Augusto **ROBLES**, *DMD, MS*

arobles@uab.edu

drroblesdmdms

THE DAWSON ACADEMY

Making Good Dentists Even Better

AUGUSTO ROBLES, DMD, MS

contemporary management of

Anterior Discolorations

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Disclaimer

- *I am part of the international consultant board for* ***DMG mbH***
- *I have been invited to the* ***Ultradent*** *KOL meeting*
- *I have received consulting fees from* ***3M ESPE****, and* ***DMG mbH***

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Disclaimer

- *I do not have any financial interest in any of the companies or products mentioned in my presentation*
- *What I mention is what I use either in research or in my practice*

AUGUSTO ROBLES, DMD, MS

*Augusto **ROBLES**, DMD, MS*

Associate Professor and Director of the Operative Dentistry curriculum at UAB School of Dentistry since 2011

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AUGUSTO BLUES, DMD, MS

Dentinaltube

Outline

- *Intro: Caries*
- *What are these discolorations?*
- *Review of treatment options*
- *Diagnostic methods*
- *Review of cases*

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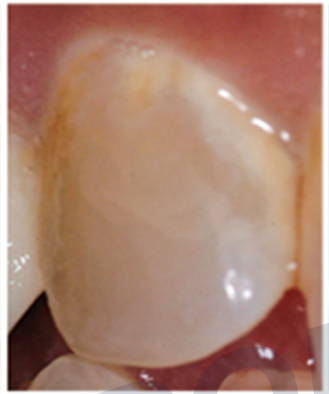
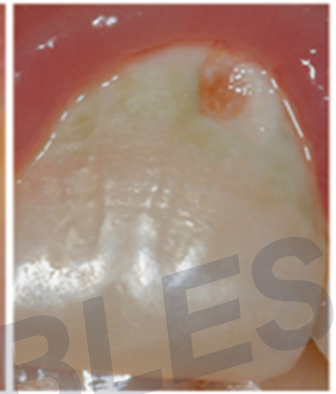
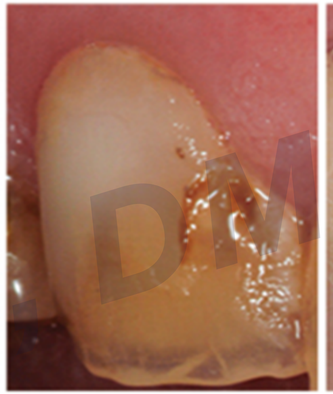
Sound	Early Lesions		Moderate Lesions			Extensive
						
Sound tooth surface; no caries change after air drying (5 secs); no hypoplasia, wear, erosion, or other noncaries phenomena	First visual change in enamel, seen only after air drying, or color change "thin" and limited to confines of pit-and-fissure areas	Distinct visual change in enamel, seen when wet, white, or colored, "wider" than the fissure/ fossa	Localized enamel breakdown, with no visible dentin or underlying shadow, discontinuity of surface enamel, widening of fissure	Underlying dark shadow from dentin with or without localized enamel breakdown	Distinct cavity with visible dentin; frank cavitation involving less than half of tooth surface	Extensive distinct cavity with dentin; cavity is deep and wide, involving more than half of the tooth

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Surface Enamel v. Sub-surface Enamel:

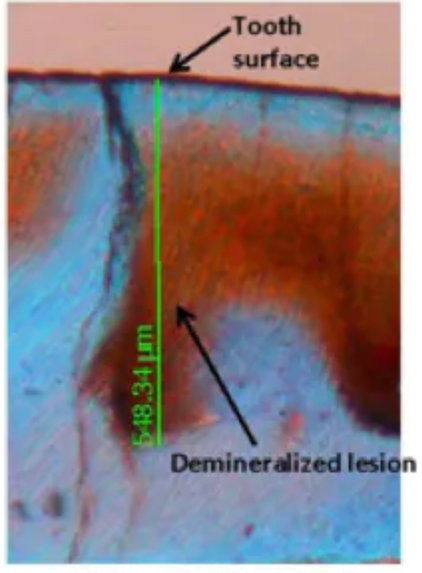
Harder

Less soluble

Aprismatic (highly mineralized)

Richer in fluoride

Buccal Surface of Maxillary Molar



PLM image of White Spot

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Discolorations

AUGUSTO ROBLES D.M.D., M.S


What is what?

Enamel can be affected before AND after eruption

PRE -eruptive

POST -eruptive

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Most anterior discolorations fall under one of the following diagnosis:

- Caries (WSL)
- Dysmineralizations
- Trauma
- Molar-Incisor-Hypomineralization (MIH)

BUT can also be a combination!!!

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Caries (WSL)

POST-eruptive
Areas where plaque accumulates
High incidence w/ fixed ortho
Pre-cavitated lesion

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Dysmineralization

PRE-eruptive
Term coined by Dr T Croll
NOT everything is fluorosis
Exposure to elements can disrupt enamel rod formation

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- **Trauma**

PRE-eruptive
Usually SINGLE tooth
Appears as depression on facial

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MIH

PRE-eruptive
Molar ALWAYS involved
Incisor may or may not
Extreme sensitivity
Poor hygiene and caries

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Why are some spots yellow/brown?
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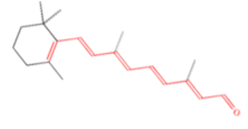
Surface irregularities and structural defects allow <u>post-eruptive</u> infiltration of extrinsic **<u>chromophores</u>** (proteins that stain)



