

In the Name of GOD



MICROABRASION MACROABRASION

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INTRODUCTION

- **Enamel microabrasion** is indicated for the removal of superficial stains and irregularities of the enamel, mainly located in esthetic areas.

The **technique** involves the mechanical rubbing of acidic and abrasive agents on the altered surface.

Recent studies show that the technique is conservative treatment when the enamel wear is minimal and clinically imperceptible, and is effective and long lasting.



These techniques are still being evaluated in order to ensure an **efficient treatment** with **minimal chair time** and **low cost** that is safe for professionals and Patients.



The **success of enamel microabrasion** is directly related to the **correct indication** of the clinical case and **the proper execution** of the technique.

EVOLUTION OF THE TECHNIQUE





In 1984, McCloskey reported the use of 18% hydrochloric acid swabbed on teeth for the removal of superficial luorosis stains.



Subsequently, in **1986, Croll and Cavanaugh** modified the technique to include the use of **pumice with hydrochloric acid** to form a paste applied with a tongue blade. his technique is called *microabrasion* and involves the surface dissolution of the enamel by acid along with the abrasiveness of the pumice to remove superficial stains or defects.



Croll further modified the technique, reducing the concentration of the acid to approximately 11% and increasing the abrasiveness of the paste using silicon carbide particles (in a water-soluble gel paste).

INDICATIONS FOR ENAMEL MICROABRASION

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Before treatment, the clinician should evaluate the **nature and extent** of the enamel defect or stain and differentiate between **nonhereditary developmental dysmineralization** (i.e., abnormal mineralization) **defects** (e.g., white or light brown fluorotic enamel and the idiopathic white or light brown spot) versus incipient caries lesions.



Incipient caries lesions usually are located near the **gingival margin**. these lesions have a **smooth surface** .

...appear opaque or chalky white when dried but are less visible when hydrated

- **Incipient caries** is **reversible** if treated immediately. Changing the oral environment through oral hygiene practices and dietary adjustments allows remineralization to occur.

If the caries lesion has progressed to have a **slightly roughened surface**, however, microabrasion coupled with a remineralization program is an initial option. If this approach is unsuccessful, it can be followed by a restoration. Cavitation of the enamel surface is an indication for restorative intervention

As the location of smooth-surface enamel caries **nears the cemento-enamel junction (CEJ)**, then enamel is too thin to permit microabrasion or macroabrasion as a treatment option.



A **developmental discolored spot** (opaque white or light brown) is the result of an unknown, local traumatic event during **amelogenesis** and is termed *idiopathic*. Its surface is intact, smooth, and hard. It usually is located in the **incisal (occlusal) half of enamel**, which contributes to the unsightly appearance. The patient (or the patient's parents in the case of a child) must be informed that an accurate **prognosis for microabrasion** cannot be given but that microabrasion will be applied first.

Summary of indications and advantages of the microabrasion technique

Indications	Requirements	Advantages
Stains or defects restricted only to enamel	Shallow alterations just in the enamel surface	Safe and conservative treatment
Dental fluorosis	Use of rubber dam	Minimal loss of enamel
Mineralized white stains	After completion of orthodontic treatment, if necessary	Leaves enamel surface lustrous, shiny and glass-like
Correction of surface irregularities	Supplemented with bleaching, if necessary	Roughness and microhardness alterations easily resolved by saliva
Localized enamel hypoplasia		Reduced bacterial colonization on enamel surface
Polishing of enamel and auxiliary removal of composite resin residues after orthodontic therapy		Lasting and stable esthetic results

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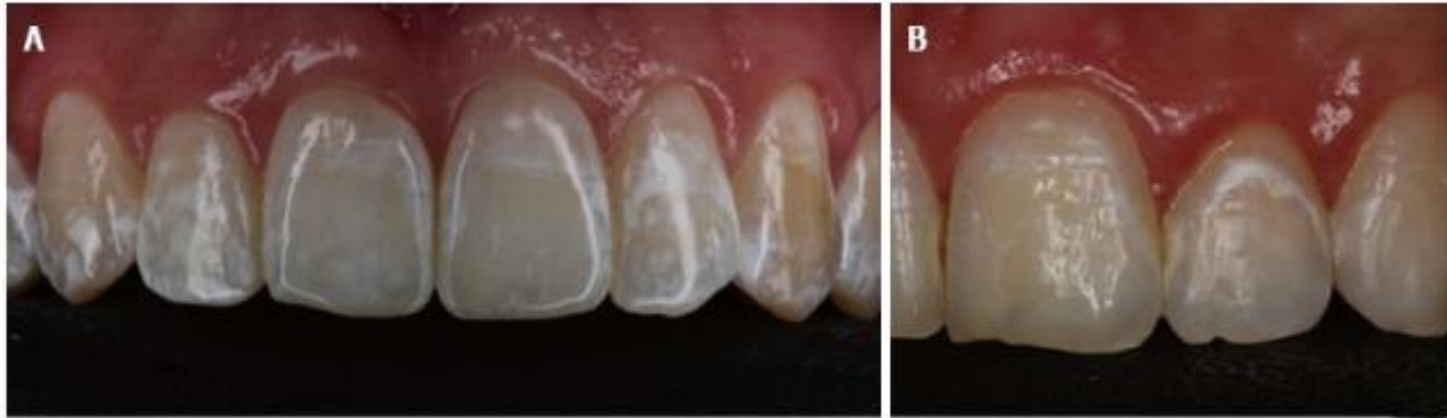


Figure 1

Indications for enamel microabrasion. Tooth staining from A: Fluorosis; B: Mineralized white spots.

