Resin-infiltration procedure of white spots.

Dr. Erik-Jan Muts

Fig. 1: *Initial situation. With a black background the contrast gets better, but the white spots is still not clear. Britt is dissatisfied with the white spots on teeth 12, 11 and 21.*

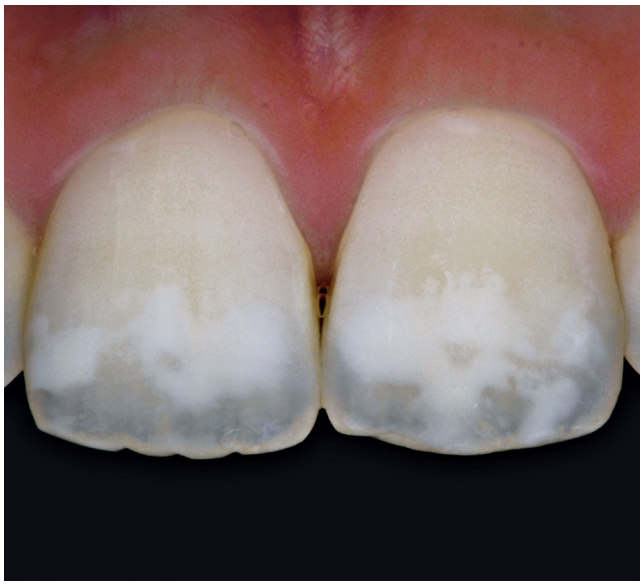

Fig. 2: *A cross-polarised photo with high colour intensity of the initial situation. In a sudden the white spots are clearly visible.*

White spots present on the front teeth can esthetically be very unpleasant for the patient. To prevent the start of a restorative cycle, invasive treatment with composite or porcelain veneers is not advised. The removal of »healthy« enamel may weaken the tooth and may cause problems later on in life.
Using a resin-infiltration technique the porosities inside the enamel, causing the white spots, can be infiltrated and filled with resin. This way we are nowadays able to treat white spots non-invasively with very good and long lasting results.

Initial status
Britt (22 years old) was looking for minimal invasive treatment to remove the white spots on her front teeth (12, 11 and 21). I decided to make some pictures.
A cross-polarized picture with high color intensity gives a lot of information because all the scattering from the flashlights is filtered away and differences between colours are more intense. Explaining the situation and the possibilities with resin-infiltration techniques, Britt was convinced and went for the treatment.
There was no need for bleaching prior to the treatment.

Micro-abrasion
First of all rubberdam (Optradam, Ivoclar Vivadent) is placed to get a clear and dry work field. Rubberdam is obligatory in these kinds of cases. Next we perform micro-abrasion using a micro-abrasive paste (Opalustre, Ultradent) to clean the surface and to start opening the porosities. It is applied three times for 60 seconds each, in between excessive rinsing is important. Instead of using a special micro-abrasive paste, the 15% hydrochloride acid (Icon-Etch, DMG) can also be mixed with some pumice and rubbed with a special rubber cup using gentle forces.

Etching
Then neighbouring teeth are isolated with Teflon tape and the etching procedure with hydrochloric acid (Icon-Etch, DMG) starts. The etching is done with a rubbing motion using the special smooth surface (sponge) tip for two minutes.

Fig. 3: *Application of a micro-abrasive paste with a special rubber cup (Opalustre, Ultradent).*

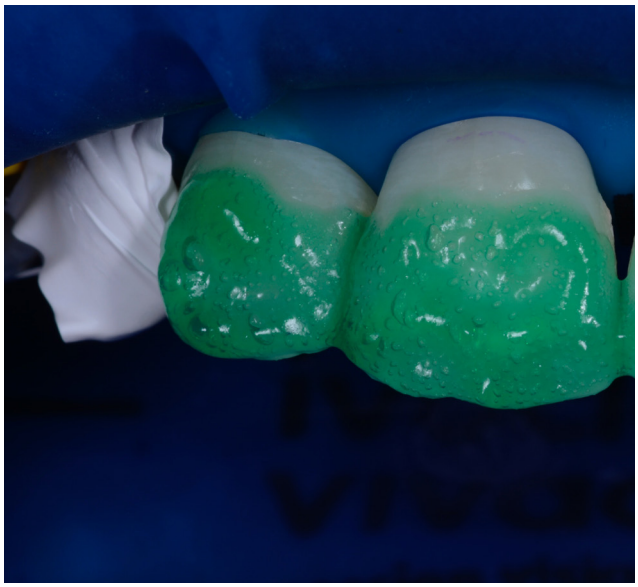

Fig. 4: *Application of hydrochloric acid (Icon-Etch, DMG) and the isolation of neighbouring teeth with Teflon.*

Fig. 5: *Result after etching three times for two minutes.*

Fig. 6: *Application of 99 % ethanol (Icon-Dry, DMG) shows the patency to the porosities. One more etching procedure was performed after this result.*

After a lot of rinsing the white spots become even more visible. This means the porosities are getting better accessible. A check can be performed with the absorption of ethanol (Icon-Dry, DMG). Once the white spots disappear after application of ethanol, the enamel is ready to be infiltrated. If not, the etching procedure is repeated, with a maximum of five repetitions total.

Infiltration

After the white spots disappear with the application of ethanol (Icon-Dry, DMG), it is time to infiltrated with the methacrylate (Icon-Infiltrant, DMG). Infiltration is also done with the special smooth surface tip.

Notice that there is no direct light on the working surface, since this may polarize the methacrylate particles preventing them to infiltrate further. Capillary forces suck the methacrylate (Icon-Infiltrant, DMG) into the enamel, filling up the porosities.

This may take a while and it is advised (DMG) to wait at least 3 minutes. In my experience it might even infiltrate further while waiting longer and I would advise to wait at least 6 minutes. Polymerisation can be performed for 40 seconds after removing the excess with air.

This infiltration procedure should be repeated for 1 to 2 minutes and light cured as well. After light curing glycerine gel is applied and polymerised again for 40 seconds to remove the oxygen inhibition layer.

Fig. 7: *Applying the methacrylate infiltrant (Icon-Infiltrant, DMG) with the special smooth surface (sponge) tip from DMG. Infiltrating the porosities with the infiltrant (Icon-Infiltrant, DMG). Polymerisation with glycerine gel is performed to remove the surface oxygen inhibition layer.*

Fig. 8: *Situation after polishing with rubbers (Brownie and Greenie, Shofu) and felt disc with aluminium oxide (Flexibuff with Enamelize, Cosmedent).*

Fig. 9: *Result immediately after treatment. The flashlight is scattering over the enamel surface, making it difficult to evaluate the result after treatment.*

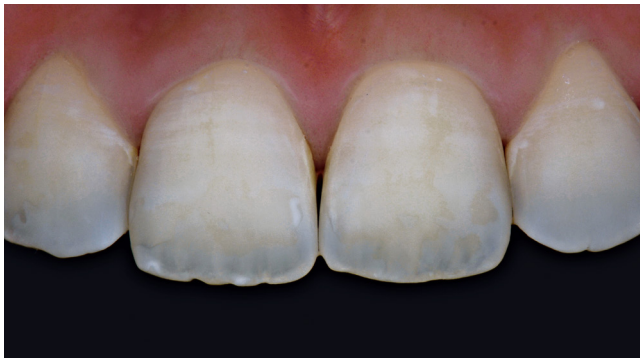

Fig. 10: *Cross-polarized photo of the initial result. There is clearly a lot of improvement compared with the initial situation. The white spots are gone!*

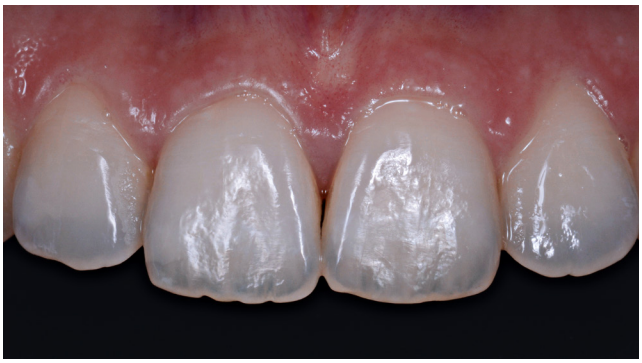

Fig. 11: *Result after 1 year seems to be very stable.*

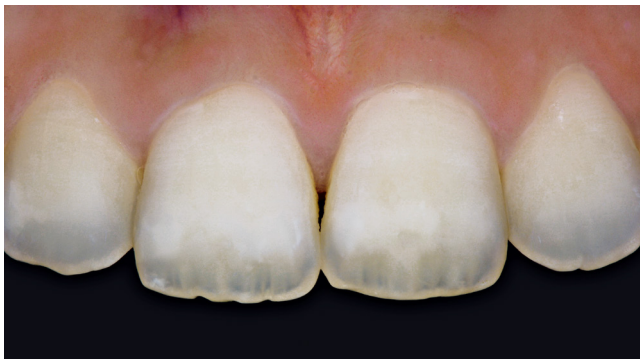

Fig. 12: *Cross-polarized record shows a very stable and satisfying result after 1 year of treatment.*

Polishing

After removal of the excess with scalers and dental floss the surface is polished with rubbers. First using a brownie (Brownie, Shofu), followed by a greenie (Greenie, Shofu) and a felt disc (Flexibuff, Cosmedent) with aluminium oxide paste (Enamelize, Cosmedent).

Evaluation

Immediately after treatment the initial result is evaluated. The white spots on the 12, 11 and 21 are completely removed and Britt is enormously happy. During and after treatment there was no sensitivity or adverse reaction of any kind. One year later I evaluated the treatment again and the result seems to be very stable. The resin-infiltration technique is a very useful and successful technique in esthetically compromised white spot cases.

Key Learnings

- With the help of Teflon it is easy to get the isolation of neighbouring teeth.
- In infiltration step, please make sure that there is no direct light on the working surface, since this may polarize the methacrylate particles preventing them to infiltrate further.
- Capillary forces suck the nano-methacrylate (Icon-Infiltrant, DMG) into the enamel, filling up the porosities. Please wait at least 3 min. or even longer to make the infiltration process complete.

Minimally invasive approach in the treatment of enamel white spot lesions due to traumatic injuries of primary tooth: a clinical case.