15-21x higher protein content

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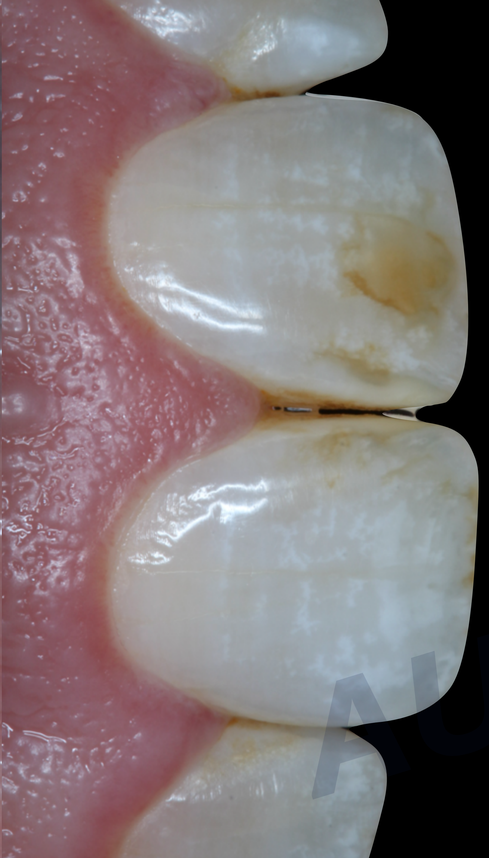


Microabrasion

AUGUSTO ROJAS D MD, MS

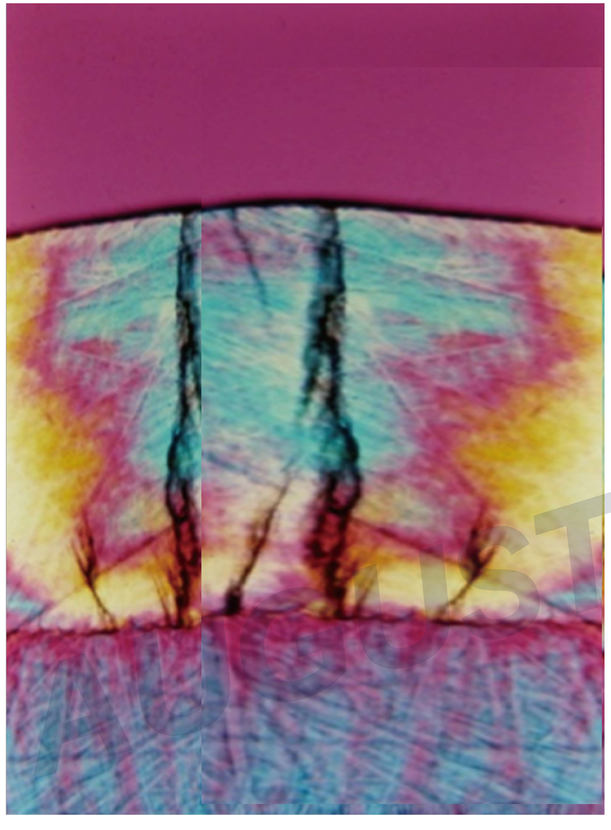
How does it work?

Combination of ‘EROSION’ and ‘ABRASION’
= “ABROSION”
HCl softens enamel and slurry with abrasive particles
removes a thin layer of enamel

AUGUSTO ROBLES, DMD, MS

Robles A. Lawson NC. Enamel Microabrasion: case selection and clinical guidelines. Journal of Cosmetic Dentistry 2018
Pini NI, et al. Enamel microabrasion: An overview of clinical and scientific considerations. World J Clin Cases. 2015

Pini NI, et al. Enamel microabrasion: An overview of clinical and scientific considerations. World J Clin Cases. 2015



60 seconds of moderate pressure of microabrasion removes 25 µm of enamel, whereas 10 minutes of microabrasion removed 200 µm

ARISTO ROBLES, DMD, MS

Robles A. Lawson NC. Enamel Microabrasion: case selection and clinical guidelines. Journal of Cosmetic Dentistry 2018

Technique

Isolation: prevent splatter of acid (ideally rubber dam)
Apply slurry and press bristle rubber cup (moderate to firm) over all facial surface
Slow speed handpiece at 500 RPMs

AUGUSTO ROBLES, DMD, MS

Robles A. Lawson NC. Enamel Microabrasion: case selection and clinical guidelines. Journal of Cosmetic Dentistry 2018

Technique

60 second intervals up to 5 times
When procedure completed, rinse thoroughly
Finishing rubber cup for surface polishing
Apply Fluoride varnish

AUGUSTO ROBLES, DMD, MS

Bhandari R, et al. In vivo comparative evaluation of esthetics after microabrasion and microabrasion followed by casein phosphopeptide–amorphous calcium fluoride phosphate on molar incisor hypomineralization-affected incisors. Contemp Clin Dent 2019

Technique

Microabrasion could be followed by a remineralizing agent such as CPP-ACFP (MI Paste Plus) for 6 months for more esthetic results

Biggest problem: **compliance**

AUGUSTO ROBLES, DMD, MS

Vital Whitening

AUGUSTO ROBLES D.M.D., M.S.

How does it work?

The color-producing materials … are typically organic compounds in **dentin** with extended conjugated chains of alternating single or double bonds … and are often referred to as ‘chromophore’ (intrinsic)

AUGUSTO ROBLES, DMD, MS

Babot Marquillas C, et al. Breaking the rules: tooth whitening by means of a reducing agent. ClinOralInvest 2020
PJoiner A, The bleaching of teeth: A review of the literature J Dent 34(2006)412–19
Petrucci RH, General Chemistry: Principles and Modern Applications, 8th Edition, Prentice Hall

What about those over the counter strips?

AUGUSTO ROBLES, DMD, MS

Naidu AS, et al. Over-the-Counter Tooth Whitening Agents: A Review of Literature. Braz Dent Jl (2020)

Conclusion: Whitening strips are effective compared to a placebo or other OTC tooth whitening agents, however, their effectiveness compared to tray-based gels with CP is debatable and dependent on the carbamide peroxide percentage and the application timespan

Brazilian Dental Journal (2020) 31(3): 213-225
http://doi.org/10.1590/0103-6440202003317

ISSN 0103-6440

Over-the-Counter Tooth Whitening Agents: A Review of Literature

Arti. S. Naidu, Vincent Beeman, John M. Aars, Paul Brunton

Department of Oral Rehabilitation, School of Dentistry and Oral Health, Fiji National University, Fiji. Department of Oral Rehabilitation, Faculty of Dentistry, University of Otago, Dunedin, New Zealand. Division of Health Sciences, University of Otago, Dunedin, New Zealand.

