

Non-Cavitated Approach for the Treatment of White Spot Lesions: A Case Report

Güvenç Başaran¹, İlknur Veli², Emine Göncü Başaran³

¹ Assistant Professor, Dicle University, Faculty of Dentistry, Department of Orthodontics, Diyarbakır, TURKEY

² Postgraduate Student, Dicle University, Faculty of Dentistry, Department of Orthodontics, Diyarbakır, TURKEY

³ Research Assistant, Dicle University, Faculty of Dentistry, Department of Prosthetic Dentistry, Diyarbakır, TURKEY

Abstract

Aim: White spot lesions (WSLs) are the most frequently observed problems in patients with poor oral hygiene. If this problem is left untreated during the initial phase, it will ultimately need major treatment. One treatment alternative in the initial phase is the caries infiltration technique. The aim of this case report is to present the treatment of WSLs by using this technique.

Methodology: An 18-year-old female who had WSLs on the buccal surfaces of the lower left canine, first and second premolars and first molar after 8 months of fixed orthodontic therapy was included in this study. Icon-Infiltrant was applied for the treatment of WSLs.

Results: After Icon-Infiltrant application, the WSLs were cured.
Conclusions: By using this technique, an esthetic smile can be achieved in one visit with the elimination of esthetic discoloration and the progression of the early enamel lesions can be prevented.

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Key Words

White spot lesion, treatment, discoloration.

Correspondence:

Güvenç BAŞARAN
Dicle University,
Faculty of Dentistry,
Department of Orthodontics,
21280, Diyarbakir, TURKEY.
e-mail: basaran@dicle.edu.tr

Introduction

White spot lesions are defined as the subsurface porosity of demineralized enamel that manifests itself as milky white opacities localized on smooth surfaces (1,2). The development of WSLs is a challenging problem in the course of orthodontic treatment. Especially in fixed orthodontic treatment, plaque accumulation increases around brackets and bands (3) and the pH on dental surfaces becomes acidic (4). The *Streptococcus mutans* (MS) and *Lactobacillus* (LS) populations in the plaque over the tooth surface increase and these microorganisms can cause enamel demineralization via organic acid production in the plaque (5, 6).

Quaard (7) observed that WSLs developed significantly more often in orthodontic patients and reported that these lesions might present severe esthetic problems in the following years. The prevalence of WSLs in patients undergoing fixed orthodontic treatment was 49.6% versus 24% in an untreated control group (8).

No gender difference was found in terms of the prevalence of WSLs (9). Gorelick et al. (8) also found no correlation between the prevalence and treatment duration. The teeth most affected by WSLs are the molars, upper laterals, lower canines, and premolars (10).

White spot lesions are the initial phase of caries lesion formation on enamel. Gorelick et al. (8) classified the lesions by into four groups: type 1 had no WSLs, type 2 had mild WSLs, type 3 had severe WSLs, and type 4 had observed cavitation. The treatment approaches for these groups change with the severity. The treatment choices for the type 2 are casein phosphopeptide-amorphous calcium phosphate (CPP-ACP)-containing mouth rinses, topical fluoride application, and fluoridated dentifrices (1). For type 3, minimally invasive approaches are the treatment of choice. The treatment options for type 4 range from the conservative treatment with Black V cavities to laminate veneer crowns (1).

Recently, a new technique called caries infiltration has been used for non-cavitated lesions.

In this technique, the pore system of a non-cavitated white spot or proximal lesion is filled or reinforced with a light-curable resin. "Icon", (DMG, Chemisch-Pharma. Fabrik GmbH, Hamburg) short for Infiltration Concept, is the product used with this technique for the invasive treatment of cariogenic lesions in the approximal and vestibular regions (11). Two product variants of Icon are available: Icon Caries Infiltrant-approximal was developed for incipient approximal caries and Icon Caries Infiltrant-vestibular is used for orthodontic patients after removing brackets (12).

In this case report, we present the treatment of WSLs localized on the lower left posterior region of a patient with poor oral hygiene after fixed orthodontic treatment.