Dr. Ali Salehi

Fig. 1: *Initial situation with large white spots on the incisal half of 11 and 22. Patient experienced trauma on primary incisors at the age of 4. The history, shape, location, asymmetry and absence of similar lesions on the other teeth indicate the diagnosis of post traumatic white spots. The opaquer areas of the white spots indicate deeper parts of the lesion that will require a deeper treatment.*

Abstract

Hypomineralization in the permanent dentition could be a consequence of traumatic injuries of primary teeth happening at children's early years of life during learning to walk and exploring the environment. This sequela is the consequence of periodontal trauma affecting the deciduous teeth [1, 2]. The proximity of these two dentitions explains why not only a severe infection but also a slight inflammation around the periapical of a primary tooth could disturb the maturation of the ameloblasts, which leads to the appearance of traumatic hypomineralization.

Diagnosis is not easy as the lesion can present a wide variety of clinical expressions differing in shape, outline, localization and color. They are generally punctiforms, which are on the incisal third of tooth crowns, limited to one tooth and asymmetrical. Associated lesions can often be found on opposite jaw which is a pathognomonic sign for post traumatic hypomineralization.

Diagnosis is important because it will give an indication on how deep we need to go to reach the body of lesion before we infiltrate. In this case the histology is similar to white spots and fluorosis as the lesion is usually close to a well mineralized enamel surface layer [3], which is the result of post-eruptive ionic precipitation. In some cases, the lesion can be deeper. The severity of the opacity of the lesion can indicate whether we are facing a really deep lesion or a relative superficial one.

On a microscopic scale, like any white spot lesions we are facing the enlargements of the interprismatic sheath creating the impression of gaps which are not present in healthy enamel. The presences of numerous gaps deviate the trajectory of the lightrays, which is responsible for the white appearance of the lesion. Erosion step before infiltration will attack the thin layer of well mineralized enamel that acts like a barrier and make the lesion accessible for the infiltration [4]. Infiltration will then be possible in the whole lesion to fill the gaps. The infiltrant's reflexion index is close to the one of healthy enamel, therefore the light rays will keep the same trajectory as in normal enamel, thus the white spots disappear.

However, for post-traumatic hypomineralization, the edges of the lesion can have acute or obtuse angle [3, 5].

Fig. 2

Fig. 3

Fig. 4

Fig. 2: *Rubber dam placement after having chosen the color of the composite that will be needed after the erosion-infiltration steps.*
Fig. 3: *The depth of the lesions indicates a thicker well-mineralized surface layer that needs more than just acid erosion in order to access the body of the lesion for infiltration. To accelerate the process and reach good final result, a red ring bur is delicately used on the surface layer prior to the acid.* **Fig. 4:** *Prior to each etching step, the surface layer is sandblasted as well as the healthy enamel surrounding the white spots to optimize the result and limit the »edge effect« due to an insufficient infiltration of the margin of the lesion.*

Fig. 5

Fig. 6

Fig. 7

Fig. 5: *Icon-Etch is applied for 2 min and repeated 4 times because Icon-Dry did not give satisfied masking results of the white spots.*
Fig. 6 and 7: *After several steps alternating mechanical and chemical erosion, the use of Icon-Dry finally shows a satisfied result with a dramatical masking of the white lesions.*

Fig. 8

In case of obtuse angles like in white spots and fluorosis the erosion stage is effective to get a complete infiltration in the entire hypomineralized area and make the spot totally disappear.
In case of acute angles, the infiltration could be incomplete on the margins where the contours of the lesion could be still visible after treatment. We are able to eliminate the thin relatively well-mineralized surface layer by erosion, but only the central part of the lesion will be accessible to the infiltrant, while on the edges of the lesion, erosion alone cannot remove the peripheral healthy enamel, which will make resin infiltration not effective on the edges of the lesion. As a result, the center of the spot disappears while a more or less homogeneous white outline remains. This result is sometimes unsightly than the spot itself.

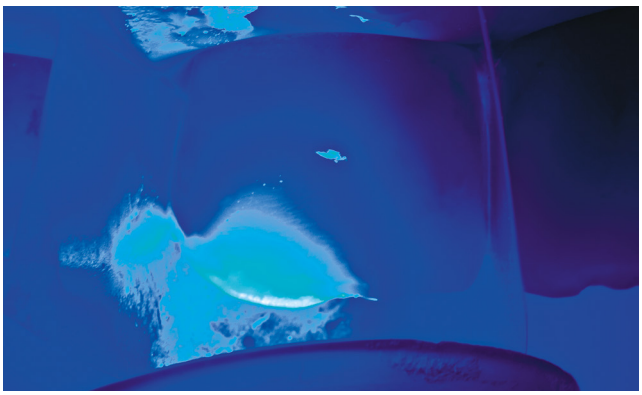

Fig. 9

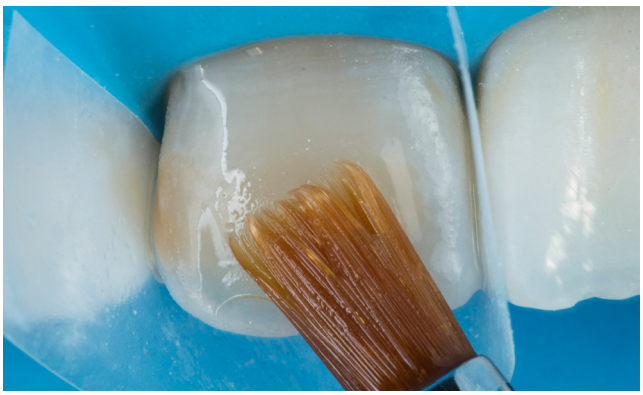

Fig. 10

Fig. 8, 9 and 10: *Apply the Icon-Infiltrant for 3 min and then light curing; followed by the application of Icon-Infiltrant for another 1 min and light curing again. To restore the morphology of the vestibular surface after the deep infiltration, a thin layer of enamel composite (Dark Enamel Essentia®, GC) is applied, light cured and polished.*

In order to improve the effectiveness of erosion-infiltration treatment in all situations of traumatic hypomineralization, light sandblasting can be done to increase the peripheral erosion.

Conclusion

In order to perform a treatment that can balance the effectiveness and minimal invasive approach, a proper diagnosis of the lesion prior to any kinds of treatment is important. Depending on the etiology of the lesion we can have an idea of its shape and depth.

It will help us to know if the good final outcome needs a superficial or deeper erosion-infiltration treatment. The latter will always need some composite to restore its initial morphology at the end of the treatment.

Key Learnings

- For post-traumatic hypomineralization, the edges of the lesion can have acute or obtuse angle. In case of acute angles, the infiltration could be incomplete on the margins where the contours of the lesion could be still visible after treatment.
- A proper diagnosis of the lesion prior to any kinds of treatment is important. Depending on the etiology of the lesion we can have an idea of its shape and depth, accordingly we can decide superficial or deeper erosion-infiltration treatment should be performed.
- The combination of sandblasting, Icon infiltration and enamel composite restoration can achieve good esthetic result for traumatic white spot lesions.

Fig. 11: *Final situation one year after the treatment show an amazing stability of the infiltration result.*

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Deep Infiltration for traumatic hypomineralization: an esthetic and conservative treatment.

Dr. Marie Clement

Fig. 1-2: *Initial intra oral picture and initial polarized picture.*

In everyday practice, dental surgeon, under increasing pressure from patients with esthetic concerns, is more and more often called on to treat abnormalities in tooth color.

The presence of a visible white area on the tooth surface is due solely to a defect in the enamel. This patient present a deep traumatic hypomineralization of a permanent tooth (**Fig. 1-2**). This is a consequence of periodontal trauma affecting the deciduous teeth. This may involve displacements of all kinds (concussion, subluxation, luxation, intrusion, extrusion, extraction). Traumatic hypomineralizations can present a wide variety of clinical expressions differing in color, shape, and outline. They are often limited to one tooth and sometimes associated lesions can often be found on mandibular opponents. Medical history is not one of the leading criteria on account of its uncertain utility (it is difficult to remember a shock that occurred several years previously). It is the elective nature of traumatic hypomineralizations rather than their clinical presentation that provides the most useful diagnostic information [1]. So the diagnosis of traumatic hypomineralization remains essentially diagnosis by exclusion (with Fluorosis, White spots and MIH).

Fig. 3

Fig. 4

Fig. 5

Fig. 3-5: *First step after Isolation with rubber dam placement is a prophylactic polishing. The deep cycle protocol is then : sandblasting with alumine oxyde 27 microns (Fig. 3). Erosion with Icon-Etch (15% HCl) 2 minutes (Fig. 4) Deshydratation with Icon-Dry (application of alcohol) (Fig. 5). At this step we have to control if the spot is always present. If yes, a second same cycle is necessary* [3].

Fig. 6

Fig. 7

Fig. 8

Fig. 6: *The third times Icon-Dry application (after 3 cycles). For our patient 3 deep cycles have been necessary: the optical change now concerns all lesions in totality and infiltration is possible.* **Fig. 7:** *Infiltration is performed with Icon-Infiltrant during 3minutes [4]. Use of dental floss before light curing is recommended. A second infiltration is necessary for 1 minute and light curing too.* **Fig. 8:** *All the lesions are translucent. If the hollow left by milling or sandblasting is significant, the slight loss of hard tissue can be made up with composite. After light-curing of the infiltrate, the resin will be used as an adhesive support. For this reason, glycerin should not be used before composite application. Several studies have shown that bonding between the resin infiltrate and composite is of very good quality [5]. So the application of a thin composite build-up to this tooth is performed with one single shade of enamel composite resin. No stratification is required : only a work of surface texture with different brushes. A last light curing is necessary under glycerin to avoid the inhibited layer because of oxygen.*

Fig. 9: *Final intra oral picture. After two months the result is satisfactory.The beauty of this internal dentin stratification has been conserved!*

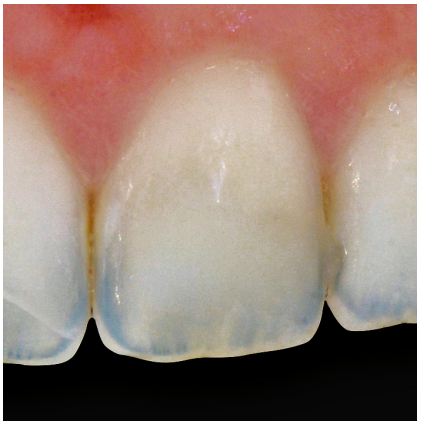

Fig. 10: *Final polarized picture*

The histopathology of traumatic hypomineralization involves subsurface hypomineralization under a relatively wellmineralized surface layer. The surface layer is the result of post-eruptive ionic reprecipitation. It is due to inconsistent angles that the results of treatment of traumatic hypomineralization by erosion-infiltration are difficult to predict.
In the case of white spots involving deep lesions of the enamel superficial infiltration is not sufficient and a new technique has been developed : the deep infiltration [2].
A deep infiltration treatment is proposed to our patient. Before the treatment the patient is informed a composite resin will be probably use on the teeth to mask concavity and alteration of enamel. Even if it remains a very conservative treatment.
The concept of deep infiltration involves paying a price in the form of mild mutilation of the enamel through preparation by sandblasting or milling so as to ensure that the infiltration can spread through almost the whole of the lesion if the latter is deep.