Correspondence: Dr Vincent Beeman, PO Box 6157, Wild Dunedin, New Zealand. Tel: +64-3-479 7000; e-mail: vincent.beeman@southerncrosspa.ac.nz

There is an increased accessibility of over-the-counter (OTC) whitening agents with very little data in the literature regarding their effectiveness. This review was done to determine their effectiveness of the predominant OTC whitening agents from 2006 until 2018 where a comparison of each agent was made with a placebo, no treatment or with other OTC whitening agents. The major categories of OTC whitening agents such as dentifrices, whitening strips and paint on gels. Detailed prescribed bleaching agents such as home and in-office bleaching studies and studies that demonstrated whitening products to participants were excluded. Articles were searched for in the databases of Medline (Ovid), PubMed, the Cochrane Library and Cochrane Central Register of Controlled Trials. Twenty-four articles were included in the systematic review and the quality of studies was determined by the GRADE (Grading of Recommendations, Assessment, Development and Evaluations) by ranking criteria. Compared to other OTC strips are reported to be effective. Two studies determined whitening strips to be effective. Whitening strips have been shown to be effective when compared with placebo and other OTC whitening agents. Dentifrices are effective in changing the shade of the tooth by removing extrinsic stains" when compared to a placebo and non-whitening dentifrices, but they are not as effective in comparison to whitening strips. There is a lack of evidence with regards to the effectiveness of paint-on gels. While there is some evidence that OTC can alter shade in the short term, there is a need for better-designed studies.

Key Words: teeth bleaching, teeth whitening, over-the-counter.

Introduction

In the developed world patients are placing a stronger interest on the aesthetic appearance of their teeth. This paradigm shift coupled with increased accessibility to over-the-counter (OTC) has resulted in an explosion of products marketed directly to the public that claim to address tooth discoloration. Tooth whitening agents aim to remove stains and discolorations. The success of tooth whitening depends on the type of stain present which can be categorized as extrinsic staining, intrinsic staining and internalized discoloration (1). So called "tooth whitening" is a term widely used to describe a change in tooth shade in OTC products marketed to the public. However, the term "tooth whitening" really only describes the end result, while "bleaching" is actually the action that changes the shade of the tooth internally and externally. As OTC products are commonly referred to as "tooth whitening" this term is generically used to describe a change in the tooth shade and the term "tooth whitening agents" refers to the whitening product.

These OTC tooth whitening techniques and materials can easily be applied at-home by the patient. The main difference between at-home teeth whitening and that which are provided / done at the dental practice (in-office) is that an OTC whitening agent and applying it independently. Another defining difference between OTC whitening and in-office is that the patient makes their own diagnosis and decides on which tooth whitening agent/s to use without any diagnosis of the discoloration (2). In numerous countries another factor is the concentration of hydrogen peroxide or carbamide peroxide (3). The percentage of bleaching agent dictates whether it can be sold direct to the public or not. The amount of hydrogen peroxide or carbamide peroxide available to the public varies depending on the country and the respective regulating authority. Therefore, dentists prescribed tray-based bleaching applied at-home and in-office bleaching studies and studies that demonstrated whitening products to participants were excluded from this review.

There are numerous tooth whitening products available, such as, dentifrices, mouth rinses, strips, whitening dental floss, toothbrushes, and paint-on gels or film activated charcoal, oil pulling, etc. However, this review focuses on four major categories of OTC whitening agents, whitening dentifrices, whitening strips, whitening mouth rinses and paint of gels / varnishes. Whitening dentifrice is the most common type of OTC tooth whitening agent found, which contains abrasives for stain removal in conjunction with low amounts of hydrogen peroxide and carbamide peroxide (3). Whitening strips were developed mainly to avoid using customized trays and to allow direct utilization from the public. They typically contain hydrogen peroxide ranging from 5-14%, which is applied to teeth, and the active ingredients are released

AUGUSTO POPLES, DMD, MS

Babot Marquillas C, et al. Breaking the rules: tooth whitening by means of a reducing agent. ClinOralInvest 2020

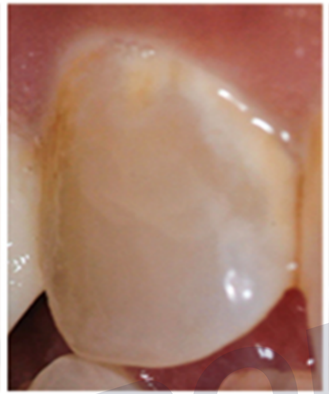
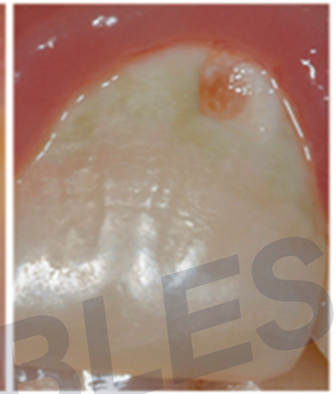
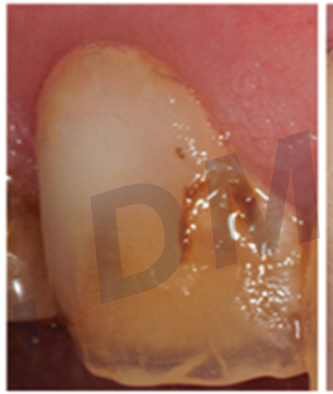
According sodium metabisulfite (MBS) is a well-known food additive, and some research listed it as a tooth-bleaching agent, even as an ingredient for caries prevention potentially can saturate double bonds breaking the aromaticity of the staining molecules, making them colorless
this study is a proof of concept and treatment optimization is necessary, results may lead to development of novel formulas in tooth whitening

MBS treatment reached the same ΔE values than CP but in a shorter time

AUGUSTO POBLES, DMD, MS

Resin Infiltration

AUGUSTO ROBLES D.M.D., M.S.

