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Case Report

Recreating an Esthetically and Functionally Acceptable Dentition Using Post and Core Restorations- A Case Report

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ABSTRACT

Patients today demand a youthful, attractive smile with comfortable functional acceptance. A 21-year-old female with complaint of pain in her upper front teeth and crowding with the same was treated with endodontic treatment followed by fiber-reinforced post and metal-ceramic restoration. The fiber reinforced restoration gives esthetically pleasing and biologically superior outcome.

Key words: Post and core; Fiber-reinforced post; periapical radiolucency.

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INTRODUCTION

Reconstruction of endodontically treated teeth is a great challenge in restorative dentistry since the tooth crown is usually totally or partially lost by caries, erosion, abrasion, previous restorations, trauma or endodontic access.

When there is maximum destruction of coronal tooth structure a dowel and core restoration is required as foundation restoration of a crown.¹The indications for a post and core restoration are tooth with extensive crown loss, crown susceptible to cervical area fracture, grossly discolored tooth, loss of two proximal surfaces, shortened tooth with insufficient retention form with favorable periodontal and periapical condition. The endodontic procedures tend to reduce tooth stiffness by 5-45% and mesio-occluso-distal preparation decreases the stiffness by 60%.² Water loss and loss of collagen cross-linking are the factors associated with brittleness of dentin of endodontically treated teeth. The tooth to be restored should exhibit a good apical seal when evaluating the radiograph, and also exhibit no sensitivity to percussion or palpation, no exudates, no fistula, no apical sensitivity, and no active inflammation.³ Generally, endodontic failure occurs due to

technical and pathological factors or it is influenced by systemic factors. The prevention of further complications coming from the maintenance of unsatisfactory endodontic treatment in a tooth that will support an intraradicular post and core and a fixed crown, demands the immediate root canal opening and justifies the retreatment necessity.³ The basis of success in teeth retreatment with failed primary endodontic treatment is the removal of various materials from the root canal – guttapercha, broken endodontic instruments, silver points. This frequently can be metal posts placed in root canals in teeth with large destruction of the clinical crown. Their removal is of essential importance for accessing endodontic space and total cleaning and disinfection of the root canal system.⁴ Strictly, all tooth, with or without the pulp vitality, is important for the stomatognathic system. Often, the tooth is so valuable that its removal will develop certain conditions and solutions even more complicated.^{5,6} Present case report describes 21-year-old female with complaint of pain in her upper front teeth and crowding with the same was treated with endodontic treatment followed by fiber-reinforced post and metal-ceramic restoration.

CASE REPORT

A 21-year-old female patient reported to the Department of Conservative Dentistry and Endodontics DR. D.Y. Patil Dental College and Hospital, Pimpri, Pune with a complaint of pain in her upper front teeth and crowding with the same. Patient gave history of pain and discoloration in her upper front teeth since last 2 months. Patient experienced pain which was mild and continuous and aggravates while taking hot and cold food stuff and lasted for 2-3 minutes. Patient also complains of crowding in the upper front teeth and wants correction for the same.

Pain on percussion was observed with respect to 11 & 21. Provisional diagnosis of chronic irreversible pulpitis with 11 & 21 was made. Pulp sensitivity test using hot and cold which revealed that 12,13,22&23 showed response where as 11 & 21 showed delayed response. Radiographic examination showed class III caries with 11 and 21 with Periapical radiolucency with 11. (Figure 1) Final diagnosis of pulpal necrosis caused by dental caries was made.



Figure 1: Pre-operative radiograph showing periapical radiolucency seen with 11

The patient was in good general health, the medical & dental histories were non-contributory. Treatment planning was done after a thorough clinical examination. Root canal treatment with 11 and 21, Intentional Root canal treatment with 12, 22 with cast metal post followed by PFM crown /Ceramic crown/Veneer in order to improve the smile and enhance esthetics

PROCEDURE

1. Root canal treatment done with 11&21.
2. Canal patency was achieved with no.10 k file Working length was taken with the help of apex locator (J morita Root ZX) and evaluated radiographically
3. Working length of 11 was 21.5 mm and 21 was 22 mm.
4. Cleaning and shaping was done
5. The canal was prepared apically till #50 k file using step Back technique
6. Coronal flaring was done using no. 60 H file
7. The canal was irrigated with 3% sodium hypochlorite and saline intermittently
8. Intracanal medicament of calcium hydroxide dressing RC Cal (Prime Dental) was given
9. Temporary restoration was done (Cavit 3M)
10. Final cleaning and shaping was done

