CASE REPORT

Digitally Customized Esthetic Restoration for Restoring Young Permanent Molars: A Novel Approach

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Abstract

Introduction: Stainless steel crowns (SSCs) are the popular restorative technique for the young permanent first molars treated endodontically. However, these restorations are not esthetically appealing and need replacement once adjacent teeth erupt and occlusion is stabilized.

Aim: Digitally customized aesthetic restoration constitutes as a reliable approach for restoring decayed young permanent molars.

Materials and methods: Here we present an innovative treatment approach for endodontically treated permanent young molars using a digital workflow with Intraoral scanners (IOS) and computer-aided design/computer-assisted manufacturing (CAD/CAM) fabrication of the restoration. IOSs include scanning of the prepared tooth, its antagonist, and the bite. CAD/CAM preparation of the customized restoration is followed by cementation and follow-up.

Result: IOSs are well tolerated by children, easily and swiftly implemented. Digital workflow should be considered for endodontically treated permanent young molars in contrast to prefabricated unaesthetic options.

Keywords: Case report, Digital scanner, Customized restoration, Young permanent molars.

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Introduction

In youngsters, for deformed and decayed molars stainless steel crowns (SSCs) are the commonly accepted mode of restoration.[1] They are cost-effective and have longevity and durability. Despite the advantages, SSCs have a few setbacks; they are unesthetic, the fabrication of SSCs needs tooth preparation of the entire tooth; which causes loss of tooth structure and they are temporary restoration for permanent molars that need replacement after a child's adolescence, and restored by a full-coverage crown.

Zirconium crowns/restorations are an alternative to SSCs due to their compromised esthetics and biocompatibility.[2] It is difficult to provide esthetic and long-term restoration in endodontically treated permanent molars in young adolescents, predominantly because of difficulty in attaining the cooperation of the child, mainly while taking the impression, which is a tactful process. Currently, computer-aided design/computer-assisted manufacturing (CAD/CAM) technology for the fabrication of zirconium/glass silicate restoration is available in most dental clinics. It is a precise, fast, minimally invasive, and single-visit alternative *via* its software/artificial intelligence.[3]

For deciduous molars, we have an option for preformed zirconia crowns but not yet available for young permanent molars. In this current report, an innovative approach for treating young permanent molar post-to-endodontic therapy, with digital workflow for construction of the customized restoration is discussed. The complete steps of the procedure will be depicted in the reported case. The treatment described here can surely facilitate improving the care in youngsters who have to go for the endodontic treatment as compared to prefabricated options.

Materials and Methods

The whole protocol is inclusive of five phases with follow-up:

- Diagnosis
  - Careful examination, medical and dental history.
  - Tooth structure left.
- Treatment planning
  - Child behavior, parent's cooperation, and budget should be considered.
- Initial preparation
  - Local anesthesia with/without nitrous oxide inhalation sedation.
  - Endodontic treatment/removal of caries.
- Digital workflow
  - Digital impression, bite scan, and digital transfer of files to the in-house prime mill.
  - Designing, milling and fabrication.
- Final restoration
  - Intraoral evaluation of restoration.

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- Cementation.
- Follow-up.

Case Description

An 8-year-old boy arrived at the clinic with the first main complaint of pain in his left, upper, and lower back tooth region of his jaw for 15 days with no significant medical or dental history. When examined intraorally and radiographically, left maxillary and mandibular permanent first molars were deeply carious. Parents were interested in a more definitive and less radical approach.

Considering longevity, precision, esthetics, less tooth reduction, and rapid treatment options, we decided to do endodontic treatment followed by customized restoration using digital workflow and hybrid zirconium CAD/CAM block. After the informed consent of parents, nitrous oxide inhalation sedation and local anesthesia were administered; a 1-day visit endodontic treatment (root canal treatment) was carried out.

On the same day visit, minimally invasive tooth preparation was done with only occlusal reduction for around 1.5 mm and no proximal/labiolingual reduction without any adhesive restorative material inside the chamber. For the constructed tooth, bite registration and antagonist were scanned with intraoral scanners (IOSs) (Primescan Connect®:Dentsply Sirona, Dental Systems GmbH, Bensheim, Germany), the software connects version no. 5.1.0 (Dentsply Sirona, Dental Systems GmbH, Bensheim, Germany). The overall capture procedure took 30 seconds (Fig. 1).

Computer-aided design/computer-assisted manufacturing (CAD/CAM) designing, milling in prime mill (wet milling—approximately 12 minutes) and, fabrication of hybrid zirconium restoration all were done chairside only with (Ivoclar Vivadent IPSe.max ZirCAD—Yttrium-stabilized zirconium oxide block), followed with sintering and glazing procedure to provide strength and esthetics (taking around 40 minutes) (Fig. 2).

Cementation was completed with resin-modified glass ionomer cement (GC Fuji PLUS). A 1-week follow-up was done; to inspect the restoration clinically and radiographically for the occlusion and marginal (Fig. 3).

Table 1 shows the advantages of customized zirconia restoration over prefabricated and lab-made restoration options.

Fig. 1: Digital scan

Discussion

The establishment of digital restorative procedures, with IOSs and CAD-CAM, for the restorative as well as prosthodontic field of dentistry has opened the latest option in treating young children. The techniques are still limited to prefabricated crowns (steel/zirconia) which are directly adapted to the tooth.[4] Interestingly, a valid alternative to prefabricated crowns, could come from

Fig. 2: Customized digital restoration

Fig. 3: Final cemented customized restoration

Table 1: Describes the advantages of customized zirconia restoration over prefabricated and lab made restoration options

Restorative considerations	*Stainless steel crown*	*Lab-made zirconia crown*	*Customized zirconia restoration (CAD/CAM)*
Tooth reduction	Proximal and occlusal	Proximal, occlusal, and labio-lingual	Only occlusal
Esthetics	Poor	Good	Excellent
Precision	Less precise	Less precise	Highly precise
Cost	Low cost	High cost	High cost
Restoration longevity	Has to be replaced later when adjacent/antagonist teeth are in occlusion	Might have to be replaced later when adjacent/antagonist teeth are in occlusion	No need to replace/long-term restoration
Chair-side	Same visit but there should be sufficient available sizes	Multiple visits	Single visit
Fabrication and milling	Prefabricated	Laboratory	In-house/chair-side
Armamentarium	Minimal inventory (all sizes)	Minimal inventory	Intraoral scanner/milling unit/blocks

Note: Advantages of customized digital restoration and decision-making considerations regarding restorative options for endodontically-treated young permanent molars in children

CAD/CAM technology, as it provides a highly precise and easy manufacturing process.[5]

In contrast to the SSCs, customized restoration needs very minimal tooth preparation, eliminating the requirement for post and core, providing high strength, saving time, preserving the structure of the tooth, and thereby maintaining periodontal health because of supragingival margins. Importantly, resin-based cement relines the restoration, sealing the preparation margins and ultimately cementing the customized restoration as well. The limitation lies in treatment cost, the skill of the dentist, and the material availability.

Conclusion

A tooth that is endodontically treated is always problematic in the case of children. On one hand, interim SSCs are anesthetic and are to be replaced at a later time. If going for a lab-made prosthesis, taking an impression on children is tough and needs the cooperation of the child. The digital workflow described here enables the dentist to provide a definitive, esthetic, and durable restorative solution for young permanent endodontically-treated molars in children as compared to prefabricated options.

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