

## WHITE SPOT LESIONS: RESIN INFILTRATION TECHNIQUE

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### Abstract

Nowadays, dentists are facing increased aesthetic demands from patients. Corrections of shade, shape, texture and position are the most requested. The shade of the teeth is a very important concern for patients, especially when white spots cover a big part of their front teeth. On the other hand, all of the focus in the last few years has been to create more conservative techniques to solve this problem. Erosion/infiltration protocol using Icon (DMG, Hamburg, Germany) is one of the most conservative and efficient protocols. The Icon treatment was initially proposed as a simple and minimally invasive alternative for caries treatment of initial proximal lesions, but surprisingly the technique proved a high ability to mask the white spots by modifying the refractive index of the lesion. The aim of this article isto describe this technique in detail using a clinical case.

**Keywords:** Enamel demineralization - white spots - resin infiltration - hydrochloric acid - adhesive.

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## LES TÂCHES BLANCHES: TECHNIQUE D'INFILTRATION DE RÉSINE

### Résumé

De nos jours, les dentistes sont confrontés à l'augmentation des exigences esthétiques des patients. Les corrections de la couleur, de la forme, de la texture et de la position sont les plus demandées. La couleur des dents est une préoccupation très importante pour les patients, surtout lorsque des taches blanches couvrent une grande partie de leurs dents antérieures. D'autre part, la recherche a été orientée vers des techniques plus conservatrices pour résoudre ce problème. La technique par érosion / infiltration en utilisant Icon, est l'un des protocoles les plus conservateurs et les plus efficaces. Icon (DMG, Hamburg, Germany) a d'abord été proposé comme une alternative peu invasive pour le traitement de la carie des lésions proximales initiales, mais la technique a prouvé une grande capacité à masquer les taches blanches en modifiant l'indice de réfraction de la lésion. Le but de cet article est de décrire cette technique en détail à l'aide d'un cas clinique.

**Mots-clés:** déminéralisation de l'émail - taches blanches - infiltration par résine - acide hydrochlorique - adhésif.

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## Introduction

Clinically, early carious lesion in enamel is initially seen as a white opaque spot and is characterized by being softer than the adjacent sound enamel. It becomes even whiter when dried with air. These lesions may present a serious aesthetic problem along with the progression of demineralization [1, 2].

These white spots can be the result of different factors: early stage caries (due to plaque accumulation and bad oral hygiene) near the gingival line or around orthodontic brackets, fluorosis, medicine intake, molar incisal hypomineralization (MIH) and traumatic hypomineralization [3 - 5].

Until now, there are many remineralizing agents and protocols for treating white spot lesions: Complex of casein phosphopeptides-amorphous calcium phosphate (CPP-ACP), amorphous calcium phosphate, sodium calciumphosphosilicate (bioactive glass), calcium carbonate carrier-SensiStat, xylitol carrier, nano-hydroxyapatite, trimetaphosphate ion, alpha-tricalcium phosphate, dicalcium phosphate dehydrate and resin infiltration technique [6 - 9].

The aim of this case report is to explain in detail, a very conservative and esthetic way to solve a complex problem called “white spot lesions” with a special product. Icon is the name of the resin infiltrate produced by DMG and stands for infiltration concept.

Product description Icon is an innovative product for the micro-invasive treatment of dental lesions in proximal regions and on smooth surfaces.

Every kit includes:

1 icon-etch syringe : 15% hydrochloric acid, pyrogenic silicic acid, surface-active substances.

1 icon-dry syringe : 99% ethanol.

1 icon-infiltrant syringe: methacrylate-based resin matrix, initiators, additives.

Accessories.



Fig. 1: Icon product.



Fig. 2: Icon-Etch / Icon-Dry / Icon-Infiltrant syringes (icon,DMG,Hamburg,Germany).

## Case Presentation

An 18-year-old female patient presented with two white spot lesions on teeth 11 and 21 due to past trauma.

