MULTIDISCIPILINARY APPROACH FOR MANAGEMENT OF ENDODONTICALLY TREATED MUTILATED TOOTH –CASE REPORT

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Abstract

A grossly decayed tooth sometime poses difficulty in fabrication of FPD, The post core is often required to gain support from the remaining tooth structure. This case report describes a simple and scientific multidisciplinary approach towards management of endodontically treated mutilated tooth. Proper analysis and treatment planning is required for correction of esthetic and functional demand of mutilated tooth.

Keywords: post and core, crown lengthening, fibre reinforced post.

1. Introduction-

A tooth with extensive damage is one that has lost substantial structure as a result of caries, previous restoration failures, fractures or even procedures related to endodontic treatment. The loss of dental tissue and the weakening of the remaining structure present a challenge in terms of prosthetic rehabilitation. Although the current success rate of dental implants is high[1] The clinician must be able to assess the probability of restoring severely damaged teeth successfully.[2-8]

It has been suggested that ET teeth dry out over time[9] and that the dentin in ET teeth undergoes changes in collagen crosslinking[10]. Therefore, it has been suggested that ET teeth are more brittle and may fracture more easily than non-ET teeth.[11-13] It is believed that it is the loss of tooth structure from caries, trauma or both that makes ET teeth more susceptible to fracture.[14,15] Some clinicians believe that a post should be placed into the root after endodontic treatment to strengthen or reinforce it. Some studies, however, point out that posts do not strengthen teeth, but instead that the preparation of a post space and the placement of a post can weaken the root and may lead to root fracture.[16-19]

These studies further suggest that a post should be used only when there is insufficient tooth substance remaining to support the final restoration. In other words, the main function of a post is the retention of a core to support the coronal restoration. Perhaps using new adhesive materials and technology, clinicians can bond the post securely to the dentin in the root canal space, the core to the post and the final restoration to the core and tooth. With all components having similar physical properties successfully bonded together, dentistry may be able to claim that a post can strengthen and reinforce the root. However, dentistry can say only that a post is used primarily to retain a core in a tooth with extensive loss of structure; the post does not make the tooth stronger.

2. General guidelines for post placement

Anterior teeth

- If no crown is required, a post is generally unnecessary.
- If a crown is necessary, a post is generally required.

Posterior teeth (crowns generally required)

- Molar teeth with an adequate pulp chamber do not require a post.

- Molar teeth with inadequate pulp chamber may require a post.
- Maxillary bicuspids generally require a post.
- Mandibular bicuspids require a post.

Optimal post preparation

- Use of non-end-cutting rotary instruments
- Minimal canal enlargement
- Diameter one-third root width or less
- Length at least equivalent to crown height (short and extra long posts increase root fracture)
- Minimum 4-5 mm gutta percha remaining
- Post modification to fit canal
- Passive post design and placement
- Adequate ferrule (1.5-2 mm) between core and crown margins.(The ferrule provides bracing or casing action to protect the integrity of the root)

Multiple factors which influence post/dowel selection:

- Amount of coronal tooth structure
- Tooth anatomy
- Position of the tooth in the arch
- Root length
- Root width
- Canal configuration
- Functional requirements of the tooth
- Torquing force
- Stresses
- Development of hydrostatic pressure
- Post design
- Post material
- Material compatibility
- Bonding capability
- Core retention
- Retrievability
- Esthetics
- Crown material

The construction of a core buildup is necessary as the amount of residual tooth substance decreases,[20] and the buildup augments the development of retention and resistance provided by the remaining tooth structure.[21] Morgano and Brackett[21]described some of the desirable features of a core material. They include adequate compressive strength to resist intraoral forces,[22] sufficient flexural strength,[22]biocompatibility,[23]resistance to leakage of oral fluids at the core-to-tooth interface,[24,25] ease of manipulation,[26] ability to bond to remaining tooth structure,[27-29] thermal coefficient of expansion and contraction similar to tooth structure,[24]dimensional stability,[30]minimal potential for water absorption[31-33]and inhibition of dental caries.[34]Unfortunately, as the commonly used materials all exhibit certain strengths and weaknesses, such an ideal core material does not exist.

