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Case Report

Resin Infiltration for White-Spot Lesion Management After Orthodontic Treatment

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ABSTRACT

This case study aimed to manage post-orthodontic extensive root canal calcification and crown white-spot-lesions using the resin infiltration technique. After undergoing orthodontic treatment with fixed appliances, a 22-year-old male patient arrived at the clinic complaining of discomfort and aesthetic dissatisfaction. According to the patient, he received orthodontic therapy for approximately four years. Clinically, the patient had mild to severe post-orthodontic white spot lesions (WSL) on both upper central incisors. In contrast to the neighboring teeth, tooth #21 had a yellowish hue. In addition to being percussion-sensitive, tooth #21 did not react to either heat or electric pulp testing (EPT). An orthopantomogram (OPG) and CBCT showed that tooth #21 had significant root canal calcification, although the lamina dura was intact and the periodontal ligament space was normal. Root canal therapy was performed on tooth #21, followed by internal bleaching with 35% hydrogen peroxide (non-vital walking bleaching). The esthetic effect was then improved by treating both teeth with white spot lesions with the resin infiltration procedure. Comprehending patient expectations, completing complete evaluations, assuring informed decision-making, and tailoring treatment programs might all lead to the greatest results.

Keywords: Root canal calcification, Tooth white spot lesion, Walking bleaching, Resin infiltration

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Introduction

Post-orthodontic decalcifications, often known as white spot lesions, or "WSL," are a major cosmetic difficulty following orthodontic treatment. According to reports, the incidence of these lesions ranges from 73-95% [1, 2]. There are several reasons for the increased incidence of enamel WSL. Patients who have permanent orthodontic equipment have an especially difficult time maintaining good oral hygiene. In addition to making cleaning them more challenging, the existence of these devices adds more surfaces for plaque and biofilm to build up on. The problem gets much more complex when these difficulties are coupled with the fact that teenagers are the most prevalent patients to have orthodontic treatment. Adolescents are more prone to dental caries and frequently show a decreased desire to maintain proper oral hygiene practices, which can lead to WSL beginning as early as one month [3-5].

The occurrence of white spot lesions is widely viewed as a negative consequence [6]. Studies have shown that resin penetration, such as the use of Icon DMG, is the most efficient way for masking WSL [7]. Furthermore, when compared to therapeutic fluoride solutions, it offers superior protection against the formation of new WSL [8]. Furthermore, teeth treated with caries infiltration display long-term color stability [9, 10], and several case studies have demonstrated excellent outcomes [11, 12]. When dealing with white spot lesions while undergoing orthodontic treatment, there is a natural concern about the bonding strength to treated surfaces. Research has shown that applying

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resin infiltration to demineralized enamel has no negative impact on the bonding strength of orthodontic brackets [13].

This case study aimed at the management of post-orthodontic extensive root canal calcification and crown white-spot-lesions using the resin infiltration technique.

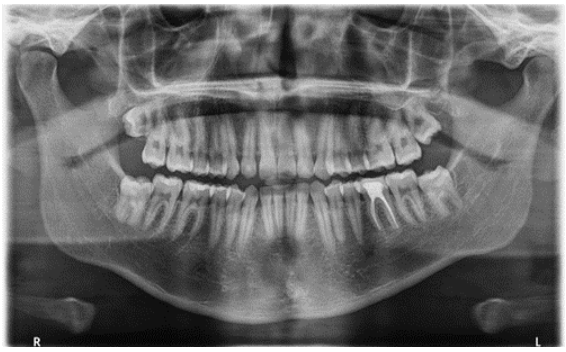
Case report

After undergoing orthodontic treatment, this 22-year-old man arrived at the clinic complaining about discomfort and aesthetic dissatisfaction. According to the patient, his orthodontic therapy lasted for almost four years. Clinical examination revealed that the patient had two upper central incisors with mild to severe post-orthodontic white spot lesions (WSL). As a result of calcific metamorphosis, tooth #21 showed yellowish discoloration in comparison to the neighboring teeth **(Figure 1)**.

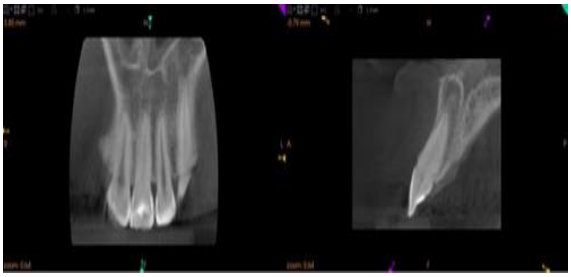


Figure 1. Preoperative frontal photo with a black background to make the contrast better and the white spots more clear.

When tooth #21 was examined radiographically, it revealed considerable root canal calcification, intact lamina, and a normal periodontal ligament gap **(Figure 2)**.



a)



b)

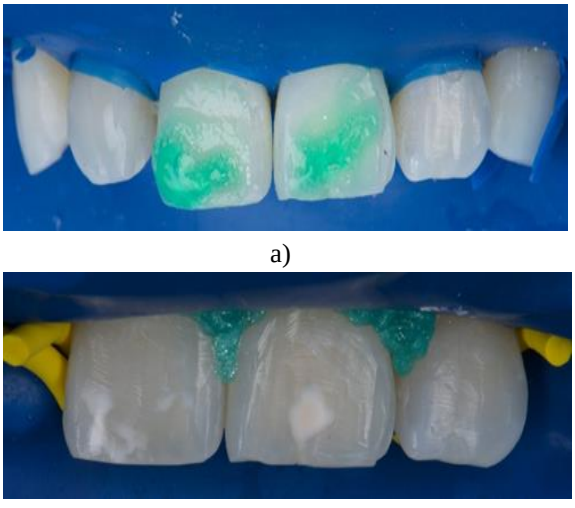
Figure 2. Preoperative radiographs; a) orthopantomogram (OPG) panoramic radiograph, and b) coronal and sagittal view of CBCT.