Key Learnings

- Traumatic hypomineralization of a permanent tooth is a consequence of periodontal trauma affecting the deciduous teeth
- The diagnosis of traumatic hypomineralization remains essentially diagnosis by exclusion (with Fluorosis, White spots and MIH).
- A last light curing is performed under glycerin to avoid the inhibited layer because of oxygen.

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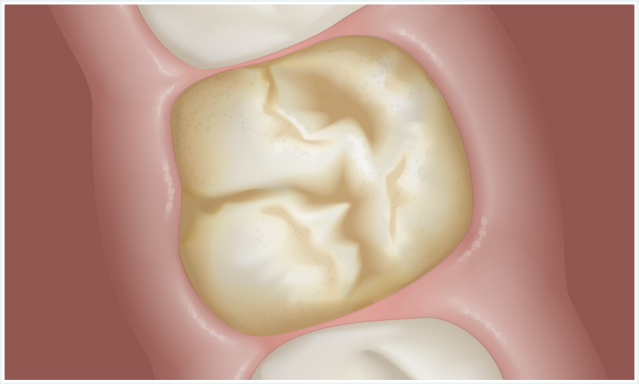
Patient history or etiology. Unknown, non specific.



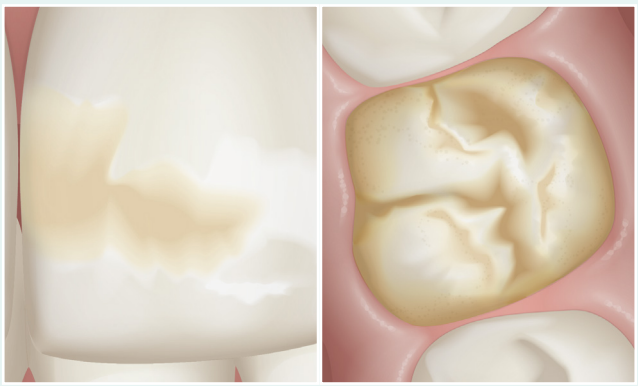
Affected tooth/teeth. One to four affected permanent molars and the associated incisors.

Localization. Affected first permanent incisors with MIH are asymmetrical.

Usually limited to the incisal or cuspal third of the crown, rarely involving the cervical third.

Border. Well-demarcated, a qualitative defect affecting enamel translucency.

No changes to the enamel thickness.



Color. Whitish-cream or yellow-brown. The intact enamel surface is hard, smooth and often hypermineralised following posteruptive maturation, the subsurface enamel is soft and porous[3,4].

Molar Incisor Hypomineralisation (MIH).

Dental history and visual diagnosis.

MIH is a condition related to demarcated hypomineralised lesions affecting at least one permanent first molar and often the permanent incisors. Other teeth can be affected by demarcated hypomineralised lesions (such as the second primary molar), however, these are not included in the MIH definition, but should be able to be treated in a similar manner.

MIH affects approximately 14% of the population [1], with approximately one third being severely affected. Diagnosis is from detection of a demarcated opaque lesion of the enamel located in the occlusal 2/3 of the crown (the gingival third is not affected) [2]. The colour varies from opaque white to yellow/brown, and severity of mineral loss normally increases with darker colour.

With more severe lesions, there may be post-eruptive breakdown (PEB) or loss of enamel, and this may be associated with a carious lesion.

MIH-type demarcated lesions differ from other developmental defects such as hypoplasia and fluorosis. Hypoplasia is a quantitative defect – that is, there is developmentally thin enamel, often in a horizontal linear pattern or pitting. Fluorosis is a diffuse hypomineralised lesion, corresponding to the developmental lines of the tooth development, with indistinct definition between sound and fluorosed enamel.

Until now, MIH is not indicated for the infiltration treatment with Icon. Nevertheless, infiltration of MIH lesions often leads to significant improvements of aesthetics and has a positive impact of patient's quality of life. In this chapter various MIH cases with different approaches and successes are shown.

Prof. Dr. David J Manton

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CASE 4. 1

A new concept for treating enamel opacities.

Prof. Dr. Nabiha Douki Zbidi, Dr. Omar Marouane, Dr. Fadwa Chtioui

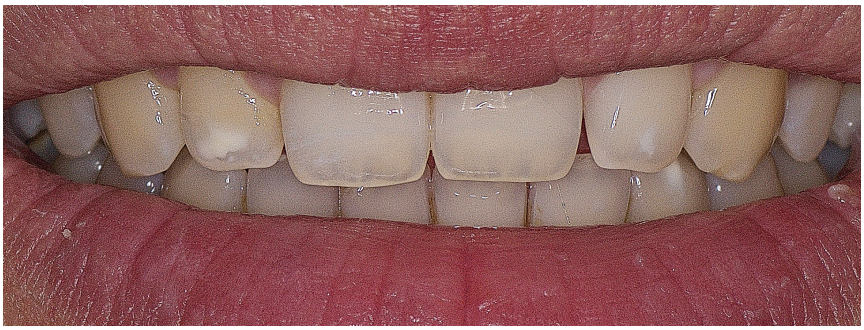

Fig. 1: *Initial view of a lesion on the upper right lateral incisor.*

Fig. 2

Introducing resin infiltration technique has completely redefined the way we treat enamel hypo mineralization. However, this procedure remains a depth-dependent technique [1]. Regarding the fact that the success of the infiltration technique totally depends on the lesion's topography, a new classification of enamel hypomineralization, based entirely on the lesion's depth was set forth. The optical properties of the enamel served as the basis for this classification. The latter includes a precise, but simple, description of the lesion in daylight conditions as well as under transillumination, to eventually match the clinical data collected to the corresponding lesion topography.

This classification regroups three major types of enamel opacities: Superficial, mixed and deep lesions. Each category has specific clinical features in relation with the topography of the lesion and the proper treatment approach will be then adopted accordingly. While keeping in mind that superficial lesions represent the easiest category to achieve a favorable treatment outcome, the idea behind the treatment concept proposed implies the transformation of mixed and deep lesions into superficial ones using abrasive procedures before proceeding with their infiltration [2]. This clinical case report describes a suggested treatment of a deep lesion affecting a lateral maxillary incisor related to MIH based on transillumination, focalization and lesion transformation to achieve a good aesthetic result.

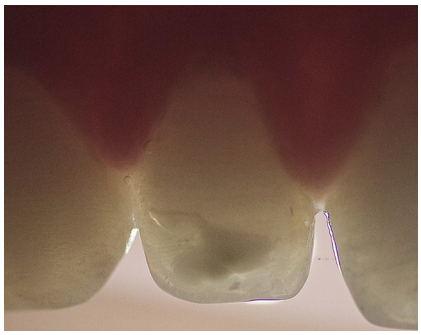

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 2: *Lateral incisor showing an ivory-white opacity melded in sound enamel tissue located in the incisal third. We may note the presence of the stained opacity affecting the first right lower molar confirming the MIH diagnosis.* **Fig. 3:** *Under transillumination, the lesion appears opaque with blurry edges showing an indistinct interface between the enamel opacity and sound enamel.* **Fig. 4:** *Lesion focalization using a light-cured resin protective barrier. The aim of this procedure is to be more conservative during abrasive and erosive steps. A mild mutilation of the enamel layer covering the lesion using an abrasive disc. This step was assessed under visual examination and transillumination until the lesion is exposed almost entirely to and superficial features are perceived.* **Fig. 5:** *The exposed hypomineralized enamel was etched during 120 s using Icon-Etch (15 % HCl)* **Fig. 6:** *Aspect of the lesion within the reflection of incident light following abrasive and erosive steps. Note the transformation of the opacity from an ivory-white to an intensely white lesion.*

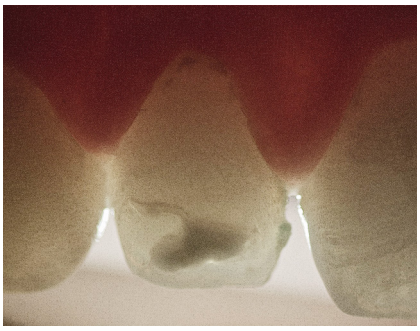

Fig. 7

Fig. 8

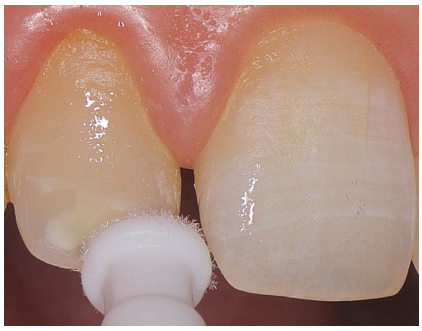

Fig. 9

Fig. 10

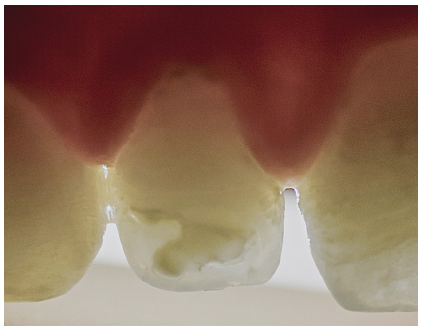

Fig. 11

Fig. 12

Fig. 13

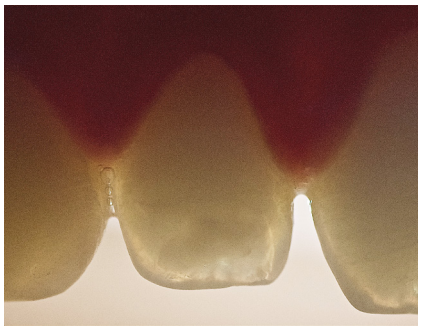

Fig. 14

Fig. 15: *Final result.*

Fig. 7: *Aspect of the lesion under transillumination after abrasive and erosive steps. The lesion edges are now well demarcated suggesting the transformation into a rather superficial lesion.* **Fig. 8:** *Dehydration using Icon-Dry.* **Fig. 9:** *Infiltration is performed using Icon-Infiltrant. The lesion should be infiltrated for at least 3 minutes until complete saturation and the infiltration does not appear to be further possible. A quick control (to avoid light curing) under transillumination is recommended during this step to assess the degree of infiltration.* **Fig. 10 and 11:** *The features of the lesion within light reflection and transillumination following the infiltration procedure show a partial infiltration with an almost complete disappearance of the opacity, which remains only at the margins. In case where the lesion is not completely infiltrated, it is highly recommended to wait for the enamel rehydration in the aim of properly assessing the final aesthetic outcome of the infiltration* [3]. **Fig. 12:** *Two weeks later, at the next appointment the appearance of the lesion shows no improvements. Accordingly, the etching, drying and lesion infiltration were all repeated exactly as performed in the first session.* **Fig. 13 and 14:** *Aspect of the lesion under incident light and transillumination after a second session of resin infiltration procedure showing the complete disappearance of the opacity as well as of the halo effect.* **Fig. 15:** *Final result.*

Key Learnings

- In transillumination and within reflection of incident light, the aspect of the opacity gives topographic information regarding the lesion's depth. This actually allows to set the treatment steps accordingly.
- The newly suggested concept provides a direct visual assistance to the practitioner during the lesion transformation and after infiltration and helps assessing the treatment progress by providing a more controllable and reproducible outcome.
- In case of partial infiltration, the re-intervention can be possible to infiltrate the remaining un-infiltrated area.