The spots are easily visible in the frontal view of the anterior teeth: a big white spot on tooth number 21 and a small one on tooth number 11. This young patient was looking for an esthetic solution for these defects in her smile (Fig. 3). After cleaning the affected teeth, a rubber dam was placed to ensure a good isolation (Fig. 4). Then, hydrochloric acid (IconEtch 15%HCL) was applied on the lesions for 2 minutes (Fig. 5). This acid removes the hypermineralized enamel on the surface and helps the resin reach the ceiling of the lesion to have a successful esthetic result. After rinsing for 30 seconds to eliminate all the etchant (Fig. 6), icon-dry (99% ethanol) was

applied for 30 seconds to desiccate the lesion and to eliminate all the water in the pores of the lesion in order to have a good adhesion with the resin (Fig. 7).

This stage is very important because it gives an overview of the final esthetic result. If the lesion is still visible after applying the icon-dry, the etching protocol has to be repeated and the icon-dry product applied again (Figs. 8, 9). If not, the resin (Icon-infiltrate) can be applied for 3min (Fig. 10). It is a very low viscosity, TEGDMA-based resin. It uses capillary action to infiltrate and goes very deep into the lesion. All the excess in the buccal surface has been eliminated using a microbrush (Fig. 11) and in the proximal area using dental floss (Fig. 12) [10 - 13]. Note that this resin appears slightly yellow since it contains camphorquinone. After the



Fig. 3: Initial situation.



Fig. 4: Isolation with a rubber dam.

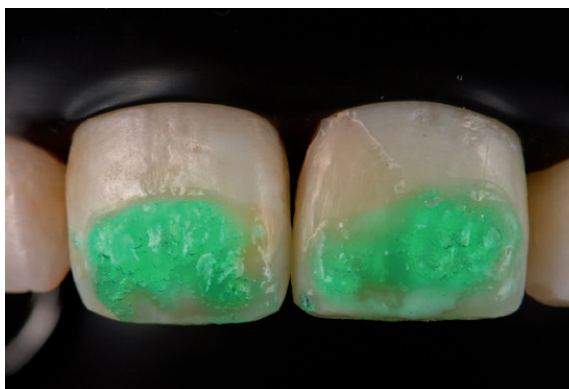


Fig. 5: Etching with 15% hydrochloric acid.



Fig. 6: Rinsing for 30 seconds.

photopolymerization which was done for 40s (Fig. 13), the yellow tinge will disappear because the camphorquinone has been consumed. Studies showed that this resin has a high staining potential mainly if the patient is a high consumer of teeth-staining food and beverages [14, 15]. Therefore it should be always covered with a layer of composite. In this case, nanohybrid composite (Z350 enamel A1) was used (Fig. 14).

At this stage and before applying the composite, we don't need to apply bonding since the resin itself is an adhesive. The composite was light cured for 20 seconds (Fig. 15) then polished with diamond burs, a multiblade bur and wheels (Fig. 16). The figure 17 shows the final esthetic result obtained in a conservative way .



Fig. 7: First application of Icon-dry.



Fig. 8: Second application of Icon-dry.

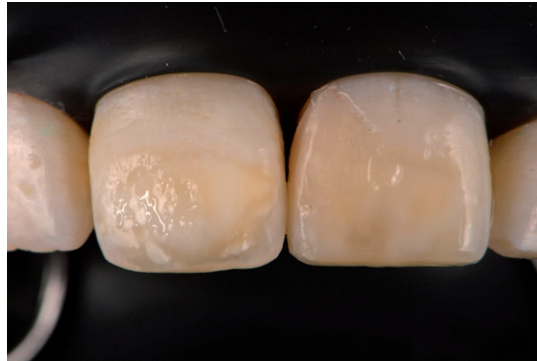


Fig. 9: Final application of icon-dry.



Fig. 10: Application of the resin.

