CASE REPORT

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The power of ICON infiltration in an adolescent patient. Case report.

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Abstract

Introduction. White spot lesions are early signs of demineralization, which may or may not lead to the development of caries. An inactive white spot lesion might act as an arrested dental caries and affect the esthetic appearance by displaying a milky white color. These lesions need a non-invasive or a minimally invasive treatment. One of the materials taken into consideration in treating these lesions is ICON, a biomimetic material that infiltrates the white spots and can reestablish the esthetic function. The aim of the current study was to evaluate the esthetic efficacy of a minimally invasive technique and a relatively new product on the dental market, ICON, in the treatment of different non-cavitated carious lesions. Case presentation. A 14-year-old patient presented to the dental clinic with asymptomatic, non-cavitating lesions on the cervical aspect of all permanent teeth. The lesions were diagnosed as incipient caries on the buccal, occlusal, and palatal surfaces of the teeth, and the proposed treatment to arrest their progression and improve the esthetic appearance was the use of the ICON infiltration technique. Conclusion. The ICON resin infiltration treatment increased esthetics, visibly diminishing the appearance of non-cavitating carious lesions.

Keywords: ICON, low viscosity resin, white spots, biomimetic restorative dentistry.

Introduction

White spots are defined as the demineralization of the enamel surface and enamel substrate with no cavitation. They are the first clinical observation of the occurrence of dental caries that can be arrested in their evolution. A white opaque appearance characterizes these lesions. Sometimes these lesions are observed in patients who have undergone orthodontic treatment with a fixed appliance hindering oral hygiene and increasing the risk of enamel demineralization [1].

These defects affect dental esthetics, lowering self-esteem [2]. These situations should be treated in a minimally invasive way, leading to better esthetics. Infiltration with low-viscosity resin has proven to be the right treatment, fulfilling both conditions. The material is effective in treating incipient caries, mild and moderate fluorosis, but also in cases of Molar Incisor Hypomineralization (MIH) and other types of opacities [3, 4].

The infiltration of demineralized enamel with a low viscosity light-curing resin resulted in a process of enamel hybridization similar to that occurring in etched dentin. However, unlike etched dentin, the resin forms extensions in the hollow spaces within the demineralized enamel [5].

ICON is a low viscosity resin produced by DMG America. DMG describes its product as a breakthrough product designed for the minimally invasive treatment of incipient and superficial carious lesions [1].

The aim of this study was to verify the esthetic effectiveness of treating incipient caries using a new product emerging from the minimally invasive category of biomimetic dentistry: ICON.

The natural appearance of the tooth is determined by how the incident light beam is absorbed by the tooth tissue and follows a linear path in healthy enamel [6]. The white spot appearance occurs when porosities develop in the enamel, as the tissue structure is altered. In this situation, photons are scattered unevenly, and light will reflect and refract in different directions. The white spot is more visible if the lesion is dehydrated since the crystals in the healthy enamel structure are replaced by organic fluids or air in the case of demineralization. Due to different refractive

indexes, light beam trajectory changes occur. Resin infiltration of the lesion makes the photon passage more homogeneous and results in the loss of the opaque white appearance [7-9].

To mask white spots, it is necessary to replace the enamel porosity with a material having a refractive index as close as possible to that of healthy enamel. By limiting the changes in the path of incident rays, light transmission is achieved similarly to healthy enamel. ICON ensures that part of the light beam is transmitted to the dentin tissue and the other part is reflected to the observer's eye [10]. Given that the refractive indexes of enamel and ICON resin are similar, the difference between them is considered negligible (enamel refractive index = 1.65, ICON refractive index = 1.46-1.52); the light beam will be only slightly or not at all deflected, and the lesion will look like healthy enamel [11].

Case presentation

This study presents the case of a 14-year-old patient who came to the dental clinic for esthetic reasons, with multiple white spot lesions, size 1 and 2 by the Ekstrand index, asymptomatic, chalky in appearance, on different dental surfaces. The lesions were diagnosed as incipient, non-cavitated caries on the buccal, occlusal, and palatal surfaces. The proposed treatment to stop their progression and improve the esthetic appearance was the use of the minimally invasive ICON infiltration technique.

