Endocrown: A Minimal Intervention Approach for Grossly Decayed Teeth

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Case Report

ABSTRACT

Endocrowns is a viable alternative for restoration of extensively damaged posterior teeth after undergoing endodontic treatment. Since after endodontic treatment these posterior teeth become fragile in relation with the removal of pulp and surrounding dentin tissues, endocrown which is a single partial restoration can be considered to replace single crowns with intra-radicular retention. Through this work, we present a clinical case report of an endocrown-type restoration fabricated from monolithic zirconia in a mandibular first molar.

KEY WORDS: endocrowns, mandibular, monolithic zirconia, restoration

INTRODUCTION:

The restoration of an endodontically treated teeth which are grossly destructed has been a hurdle for most clinicians[1]. The conventional root canal therapy exhibits biomechanical changes and extensive loss of dentinal tissue which directs the clinicians towards restorative treatment planning[2]. Restoration of Endodontically treated teeth with extensive coronal loss follows a protocol with fabrication of full coverage restorations supported on Post-cores[3]. Besides, there are limitations to the use of posts as (a) those require the removal of additional tooth structure; and, (b) those have limited use in calcified canals, narrow canals, severely curved canals, or fracture of an instrument[4,5]. Bindl and Mormon, in 1999, proposed a complete glass ceramic restoration; endocrown, which can be fixed to the internal walls of the pulp chamber and on the cavity margins to improve macromechanical retention. The use of adhesive cementation would also improve micro retention[6]. Furthermore, the pulpal floor saddle form enhances stability[23].

Earlier reinforced non silica based ceramics and silica based feldspar ceramics were used for the fabrication of an endocrown[4] heat-pressed technique or later CAD/CAM technology. Later, glass ceramics were the material of choice as those provided the advantage of surface modification either with the use of hydrofluoric acid or air-abrasion. According to the literature, glass ceramics reinforced either with leucite or lithium disilicate have been the best option for the fabrication of endocrowns since they exhibit higher flexural strength than feldspathic glass ceramics and resin composite, and being able to withstand the occlusal forces during mastication[6,24,25].

The purpose of this work is to discuss the use and indication of an endocrown by using it to restore a mandibular molar that presented endodontic treatment and extensive coronal destruction.

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CASE REPORT:

A 21 year old female reported to the Department of Conservative dentistry and Endodontics of Mahatma Gandhi Dental College and Hospital, Jaipur with chief complaint of pain in relation to tooth 46. The pain was continuous, severe and it lingered for several minutes even after removal of stimulus and led to disturbed sleep. The medical history was irrelevant. The dental history stated that the tooth 46 was RCT attempted around 10 days ago after which the patient had reported to the department of conservative dentistry and endodontics.

On oral examination the tooth 46 was restored with severe tenderness on percussion. Radiographic examination revealed peri-apical radiolucency associated with mesial root of 46. The tooth was

Figure 1: Tooth (46) after root canal completion.

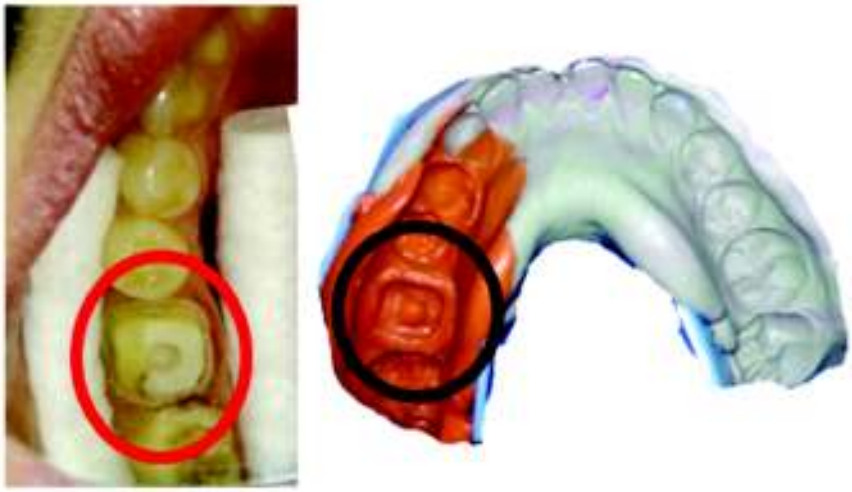

Figure 2: Tooth Preparation & Impression.