Sound	Early Lesions		Moderate Lesions			Extensive
						
Sound tooth surface; no caries change after air drying (5 secs); no hypoplasia, wear, erosion, or other noncaries phenomena	First visual change in enamel, seen only after air drying, or color change "thin" and limited to confines of pit-and-fissure areas	Distinct visual change in enamel, seen when wet, white, or colored, "wider" than the fissure/ fossa	Localized enamel breakdown, with no visible dentin or underlying shadow, discontinuity of surface enamel, widening of fissure	Underlying dark shadow from dentin with or without localized enamel breakdown	Distinct cavity with visible dentin; frank cavitation involving less than half of tooth surface	Extensive distinct cavity with dentin; cavity is deep and wide, involving more than half of the tooth

AUGUSTO ROBLES, DMD, MS

H Meyer-Lueckel

S Paris

In 2009, after years of research, a commercial product was finally launched: **ICON** Interproximal (**DMG**mbH)

AUGUSTO ROBLES, DMD, MS

UNPREDICTABLE

AUGUSTO ROBLES DMD, MS

DOI: 10.1111/j.1365-263X.2011.01126.x

The evaluation of resin infiltration for masking labial enamel white spot lesions

SHIN KIM[1], EUN-YOUNG KIM[1], TAE-SUNG JEONG[1] & JUNG-WOOK KIM[2]

[1]Department of Pediatric Dentistry, School of Dentistry, Pusan National University, Yangsan, Korea, and [2]Department of Pediatric Dentistry, School of Dentistry, Seoul National University, Seoul, Korea

International Journal of Paediatric Dentistry 2011; 21: 241–248

Objective. The aim of this study was to clinically assess the effectiveness of masking white spot enamel lesions using a resin infiltration technique that was recently developed to arrest incipient caries in a micro-invasive concept.

Methods. Twenty teeth with a Developmental Defect of Enamel (DDE) and 18 teeth with Post-orthodontic Decalcification (POD) were selected and treated with resin infiltration. Standardized photographs were taken before, immediately after, and 1 week after treatment and were analysed using image analysing software to calculate the ΔE values. The results were classified into three groups: completely masked, partially masked, and unchanged.

Results. Among the 20 teeth with DDE, five teeth (25%) were classified as completely masked, whereas seven (35%) and eight teeth (40%) were partially masked and unchanged, respectively. Among the 18 teeth with POD, 11 teeth (61%) were completely masked, six teeth (33%) were partially masked, and one tooth (6%) was unchanged. In some teeth, the result was more improved after 1 week than immediately after infiltration.

Conclusion. The masking effect was dramatic in some cases but not in others. The long-term colour stability of the result should be followed up through continuous clinical and scientific studies.

Introduction

It is not difficult to observe white spot lesions because of dental caries, Developmental Defect of Enamel (DDE), or post-orthodontic decalcification (POD) in the dental clinics of children and adolescents. The prevalence of molar incisor hypomineralization (MIH) to describe a more specific pattern of DDE ranges from 3.6 to 25%[1] and that of POD varies from 2 to 96% depending on the methods used to assess and score the extent of decalcification, the presence of decalcification before treatment, and the use of fluoride supplements during treatment[2].

These lesions may present aesthetic problems as well as the progression of demineralization[3]. Although white spot lesions after orthodontic treatment with fixed appliances might be remineralized partially after debonding, white enamel lesions are often irreversible[4–6]. These lesions may present aesthetic problems even more than 5 years after treatment[7].

Up to now, there are four methods available for treating white spot lesions. First, several studies have shown that white spot lesions may regress as a result of the remineralization by fluorides or casein phosphopeptide–amorphous calcium phosphate (CPP–ACP)[8,9]. Remineralization techniques are to some degree effective, but their aesthetic effect is limited because remineralization often is limited to the lesion surface[9,10]. Moreover, it takes considerable time and needs to be implemented at the very early stages of the lesion development. Furthermore, it strongly relies on the patient's compliance[10]. Second, the bleaching therapy with hydrogen peroxide for masking white fluorosis blemishes has been reported[11,12], but its aesthetic effect is also limited, and side effects such as post-treatment sensitivity are commonly encountered. The microhardness of

Correspondence to:
Dr S. Kim, Department of Pediatric Dentistry, School of Dentistry, Pusan National University, Beomeo-Ri, Mulgeum-Eup, Yangsan-Si, Gyeongsangnamdo, 626-770 Korea. E-mail: shinkim@pusan.ac.kr

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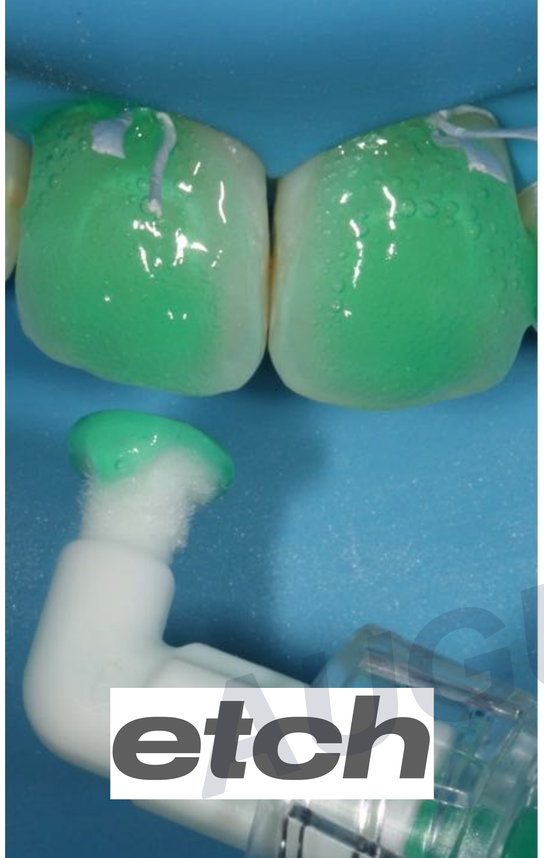

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ACCESS?

