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Case Series

Post Endodontic Restoration of Severely Damaged Posterior Teeth : A Case Series

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Abstract

Modern postless adhesive dentistery has shifted traditional concepts when restoring endodentically treated teeth.

Current knowledge preserves tooth structure and prevents catastrophic failures that could occur with different types of posts.

Indirect ceramic restorations seem to fit within biological and mechanical requirements.

Therefore, the clinical longivity of such restorations is defined by the tooth preparation design, material selection and adhesive cementation procedures.

Keywords: Endodontically Treated Teeth; Damaged Teeth; Posterior Teeth, Restoration; Post and Core; Endocrown; Inlay/Onlay; No Post No Crown; Bonding; Ceramic

Introduction

The restoration of endodontically treated teeth with an extensive loss of coronal structure remains controversial [1].

Studies have shown that several factors could influence their clinical performance.

These factors might be related to teeth or to the material of the post/crown and the cement used that could influence the biomechanical behavior of the treated teeth threw the incoherence of the elastic modulus of different prosthetic components [2].

Clinical prosthetic procedures of root canal treated teeth with insufficient structure range from a post and core restoration to a complete crown coverage [3].

Weine., *et al.* reported success rates of 98.5% and 90.6%, respectively, for root filled teeth restored with cast posts and cores and complete-coverage crowns [4].

Root canal treated teeth extractions have included periodental diseases, caries, poor structural integrity, prosthetic damages and endodontic failures [5,6].

Teeth with substantial hard tissue loss resulting from cavities or trauma require a post-and-core foundation to improve retention which involves the risk of iatrogenic perforation.

Failures of teeth restored with metal posts and cores regularly show dislodgment and root or tooth fracture [7,8].

Although earlier publications have called for the use of posts to retain coronal buildup materials, other evidence has demonstrated that the loss of hard tissue during root preparation reduces the rigidity and the stiffness of the tooth by removing an important amount of radicular dentin which could affect its survival prognosis.

Root fracture is the most serious damage in post-restored teeth since it may result in fewer irreparable fractures. The fracture susceptibility may be related to the remaining tooth tissue [9].

It has been suggested that sufficient ferrule (2 mm) of the covering crown could reinforce its fracture resistance [10].

The approach towards restoring endodontically treated teeth has changed. With the development of adhesive techniques and ceramic materials, alternative prosthetic solutions without the need of the use of endodontic posts, were described as adhesive restorations [11,12].

Macro-retentive designs are no longer a pre-requisite with adhesive restorations when there are sufficient tooth surfaces for bonding.

The use of bonded overlays such as endo-inlays and endocrowns is becoming common than classic full crown restorations.

Endocrown is a post free core restoration that preserves root tissue and constructs both the crown and core build-up [13].

Its preparation consists of a central cavity the size of the pulp chamber that allows stability and retention associated to a circular shoulder margin of 1 mm width.

Several studies have shown the potential of this restorative design to provide adequate function and aesthetics.

Moreover, endocrowns dicrease treatment time and cost by eliminating many steps during the fabrication, such as post trying and cementation, core buildup, temporary crowns and potential crown lengthening [14,15].

Case Presentation

First case

A 33 year old male patient came to our dental clinic for the restoration of his cracked premolar and the replacement of a defectuous composite restoration in 16 with no pain and sensitivity in both teeth.

He was interested in aesthetical durable restorations.

Both teeth were endodontically treated.

The premolar presented an extennsive coronal loss reaching the infra-gingival area.

After removing the coronal filling material on the molar, we discovered that the cavity borders were supra-gingival. Cavity walls presented a sufficient width (2mm) for bonding isolation.

It was decided to give all ceramic full coverage crown on 15 and a ceramic inlay as a restoration on 16.

Since the insufficient remained coronal structure on 15 (Figure 1), we had to reinforce coronal buildup material with a macro-retentive post on its palatal canal.

