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Metal Endocrown – Novel Restorative option for Mutilated teeth; A Case Report

Abstract :
Extensively damaged endodontically treated molars pose a constant challenge for the practitioner. Although the classical post and core restoration is widely used in dentistry, its invasiveness has been criticized worldwide. Minimally invasive crown preparation preserving the maximum amount of tooth structure is considered to be the main objective for restoring teeth. Bindl and Mormann described the concept of endocrown in 1999 to limit the use of root anchorages. This case report illustrates this restorative option for functional rehabilitation of a devitalized mandibular molar, presenting with a small amount of remaining coronal tooth structure.

Keywords: Endocrown; Endodontically treated tooth; Metal crown; Mutilated teeth; Post-endodontic restoration

Introduction:

Post-endodontic restoration should protect and preserve the existing tooth structure, while restoring the esthetics, form, and function satisfactorily [1].

Crown replacement in grossly mutilated endodontically treated tooth(ETT) is a challenging task (1) which is attributed to physiological alterations in root canal treated tooth, including its composition and remaining dentin macrostructure that predisposes the tooth to numerous risks. These risks include compromised fracture resistance, reduced retention/stability, and increased tooth fragility, leading to prosthesis failure [1].

Treatment modalities in these cases depend on structural integrity, functional load and estheticism of the tooth. In this perspective, Endocrown offers a good alternative to full crown in cases of badly broken ETT [2].

Although initially, the endocrown, pioneered and described by Pissis and Bindl(4) respectively, was a monolithic ceramic-bonded construction, (3), nowadays it has been modified to include metal as a phase too. It is a conservative restoration which uses pulp chamber space for retention, favoring the biomechanics for effective reconstruction of lost tooth structure [2]. Though this type of restoration is usually total ceramic restoration only, due to the patient's severe economic constraints we decided to opt for fabrication of metal Endocrowns.

Case Report:

A 20 year old female reported to our department with a chief complaint of food lodgment in lower right and left back tooth region. Her medical history was non-contributory. Clinical

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examination revealed grossly carious mandibular first left(36) and right(46) molars with extensive destruction of tooth structure (>50%). Radiographic evaluation revealed large occlusal radiolucency involving pulp with periapical rarefaction in both teeth (Fig-1).

Treatment plan formulated was Root Canal Treatment (RCT) followed by Coronal Prosthesis in 36, 46. RCT was commenced and completed (Fig- 2) in both teeth, followed by a Post Root Canal filing with resin based composite (Fig- 3). Post-operative diagnostic impression for fabrication of Coronal Prosthesis was also made on the same appointment. After careful inspection of diagnostic cast, patient was suggested all ceramic Endocrowns due to low height of clinical crowns of 36 and 46 and presence of minimal inter-occlusal space between maxillary and mandibular teeth (Fig 4).

Treatment plan had to be altered due to patient's severe economic constraint, and Bilateral Metal Endocrowns were finalized as post-endodontic restoration.

Clinical Procedure:

Tooth preparation of both the teeth was done according to the technique given by Bindl and Mörmann (5).

Occlusal Preparation: Occlusal tooth reduction was carried out with a diamond wheel bur (WR-13, Dia-Burs, Mani), holding it parallel to the occlusal surface. This ensured a flat surface and determined the precise position of cervical margin. This form of occlusal reduction is termed as cervical "sidewalk" or "walk around" preparation. Crown reduction was achieved by drilling depth grooves as guides, then using a diamond bur (SO-21, Dia-Burs, Mani) to ensure that the uniform thickness of 1.5 mm was maintained.

Axial Preparation: It involved eliminating undercuts in access cavity using a tapered bur. Cervical band was polished to provide a flat and polished cervical butt angle joint. An occlusal divergence of 6 degrees was prepared for the cavity. After completion of tooth preparation, cylindrical-conical diamond bur (848 018F-FG) was used to make the coronal pulp chamber and endodontic access cavity continuous (Fig- 5).

Gingival Retraction Cord 00 (Ultracord, Dent One Inc, USA) was placed (Fig- 5) and impression was made with polyvinyl siloxane silicone (Aquasil LV, Putty/Light Body, Dentsply, Germany) of light and putty consistency using a double-mix single-stage technique.

Sandblasting of the fabricated Endocrowns (Fig - 6) was done to enhance the retention of these restorations followed by Try-in of the prostheses in patient's' mouth.

Luting of the final finished endocrowns was done with Glass Ionomer Cement (GC Fuji I, GC Corporation, Tokyo, Japan) under proper isolation (Fig 7, 8).

