Resin infiltration for the aesthetic management of mild molar-incisor hypomineralisation: a clinical case report

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Introduction

Resin infiltration was originally introduced as a minimally invasive technique to arrest the progression of non-cavitated enamel lesions by creating a diffusion barrier within the porous enamel structure. Over time, its indication has expanded to include the aesthetic management of enamel defects, such as white and brown opacities associated with molar-incisor hypomineralisation (MIH)[1-3].

In anterior teeth affected by MIH, treatment planning can be challenging due to the variable depth and morphology of the hypomineralised enamel. The aesthetic outcome of resin infiltration is strongly influenced by the ability to adequately expose the lesion body by removing the hypermineralised surface layer. For this reason, an accurate clinical assessment of lesion depth and a stepwise, conservative approach are mandatory to achieve predictable results[1,4].

This case report describes the clinical management of mild MIH affecting the maxillary central incisors of a young patient, using a combination of transillumination-based diagnosis, controlled enamel erosion, microabrasion, and resin infiltration.

Case report

Diagnosis and treatment planning

A 10-year-old female patient presented with mild molar-incisor hypomineralisation (MIH) involving the permanent first molars and the maxillary central incisors. The patient's parents expressed a specific aesthetic concern regarding the visible enamel opacities on the upper incisors (Fig. 1).

Intraoral examination revealed demarcated hypomineralised areas on teeth 1.1 and 2.1, with an irregular distribution and heterogeneous opacity (Fig. 2). No cavitation or post-eruptive enamel breakdown was detected.

Transillumination was performed using a high-intensity LED curing light positioned on the palatal surface (VALO X lamp, Ultradent) (Fig. 3). The lesions showed poorly defined margins and overlapping opaque areas, suggesting deep and irregular hypomineralised zones covered by a relatively thick surface layer[5,6].

Based on the patient's age, the absence of structural breakdown, and the aesthetic request, a minimally invasive treatment plan was selected. The objective was to improve the optical integration of the affected enamel while preserving as much sound tissue as possible.

Fig. 1: Extraoral view of the lesions on the two maxillary incisors

Fig. 2: Intraoral view of the enamel defects

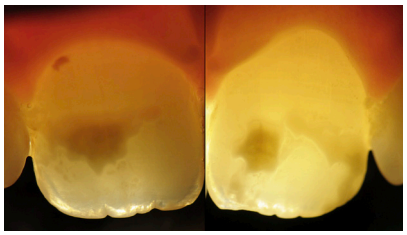

Fig. 3: Transillumination examination

Fig. 4: Isolation of the operative field using a rubber dam

Clinical protocol (step by step)

Isolation

The operative field was isolated using a rubber dam to ensure moisture control, improve visibility and provide a safe working environment during repeated erosive and infiltration steps (Fig. 4). The isolation also allowed a conservative and controlled approach while monitoring enamel changes at each stage.

Step 1 – Chemical erosion of the surface layer (HCl 15 %)

A 15 % hydrochloric acid gel (Icon Etch, DMG) was applied on the buccal surfaces of both maxillary central incisors for 2 minutes (Fig. 5). The gel was then thoroughly rinsed and the surface was evaluated.

Clinical rationale: MIH-related opacities often present a hypermineralised superficial layer that limits resin penetration. Controlled chemical erosion is used to remove this layer and expose the porous lesion body, improving the masking effect after infiltration[1,7].

Step 2 – Microabrasion (HCl-based) where needed

After the initial etching step, microabrasion was performed using a hydrochloric acid–based microabrasion paste (Opalustre, Ultradent; HCl 6.6 %) (Fig. 6). The paste was activated with a dedicated rubber cup (OpalCup, Ultradent) for 1 minute per tooth (Fig. 7).

A frontal view during microabrasion illustrates the clinical action of the paste and the controlled removal of superficial enamel (Fig. 8).

Clinical rationale: Combining controlled HCl etching with microabrasion helps to regularise the enamel surface and further reduce the thickness of the surface layer. This is particularly useful in irregular, deep, or layered lesions where a single erosive step is insufficient[8,9].

Clinical note: With both HCl-based approaches (Icon Etch and Opalustre), enamel removal remains limited and controllable – it allows removal of approximately 40–50 microns of enamel with each microabrasion cycle; however, multiple cycles may be required in deep lesions. The optimal number of etching or microabrasion cycles can be determined clinically using Icon Dry (as described in the next section) and/or trans-operatory transillumination, which allows assessment of lesion depth and enamel response and helps guide the decision to perform additional cycles or proceed to the resin infiltration step.