The dimensions of the remaining tooth tissues as well as several biological and occlusal factors must be properly assessed to establish the correct treatment plan The primary purpose of a post is to retain a core in a tooth that has lost its coronal structure extensively. During the treatment procedure, a structurally compromised tooth can give rise to complications such as root fracture, loss of restorative seal, dislodgement of core, and periodontal injury due to biological width invasion during margin preparation. The approach to severely compromised teeth should be based on consistent scientific evidence to reduce dental error and improve the prognosis.

3. Case report-

A 42 years-old female patient reported to the Department of prosthodontics and crown& bridge, posr graduate institute of dental science, Rohtak, for a routine check-up. On examination, it was found that tooth 45 had undergone root canal treatment 5-6 months ago. However, tooth 45 was asymptomatic and the clinical crown was <2 mm. The radiographic examination of tooth 45 revealed straight root canal with well condensed guttapercha filling extending 0.7 mm short of the radiographic apex.. An occlusal model evaluation was done to assess the amount of space available for the post endodontic restoration to restore the tooth to function.

Various point regarding treatment needed to be consider

- Height of remaining tooth was 0.5–2 mm with visible margins (on mesiobuccal and mesiolingual side) and less than 1 mm with non-visible margins(on distobuccal and distolingual side) (Fig.1)
- Remaining root length was at least as long as the future crown height plus 5 mm for the apical seal.
- Endodontic condition: Endodontic treatment was performed without predictable complications. No periapical changes were noted in relation to tooth 45 (Fig.2)

Fig.1

Fig.2

Crown lengthening procedure-

To obtain ferrule of 1.5-2mm and placement of crown margins supragingivally, crown lengthening weas performed by conventional surgical procedure including gingivectomy followed by osseous recontouring(with low speed micromotor bur) due to presence of o.5 to 1mm probing depth at distal, distobuccal and distolingual site. Gingivectomy with less osseous recontouring at mesial, mesiobuccal and mesiolingual site having probing depth of 2-3 mm and to obtain biological zone of 3-4 mm around involved tooth.

3-0 non absorbable black silk suture was placed for 1 week followed by patient was recalled for further treatment portion.(fig.3)

Fig.3

Post space preparation

The pulp chamber preparation included removal of any endodontic filling material. The root canal preparation included the post length[35-39], which was decided by the remaining bone support, root anatomy, root curvatures, and the apex obturation A GG drill was used to remove the guttapercha. Post space was prepared in canal of tooth 45 with Peeso reamer. The Peeso reamers (Dentsply, Ballalgues, Switzerland) length was chosen by measuring against the radiographs so that at least 3-4 mm in length of the gutta percha was left in the apex to prevent dislodgement and leakage. Care was taken to ensure that the length of the post was 2/3 the length of the canal or in other words, ½ the bone supported the length of the root.(fig.4) The more coronally located the root curve, the shorter the post should be.[40] Thus, 1 mm of the surrounding dentin was preserved to maintain the strength of the root.[41]

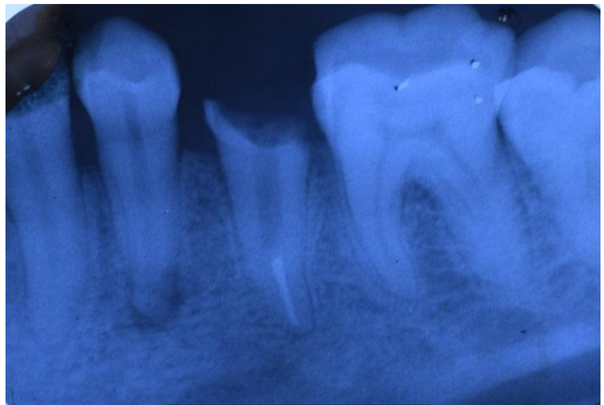

Fig.4

Post placement and core build up:

SF fiber post was selected for placement of adequate length according to remaining length after required removal of GP, post was cleaned with alcohol. Etchant was applied in post space and to the exposed dentin for 15 seconds. Rinse was done for 10 seconds. Excess water was removed with paper points. Two coats of dual cure primer was applied in post space by compibrush Excess was removed with paper points and gentle air pressure. Single coat of primer was applied on post outside the oral cavity and light cure for10-20 seconds.