Post and core acrylic pattern was created by a direct build-up with an autopolymerizing acrylic resin (Figure 2) and sent to laboratory for burnout and casting.

The post and core was tried and cemented on the tooth (Figure 3)

Cavity preparation on 16 was done with the principle of inlay –onlay preparatio after a slight margin elevation(Figure 4,5).

After the cavity preparation, impression was made and sent to laboratory (Figure 6), where a full zirconia crown and IPS e.max CAD Ceramic inlay were fabricated.(Figure 7)

The inlay-onlay was etched, silanated and cemented with VARIOLINK dual-adhesive Resin Cement. (Figure 8)

Figure 1: Inital view of teeth 15 and 16.

Figure 2: Post and core acrylic buildup on tooth 15.

Figure 3: Cemented post and core on tooth 15.

Figure 4: Inlay-Onlay cavity preparation on tooth 16.

Figure 5: Margin elevation on tooth 16.

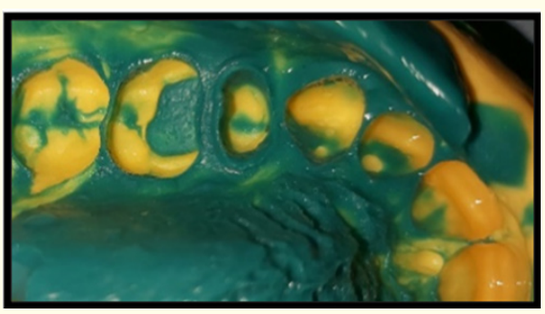

Figure 6: Impression with a polyvinyl siloxane.

Figure 7: Full ceramic crown and lithium disilicate inlay.

Figure 8: Final aspect of cemented restorations.

Second case

A 25-year-old female was referred to our prosthetic dental department in our dental clinic, Monastir, for the restoration of tooth 26 (Figure 9).

The patient reported that she suffered from repetitive filling material dislodgment.

Her medical history was noncontributory. Radiographic and clinical examinations were performed initially (Figure 10).

We concluded a defectuous glass ionomer cement restoration of a satisfying endodontically treated tooth (26).

After removing the glass ionomer cement restoration, an endocrown was indicated because of the amount of remaining tooth structure and the thickness of the cavity walls (Figure 11).

Being aware of the importance of tissue preservation, we proposed an endo-inlay to restore this tooth.

We chose lithium disilicate IPS e-max CAD as a material for our retoration.

The preparation for this monolithic, ceramic adhesive restoration requires specific preparation steps to be suitable for its biomechanical needs.

Cervical margin elevation was needed in this case to improve bonding conditions (Figure 12,13).

After evaluating the occlusal space of the preparation, the impression of the tooth was taken (Figure 14).

We, then, selected the ceramic shade and sent the impression to the laboratory (Figure 15,16).

A temporary acrylic resin restoration was made and cemented with eugenol freetemporary cement.

After receiving our CAD/CAM endocrown, we made our adjustments to prepare it for final colorant and glaze.

We used a rubber dam to isolate the tooth and begin its surface treatment with phosphoric acid(30 sec on enamel and 15 sec on dentin), washed and dried it (Figure 17,18).

We then applied adhesive and polymerized it for 20 sec with light curing.

VARIOLINK Dual polymerized resin cement was applied on the internal surface of the endocrown and then inserted to be polymerized at intervals of 5 sec ech side in order to precisally position the restoration and to easely remove the excess of cement (Figure 19).

Figure 9: Inital view of tooth 26.

Figure 10: Intraoral preoperative radiograph.

Figure 11: Dental state after removing provisional obturation with cavit®.

Figure 12: Rubber dam isolation for margin for distal margin elevation with flowable composite on tooth 26.

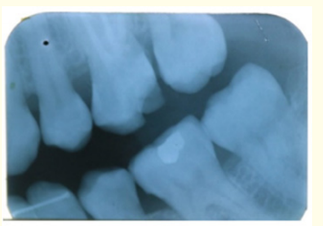

Figure 13: Bitewing radiographic margin elevation control.