The differential diagnosis of incipient carious lesions was made with non-carious white spots, classified as fluorosis, progressive enamel hypomineralization, Molar Incisor Hypomineralization syndrome, hypomineralization resulting from trauma, and enamel hypoplasia, which may be caused by genetic, environmental factors or rare disease [11-14]. Given the location of the carious lesions at the cervical level, their presence on each tooth, and the fact that palpation with a probe did not reveal any loss of substance, the positive diagnosis was that of incipient carious lesions.

Prior to implementing the ICON treatment, the patient was instructed about oral hygiene and diet and was recommended to use a toothpaste with 1450 particles per million of Fluoride and a Casein phosphopeptide - amorphous calcium fluoride phosphate (CPP-ACFP) paste - the latter for about 6 months, to remineralize the affected teeth. Even with improved hygiene and constant remineralization treatment, the white spots were not fading. Thus, treatment with low viscosity resin was required on all of the patient's teeth.

Various therapeutic procedures complementary to the infiltration technique may be necessary before starting the ICON treatment, depending on the lesion type: bleaching, microabrasion with sandblasting, macroabrasion, and diamond burr polishing [15]. However, complementary treatments were not necessary in the present study.

For the correct and efficient use of the material and to avoid accidents or possible allergic reactions to the constituents of the material, the teeth were isolated using a rubber dam system and dental floss.

Prior to each treatment session, the teeth were cleaned with airflow to remove any exogenous discoloration and infiltrate the substance onto a clean tooth surface.

Six treatment sessions were required to treat all affected areas following the same protocol.

After dam isolation and teeth cleaning, the following protocol was used:

1. ICON-Etch application on the dental surfaces for 2 minutes
2. Washing ICON-Etch for 30 seconds
3. Air drying
4. ICON-Dry application for 30 seconds on each treated surface to visually inspect the demineralization result
5. Air drying
6. These steps were repeated twice more, applying ICON-Etch and ICON-Dry three times on each tooth

7. Following the treatment with the first two components of the ICON system, ICON Infiltrant was applied for 3 minutes
8. Dental floss was used to remove the excess resin present interdentally
9. Light curing the material for 40 seconds
10. ICON Infiltrant was repeated for 1 minute
11. Dental floss was used to remove the excess resin present interdentally
12. Light curing the material for 40 seconds

At the end of the treatment, the treated teeth were refined with polishing discs and prophylaxis brushes.

Because the premolar lesions did not disappear after the first treatment session, it was decided to repeat the protocol in the following treatment sessions. In this case, ICON proved ineffective in the second session as well.

From an aesthetic point of view, the ICON resin infiltration treatment was effective as seen in figure 1 – 6, although not all the spots disappeared completely.

