

Resin infiltration: case series

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ABSTRACT

Background. Hypomineralization of the incisors and first molars (MIH) is distinguished by a systemic enamel maturation condition that influences minimum single permanent first molar and is frequently linked to incisor enamel deficiencies. The estimated incidence of MIH is 12.9% (11.7–14.3%). To our knowledge, no case series has been presented in the literature that discusses the resin infiltration technique for aesthetic management of MIH of enamel.

Aim. This case series discusses four cases where MIH has been effectively managed by the resin infiltration technique.

Case presentation. The diagnosis of MIH was made after careful evaluation of the defects during clinical follow-up, considering the patient's previous medical history, and making a diagnostic evaluation with other enamel abnormalities. The same dental professional applied resin infiltration (Icon, DMG America; Englewood, USA), and there were regular follow-ups after the procedure. After the resin infiltration procedure, the patients were asked about their comfort throughout the procedure, satisfaction with the results, and whether they would suggest this intervention to others.

Results. At follow-up, patients remarked that they felt at ease throughout the procedure, expressed satisfaction with the results, and said they would recommend this course of treatment to others.

Conclusion. High patient contentment with resin infiltration treatment was reported in all four cases, which successfully obscured MIH on teeth of the maxillary anterior region.

Keywords: resin infiltration, maxillary anterior teeth, white spot defects

INTRODUCTION

Hypomineralization of the incisors and first molars (MIH) is distinguished by a systemic enamel maturation condition that influences minimum single permanent first molar and is frequently linked to incisor enamel deficiencies. The estimated incidence of MIH is 12.9% (11.7–14.3%). The exact cause of this illness is unknown. Several theories have been proposed, including postnatal theories (breast-feeding, inadequate diet, childhood ailments, and drug use) and postnatal speculations (maternal infections or smoking during pregnancy). Perinatal speculations include preterm births, cesarean procedures, and delivery comorbidities. None of these variables can be regarded as causal [1-3].

MIH components exhibit macroscopic clinical variations. Histologically, they have enamel crystal malposition. They are mechanically less elastic and

more brittle. Increased levels of type I collagen substance, α 1-antitrypsin substance, and antithrombin III substance, which all prevent the development of mineral particles during enamel maturation, are characteristics of such enamel [4].

The histologic prism layer of teeth with enamel deficiencies is less defined than that of healthy teeth and lacks hydroxyapatite crystals. Hypomineralized enamel also has inferior mechanical qualities compared to normal enamel, including hardness and flexibility. The number of proteins – such as serum albumin protein, type I collagen protein, ameloblastin protein, α 1-antitrypsin protein, and antithrombin III protein – is also higher in the enamel afflicted by these conditions, which prevents the development of hydroxyapatite crystals and decreases the number of elements in the enamel [5,6]. Depending on the depth of the defect, therapeutic options vary from highly conservative (physiological reminerali-

zation) to more extensive (tooth preparations and restoration) operations.

Bleaching, microabrasion, and indirect restoration are examples of more extensive treatment techniques. For managing MIH, microabrasion represents a more extensive approach than bleaching and involves both mechanical and chemical manipulation of the tooth enamel. Resin infiltration is a non-traumatic treatment option that incorporates the utilization of a strong acid [7-10]. This is done to expose the enamel and dentinal tubules, allowing a low viscosity resin material to replace the water or air present in the pore spaces. This restores the targeted enamel's optical properties, making it appear healthy and improving the aesthetic appearance of the lesion. To our knowledge, no case series exists in the literature that discusses the resin infiltration technique for aesthetic management of white spot defects of enamel. Therefore, this case series is presented, discussing four cases where the MIH of enamel has been effectively managed by the resin infiltration technique.

CASE PRESENTATION

On arrival, the patients' most significant concern was white defects in the labial faces of their maxillary anterior teeth. They consented to attend the planned session to review their treatment options. Four were interested in the resin infiltration treatment to address their white defects.

