

Letters to the editor*

The value of procedural specifications

Sincerely we congratulate the authors for their article, "Benzalkonium chloride in an orthodontic adhesive: Its effect on rat enamel demineralization using color-based image analysis," published in the January 2019 issue (Torres-García ML, Llavore LD, Bungay A, Sarol JD Jr, Pineda RR, Penas KD. *Am J Orthod Dentofacial Orthop* 2019;155:88-97). It was a pleasure reading the article which examines the effect of an orthodontic bonding adhesive that contains benzalkonium chloride (BAC) which has the potential to reduce the amount and percentage of demineralization in the enamel. So we would like to present some consultation regarding this.

When performing the bonding procedure of the brackets being replaced every week for a total of 7 weeks, using the same specimen could have altered the structure of the enamel because the consecutive use in each week of the etchant can affect the pattern of surface engraving of the enamel and the reduction of the micro-mechanical retention can negatively affect the strength and durability of the union, causing an inadequate follow-up and that could lead to a nonspecific method of evaluation.¹

The type of evaluation to determine the percentage of enamel demineralization can be questionable because it does not have the specifications of the delimitation of the surface area of the tooth, so the evaluation could give us unreliable data in the study.

Readers appreciate the contribution to scientific knowledge. Thank you.

Magali L. Quispe Figueroa
Lima, Perú

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REFERENCE

1. Pouyanfar H, Tabaii ES, Aghazadeh S, Nobari SPTN, Imani MM. Microtensile bond strength of composite to enamel using universal adhesive with/without acid etching compared to etch and rinse and self-etch bonding agents. *Open Access Maced J Med Sci* 2018;6:2186-92.

*The viewpoints expressed are solely those of the author(s) and do not reflect those of the editor(s), publisher(s), or Association.

Author's response

We appreciate your encouraging comments and value your observations. We agree that the application of an acid etchant can affect the surface roughness of enamel and micromechanical retention of an orthodontic adhesive. However, it is important to consider that in our study, all brackets attached to the experimental samples, which included brackets bonded with conventional orthodontic adhesive and adhesive incorporated with benzalkonium chloride (BAC), were debonded. To rebond the brackets, the etchant was applied to all experimental samples the same number of times, with the same technique, and the same etchant. Therefore, etchant application per se, whether it was done once or multiple times on the same specimen, was not considered to be a confounding variable and could not have altered the results of the study.

The delimitation of the surface area of each sample in our study was determined with the use of the Python programming language and the Opencv library. In preparation, the maxillary bone was colored with black permanent marker to isolate the molars in the photographs and mounted on a labeled black square background over 1-mm gridlines. It was ensured that the distance and angle between the camera lens and the tooth surfaces were the same for all subjects. Binary thresholding was used to segment the other areas from the teeth. Any pixel with a hue >40 was considered to be background, with everything else retained. Connected components analysis was performed to group neighboring nonblack pixels for segmentation from the background. The largest groups from the results of components analysis underwent another thresholding to segment the outline of the tooth. Flood-fill algorithm was applied to the segmented outline to produce a mask corresponding to the tooth areas.

In our article, we also included in detail how the demineralized areas on the teeth were determined. The pixels with hue ϵ [0,11], saturation ϵ [65,255], and value ϵ [180,250] were considered to be demineralized areas. Pixel values from 200 to 255 were simplified and converted to white, and those with pixel values from 0 to 199 were converted to black. The conversion of an image to black and white automatically removed noise or the unwanted information in a digital image. This transformation converted the images to measurable binary form which can be further enhanced to create more solid lines. Binarization plays an important part in improving,

recognizing, and measuring images.¹⁻³ The estimated pixels per 1 mm² in the data set, given the parameters of the camera and the setting of the gathering site, was 2450. This value was used to calculate the over-all surface area of the teeth, the demineralized pink areas, and the white or sound areas. The percentage of enamel demineralization was computed by dividing the surface area of the entire maxillary molars and then multiplying the quotient by 100.

