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Endocrown: Rebirth of mutilated tooth

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Abstract
Restoration is necessary to make teeth that have undergone root canal therapy functioning once again. It is generally agreed upon that the typical objective for repairing teeth is minimally intrusive preparation to preserve the greatest amount of tooth structure. A straightforward, conservative, and aesthetically pleasing replacement for traditional crowns is an Endocrown. It is a single-piece restoration that is typically recommended in circumstances when the crown height has dropped. These restorations prolong the lifetime of the tooth, maintain natural contact, prevent interferences with periodontal tissues because of the supragingival edges, and are self-cleaning. The idea behind this method is to employ adhesive techniques to produce stability and retention by making advantage of the surface area present in the pulp chamber. An all-ceramic Endocrown was employed in the case study as a conservative and attractive substitute for a full coverage crown to treat a severely damaged mandibular molar.

Keywords: Endocrown, postendodontic restoration, severely damaged tooth

Introduction
The clinical experiment of restoring teeth with extensive coronal destruction relics.[1] A momentous amount of tooth structure is already mislaid once a tooth is endodontic ally treated as a consequence of shock or caries in count to vital demolition designed for endodontic access. This customarily results in the tooth that deficits enough comprehensive tooth assembly to upkeep a casted reinstatement. There is also an augmented jeopardy of tooth splintering beneath masticatory pressure [2].
In endodontic ally treated teeth, post endodontic restorations automatically soothe the tooth-restoration compound [1]. They should realm and defend the existing tooth structure while re-establishing aesthetics, form and role to a agreeable level. In such cases, the goalmouth is to have negligibly intrusive measures with maximum tissue preservation for an encouraging enduring prediction [3].
Direct composite restorations, cuspal coverage with on lays and overlays, full coverage crowns, post and core supported crown and Endocrown are some of the treatment routes for repairing endodontic ally treated teeth. When equated to post and core trailed by jam-packed coverage renovations, Endocrown is a respectable substitute in cases with endodontic ally preserved teeth with dumpy clinical height but adequate tissue accessible for bond and steadiness [3]. Bindl and Merman coined the term "Endocrown" in 1999. These restorations are fastened to the pulp chamber's internal portion, resulting in micromechanical preservation provided by the pulpal walls and micromechanical preservation delivered by adhesive cements [1].
The purpose of this research is to describe a real-world example of a mandibular molar that was substantially injured, had a shallow pulp chamber, and was conservatively treated with an endocrown.

Case Report
A 46 year old male patient named Surrender, reported to Institute of Dental Studies and Technologies, Modinagar, Kadrabad, Uttar Pradesh with a chief complaint of decayed tooth in the lower right back region of the jaw 6 months back. The medical background was irrelevant. Initial radiographic and clinical exams revealed severe dental cavities including the right mandibular second molar's pulp and enlargement of the periodontal ligament gap (Figure 1, 2, & 3).

The patient was given a number of treatment choices, such as endodontic treatment, root canal therapy, extraction and replacement with implants, or fixed partial dentures, but the patient was adamant about saving the tooth (Figure 4). The patient's dental hygiene was good. Endocrown restoration was advised due to the amount of surviving tooth structure and the thickness of the walls (Figure 5). It was chosen to use a ceramic lithium dislocate endodontic crown to restore the tooth (IPS e. Max CAD).

Fig 1: Preoperative before crown preparation

Fig 2: Preoperative occlusion before crown preparation

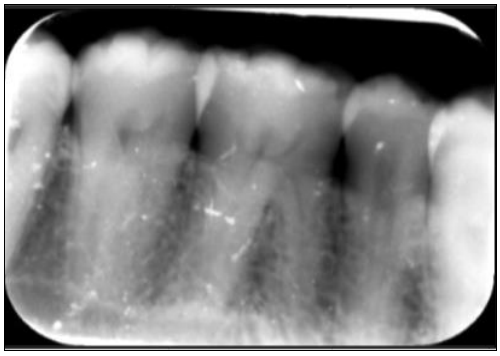

Fig 3: Preoperative radiographic image

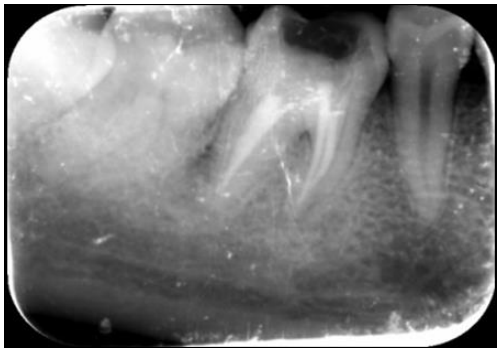

Fig 4: Postoperative radiograph of obturated tooth

Fig 5: After Endocrown Preparation

The endocrown preparation differs from that of a traditional full crown. This monolithic, ceramic adhesive restoration needs to be prepared specifically in order to meet the necessary biomechanical requirements. It seeks to produce a cervical margin, or "cervical sidewalk," in the shape of a butt joint, as well as an overall reduction in occlusal surface height of at least 2 mm in the axial direction. Enamel walls less than 2 mm thick and a supragingival cervical margin are required. During axial preparation, undercuts from the access cavity were eliminated using a tapered bur. The cervical border stayed above the gingiva. The depth of the access cavity was restricted at 4 mm. To protect the canal orifice, glass ionomer cement was applied to the root canal openings to finish the preparation. Using putty wash technique and polyvinyl siloxane impression substance, the impression was created. The impression was sent to the lab for restoration manufacturing after being visualised and the quality of the imprint was assessed (Figure 6). In the patient's mouth, the restoration was tested the following session, and any occlusal interference was assessed.

