impression trays to improve the quality of work for patients as well as saving time and money for dentists.

J. S. Hans, London
DOI: 10.1038/sj.bdj.2016.69

1. Carrotte P V, Winstanley R B,Green J R. A study of the quality of impressions for anterior crowns received at a commercial laboratory. *Br Dent J* 1993; **174**: 235–240.

ENDODONTICS

Gross misinterpretation

Sir, as postgraduate students in endodontics, we have undertaken a review of the paper by Hansrani (*BDJ* 2015; **219:** 481–483) and would like to share some of our observations with your readers.

Given the content of the paper, the use of the word 'overview' in the title is not justified as it is more of a personal, discursive exercise undertaken by the author. The notable omissions in the paper are the myriad of factors that affect radiographic interpretation, ranging from observer bias to the location of the periapical lesion in the arch and involvement, or otherwise, of the bony cortical plate. Newer, three-dimensional imaging, such as cone beam computed tomography, was not mentioned at all.

Many of the author's statements are as a result of misinterpretation of, and based on, dated literature. There is no mention of the causes of 'failure' that may, for example, be due to extra-radicular or intra-radicular infection. There is also a complete absence of reference to apical surgery and extraction as treatment options for 'failure' cases apart from these being used as criteria to denote 'failure'.

The author failed to adequately define the criteria used to determine treatment outcome; instead, he compounded the deficiency by misquoting the European Society of Endodontology guidelines.[1] In fact, these guidelines divided outcome into 'favourable', 'unfavourable' and 'uncertain' as well as an 'exception' category for periapical scars.

Recent outcome studies, for example, Ng *et al.*[2] reported on factors associated with endodontic 'success' and 'survival'. This seminal research is not referenced by the author and if enlightened, perhaps the author would not have given credence to the outdated and discredited theory of 'anachoresis'.

The relative importance of thorough canal preparation, effective irrigation, complete obturation and a good coronal seal are poorly addressed and mislead the readers into thinking that obturation is of no significance. Both Klevant and Eggink[3] and Ray and Trope[4] were misquoted. Supported by more recent literature (eg Ng *et al.*[2]), the evidence points to a combination of high technical quality root canal treatment, as exemplified by good quality obturation, and a good coronal seal, as major contributory factors to 'success'.

In conclusion, we feel that this article grossly misrepresented the topic of radiographic evaluation of 'root fillings'.

S. Jivraj, N. Dollay, P. Shah, N. Louskos, K. Ranshi, by email
DOI: 10.1038/sj.bdj.2016.70

1. European Society of Endodontology. Quality guidelines for endodontic treatment: consensus report of the European Society of Endodontology. *Int Endod J 2006*; **39:** 921–930.
2. Ng Y L, Mann V, Gulabivala K. A prospective study of the factors affecting outcomes of non-surgical root canal treatment; part 1: periapical health. *Int Endod J 2011*; **44:** 583–609.
3. Klevant F J, Eggink C O. The effect of canal preparation on periapical disease. *Int Endod J* 1983; **16:** 68–75.
4. Ray H A, Trope M. Periapical status of endodontically treated teeth in relation to the technical quality of the root filling and the coronal restoration. *Int Endod J* 1995; **28:** 12–18.

Blatant ignorance

Sir, we are compelled to write to express our dismay at the content of the paper by Hansrani on assessing root canal fillings.

Nearly all the views expressed in the paper are personal opinions, not based on sound scientific evidence or supported by careful and critical analysis of the literature. A principal worry is the constant use of unreferenced or indeed inappropriately referenced statements, which are misleading and not evidence-based. We could provide a line-by-line critique and multiple examples of the deficiencies of the paper but we have selected just a few.

The title does not reflect the contents; purporting to be an overview on assessing root fillings on a radiograph, it is one person's philosophical discourse on the science and practice of endodontics. The interchangeable use of the terms 'periradicular periodontitis', 'periapical periodontitis' and 'apical periodontitis' shows ignorance of terminology and is only one of many examples of sloppiness.

In the opening paragraph, it is claimed that the European Society of Endodontology (ESE) guidelines[1] state that 'radiographs should show the root apex with preferably at least 2-3 mm of the periapical region clearly identifiable.' In an act of self-contradiction, the author then included, amongst the 11-year-old reprinted illustrations, a radiograph (Fig. 2) that failed to meet this requirement and of 'unacceptable' quality if rated according to published guidelines;[2-4] the other two accompanying radiographic images (Figs 1 and 3) are only just about 'diagnostically acceptable'.