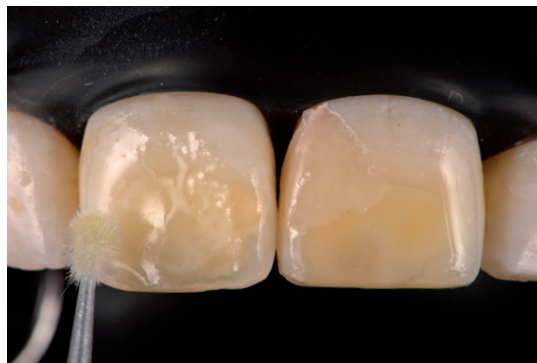


Fig. 11: Removing the excess with a microbrush.

## Discussion

White spots are located just on the enamel and the dentin is never involved.

An early enamel lesion is characterized by four distinct histopathologic zones; two zones of demineralization are present:

1. The translucent zone (1% pore volume) along the advancing front of the lesion;
2. The body of the lesion (>5-25% pore volume) representing the majority of the lesion. It is situated approximately 15-30  $\mu\text{m}$  beneath the overlying intact enamel surface.

Two zones of remineralization are also present:

1. The dark zone (2-4% pore volume) situated near the advancing front

just superficial to the translucent zone;

2. The surface zone (1 to <5% pore volume) forming the intact surface overlying the lesion.

The initial formation of the lesion is due to the dissolution of hydroxyapatite (HAP) from the enamel prisms forming the enamel surface [1].

Normally, the enamel is the most highly mineralized tissue in the organism (96% minerals and 4% organic fluids). The light ray passes through the substrate with no modification of its trajectory until it is reflected at the dentino-enamel junction. But in the presence of white spots, this mineral phase is diminished and replaced by organic fluids.

The rules of optics indicate that when there is a difference in refrac-

tive index between two phases, there will be an interface causing deviation of incident light rays. So the light touches several interfaces between organic fluids (RI=1.33) and the mineral phase (RI=1.62), with different indices of refraction. At each interface, the light is thus deviated and reflected, becoming imprisoned in an "optical maze" that is over-luminous and therefore perceived as white. Infiltration of the pores of the lesion with a resin whose refractive index (1,52) is close to that of healthy enamel (1,62) improves the transmission of photons through the hypomineralized enamel and restores its translucency [16, 17]. Therefore the lesion is still present but cannot be seen anymore.

Since studies showed that this resin has a high staining potential, it has to be covered with a thin layer of nanohybrid composite.

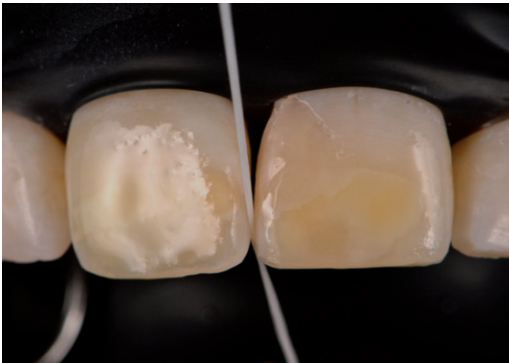


Fig. 12: Removal of the excess using dental floss.



Fig. 13: Light curing for 40 seconds.



Fig. 14: Covering the resin with a layer of composite.

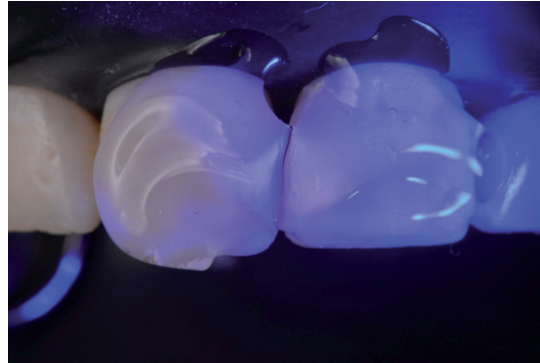


Fig. 15: Light curing through glycerin.