9 month follow-up revealed that the patient was asymptomatic and satisfied with treatment outcome (Fig – 9, 10)

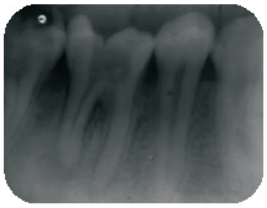

Figure 1a – Pre Op 46

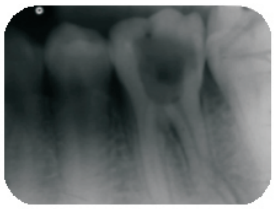

Figure 1b – Pre Op 36

Figure 2a – Obturated 46

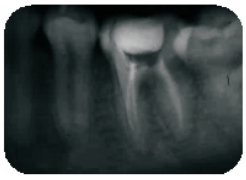

Figure 2b - Obturated 36

Figure 3a – Post Op 46

Figure 3b - Post Op 36

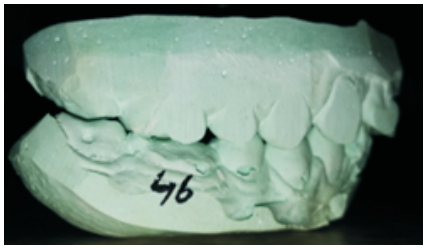

Figure 4a – Buccal view of 46

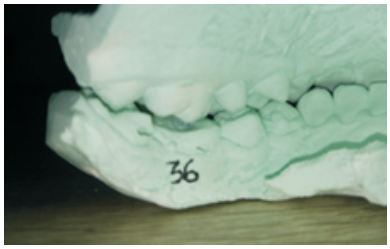

Figure 4b – Lingual view of 36

Figure 5 – Tooth preparation

Figure 6 – Endocrown Fabricated

Figure 7 – EndoCrown Cementation

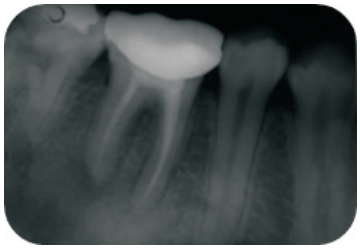

Figure 8a – Endocrown cementation 46

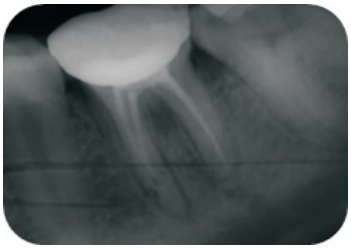

Figure 8b – Endocrown cementation 36

Figure 9 – 9 months follow-up

Figure 10a – 46 in Occlusion

Figure 10b – 36 in occlusion

Discussion:

Successful endodontic treatment depends on good post-endodontic restoration to integrate the pulpless tooth with masticatory apparatus [2]. Endocrown is majorly indicated in molars with obliterated, short, dilacerated roots and when there is limited inter-occlusal space between the opposing dentition. [6]

The endocrown is cemented to a de-pulped tooth, which is fixed to the internal portion of the pulp chamber and to the margins of the cavity, obtaining macromechanical retention by pulpal walls, and microretention by adhesive cementation[1].

Apart from better retention, Endocrown has a few more merits over the conventional crown-

1. Reduced number of interfaces based on monobloc concep lowers stress concentration.
2. Preparation design is more conservative than traditional crown, maintaining biologic width, hence less damage to periodontium
3. Bonding surface offered by pulpal chamber in Endocrown is equal or even superior to that of a radicular post of 8 mm
4. Application and polymerization of luting resin cement is better controlled here. [2]

Keeping these superior properties in mind, various studies have shown the success of the Endocrowns over other

treatment methods;

In an evaluation of endocrowns placed adhesively after 2 years, Bindl and Mörmann concluded that "the overall clinical quality of the endocrowns was very good." Only one molar EndoCrown out of 19 Endocrowns failed because of recurrent caries [[5].

In another 2-year evaluation, Bernhart et al. concluded that endocrowns "represent a very promising treatment alternative for endodontically treated molars." [7]

In 2018, Oswal et al demonstrated a case, where a porcelain-fused-to-metal endocrown was fabricated using similar protocols and clinical procedures as for a ceramic endocrown. The rationale of this technique was to use the surface area available in the pulpal chamber to acquire the stability and retention through adhesive procedures [8].

Similar case was presented by Vinola, wherein PFM endocrown was delivered to the patient. Meticulous care was followed to enhance the retention by incorporation of secondary retentive grooves in the axial walls in addition to the sandblasting of the metal surface before cementation(9) which was also performed in our case.

Variety of materials are used to fabricate endocrowns: feldspathic and glass-ceramics, hybrid composite resin, CAD/CAM ceramic (1) and recently porcelain fused to metal or even all metal[10].

Although metal is not the material of choice when it comes to an Endocrown, in our case the patient's financial condition did not allow her to opt for an all ceramic or even a PFM endocrown.

Compromised micromechanical retention in PFM or metal endocrown cases, can be countered by incorporation of secondary retentive grooves and sandblasting of metal surface before cementation [1].

Secondary retentive factors considered in such cases, are pins, boxes and slots (11). These features aid in retention of metal surface onto the tooth accompanied by luting cement to reduce the radius of rotation. They also enhance the retention by presenting additional near parallel sided walls to the preparation and limit the path of insertion [12].

The 9-month follow-up in the case of Endocrown showed no functional degradation on clinical as well as radiographic examination. These results depict the success of these bilateral endocrowns.

Conclusion:

Endocrown represents a hopeful treatment alternative for endodontically treated molars, as it allows preservation of the tooth structure and it is compatible with minimally invasive dentistry. Endocrown gives better retention with minimal load and lateral stresses. It is a conservative approach for mechanical and esthetic restoration of non-vital posterior teeth. This type of rehabilitative treatment, which is still uncommon, should be more widely practiced.

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