11. The canal was irrigated intermittently with sodium hypochlorite (3%) and saline.
12. Final wash was done with 17% EDTA
13. Then obturation was done with 11 and 21 by lateral compaction technique.
14. Mock Up On Plaster Model
15. Post Cementation Done
16. Shade Selection Done For Crown
17. Impression Was Taken With Polyvinyl Siloxane Impression Material (3m)
18. Picture after Crown Placement



Figure 2: Radiograph with 12



Figure 3: Radiograph with 22

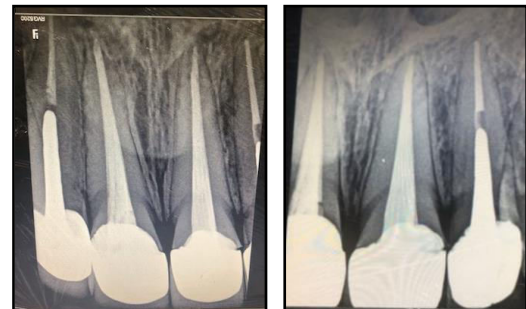


Figure 4: Intraoral photograph and radiograph after post cementation



Figure 5: Photograph after placement of crowns labial and occlusal views



Figure 6: Photograph after one year follow up

DISCUSSION

Smile Designing is one of the most sought after treatment in today's times. With smile design, the effects are nearly instantaneous – it can restore tooth to their former pearly appearance, helping the patient feel better about his/her smile.

Smile Designing treatment makes use of some of the procedures including Cleaning, Bleaching, Bonding, Veneers, Bridges & Crowns, Gum Lifting, Extraction, Dental Braces, Laminates and Dental Implants. Smile design/esthetic dentistry can be used in case of the following.

- Uneven or disproportionate tooth
- Chipped, broken or rough edged tooth
- Missing tooth or gaps between tooth
- Red, swollen, receded or bleeding gums
- Crowded, overlapping or crooked tooth

In this case root canal treatment with 11 and 21 was done followed by intentional root canal treatment with 12 & 22 and dental esthetic improvement with the help of a dental custom metal post and core placement followed by the prosthetic crown.

This treatment option was selected as the patient was not willing for orthodontic treatment and this treatment option was cheaper and less time consuming. A post and core is a prosthetic device that is utilized when there is inadequate tooth structure remaining to support a traditional restoration or an artificial crown. A great deal of a dental crown stability depends on the amount of tooth structure that extends into its interior. If very little tooth structure occupies this space, the crown will be easily dislodged, especially by forces directed at its side. Basically, the core is rebuilding the tooth so it is closer to its original dimensions. Hence, the crown's retention and stability will greatly increase, and therefore its long-term chances for success are maximized.^{1,5,6}

Cast post and cores are utilized when a prefabricated post does not conform to the shape of the post space. A cast post and core is a one-piece unit that is custom fabricated for the tooth at the dental laboratory. There are two ways of constructing a cast post and core: The direct method and the indirect method, which involves a dental impression. After the fabrication, the cast post and core is cemented inside the canal space with luting cements. The metal core is shaped so it resembles a prepared tooth. After cementation, an impression taken for the fabrication of the prosthetic crown.⁶⁻⁹

Materials

Cast post and cores can be made of various metal alloys: gold, titanium or another metal. Where a metal post could be difficult to conceal, a custom post made of zirconia can be constructed; its tooth colour leaves less of a shadow under the final restoration. When metal alloys are used, the post and core is fabricated using a wax technique. Zirconia post and cores are manufactured with the CAD/CAM system.^{8,9}

Cementation

After completion, the dental technician sends the post and core to the dental practice for the definitive cementation. Cast post and cores are cemented inside root canals with dental cement or composite resins. The materials are placed inside root canals with Lentulo files. After the post and core is cemented, an impression is taken for the fabrication of the prosthetic crown.