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TECHNIQUE



An **ideal microabrasion technique** should produce insignificant enamel loss, no damage to pulp or periodontal tissues, and satisfactory and permanent results in a short clinical time without discomfort to the patient.



A **rubber dam** is placed to isolate the teeth to be treated and to protect the gingival tissues from the acid in the **Prema paste or compound** (Premier Dental Products). Protective **glasses** should be worn by the patient to shield the eyes from any spatter. The Prema paste is applied to the defective area of the tooth with a **special rubber cup** that has luted edges. The abrasive compound can be applied with either the side or the end of the rubber cup. A 10× gear reduction, **low-speed handpiece** (similar to that used for placing pins) is recommended for the application of the Prema compound to reduce the possibility of removing too much tooth structure and to prevent spatter. **Moderately firm pressure** is used in applying the compound.



A hand application device also is available for use with the **Prema compound**. **Periodically**, the paste is rinsed away to assess the extent of defect removal. the facial surface also is viewed with a **mirror from the incisal aspect** to determine how much tooth structure has been removed. Care must be taken not to remove too much tooth structure.



The **number of applications** can vary according to the **severity** of the enamel staining.

To reduce the clinical **time**, the enamel can first be “regularized” with a **tapered fine-diamond bur** to **lightly** abrade the affected area, referred to as enamel **macroreduction**. With this procedure, the application of microabrasive slurry can be reduced to two or three applications to remove the remaining stains and to smooth the enamel surface ground with the diamond bur.

Afterwards, **polishing** of the microabraded surface with **felt discs** and **polishing or fluoridated pastes** is recommended. Application of sodium fluoride gel is also recommended to promote the remineralization process



enamel **microabrasion combined with**
at-home tooth bleaching effectively reduced
staining in cases of mild to severe fluorosis,
improving the esthetic

Commercial products used for microabrasion

Material	Manufacturer	Acid	Abrasive	Particle size (mm)
Prema compound	Premier Dental Company (Philadelphia, PA, United States)	10% hydrochloric acid	Silicon carbide/dioxide	30-60
Opalustre	Ultradent Products (South Jordan, UT, United States)	6.6% hydrochloric acid	Silicon carbide	20-160
Pumice	Pumex (Newcastle-under-lyme, Staffordshire, United Kingdom)	-	Pumice	30-50

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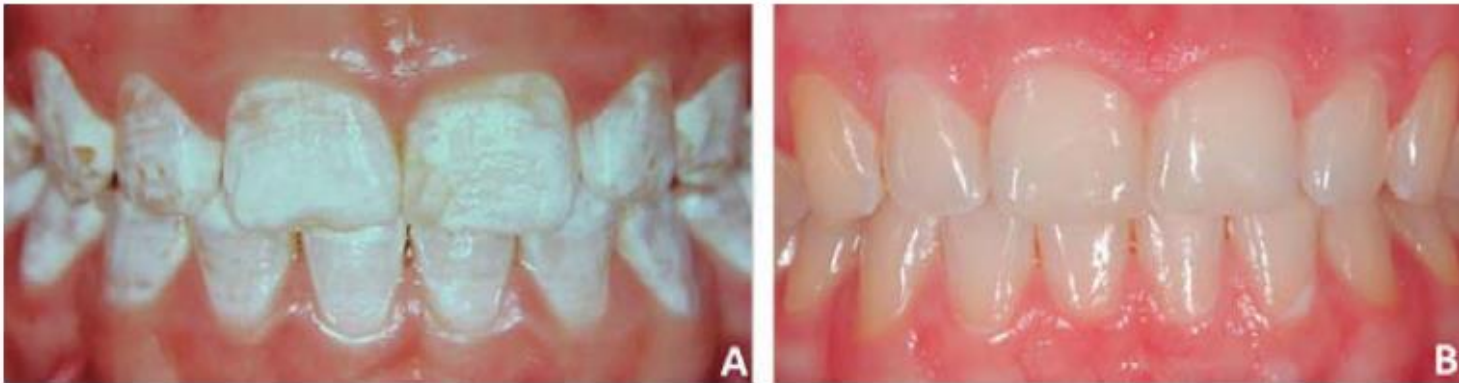