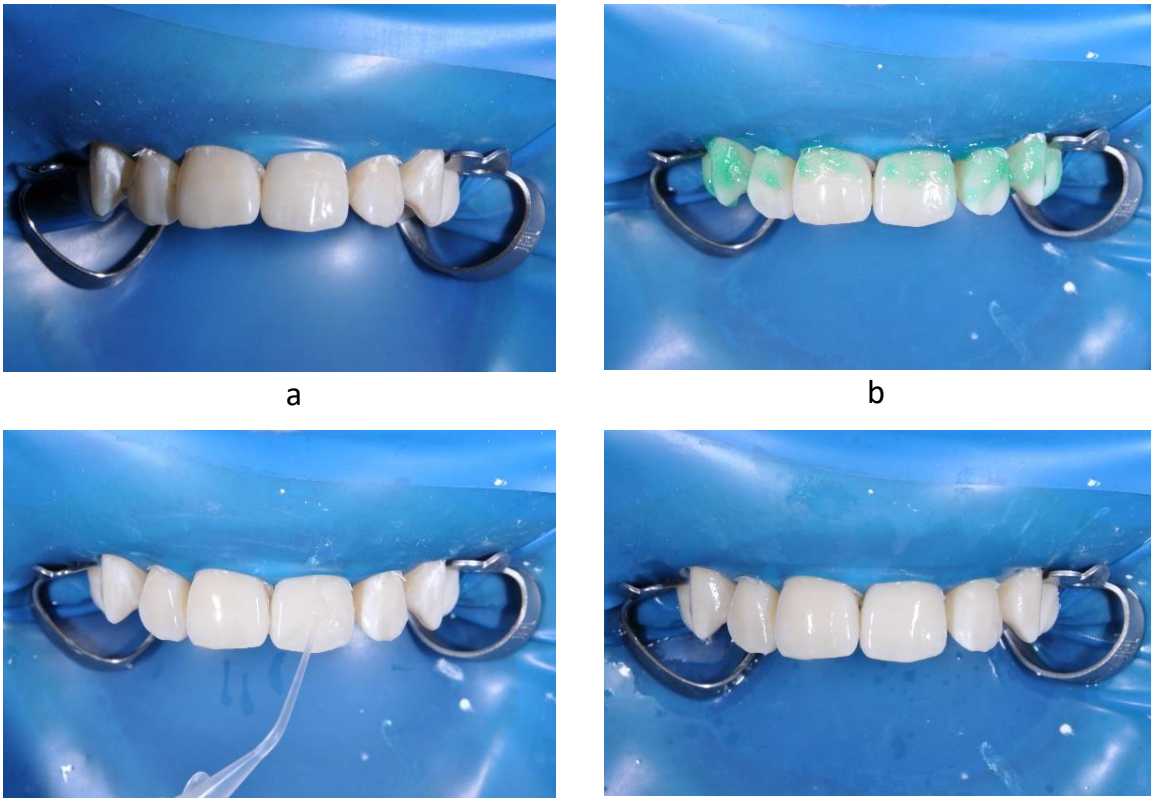
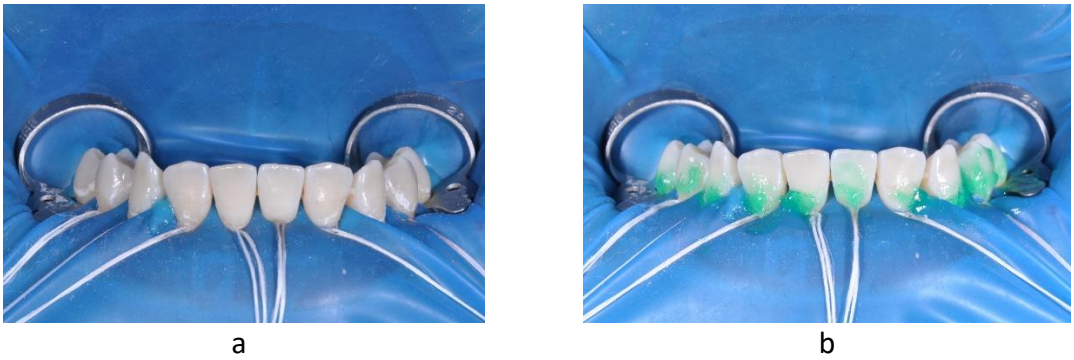
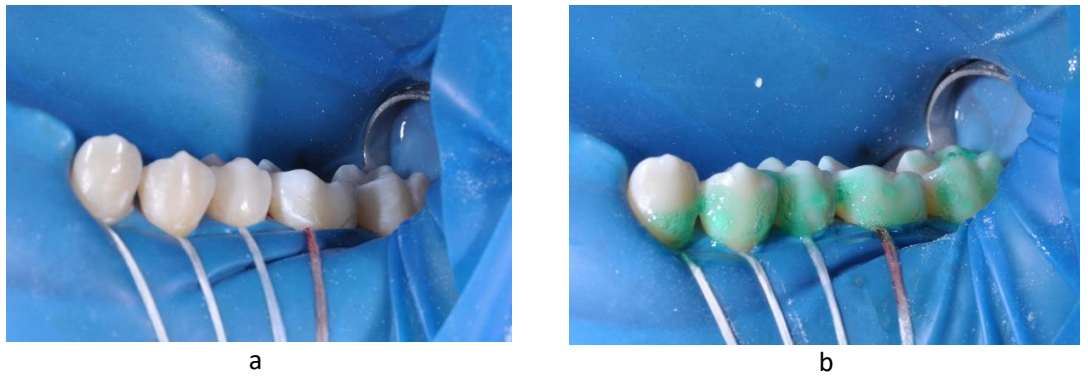