Case Presentation 1

Preoperative assessment

The diagnosis of MIH was made after careful evaluation of the defects during clinical follow-up, considering the patient's previous medical history, and making a diagnostic evaluation with other enamel abnormalities.

The intensity of MIH is categorized using a variety of methods. The pathology is typically split into mild and severe categories. In mild situations, without clinically evident enamel disintegration, the teeth exhibit defined enamel hypoplastic areas and environmental cues rarely cause hypersensitivity. More severe examples have defined opacities, enamel disintegration, and abrupt hypersensitivity on the enamel (Table 1).

Neither fluorosis nor amelogenesis imperfecta was observed on any of the four participants' teeth of the maxillary anterior region.

The first patient in this case series was a 16-year-old male. He complained about the presence of white opaque areas in four teeth of the maxillary anterior region. These teeth were two central incisors and two lateral incisors. The MIH-THI grading was Grade 2a. The patient had no history of smoking and brushed and flossed his teeth at least once a

TABLE 1. MIH treatment need index (MIH-THI)

Grade	Description
Grade 0	No MIH
Grade 1	MIH without hypersensitivity without defect
Grade 2	MIH without hypersensitivity with defect
2a	<1/3 of the area involved
2b	>1/3 of the area involved
2c	>2/3 of the involved surface and/or defect close to the pulp or atypical extraction or restoration
Grade 3	MIH with hypersensitivity without defect
Grade 4	MIH with hypersensitivity with defect
4a	<1/3 of the area involved
4b	>1/3<2/3 of the surface involved
4c	>2/3 of the involved surface and/or defect close to the pulp or atypical extraction or restoration

day. Prior to the procedure, the patient was prompted to rate his level of discomfort or annoyance with the white spot defects. The rating scale ranged from one (very comfortable and unbothered) to five (highly uncomfortably and disturbed). He chose a rating of five, indicating that the white spot defects on his anterior teeth caused him great annoyance.

The procedure of resin infiltration

A dental professional applied resin infiltration (Icon, DMG America; Englewood, USA) as follows:

1. A rubber disc with plain pumice was used to scrub the facial regions of the problematic teeth, which were then flushed and aired for 30 seconds.
2. A rubber dam was used to segregate the teeth, and gel consisting of 15% hydrochloric acid (Icon Etch) was applied for 2 minutes, washed off with fresh water, and allowed to air dry over the following 30 seconds.
3. Ethanol (Icon Dry) was applied and allowed to dry for 30 seconds.
4. The white opaque discolored areas on the teeth of the maxillary anterior region were visually assessed to see if they had subsided considerably; if not, the preceding steps were repeated.
5. When the appropriate effect was obtained, resin infiltration was carried out over the affected teeth for 3 minutes; surplus resin was removed using a cotton roll.
6. The teeth were flossed and exposed to light for curing for 40 seconds, as directed by the manufacturer.
7. Steps 1–6 were repeated, this time applying the second coat of resin for only 1 minute.
8. Finally, a spiral cleaning wheel was used to polish the surfaces of the anterior teeth.

Figures 1–3 depict the first case's pre-treatment, process of resin infiltration, and post-treatment outcomes, respectively.



FIGURE 1. Case 1: Pre-treatment (above) and post-treatment with resin infiltration (below)

