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Erosion–Infiltration (with Icon) in MIH: Practical Tips for Managing White Spot Lesions

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Abstract:

Introduction:
Molar–incisor hypomineralization (MIH) is a developmental enamel defect that compromises both function and aesthetics. Conventional treatments often show limited effectiveness due to altered enamel properties. Resin infiltration (Icon®) offers a minimally invasive option for managing white spot lesions, with refinements allowing deeper penetration.

Case presentation:

Through a case serie illustrates the step-by-step protocol for treating MIH-related white opacities through a clinical case of a 23-year-old patient, emphasizing key factors for achieving successful outcomes.

Discussion:
The prevalence of MIH in Tunisia is estimated between 10–25%, making it a significant public health concern. Diagnosis is based on exclusion from other enamel defects and carious changes. The present case illustrates that infiltration alone may be insufficient in deeper MIH lesions due to their sub-surface localization. A combined approach, involving selective enamel removal, erosion–infiltration, and composite restoration, enhances both aesthetic outcomes and enamel reinforcement. Adjunctive tools such as transillumination, ethanol testing, and ultrasonic preparation optimize treatment predictability.

Conclusion:
The combined use of microabrasion, erosion–infiltration, and composite restoration proved to be a conservative and effective strategy for MIH-related opacities. Careful lesion preparation and clinical refinements enhanced resin penetration and improved the aesthetic outcome.

Keywords: Molar–incisor hypomineralization, resin infiltration, Icon®, microabrasion, minimally invasive dentistry, enamel defects.

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Erosion–Infiltration (with Icon) in MIH: Practical Tips for Managing White Spot Lesions

Introduction:

Molar–incisor hypo mineralization (MIH), first described by Weerheijm et al. in 2001, is a developmental enamel defect affecting one to four first permanent molars and often associated incisors [1]. Clinically, MIH presents as well-demarcated opacities ranging from white to yellow brown, sometimes accompanied by post-eruptive breakdown, hypersensitivity, and aesthetic concerns. Its etiology is multifactorial, involving systemic disturbances during amelogenesis in early childhood, as well as environmental and nutritional factors.

Conventional treatments, including bleaching, micro abrasion, and composite restorations, have limitations due to altered enamel properties or the need to remove healthy tissue. To address these challenges, an erosion–infiltration protocol was developed, enabling resin penetration into hypo mineralized enamel. Recent refinements, including deep micro-invasive infiltration techniques, allow optimal resin penetration even in lesions covered by intact enamel [2].

This article illustrates the step-by-step protocol for treating MIH-related white opacities through a clinical case of a 23-year-old patient, emphasizing key factors for achieving successful outcomes.

Case report:

A 23 -year- old patient, presented to the OCE department at dental medicine in Monastir, with complaints of aesthetic concerns. Clinical intraoral examination revealed well defined white opacity in tooth 11 and 41 (**figure 1).** Further clinical examination of upper permanent first molars showed atypical hypo mineralization, supporting the diagnosis of MIH **(figure 2).**

A deep resin infiltration was performed on teeth 11 and 41 as a minimally invasive therapeutic approach for the management of enamel white spot lesions.

Initially, the spatial characterization of the lesion was conducted using transillumination (Figure 3). Subsequently, under rubber dam isolation, minimal microabrasion was performed to expose the lesion ceiling (Figure 4). Erosion was then achieved by applying 15% hydrochloric acid gel (Icon-Etch, DMG, Hamburg, Germany), which was activated for two minutes (Figure 5). The gel was carefully removed using surgical suction, followed by a 30-second water spray rinse, and the enamel surfaces were thoroughly air-dried.

Prior to resin infiltration, desiccation with 99% ethanol (Icon-Dry®, DMG) was performed to confirm accessibility of the lesion's ceiling and facilitate resin penetration into the lesion body. As the optical outcome remained unsatisfactory, ultrasonic tips were employed to selectively remove the superficial lesion ceiling in localized areas (Figure 6), and an additional cycle was

carried out (selective peripheral micro-milling, erosion, and ethanol desiccation). A subsequent ethanol application confirmed readiness for infiltration (Figure 7).

Resin infiltration (Icon Infiltrant®, DMG) was performed by vigorously applying the infiltrant with an applicator for three minutes, followed by light-curing for 40 seconds. A second application of infiltrant was then carried out, with another 40-second light-curing. Composite restoration was placed immediately after the second infiltration to compensate for the loss of hard tissue (Figure 9). The same protocol was subsequently applied to tooth 41.