Figure 1. Treatment protocol using ICON in the maxillary frontal area. a-Situation before treatment; b-Situation during ICON Etch; c-Situation during ICON Dry, d-Situation after treatment.



a b c d

Figure 2. Treatment protocol using ICON in the mandibular frontal area. a-Situation before treatment; b-Situation during ICON Etch; c-Situation during ICON Dry; d-Situation after treatment.



a b c d

Figure 3. Treatment protocol using ICON in the left lateral mandibular area. a-Situation before treatment; b-Situation during ICON Etch; c-Situation during ICON Dry; d-Situation after treatment.

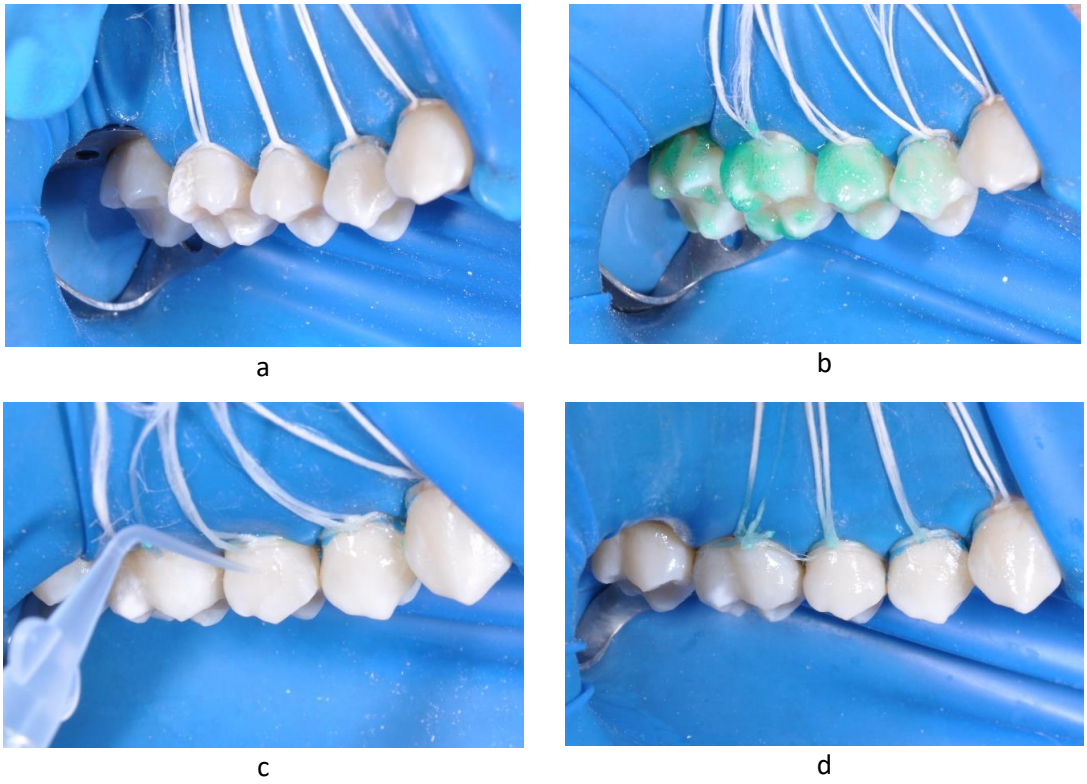


Figure 4. Treatment protocol using ICON in the right maxillary lateral area. a-Situation before treatment; b-Situation during ICON Etch; c-Situation during ICON Dry; d-Situation after treatment