Etchant was applied on canal walls followed by application of bonding agent with help of microapplicator tip. Flowable composite was placed in post space followed by placement of post. Two coats of bonding agent was applied to exposed post,cement and coronal areas. Core build up of adequate height was made by resin based composite.(fig.5,6)

Fig.5

Fig.6

Crown placement:

Impression was made using Double impression technique with stock tray using putty and light body as impression material. Impression was inspected for any discrepancy and then poured.

Provisional restoration was fabricated using autoploymerizing acrylic resin. Proviosinal restoration was fabricated extraorally on cast using indirect technique.(fig.7) Cementation of provisional restoration was done with zinc oxide eugenol cement. After one week provisional restoration was removed and definitive PFM crown cementation was done with GIC cement.(fig.8)

Fig.7

Fig.8

4. Discussion

The number of endodontic procedures has increased steadily in the past decade with highly predictable results. Therefore, restoration of teeth after endodontic treatment is becoming an integral part of restorative practice in dentistry. Proper restoration of endodontically treated teeth requires a sound knowledge of the endodontic, periodontal, restorative, and occlusal principles. When a considerable amount of tooth structure has been lost, as in the case discussed above, because of caries or previous restoration or the endodontic treatment itself, special techniques are needed to restore such a tooth. This loss of tooth structure makes retention of a subsequent restoration problematic and increases the likelihood of fracture during function In this case crown lengthening was carried out surgically by bone recontouring and gingivectomy to get the ferrule effect for extracoronal retention. Prefabricated post was used over metal post core due to disadvantages associated with cast post including requirement of two visits and laboratory fabrication along with esthetic problem . Fiber-reinforced polymer post is made up of carbon or silica fibers surrounded by a matrix of polymer resin, which usually is an epoxy resin and fibers are 7 to 10 micrometers in diameter

According to two in vitro studies,[42,43] the physical strength of fiber-reinforced post is significantly weaker than that of cast metal posts and cores. The highly rigid metal would transfer lateral forces without distortion to the less rigid dentin and lead to a higher chance of root fracture. The lower flexural modulus of fiber reinforced posts (between 1 and 4 x 106 psi), on the other hand, measures closer to that of dentin (2 x 106 psi) and can decrease the incidence of root fracture.[42,44] In the event of failure when restored with fiber-reinforced posts, teeth are more likely to be restorable.[43,45,46] Fiber-reinforced posts are fabricated to bond with most resin cements and resin based composite core materials. In vivo bonding of fiber-reinforced posts to the dentinal wall of the root canal space using resin cement has been demonstrated.[47-49]Scanning electron microscopic (SEM) evaluation has show clearly the formation of a hybrid layer, resin tags and an adhesive lateral branch. Successful bonding minimizes the wedging effect of the post within the root canal, requires less dentin removal to accommodate a shorter and thinner post and leads to lower susceptibility to tooth fracture. Since fiber-reinforced posts are metal-free, they do not cause metal allergies or corrode. They offer good esthetics in easily visible areas of the mouth, especially under the all-ceramic crowns and bridges. Finally, fiber-reinforced posts can be removed easily in case of an endodontic failure requiring re-treatment.[50] Various retrospective studies up to four years long also reported a success rate of approximately 95 percent using fiber-reinforced posts to restore ET teeth.[51,52] Like the ceramic posts, fiber-reinforced posts are relatively new, and data on their long-term clinical performance are not available yet. Resin-based composite for core build up offers an esthetically pleasing material especially in the anterior section under an all-porcelain restoration. It has good strength characteristics and low solubility. Some of the negative features of resin-based composite are polymerization shrinkage, hydroscopic expansion as a result of water adsorption and incorporation of voids in the buildup because it cannot be condensed like amalgam. Furthermore, resin-based composite is incompatible with ZOE in many root canal sealers, which can result in resin that is not cured completely. These negative features may lead to microleakage if they are not addressed properly during placement of the material. Proper removal of the residual root canal sealer coupled with a small incremental buildup using condensable resin-based composite material may help alleviate the potential of microleakage. The ultimate success of post and core depends largely on the level of education and motivation that the patient has gone through. Patient was demonstrated through visual means the prognosis of the treatment; she was recalled every month initially. The case was followed for 1 year in which no root fracture, no loosening or dislodgement of post, and no secondary caries were reported.

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