Case Report

An 18-year-old female patient was referred to our clinic with esthetic and functional complaints. The patient complained of protruding upper incisors and difficulty in biting. Angle Class II dental malocclusion was observed in the intraoral examination (Fig. 1). A radiographic and periodontal examination revealed no pathological finding. A fixed orthodontic treatment with an extraoral appliance was planned. First, the upper and lower first molars were banded and Edgewise Roth brackets (Omni

Roth, GAC International, Inc, Bohemia NY, USA) with a 0.018-inch slot were bonded to them. The patient was instructed on headgear use. After an 8-month active treatment period, an Angle Class I relationship was achieved on the left side. However, due to the potential for WSL occurrence and lack of oral hygiene, the patient and her parents were told about the risks and the treatment was terminated with their approval. Thus, an Angle Class II relationship remained on the right side. After the orthodontic treatment, WSLs were observed on the buccal surfaces of the lower left canine, first and second premolars, and first molar (Fig. 2a).

According to the classification of Gorelick et al. (8), the WSLs on the buccal surfaces of lower left canine, first, and second premolars were type 3, while the WSL on the buccal surface of the first molar was type 2. After a debonding procedure with a tungsten carbide bur, the WSL on the first molar was followed only, because the lesion was type 2 and localized gingivally. The patient was informed about the treatment alternatives. She requested that the non-esthetic appearance of the canine and first and second premolars be treated as soon as possible. Considering her request, a minimally invasive, rapid treatment approach was planned with Icon. Because the WSL on the first molar was localized near the gingiva and the gingival fluid would complicate the treatment procedure, this tooth was not treated.

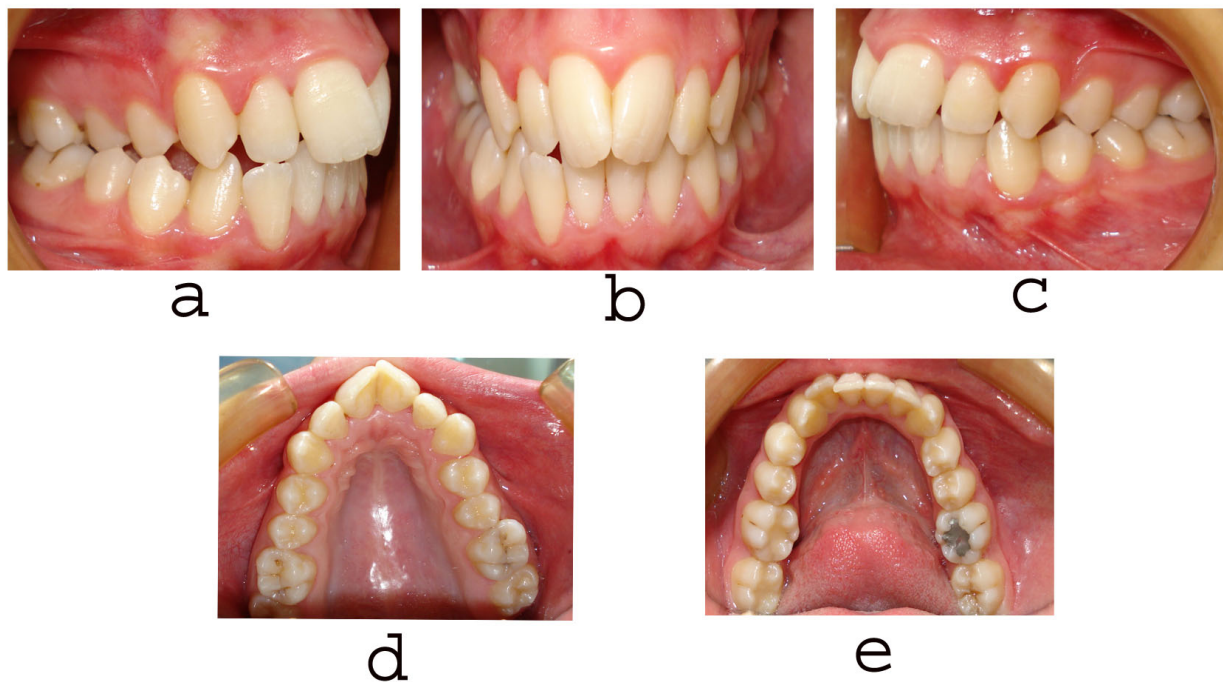


Figure 1. Pre-treatment intraoral photographs: (a) Frontal view; (b) Right view; (c) Left view; (d) Upper view; (e) Lower view.