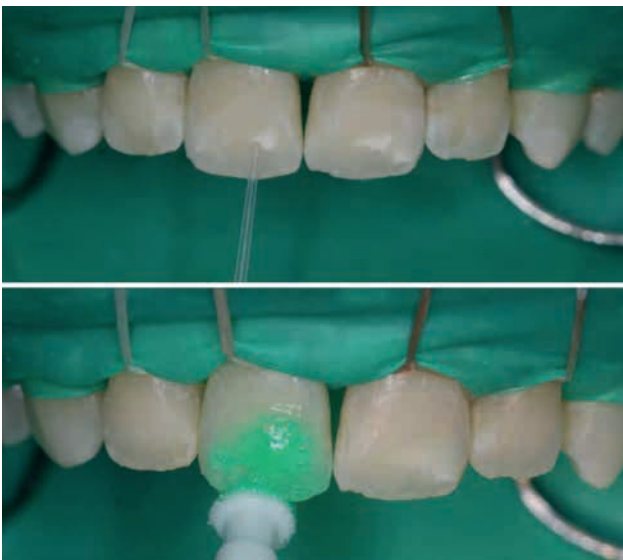


FIGURE 2. Case 1: Procedure of resin infiltration in maxillary anterior teeth to treat white spot lesions



FIGURE 3. Case presentation 1, post-treatment

Case Presentation 2

The second patient was a 23-year-old female. On clinical examination, white opaque areas were observed on the right side maxillary central incisor. The MIH-THI grading was Grade 2a. A thorough pre-operative assessment was conducted, after which resin infiltration was applied over the affected teeth by the same dental professional following the procedure described in Case 1.

Figures 4 and 5 depict the pre-treatment status and post-operative status, respectively.



FIGURE 4. Case Presentation 2, pre-treatment



FIGURE 5. Case Presentation 2, post-treatment

Case Presentation 3

The third patient – a 21-year-old female – also complained of white spot defects. On clinical examination, white opaque areas suggestive of MIH were observed on two teeth of the maxillary anterior region (11 and 21). These teeth were both central incisors.

The MIH-THI grading was Grade 2b. After a thorough preoperative assessment, resin infiltration was applied over the affected teeth, as described above.

Figures 6-8 show the pre-treatment, procedure, and post-treatment resin infiltration outcome, respectively.



FIGURE 6. Case presentation 3, pre-treatment



FIGURE 7. Resin infiltration on maxillary anterior teeth



FIGURE 8. Case presentation 3, post-treatment

Case Presentation 4

The fourth patient, a 19-year-old female, also complained of white spot defects. The clinical exam-

ination provided the same assessment as in Case 3, with white opaque areas suggestive of MIH observed on the two central incisors, with MIH-THI grading of Grade 2b. After preoperative assessment, resin infiltration was applied over the affected teeth, as in previous cases.

Figures 9 and 10 show the pre-treatment and post-treatment images, respectively.



FIGURE 9. Case Presentation 4, pre-treatment



FIGURE 10. Case presentation 4, post-treatment

FOLLOW-UP WITH PATIENTS

The patients were contacted by phone two weeks after treatment to inquire about their level of satisfaction with the treatment results and whether they were considering scheduling a second appointment. The patients expressed great satisfaction with the results and noted that the appearance of their teeth had improved since the beginning of the process. None of the patients believed they would require additional treatment to achieve the desired results.

Well after the treatment, the patients were also questioned about their comfort levels during the procedure, satisfaction with the results, and whether they would suggest this intervention to others. The patients reported feeling at ease throughout the procedure and were happy with the results. Additionally, they said they would suggest this course of treatment to others.

DISCUSSION

High patient satisfaction with the resin infiltration treatment was reported in all four cases, with the procedure successfully obscuring MIH on teeth of the maxillary anterior region.

Hypomineralization of the incisors and first permanent molars, often known as MIH, is a delineated qualitative developmental enamel abnormality with systemic etiology. Dental issues brought on by this syndrome include hypersensitive teeth, greater vulnerability to tooth decay, difficulty eating because of the fast loss of teeth, and aesthetic consequences [8-11]. It is crucial to recognize these lesions early and establish treatment plans to protect the dentition as much as possible because these conditions may negatively impact patients' standard of life from a young age. However, selecting the best strategy is difficult. Patient satisfaction, level of tooth development, and defect intensity are the key considerations. Other factors include patient and familial choices, other defects, and the stress of therapy on the patient [12-15].