Figure 2 A: A 12-year-old girl had idiopathic white enamel demineralization of both the maxillary and mandibular teeth; B: The teeth are shown eleven years after the enamel microabrasion. The worn mesial and incisal surfaces of the maxillary central incisors were reconstructed with composite resin, shades A1 and A2

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Figure 3 A: A 9-year-old boy with white enamel demineralization staining of six incisors; B: Twenty years after removal of the white stains on the maxillary central incisors by application of 18% hydrochloric acid and pumice; and after removal of white stains located on the mandibular teeth by application of the PREMA compound. The right mandibular lateral incisor presented a deep white stain; it was restored with resin-based composite

CLINICAL AND SCIENTIFIC CONSIDERATION

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The **potential erosive and abrasive effects** depend on several parameters, including the **type, concentration and pH of the acid used, the abrasive medium, time of instrumentation, application mode, force applied, and revolutions per minute.**



the **pressure** used during the microabrasion procedure is crucial for total enamel removal, such that the **higher the pressure**, the greater the quantity of enamel removed.

In addition, enamel wear from the microabrasion technique is **time-dependent**

- The simultaneous abrasion and acid erosion of enamel prisms may **compact mineralized tissue** within the organic area, replacing the outer layer of prism-rich enamel with a **densely compacted, prism-free region**.

Microabrasion presents a **lustrous, shiny, and glass-like** surface of the enamel, which may reflect and refract light differently. These optical properties may be able to **camouflage any remaining subsurface enamel stains**.



Schimdlin *et al* found that the **luminescence and fluorescence** of enamel after microabrasion of demineralized lesions was decreased in comparison with the untreated demineralized enamel



Tooth hydration by **saliva** augments these favorable optical properties.



The microabrasion technique increases the **roughness** of the enamel surface, regardless of whether 18% or 35% phosphoric acid or 6.6% hydrochloric acid with abrasive was used.

Similarly, enamel microabrasion is also related to reduced enamel **Microhardness**.



Bertoldo *et al* recently reported that microabrasion with 6.6% hydrochloric acid and silica results in the **incorporation of chloride ions and silica into the enamel.**



The smoother, dense, mineralized enamel layer created by microabrasive systems is also less favorable for bacterial colonization, particularly by *Streptococcus mutans*.



Although the microabrasive system causes change in the enamel surface, which can be observed by scanning electron microscopy, confocal imaging demonstrates that the subsurface is not altered

CLINICAL SUCCESS

- Several case reports demonstrate the lasting and **stable esthetic results** of the microabrasion technique. According to clinical results, enamel microabrasion produced **permanent color modification** of superficial enamel coloration defects because the discolored enamel was removed, rather than altered or masked.

Microabraded enamel surfaces achieved a **brilliant luster** over time.

- Enamel microabrasion is considered effective in cases of white, yellow or brown stains located in the outer enamel layer.

it is important to recognize the severity of enamel stains when facing fluorosis. performed enamel microabrasion with Opalustre in mild-to-severe fluorosed teeth and found that more applications were needed when lesions were more severe.

Mild staining was treated with five applications, whereas moderate to severe staining needed ten applications



Enamel microabrasion should still be the **first option** for patients that seek **minimally invasive** treatment.

in cases with **severe fluorosis**. In such cases, removal of **opaque white areas** or brown stains may **increase the success of further treatment**, such as bleaching, to achieve a uniform tooth shade.



Figure 6

Resolution of fluorosis staining by microabrasion. A: Clinical case of fluorosis before treatment; B: Results after enamel microabrasion (reprinted with permission Machado et al[58]).

MACROABRAION



An alternative technique for the removal of **localized, superficial white spots** (not subject to conservative, remineralization therapy) and **other surface stains or defects** is called *macroabrasion*



Macroabrasion simply uses a **fine-grit finishing diamond** in a **high-speed handpiece** to remove the defect .

Care must be taken to use **light, Intermittent pressure** and to monitor the removal of tooth structure carefully to avoid irreversible damage to the tooth. **Air-water spray** is recommended, not only as a coolant but also to maintain the tooth in a hydrated state to facilitate the assessment of defect removal.



After removal of the defect or on termination of any further removal of tooth structure, a **30-luted finishing bur** is used to remove any facets or striations created by the previous instruments. Final polishing is accomplished with an **abrasive rubber point** .

CONCLUSION



Microabrasion has the advantage of ensuring better control of the removal of tooth structure.

High-speed instrumentation used in **macroabrasion** is technique sensitive and can have catastrophic results if the clinician fails to use extreme caution. Macroabrasion is considerably faster and does not require the use of a rubber dam or special instrumentation

- microabrasion is recommended for the treatment of superficial defects in **children** because of better operator control and superior patient acceptance.

To accelerate the process, a combination of macroabrasion and microabrasion also may be considered. Gross removal of the defect is accomplished with macroabrasion, followed by final treatment with microabrasion.



Macroabrasion. Outer surface of mandibular first molar is anesthetic because of superficial enamel defects., Removal of discoloration by recontouring and polishing procedures. Completed treatment.

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