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RESEARCH ARTICLE

DENTIN POST: A Challenging Post For Commercially Available Posts.

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Abstract

Ideal coronal reconstruction of endodontically treated tooth is still a challenge for restorative dentistry. Despite having varied types of commercially available posts, none of them meet all the ideal biological and mechanical properties. In this context a "Biological Post" serves as a homologous recipe for intraradicular rehabilitation of a fractured endodontically treated tooth by virtue of its biomimetic property. This case report addresses the esthetic and functional restoration of a fractured, endodontically treated maxillary left central incisor in a young patient, through the preparation and adhesive cementation of a "Biological Post" made from a freshly extracted, intact human canine. The use of biological post can be considered as a novel alternative technique for the rehabilitation of an extensively damaged tooth.

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Introduction:-

Anterior tooth fracture, as a result of traumatic injuries, occurs frequently with high prevalence of 8.1 in 1000². Anterior tooth trauma often results in functional, esthetics, psychological problems and reducing patient's quality of life. Over the past decades, dentistry has achieved great scientific and technological advances regarding restorative and adhesive materials. Nevertheless, to date, no restorative material has been more effective than the properties of the natural dental structures themselves. Several authors have suggested the use of natural teeth fragments as an efficient method for restoring fractured anterior teeth. In the past, fractured teeth were restored using acrylic resin or complex ceramic restorations associated with metals. These restorations did not promote adequate long term esthetics, and also required a significant tooth reduction during preparation.

A proper coronary reconstruction that produces satisfactory esthetic and functional conditions for endodontically treated and extensively damaged teeth is still a challenge for restorative dentistry, considering that, to achieve these conditions, the making of an intracanal retention, aimed at a better retention and stability of the dental fragments, becomes imperative. This retention can be performed by using posts made from several materials⁵ such as fiberglass, carbon fiber, metal and ceramic. However, no commercially available premanufactured post meets all ideal biological and mechanical properties⁷. The use of biological posts made from natural, extracted teeth represents a feasible option for the strengthening of the root canal, thus presenting the potential advantages:

1. Does not promote dentin stress,
2. Preserves the internal dentin walls of the root canal,
3. Presents total biocompatibility and adapts to conduct configuration, favoring greater tooth strength and greater retention of these posts as compared to premanufactured posts,
4. Presents resilience comparable to the original tooth, and
5. Offers excellent adhesion to the tooth structure and composite resin and at a low cost^{5,7,13,6}.

Biological restorative system has advantage of shorter treatment time without involvement of laboratory procedures, low treatment cost, preservation of healthy tooth structure, less chances of galvanic corrosion, good adherence to canal surface, and best esthetics⁶. However, the only disadvantage is that patient may refuse to accept a tooth fragment obtained from another patient, which prevents the execution of the restoration³.

This case report is a case of coronal tooth fracture that was successfully treated using biological post.

Case report:-

A 23-year-old male patient was referred to the department of Conservative Dentistry and Endodontics, Farooqia Dental College and hospital, Mysore (India), with a complaint presenting crown fracture in left maxillary central incisor due to a fall 3 years back. The clinical and radiographic examinations revealed that fractured tooth had suffered a loss of tooth structure extending to the middle to cervical $1\frac{1}{3}^{\text{rd}}$ third as well as an exposure of the root canals and pulp necrosis (Fig 1).

The following treatment options were presented to the patient including extraction of the tooth followed by implant or fixed partial denture, Post and core and crown. And patient agreed for the post and core and crown. To patient biological post option was given.

The patient and his parents were given detailed information regarding the advantages and disadvantages of all the feasible treatment options. Having agreed for the biological post, the proposed treatment plan included intraradicular biological post, followed by Porcelain fused to metal crown fabrication. Prior to the execution of the proposed treatment, a consent form duly signed by the patient was taken.

First, all necrosed and carious tissues were removed, followed by endodontic treatment by standard technique was done under rubber dam isolation. The post space was prepared using Peezo reamers (Mani, Prime Dental product) besides preserving a 5 mm of apical seal. A direct wax impression of the post space (GC inlay wax) was done (Fig 2).

A freshly extracted, intact maxillary canine tooth was chosen and subjected to autoclaving at 121°C for 15 minutes. The tooth was then sectioned bucco-lingually along the long axis using a diamond disk. The direct wax impression of the prepared post space served as a guide for the shape, thickness and length of the post. Using the wax impression, further contouring of the sectioned tooth into a dentin post was done (Fig 3).

