

# Minimally invasive treatment of white spot enamel lesions

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This article describes a technique used to treat superficial white spot lesions by a minimally invasive approach. The proposed technique is based on reactivation of enamel by elimination of its hypermineralized external layer through microabrasion, followed by daily home application of casein phosphopeptide–amorphous calcium phosphate complexes (CCP-ACP). The technique may allow elimination of white spot lesions without involving restorative procedures. Microabrasion followed by long-term daily home application of CCP-ACP may be considered an interesting alternative to the restorative approach for treatment of white spot lesions. (*Quintessence Int* 2007;38:633–636)

**Key words:** CCP-ACP, microabrasion, minimally invasive treatment, white spot lesions

Cosmetics and esthetics are current trends of our society. These trends also touch the dental profession, as more and more patients are demanding orthodontic treatment to obtain a “perfect smile,” especially in the anterior region.<sup>1</sup> Because of insufficient oral hygiene, white spot lesions may develop around orthodontic brackets. They remain visible after bracket debonding and need treatment.<sup>2</sup> Similar lesions can be found in young adolescents and in patients with a lack of brushing dexterity or wherever tooth position does not allow a proper mechanical oral hygiene approach.<sup>3</sup>

The conventional treatment approach of white spot lesions is based on restoration, which, in most instances, is quite invasive.<sup>4</sup> Attempts have been made toward conservation of tooth tissues by using high concentra-

tions of topical fluoride, because highly concentrated fluoride solutions hypermineralize the surface of the lesion, leaving them more resistant to acid attacks. Unfortunately, since these solutions do not penetrate inside the lesion,<sup>5</sup> they do not eliminate its opaque whitish aspect, thus compromising esthetics.

The aim of this article is to describe and illustrate a minimally invasive technique that improves the esthetic aspect of the affected tooth without requiring restorative techniques.

## CLINICAL PROCEDURE

The proposed minimally invasive technique is based on a combined approach of microabrasion<sup>6</sup> and enamel remineralization.<sup>7</sup> Once a white spot lesion has been diagnosed (Figs 1a to 1c and 2a to 2c), before the treatment is started, meticulous oral hygiene instruction is given to the patient to be sure that he or she can perform correct toothbrushing and flossing. Scaling and polishing is then performed (Fig 1d), followed by the chemo-mechanical reactivation of the superficial enamel substrate. For this procedure rubber dam is applied and then microabrasion is performed with an abrasive paste containing silicon carbide microparti-

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**Figs 1a to 1c** Facial and lateral views of white spot lesions after bracket debonding.



**Fig 1d** Polishing procedures.

**Fig 1e** Rubber dam application and microabrasion procedure.

**Fig 1f** Chairside CCP-ACP application after the microabrasion procedures.



**Figs 1g to 1i** Facial and lateral views posttreatment, after 3 months of microabrasion and daily CCP-ACP home application.

cles in water-soluble paste and 6.6% hydrochloric acid (Opalustre, Ultradent). A layer of about 2 to 3 mm is applied on the affected surfaces of the teeth (Figs 1e and 2d), and a special rubber cup (Oralcups, Opalustre, Ultradent) attached to a gear-reduction contra-angle handpiece is used. The tooth surface is microabraded with slight pressure for 60 to 120 seconds. Whenever necessary, a small water drop may be added and the abrasion may be repeated. Several applications may be necessary, and the effect must be optically evaluated after water rinse after each application.

A paste containing casein phosphopeptide-amorphous calcium phosphate com-

plexes (CCP-ACP) (GC Tooth Mousse, Recaldent, GC Europe) is then applied on the treated enamel surface (Figs 1f and 2e), left undisturbed for 15 minutes, and finally removed by aspiration, but not water sprayed.

The patient is instructed to apply on the white spot lesion a moderate quantity of CCP-ACP after brushing and flossing, twice a day, after breakfast and just before bedtime. The in-office recall depends on the patient's compliance. The treatment may be continued for several months (Figs 1g to 1i and 2f to 2h), eventually supplemented with home bleaching to achieve more uniform tooth color.



**Figs 2a to 2c** Facial and lateral views of white spot lesions and plaque deposits after bracket debonding.



**Fig 2d** Rubber dam application and microabrasion procedure.

**Fig 2e** Chairside CCP-ACP application following microabrasion and Class 4 resin composite buildup on the left central lateral incisor.



**Figs 2f to 2h** Facial and lateral views posttreatment, after 3 months of microabrasion and daily CCP-ACP home application.

## DISCUSSION

Dairy products have been demonstrated to have anticariogenic potential.<sup>8–11</sup> It has been shown that casein phosphopeptides (CPP) have the ability to stabilize calcium phosphate in solution by forming colloidal casein phosphopeptide–amorphous calcium phosphate complexes (CPP-ACP). This property is important because it prevents the calcium phosphate growth to the critical size required for nucleation and subsequent precipitation.<sup>12–14</sup> CPP-ACP has been demonstrated to have anticariogenic potential in laboratory, animal, and human in situ experiments.<sup>7,12,14–18</sup>

This property can be explained by 3 different mechanisms: First, the anticariogenic potential of CPP-ACP has been attributed to the ability of the CPP to localize ACP at the tooth surface, increasing the level of calcium phosphate in plaque. In this way, the CPP-ACP may act as a calcium phosphate reservoir, buffering the free calcium and phosphate ion activities, thereby helping to maintain a state of supersaturation with respect to tooth mineral, depressing enamel demineralization, and enhancing remineralization.<sup>12,14,15,19</sup> Another interesting aspect of CPP-ACP, which reduces caries activity in a dose-dependent mechanism,<sup>7,12,16</sup> is that the subsequently formed mineral is more resistant to acid attack.<sup>18</sup>

Another suggested mode of action is the CPP-ACP inhibition of cariogenic streptococci adhesion to tooth surface, inducing the formation of a noncariogenic plaque.<sup>20</sup> Rose demonstrated that CPP-ACP competes with calcium for plaque calcium binding sites<sup>21</sup> and that this will reduce the degree of calcium bridging between the pellicle and adhering cells and between the cells themselves, as supposed by Schupbach et al.<sup>20</sup> Finally, it has been demonstrated that high extracellular free calcium concentrations may have bactericidal or bacteriostatic effects, and Rose suggested that by forcing the maintenance of high free calcium, CPP-ACP could have an additional antiplaque effect.<sup>21</sup>

## CONCLUSIONS

The use of the proposed minimally invasive technique allows for the recovery of natural tooth appearance and may promote enamel remineralization in depth. This kind of approach has the advantages of maximum tooth substance conservation and excellent acceptance by patients. It may be considered an interesting alternative to conventional operative intervention.

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