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Clearly defined edges

Blurry edges

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Predictor of success:

ICON Dry makes discoloration completely disappear

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Decision making Flowchart

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Time

Location/ aspect

Diagnosis

When did you notice it first?

- **after eruption** → Areas where plaque accumulates, defined edges → **Caries/WSL**
- Symmetric specs, lines or clouds, edges defined or blurry → **Dysmineralization**
- **since eruption** → Single, ‘punctiform’, mostly blurry edges → **Trauma**
- Asymmetric, MOLAR involved, mostly blurry edges → **MIH**

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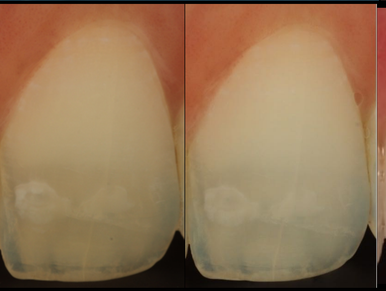

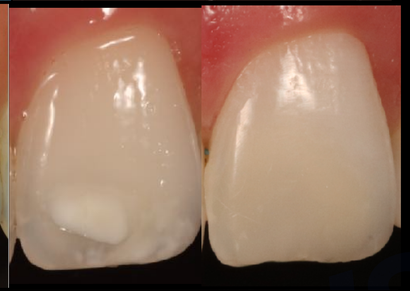

Cases

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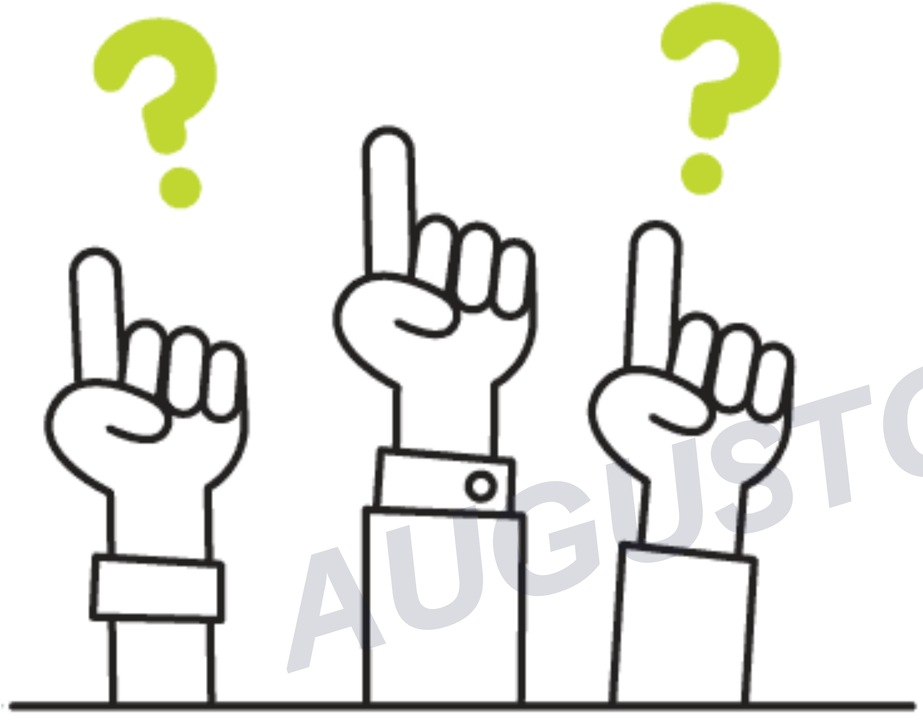

COMMON QUESTIONS ?

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How long will it last?

AUGUSTO RODRIGUES, DMD, MS

Original Article

Long-term follow-up of camouflage effects following resin infiltration of post orthodontic white-spot lesions in vivo

Michael Knösel[a]; Amely Eckstein[b]; Hans-Joachim Helms[c]

ABSTRACT

Objectives: To reassess the long-term camouflage effects of resin infiltration (Icon, DMG, Hamburg, Germany) of white spot lesions (WSL) and sound adjacent enamel (SAE) achieved in a previous trial. The null hypothesis was tested that there were no significantly different CIE-L*a*b*-ΔE-values between WSL and SAE areas of assessment after at least 24 months (T24) compared to those at baseline (T0).

Materials and Methods: Of twenty subjects who received previous resin infiltration treatment of $n_{teeth} = 111$ nonrestored, noncavitated postorthodontic WSL after multibracket treatment during a randomized controlled trial and were contacted 20 months after baseline, eight subjects (trial teeth $n_{teeth} = 40$; m/f ratio 1/7; age range (mean; SD) 12–17 (15.25; 2.12) years); response rate: 40%) were available for follow-up after at least 24 months (T24). CIE-L*a*b* differences between summarized color and lightness values ($\Delta E_{WSL/SAE}$) of WSL and SAE were assessed using a spectrophotometer and compared to baseline data assessed prior to infiltration (T0), and those after 6 (T6), and 12 (T12) months using paired *t* tests at a significance level of $\alpha = 5\%$.

Results: T24 assessments were performed after a mean 33.86 (SD: 8.64; Min: 24; Max: 45) months following T0. Mean (SD) $\Delta E_{WSL/SAE}$ units of available teeth were 8.76 (5.33) at baseline; 5.5 (2.75) at T6; 5.2 (2.41) at T12, and 5.57 (2.9) at T24. Comparisons of T6, T12, and T24 with T0 yielded highly significant differences, whereas T6–T24 and T12–T24 differences were found to be not significant.

Conclusions: Assimilation of infiltrated WSL to the color of adjacent enamel by resin infiltration is considered to be suitable for the long-term improvement in the esthetic appearance of postorthodontic WSL. (*Angle Orthod*. 2019;89:33–39.)

