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Biological Post- A case series

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Abstract

Ideal coronal restoration of an endodontically treated tooth is still a challenge for restorative dentistry. Better retention and stability of coronal restoration can be achieved using posts made from different materials such as carbon fiber, fiber glass, metal and ceramic. The ideal properties of post material should exhibit the modulus of elasticity, compressive strength, thermal expansion, and aesthetics similar to that of dentin. It should also bond predictably to root dentin. Biological or dentinal post made of human extracted tooth provide resilience comparable to the natural tooth. It also provides good adhesion to the tooth structure by composite resin. The use of biological post can be considered as a novel alternative technique for the rehabilitation of an extensively damaged tooth. In this case report "Biological post" was prepared and used for the reinforcement of extensively damaged endodontically treated teeth. A freshly extracted human maxillary cuspid was used to prepare a dentinal post in this case and cemented with dual cure resin cement after being verified into the post space. Dentinal posts are considered a good alternative to conventional post systems.

Keywords: Dentinal post, intra-radicular post, custom post

Introduction

Traumatic injuries that lead to fracture of anterior teeth, frequently occurs in dentistry. Onetto et al. conducted a study on children and adolescents and reported that 16–30% of these individuals sustain dental trauma more than once[3,4,6,7] and the prevalence of anterior teeth fracture, as a result of traumatic injuries, occurs 8.1 in 1000.[2] Treatment

of fractured teeth due to trauma depend upon the amount of teeth structure loss. When fracture leads to loss of half or more than half of coronal tooth structure than a satisfactory option to restore these teeth by post and core technique, and various aesthetic materials such as composite and porcelain.[9] Ideally the post material should have physical properties such as modulus of elasticity, thermal expansion and aesthetics that are close to dentin and additionally should bond very well with the dentine.[15] But till date there is no material that has been proved to be as effective as natural structure considering mechanical as well as biological properties.[20] Various post systems have been used such as custom made cast post or prefabricated posts such as fibre glass, carbon fibre, metal and ceramics. However, the moduli of elasticity of these posts are 4-7 times higher than that of the dentine and hence have showed higher failure rate in anterior teeth.[13]

Biological or dentinal post made of human extracted tooth provide resilience comparable to the natural tooth. It also provides good adhesion to the tooth structure by composite resin. The use of biological post can be considered as an alternative technique for the rehabilitation of an extensively damaged tooth.

In this case report “Biological post” was prepared and used for the reinforcement of extensively damaged endodontically treated teeth. A freshly extracted human maxillary cuspid was used to prepare a dentinal post in this case and cemented with dual cure resin cement after being verified into the post space.

Case Report

Case 1: A 32-year-old male patient was referred to the Department of Conservative Dentistry and Endodontics with a chief complaint of decayed and broken upper front teeth. Clinical examination revealed deep dentinal caries in tooth number 11 and 21. 11 and 21 showed discolouration. There was tenderness to percussion, delayed response to pulp vitality test and the mobility of the teeth were within normal physiologic limits. Intraoral periapical radiograph revealed slight widening of the periodontal ligament space with respect to teeth number 11 and 21. The diagnosis of chronic irreversible pulpitis with apical periodontitis was made. All treatment options were explained, and the patient gave consent to restore the teeth with biological post made from a freshly extracted premolar. Endodontic treatment was initiated. Obturation was done using Gutta Percha and root canal sealer. Post space was prepared using Peeso reamers and 5mm of apical seal was preserved. A freshly extracted, intact premolar was chosen. The tooth was cleansed and subjected to autoclaving at 121^0C for 15 mins at 15 lbs. The extracted tooth was sectioned buccolingually along the long axis using a diamond disk. Coronal enamel and radicular cementum was removed. Contouring of the sectioned tooth into a dentin post and core was done with the help of a tapered fissure bur. Following satisfactory adaptation of the biological post clinically and radiographically, the post was acid etched and stored in chlorhexidine to avoid any infections. Post was then cemented in the root canal using a dual-cure resin followed by core build up.