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Deep infiltration of MIH lesions: the use of transillumination as a diagnostic tool.

Associate Prof. Carlos Rocha Gomes Torres, Associate Prof. Alessandra Bühler Borges.

Fig. 1: *Patient with main lesions in upper incisors, left canine and first upper molars, characterizing MIH. The lesions on mesial surface of molars were already restored with composite*

The esthetic treatment of white lesions in anterior teeth is a frequent challenge for the dentists in the clinical practice. Different etiologies may change the enamel mineral structure and interfere with its interaction with the environmental incident light. Due to pathological changes that affect the enamel refractive index, the light suffer deviation and reflection inside the lesion, creating an optical maze which is over-luminous and responsible for the whitish aspect on the affected areas [1]. The enamel caries lesion is one of the most common problems, as a result of the hydroxyapatite demineralization by acids from bacterial biofilm, associated with the high consumption of fermentable carbohydrate. Even with the reduction of the caries disease activity, the arrested deep lesions can remain visible, impairing the esthetics of the smile. Since the 1970s, attempts to infiltrate initial enamel caries have been reported [2, 3], but only in the late 2000s the technique was improved and a commercial product (Icon, DMG) was developed.

At this time, the resinous infiltration technique was mainly directed to arrest the approximal lesions progression on posterior teeth, filling the lesion body with resinous monomers [4, 5, 6]. The treatment is based on erosion of the external surface zone of the lesion with hydrochloric acid gel, followed by washing, dehydration with absolute ethanol, infiltration with resinous monomers and light curing. However, since the infiltrant formulation has a refractive index close to the sound enamel, a color masking effect was observed, stimulating its use as an esthetic treatment on anterior teeth [7, 8]. Due to the histological structural similarities between carious white spot lesions and hypomineralized fluorotic white lesions, the resinous infiltration procedure also produced excellent clinical results on those cases [9].

The success of the infiltration protocol on the treatment of caries and fluorotic lesions stimulated the researchers to test this procedure in other kinds of developmental white lesions, such as traumatic lesions and Molar Incisor Hypomineralization (MIH). The MIH lesions are enamel defects that occur due to depressed activity of the enamel-forming ameloblasts. This condition has a multifactorial etiology, such as preterm born, low birth weight, respiratory diseases, poor general health or systemic conditions in the first 3 years of life [10, 11]. The clinical expression of the disease implies the presence of

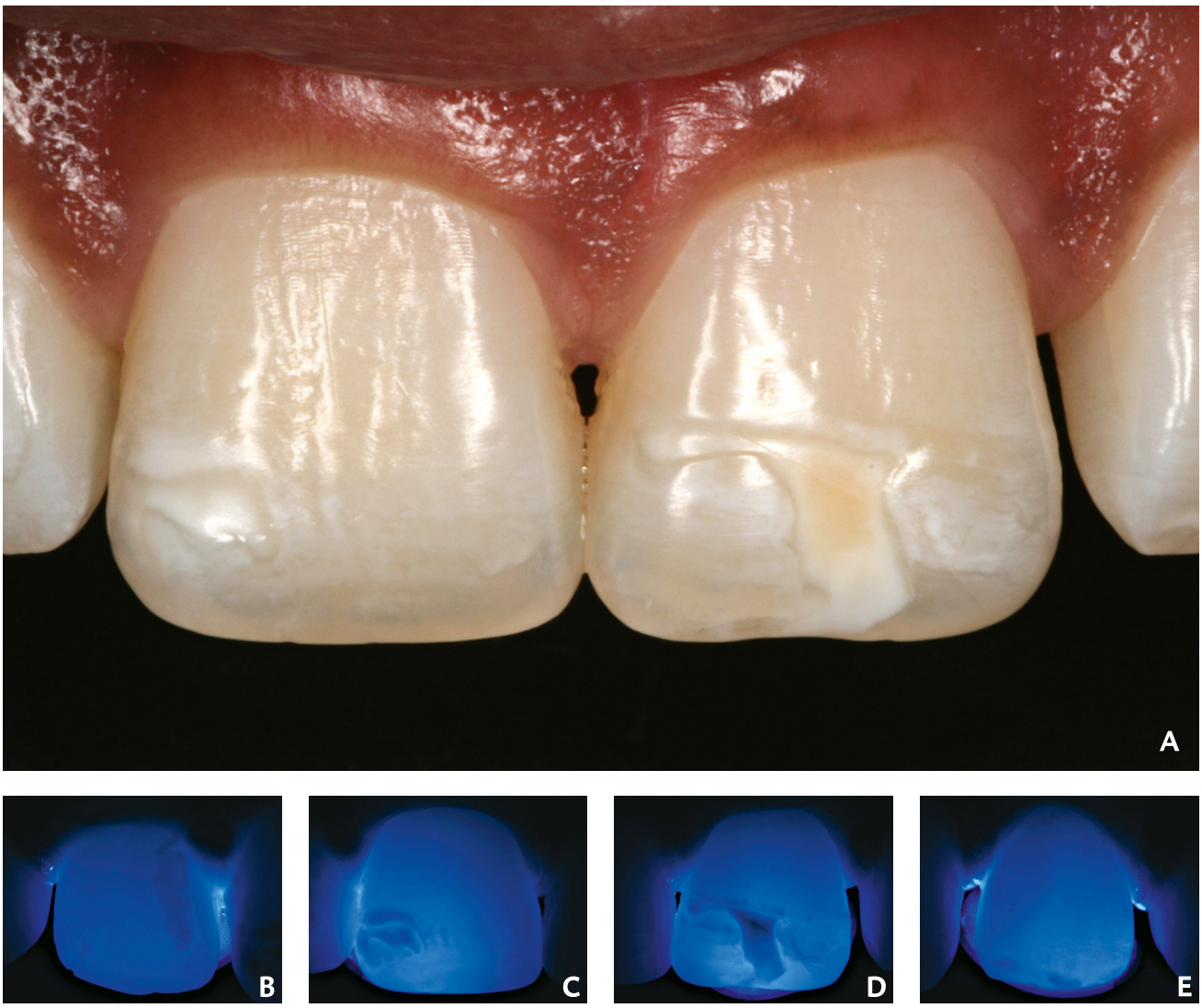


Fig. 2 A-E: *Transillumination of the main lesions in the upper. It can be observed that the main lesion in the left central incisor (Fig. 2 d) presented a black central area when transilluminated, indicating to be deeper than the lesions in the other incisors (Fig. 2 b, c and e). Based on that, the deep infiltration technique was applied only on the left central incisor. Besides the main lesions, small whitish areas were spread over the whole surfaces of the anterior teeth.*

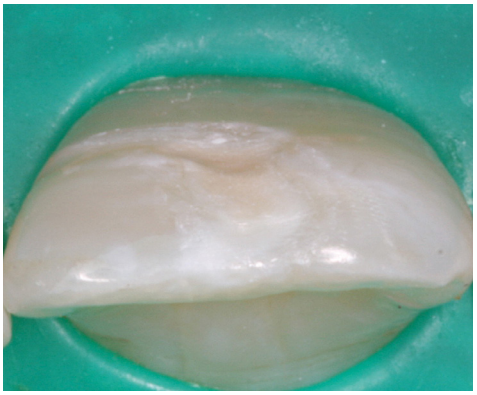
qualitative enamel defects in at least one of the four first permanent molars, associated or not with lesions on the permanent incisors. Sometimes, the cusps of the canines and the second molars are also involved [1].

However, the attempt to infiltrate the MIH lesions with the same technique applied for caries and fluorosis did not produce acceptable esthetic results. A white halo or edge effect was observed around the lesion after the infiltration, indicating an improper penetration of the resinous monomers at the borders [12]. This occurs due to the fact that the internal lesion margins form a different angle with the external tooth surface in relation to the caries and fluorotic ones. In MIH, the lesions margins form an acute angle with the external surface, impairing the monomer penetration at this area, while for the caries and fluorosis lesions the borders form an obtuse angle with the surface, allowing an uniform resinous infiltration [1]. In addition, in deep MIH lesions, sometimes the defective enamel is covered by a layer of intact enamel, which cannot be removed by the erosive effect of the hydrochloric acid alone, completely preventing the interaction of the infiltrant with the lesion body [1].

In attempt to overcome this problem, Attal et al [12]. Proposed the deep infiltration protocol; in which the external lesion surface should be previously removed using mechanical abrasion with aluminum oxide sandblast or a rotary diamond bur. This procedure grants access to the lesion body, allowing penetration of the resinous monomers. In addition, the border area can be gently removed, preventing the halo effect after the infiltration. The area is then covered with a composite restoration. Even after a small superficial enamel tissue removal, the infiltration of the lesion body can increase the translucency of the subjacent affected enamel, providing a better background for the composite restoration. Without a previous infiltration, the opaque background hinders the proper masking of the whitish area by the composite layer applied, being necessary a deeper removal of the affected tissue in order to provide adequate results. Therefore, although the deep infiltration procedure demands some tissue removal, it could be considered a more conservative approach, since it eliminates the necessity of a deep cavity preparation in order to obtain acceptable esthetic outcome.

