

A minima treatment for superficial enamel defects

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ABSTRACT

Many defects can affect the smile of our patients. For superficial enamel defects that may involve one or several natural teeth, we have perfected, after trying many different methods of treatment, a simple, rapid, atraumatic and very effective technique.

This method has five successive stages: a chemical whitening at the chair, an ameloplasty, a microabrasion, a careful polishing, and a remineralization treatment.

This method is especially used for patients who present superficial enamel defects (chalky white veils, leucomas, brown spots, pitting, ...).

For deeper defects, it is sometimes necessary to complete this treatment with composite or ceramic restorations.

KEY WORDS

Whitening,

Microabrasion,

Ameloplasty.

1 – INTRODUCTION

Today, our patients have become more and more demanding in their requests for esthetic treatment: for the most part, they want to have white teeth, perfectly aligned, free of any defects in color, shape or position.

Besides problems of color, shape and position that we can treat very effectively, there are superficial enamel defects that require particular attention and that can, in most cases, be treated with minimally

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invasive techniques that inflict little or no harm on dental tissues.

Before any decision about therapy can be made, it is important to evaluate the surface defects that have to be treated: are they superficial or deep, colored or not, minor or extensive...?

Based on that evaluation¹, which must be completed with a clinical examination of the general condition of the mouth and with a precise diagnosis of the cause of the super-

ficial defects, we set up a 5-stage treatment plan:

- a chemical whitening at the chair,
- an enameloplasty,
- a microabrasion,
- a careful polishing,
- a remineralization treatment.

Depending on the type of defect that is being treated, each stage may vary in length and may, ultimately, need to be completed by composite or ceramic restorations.

2 – CHOOSING THE ACTIVE INGREDIENTS

2 – 1 – Bleaching with chemical agents

For a chemical whitening of the teeth procedure, we are always going to choose in office bleaching and therefore we will need some high-concentration hydrogen peroxide gel, an efficient light “Activation” and a sterile surgical site that protects all the perio-buccal soft tissues (lips, tongue, gingiva...)⁷.

Presently, we prefer the Zoom (Discus Dental) system, which uses 25% hydrogen peroxide activated by a high performance UV lamp. This procedure will require 3 to 4 fifteen-minute sessions.

As we will see later when we are presenting clinical cases, this first stage brightens the teeth, eliminates certain superficial stains, but its main purpose is to bring surface defects (veils, leucomas,...) into sharp focus.

In fact, the momentary dehydration of the enamel caused by the bleaching highlights chalky and white opaque

areas where demineralization has occurred.

After the whitening procedure is finished, we can then easily transition to the second stage of treatment, which consists in mechanically eliminating these defects either partially or totally.

2 – 2 – Enameloplasty

Once the surface defects are highlighted by the action of the hydrogen peroxide, we use fine grit diamond instruments (white, yellow or red burr) mounted on a turbine, or high-speed counter angle⁸.

Vertical motion counter angles such as the Profin (Dentatus) or the Intra-compact 2061 (Kavo) with diamond blades might also be employed.

2 – 3 – Microabrasion

For more than a century, many authors have proposed different types of treatment associated most often

with the use of the action of a strong acid combined with the mechanical action of an abrasive².

In 1991, after testing different acids and different abrasives, we developed a micro-abrasion kit Microclean (Cedia), composed of a mixture of hydrochloric acid and of micronized pumice. The results were excellent but the stabilization of hydrochloric acid proved to be particularly delicate and that is one of the reasons that made us stop marketing it.

Many years later, all the research efforts and clinical development helped us to test a new, more stable mixture that was just as effective: we now mix 35% phosphoric acid gel and micronized pumice until the consistency is firm.

2 – 4 – Polishing

The final polishing is a fundamental step, which requires an effective paste and all the especially adapted instruments (brushes, polishing cups, felt polishing bits...) and very meticulous technique.

It is essential to spend at least fifteen minutes each time this is performed. We often plan a second visit for polishing a week later.

2 – 5 – Remineralization

It is important to finish this treatment with a topical application of remineralizing gel with an ACP fluoride base¹⁰.

We prefer polyethylene trays filled with ACP gel (Relief, Toothmouth) that the patient will wear 30 minutes a day for one week.