diagnosed with apical periodontitis. Hence Root canal therapy in relation to 46 followed by coronal prosthesis was the decided treatment plan.

Following the endodontic therapy the tooth was found to be asymptomatic.The patient had a favorable oral hygiene. The prosthetic decision was to restore tooth 46 with an endocrown fabricated from Monolith Zirconia crown. Because of less cervico-occlusal hight of clinical crown. Endocrown requires a different preparatory technique as compared to normal crown.

Post endodontic restoration was done with restorative composite.In axial direction, occlusal surface was reduced by 2 mm for structural durability in ceramic prosthesis by diamond wheel bur.

The cervical margin was a butt joint prepared by a tapered fissure diamond bur. It was supragingival to maintain the biologic width.The enamel walls were eliminated by less than 2mm.

A cylindrical – conical diamond bur (7degree taper) oriented along the long axis of the teeth, was used to establish continuity between the endodontic access cavity and the coronal pulp chamber. The bur was used without drilling the pulpal floor and maintaining 3 mm as the depth of the cavity.

After inspecting the interocclusal space and the entire cavity, addition silicon were used to make the impression by double impression technique.

The CAD-CAM technique was used to fabricate the endocrown and try-in was made followed by Try-in. Occlusal, proximal and internal relationship with adjacent structures was checked.

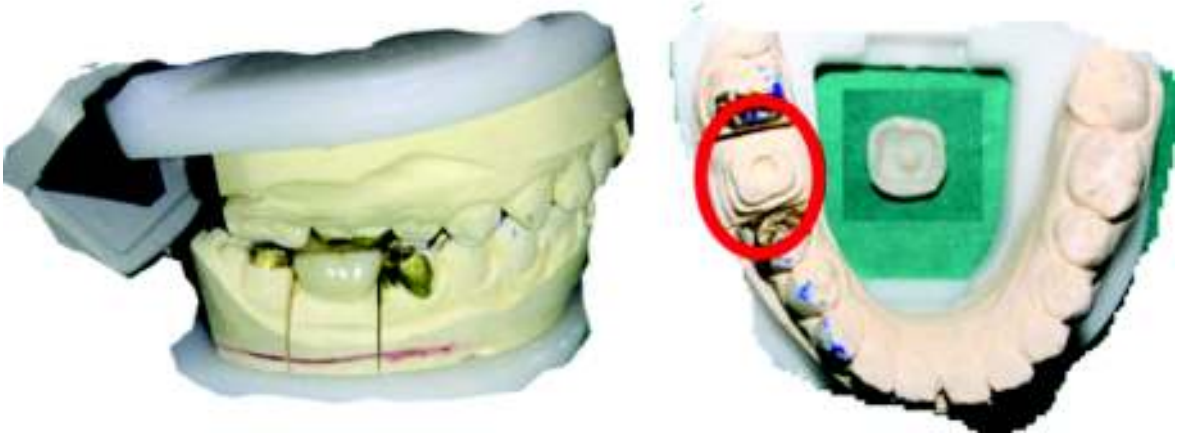

Figure 3: Endocrown.

Figure 4: Tooth (46) after prosthesis.

The endocrown was etched with 10% Hydrochloric acidfor 10-15 seconds and rinsed with normal water; dried and silane coupling agent was applied and dried thereafter.

Subsequent to proper isolation of the prepared tooth, 37% Phosphoric acid was used to etch the prepared surface for 20 seconds; rinsed with normal water then dried. Bonding agent is applied and polymerized for 20 seconds by light cure.

