



Infiltration of the Root Canal Obturation Due to Deficient Composite Restoration

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Abstract

The aim of this study is to demonstrate the significance of carrying out a proper, well-adapted coronal restoration in order to prevent bacterial infiltration of the root canal sealing. We studied 49 clinical cases endodontically pretreated, with occluso-proximal restorations placed. We selected to present 10 clinical cases that had incorrect coronal obturation, which allowed contamination of the root canal treatment. Incorrect marginal adapted restorations with composite resin and, also the fissures/fractures of the composite material or dental structure, the appearance of secondary caries, and marginal discolouration, can cause infiltration of the root canal filling.

We must highlight the fact that the quality of the root canal treatment also depends on the correct type of coronal restoration chosen (direct or indirect restorations).

Keywords: Root Canal Obturation; Deficient Composite Restorations; Periapical Pathology

Introduction

A good quality coronal restoration prevents coronal-apical infiltration. Bacterial penetration into the root canal does not occur in case of a correctly restored access cavities. Teeth with adequate restoration have a low prevalence of apical periodontitis [1].

Currently, light-curing composite resins are the filling materials of choice used for direct frontal and lateral restorations.

The quality of composite resin restorations can be considered the key to long-term success, along with correct endodontic treatment.

Of course, in this sense, an integrative approach is needed both to the desired aesthetic and to the correct occlusal relationships, but what we wanted to highlight is the fact that the importance of a completed coronal restoration in our study, from composite resins, must offer the guarantee of an obturation that ensures the absence of marginal infiltration, which can be the causal factor of compromising the quality of the root canal treatment [2-5].

In order to achieve a correct root canal treatment, it must be followed in the shortest possible time by a correct restoration of the endodontic access cavity and possibly other deep cavities in the respective tooth.

Studies have shown that endodontically treated teeth have a higher risk of fractures than vital, unrestored teeth [6-8], caused by the loss of dental structure. Correct cuspal covering restoration (direct composite restoration or cast restoration) placement can lower the chances of fracture [9-11].

Coronal composite resin restorations with deficiencies

The purpose of this study is to radiologically evaluate the quality of inadequate coronal restorations. We investigated 49 cases with inadequate class I and II coronal restorations applied to previously endodontically treated teeth. Of these, 9 cases were eliminated from the study because it was clinically established, after the removal of the coronal restoration with minimal deficiencies, that the quality of the root canal obturation was not affected.

The following images show suggestive retroalveolar radiographs with infiltrated root canal obturation after a coronal restoration

with deficiency, either you find a complete or incomplete fracture in the composite segment that affects the depth of the cavity (both enamel and dentin) (figure 1, 2, 4, 6), or the fracture of a composite fragment that interests the edge of the cavity (figure 2, 3, 4, 5, 7, 8).

After the removal of the corono-proximal restorations, we used an endodontic probe to examine the root canal obturation and observed that sealing has been altered, suggesting that the root canal treatment has been compromised.

X-Rays of endodontically pretreated teeth with root canal obturation and deficient restorations (figure 1-8).

In this retroalveolar radiographs are presented teeth with deficient coronal restoration, compromising the root canal obturation by the infiltration of the sealer. It is necessary doing in the same session, the endodontic retreatment and reapplying the composite coronal restoration.



Fig.1 Teeth 24, 25



Fig.2 Tooth 14



Fig.3 Tooth 26



Fig.4 Tooth 26

Figure 1, 2, 3, and 4, the teeth 24, 25, 14, 26 and 26, presented coronal fillings with *deficiencies* in the vertical direction, meaning

the absence of material in the depth of the cavity. Therefore, the lack of tightness of the composite resin allows the infiltration of the root canal treatment.

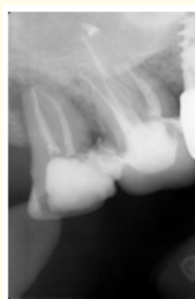


Fig. 5 Tooth 17



Fig. 6 Tooth 16



Fig. 7 Tooth 26

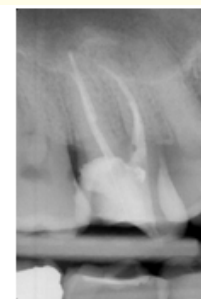


Fig. 8 Tooth 16

In figure 5, 7 and 8, there are several improperly marginally adapted voluminous coronal fillings that show signs of secondary

caries. Teeth 17, 26, and 16 need root canal retreatment and restore the abutment in the same session. Preparing the teeth for a dental crown.