KEY WORDS: White spot lesion; Resin infiltration; Durability of camouflage effect; CIE-L*a*b; in vivo

INTRODUCTION

The incidence of labial enamel decalcification or white spot lesions (WSL) during treatment with fixed orthodontic appliances has been reported to vary between 46% and 73%.[1,2] Although cavitated lesions require invasive therapy, the choice of WSL treatment is based on the patient's individual esthetic demands. Remineralization by local fluoride application may arrest lesion progression[3] and, in combination with tooth brushing abrasion, bring about some improvement in the appearance of WSL within the first few months following debonding,[4–6] however, rarely to an extent that provides for an esthetically acceptable dentofacial appearance.[7–9] In contrast, the technique of resin infiltration (Icon, DMG) of postorthodontic enamel decalcifications yields esthetically more satisfying results. A recent split-mouth randomized controlled trial (RCT) revealed that there was a significant and clinically relevant abatement of color- and lightness differences between infiltrated WSL and sound adjacent enamel, whereas there were no significant

[a] Senior Lecturer, Department of Orthodontics, University Medical Center Göttingen (UMG), Göttingen, Germany; and Universidad de La Frontera (UFRO), Temuco, Chile; and private practice, Hamburg, Germany.
[b] Research Assistant, Department of Statistics, University Medical Center Göttingen (UMG), Göttingen, Germany.
[c] Research Fellow, Department of Orthodontics, University Medical Center Göttingen (UMG), Göttingen, Germany.
Corresponding author: Prof Dr Michael Knösel, Department of Orthodontics, University Medical Centre Göttingen (UMG), 37099 Göttingen, Germany
(e-mail: mknoesel@yahoo.de)

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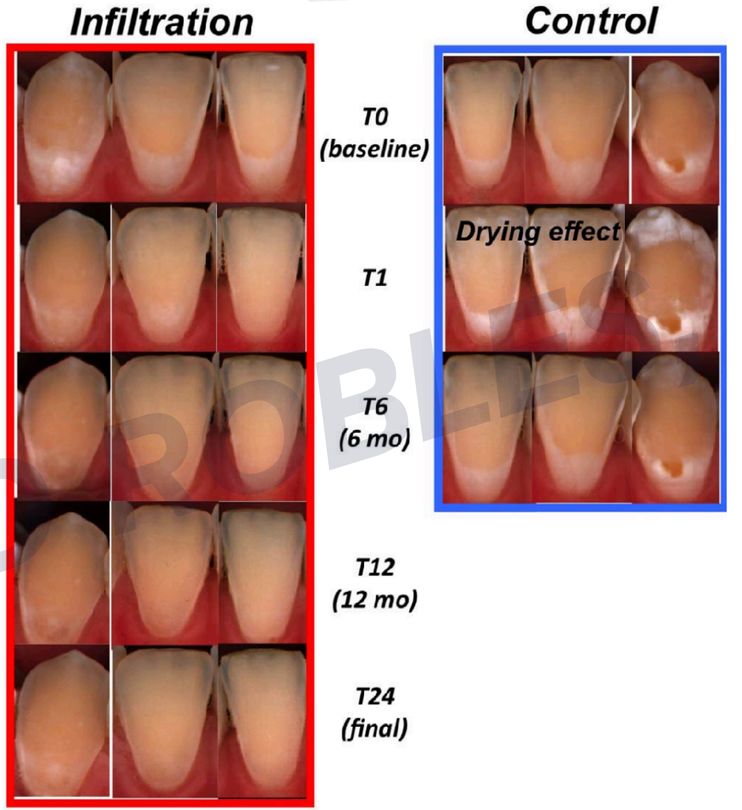

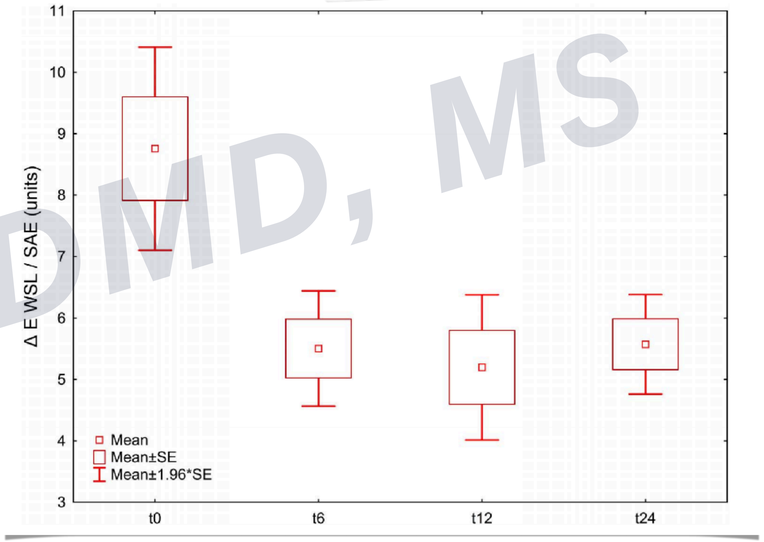

Color change between treated tooth and control tooth is unchanged after 2 years

AUTOR ROBERTO DMD, MS

> Am J Dent. 2007 Apr;20(2):67-72.

Considerations about enamel microabrasion after 18 years

Renato Herman Sundfeld [1], Theodore P Croll, André Luiz Fraga Briso, Rodrigo Sversut de Alexandre, Daniel Sundfeld Neto

Affiliations + expand

PMID: 17542197

Abstract

Purpose: To review of the current status of enamel microabrasion method and its results 18 years after the development and application of this method.

Methods: A technique performing enamel microabrasion with hydrochloric acid mixed with pumice and other techniques employing a commercially available compound of hydrochloric acid and fine-grit silicon carbide particles in a water-soluble paste have been described. Much has been learned about the application of this esthetic technique, long-term treatment results and microscopic changes to the enamel surface that has significant clinical implications. The latest treatment protocol is presented and photographic case histories document the treatment results. Clinical observations made over 18 years are discussed.

Results: According to our findings, the dental enamel microabrasion technique is a highly satisfactory, safe and effective procedure.