Fig 6: Impression taken and cast made

Occlusal modifications were made using ceramic finishing tools. The interior of the endocrown was etched for 20 seconds with hydrofluoric acid, then washed with water and dried with an air syringe. A silane coupling agent was then sprayed on and cured for one minute. Phosphoric acid was applied to the tooth surface for 15 seconds on the dentin and 30 seconds on the enamel, which was then meticulously rinsed and dried. Light polymerization occurred for 20 seconds after two glue applications.

The endocrown was coated with a thin layer of a dual polymerizing resin, inserted into the tooth, and polymerized at 5-second intervals, facilitating removal of the excess cement.

It was then polymerized on all surfaces for 60 seconds. Fig. 7 shows the completed restoration.

Fig 7: Occlusal view of cemented endocrown

Discussion

The choice of post endodontic restoration depends on the tooth's type, whether it is anterior or posterior, and the amount of dental structure that still exists. Direct composite restorations are an option for anterior teeth with a tiny access opening and enough dental structure, however crowns may be necessary for teeth with structural deterioration. On the other hand, because of their anatomical traits and magnified loads, posterior teeth that have had endodontic treatment will always require cuspal covers. Core development and a crown are required for a tooth with substantial coronal structural loss. It is necessary to apply an extra retentive mechanism if the remaining tooth structure is insufficient to hold the core in place. To maintain the integrity of the main structure in such circumstances, a post or dowel is frequently utilised.

These posts can be ordered in one piece or prefabricated with a direct core. Prior study led people to believe that the post and core strengthened the residual tooth structure, but recent studies have revealed that the post just helps the restoration to stay in place. On the other hand, eliminating the radicular structure in order to implant the post might deteriorate the root and make it more brittle. Additionally, the presence of a post can make further endodontic therapy impossible.

In the restoration of endodontic ally treated teeth, the invention and development of efficient dentine bonding agents represented a turning point. As long as there is enough surface area available for micro mechanical retention, the insertion of a radicular post is no longer a viable alternative. In 1995, Pissis introduced a brand-new approach that employed a porcelain core/crown unit as a single unit. The monobloc approach, an alternative to the conventional metal post and core, was proposed. In 1999, Bindle and Mörmann created the Endocrown method. It has been described as an adhesive restoration that offers sufficient retention, stability, and structural durability and requires only minimally invasive preparation [2].

The current gold standard for repairing teeth that have undergone endodontic treatment is minimum intrusive preparations with optimal tissue preservation. The same reasoning applies to the preparation for endocrowns: a circular supragingival/equigingival butt-joint edge and a central retention cavity. Root strength is kept, and preparation is carried out in accordance with the anatomical form of the pulp chamber. In order to moderate the load on the pulpal floor, forces operating on the tooth are distributed along the axial walls and cervical butt joint (compression forces). Micromechanics retention is provided by the interior cavity, and micromechanical retention is provided by adhesive cementation. This restoration's cervical sidewalk serves as its cornerstone, and it aims to provide a broad, level surface that is resilient to compressive load. Stability and retention are guaranteed by the saddle-shaped pulpal floor.

The research reports that choosing a prosthesis for repairing an endodontic ally treated tooth is a challenging choice that is mostly impacted by the substantial quantity of tooth structure that is left behind following root canal therapy. Reinforcing the remaining, healthy dental tissues is necessary for a sturdy and long-lasting repair, which can harmonise the complex of dental restorations. In today's cosmetic and adhesive dentistry, the Endocrown is a sensible and workable substitute for traditional post and core crowns since it protects root tissues and restricts internal pulp chamber preparation to the anatomic form of the chamber [4].

They are simpler to prepare and need less time and appointments in the clinic than conventional posts, cores, and crowns, among other benefits. The aesthetic qualities are also superb. Furthermore, adhesive restorations can limit microbial penetration from the coronal to the apical area of the tooth, enhancing the clinical outcome of endodontic treatment. Furthermore, they offer a considerable benefit in circumstances when posts are not advised owing to short or narrow canals. Endocrown are not suggested when the pulp chamber is small and narrow, adhesion is unclear, and there is very little tooth structure remaining [2].

Numerous various materials, such as Feld spathic porcelain, glass ceramic, hybrid composite resin, and recently developed all-ceramic blocks produced using computer-aided design and manufacturing, have been suggested for the creation of endocrown [4]. The ceramic material, which must be acid etch able in order to produce the bond to tooth preparation via an adhesive cementation technique, may be the only restriction for carrying out this treatment. The optimum choice seems to be pressed or machined ceramics, especially those strengthened with lithium disilicate. They offer restorations that closely resemble tooth structure and have good mechanical strength [5].

According to a research by Biacchi *et al*., endocrowns are more resilient to compressive stresses than traditional crowns supported by glass fibre posts [6]. In a comprehensive analysis, Sedrez-Porto *et al*. found that endocrown restorations may perform as well as or better than traditional procedures that employ intraradicular posts, direct composite resin, or inlay/only restorations in clinical (survival) and *in vitro* (fracture-strength) investigations [7]. Higher masticatory pressures and unfavourable strains are placed on mandibular molars. Endocrown restoration was a practical choice in this situation because of the tooth's superior compressive strength and lower levels of stress [1].

Conclusion

Endocrowns are a practical substitute for traditional post core and fixed partial dentures when restoring teeth that have undergone endodontic treatment and have suffered significant coronal tissue loss. It works better in molars than premolars and is advised for posterior teeth. Endocrowns are an effective

alternative to traditional procedures for dental restoration since they preserve the existing tooth structure, are less expensive, take less time to complete, and function mechanically and aesthetically.

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