Endodontic retreatment and adhesive restoration of structurally compromised second premolar

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A light of the scientific literature concerning the outcome of the endodontic treatment, it doesn't sound inappropriate that the restoration of the endocorononal treatment has been completed by the endodontist. In this context, the following report presents a case of successful rehabilita-
tion of a second premolar, including retreatment and definitive restoration.

Teeth that need retreatment are mostly ones that have been decayed due to caries, fracture or/and previous restoration. The endodontic retreatment in such cases is a challenge concerning the isolation, overcoming different obstructions, perforation management (if they exist) and final restoration. The success rate for teeth that exhibit one or more technical problems, such as transportation, stripping, perforation or internal resorption, is reported to be 47 per cent. Perforations have the most negative influence.

One of the factors that influence the outcome following non-surgical retreatment is the final restoration. Though some authors question the importance of the coronal restoration for the longevity of endodontically treated teeth, it is well accepted that the final restoration is as important for the outcome of the endodontic treatment as the quality of the treatment itself. Still, restoration of the previously treated tooth remains a controversial issue. In the context of the increasing relevance of biometrics, adhesively inserted indirect partial tooth-colored restorations are gaining more and more attention. The restoration or mimicking of the biomechanical, structural and aesthetic integrity of the tooth in a conservative manner is an advantage that must be used and preferred whenever possible. Still, these types of restorations are time-consuming, labor-
tilized restorative modality, particularly in endodontically treated teeth. In these cases, crowns. This may be because clinicians and dental techni-
cians are not used to work with the composite resin. The op-
erative field was isolated with rubber dam and covered in A2C5 and Matrix band (Fig. 5). While keeping the access open with gutta-percha points and Cavit, the total etch technique was performed. Enamel and dentin were covered with adhesive (Prime & Bond NT, DENTSPLY) and polymerized for 10 seconds. Bulk-fill flowable composite was ap-
plied (SDR, DENTSPLY) and polymerized for 40 seconds in order to create a reservoir for the irrigants during endodontic treatment (Fig. 4). After the removal of gutta-percha points and Cavit, the real ca-
nal (blue arrows) and the resta-
oration (red arrow) were eas-
ily accessible (Fig. 5).

Since the artificial canal was previously obturated with a paste, cleaning, with a combina-
tion of hand files, ultrasonic (Pro Ultra 5 and 6) and irrigation with citric acid was used. To confirm the effectiveness of the cleaning procedure, an intra-operative X-ray was done (Fig. 6). Because of the different angulation of the beam, it seems as if the per-
oration is on the level of the crestal bone, which is not the real case.

For cleaning and shaping of the real root canal, the following protocol was used:

1. Glide path was established using SS K-files 8, 10, and Path Files 015, 016, 016, (DENTSPLY Maillefer).
2. The upper two-thirds was prepared using S1 and S2 files from Pro Taper system (DENTSPLY Maillefer).
3. The apical third—20 (04) GTX file (DENTSPLY Maillefer).

Throughout the whole procedure, irrigation with Citric acid (40%, Cerkamed, Poland) and NaOCl (2%, Cerkamed, Poland) was used.

We preferred S1 and S2 files because of their ability to brush against the canal wall, which is very useful in case with oval cross sections, where it is of paramount im-
portance to clean all aspects of the root canal spaces. For the apical one third we chose langed GTX file, because the canal was very narrow and we have the possibility to transport the apical foramen. Both artificial and true apical foramina are eliminated using warm vertical compac-
tion of gutta-percha and MTA-
(Files, Am-
gelus, Brasil). On the post-op radiograph, the preparation and obturation seem short, but this was the reading we repeatedly got with our apex locator (BayPex5, VDW, Ger-
manship) (Fig. 7).

After the completion of the endodontic retreatment, the pre-endodontic buildup was left at place and the endodonti-
cal access was restored again with SDR, creating a core, on which an onlay prepara-
tion with diamond bars (Mani Inc.) was performed (Figs. 8 & 9). The enamel margins were exposed and unsup-
pported enamel prisms were removed using fine-grit dia-
mond points. The remaining tooth structure was prepared to receive a built-in joint with the restoration margins. Internal line angles were rounded and the walls provided 5- to 15-de-
gree path of divergence. The proximal box preparations extended to the existing com-
posite, since they were located in the dentin.

The dimensions of the prepa-
ration provided at least 2mm of interocclusal clearance, which could be verified on the im-
pression. A condensable sili-
cone impression was taken (Fig. 10). A custom made pro-
visional restoration was creat-
ed using direct technique and temporarily cemented with a non-eugenol luting agent (Temp-Bond NE) (Fig. 11). The fitting aspect of the resto-
ration was sandblasted by the dental technician.