Fig. 3: *As a composite would be necessary to cover the deep infiltrated area, the shade selection was performed as the first step.*

A



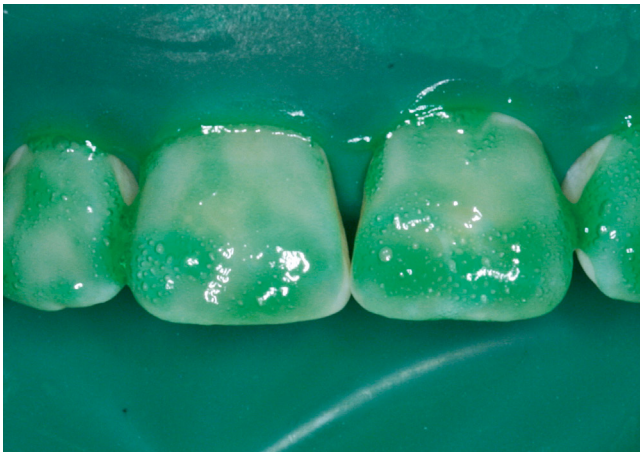
B

Fig. 4 A-B: *A small preparation performed in the deep lesion in order to provide access to the lesion body and remove the external enamel on the borders. A round diamond bur was used to remove only a minimal amount of tissue.*

However, the correct diagnosis and clinical decision about when to indicate the regular superficial infiltration and when to use the deep infiltration technique remains a clinical challenge. In order to help the clinician to take this decision, the transillumination technique can be very useful. This procedure was originally developed for diagnosis of caries lesions mainly in the proximal surface of posterior and anterior teeth. It is performed placing a high output light source, such as a blue light-curing unit, on the lingual surface of the suspected tooth, allowing the light to pass through its structure and reach the labial surface, which can be evaluated by the dentist. On a sound tooth, due to the relatively homogeneous structure of enamel and dentin, the light is normally transmitted and a light blue aspect is noticed in the whole crown. However, in the presence of caries or a hypomineralized lesion, the area can appear dark blue or completely black, indicating the reduction or complete blockage of the light transmission through the tooth, depending on the lesion dimensions. Our personal experience on using the transillumination technique on MIH lesions has shown that, when a light blue aspect is noticed in the baseline analysis of the clinical case, the lesion is supposed to be shallow, and the regular superficial infiltration can be attempted first. However, when dark blue or black areas are observed in the center of the lesion, it is considered deep, and the deep infiltration technique should be performed since the beginning of the treatment.

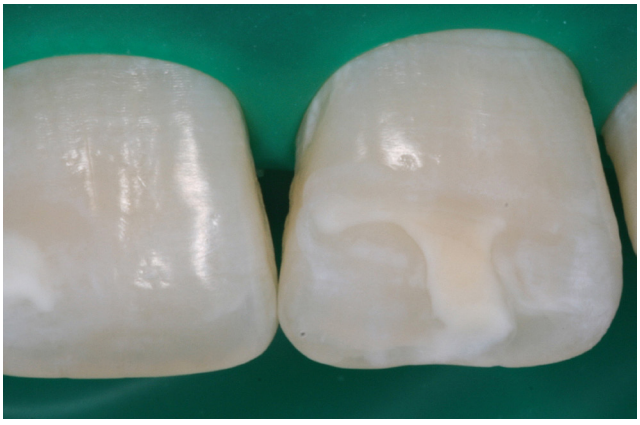
Next, a clinical case of color masking of MIH lesions is presented, in which some lesions were infiltrated with the superficial technique, while others received the deep infiltration procedure associated with the composite restoration.

A



B

Fig. 5 A-B: *After that, etching with hydrochloric acid gel was performed only over the main lesions, in order to remove the external surface of the shallow ones, and increase the permeability of the bur opened deep ones. The acid (Icon-Etch, DMG) was applied for 6 minutes over the main lesions, since shorter times are usually insufficient on those cases. Then, the whole surface was additionally etched for 2 minutes, in order to etch the small lesions spread over the teeth surfaces.*



A

B

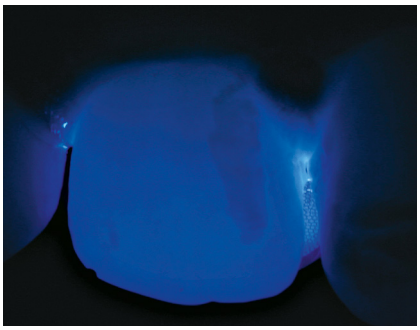
C

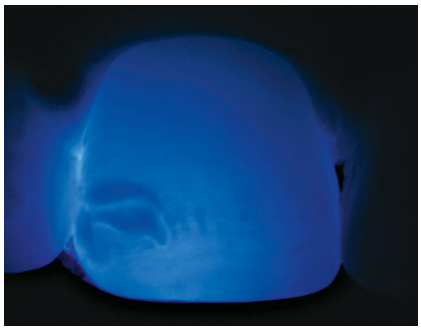
D

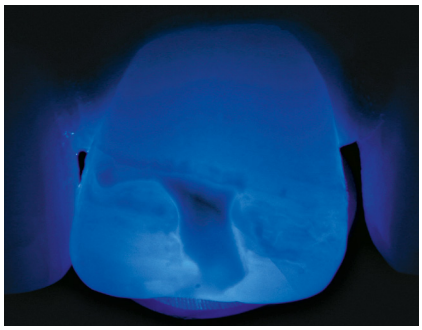
Fig. 6 A-D: *The gel was washed and the surfaces dried with an air stream, followed by the ethanol application (Icon-Dry, DMG). Besides to dehydrate the enamel, the ethanol penetration can also provide a preview of the infiltrant masking effect [13]. Although the refractive index of ethanol is lower than that of the infiltrant, if some masking effect is observed after its application, a more favorable masking will be provided by the resinous infiltrant. However, if the aspect is not changed after the ethanol application, no change is supposed to be observed after using the infiltrant, indicating that an additional etching or wear with the bur must be performed. Comparison among after etching and drying (A,B) and after the ethanol application (C,D).*

A B

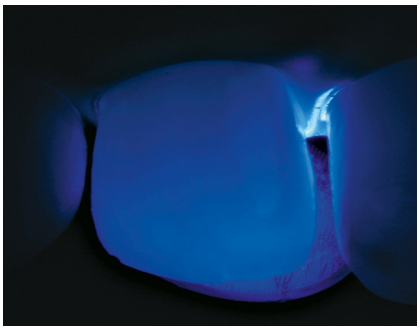
↰ **Fig. 7 A-B:** *After that, the surface was dried with air and the resinous infiltrant (Icon-Infiltrant, DMG) was applied over the labial surface of all teeth, remaining undisturbed for 3 min. The excess was removed with an air stream and the light-curing was performed during 40 s on each teeth. Then the infiltrant was applied again and let over the surface for 1 minute. The excess was removed and the light-curing was performed.*

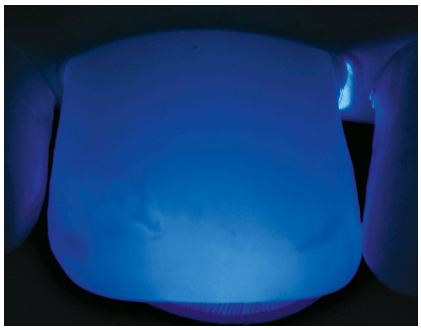


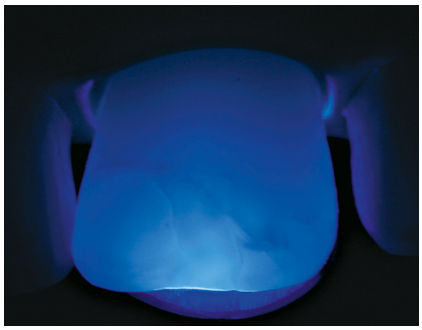




A B C

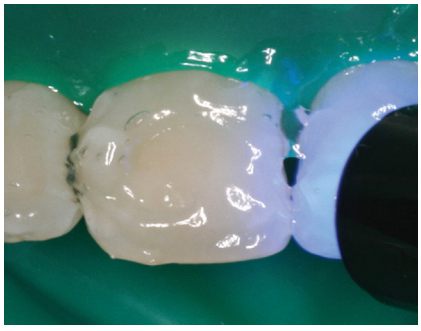




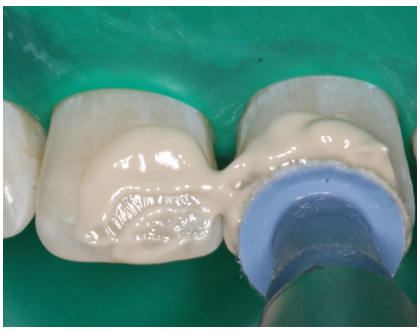


D E F

↰ **Fig. 8 A-F:** *The transillumination procedure was repeated after the infiltration, showing a significant increase in the light transmission. The dark areas of the deep lesion in the left central incisor became lighter (Fig. 8C and 8F), while the lesion in the right lateral incisor became even more translucent than at the baseline (Fig. 8A and 8D).*



A B C



D

Fig. 9 A-D: *Next, the deep infiltrated lesions were restored with composite (Fig. 9 A). A layer of glycerin gel was applied over the whole infiltrated teeth surface in order to eliminate the environmental oxygen, which can inhibit cure of the external infiltrated layer, providing a better conversion degree of the monomers in polymers (Fig. 9 B). After that, the surface was first polished with abrasive disks and then with felt disks and polishing paste.*

A

B

Fig. 10 A-B: *Post-treatment results.*

Key Learnings

- In the deep infiltration protocol the external lesion surface should be previously removed using mechanical abrasion with aluminum oxide sandblast or a rotary diamond bur.
- Transillumination technique can be very useful to identify the depth of the lesion. When a light uniform blue aspect is noticed in the baseline analysis of the clinical case, the lesion is supposed to be shallow, and the regular superficial infiltration can be attempted first However, when dark blue or black areas are observed in the center of the lesion, it is considered deep, and the deep infiltration technique should be performed.
- The esthetic treatments of MIH may combined with the superficial infiltration technique and the deep infiltration procedure followed with the composite restoration.

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Micro-invasive esthetic treatment for MIH lesions.