Fig. 5: Application of Icon Etch (HCl 15 %)

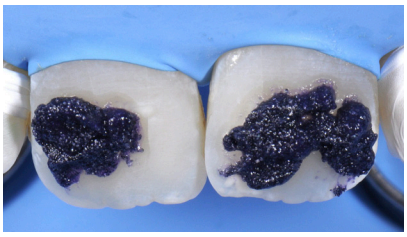

Fig. 6: Subsequent use of Opalustre (Ultradent) (HCl 6.6 %)

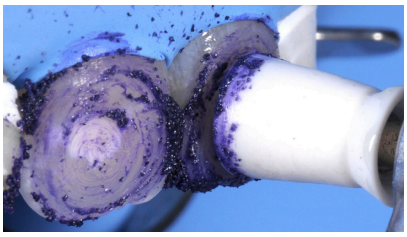

Fig. 7: Microabrasion with Opal Cup (Ultradent) + Opalustre

Fig. 8: Frontal view of the action of Opalustre

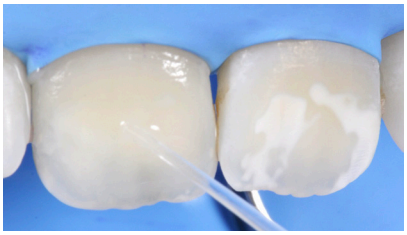

Fig. 9: Appearance of the lesion on tooth 1.1 after application of Icon Dry – the lesion disappeared

Step 3 – Reassessment and “ethanol test” (Icon Dry)

After completing three cycles of chemical erosion (Icon Etch) and three applications of microabrasion (Opalustre), the lesions were reassessed using ethanol (Icon Dry, DMG).

On tooth 1.1, the lesion disappeared after ethanol application, indicating that the porous lesion body had been sufficiently exposed and that resin infiltration was likely to provide an effective masking result (Fig. 9).

On tooth 2.1, the ethanol test did not lead to complete disappearance of the opacity, as the lesion remained partially visible, suggesting incomplete lesion exposure and/or greater lesion depth (Fig. 10).

Clinical rationale: Ethanol temporarily changes the refractive index of porous enamel and provides a practical, chairside predictor of the potential masking effect. If the lesion “disappears” after ethanol application, a comparable optical integration can generally be expected after infiltration[1].

Step 4 – Resin infiltration (tooth 1.1)

The infiltrant resin (Icon Infiltrant, DMG) was applied to tooth 1.1 and left in contact for 3 minutes (Fig. 11). The resin was allowed to penetrate the lesion by capillary action. The surface appearance after infiltration – before light curing and excess removal—is shown in Fig. 12.

The infiltrant was then light-cured according to manufacturer instructions, and before light curing, excess was removed.

Clinical rationale: Adequate infiltration time is essential, especially in MIH lesions where porosity distribution can be irregular. The goal is to allow the resin to penetrate the lesion body and achieve optical blending by modifying the refractive index mismatch between sound and hypomineralised enamel[1,10]. (In some cases it can be useful to increase the infiltration time from 3 to 15 min).

Step 5 – Minimal composite compensation (tooth 1.1)

In this case, the lesion depth required multiple superficial erosion and microabrasion cycles to enable complete infiltration. To avoid leaving a slightly altered superficial enamel texture due to the controlled tissue removal, a minimal amount of composite was applied as a compensatory layer.

A nanohybrid composite (Ecosite Element, DMG, shade A1) was placed directly over the infiltrated surface after light curing of the infiltrant (Fig. 13). No additional adhesive procedure was performed. The composite was then light-cured.

Fig. 10: Result on tooth 2.1, where after the application of Icon Dry the lesion is still partially visible

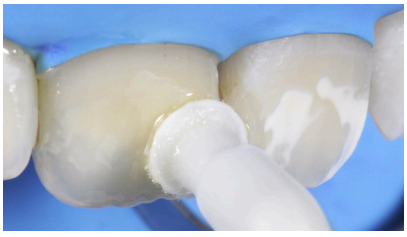

Fig. 11: Application of Icon Infiltrant

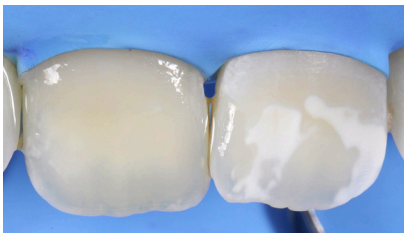

Fig. 12: Appearance of the lesion on tooth 1.1 after infiltration, prior to light curing and removal of excess material