3 BIOCOMPATIBILITY

3 – 1 – Whitening techniques

All the studies show that the above techniques are effective and, in most cases, these procedures have limited side effects¹¹.

We observed, depending on the products that were tested, a slight surface demineralization with some transitory sensitivity but no general toxic effect.

Although millions of whitening procedures have been performed worldwide, it is rather reassuring to know that there have been very few problems or serious accidents. However, we are still waiting for more precise

scientific and clinical studies on the acid concentrations, the activation techniques and the implementation modalities of clinical treatment.

3 – 2 – Enameloplasty

Few scientific studies, if any at all, have been proposed for enameloplasty.

Our clinical experience, during 10 years of practice, shows that even if surface enamel sometimes presents a certain number of defects (leucomas, stains, veils...) the deep enamel may appear very healthy⁷.

Depending on the type of teeth, the removal of .1 to .3 mm of enamel is completely harmless in terms of sensitivity or caries, and in fact, this procedure allows us to restore and improve the enamel surface.

3 – 3 – Microabrasion

A study that we published in 1991⁹ shows that the results of treatment of enamel, examined under a scanning electron microscope, depend on the concentration of the acid and the duration of the application when pressure and speed of reciprocating motion of the mechanical applicator are constant.

Microabrasion with controlled forces is always superficial. The surface enamel, transformed by this mechanical and chemical abrasive treatment, regains its natural appearance after a careful polishing.

After microabrasion and polishing, we have even noticed that, as a direct

consequence, the retention of bacterial plaque is reduced. Numerous journal articles by Croll³, Killian⁶... come to the same conclusion. Other experiments done in vitro show that surface enamel treated by microabrasion followed by fluoride treatment is less vulnerable to demineralization in an artificial mouth situation¹³.

Along with its esthetic benefits, all dental research shows that microabrasion can be used and adapted to preventive dentistry in order to improve the superficial enamel of the teeth.

We have also noticed that performing microabrasion followed by polishing gives the enamel surface a very shiny appearance and a special sparkle that the Americans call the abrasion effect⁴.

Thermal sensitivity after treatment is rare and generally disappears in a few days, especially if we prescribe desensitizing or remineralizing medication (fluoride, ACP)¹⁴.

4 – CLINICAL CASES

4 – 1 – Clinical case n° 1

Our first patient has two chalky white veils on central incisors 11 and 21 (Fig. 1).

A photo taken with scanning electron microscopy which appears in a study done by Haïkel⁹, shows normal superficial enamel: we see a certain roughness on the surface.

After placing a photopolymerizable dam to protect the surrounding tissues, we treat the teeth with a

controlled acid-pumice abrasion (Fig. 2).

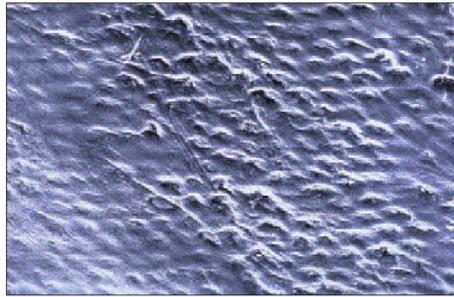
Another photo taken with scanning electron microscopy from the same study, shows the characteristic appearance of a corroded surface.

After a careful polishing (Fig. 3), the two treated teeth have regained a very natural look and an excellent surface luster.

The scanning electron microscopy allows us to see the significantly smoother surface of teeth treated

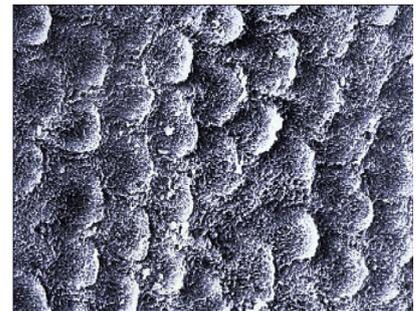


a



b

Figures 1a and 1b
Case n° 1. The two central incisors present leucomas in the form of veils.
A scanning electron microscopy photo shows the natural state of enamel.



