

Letter to Editor

A letter to editor addressing a methodological concern: A critical analysis of papers included in a systematic review on vertical root fractures

Dear Editor,

One of the most important problems that can lead to tooth loss is vertical root fractures (VRFs). The American Association of Endodontists divides “cracks” into five types: (1) craze lines, (2) fractured cusp, (3) cracked tooth, (4) split tooth, and (5) VRF. It should be mentioned that these types are not completely mutually exclusive. These cracks can grow and change over time, leading to the change of one crack type into another type.^[1]

VRF is an incomplete or complete longitudinal fracture that extends through the longitudinal axis of the root toward the apex.^[1] These fractures can start from any level of the root and spread in the facial or lingual direction and sometimes divide the root into two parts.^[1,2]

Recently, Khanagar *et al.*^[3] have evaluated artificial intelligence (AI)-based models for detecting VRFs in their systematic review. They concluded that AI is potential for endodontic purposes as well as detecting VRFs. The result of this systematic review regarding the usefulness of AI in diagnosing VRFs is not discussed in this letter to editor, but our goal is to critically examine the articles included in this study and remind of a possible bias in future systematic review studies regarding VRFs.

In Khanagar *et al.*'s study, six papers including Shah *et al.* and Vicory *et al.* were included regarding the detection of VRFs. Shah *et al.*'s study was performed on the detection of cracks in molar teeth. Six longitudinal cracks were stimulated with different directions in each tooth. On the other hand, Vicory *et al.* also studied on dental microfractures (cracks). Cracks were stimulated in 22 of 36 extracted human premolars, first molars and second molars using compression on the crowns by an Instron machine leading to mesio-distal cracks extending from the crowns to the roots with crowns remained. None of

these two studies have mentioned VRF or used a specific method for stimulating it and they only tried to create “cracks.” We think that these two different methodologies for stimulating VRF may not guarantee its occurrence in the teeth.

The inclusion of studies aiming the detection of “cracks” (which are a wider range than VRFs) into a systematic review about VRFs may lead to unexpected bias. The authors should have clarified that the problem (patient) component of PICO investigated in this systematic review is cracks or VRFs. Hence, it may not be appropriate to include them in the systematic review aiming at the detection of VRFs. We need to note the previously mentioned fact that all these cracks can overlap or change to each other, but this may not necessarily happen. Decoronating teeth at the level of the cemento-enamel junction was done in other two *in vitro* included studies, which seems to be a better way to avoid bias related to crown fractures. This method has been used more frequently in recent studies regarding the detection of VRFs.^[2,4] The other two were *in vivo* studies where the occurrence of VRFs was confirmed by at least two experienced radiologists observing the fracture line on roots.

Moreover, VRFs usually occur in endodontically treated teeth. Artifacts produced by canal filling materials (like gutta-percha) and metal posts of these teeth can impair VRF detection according to previous studies.^[5] These factors can make the detection of VRFs different from other cracks.

Finally, we believe that papers only focusing and ensuring occurrence of VRFs should be included in future systematic reviews and meta-analysis on this field. Moreover, ignoring the difference of VRFs with other cracks due to their overlap may cause misleading results.

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Conflicts of interest

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REFERENCES

1. Kahler W. The cracked tooth conundrum: Terminology, classification, diagnosis, and management. *Am J Dent* 2008;21:275-82.
2. Tamse A, Fuss Z, Lustig J, Kaplavi J. An evaluation of endodontically treated vertically fractured teeth. *J Endod* 1999;25:506-8.
3. Khanagar SB, Alfadley A, Alfouzan K, Awawdeh M, Alaqla A, Jamleh A. Developments and performance of artificial intelligence models designed for application in endodontics: A systematic review. *Diagnostics (Basel)* 2023;13:414.
4. Fontenele RC, Farias Gomes A, Nejaim Y, Freitas DQ. Do the tube current and metal artifact reduction influence the diagnosis of vertical root fracture in a tooth positioned in the vicinity of a zirconium implant? A CBCT study. *Clin Oral Investig* 2021;25:2229-35.
5. Chang E, Lam E, Shah P, Azarpazhooh A. Cone-beam computed tomography for detecting vertical root fractures in endodontically treated teeth: A systematic review. *J Endod* 2016;42:177-85.

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