Figure 14: Final aspect of the preparation.

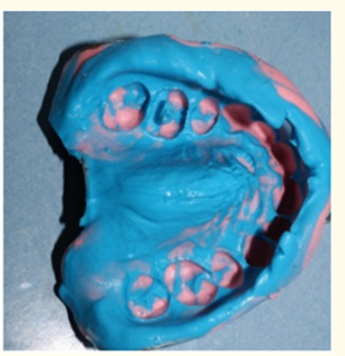

Figure 15: Impression of the upper jaw.

Figure 16: Color choice

Figure 17: Tooth isolation for bonding procedures.

Figure 18: Surface treatment with phosphoric acid.

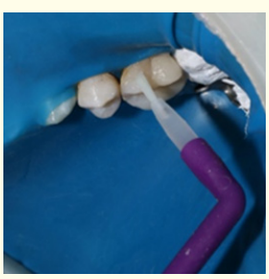

Figure 19: Endo-inlay final cementation and excess removing of the bonding resin.

Discussion

The biomechanical behavior recovery of ETT with limited remaining coronal substance often requires the use of post-and-core restorations.

The use of a post provides adequate resistance and retention for both tooth and crown.

Several finite element analysis researches indicated that a rigid post could strengthen a tooth in its cervical part [16].

Post and core restoration role of maintaining the core material seems to be particulary relevant for posterior teeth, where masticatory loads are essentially compressive [16].

Different techniques and materials have been advocated for biological and biomechanical purposes when restoring with post and cores.

Direct restorative techniques combine prefabricated stainless steel, titanium, carbon-fiber, glass-fiber, and zirconia posts with amalgam or resin composite core build-up.

Direct restorative procedures reduce treatment time and cost.

However, it could be responsable for improper marginal adaptation and difficulty in finishing which increases the chances for microleakage.

Moreover, this technique should be used in specific situations where adequate coronal tooth structure is remaining.

When endodentically treated tooth has lost a significant amount of coronal structure, metal post and core has been advocated to be the gold standard.

Two main techniques have been described in literature, for its fabbrication **: indirect and direct techniques.**

Direct method, such as described in the first clinical situation, provides better predictibility since it involves clinician with the internal anatomy of the post.

However, autopolymerizing acrylic resins are khnown to set an exothermic reaction, and are difficult to adjust.

Adjusting resin with diamond burrs may be responsable for the loss of more of the remaining tissue which may dicrease the tooth fracture resistance [17].

Multiple restorative procedures and reintervations could be reponsable of significant tooth damage and promote its extraction risks.

No-post/no-crown technique have emerged with modern adhesive restorative dentistry. This concept has been gaining notoriety for both vital and non vital teeth [18].

The tooth death spiral discussed the delay of the tooth death by maintating sound tooth tissue with modern adhesive partial restoration instead of tooth reduction for full crowns [19].

Partial restorations can be adhesively bonded to the preserved coronal structure, particularly to the enamel substrate, directly or indirectly [20].

Indirect Ceramic partial restorations can ensure biocompatibility and biomimicry.

Ceramic inlays exhibited a success rate of 100% in posterior bonded restorations [21].

All ceramic inlays presented a successful stress bearing when restoring permanent posterior teeth [22].

The most commun failure associated with all ceramic inlays/onlays was bulk fractures [23].

Monolithic leucite and lithium disilicate glass ceramic systems have shown promising laboratory and clinical results for small restoration.

Furthermore, the single interface of a one piece restoration provides better cohesion and colour match.

Adhesive technique reinforces tooth structures. It increases dental stiffness values to approximate the value of sound teeth.

However, partial restorations could be costly an difficult to repair.

Conclusion

Classic cast posts are still essential in the prosthodontist's armamentarium.

Partial ceramic restorations are better alternatives since they overcome the weakness of other aesthetic restorative materials.

However clinicians should be cautious when indicating them.

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