Associate Prof. Carlos Rocha Gomes Torres, Rayssa Ferreira Zanatta, Associate Prof. Alessandra Bühler Borges

Fig. 1: *Initial aspect of the lesion.*

Molar incisor hypomineralization (MIH) lesions represent a challenge for Pediatric Dentistry with increasing prevalence [1]. The lesions are characterized by enamel with deficiency in minerals, rich in albumin and with normal content of amelogenin [2, 3]. Its etiology is still unknown but it is believed that it is caused by disturbances during the enamel mineralization stage [4].

Fig. 2: *Hypomineralization in the maxillary molar associated with MIH.*

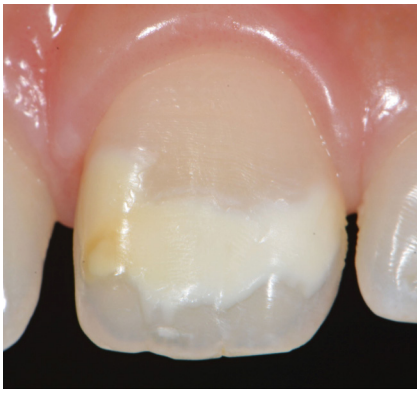

Fig. 3: *Closer view of the white-yellow lesion in the enamel.*

The clinical aspects of the lesion are changes in the enamel color and translucency, resulting in brown-yellow or white asymmetrical spots mainly in incisors and first molars [4]. Histologically, these lesions are characterized by disorganized crystals and larger interprismatic spaces, with lower mineral density [5-7].

Attempt to mineralize the molars and incisor spots with fluoride varnishes, similarly to what is indicated for treatment of white spot lesions (WSL) has been made without the success [8-10]. Recently, the infiltration of low viscosity resin (Icon, DMG, Hamburg, Germany) became a minimally invasive option for treatment of WSL [11-14]. This treatment aims to fill the porous interprismatic spaces inside the lesion [11, 13, 15] with the resin infiltration[14]. The infiltrant presents similar light refraction index as sound enamel [16], and therefore creates a masking effect [14, 17].

The efficacy of resin infiltration for superficial WSL has been shown previously [12, 13, 18-20]. Since favorable esthetic outcomes were

Fig. 4: *In the first step, prophylaxis was performed and the labial surface of the affected enamel was slightly prepared with a diamond bur to expose the top surface of the lesion and allow the access of the resin infiltrant inside the affected region.*

Fig. 5: *After partial removal of affected enamel, (note that the discolored inner enamel remains), resin infiltration technique was performed using Icon-Infiltrant for smooth surfaces kit (DMG, Hamburg, Germany). The rubbed dam isolation was applied.*

Fig. 6: *The surface was eroded with 15 % HCl gel (Icon-Etch) for 2 minutes. After that, the acid was fully washed with air/water spray and dried.*

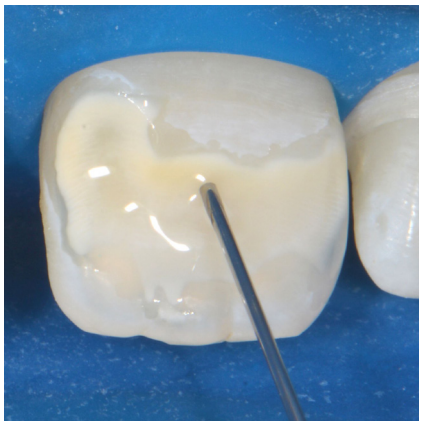

Fig. 7: *In order to completely remove water from microporosities, the lesion surface received the application of 99 % ethanol (Icon-Dry) for 30 s, and again air-dried. After Icon-Dry application, when the lesion becomes invisible or is reduced in intensity, that means the etched lesion is ready to be proper infiltrated. When no change happens, the preparation can be extended in depth, and/or a new etching step is performed, until some masking with Icon-Dry is observed. The total depth of enamel removal in this clinical case was about 0.5 mm, and the acid was applied for 6 minutes (3 applications of 2 minutes). This progressive preparation is made to allow the minimal invasive intervention as possible.*

obtained, the technique was also used in enamel developmental defects lesions, such as fluorosis, traumatic hypomineralization, and MIH [21, 22].

Different from caries and fluorosis lesions, which presents an external surface larger than the internal one, the MIH lesions have origin at the dentin-enamel junction and extend into the enamel, therefore, the erosive effect by HCl application on surface before infiltration does not allow reaching the »ceiling« of the lesion [21].

As the infiltration takes places on superficial healthy enamel and the anatomy of the MIH lesion presents an internal surface larger than the external one, it does not produce a favorable optical effect, explaining why treatments of MIH lesions by erosion/infiltration are not successful. Thus, in MIH lesions, the requirements for deep infiltration are preferable [21]. In deep infiltration, the superficial portion of enamel must be slightly removed, in order to reach the subsurface enamel portion where the MIH lesion is present.

Fig. 8: *Finally, the Icon-Infiltrant was applied in two steps. The first application was performed for 5 minutes, with surface protected from ambient light with an opaque screen.*

Fig. 9: *Then excess was removed from the surface with a blow of air, and light curing was performed for 40 s. The infiltrant was applied a second time, for 1 minute, and again light cured for 40 s.*

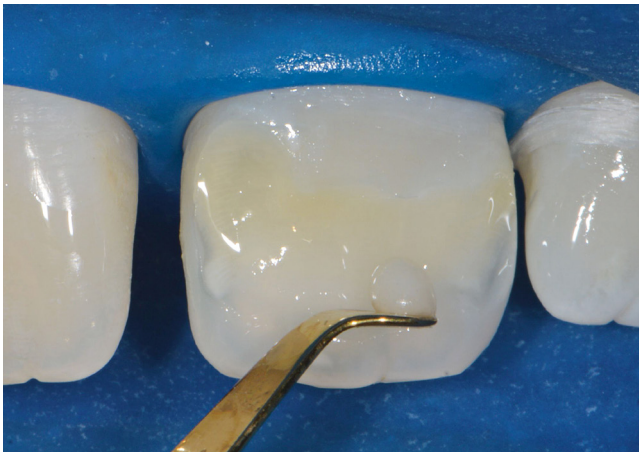

Fig. 10: *Then, composite resin was applied (Filtek XTE Supreme, 3M ESPE, St Paul, MN, USA) in increments. No separated bonding agent was applied, since the Icon-Infiltrant per se is able to promoted adhesion to the tooth structure [23]. Each increment was light cured for 40 s. Finishing and polishing procedures were performed (Soflex discs, 3M ESPE).*

Fig. 11: *Immediate outcome of the teeth in closer look.*

Case Report

A 11-year old female patient presented a yellow-white lesion in the left maxillary central incisor (Fig 1), and also affected maxillary first molars, presenting enamel breakdown and cavities (Fig 2). The pronounced discolored lesion at the front incisor seriously compromised patient's smile aesthetic (Fig 3).

The patient reported that the tooth erupted with the spot, and that she had never undergone any kind of dental trauma. Also, the diagnosis of fluorosis was discarded due to the asymmetrical distribution of discolorations. Since the defects affected both molars and incisors, MIH was diagnosed.

The proposed treatment option was deep resin infiltration associated with composite restoration.

Summary

Molar incisor hypomineralization is a growing concern in Pediatric Dentistry. The unsatisfactory aesthetic promoted by the white spots lesion in anterior teeth is usually the main reason patients look for treatment. Minimal intervention is required for these cases, and deep resin infiltration might be a viable option.

Key Learnings

- The MIH lesions have origin at the dentin-enamel junction and extend into the enamel, therefore, the anatomy of the MIH lesion presents an internal surface larger than the external one.
- As the infiltration takes places on superficial enamel and the anatomy of the MIH lesion, it does not produce a favorable optical effect, explaining why treatments of MIH lesions by erosion/infiltration are not successful. Thus, in MIH lesions, deep infiltration is necessary to be performed.
- In deep infiltration, the superficial portion of enamel must be slightly removed, in order to reach the subsurface enamel portion where the MIH lesion is present.

Fig. 12: *Final outcome after one month.*

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Dr. Ingo Frank – Praxisklinik Dres. Bayer, Kistler, Kistler, Elbertzhagen, Frank, Neugebauer & Kollegen, Landsberg am Lech, Germany

2008 - 2013:	Studies of dentistry at the University of Tübingen
2014 - 2015:	Private practice OPUS Dental Clinic, Ulm
2015	Graduation to Dr. med. dent. at the Eberhard Karls University Tübingen
2015 - 2017:	Private practice at the Praxisklinik Dres. Bayer, Kistler, Kistler, Elbertzhagen, Neugebauer & Kollegen, Landsberg am Lech
2017	Winner of the „Patient Poster Competition“ by Dentsply Sirona Implants
2018	Partner at the Praxisklinik Dres. Bayer, Kistler, Kistler, Elbertzhagen, Frank, Neugebauer & Kollegen, Landsberg am Lech

Main areas of work: Aesthetic and Restorative Dentistry, Implantology, Periodontology, Dental Photography

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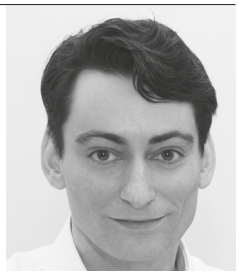


Prof. Dr. Michael Knösel – University of Göttingen (UMG), Germany; Private Practice, Hamburg, Germany; Universidad de La Frontera (UFRO), Temuco, Chile

1995 - 2001	Studies of dentistry at the University of Göttingen
2003	Graduation to Dr. med. dent.
2006	Specialist in Orthodontics
2009	Habilitation at the University of Göttingen (Priv.-Doz.)
2013	Adjunct professor at the University of Göttingen (apl. Prof.)
Since 2015	Visiting professor, Universidad de La Frontera (UFRO), Temuco, Chile
Since 2016	Private orthodontic practice in Hamburg

Main areas of work: White-spot lesion prophylaxis and innovative treatment approaches; lingual orthodontics; interactions between intra-oral soft-tissue dynamics and malocclusion

Contact: Prof. Dr. Michael Knösel, Kieferorthopädie „in der 'Welle“, Lübecker Str. 128, 22087 Hamburg, Germany