Neither heat nor electric pulp tests produced any results for this tooth. With the use of an endo access bur and after the measurements and angulations obtained from the cone beam computed tomography (CBCT), root canal therapy was started in tooth #21. With a dental operating microscope, the canal was found and navigated with a size #10 C file. The root canal system was prepared using 17% EDTA, 5.25% sodium hypochlorite, and Reciproc files. Gutta-percha and EndoSequence® BC Sealer (a hydraulic condensation method) were used for obturation. Opalescence™ Endo was used to start internal bleaching, also known as non-vital walking bleaching, following the manufacturer's recommendations. The Opalescence Making sure the endo-bleaching gel did not come into touch with soft tissues, it was injected into the coronal pulp chamber. After placing a temporary filling, it was ensured that there was adequate occlusal clearance **(Figure 3)**. The required tooth color change was attained after five days. Next, until the amount of coronal sealing material was reached, the bleaching and temporary restorative materials were eliminated. Using a suitable barrier and temporary restorative materials, seal the access opening. Before placing a permanent restoration, wait seven to ten days after the whitening operations. This is because whitening products might interfere with the bonding agents used in restorative processes. After that, tooth #21's palatal access cavity was sealed with a permanent composite restoration. By the conclusion of this procedure, the patient's main complaint had been partially resolved by internally whitening the tooth and matching the color of the neighboring teeth. But in the next phase, white spot lesions will be applied by using ICON resin infiltration following the manufacturer's recommendations.



Figure 3. Periapical radiograph showing tooth #21 after root canal treatment.

To provide a clean and dry working environment, a rubber dam must be placed before beginning the resin infiltration procedure. In situations like these, a rubber dam must be used. Then, to clean the surface and start the opening of small pores, we use a micro-abrasion method using a micro-abrasive paste (Opalustre, from Ultradent). Three applications of this paste are made, each lasting 60 seconds. It is important to rinse well in between applications. After that, the hydrochloric acid etching procedure is started using DMG's Icon-Etch. A particular smooth surface (sponge) tip is used to massage the surface for two minutes during the etching process. The white patches on the teeth are even more noticeable after a thorough rinse **(Figure 4)**. This suggests that the minuscule holes are more easily accessible. Ethanol (Icon-Dry, DMG) can be applied as an evaluation to verify infiltration readiness. Following the application of ethanol, if the white spots go away, the enamel is ready for penetration. Should this not be the case, the etching process may be repeated up to five times.



a)

b)

Figure 4. a) Application of hydrochloric acid (Icon-Etch, DMG), and b) Result after etching three times for two minutes.

Following the removal of the white spots after utilizing ethanol (Icon-Dry, from DMG), we used methacrylate (Icon-Infiltrant, from DMG) to continue the infiltration process. Additionally, a particular smooth surface tip is used to carry out the infiltration procedure. Following the removal of surplus material with air, polymerization was carried out for 40 seconds. The patient was quite pleased with the outcome **(Figure 5)**.



Figure 5. Final results after both internal bleaching and resin infiltration.

Results and Discussion

Another treatment strategy for stopping the progression of enamel defects is the resin infiltration procedure. Its goal is to use a specialized low-viscosity light-curing resin that is made to quickly penetrate the porous enamel to seal the micropores inside the WSL [13]. Capillary pressures drive the resin into the lesion body. Its main objective is to create a diffusion barrier inside the WSL as opposed to only on its exterior. According to Robinson *et al*. [14], resin filled around 60 ± 10% of the WSL pore volume.

Resin can also penetrate subsurface lesions to create areas of the lesion that are injected with resin. Interestingly, resin infiltration extends beyond 100 µm [15]. The fact that enamel lesions lose their white look once the resin has been infused into their micropores is a benefit of resin infiltration. They instead start to resemble whole, healthy enamel. Sadly, white spot lesions cannot be removed by resin infiltration or microabrasion methods. Because certain lesions extend beyond the enamel's outermost layer, this partial efficacy can be explained [16]. According to research, resin infiltration penetrates to a depth of around 60 µm, whereas microabrasion destroys about 200 µm of the surface enamel. A white spot lesion may still be evident if it continues beyond these treatment depths. Consequently, when selecting these techniques, case selection should be carefully considered [17].

The results of this case report highlight the significance of careful case selection by indicating that, given the limits of this study, the resin infiltration approach

seems to be more beneficial for treating white spot lesions.

Conclusion

This case study concludes by emphasizing the importance of post-orthodontic white spot lesions in patients. A patient's overall happiness with orthodontic therapy and oral health may be significantly impacted by these abnormalities.

Understanding the multifactorial nature of white spot lesions is essential for dentists, who must also emphasize the significance of early detection, prevention, and management. As dental professionals, we must keep looking for new and creative ways to reduce the risk of white spot lesions both during and after orthodontic treatment.

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Ethics Statement: Written consent from the patient was obtained for using his pictures in this publication.

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