

## Letter to the Editor

### Root dentinal microcracks - absence of evidence is not evidence of absence

Dear Editor,

We read with great interest the article 'Root dentinal microcracks: a post-extraction experimental phenomenon?' (De-Deus *et al.* 2019).

It is an impressive study performed with cadavers, to test for the presence of microcracks in natural teeth prior to endodontic treatment.

We compliment the provocative title and the data presented but raise serious concerns about the way the authors chose to phrase their abstract and conclusions. Specifically, both sections suffer from significant omissions:

1. The study was performed on young adult cadavers (mean age 31 years). This fact should be explicitly mentioned in the abstract and conclusions. It is the older teeth that typically exhibit cracks and these are the teeth often treated. The authors acknowledge that the sampling used in their study is limited, but only later in the discussion. Clearly, the inclusion of older individuals could radically change the results of the study.
2. The authors loosely refer to the term 'high-resolution'. However, the pixel size used was 13 microns, suggesting that the resolution is in the order of 25 microns or worse and that only gaps larger than this are detectable. Consequently, any cracks where the edges are closer than this are invisible in this study. Although this resolution may be considered 'high' by some, much higher resolutions are available nowadays and are probably needed for this purpose (Moinzadeh *et al.* 2016).
3. The abstract claims that in more than 65 000 cross-sectional images from 178 teeth, no dentinal cracks were detected. This calls for some attention to the concept of contrast. Specifically, it has been shown by Rödiger *et al.* (2018) that cracks observed in dry roots become invisible in hydrated specimens. This is because laboratory micro-CT has strong limitations in contrast, as shown previously (Zaslansky *et al.* 2011).
4. The abstract conclusion is misleading: 'This *in situ* cadaveric model revealed the lack of pre-existing dentinal microcracks in nonendodontically treated teeth. Thus, the finding of dentinal microcracks observed in previous cross-sectional images of stored extracted teeth is unsound and not valid'. The fact that the authors did not find cracks in their sample is not equivalent to the claim that previous results are 'not valid'. This appears to be an '*argumentum ad ignorantiam*': absence of evidence is not evidence of absence.
5. The authors further conclude that 'it should be assumed that microcracks observed in stored extracted teeth subjected to root canal treatments are a result of the extraction process...' which is not supported by their own results. While teeth *may* crack or fracture during extraction, this is not necessarily the case, as demonstrated by these authors where teeth scanned both in bone and after extraction showed no cracks.

While we agree with the authors that post-extraction storage conditions need to be considered carefully, it is unrealistic to expect all future endodontic research on this subject to be performed on fresh cadavers especially when all bureaucratic and ethical aspects are considered.

In fact, evidence suggests that cadavers of old individuals exhibit large numbers of pre-operative cracks (Arias *et al.* 2014).

Considering the information shown in their own paper, we put forward that the abstract should reflect the uncertainty in the data as to not mislead the uninformed reader.

**P. Zaslansky<sup>1</sup>, A. Prates Soares<sup>1</sup>, H. Shemesh<sup>2</sup>**

<sup>1</sup>Department for Restorative and Preventive Dentistry, Charité Universitätsmedizin Berlin, Berlin, Germany

<sup>2</sup>Department of Endodontology, Academic Centre for Dentistry Amsterdam (ACTA), University of Amsterdam and VU University, Amsterdam, Noord-Holland, The Netherlands

E-mail: h.shemesh@acta.nl

## References

- Arias A, Lee YH, Peters CI, Gluskin AH, Peters OA (2014) Comparison of 2 canal preparation techniques in the induction of microcracks: a pilot study with cadaver mandibles. *Journal of Endodontics* **40**, 982–5.
- De-Deus G, Cavalcante DM, Belladonna FG *et al.* (2019) Root dentinal microcracks: a post-extraction experimental phenomenon? *International Endodontic Journal* **52**, 857–65.
- Moinzadeh AT, Farack L, Wilde F, Shemesh H, Zaslansky P (2016) Synchrotron-based phase contrast-enhanced micro-computed tomography reveals delaminations and material tearing in water-expandable root fillings ex vivo. *Journal of Endodontics* **42**, 776–81.
- Rödig T, Müller C, Hoch M *et al.* (2018) Moisture content of root canal dentine affects detection of microcracks using micro-computed tomography. *International Endodontic Journal* **51**, 357–63.
- Zaslansky P, Fratzl P, Rack A, Wu MK, Wesselink PR, Shemesh H (2011) Identification of root filling interfaces by microscopy and tomography methods. *International Endodontic Journal* **44**, 395–401.