Various luting agents are used for post cementation:-

- Zinc phosphate cement
- Polycarboxylate cement
- GIC
- Resin based cement

Dental Crowns and dental bridges are closely linked. Basically, dental crowns are the building blocks of dental bridges. These crowns are permanently cemented on the abutment teeth to ensure proper support. Over the years, many manufacturing materials have been suggested. They

have constantly improved their qualities, leading to materials with excellent strength and aesthetics. Mainly, the materials used for dental restorations must have two qualities :

- 1) Strength and durability
- 2) Aesthetics

a. Porcelain fused to metal

b. Porcelain fused to zirconium

c. All ceramic restorations

Zirconium or zirconia is an extremely durable material that has a white color. Large dental restorations can be manufactured using zirconium, but because of its restricted range of shades, it cannot be used, alone, in areas where aesthetics is a very important factor. In this case the cast post was thus used as a lingually inclined post was required for the dental esthetic correction. The metal core was shaped accordingly such that it resembles prepared tooth. Then after cementation with resin bonded glass ionomer cement RMGIC(3M), an impression was taken with polyvinyl siloxane impression material (3M) and was sent to the lab for the fabrication of the prosthetic crown. Porcelain fused to metal reconstructions are widely used in dentistry. Porcelain fused to metal restorations have a metal shell on which porcelain is fused in a high heat oven. Porcelain can cover the metal core on all sides, leaving no parts of the metal visible. Another variation is that crowns are made with a *partial veneer* that covers only the aspects of the crown that are visible while the remaining surfaces of the crown are bare metal. The thickness of the ceramic layer is 1.5 to 2 mm depending on the area of the tooth. It has a very good resistance to chewing forces and great aesthetics. There is a huge range of colors, with the possibility of combining them. Consequently, porcelain will give the crown a tooth-like appearance and can be color matched to the adjacent teeth or gingivae. Moreover, porcelain has a translucency that resembles the enamel, which highly improves its appearance.

If pain, swelling or other symptoms arise in the first days after cementation, it is more likely the consequence of the endodontic therapy conducted prior to post fabrication. Normally, these symptoms go away after a few days.

1. Endodontic failure

- Endodontic failure is one of the major concerns when designing a post and core device. Because the post is placed within the root canal, the tooth must first be endodontically treated.
- First, there is the failure risk inherent to any endodontic treatment. Secondly, when the root canal is prepared for the post and core, it is important to leave at least 4 mm of root canal filling at the apex of the root canal.
- Otherwise, the chances of microleakage and percolation of microbes are greatly increased, thereby increasing the likelihood of an endodontic failure.

2. Root fracture

- This accident is caused by an inappropriate post selection. In most of the cases, it is indicated to use the narrowest and longest post possible. This will ensure that the forces transmitted from the crown are distributed over as much of the root as possible and enough tooth structure is left to support the post and absorb the transmitted forces.
- On the other hand, threaded posts actively engage the internal walls of the root canal as they are screwed in, and thus produce high forces on the brittle root structure thereby increasing the risk of root fracture.

3. Post and core detachment

The post can easily detach if the consideration of crown-to-root ratio is overlooked. It is desirable that the post descends not less than the height of the crown inside the root canal. If, for example, the post is 15 mm long, but only extends 4 mm into root structure, the restoration will have a poor prognosis. In these conditions, even if the post is re-cemented inside the root canal, the restoration prognosis will not change.

4. Post and core fracture

This is a rare accident and is caused by selecting a post that is too short or too thin. If the post fractures at any level, it must be re-fabricated.

ESTHETIC IMPROVEMENT

Dental esthetics could have been better with the help of zenith placement and gingival contouring but it is important to keep in mind that posts do not strengthen teeth as in past decades there was a misconception that metallic dental posts played a role in reinforcing or strengthening the teeth in which they were placed.

Dental research has since shown that posts offer no reinforcement benefit and, in fact, can actually weaken teeth and place them at risk for fracture. This does not suggest that post placement is a wrong therapeutic approach. However, a dental post should be utilized only when a large part of the crown structure is missing and no other affordable solutions are available. Before commencing with any treatment, it is wise to fully consider all the various treatment options. When the choice is endodontic nonsurgical retreatment, then the goal should be to access the pulp. The practitioner's ability to accurately assess the restorative, endodontic and periodontal outcomes will result in successful retreatment plans.

CONCLUSION

Esthetic treatment planning, or "smile designing," has become an integral part of today's dental treatments. Improving the smile is no longer a by-product of a treatment plan, but is actually the goal of modern dental therapy. The biggest challenges for the dental practitioner come in creating esthetic outcomes for complex cases that involve

various disciplines of dentistry. A systematic approach to planning and sequencing treatment can eliminate guesswork from the equation, and empower a practitioner in creating predictable results. A comprehensive esthetic treatment plan enables the dentist to visualize the final outcome from biologic, functional, and esthetic perspectives. A multidisciplinary approach with a definitive treatment plan can salvage case. The treatment described in this case report requires commitment and motivation from the patient and the dentist in order to achieve a satisfactory result.

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