Fig1: Intraoral view showing white spots with distinct borders in tooth 11 and 41

Fig2: Intraoral view showing Brown spot in upper first molar and lower first molar (signs of hypomineralisation)

Fig3: Lesion mapping by transillumination revealing a deep depth lesion in tooth 11

Fig4: Application of the micro abrasive product (Opalustre) for exposing the ceiling of the lesion

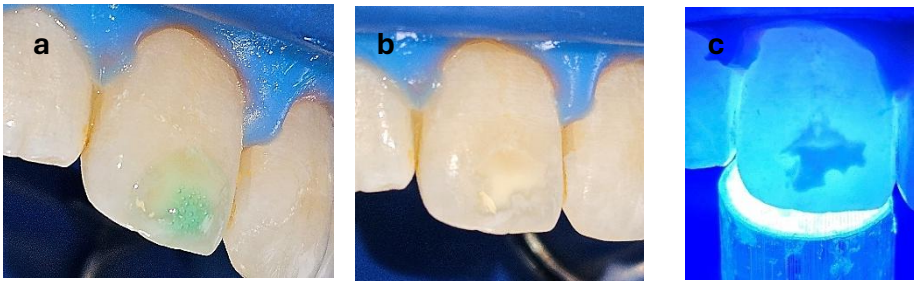

Fig5: Micro-etching. **(a)** applying 15 hydrochloric acid (Icon-Etch) and activating it for two minutes with a brush **(b)** washing of cavity **(c)** Transillumination control revealed that parts of the lesion remained deep with blurred margins, while other areas appeared clearer.

Fig6: (a) Using Ultrasonic tips to selectively remove the superficial "ceiling" of the lesion in certain areas. **(b)** Lateral view of cavity prepared.

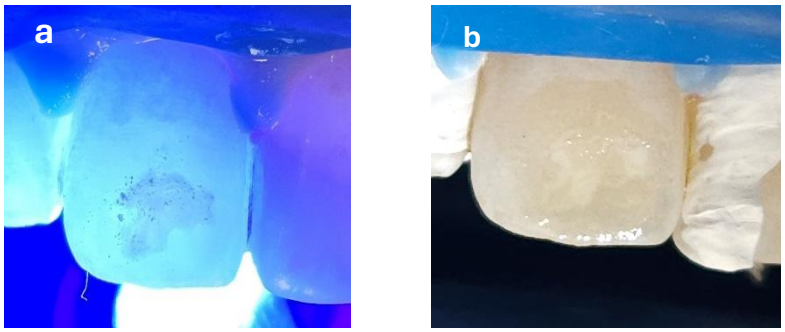

Fig7: Validation of access to the ceiling **(a)** transillumination control: Clear margin of the lesion. **(b)** alcoholic draft with 99 ethanol (Icon -dry) for 30 seconds.

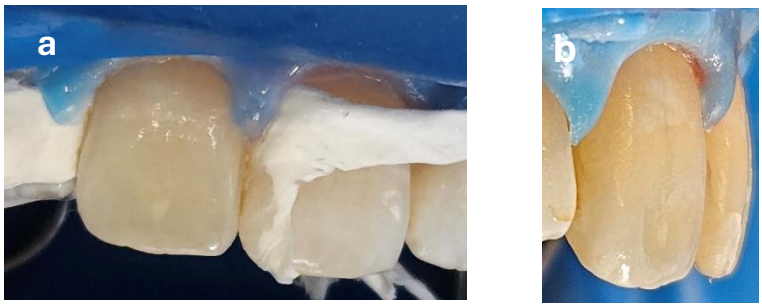

Fig8 Application of the resin infiltration (Icon Infiltrant). **(b)** Lateral view after infiltration confirm certain areas still showed missing enamel.

Fig9: Insertion of an opaque and translucent composite and finishing and polishing.

Fig10: Postoperative image of anterior maxillary teeth, revealing the result of the composite restoration.