Prof. Dr. Hendrik Meyer-Lückel – University of Bern, Bern, Switzerland

2000 - 2008	Postgraduate Scientist / Assistant Professor (10/01) Department of Operative Dentistry and Periodontology, Freie Universität Berlin/Charité – Universitätsmedizin Berlin
2008	PhD in Dental Medicine (Habilitation), Charité – Universitätsmedizin Berlin
2009	Master of Public Health (Focus: Epidemiology) Berlin School of Public Health at Charité
2008 - 2012	Associate Professor Clinic for Conservative Dentistry and Periodontology Universitätsklinikum Schleswig-Holstein-Campus Kiel, Christian-Albrechts-Universität zu Kiel
2012 - 2017	Professor and Head of Department for Operative Dentistry, Periodontology and Preventive Dentistry, RWTH Aachen University
Since 2017	Professor and Head of Department for Operative, Preventive & Paediatric Dentistry, Universität Bern, Switzerland

Main areas of work: De- and remineralization of dental hard tissues, Sealing / caries infiltration, Caries epidemiology and Dental Public Health, Adhesive dentistry / Postendodontics

Contact: Prof. Dr. Hendrik Meyer-Lückel, Universität Bern, Klinik für Zahnerhaltung, Präventiv- und Kinderzahnmedizin, Hochschulstrasse 6, 3012 Bern, Switzerland

Dr. Alexander Aresdahl – Aqua Dental, Stockholm, Sweden

2005	Exchange program 05’ Harvard high school, Boston, Massachusetts, USA
2012	MSDS/DDS (Master of Science in Dental Surgery/Doctor in Dental Surgery) from the prestigious Royal Institute of Caroline in Stockholm, Sweden
2012 - 2014	Dental practitioner in Norway and in London, mainly focusing on implant dentistry and restorative dentistry
Since 2013	academic researcher at Uppsala University, department of maxillofacial surgery
2014	AOCMF course, Principles in Craniomaxillofacial Fixation Techniques for Surgeons in Leeds, United Kingdom
Since 2014	dental practitioner at Aqua Dental, Stockholm, Sweden
2016 -	Master course on composite restorations in Tokyo, Japan

Main areas of work: Ceramic crowns, bridges and veneers, dental implantology, Advanced TMJ conditions and bite physiology, Invisalign orthodontics, composite restorations, aesthetic dentistry

Contact: Dr. Alexander Aresdahl, Aqua Dental, Sturegatan 48, 114 36 Stockholm, Sweden

Prof. Dr. Sebastian Paris – Charité - Universitätsmedizin, Berlin, Germany

2003	Graduation to Dr. med. dent.
2005	doctorate thesis (Promotion)
2004 - 2008	lecturer and instructor of undergraduate students at the Department of Operative Dentistry and Periodontology, Charité, Berlin
2008 - 2013	lecturer and associate professor at the Clinic for Operative Dentistry and Periodontology, University of Kiel, Germany
2011	PhD-Thesis (Habilitation)
Since June 2013	head of the Department of Operative and Preventive Dentistry at the Charité in Berlin.

Main areas of work: cariology, caries infiltration, minimal invasive dentistry, oral microbiology

Contact: Prof. Dr. Sebastian Paris, Charité - Universitätsmedizin Berlin, Abteilung für Zahnerhaltung und Präventivzahnmedizin, Aßmannshauser Str. 4-6, 14197 Berlin, Germany

Dr. Erik-Jan Muts – MSc. - MP3 Tandartsen, Apeldoorn, Netherlands

2007 - 2013	Studies of dentistry at the University of Groningen
Since 2013	Private practice MP3 Tandartsen in Apeldoorn
2013 - 2016	Dentist at Beekmans Tandartsen in Laren
2013	Clinical Case Winner 3M Espertise Talent Awards
Since 2014	Boardmember of the Dutch Academy of Esthetic Dentistry
2015	Glen P. McGnivey Scientific Writing Award for Best Systematic Review

Main areas of work: Restorative dentistry, prosthodontics, microscopic dentistry, photography, aesthetic dentistry

Contact: Dr. Erik-Jan Muts, MP3 Tandartsen, Regentesselaan 3, 7316 AA Apeldoorn, The Netherlands

Dr. Ali Salehi – University of Strasbourg, France

2001 - 2007	Studies of dentistry at the University of Strasbourg
2007	Graduation to Dr. med. dent.
2007 - 2018	Private practice in Strasbourg
2015 - 2018	Assistant professor at the Department of Prosthodontics, University of Strasbourg
2015	Clinical case winner of the 3M "Espertise European Talent Award"
2017	Clinical case winner of the first french national "Grand Prix de Dentisterie Esthétique"
Since 2017	Teacher at the Smile Academy
Since 2017	Teacher at the dental master of aesthetic dentistry of the University of Strasbourg

Main areas of work: Dental photography, aesthetic dentistry, digital smile design, minimal invasive dentistry, bonding and cementation, direct composite restorations and prosthodontics

Contact: Dr. Ali Salehi, Faculté de Chirurgie Dentaire de Strasbourg, 8, Rue de Saint Elisabeth, 67000 Strasbourg, France

PD Dr. Michael Wicht – University of Cologne, Germany

1987 - 1993	Studies of dentistry at the University of Cologne
1994	Private practice in Duisburg
1995 - 2000	Assistant professor at the Department of Operative Dentistry and Periodontology, University of Cologne
1996	Graduation to Dr. med. dent.
Since 2000	Associate professor and senior lecturer
2008	Postdoctoral lecture qualification

Main areas of work: Oral microbiology, root caries, antibacterial therapy of the infected dentine, paediatric dentistry, professional-client interaction and communication, shared-decision making

Contact: PD Dr. Michael Wicht. Uniklinik Köln, Abteilung Zahnerhaltung und Parodontologie, Kerpener Str. 32, 50931 Köln, Germany

Dr. Ryan Li – North China University of Science And Technology (NCST), Tangshan, China

2010	Graduated from Endodontics College of China Medical University
2010 - 2018	Endodontics lecturer at college of Stomatology, North China University of Science And Technology (NCST)
2015 - 2018	Vice director of the Special Demand Departments, Affiliated Stomatology hospital, NCST
2015 - 2018	Visiting professor of Langfang Society of Stomatology
2015 - 2018	Senior lecturer of Sybronendo Dental Institute

Main areas of work: Nonsurgical Root Canal Therapy, Nonsurgical Root Canal Retreatment, Minimally Invasive Cosmetic Dentistry, Regenerative Endodontic, Microscoptic Apical Surgery

Contact: Dr. Ryan Li, North China University of Science and Technology, School of Stomatology, Hebei Tangshan 063000, China

Dr. Marie Clement – Private Practice, Lyon, France

2005 - 2011	Studies of dentistry at the University of Lyon – France
Since 2011	Private practice in Lyon France (specialist in aesthetic and restorative dentistry)
2013	Post-Graduated in aesthetic dentistry in Strasbourg University France
2012 - 2016	Assistant professor at the Department of Prosthetic Dentistry - University of Lyon –France
Since 2016	Digital Smile Design Instructor
Since 2017	Style Italiano Silver member

Main areas of work : Aesthetic, conservative and prosthetic dentistry

Contact: Dr. Marie Clement, 8 avenue Maréchal Foch, 69006 Lyon, France

Dr. Omar Marouane – University of Monastir, Tunisia

2006 - 2012	Studies at the Faculty of Dentistry of Monastir
2013 - 2016	Postgraduate student and speciality training in Restorative Dentistry & Endodontics
2017	National Certificate in Restorative Dentistry & Endodontics
2017	Private Practice in Tunis; Applied learned skills and advancing the study of research involving enamel opacities
Since 2018	Assistant doctor at the Department of Restorative Dentistry and Endodontics

Main areas of work: White Spots, Enamel Opacities, Resin Infiltration, MIH, endodontic irrigation

Contact: Omar Marouane, University of Monastir, Dental faculty of Dentistry Monastir, Avenue Avicenne, 5019 Monastir, Tunisia

Dr. Fadwa Chtioui – University of Monastir, Tunisia

2008 - 2014	Studies at the Faculty of Dentistry of Monastir
2015	DDS degree and nomination for the faculty's annual thesis prize
Since 2016	Postgraduate student and speciality training in Restorative Dentistry & Endodontics
02 - 07.2018	selected for the annual postgraduate Scholarship of the Ministry of higher Education of Tunisia for a Clinical training in Paris
2018	Member of the French Society of Endodontics

Main areas of work: White Spots, Enamel Opacities, Resin Infiltration, MIH, Dental Traumatology

Contact: Dr. Fadwa Chtioui, University of Monastir, Dental faculty of Dentistry Monastir, Avenue Avicenne, 5019 Monastir, Tunisia

Prof. Dr. Nabiha Douki Zbidi – University of Monastir, Tunisia

1989	DDS National Degree and winner of the national of the best thesis prize
1990	Presidential Award in dentistry
1995 - 07	Postgraduate degree of a dental specialist in Restorative Dentistry & Endodontics
1995 - 11	Assistant professor at the Department of Restorative Dentistry and Endodontics
1997	Associate professor in Restorative dentistry and Endodontics at the University of Dentistry of Monastir and senior lecturer
Since 1999	Head of research unit 03/UR/16-02 (www.recherche-odontologique.com)
Since 2004	University professor in the school of dentistry of Monastir, Tunisia
Since 2006	Head of the Odontology department at the University Hospital of Sahloul - Sousse – Tunisia

Main areas of work: Restorative Dentistry, Endodontics, Enamel Opacities, Resin Infiltration

Contact: Prof. Dr. Nabiha Douki Zbidi, University of Monastir, Dental faculty of Dentistry Monastir, Avenue Avicenne, 5019 Monastir, Tunisia

Prof. Dr. Leandro Augusto Hilgert – University of Brasília, Brazil

1999 - 2003	Dental School at the University of Passo Fundo, Brazil
2004 - 2006	Specialization and MSc in Operative Dentistry at the Federal University of Santa Catarina, Brazil
2006 - 2009	PhD in Operative Dentistry at the Federal University of Santa Catarina, Brazil
2008	Visiting Researcher at the Prosthodontics Department of the University of Munich, Germany
2012 - 2015	PhD in Medical Sciences (Cariology/Dentistry) at the Radboud University Nijmegen, Netherlands
2009 - 2018	Adjunct Professor of Operative Dentistry at the University of Brasília, Brazil
Since 2018	Associate Professor of Operative Dentistry at the University of Brasília, Brazil

Main areas of work: Preventive and Restorative Dentistry focused on Minimum Intervention, Adhesion to enamel and dentin, Tooth Bleaching, Resin Infiltration, Composite Resins.