At the second appointment after assessment of the pre-
pared restoration, removal of the provisional and cleaning
of the preparation the fit and aesthetics of the overlay were evaluated. Rubber dam was placed and the preparation was cleaned with acetone, etched with 57 per cent phosphoric acid for 15 seconds, rinsed and dried. The fitting aspect of the restoration was also cleaned with acetone prior to cementation. A dual-cure self-adhesive luting resin (SmartCem2, DENTSPLY) was applied to the walls of the preparation and the restoration was placed with firm pressure and finally seated. The excess cement was removed with an explorer, a #415 scalpel blade and dental floss in the interproximal area after five-second polymerization that brought the cement to a "rubbery" stage (Figs. 12 & 15). The restoration was covered with gauze and finally cured for 60 seconds from each side (Figs. 14 & 15). The minimal occlusal adjustments were done with fine diamond burs under water coolant. Finishing and polishing were accomplished with the Enhance system (DENTSPLY) (Fig. 16).

Once finishing and polishing was done, a 57 per cent phosphoric acid gel was applied for 15 seconds to clean the surface of the restoration and to acid etch the marginal enamel. After washing and drying, the nanofilmed adhesive (Prime&BondNT, DENTSPLY) was applied and permitted to rest for 10 seconds to permeate the superficial and marginal fissures created by the finishing process. The adhesive was then thinned with water and polymerized for 40 seconds (Fig. 17). At the six-month recall, the tooth was asymptomatic and the patient was completely satisfied (Figs. 18,19).

Discussion
This case report demonstrates endodontic retreatment and composite onlay as definitive restoration for a compromised tooth with minimal coronal tooth structure.

The two most important factors in terms of prognosis of treatment of perforations are the age of the lesion and degree of bacterial contamination. In our case, the previous endodontic treatment was done four years ago. The long period of time is not favourable for the prognosis, but since the perforation is in the apical third the likelihood of bacterial contamination is low. After the patient has been informed, he chooses orthograde endodontic retreatment as a treatment modality.

The material of choice for perforation repair is MTA (mineral trioxide aggregate). Because of the small size and apical position of the lesion, we decided to treat it like a second canal and to obturate with gutta-percha and MTA based sealer. The absence of worsening of the periradicular conditions in the six months post-op X-ray (Fig. 19) supports this approach, and the patient is still under observation.

Although still debatable, recent comprehensive meta-analysis by Gillen et al.6 demonstrates that a well-fitting, bacteria-proof final restorations has the same importance for the long-term prognosis as the endodontically treated tooth as does the well-performed endodontic therapy. Besides the prevention of coronal microleakage, a key factor for the long-term survival of an endodontically treated tooth appears to be the amount of remaining tooth substance,4,5 which is determined by the dimensions of the final restoration. So an ideal treatment option for an endodontically retreated tooth seems to be adhesively bonded restorations that preserves as much of the tooth structure as possible.

An endodontically treated posterior tooth presenting with extensive decay is most frequently restored with a post and a crown. That is incontestable, because crowns are well-established and known, clinically proven restorative modality, and still a considerable amount of research is being performed in this direction.4,6 On the other hand, partial toothcoloured restorations are recognized as valuable alternatives to full crown procedures, and questions are raised if intracanal posts are necessary at all for an endodontically treated tooth.

Since their introduction in 1980,4 indirect laboratory processed composites are being continuously improved in their physical and mechanical properties. Now this restorative option offers adhesive, biomimetic approach far less aggressive than crowns and far less technique sensitive than ceramics.

Achieving a perfect marginal quality with composite onlays, when gingival margins are located in the dentine, continues to be critical even when new adhesive techniques and systems are used.17 The application of a composite base underneath indirect composite restorations represents a feasible non-invasive alternative to surgical crown lengthening to relocate cavity margins from an intracrevicular to a supra-crestal position. This also permits the placement of rubber dam for absolute isolation. Surgical crown lengthening also compromises the periodontal tissue support of neighbouring teeth.26 We did not use the subgingival placement of the pre-endodontic build up. This material has the advantage of the availability of a low viscosity resin composite and in the same time polymerization shrinkage stress similar to regular viscosity composite.

To simplify the procedures for bonding indirect restorations, resin composites have been introduced recently that are promoted as self-adhesive. However, they do not require a separate adhesive application step. Manufacturers claim that these composites are hydrophilic when mixed (aesthetic phase) but become hydrophobic (neutral pH) upon reaction with the tooth structure. The bond strengths to the tooth structure are questionable. In our case we decided to additionally etch the enamel margins in the preparation, although not recommended by the manufacturer, because the procedure is simple and, as Duarte et al.28 and de Andrade et al.29 demonstrated, improves the bond strength of the restoration.

We preferred condensation-type silicon impression material for its better ability to reproduce the surface characteristics of low viscosity resin reported by Takano et al.30

The surface and margins of the restoration were sealed with a filled adhesive. This treatment improves the marginal adaptation,2 and it could be demonstrated that adhesives are superior to specially designed resin coating materials.

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