Fig1: (**a)** Intraoral view showing white spots with distinct borders in tooth 41. (**b)** transillumination shows moderate depth lesion

Fig2: Application of Icon -etch and activating for 2 minutes

Fig3: Intraoral view showing that the lesion body is now exposed

Fig4: Application of icon dry

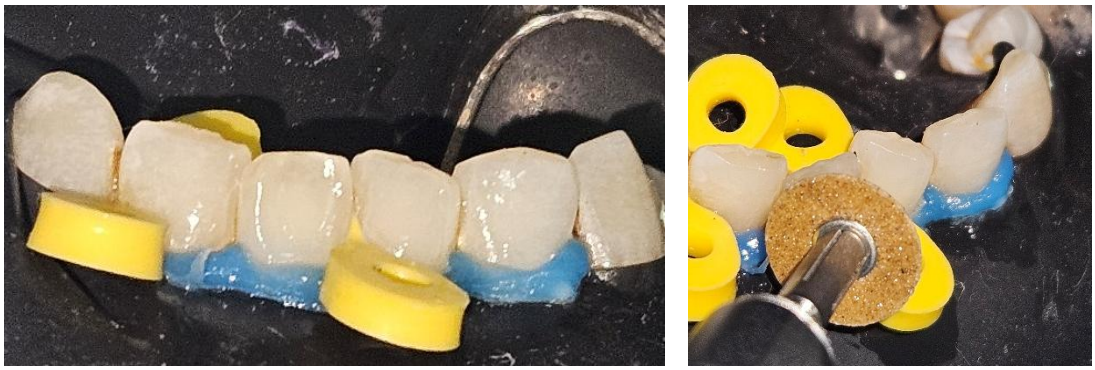

Fig5: Application of icon infiltrate and finishing and polishing

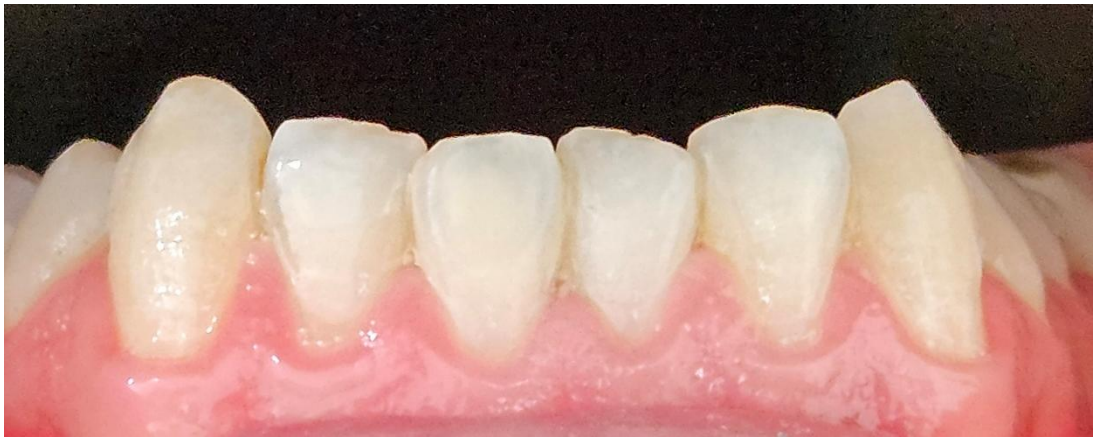

Fig6: Postoperative image of anterior maxillary teeth, revealing the result of the composite

Discussion:

Prevalence and diagnosis of MIH in Tunisia

Molar–incisor hypo mineralization (MIH) has been increasingly recognized as a global condition, with reported prevalence varying from 10% to over 25% depending on the studied population. In Tunisia, recent epidemiological surveys indicate a prevalence within this range, highlighting MIH as a significant public health concern in pediatric dentistry [3].

Clinically, MIH lesions are diagnosed based on their characteristic demarcated opacities, ranging from creamy-white to yellow–brown, and often affecting first permanent molars and incisors. The diagnostic challenge lies in differentiating MIH-related opacities from other developmental enamel defects or post-eruptive carious changes. Early and accurate diagnosis is essential to guide appropriate minimally invasive management strategies.

In our case, according to the intraoral clinical examination, there was no evidence of carious demineralization, no symmetrical involvement of other teeth, and the lesions were limited to

the first permanent molars. Based on these findings, a diagnosis of MIH was established by exclusion.