Re-stating the ESE's criteria defining an unfavourable outcome,[1] the author is economical with accuracy by conveniently not including the 'Exception: An extensive radiological lesion may heal but leave a locally visible, irregularly mineralised area. This defect may be scar tissue formation rather than a sign of persisting apical periodontitis. The tooth should continue to be assessed.' Compounding the sin of omission, the author listed in the next paragraph the unrecognised criteria defining 'failure', which is not part of the ESE guidelines[1] and not one of the three outcome categories ('favourable', 'uncertain' and 'unfavourable').

The inaccurate claim that 'radiographs of single rooted teeth can be easier to interpret and understand than those of maxillary permanent molar teeth' discounted mandibular molars. The one reference[5] cited on the microbiota of the root canal system overlooks the more recent, and abundance of, studies using newer, culture-independent techniques.

To trot out Dubrow[6] as a reference in order to claim that canal obturation is not required is to live in the past as the paper made reference to silver points, an obsolete root filling material already consigned to history. In addition, to further justify this contention Klevant and Eggink[7] was inappropriately used as in their paper healing was improved in the 'root filled' cohort over the 'dressed' controls.

The statement that the use of NiTi 'leads to improved success rates in endodontics' is unreferenced and presented as fact when, at present, there is a lack of a convincing body of evidence to uphold this claim. The author continuing to live in the past is further exemplified by the claim that 'obturation prevents entry of microorganisms into the root canal system from the oral cavity or via the blood system'. The idea of blood (anachoresis) as a source of infection has been outdated for years.

To claim that 'similar failure rates for teeth with radiographically optimal and suboptimal root fillings suggest RCT is not as technically sensitive as once thought' shows blatant ignorance. Does it mean that the author is happy to receive a suboptimal root filling? Is the author saying that dental schools no longer need to teach and expect, and clinicians do not need to achieve, high technical quality root fillings? Is the author not aware of, for example, the work of Sjogren *et al.*,[8] Ng *et al.*, as well as the systematic review by Ng *et al.*?[10] They all highlighted technical factors, as measured by radiographic quality of root fillings, as a principal prognostic factor in healing. A strong association between

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apical periodontitis and root filled teeth, and between periapical health and the technical quality of the root canal treatment, was further confirmed in a recent paper[11] in the *BDJ*. In addition, papers contrary to the views of Ray and Trope[12] and the many deficiencies of the study by Tickle *et al.*[13] have been pointed out in letters[14-16] to the *BDJ*.

We think this paper by Hansrani should have been rejected. It is unfortunate at a time where our medical colleagues are insisting on placing evidence within the context of systematic reviews[17] that there is publication space for the opposite.

B. S. Chong, A. M. Berman, G. Billis, A. M. Quinn, C. D. Emery, G. Di Filippo, London; H. F. Duncan, Dublin; E. Schäfer, Münster; N. P. Chandler, Dunedin

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1. European Society of Endodontology. Quality guidelines for endodontic treatment: consensus report of the European Society of Endodontology. *Int Endod J* 2006; **39:** 921–930.
2. National Radiological Protection Board. Guidance notes for dental practitioners on the safe use of X-ray equipment. National Radiological Protection Board/Department of Health, London, 2001.
3. European Commission Radiation Protection 136. Online information available at European Guidelines on Radiation Protection in Dental Radiology. 2004. www.ec.europa.eu/energy/nuclear/radiation_protection/doc/publication/136.pdf.
4. Horner K, Eaton K A (eds). *Selection criteria for dental radiography*, 3rd ed. London: Faculty of General Dental Practice (UK), 2013.
5. Gomes B P, Pinheiro E T, Gadê-Neto CR *et al.* Microbiological examination of infected dental root canals. *Oral Microbiol Immunol* 2004; **19:** 71–76.
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8. Sjogren U, Hagglund B, Sundqvist G, Wing K. Factors affecting the long-term results of endodontic treatment. *J Endod* 1990; **16:** 498–504.
9. Ng Y L, Mann V, Gulabivala K. A prospective study of the factors affecting outcomes of nonsurgical root canal treatment: part 1: periapical health. *Int Endod J* 2011; **44:** 583–609.
10. Ng Y L, Mann V, Rahbaran S, Lewsey J, Gulabivala K. Outcome of primary root canal treatment: systematic review of the literature - Part 2. Influence of clinical factors. *Int Endod J* 2008; **41:** 6–31.
11. Di Filippo G, Sidhu S K, Chong B S. Apical periodontitis and the technical quality of root canal treatment in an adult sub-population in London. *Br Dent J* 2014; *216:* E22.
12. Ray H A, Trope M. Periapical status of endodontically treated teeth in relation to the technical quality of the root filling and the coronal restoration. *Int Endod J* 1995; **28:** 12–18.
13. Tickle M, Milsom K, Qualtrough A, Blinkhorn F, Aggarwal V R. The failure rate of NHS funded molar endodontic treatment delivered in general dental practice. *Br Dent J* 2008; **204:** E8.
14 Hyatt A T. Endodontic intervention. *Br Dent J* 2008; 204: 595.
15. Pitt Ford T R. Tooth survival. *Br Dent J* 2008; **204:** 595–596.
16. Chong B S. Highlighting deficiencies. *Br Dent J* 2008; **204:** 596–597.
17. Clarke M, Hopewell S, Chalmers I. Reports of clinical trials should begin and end with up-to-date systematic reviews of other relevant evidence: a status report. *J Royal Soc Med* 2007; **100:** 187–190.