Figures 2a to 2c

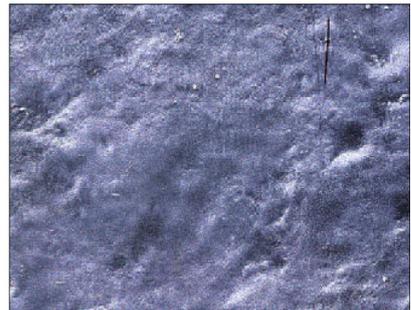
Case n° 1. A high speed reciprocating motion counter angle is used to perform microabrasion. A scanning electron microscopy photo shows the corroded appearance of enamel after a microabrasion.



a



b



c

Figures 3a to 3c

Case n° 1. After polishing, the leucomas have completely disappeared and the tooth has regained its natural brightness. A scanning electron microscopy photo shows the appearance of the enamel after treatment and repolishing. The surfaces seem much smoother.

with abrasion and polishing. Our intraoral examination confirmed this observation.

4 – 2 – Clinical case n° 2

This patient's smile presents extensive dyschromias (Fig. 4).

It becomes apparent, after asking some questions and performing an intraoral exam, that the patient is suffering from severe fluorosis with extensive leucomas, brown spots caused by infiltrated lesions, as well



Figure 4

Case n°. This patient presents severe fluorosis.



Figure 6

Case n° 2. Whitening treatment at the chair with a Zoom light.

as rather deep pitting on the lower 4 incisors (Fig. 5).

This type of severe fluorosis is often treated by installing composite or enamel laminate veneers.

Here we are going to apply the five stages that have just been described above.

The 1st phase is the chemical treatment at the chair using a Zoom light (Fig. 6) and 25% hydrogen peroxide.

After carefully protecting the soft tissues, we do 4 separate treatments lasting 15 min each time. The results of the whitening treatment (Fig. 7)



Figure 5

Case n° 2. We plainly see leucomas, brown spots and pitting on the incisors.



Figure 7

Case n° 2. Results after 4 fifteen-minute sessions with the Zoom light: the teeth are brighter and the brown spots have disappeared.



Figures 8a to 8d
Case n° 2. Enameloplasty.

show an improvement in the overall color and an attenuation of the brown spots; the chalky white appearance of the surface reveals all areas where demineralization has occurred.

Using fine grit diamond instruments, we are going to perform an enameloplasty (Fig. 8) in order to remove .1 to .3 mm of enamel as needed. This delicate phase requires meticulous attention and some practice; it is imperative to work without applying any pressure with the diamond instrument and generously flushing with the spray.

Any mishaps during this stage of treatment may lead to an excessive reduction in the enamel angle, the creation of a step or grooves...

When this phase has been successfully concluded, we see that most of the major defects have been eliminated (Fig. 9).

A microabrasion performed with a reciprocating motion counter angle and a rubber dental cup gives the tooth surface a very smooth appear-



Figures 9a and 9b

Case n° 2. The enameloplasty has almost completely eliminated the dyschromias and the dysplasias from the enamel surfaces.

ance and eliminates fine striations left by the diamond instrument (Fig. 10).

A careful polishing is essential for restoring the highly polished surface and natural brilliance of the tooth. A mineralization treatment is the final step in this clinical sequence. In this case, the patient wore tooth trays filled with Tooth Mousse GC (Fig. 11).

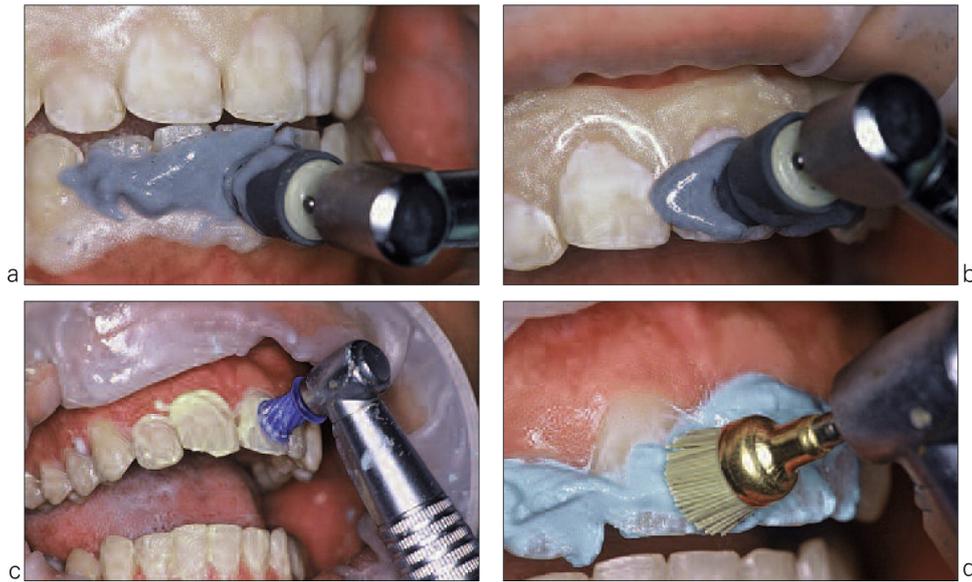
If we compare the before and after treatment photos (Fig. 12), the results are favorable, since the dyschromias have disappeared and the teeth are smoother and especially brighter.