Clinical Procedure

After debonding, all of the teeth were polished with a non-fluoridated prophylaxis paste. A rubber dam was placed about the lower left canine and first and second premolars to provide a dry working field (Fig. 2b). The teeth surfaces were dried with oil- and water-free air. A 2-mm area beyond the WSL was etched with 15% hydrochloric acid (Icon-Etch-DMG, Chemisch-Pharma. Fabrik GmbH, Hamburg) for 120 s (Fig. 2c). Then, the HCl was evacuated with a surgical aspirator. The teeth surfaces were rinsed with water for 30 s and dried with oil- and water-free air for 30 s.

Next, 99% ethanol containing Icon-Dry (DMG, Chemisch-Pharma. Fabrik GmbH, Hamburg) was applied to the dry lesion sites and allowed to set for 1 min (Fig. 2d). Then, the lesion sites were dried with air for 30 s.

Icon-Infiltrant was applied on the dry, solvent-free lesion sites under daylight and set for 3 min. After 3 min, the affected surfaces were light-cured with an Ultra-Lite 1000E LED light-curing unit (Rolence Enterprise Inc. Chungli, Taiwan) that had an output of 450 nm and a light intensity of 800 mW/cm² for 40 s. The Icon-Infiltrant was applied again and allowed to set for 1 min and then light-cured for 40 s. The rubber dam was removed. Irritation in the gingiva resulted from the clamp for the rubber-dam placed around the second premolar. KerrHawe finishing and polishing discs (KerrHawe SA, Bioggio, Switzerland) were used to remove any excess Icon-Infiltrant that extended over the edges of lesion sites (Fig. 2e-f). After this treatment, the WSLs were cured and progression of the early enamel lesions was prevented. No pathological finding was observed on panoramic and cephalometric radiographs taken after Icon-Infiltrant application.

