

During the twentieth century, cast gold post-and-core restorations became the gold standard for restoring severely damaged endodontically treated teeth. Although modern fiber-reinforced posts have gained popularity due to their favorable biomechanical properties, custom cast post-and-core restorations remain indispensable in selected clinical situations.

Definition and Components

An individual post and core is a one-piece restoration fabricated specifically for a particular tooth. It consists of two major components:

Post

The post extends into the prepared root canal and provides retention for the core. It occupies a portion of the root canal space that was previously filled during endodontic treatment.

Core

The core replaces missing coronal tooth structure and serves as the foundation for the final crown restoration. The core reproduces the shape necessary for proper crown preparation.

Because the post and core are fabricated as a single unit, they exhibit excellent structural integrity and resistance to dislodgement.

Indications

Custom-made posts and cores are indicated in the following situations:

1. Extensive loss of coronal tooth structure.
2. Teeth with irregularly shaped or flared root canals.
3. Endodontically treated teeth requiring full-coverage crowns.
4. Teeth subjected to high occlusal loads.
5. Cases where maximum retention is required.
6. Situations in which prefabricated post systems cannot provide adequate adaptation.

Commonly treated teeth include maxillary incisors, canines, and premolars with severe structural destruction.

Contraindications

Custom posts and cores may be contraindicated in the following conditions:

1. Inadequate root length.
2. Vertical root fractures.
3. Poor periodontal support.
4. Severely curved or narrow canals.
5. Insufficient remaining root structure.
6. Teeth with unfavorable crown-to-root ratios.

Proper case selection is essential for long-term success.

Materials Used

Several materials may be used for fabricating individual posts and cores.

Gold Alloys

Gold alloys have historically been considered the ideal material due to their excellent corrosion resistance, biocompatibility, and casting accuracy.

Advantages include:

Excellent fit.
Long clinical service life.
Good biocompatibility.

Disadvantages include:

High cost.
Poor esthetics in anterior regions.
Base Metal Alloys
Nickel-chromium and cobalt-chromium alloys are frequently used alternatives.
Advantages:

High strength.
Lower cost compared with gold alloys
Disadvantages:
Greater rigidity.
Potential biocompatibility concerns in susceptible individuals.
Zirconia and CAD/CAM Materials
Modern digital dentistry has introduced zirconia-based custom post systems.
Advantages:
Superior esthetics.
Excellent biocompatibility.
Disadvantages:
Difficulty of removal during retreatment.
Increased brittleness compared with metal systems.

Design Principles

The success of individual posts and cores depends on adherence to several biomechanical principles.

Post Length

The post should generally be equal to or greater than the clinical crown length while maintaining an adequate apical seal. A minimum of 4–5 mm of gutta-percha should remain in the apical portion of the canal.

Post Diameter

Increasing post diameter does not significantly improve retention but may weaken the root structure. Therefore, excessive enlargement of the canal should be avoided.

Ferrule Effect

A ferrule refers to a circumferential band of sound tooth structure extending coronally above the crown margin. A ferrule height of at least 1.5–2 mm significantly improves fracture resistance and restoration longevity.

Fabrication Techniques

Direct Technique

In the direct technique, a pattern is fabricated directly within the patient's mouth using pattern resin.

Steps include:

1. Removal of gutta-percha.
2. Canal preparation.
3. Lubrication of the canal.
4. Fabrication of resin pattern.
5. Core contouring.
6. Removal and inspection of the pattern.
7. Casting procedure.
8. Finishing and polishing.

Advantages:
Accurate adaptation.
Reduced laboratory errors.

Indirect Technique

The indirect technique involves taking an impression of the prepared canal and fabricating the pattern on a working cast.

Advantages:

Increased patient comfort.

Easier laboratory manipulation.

Disadvantages:

Additional laboratory procedures.

Potential impression inaccuracies.

Clinical Procedure

The clinical protocol generally includes the following steps:

1. Endodontic Evaluation

The quality of root canal treatment must be assessed radiographically.

2. Post Space Preparation

Gutta-percha is removed while preserving the apical seal.

3. Canal Shaping

The canal is prepared using dedicated post drills and instruments.

4. Pattern Fabrication

A direct or indirect pattern is produced.

5. Casting and Finishing

The restoration is cast in the selected alloy and polished.

6. Cementation

The completed post and core is cemented using conventional or resin cements.

7. Crown Fabrication

A definitive crown is fabricated and placed over the prepared core.

Advantages of Individual Posts and Cores

Custom-made post-and-core restorations offer several benefits:

Excellent adaptation to canal anatomy.

High retention and stability.

Suitable for extensively damaged teeth.

Reduced thickness of cement layer.

One-piece construction minimizes component separation.

Long-term clinical success.

Disadvantages

Despite their advantages, several limitations exist:

Multiple clinical appointments.

Laboratory costs.

Increased treatment time.

Potential root fracture due to high stiffness.

Difficult retrieval during endodontic retreatment.

Inferior esthetics compared with fiber posts.

Clinical Success and Prognosis

Numerous clinical studies have demonstrated favorable long-term outcomes for custom cast post-and-core restorations when appropriate case selection and treatment protocols are followed. Factors influencing success include ferrule presence, root morphology, occlusal forces, periodontal health, and quality of endodontic treatment.

Failure may occur due to:
Root fracture.
Loss of retention.
Secondary caries.
Crown failure.
Endodontic complications.
Regular follow-up examinations contribute significantly to restoration longevity.
Contemporary Perspectives

The introduction of fiber-reinforced composite posts has altered restorative approaches for endodontically treated teeth. Fiber posts possess an elastic modulus closer to dentin and may reduce the risk of catastrophic root fracture.

Nevertheless, custom cast post-and-core restorations continue to be preferred in cases involving severely damaged teeth, flared canals, and situations requiring maximum retention. Modern CAD/CAM technologies are also expanding the possibilities for individualized post-and-core fabrication.

Conclusion

Individual posts and cores remain an important restorative option in contemporary prosthodontics. Their ability to precisely adapt to root canal anatomy provides excellent retention and support for definitive restorations. Although newer post systems have emerged, custom-made post-and-core restorations continue to demonstrate predictable clinical performance, particularly in complex cases with extensive tooth structure loss. Careful diagnosis, proper treatment planning, adherence to biomechanical principles, and meticulous clinical execution are essential for long-term success.

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