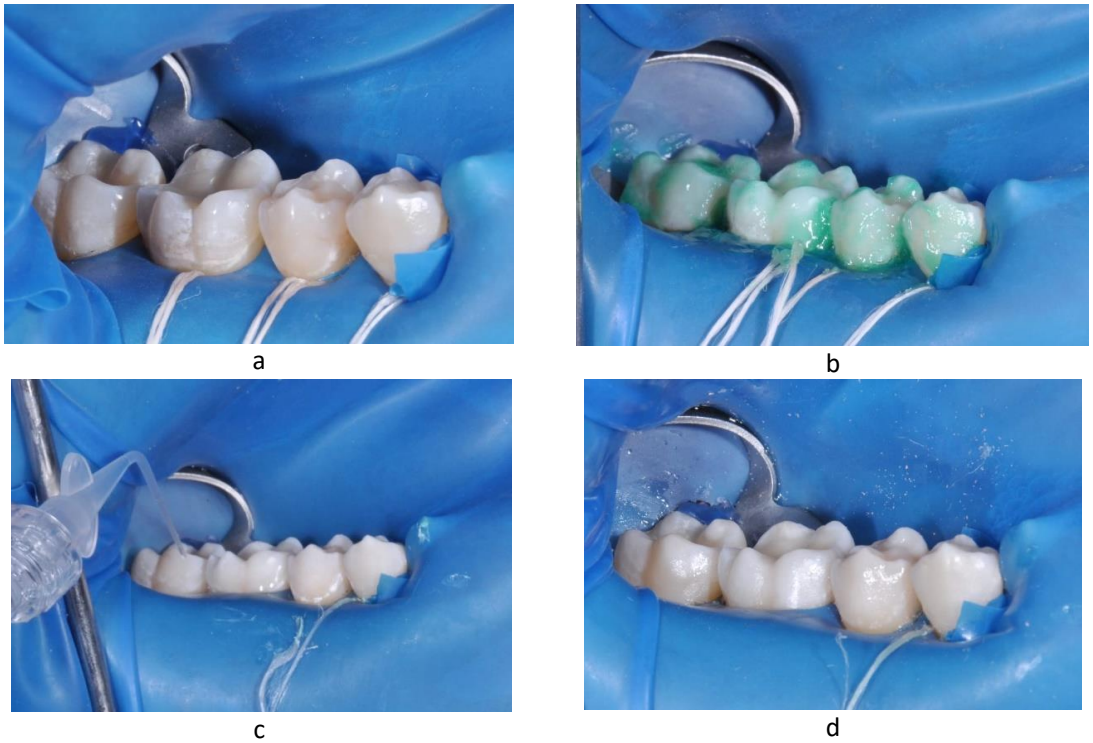


Figure 5. Treatment protocol using ICON in the right lateral mandibular area. a-Situation before treatment; b-Situation during ICON Etch; c-Situation during ICON Dry; d-Situation after treatment.