The author Virat Hansrani responds to the above letters: I thank the authors of these two letters for their comments. The main cause of concern in this article stems from the rather general title, which in hindsight may not have helped. However, the detailed abstract should have cleared any confusion in understanding the learning objectives of the article, which I feel have been misinterpreted.

One objective of the article, as per the abstract, was to 'discuss why a root filling that appears satisfactory on a radiograph may fail, and why one which appears unsatisfactory on a radiograph may succeed.' Perhaps this would have been a better title. Other objectives were to discuss the criteria of endodontic success and failure and its implications on the decision to re-treat.

I acknowledge the concerns regarding the European Society of Endodontology (ESE)[1] guidelines. According to these, when assessing the outcome of root canal treatment, root canal treatment has either a favourable outcome, uncertain outcome, or an unfavourable outcome and there is an exception too. More detailed and accurate ESE guidelines for an unfavourable outcome are (1) the tooth is associated with signs and symptoms of infection; (2) a radiographically visible lesion has appeared subsequent to treatment or a pre-existing lesion has increased in size; (3) a lesion has remained the same size or has only diminished in size during the four-year assessment period; (4) signs of continuing root resorption are present. I acknowledge the idea of anachoresis is an outdated theory.

Comments to Jivraj et al.*: I acknowledge that no reference was made to cone beam computed tomography, and its usefulness could have been included as an adjunct to radiographs. The following examples provided by Ng* et al.[2] *which were not discussed in my article, can also provide reasoning behind why a radiographically successful root filling may fail and why a radiographically unsuccessful root filling may succeed: absence of a pre-operative sinus tract, achievement of patency at canal terminus, extension of canal cleaning as close as possible to its apical terminus, use of ethylenediamine-tetra-acetic acid (EDTA) solution as a penultimate wash followed by a final rinse with NaOCl solution in secondary RCT cases and absence of tooth/root perforation. It is important to understand that some of these examples Ng* et al. *provided are visible on a post-operative radiograph (canal cleaning as close as possible to canal terminus) and others are not (use of EDTA). This was the key theme running through the article, and advice was provided to help clinicians elucidate under what conditions the root filling was conducted.*

I understand why Jivraj et al. *feel the article could mislead the readers into thinking that obturation is of no significance. To remove this concern, we must re-refer back to the abstract and learning objectives of the article. One objective was to discuss why a radiographically unsatisfactory root filling may succeed. This article identifies obturation as being one of few features visible on a post-operative radiograph, and thus states that other features which are integral to a successful root filling, may not be visible on a post-operative radiograph. For example, the quality of disinfection. At this stage, I must state that a good quality obturation is a major contributory factor to 'success' and I was not trying to diminish its importance; rather stating that there were other features during root canal preparation which are also contributory to the success even though they are not visible on a radiograph.*

Comments to Chong et al.*: I acknowledge that the interchangeable use of periradicular periodontitis, periapical periodontitis and apical periodontitis may lead to confusion amongst readers. At the time of writing this article, I did not have access to sufficient clinical exposure to take my own radiographs, hence they were referenced from another* BDJ *article. I appreciate that I could have included in the figure legend that one radiograph (Fig. 2) presented in the article did not meet the ESE guidelines and the other two radiographs (Fig. 2 and Fig. 3) were diagnostically acceptable.*

The authors made reference to Di Filippo et al.[3] *who assessed the quality of root fillings as adequate or inadequate based on ESE guidelines.[1] Di Filippo found inadequately root filled teeth were associated with apical periodontitis in 68.6% of cases compared with 14% of cases with adequately root filled teeth. My article discusses why these adequately root filled teeth may have failed and why the inadequately root filled teeth succeeded.*

Overall my article made no claim that canal obturation was not required. I understand that it is a major contributory feature in the success of root fillings. I was discussing why root fillings, which may look satisfactory on a radiograph, can fail and why some root fillings which look unsatisfactory can succeed. In doing so, I was discussing which features important to the success of endodontics are seen on a post-operative radiograph and which are not seen on a post-operative radiograph.

I would like to thank all the authors for taking the time to read and so thoroughly provide their feedback on my article. This has been very instructive to me for my future work and I hope, thanks to the open stance

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