AUGUSTO ROBLES, DMD, MS

Will ICON stain?

AUGUSTO RODRIGUES, DMD, MS

Evaluation of staining and color changes of a resin infiltration system

Andrew Leland; Sercan Akyalcin; Jeryl D. English; Eser Tufekci; Rade Paravina

Angle Orthod (2016) 86 (6): 900–904.

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Split-Screen Views PDF Share Tools

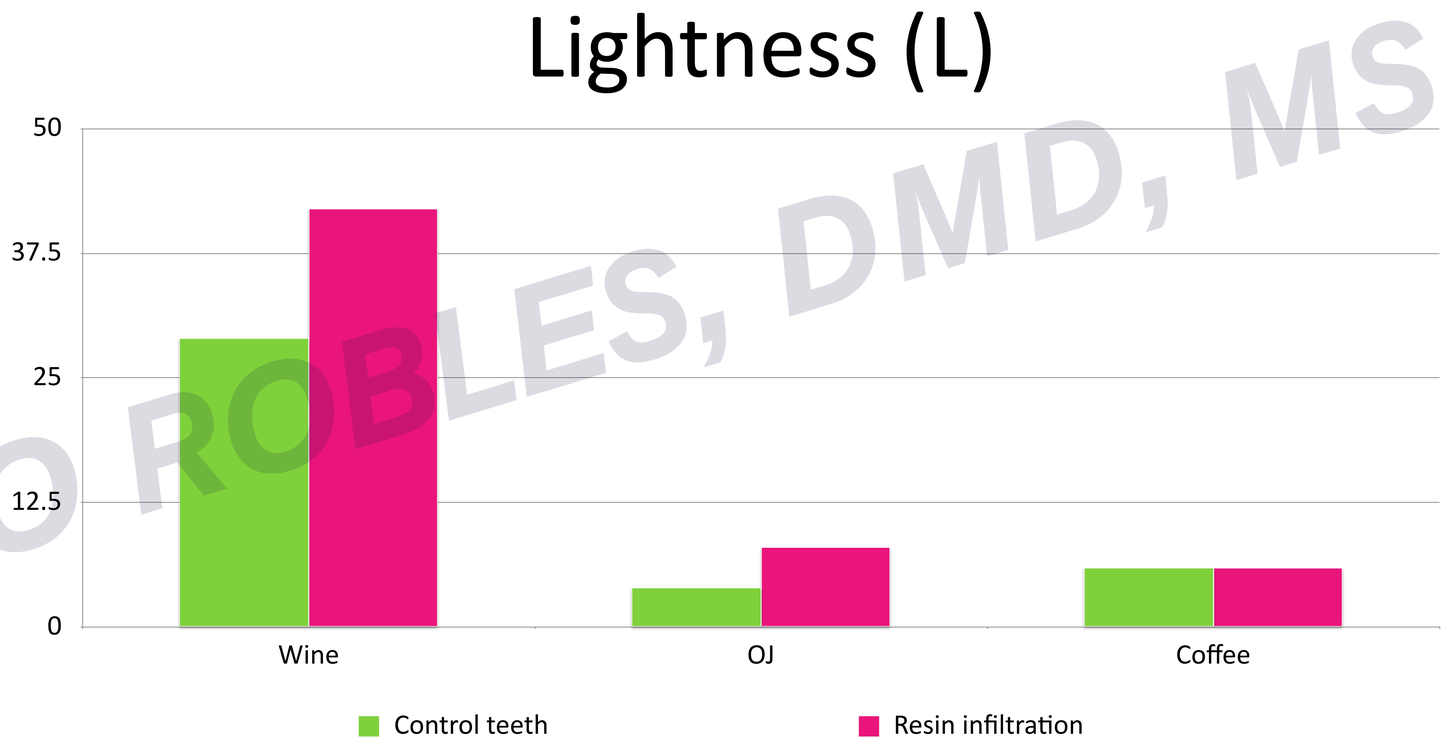
ABSTRACT

Objective:
To analyze the staining and color changes of a resin infiltrant system used for management of white spot lesions (WSLs).

Materials and Methods:
WSLs were artificially created on left buccal halves of 48 extracted human teeth. These sites were then treated with resin infiltration (RI) while the right halves of the teeth remained as nonresin (NRI) areas. Six groups were formed (n = 8 teeth/group) and were exposed to the following: red wine, coffee, orange juice, combined staining agents, accelerated aging, and distilled water for 1 week. The teeth were then polished with a prophy cup and polishing paste. Color properties were assessed using a spectrophotometer at baseline (T0), after each exposure (T1), and after polishing (T2). Color difference (ΔE^*) was calculated between each time point for both halves of the teeth (RI and NRI). Data were analyzed with a two-way analysis of variance with presence of resin infiltration and staining agents as the main effects for each time point pair. Multiple comparisons were made with a Bonferroni post hoc test. The level of significance was set at $P < .05$.

Results:
The red wine and combined staining agent groups caused the greatest color change between all intervals ($P < .05$). Significant interactions were recorded between resin infiltration application and staining agents at all time periods ($P < .05$). The presence of resin infiltration as a main effect did not affect color change between T0 and T2 ($P > .05$).

Conclusions:
RI areas showed higher staining susceptibility than did NRI areas. However, prophylaxis had a strong effect on reversing the discoloration of both RI and NRI areas.