We think that color-based image analysis can be more objective, scientific, and reliable in measuring demineralized areas after murexide analysis than scoring the demineralized areas subjectively, as was done in previous studies.^{4,5}

*Maria Lourdes Torres-Garcia
Manila, Philippines*

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REFERENCES

1. Firdousi R, Parveen S. Local thresholding technologies in image binarization. *Int J Eng Comput Sci* 2014;3:40-62.
2. Boyat A, Joshi B. A review paper: noise models in digital image processing. *Signal Image Process* 2015;6:63-75.
3. Singh T, Roy S, Singh O, Sinam T, Singh K. A new local adaptive thresholding technique in binarization. *Int J Comput Sci Issues* 2011;8:271-7.
4. Navia JM. Experimental and animal husbandry procedures in rat caries research. In: Tanzer JM, editor. *Proceedings "Symposium on animal models in cariology"*. Washington, DC: Information Retrieval; 1981. p. 77-87.
5. Dubroc G, Mayo J, Christopher A. Reduction of caries and of demineralization around orthodontic brackets: effect of a fluoride-releasing resin in the rat model. *Am J Orthod Dentofacial Orthop* 1994;106:583-7.

Apical root shortening versus root resorption—Is there a difference?

We write in praise of Mucahid Yildirim and Mehmet Akin for their well done in vivo experiment regarding root resorption (Yildirim M, Akin M. Comparison of root resorption after bone-borne and tooth-borne rapid maxillary expansion evaluated with the use of microtomography. *Am J Orthod Dentofacial Orthop* 2019;155:182-90.)

In orthodontics, the term “root resorption” is perceived as a threat. Although we are fully aware and understand the comprehensive scale of the process and its effect on the teeth, our hands are shaking every time we look at the posttreatment X-rays of each of

our patients. However, is it true that root resorption should be a threat? Absolutely not! Root resorption is a mandatory process in the defense mechanism of the roots. The term that we have and should be troubled about, is apical root shortening (ARS). There is a major difference between those 2 processes. This letter, like several previous ones,^{1,2} is trying to convince the authors and the profession that the current article discusses the root resorption process and it has nothing whatsoever to do with ARS. Even the authors, as they express themselves in the discussion part (page 189, left column, lines 17-14 from the end), fully agree with this statement. Again, we would like to state that each time the root surface is exposed to orthodontic pressure, the root and the tissues that surround it react accordingly as they should—they defend themselves. This reaction, in certain force limits, is in direct relation to the applied pressure, as this study proves. Surface resorption, as detected in the publication, is the initial part of this process, that in most of the times and areas ends with cemental apposition. This, as mentioned before, is a necessary or mandatory part of the process we previously named as orthodontitis.^{3,4}

Another remark is related to the statement in the discussion part, found at the end of the first paragraph on page 189: This study (at least the part that was published) did not examine the undesirable effects of rapid maxillary expansion, namely the buccal fenestration of the roots etc, and therefore this study cannot confirm (or deny) the hypotheses of other researches. Unfortunately, future studies might refer to this sentence as an actual scientific finding, although it was not.

Again, this study by itself brings new data that should be learned as a part of understanding the complex defense mechanism processes that orthodontics is involved with.

*Naphtali Brezniak
Atalia Wasserstein
Jerusalem and Tel Aviv, Israel*

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REFERENCES

1. Brezniak N, Wasserstein A. Effects of short-term in-vivo studies on orthodontic root resorption paradigms. *Am J Orthod Dentofacial Orthop* 2017;152:11.
2. Brezniak N, Wasserstein A. Short-term studies of apical root shortening. *Am J Orthod Dentofacial Orthop* 2018;154:156.
3. Brezniak N, Wasserstein A. Orthodontic root resorption: a new perspective. *Angle Orthod* 2016;86:1056-7.