4 – 3 – Clinical case n° 3

The surface enamel of this young female patient is very unhealthy and is highly discolored; some leucomas have transformed into caries on 12 and 45 (Fig. 13).

We will follow our usual protocol for treatment.

Chemical whitening (Fig. 14) was very successful, the teeth are brighter,



Figures 10a to 10d

Case n° 2. Film sequence of microabrasion followed by polishing of the treated teeth.



Figures 11a to 11c

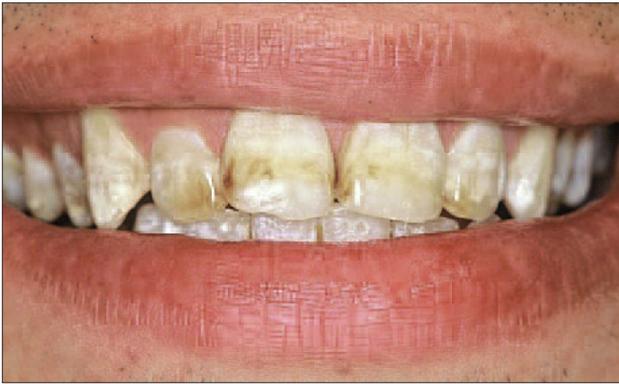
Case n° 2. Demineralization is performed with trays filled with Tooth Mousse; Relief could also be used.

but their chalky appearance highlights areas where demineralization has occurred (Fig. 15).

Two composite fillings were made before whitening to protect 12 and 45. After enameloplasty using very little

pressure, we perform microabrasion (Fig. 16) followed by a step-by-step thorough polishing (Fig. 17).

If we compare the before and after treatment photos (Fig. 18), it is interesting to note that after eliminating



a



b

Figures 12a and 12b

Case n° 2. By comparing the before and after photos, we see that the results are very favorable.



Figure 13

Case n° 3. This young female patient presents an unhealthy tooth surface with extensive surface leucomas.



Figure 14

Case n° 3. Zoom treatment.



Figure 15

Case n° 3. The chalky and opaque appearance of the dental surface after chemical whitening.



Figure 16

Case n° 3. After applying a plastic gel coating to protect the lips and gingiva, we perform microabrasion.



Figures 17a to 17d
Case n° 3. Sequence for polishing.



Figures 18a and 18b

Case n° 3. A before and after treatment comparison proves to us that these treatments are particularly effective.

some enamel, this patient has regained a perfectly healthy enamel surface that is greatly improved both visually and qualitatively.

The end result has surpassed our expectations (Fig. 19).

5 – CONCLUSION

These atraumatic treatments, when the indication is clearly justified and when clinical procedures are strictly

followed, provide immediate and outstanding results.