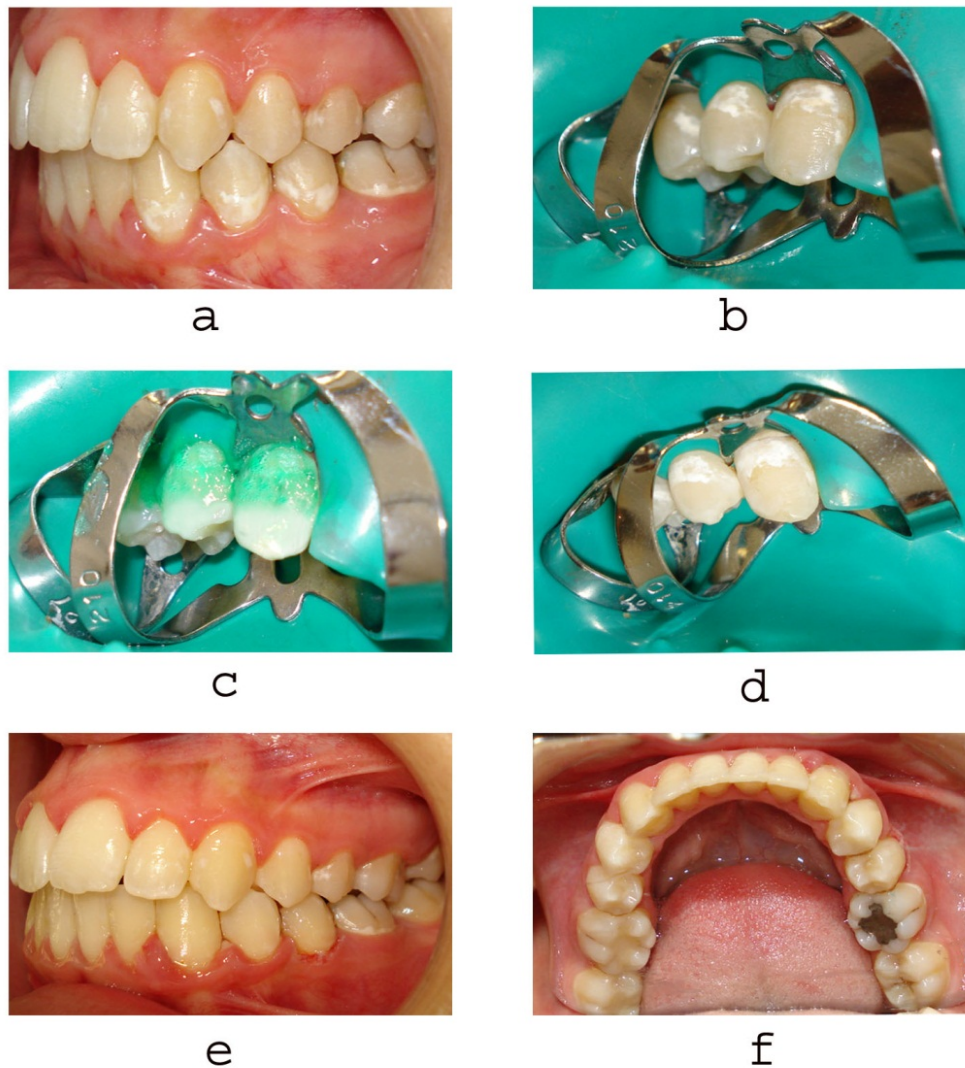


Figure 2. (a) Right buccal segment with WSLs after fixed orthodontic treatment; (b) Rubber-dam placement before Icon Infiltrant application; (c) The 15% HCl etched teeth surfaces before Icon Infiltrant application; (d) The appearance of enamel surfaces after ethanol application; (e) The buccal appearance of teeth surfaces after Icon Infiltrant application; (f) The occlusal appearance of teeth surfaces after Icon Infiltrant application.

Discussion

Enamel decalcification or WSLs result from the accumulation of bacterial plaque over an enamel surface. The bacterial plaque causes the surface pH to decrease, which disrupts the mineral balance in the enamel and decalcified areas of different shapes and sizes occur (8, 13). These WSLs are treated with various approaches depending on the patient and type of WSL.

Gorelick et al. (8) suggested conservative treatment approaches for types 3 and 4 WSLs. Today, WSLs are commonly prevented by good oral hygiene or fluoridation. However, in non-compliant patients, small WSLs can extend and lead to cavitation (14). Treatment with infiltration techniques that are an alternative to minimally invasive approaches and need no cavitation for noncompliant or agitated patients is preferable in terms of psychology and the rapid achievement of an esthetic outcome (15).

An innovative technique called the caries infiltration technique is used in non-cavitated approaches. Caries infiltration materials are a promising treatment for WSLs.

With the infiltration technique, a diffusion barrier is formed in the inner parts of the lesion and the affected surface is restored with resin material (14). In recent clinical research, this technique has been reported to have positive effects on 43% of proximal enamel lesion over an 18-month period (20). Other advantages include enabling the clinician to remove the excessive resin before light curing, minimal enamel loss on all surfaces, and the prevention of plaque accumulation sites by achieving smooth surfaces (14). Consequently, plaque accumulation is prevented and the periodontal structures are protected.

With this technique, 15% HCl is commonly used. Sebastian et al. (14) observed that etching with phosphoric acid affected only the outermost 25 µm of the surface. However, superficial phosphoric acid etching causes the caries lesion to extend into the deeper enamel layers. Consequently, cavitation may be necessary in the future.

The penetration depth of 15% HCl etching is more than twice (58 µm) that of phosphoric acid, enabling penetration into the deepest part of the lesion and eliminating the decalcified areas, preventing further attacks (16). A rubber dam is necessary with all applications, because 15% HCl produces soft tissue ulceration within 30 s (17).

Several studies have reported that 120 s is the optimum etching time (18, 19). The primers and resin materials used contain solvents, such as ethanol, which increase the surface tension of

enamel, enabling rapid penetration of resins into the lesions, increasing the adhesion strength (20, 21).

With a one-visit treatment procedure, the progression of early enamel lesions was arrested with no drilling or anesthesia. However, to evaluate the short- and long-term results, further studies should be performed with larger sample sizes.

Conclusion

This new caries infiltration technique may be an alternative for the treatment of noncompliant patients with WSLs in one visit.

Acknowledgments

The authors deny any conflicts of interest related to this study.

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