Kim et al. assessed the clinical efficacy of resin infiltration in concealing white opaque lesions indicative of MIH [16]. They reported that immediately after the administration of the resin infiltration, while most lesions were entirely covered, some were just partially covered or remained unchanged. This was attributed to the possibility that resin infiltration's aesthetic effect is more potent in superficial, active defects than in deeper, dormant defects with thicker external protective layers. In our case studies, the resin infiltration treatment was given while the white lesions were active and superficial. At two, six, and 12 months following the therapy, the cosmetic effect of resin infiltration in treating MIH was observed to be stable.

Several clinical investigations have examined the advantages of utilizing remineralizing substances such as fluoride (in its many preparations), casein-based meringues, polycrystalline calcium phosphate (CPP-ACP), and hydroxyapatite. The physical makeup of the enamel in teeth with MIH, the symptoms (particularly hypersensitivity), and the aesthetics of the affected teeth can all be improved by increasing the mineral component [17-19]. According to several studies, biomimetic hydroxyapatite even induces mineral deposition, establishing a true covering on enamel and tooth surfaces. However, items containing fluoride may increase the risk of toxicity, including fluorosis in children and bone ailments in older adults, depending on how much is consumed. The highest limit of fluoride concentration for dental care preparations – including toothpaste – is suggested to be 1500 mg/kg. Additionally, children between the ages of 1 and 8 should consume no more fluoride than 0.1 mg/kg daily [20,24].

After carefully examining the flaws during clinical follow-up, considering the patient's prior medical history, and performing a diagnostic evaluation with other enamel abnormalities, MIH was identified. Various techniques are now used to categorize MIH intensity. Usually, the pathology is divided into categories for mild and severe cases. Enamel hypoplastic regions are visible on the teeth in moderate cases, but there is rarely clinically evident enamel breakdown, and environmental factors rarely result in hypersensitivity. Defined opacities, enamel disintegration, and sudden hypersensitivity on the enamel are manifestations of more severe cases [16,21-23].

First molar and incisor hypomineralization (MIH) is characterized by a systemic enamel maturation syndrome that affects at least one permanent first molar and is commonly associated with deficient incisor enamel. MIH is thought to occur in 12.9% (11.7–14.3%) of cases [20-22]. The precise cause of this condition is still a mystery. Several theories have been proposed, including postnatal hypotheses (breastfeeding, a poor diet, childhood illnesses, and drug use) as well as postnatal conjectures (maternal infections or smoking while pregnant). Preterm babies, cesarean sections, and delivery comorbidities are perinatal hypotheses. It is impossible to consider any of these factors to be causal [23-26].

Patient satisfaction with aesthetic improvements from resin infiltration therapy was assessed by Hughes and Roseberg [27]. Patients claimed that their smile was very important to them and that white opaque areas disturbed them before the procedure. Patients expressed satisfaction with the results attained immediately after the procedure, congruent with our four case descriptions [27]. Additionally, it has been noted that using both home bleaching and resin infiltrations to treat teeth with varying degrees of fluorosis increases patient self-esteem and satisfaction. Another controlled experimental investigation revealed that the duration of the resin infiltration approach for the management of fluorosis lesions was highly praised by patients. Because of its deep penetration, resin infiltration can be used as a treatment method for camouflaging MIH, as this case series demonstrates. We advise further research to examine resin infiltration's long-term effectiveness and relapse frequency as a conservative treatment for white spot defects for longer follow-up durations.

CONCLUSIONS

According to the most recent scientific research, MIH can have a substantial detrimental impact on individuals' lives. The most prevalent symptoms are hypersensitivity, predisposition to caries, and effects on oral aesthetics. In order to treat this con-

dition early and with a noninvasive technique, it is crucial to understand MIH and distinguish it from other enamel lesions. High patient satisfaction with resin infiltration treatment was reported in all four

Conflict of interest: none declared

Financial support: none declared

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