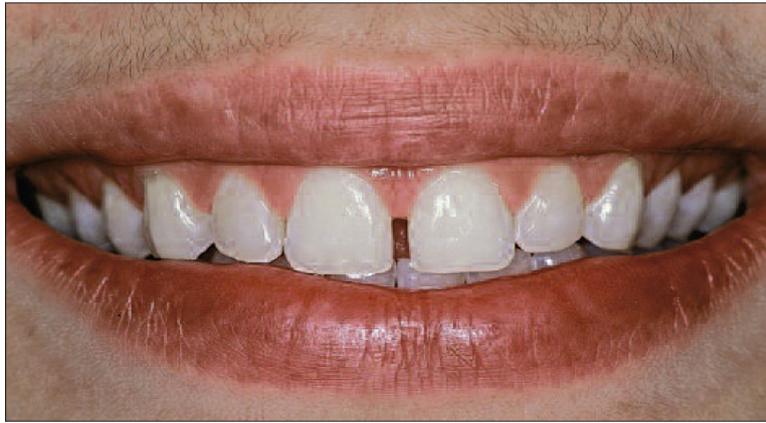
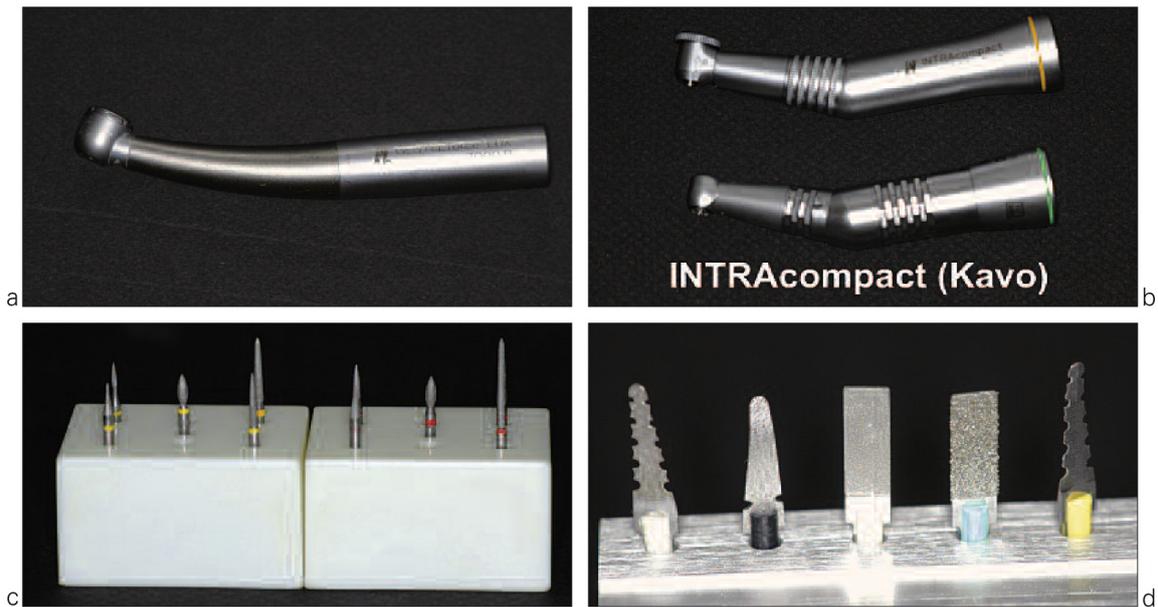


Figure 19

Case n° 3. The smile of the patient has been totally transformed.



Figures 20a to 20d
Necessary equipment for enameloplasty.



Figures 21a to 21d
Necessary equipment for microabrasion.



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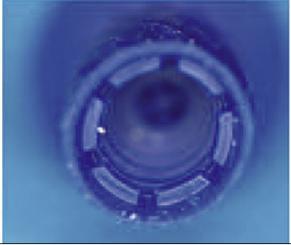




Figure 22
Necessary equipment for polishing.



Figure 23
Necessary equipment for remineralization.

In the long term, the results that we have obtained after 10 years of practice confirm that the surface improvement is sustainable, the eliminated defects certainly do not reappear, and only the color changes slightly.

As with any whitening treatment, it is necessary to see the dentist on a regular basis to maintain the results.

To perform the five procedures, a dentist must have simple but perfectly adapted equipment:

- **for the whitening treatment**
the Zoom (Discus Dental) system gives us great results;
- **for the enameloplasty** (Fig. 20)
the choice of diamond instruments based on their shape and especially

their capacity for determining granulometry is essential;

- **for the microabrasion** (Fig. 21)
our preference is to confect a mixture of 35% phosphoric acid with pumice. Prophy Duratec (Kavo®) comes with rubber dental cups and seems perfectly adapted to perform this procedure.

- **for the polishing** (Fig. 22)
Cleanic paste (Kerr®) and the Pro-cup (Kerr®) dental cup help the dentist restore the superficial enamel;

- **for the remineralization** (fig. 23)
presently, we choose products with an ACP base, either Relief (Discus Dental®) or Tooth Mousse (GC®).

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