Fig. 13: Application of a thin layer of composite is required to compensate for the minor loss of tissue. The composite used was Ecosite Elements Pure A1 (DMG)

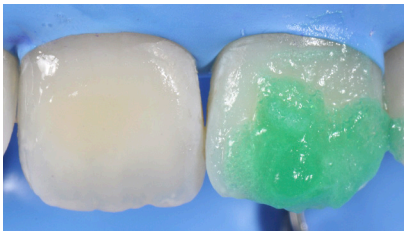

Fig. 14: Two additional applications of Icon Etch on tooth 2.1

Clinical rationale: When superficial enamel is intentionally reduced to expose the lesion, a very thin composite "compensation" layer can restore surface continuity and gloss potential, maintaining a natural appearance while remaining minimally invasive[10].

Step 6 – Transition to tooth 2.1: additional erosion and reassessment

At this stage, tooth 1.1 was completed (pre-polishing view, Fig. 14). Considering the incomplete masking during the ethanol test on tooth 2.1 (Fig. 10), an additional 2 minute etching cycle with Icon Etch was performed on 2.1 (Fig. 14).

After this additional surface-layer removal, the ethanol test (Icon Dry) produced a favourable result: the lesion was no longer visible, indicating that infiltration could be expected to successfully mask the defect (Fig. 15). The clinical appearance of tooth 2.1 before infiltration is shown in Fig. 16.

Step 7 – Resin infiltration (tooth 2.1)

Icon Infiltrant (DMG) was applied on tooth 2.1 for 3 minutes (Fig. 17) and then light-cured. As performed for tooth 1.1, a minimal composite layer (Ecosite Element, DMG, A1) was placed directly on the infiltrated surface after curing (Fig. 18), in order to optimise surface integrity and finishing potential.

Step 8 – Finishing protocol and oxygen-inhibition control

The final result before surface finishing is shown in Fig. 19. A final light-curing cycle was performed under a transparent glycerine gel for 60 seconds (Fig. 20) to prevent oxygen inhibition at the composite surface and support complete polymerisation.

Outcome and follow-up

After completion of the clinical protocol, the immediate aesthetic result was evaluated (Fig. 21). Both maxillary central incisors showed a significant improvement in optical integration, with effective masking of the hypomineralised areas and preservation of the original tooth anatomy.

At the 7-day follow-up appointment, final polishing was performed and the surfaces were reassessed under clinical lighting conditions (Fig. 22). The treated enamel surfaces appeared smooth, glossy, and well-integrated with the surrounding sound enamel.

A direct comparison between pre- and post-treatment images highlights the conservative nature of the approach and the effective masking of the MIH-related opacities, without signs of surface alteration or over-treatment – the original tooth anatomy is fully preserved and the treated surfaces are perfectly integrated (Fig. 23). The final extraoral view confirms a natural and harmonious smile appearance, fully addressing the initial aesthetic concern expressed by the patient's parents (Fig. 24).

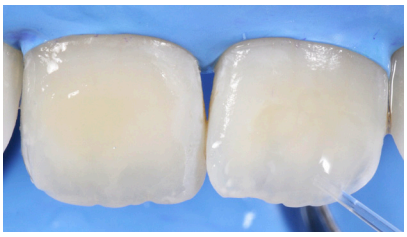

Fig. 15: Result achieved on tooth 2.1 after applying Icon Dry is satisfactory – the lesion is no longer visible

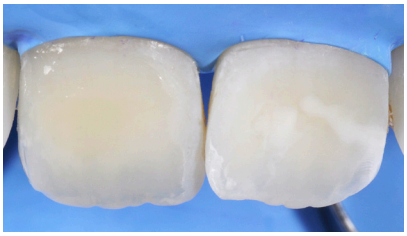

Fig. 16: Appearance of the lesion on tooth 2.1 before resin infiltration

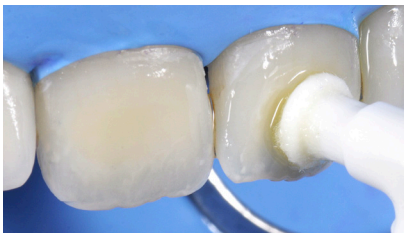

Fig. 17: Resin infiltration on tooth 2.1

Fig. 18: After polymerisation of Icon Infiltrant, composite (Ecosite Elements Pure A1, DMG) is applied on the surface of tooth 2.1, directly over the infiltrated surface