Fig 1: Pre-operative image

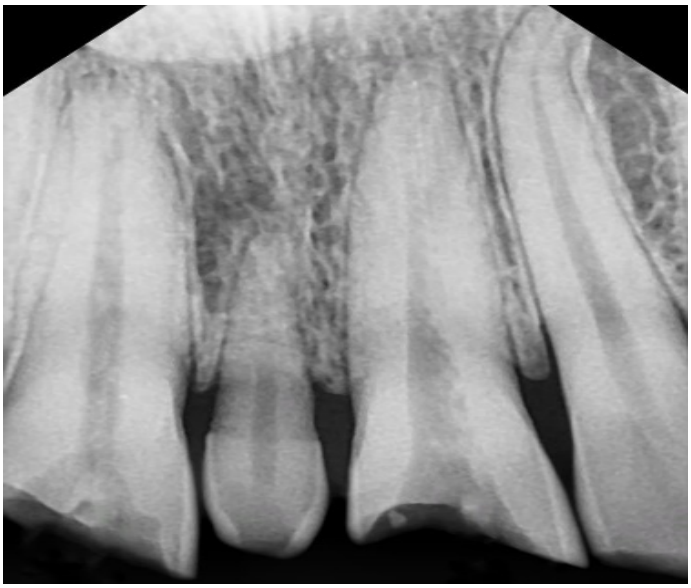

Fig 2: Pre-op IOPAR

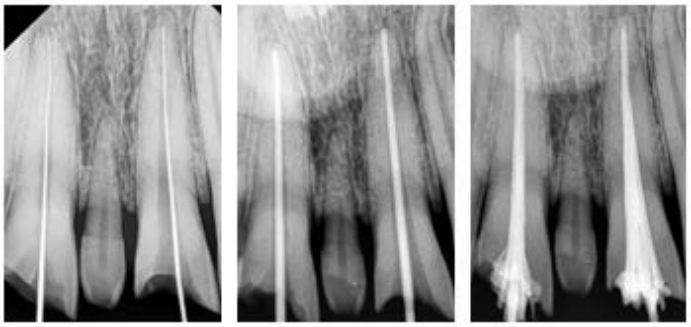

Fig 3: Working length, Master cone selection, Obturation

Fig 4: Freshly extracted premolar

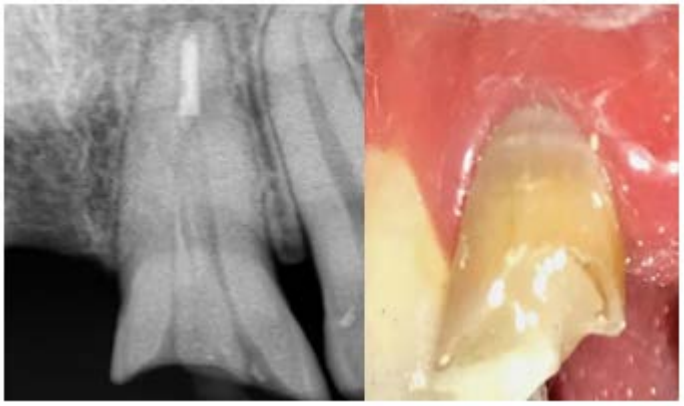

Fig 5: Biological post in post space

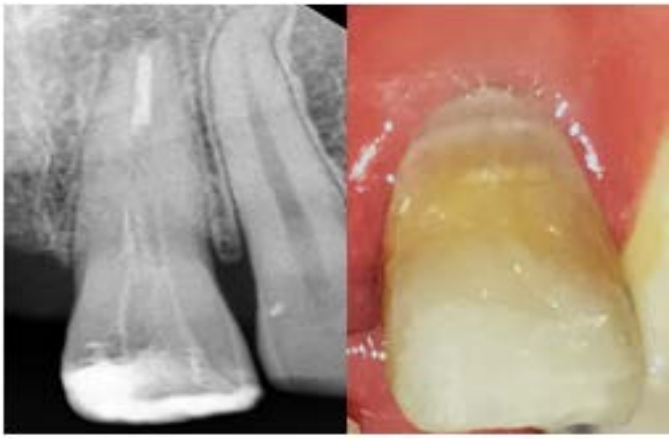

Fig 6: IOPAR of Biological post cemented in post space; Post-operative image after composite build up

Case 2: A 36-year-old female patient was referred to the Department of Conservative Dentistry and Endodontics with a chief complaint of dislodged filling in the left upper teeth region. Clinical and radiographic examination revealed previously endodontically treated tooth number 25 with insufficient coronal structure. There was no tenderness to percussion. The tooth mobility was within normal physiologic limit. Treatment plan aimed at restoring the endodontically treated teeth with post and core. Patient gave consent to restore the tooth with biologic post made from a freshly extracted premolar. Post space was prepared using Peeso reamers and 4mm of apical seal was preserved. An impression of the prepared post space along with the upper and lower arches were made using addition silicone impression material and casts were poured in dental stone. A freshly extracted, intact

premolar was chosen. The tooth was cleansed and subjected to autoclaving at 121^0C for 15 mins at 15 lbs. The extracted tooth was sectioned buccolingually along the long axis using a diamond disk. Coronal enamel and radicular cementum was removed. An acrylic resin mold was made of the post space to use as a reference to orient the thickness, shape, and length of the biological post. Following satisfactory adaptation of the biological post clinically and radiographically, the dentin post was acid etched and stored in chlorhexidine to avoid infection. Post was then cemented in the root canal using a dual-cure resin followed by core build up.