## Conclusion

The infiltration technique is a minimally invasive and aesthetic treatment of white spots. It has many advantages such as preservation of hard tissue, stopping the demineralization process by increasing the resistance of the enamel to demineralization, sealing of the micropores and cavities and minimizing the risk of developing secondary caries.

This procedure is also well accepted by the patient and practitioner. The only disadvantage is the high staining potential of the infiltrating resin over time. This can be resolved by covering the resin with a thin layer of composite.



Fig. 16: Polishing the treated teeth.



Fig. 17: Final result.

## References

1. Roopa KB, Pathak S, Poornima P, Neena IE. White spot lesions: A literature review. *J Pediatr Dent* 2015;3:1.
2. Arends J, Christoffersen J. The nature of early caries lesions in enamel. *J Dent Res* 1986;65: 2-11.
3. Gorelick L, Geiger AM, Gwinnett AJ. Incidence of white spot formation after bonding and banding. *Am J Orthod* 1982;81(2):93-8.
4. Richter AE, Arruda AO, Peters MC, Sohn W. Incidence of caries lesions among patients treated with comprehensive orthodontics. *Am J Orthod Dentofacial Orthop* 2011;139(5):657-64.
5. Toumba DC. Diagnosis and prevention of dental caries. In: Welbury R, Duggal MS, Hosey MT, editors. *Paediatric Dentistry*. 3rd ed. UK: Oxford Univ Press; 2005. p. 109.
6. Reynolds EC. Calcium phosphate-based remineralization systems: Scientific evidence? *Aust Dent J* 2008;53:268-73.
7. Llana C, Forner L, Baca P. Anticariogenicity of casein phosphopeptide amorphous calcium phosphate: A review of the literature. *J Contemp Dent Pract* 2009;10:1-9.
8. Walsh LJ. Contemporary technologies for remineralization therapies: A review. *Int Dent S Afr* 2009;11:6-16.
9. Mäkinen KK. Sugar alcohols, caries incidence, and remineralization of caries lesions: A literature review. *Int J Dent* 2010;2010:981072.
10. Jean-Pierre Attal, Anthony Atlan, Maud Denis, Elsa Vennat, Gilles Tirlet. White spots on enamel: Treatment protocol by superficial or deep infiltration (part 2). *International Orthodontics* 2014;12: 1-31.
11. Gomes Torres CR, Borges AB, Sarmiento Torres LM, Gomes IS, de Oliveira RO. Effect of caries infiltration technique and fluoride therapy on the color masking of white spot lesions. *J Dentistry* 2011;39:202-207.
12. Tirlet G, Attal JP. L'érosion /infiltration : une nouvelle thérapeutique pour masquer les taches blanches. *Int Dent* 2011;2-7.
13. Garcia EJ, Mena-Serrano A, de Andrade AM, Reis A, Grande RH, Loguercio AD. Immediate bonding to bleached enamel treated with 10% sodium ascorbate gel: a case report with one-year follow-up. *Eur J Esthet Dent* 2012;7(2):154-62.
14. Cohen-Carneiro F, Pascareli AM, Christino MR, Vale HF, Pontes DG. Color stability of carious incipient lesions located in enamel and treated with resin infiltration or remineralization. *Int J Paediatr Dent* 2013; doi: 10.1111/ipd.12071.
15. Rey N, Benbachir N, Bortolotto T and Krejci I. Evaluation of the staining potential of a caries infiltrant in comparison to other products. *Dent Mater J* 2014;33(1):86-91.
16. Denis M, Atlan A, Vennat E, Tirlet G, Attal JP. White defects on enamel: Diagnosis and anatomopathology: Two essential factors for proper treatment (part 1). *International Orthodontics* 2013;11:139-165.
17. Kim S, Kim EY, Jeong TS, Kim JW. The evaluation of resin infiltration for masking labial enamel white spot lesions. *Int J Paediatr Dent* 2011;21:241-248.