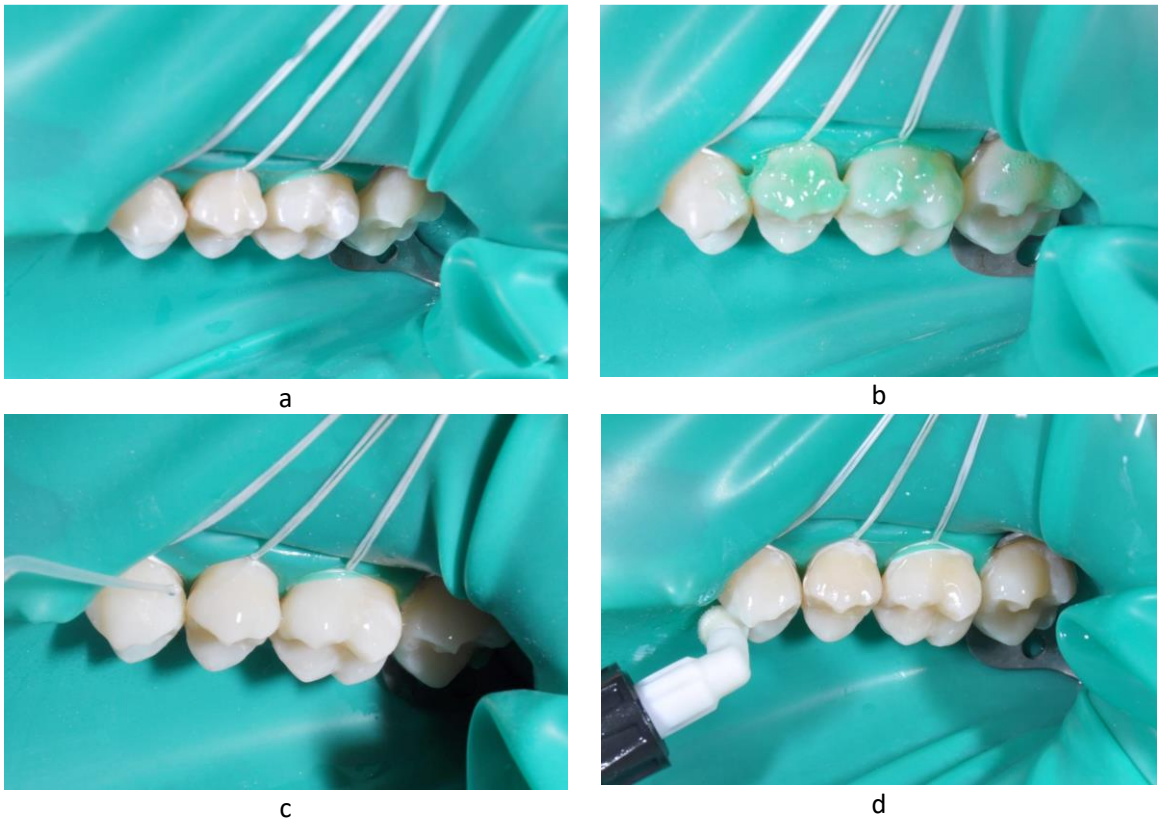


Figure 6. Treatment protocol using ICON in the left maxillary lateral area. a-Situation before treatment; b-Situation during ICON Etch; c-Situation during ICON Dr; d-Situation after treatment.

Of 28 incipient carious lesions, 15 showed Ekstrand 1 carious lesions, and 13 showed Ekstrand 2 carious lesions. After treatment with ICON, 11 Ekstrand 1, and 11 Ekstrand 2 carious lesions disappeared. Figure 7 shows that of 28 incipient carious lesions, 6 lesions were diminished, not completely removed, 4 of them being Ekstrand 1 carious lesions, and two Ekstrand 2.