The endocrown was then cemented to the prepared tooth by the use of dual polymerize resin cement.The crown was evaluated for interference post removal of the excess cement.

DISCUSSION:

Careful planning is required for the restorative treatment of molars with large coronal destruction. Hence, an efficient treatment plan has to be decided for the restoration to be a clinical success. The Endocrown is used particularly in multi-rooted teeth with short cervico-occlusal crown height, calcified root canals or narrow canals[7]. Adequate adhesion, depth of the pulp chamber and width of the cervical margin is protocol for recommending Endocrown[8].

The procedure is easy, advantageous and protects the periodontium[7,9]. Also, ceramic is advantageous as it has the wear coefficient close to that of the natural tooth, is biocompatible and biomimetic[9,10]. Compressive stresses are frequent in molars hence arises the need of a wide stable surface of the preparation resisting these stresses[11]. Stress resistance along the long axis of the tooth is provided by preparing the surface parallel to the occlusal plane[12]. Prosthetic crowns exhibit more stress as compared to Endocrown[10,13].

Additional preparation is unwarranted as the trapezoidal shape of the pulp chamber in mandibular molars and triangular shape in maxillary molars accounts for stability and retention of the resotoration. The use of post involving root canals is uncalled-for

owing to the anatomy of the pulpal floor and adhesive qualities of the bonding material[12]. Since the compressive stresses are being distributed over the cervical butt joint and the walls of the pulp chamber, the root canals do not receive the stresses associated with post. Hence those are not vulnerable and do not require a specific shape[7,12,14,15,16].

The biomechanical behaviour of root canal treated teeth restored using different extensions of endocrowns inside the pulp chamber, evaluated by Dartora et al has concluded that the greater extension of endocrowns provided better mechanical performance. A 5 mm extension will present a more fracture resistance and a less possibility of rotating the piece when in function as compared to a 1 mm extension[17,18]. The effect of different margin designs on the fracture resistance of endodontically treated teeth restored with polymer-infiltrated ceramic endocrown restorations was assessed by an in vitro study performed by Taha et al. The results showed that endocrowns with shoulder finish line and axial reduction were high resistant to fractures than endocrowns with butt margins. It is also stated that compressive stresses are better resisted by butt joint margins as it is prepared parallel to the occlusal plane[19].

According to Biacchi and Basting, the fracture strength of 2 types of full ceramic crowns: indirect conventional crowns retained by glass fibre posts and Endocrowns, Endocrowns were more resistant to compressive forces[6].

In teeth restored with post and core systems leakage may be expected to occur at connections of different materials (tooth structure, post material, core buildup material and luting cement)[26]. The microleakage test was performed after cementation of Endocrown and there was no relationship between microleakage and intracoronal cavity depth. The present study corresponds to the research of Darwish et al[27].

The preservation of biomechanical integrity of nonvital posterior teeth and acquisition of adequate function and aesthetics, as stated by Biacchi et al, is brought about by the use of endocrowns[20]. Teeth restored by endocrowns are potentially more resistant to failure than teeth those with FRC posts (Fiber reinforced composite). This was revealed in a research comparing stresses in molars restored with endocrowns as well as posts and cores during masticatory simulation using finite element analysis[13].

Endocrowns may perform similar to intraradicular posts, direct composite resin, or inlay/onlay restorations or better than the conventional treatments as per a systematic review achieved by Sedrez-Porto et al[21]. According to Belleamme et al., endocrowns are a reliable restoration for damaged premolars and molars even in the presence of extensive coronal tissue loss or occlusal risk factors, such as bruxism or unfavourable occlusal relationships[22].

CONCLUSION:

The endocrowns are a simple and a viable alternative for restoration on posterior teeth with extensive coronal destruction. It follows a minimally invasive approach with lesser time and cost as compared to conventional posts with significant aesthetics. Also, the periodontium is preserved owing to the supragingival margin.

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