Rationale for using Icon and combined approaches
Resin infiltration with the *Icon® system* has been advocated as a conservative treatment option for white spot lesions, including those associated with MIH. Its mechanism relies on penetrating the hypo mineralized enamel with a low-viscosity resin, reducing porosity and masking the optical contrast with adjacent healthy enamel. However, in some cases—particularly when lesions are deeper or present with irregular surfaces—the infiltration alone may not achieve satisfactory aesthetic outcomes. The pathological features of MIH lesions pose a particular challenge, as the defect typically develops at the enamel–dentin junction rather than at the outer enamel surface. Owing to their sub-surface localization beneath a relatively preserved enamel layer, conventional erosion–infiltration techniques often fail to yield significant optical improvement. To overcome this limitation, Attal et al. proposed the strategy of *deep infiltration*, which entails a controlled micro-preparation of the enamel to facilitate resin penetration up to the coronal extent of the lesion [2].

In such scenarios, a combined approach can be considered. Micro-abrasion allows removal of superficial opacities, creating a smoother surface and facilitating resin penetration, while composite resin application can further enhance aesthetics in more extensive defects [4]. In our case, the use of Icon in combination with micro-abrasion and composite resin provided a predictable and satisfactory outcome, illustrating the value of tailoring the approach to the lesion's severity and morphology.

Practical tips for successful Icon application
Achieving optimal results with resin infiltration requires strict adherence to the clinical protocol and, in some cases, the use of adjunctive techniques.

The protocol followed in our patient is based on three steps: (1) Remove the superficial "ceiling" of the lesion, (2) Carry out the resin infiltration, and 3) Rebuild the missing enamel

Accurate access to the upper limit of the lesion requires a clear appreciation of its three-dimensional orientation. Transillumination represents a straightforward, painless, and non-invasive tool for visualizing white enamel defects in anterior teeth. The technique consists of projecting UV light from a curing lamp perpendicularly onto the palatal surface [5]. As the light passes through the dental tissues and emerges externally, two image parameters can be evaluated: opacity and definition [2]. Lesions with higher opacity are generally thicker and demand only minimal enamel removal, as illustrated by the defect of tooth 41. Conversely, lesions that appear less well-defined are usually located deeper, as observed at the peripheries of the spot in 11, and therefore required broader preparation. This preparation may be performed either by low-speed reduction using a yellow-ring bur or by micro-abrasion with 50-µm aluminum oxide, the method selected for our patient.

Following guided micro-preparation, surface erosion is achieved with 15% hydrochloric acid gel. Compared to 37% phosphoric acid, hydrochloric acid provides more than double the etching depth, thereby facilitating superior resin infiltration into the lesion [6].

After etching, Icon Dry (99% ethanol) was used to dehydrate the enamel and simulate the final outcome.This alcohol test, due to its high refractive index, helps predict the outcome after resin infiltration. The visual disappearance of enamel opacities indicated successful lesion access, as ethanol penetrated the porous enamel and temporarily matched the refractive index.[2]

However, if no change is observed or only in part of the lesion, it indicates that the lesion has not been sufficiently reached in depth, necessitating selective re-treatment focused on the remaining opaque areas. In our case, the additional use of ultrasonic instrumentation proved particularly beneficial to remove the superficial “ceiling” of the lesion, thereby facilitating deeper resin infiltration to achieve a satisfactory result.

Other key factors for success include maintaining a dry field with rubber dam isolation, ensuring sufficient application time for the infiltrant, and repeating the etching–infiltration cycle when needed

Resin infiltration is performed after ensuring proper lesion access and dehydration [7]. The infiltrant consists mainly of triethylene glycol dimethacrylate (TEGDMA), a low-viscosity monomer with a refractive index close to that of sound enamel, which improves light transmission and restores enamel translucency [2]. Beyond aesthetic improvement, resin infiltration increases enamel resistance and microhardness by creating a reinforced resin–enamel hybrid layer [8]. The technique involves two application phases: an initial three-minute infiltration followed by polymerization, and a shorter second application to compensate for polymerization shrinkage.

A thin layer of enamel-shaded composite was applied to fill the minor concavities created by the chemical and mechanical preparation of the lesions. Since the infiltrating resin functions as an adhesive, the composite was placed immediately after the second infiltration. Previous studies have demonstrated that infiltration resins provide reliable adhesive performance when bonded to composite materials.[2]

Such refinements of the standard protocol can significantly improve the depth of resin penetration and the masking effect, especially in MIH-related lesions where enamel is more resistant to infiltration.

Conclusion

Managing MIH-related opacities remains challenging in daily practice. The erosion–infiltration technique with Icon offers a conservative solution, and when combined with micro-abrasion or composite resin, it can achieve highly satisfactory aesthetic results. Simple clinical refinements, such as using ultrasonic tips to open the lesion surface, can greatly enhance resin penetration and improve treatment success

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