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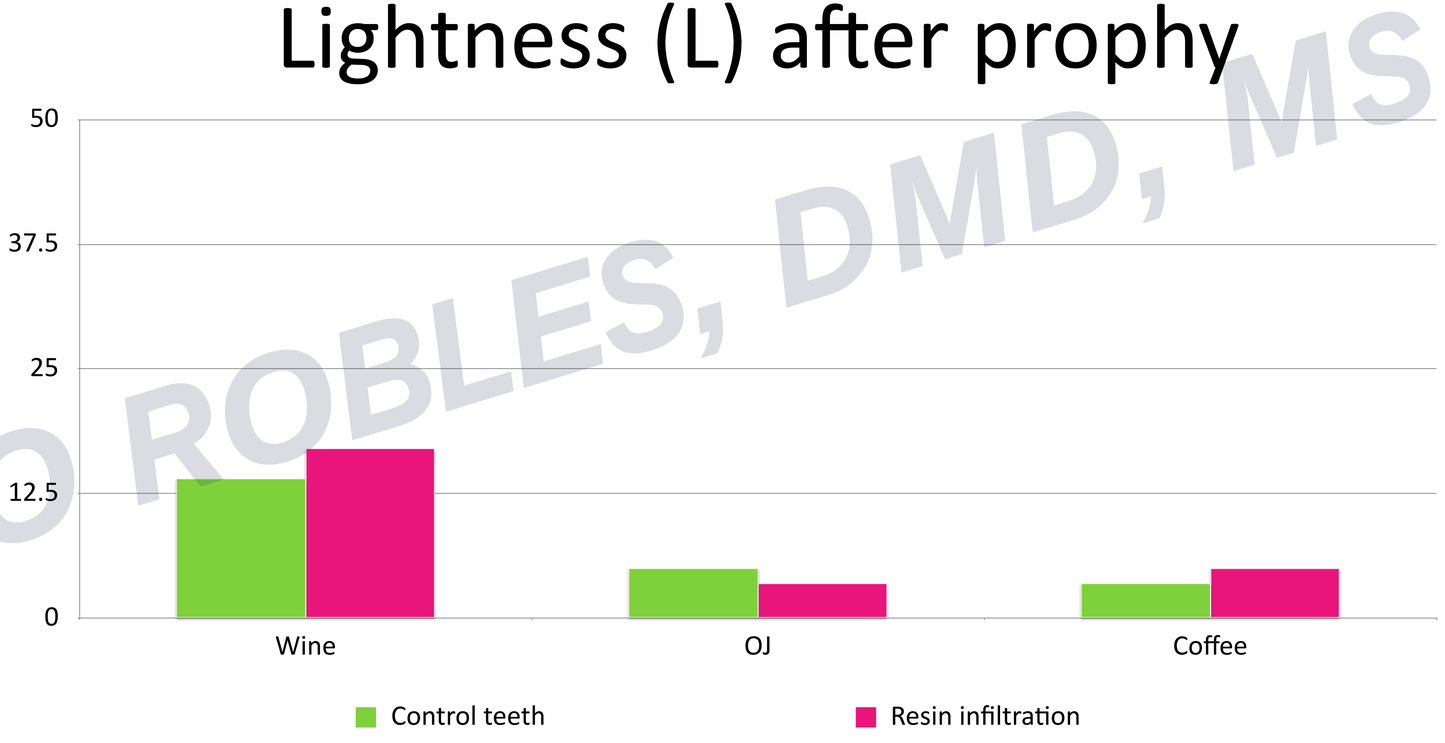

What first, Microabrasion, Bleaching, or Infiltration?

AUGUSTO RUBIES, DMD, MS

Investigation

Comparison of bleaching effects when applied to white-spot lesions before or after resin infiltration

An in vitro study

Al-Shaheen Youssef, DDS, MS; David A. Covell Jr., DDS, PhD; Steven Makowka, MS; Adam Gailey, DDS; Robert G. Dunford, MA; Thikriat Al-Jewair, BDS, MSc, MS, FRCD(C); Violet I. Haraszthy, DDS, MS, PhD

ABSTRACT

Background. The purpose of this study was to compare color alterations (ΔE) of white-spot lesions (WSLs) bleached before versus after resin infiltration (RI).

Methods. Using the facial surfaces of bovine maxillary incisors, WSLs were created and the teeth were allocated into 2 groups (n = 45/group): bleach then RI (B-RI group) and RI then bleach (RI-B group). To determine ΔE, Commission Internationale de l'Eclairage $L^* a^* b^*$ (L^* represents lightness, ranging from black to white [0-100]; a^* represents green to red chromaticity [−150-+100]; and b^* represents blue to yellow chromaticity [−100-+150]) measurements were obtained at baseline, after WSL formation, and after RI and bleaching. Representative specimens were evaluated by means of scanning electron microscopy. Statistical analyses included the Mann-Whitney U and Wilcoxon signed rank tests ($P \leq .0016$) and repeated measures analysis of variance ($P \leq .05$).

Results. No differences in ΔE were found comparing B-RI with RI-B groups or when the B-RI group was compared with bleached enamel. A statistically significant difference was found when the RI-B group was compared with bleached enamel (ΔE, 0.81; $P < .001$), but the difference was deemed not clinically significant. Scanning electron microscopy revealed that bleaching after RI increased surface roughness of the resin.

Conclusions. There were no clinically significant differences in ΔE of WSLs when bleach was applied before or after RI; however, applying bleaching agent after RI roughened the surface of the resin material.

Practical Implications. Results indicate that ΔE were not clinically significantly different between WSLs bleached before versus after RI, although it is best to sequence bleaching before RI therapy, as bleaching after RI roughened the restoration's surface.

Key Words. White-spot lesions; demineralization; resin infiltration; tooth bleaching.

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There was no difference in color change if teeth bleached (60 min with 40% hydrogen peroxide)before or after infiltration

AUGUSTO ROBLES, DMD, MS

When applicable:

Microabrasion, then Whitening, finish with Infiltration

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Can you do several rounds of ICON?

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Since the resin blocks access to deeper areas, if they were not infiltrated correctly the first time, it is not possible to redo

Have to be sure when to infiltrate!!!

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How much does it cost?

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Ultradent

~$130

Kits of 2 or 4 syringes
20 cups

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$170

1 minikit

About 6 teeth

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ICON Cube: 7 patients

$170

1 minikit

About 6 teeth

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~$120

1 etch refill kit

3 syringes

15 tips


Thank you for your kind attention
AUGUSTO ROBLES, DMD, MS

Augusto **ROBLES**, DMD, MS

arobles@uab.edu

drroblesdmdms