The dentin post was periodically verified in the prepared post space throughout the process of contouring. Following satisfactory adaptation of the biological post clinically and radiographically, the posts and the inner portion of the canals were conditioned with 37% phosphoric acid for 15 seconds. Next, the adhesive system (ADPER SINGLE BOND 2, 3M ESPE) was applied (Fig 4) and the post was polymerized. The self-cured resin cement (RelyX™ U100) was applied to the inner portion of the canals with the help of a lentulo spiral and lightly applied to the surface of the posts, which were then inserted into the canals under constant digital pressure until the end of the cement polymerization under manufacturer's instructions (Fig 5).

The core build up was done with composite restorative material (3M ESPE) (Fig 6). Following tooth preparation to receive Porcelain fused to metal crown, gingival tissue retraction was done and a rubber base impression was made. The PFM crown was fabricated and cemented using RelyX™ U100 Self-Adhesive cement (Fig 7).

Discussion:-

Increased emphasis on the maintenance and preservation of natural dentition combined with an increase in the predictability and effectiveness of endodontic therapy has made their post endodontic restoration a great challenge. However, ideal coronal reconstruction of an endodontically treated tooth is still a challenge for restorative dentistry. Better intracanal retention and stability of coronal restoration can be achieved using posts made from different materials such as fiber glass, carbon fiber, metal and ceramic. These recent developments in restorative materials coupled with advances in adhesive protocols many a times turn out to be expensive and technique sensitive and also require expertise of operator^{12,11,15}. Moreover, none of the commercially available posts meet all the ideal biological and mechanical properties. In this context a "Biological Post" presents several advantages when assessing the recovery of tooth function and esthetics⁴.

This case report presents an effective management of a fractured tooth with a dentin post. Faria P et al.,⁴ have reported a successful esthetic and functional recovery of extensively damaged maxillary central incisors through the preparation and adhesive cementation of biological posts and crowns in a young patient. The technique used by

them for the fabrication of dentin post was, retrieval of an acrylic resin pattern of the canals from a plaster model, which was then used as a reference for shaping the dentin post. Similarly Mandroli PS¹⁰, Ranires Romito ACD et al.,¹⁴ also reported successful management of grossly mutilated deciduous teeth in pediatric patients using biological posts and crowns. A direct wax impression of the canal was obtained, to be used as a guide for shaping the dentin post which is definitely a time conserving. Although the technique is simple, it requires professional expertise to prepare and adapt the dentin intracanal posts^{10,14}.

In the present case, the extracted tooth for preparation of dentin post was selected from a patient scheduled for extraction of an intact maxillary canine due to aesthetic concern since it had erupted buccally. The donor was subjected to a thorough review of medical history and routine blood investigations before the initiation of the procedure. Following extraction the tooth was properly cleaned, stored, and sterilized by autoclaving at 121°C for 15 minutes, ensuring all biosecurity standards⁹. As a freshly extracted tooth was used, the biomechanical properties of the dentine would be well preserved.

Owing to the limited number of cases reported in literature we cannot accurately predict the success rate of biological dentin posts, however, Ambica K et al.,¹ and Kathuria A et al.,⁸ in their in vitro study reported that dentin posts demonstrated higher fracture resistance than Carbon Fiber posts and Glass Fiber posts. Hence, the novel biological post technique for the management of endodontically treated teeth appears as a promising alternative to various commercially available post systems. In order to work ethically a universal protocol as established and has been followed.

Picture:-



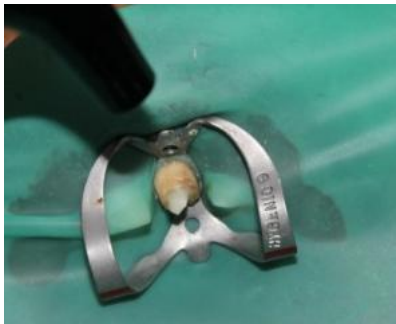
Fig 1



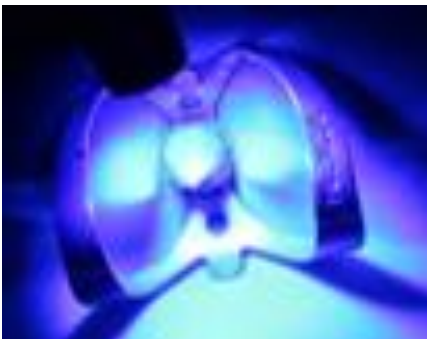
Fig 2



3.
Fig 3



4.
Fig 4



5.
Fig 5



6.
Fig 6



7.
Fig 7

Conclusion

This case report has demonstrated a morphofunctional rehabilitation of an extensively damaged endodontically treated tooth using a biomimetic post. However, further studies are called for to assess the long-term biomechanical behavior of the biological posts so as to better understand the benefits of the technique and make it a more viable treatment option, especially for the lower economy group of patients.

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