Contact: Prof. Dr. Leandro Augusto Hilgert, University of Brasília (UnB), Department of Operative Dentistry, Campus Darcy Ribeiro, 70910-900 - Asa Norte – Brasília, Brazil

MSc. Marilia Bizinoto Silva Duarte – University of Brasília, Brazil

2008 - 2012	Dental School at the University of Brasília, Brazil
2013 - 2014	MSc in Health Sciences (Dentistry) at the University of Brasília, Brazil
Since 2016	Lecturer of Operative Dentistry at the University of Brasília, Brazil
Since 2016	PhD candidate in Health Sciences (Dentistry) at the University of Brasília, Brazil
Since 2018	Dentist of the Public Health System of the Federal District, Brazil

Main areas of work: Resin Infiltration, Enamel Developmental Defects, Preventive and Restorative Dentistry focused on minimum intervention.

Contact: MSc. Marilia Bizinoto Silva Duarte, University of Brasília (UnB), Department of Operative Dentistry, Campus Darcy Ribeiro, 70910-900 - Asa Norte – Brasília, Brazil

Prof. Dr. Vera Mendes Soviero – Universidade do Estado do Rio de Janeiro and Faculdade Arthur Sá Earp Neto, Brazil

1991	Graduation in Dentistry at Universidade do Estado do Rio de Janeiro, Brazil
1994	Master Degree at Universidade Federal do Rio de Janeiro, Brazil
1997	PhD Degree at Universidade Federal do Rio de Janeiro, Brazil
Since 1999	Associate professor at Universidade do Estado do Rio de Janeiro, Brazil
Since 2015	Dean of the Dental School at Faculdade Arthur Sá Earp Neto, Brazil

Main areas of work: Clinical studies on Cariology and Enamel defects

Contact: Prof. Dr. Vera Mendes Soviero, Universidade do Estado do Rio de Janeiro, Av. 28 de Setembro 157 – 2o andar, 20551-030 Rio de Janeiro, Brazil

Prof. Dr. Neeraj Gugnani – DAV (C) Dental College, Haryana, India

1991 - 1996	BDS study at DAV (C) Dental College Yamunanagar
1997 - 2000	MDS study in Pediatric and Preventive Dentistry at King George's Medical College, Lucknow
April 2000	faculty member at DAV (C) Dental College Yamunanagar and since 2008 Professor at the same institute
2009	Joined as Commonwealth Scholar at Dental Health Unit, University of Manchester, UK, for research training in the field of Dental caries, especially Early Caries Detection and Management.
2011	Awarded ORCA travel fellow award for research proposal regarding management of white spot lesions using Resin Infiltration and other non-invasive strategies
2012 - 2014	Completed MSc in Clinical Trials (with Distinction) from London School of Hygiene and Tropical Medicine, University of London, UK.

Main areas of work: Caries detection and management including Caries risk assessment, Minimal Invasive Dentistry, Community level prevention of Caries, Dental traumatology and restoration, Pediatric dentistry, Conducting Phase III and IV Clinical Trials, Establishing academic and corporate partnerships, Clinical teaching and Training for effective research methodologies and Systematic Reviews.

Contact: Prof. Dr. Neeraj Gugnani, DAV (C)Dental college, Department of Pedodontics & PCD, Yamuna Nagar 135001, Haryana, India

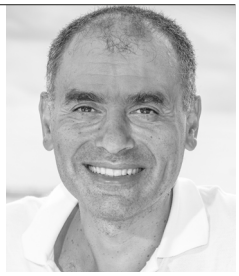
Dr. Arzu Tuna – myveneers, Cologne, Germany

1990 - 1997	Studies of dentistry at the University of Cologne
1998 - 2012	Assistant professor at the Department of Operative Dentistry and Periodontology, University of Cologne
2002	Graduation to Dr. med. dent.
Since 2012	private practice Attendorn with Dr. Umut Baysal
Since 2016	private practice myveneers in Cologne, Germany, with Dr. Umut Baysal
2017	Founding of MYV Smileclub

Main areas of work: Paediatric dentistry, Aestethic dentistry, Aligner Orthodontics

Contact: Dr. Arzu Tuna, Praxis am Nordwall, Nordwall 2, 57439 Attendorn, Germany

Dr. Jean-Pierre Attal – University of Paris Descartes, France



1983 - 1988	Studies of dentistry at the University of Paris Descartes
1991 - 1995	Assistant professor at the Department of Dental Materials (Paris Descartes)
1995	PhD directed by Pr Michel Degrange
Since 1997	Senior lecturer
Since 2008	Accreditation to supervise research
Since 2015	Director of the dental materials lab URB2i (EA 4462)
Since 2015	President of the French Society of Biomaterials (SFBD)
Since 2016	Redactor in chief of the Biomaterials Clinic Journal, Director of a Master in Biomaterials Engeneering (Paris Descartes), Private Practice from 1990 until now in Paris

Main areas of work: Adhesion to calcified tissues, Glass ionomer cements, CAD-CAM materials, Dental bleaching and resin infiltration

Contact: Dr. Jean-Pierre Attal, Université Paris Descartes, 9, boulevard Arago, 75013 Paris, France

Associate Prof. Carlos Rocha Gomes Torres – Sao Paulo State University - UNESP, Brazil

1992 - 1995	Undergraduate studies at Sao Jose dos Campos School of Dentistry, Sao Paulo State University – UNESP
1996 - 2002	Private practice in Sao Paulo State
1999 - 2002	PhD degree in Operative Dentistry at Sao Paulo State University – UNESP
2002 - 2013	Doctor assistant professor at the Department of Restorative Dentistry, Sao Paulo State University – UNESP
2009	Postdoctoral researcher at the University of Zurich – Switzerland
2013	Habilitation in Operative Dentistry at Sao Paulo State University – UNESP
Since 2013	Associate professor at the Department of Restorative Dentistry, Sao Paulo State University – UNESP

Main areas of work: Esthetic treatments, Dental bleaching, Caries, Dental Erosion, Adhesives, Composites

Contact: Prof. Carlos Rocha Gomes Torres, Universidade Estadual Paulista – UNESP, Faculdade de Odontologia de Sao José dos Campos, Av. Eng. Franicsco José Longo, 777, Jd. Sao Dimas, Sao José dos Campos – Sao Paulo, Brazil

Prof. Dr. Zafer Cehreli – Hacettepe University, Ankara, Turkey

Professor of Pediatric Dentistry at Hacettepe University
Professor of Pediatric Dentistry at Louisiana State University Health Sciences Center
Chair, Education Committee, International Association of Dental Traumatology

Main areas of work: Minimally invasive restorative dentistry, Pediatric Endodontics, Dental Traumatology, Biocompatibility and biomechanical testing

Contact: Prof. Dr. Zafer Cehreli, Hacettepe Üniversitesi, Diş Hekimliği Fakültesi, Çocuk Ve Ergen Dişhekimi, 06100 Sıhhiye Ankara, Turkey

Prof. Dr. David J. Manton – University of Melbourne, Melbourne, Australia

1984	Graduated BDSc at the University of Melbourne
1984 - 1991	General practice
1991 - 1993	MDSc in Paediatric Dentistry
1994 - 1996	Dental Adviser to Commonwealth Department of Human Services
2002 - 2006	Lecturer at the University of Melbourne
Since 2006	Elsdon Storey Chair of Child Dental Health and Head of the section of Growth and Development at The University of Melbourne

Main areas of work: all aspects of paediatric dentistry, enamel de- and remineralisation, teledentistry, and MIH.

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Dr. Richard Johannes Wierichs – RWTH Aachen University, Aachen, Germany

2006 - 2011	Studies of dentistry at the University of Bonn (Rheinische Friedrich-Wilhelms-Universität Bonn), Germany
2012	Graduation to Dr. med. dent. at the University of Bonn (Rheinische Friedrich-Wilhelms-Universität Bonn), Germany
2012	Private practice in Neuwied, Germany
2012 - 2016	Assistant professor at the Department of Operative Dentistry, Periodontology and Preventive Dentistry, RWTH Aachen University, Aachen, Germany
Since 2016	Assistant professor and senior physician at the Department of Operative Dentistry, Periodontology and Preventive Dentistry, RWTH Aachen University, Aachen, Germany
Since 2017	Scholarship holder of the medical faculty at the Department of Biohybrid & Medical Textiles, Institute of Applied Medical Engineering, RWTH Aachen University, Aachen, Germany

Main areas of work: Non-/microinvasive therapies of caries, Root caries, De-/remineralization of dental hard tissue, Antibacterial therapy of dental hard tissue, Healthcare research

Contact: Dr. Richard Johannes Wierichs, Rheinisch-Westfälische Technische Hochschule Aachen (RWTH), Klinik für Zahnerhaltung, Parodontologie und Präventive Zahnheilkunde, Pauwelsstraße 30, 52074 Aachen, Germany

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Dr. Carla Cohn - Kids Dental and Western Surgical Centre Winnipeg, Manitoba, Canada

1984 - 1987	University of Manitoba Faculty of Sciences undergraduate programme
1987 - 1991	University of Manitoba Faculty of Dentistry
1991	Graduated Faculty of Dentistry with DMD (Doctor of Dental Medicine)
1991 - 1992	Health Sciences Centre Children's Hospital Dental Internship
1992	Certificate of Internship of Children's Dentistry
1992	present: part-time clinical instructor University of Manitoba Faculty of Dentistry
1992	present: private dental practice Kids Dental and Western Surgical Centre
2009	present: key opinion leader / lecturer

Main areas of work: Paediatric Dentistry, lecturer on »paediatric dentistry for the general practitioner«

Contact: Dr. Carla Cohn, Kids Dental 128-2025 Corydon Avenue Winnipeg Manitoba Canada R3P 0N5,

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Associate Prof. Giuseppe Allocca

2000 - 2001	Studies of Pharmacy at the University of Milan
2001 - 2003	Studies of Dental Hygiene at Medical- School University of Milan
2004	Graduated- Enabling of Dental Hygiene at Medical School - University of Milan
Since 2004	Private practice in Milano – Lodi- Bergamo, Italy
2014 - 2016	Professor a/c of Applied Medical Technical Sciences - Department of Operative Dentistry – University of Milan
Since 2015	Supervisor courses Hard Tissues -Periodontology and Preventive Dentistry
2014 - 2018	Professor a/c of Internship (Tirocinio clinico)- Department of Operative Dentistry – University of Milan

Main areas of work: Microinvasive therapies of caries, Root caries, Fluorosis and MIH, remineralization of dental hard tissue, Antibacterial therapy of dental hard tissue, Dental Aesthetics-Healthcare research

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