In Figure 5, also a periodontal disease can be seen in the radiograph of tooth 17. It can be observed that the incorrect coronal restoration helped progress the marginal periodontitis.

Figure 6, tooth 16 does not have a coronal restoration, so the root canal treatment is exposed and can be easily infiltrated. Both the coronal obturation and the root canal retreatment must be completed in the same session.



Fig. 9 Tooth 38 preoperative



Fig. 10 Tooth 38 postoperative

In Figure 9, tooth 38 with a small distal fragment of the restoration fractured and infiltrated, due to the lack of adaptation of the dental crown. After removing the restoration material, we examined the root canal obturation using endodontic tools (Kerr files, endodontic probe) and decided to the endodontic retreatment.

At examination, the root canal sealing was soft and not adapted to the root canal walls.

Figure 10, tooth 38 with root canal retreatment finished and dental crown applied.

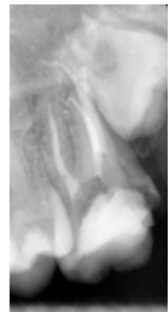


Fig. 11 Tooth 27 preoperative



Fig. 12 Tooth 27 postoperative

Figure 11, tooth 27 has a coronal composite restoration which shows a deficiency in the distal area as a result of the wall restoration fracturing. Also the root canal obturation is infiltrated. It is recommended to be done in one single appointment, the root canal retreatment and the composite coronal restoration.

Figure 12, tooth 27 with endodontic retreatment and coronal obturation finalised.

Discussions

The success of endodontic therapy is determined by the decontamination and complete obturation of the root canal system, and also by the correct coronal restoration [12].

Endodontic failures are typically caused by inadequate coronal sealing (microleakage), bacteria present in the the root canal system and iatrogenic errors (i.e., inadequate access cavity preparation) [13].

The success of the endodontic therapy depends also on the crown restoration of the endodontically treated tooth being completed in the same session.

The lack of tooth substance with small dehiscent areas, and the radiological image is much more relevant and betrays a maladaptation of the restorative material, which we can assume has determined, in addition to coronal microleakage, also the presence of bacteria at the root canal level, compromising its quality.

Following photopolymerization, the composite resins experience a thermal contraction at the restoration margins, or the tooth-composite material interface, leading to voids and microleakage [14]. Any bonded restorative's adaptability is mostly determined by the cavity's form and the number of bonded walls with proper adhesive system [14].

While root canal filling and disinfection may be required, oral bacteria can easily recolonize the root canal at any point, owing to a lack of tooth substance or a poorly adapted restoration [15-17].

If in the past the definitive obturation was postponed for a later session, during which the clinician waits to heal the periapical tissue, now it is recommended that the definitive obturation be applied in the same session as the root canal obturation, so that the risk of bacterial infiltration is diminished or even canceled.

Conclusions

Our study indicates that by damaging the interface between the hard dental structures and the coronal restoration, marginal microinfiltration is favored. This can lead to both immediate and delayed consequences, such as the development of secondary caries and pulpal pathology. Additionally, it can compromise the quality of the root canal obturation by favoring the infiltration of the endodontic system from the coronal-apical direction.

Incomplete or complete microcracks in the enamel were highlighted, including the dentin, as well as dehiscent areas that can be attributed to the polymerization contraction of the composite material from the interface area between the composite resin and dentin, as well as to the defects of procedure in applying the material.

Using endodontic microscopes, the quality of restoration of dental morphology can be appreciated in detail and the quality of marginal adaptations.

Presently, the issue of retreatment in the single session is recommended in most cases. This means that the endodontic treatment must be finished with a root canal filling, and the resin coronal restoration must also be applied in the same session.

We believe that it is necessary to extend the study on an appropriate number of extracted teeth, in order to obtain relevant results.

Incorrect coronal restoration can affect the prognosis of endodontic treatment.

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