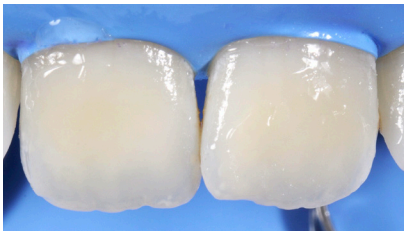

Fig. 19: Final result prior to surface finishing

Discussion

Managing anterior teeth affected by MIH requires a careful balance between aesthetic improvement and tissue preservation, especially in young patients. The main clinical challenge lies in the variable depth and irregular morphology of hypomineralised enamel, which can compromise the predictability of resin infiltration if the surface layer is not adequately removed.

In this case, transillumination proved to be a valuable diagnostic aid, allowing a preliminary assessment of lesion depth and guiding the clinical strategy. Lesions with diffuse and poorly defined margins under transillumination were interpreted as deeper defects covered by a thicker surface layer, requiring multiple controlled erosion and microabrasion cycles.

The use of ethanol (Icon Dry) as a visual predictor was a key decision-making step. The disappearance of the lesion after ethanol application provided a reliable indication that resin infiltration would be effective. Conversely, persistence of the opacity highlighted the need for further surface-layer removal before proceeding with infiltration.

In both incisors, a combination of chemical erosion (HCl 15 %), HCl-based microabrasion, and extended infiltration time allowed adequate penetration of the infiltrant. In areas where repeated surface treatment was necessary, the application of a minimal composite compensation layer helped restore surface continuity and optimise the final aesthetic result, without compromising the minimally invasive philosophy of the procedure.

This stepwise approach emphasises the importance of continuous clinical reassessment rather than relying on a fixed protocol. Adapting the number of erosion and infiltration cycles to the individual lesion characteristics is essential to achieve predictable outcomes in MIH-related enamel defects.

Conclusion

Resin infiltration, when combined with careful surface-layer management and guided by transillumination and ethanol testing, represents an effective and minimally invasive option for the aesthetic treatment of MIH affecting anterior teeth. A flexible, step-by-step clinical protocol allows the clinician to adapt the procedure to lesion depth and morphology, improving predictability while preserving sound enamel.

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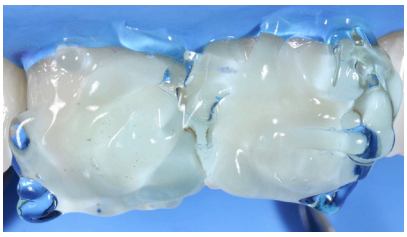

Fig. 20: Final light curing under transparent glycerine gel to prevent oxygen inhibition and ensure complete light-curing

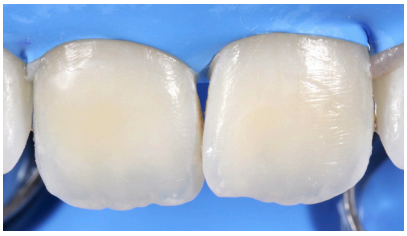

Fig. 21: Final result before removal of the rubber dam

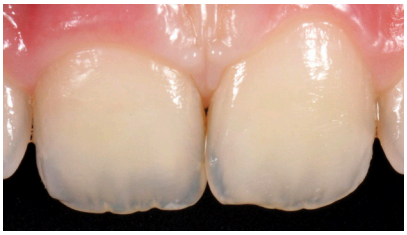

Fig. 22: Final result after polishing and 7-day follow-up

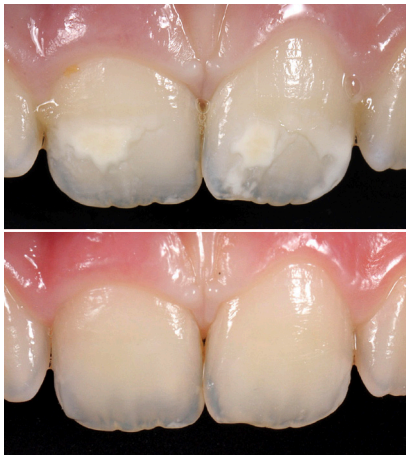

Fig. 23: Before-and-after comparison

Fig. 24: Final smile, extraoral image

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