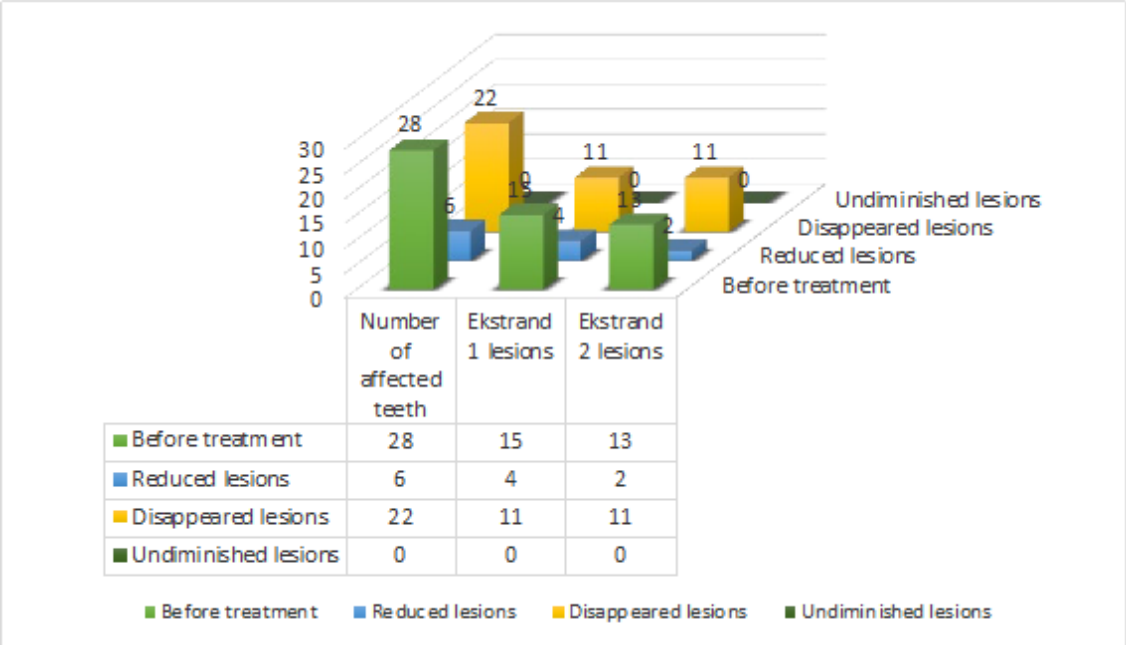


Figure 7. ICON effect on 28 incipient carious lesions.

Discussions

While several studies claim that the number of etching intervals should be adjusted to the surface hardness and depth of the carious lesions [16], product guidelines limit the number of etchings to three. Thus, we decided to use the product as the manufacturer recommends.

The results of the present study were similar to Krishna L Prasada et al. who demonstrated that ICON improves the esthetics of white spot lesions [17]. Other authors such as Seth V Senestraro et al. had similar results in a study conducted on 30 patients. They concluded that resin infiltration significantly improved the clinical appearance of white spot lesions and the results were stable eight weeks after treatment [18].

Baafif HA et al. compared the effectiveness of the ICON infiltration technique with that of using a casein phosphopeptide-amorphous calcium fluoride phosphate (CPP-ACFP) varnish in the treatment of carious lesions, and the result was positive for both treatment techniques. However, they proved that the CPP-ACFP was more effective than ICON [19]. In the present case, the use of Casein phosphopeptide-amorphous calcium fluoride phosphate (CPP-ACFP) paste stopped the patient's white spots from developing, but did not improve the esthetic appearance. Therefore, ICON proved to be more esthetically effective than CPP-ACFP treatment. In another study, Parastou Behrouzi et al. compared the hardness of dental tissue following treatment with two remineralizing pastes and ICON, and the results were unfavorable for resin since the ability of the pastes to remineralize dental tissue increased its hardness [20].

Further studies have evaluated the reduction of white spots following infiltration treatment using fluorescence, showing that all lesions reduced in size regardless of their depth, resulting in the affected tissue losing fluorescence at the end of the treatment [21].

Epigares J. et al attempted the use of ICON in sealing microfractures formed between fillings and enamel. As a result, they found that ICON can be used to improve the sealing of existing composite fillings. They concluded that infiltration with low viscosity resin is a viable option for direct restorations with poor marginal adaptation [22].

Chandrasekhar R. et al. concluded that resin infiltrated enamel did not show surface alteration compared to healthy enamel, and resin infiltration can be considered an effective treatment in restoring early enamel lesions due to its good penetration properties, providing a surface with better characteristics and masking lesions in the form of white spots in both temporary and permanent dentition [23].

S. Paris et. al tested whether infiltration of interdental caries with the ICON system can stop the progression of caries. Their study indicates that resin infiltration of radiologically limited proximal carious lesions around the amelo-dental junction is very effective after 7 years. Progression of infiltrated interproximal lesions was significantly reduced compared to non-infiltrated control lesions treated with other preventive methods [24].

Conclusions

The ICON infiltration technique is effective for most carious lesions with a white-opaque appearance. The treatment results of the 28 incipient carious lesions presented in this case report are favorable. There is no doubt that dental esthetics was improved, and incipient caries were arrested in their evolution. The patient will be called for follow-up every 3 months to keep changes in her dental status under observation and evaluate the effects of ICON treatment in the medium and long term. Within the limitations of our case report, we conclude that the ICON infiltration technique visibly improves the esthetics of the white spot lesions.

Conflict of interest: None to declare.

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