



# Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology

## EDITORIAL

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### Systematic reviews in endodontics—examples of GIGO?

In many areas of medicine the amount of published information is increasing at an exponential rate, making it difficult for the clinician to condense the data to a manageable amount of valuable and useful information. Systematic reviews have been suggested as a remedy for this information overload.<sup>1</sup> Such reviews are regarded as the highest level of evidence. Certain statistical methods, e.g., meta-analysis, have also been introduced for the calculation of a more comprehensive summation of the compiled results from studies with small sample sizes. These findings would then serve as an authoritarian guide for evidence-based practice.

Endodontists have lately jumped on the bandwagon of systematic reviews and meta-analyses, and papers on various topics are being published. Well done, such comprehensive information would be very useful and authoritative for the practitioner. Alarming, the quality of these recent publications is negatively correlated to the frequency. This can have serious consequences in the clinical arena if spurious information is given a seal of approval when communicated as facts in refereed journals.

A systematic literature review is designed to focus on a single question and to synthesize all high-quality research reports relevant to the question. In these studies, however, sources of bias are often not controlled. Therefore, even the best review and meta-analysis becomes useless if it is based on poorly designed research. Furthermore, these reviews are mostly based on published data which are too often biased toward studies that show significant differences in results and/or outcome. “Uninteresting” conclusions tend not to be published.<sup>2</sup> Endodontic literature, thus far, is short on well designed and executed randomized clinical trials. Furthermore, clinical protocols often have many important “proprietary” modifications that make comparison difficult. This makes it very hard to undertake a systematic review to answer a narrow question. Such GIGO (garbage in, garbage out) can easily lead to

biased conclusions and reinforce already existing biased conclusions.

An example of such bias can be illustrated by a meta-analysis recently published.<sup>3</sup> The study focused on assessing if there were differences in outcome between 1 and 2 treatment visits when treating teeth with apical periodontitis. Relevant publications on this topic are rare, and with the narrow inclusion criteria only 3 investigations were available for the review.<sup>4-6</sup> However, the only factors connecting these 3 studies was the words “single” and “two visits” in the title. Beyond that, the selected studies are too different and inadequate for the study. Only 1 study is somewhat demonstrably randomized,<sup>4</sup> and outcome assessments are based on 3 vastly different criteria. Two of the studies<sup>5,6</sup> use calcium hydroxide as intracanal dressing, whereas the third<sup>4</sup> uses no intervisit medication. Complexity of initial pathology and healing time are also clearly factors of great importance but not controlled. In addition, sample sizes in the component studies as well as the final cohort are all too small for the conclusions that there was no significant difference between 1- or 2-visit treatment protocols. To undertake and publish a meta-analysis on such an incomplete sample is counterproductive. Although the publication noted its numerous limitations, it will still communicate erroneous conclusions with a poor scientific foundation to the less informed reader.

There are other examples of recently published systematic reviews that are very ambiguous and tend to communicate spurious facts.<sup>7,8</sup> One of these studies<sup>7</sup> looks at the effect of smear-layer removal on sealing ability of root canal obturation.<sup>7</sup> The study is entirely limited to laboratory experiments, with the majority of evaluations using dye leakage which is generally considered to be unreliable. This is an example of reviewers lacking content expertise. The authors draw the conclusion, using defective review material, that removal of smear layer enhances the seal of the root filling. We may generally believe that this is the truth,

but there is absolutely no universal answer to this question in the selected literature.

Another study<sup>8</sup> looks at differences in treatment outcome between teeth filled with cold lateral condensation or warm gutta-percha. This study, too, searched for documentation that in general is unavailable in the mainstream endodontic literature. The authors were able to find some low-quality studies from very obscure journals. To compare and combine studies on obturation, it is very important to control treatment protocol details, such as diagnosis, asepsis, antisepsis, and instrumentation, all of which have significantly greater effect on treatment outcome than root filling technique. There is no such critical information available in the very heterogenic studies selected, and therefore data can not be combined to study the defined question. Follow-up time for 3 of the 10 studies mentioned is listed as 0, which makes for a poor outcome study. The conclusion of this study is once again the result of a poorly designed and executed systematic review.

The 3 studies described are examples of, respectively, biased sampling, lack of scientific insight, and poor understanding of topic content.

A systematic review is not easy to do, and a great deal of work is required in combination with a substantial portion of common sense. Adequate literature to review and logical questions to ask must precede a review.<sup>9</sup> There is also a real need that the reviewer(s) have significant training in research methodology and a good understanding of the content area studied.

So why have I picked out these 3 articles, and why is it a big deal? We are all told to follow available evidence when practicing dentistry. Therefore, it is of utmost importance that publications in refereed journals are just that—seriously reviewed. The 3 articles

given as examples will confuse the uninformed reader as being the facts. Only if the reader is very familiar with the endodontic literature is it possible to see these studies and their conclusions as inadequate.

Lacking randomized controlled trials, which are the gold standard, it is probably better to focus on some of the good observational studies available. Good clinical endodontic literature is still infrequent and it may still be a while before it can support authoritative clinical meta-analysis projects.

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