Fig 7: Pre-operative image; Pre-operative IOPAR

Fig 8: Post space preparartion; Impression of the prepared post space; freshly extracted premolar

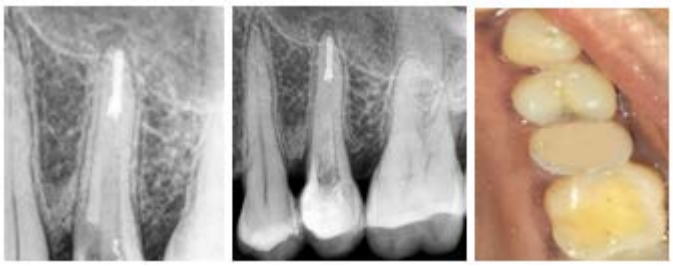

Fig 9: IOPAR of Biological post in prepared post space; IOPAR of Biological post cemented; Post-operative.

Discussion

Ideal coronal restoration of an endodontically treated tooth is still a challenge for restorative dentistry. Retention and stability of coronal restoration can be enhanced using posts made from different materials such as carbon fiber, fiber glass, metal and ceramic. The ideal properties of post material should exhibit the modulus of elasticity, compressive strength, thermal expansion, and aesthetics similar to that of dentin and should also bond predictably to root dentin. As the property of dentinal post is similar to the root dentin, so both the units flex in the same manner under stress. Biological post act as a shock absorber transmitted a very little stress to root dentinal walls. Ambica K et al. and Kathuria A et al. in studies reported that biological posts have high fracture resistance as compared to carbon fibre and glass fibre post system in their in vitro study.[22,23] Craig et al. reported that teeth restored with intraradicular solid dentinal posts exhibited higher fracture resistance than those restored with fiber reinforced composite posts.[1] This higher fracture resistance of biological post can be attributed to the physiomechanical properties of the dentinal post are similar to radicular dentin causing uniform stress distribution. The dentin post closely resembles root dentin in all its physical properties, such as modulus of elasticity, viscoelastic behavior, [12] compressive strength, [11] and thermal expansion.[10] Moreover, the fracture toughness of dentin has been found to be better than most of the current restorative materials.[5] A dentin post forms a micromechanical homogenous unit with the root dentin that results in uniform stress distribution. [13] The similarity in the elasticity of a dentin post to that of root dentin may allow post flexion to mimic tooth flexion so that the post acts as a shock absorber, transmitting only a fraction of the stresses placed on the tooth to the dentinal walls. [8]

This case report presents the restorations of maxillary left central incisor (Case 1) and maxillary left second premolar (Case 2) using dentinal posts made from human extracted teeth. The human extracted teeth were first properly cleaned and sterilized by autoclaving (Saturated steam under pressure) at 121°C for 15 minutes, ensuring all biosecurity standards.[19] Calcium hydroxide was used as an intracanal medicament in the first case. Its better antibacterial property helps in disinfection of root canal without any tooth discoloration.

Some in vitro and in vivo studies have suggested that the application of 2% CHX solution, a MMP inhibitor, to acid-etched dentin for 60 s minimizes the degradation of the dentin bond over time, the fibrillar network of the hybrid layers formed without pretreatment with CHX solution depicts a significant and progressive disintegration. [14,16,17,18,21]

Hence the dentin posts were acid etched and then treated with chlorhexidine solution before cementation

Advantages

1. It does not increase radicular dentin stress.

2. It will preserve the internal radicular dentin walls of the root canal.

3. It will favour greater tooth strength and retention of these dentinal posts as compared to premanufactured posts

4. It will provide excellent adhesion to the tooth structure and composite resin.

5. It will be a feasible treatment option in people of lower economic status because of lower cost.

Disadvantages

1. Difficulty of finding teeth.

2. Rejection to accept an extracted tooth fragment of any another patient.

Conclusion

This case report presents effective management of fractured endodontically treated teeth with dentinal post. The availability of human extracted teeth would allow the biologic restorations to preserve the integrity of patient's dentition. Dentinal Posts offers excellent aesthetic, functional, and psychosocial results. However, further studies are required to assess fracture resistance, adhesion and long-term behaviour of the dentinal post so as to better understand the advantages and limitations of the technique and make it a more acceptable for dentists and patients.

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