

## Paradigms and EBD

Professor Reynaldo Leite Martins-Júnior asks researchers and educators to transfer to clinicians some basic concepts about science in general and evidence-based dentistry (EBD) in particular.<sup>1</sup> This should be done repeatedly in every media available, using the simplest language possible. The purpose is to help clinicians understand that an old paradigm, personal affinity with professors or theories, has already been replaced by a new one, EBD.

The concept of paradigm was introduced by Kuhn<sup>2</sup> in 1962. The exact meaning of the term is elusive as witnessed by Kuhn's own postscript in the second edition in 1970.<sup>3</sup> In fact, the basic idea had already been published by Fleck<sup>4</sup> in the 1930s. Usually, paradigm is the framework within which researchers try to solve a part of a puzzle. In other words, it is a set of "facts" which are, often unconsciously, accepted as true when methods to test a scientific hypothesis are chosen. The paradigm itself is not tested. If tests of a hypothesis within a paradigm produce results that do not make sense or cannot be explained by the accepted paradigm, a paradigm shift may occur. However, an alternative paradigm explaining the anomalies must be available.

EBD is not a paradigm in the sense Kuhn presented it. The introduction of EBD did not change the way scientific problems are seen, it just presented a systematized tool to assess studies and, thereby, treatment methods. However, even the best possible methodological rigor does not guarantee that conclusions drawn from the results are correct. If the nature of the problem is misunderstood, the methods chosen to solve it will be invalid.

According to Popper,<sup>5</sup> it seems possible only to prove hypotheses wrong, not right. His view is not shared by all philosophers of science. However, verification and falsification are not symmetrical concepts. A hypothesis cannot survive falsification, ie, results that logically contradict expectations based on the unconsciously accepted paradigm. Results that are within expectations neither verify the hypothesis nor add to its logical strength because there are always an infinite number of conditions not accounted for.

In the clinical world, the relationship between treatment indication and contraindication is analogous to verification and falsification in research. To reject a traditional treatment method requires contraindication, not only an alternative treatment.

Clinicians "verify" and "falsify" scientific arguments by observing how the arguments explain the clinical reality. It has long been a tradition to limit the validity of a treatment option by showing cases where the treatment is contraindicated. EBD has not changed this.

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### Response

I am honored by the interest of Dr Kirveskari and Dr Alanen<sup>1</sup> in my letter.<sup>2</sup> The authors say evidence-based dentistry (EBD) is not a paradigm shift, since it "did not change the way scientific problems are seen." To respond, if EBD is or is not a paradigm shift, we have to specify the alternative with which we are comparing EBD. If EBD is understood only as the result of the evolution and systematization of something bigger, that we could call "Science-Based Dentistry," and since EBD did not change the way dental research was practiced before its appearance (randomized controlled trials, for example, existed long before EBD), *in this way*, I would agree that EBD is not a paradigm shift.

But I propose something different from a comparison of dental research before and after EBD. What I propose is to contrast EBD (here *representing* "Science-Based Dentistry") to an alternative

approach, that I could call “Oracle-Based Dentistry” (OBD) since, unlike a scientist, an oracle does not have to justify the foundation of his or her statements.

OBD is a totally different way to “see scientific problems” than EBD. It is based mostly on non-tested hypotheses or, even worse, hypotheses that were tested and had been “falsified” (according to Popper<sup>3</sup>), but still had been recommended and taught as a “scientific approach” for problems associated with temporomandibular disorders (TMD). OBD sometimes ignores and/or denies scientific evidence.

OBD coexisted with what we now call EBD and is still coexisting today, as we can see in books, journals, meetings, conferences, and lay media. It is closer to the clinical setting than papers published in high-impact journals, is more easily understood by the ordinary clinician, and is responsible for the popularity worldwide of approaches for TMD that were classified as “wrong/bad” or “outrageous” by Greene.<sup>4</sup>

Within this context, they are different paradigms because they reflect different worldviews; different “constellation of beliefs, values, and techniques, and so on shared by the members of a given community”; different “frameworks within which researchers try to solve a part of a puzzle”; “different set of ‘facts’ which are, often unconsciously, accepted as true when methods to test a scientific

hypothesis are chosen.”<sup>5</sup> As different paradigms, they are incommensurable. The spread of the principles of EBD after the 1990s is responsible for the increase in the conflict between them, as we can see in some discussions about TMD where sometimes scientific evidence is not accounted for.

I am convinced that showing their differences (and EBD principles are the best instrument to do it) should precede the transfer of the best evidence available in the TMD field to the clinical setting.

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## Tender Muscles and Masticatory Myofascial Pain Diagnosis: How Many or How Much?

In our article,<sup>1</sup> we report that in masticatory myofascial pain (MMP) patients pain-related awakening correlates with the degree of muscle tenderness on palpation but not with the number of involved muscles. This is surprising since the diagnosis of MMP is partly based on the number of regional tender muscles and points involved.<sup>2,3</sup> However, the American Academy of Orofacial Pain guidelines do not require a minimum number of muscles, just muscle pain to palpation.<sup>4</sup>

Reanalysis of our data revealed that reported pain intensity in MMP patients significantly correlated with the total tenderness score (TTS) (Regression:  $P = .01$ , Pearson's  $R^2$  0.06) but not with the number

of muscles involved (Regression:  $P = .08$ , Pearson's  $R^2$  0.03). TTS is commonly used in the headache literature; it summates palpation scores from all the muscles examined.<sup>5</sup> We recalculated the positive- and negative predictive values (PPV, NPV) for MMP diagnosis that we originally reported; facial pain,  $\geq$  three tender muscles, and pain on function (PPV = 0.82, NPV = 0.86)<sup>2</sup> but replaced the number of tender muscles with an arbitrary TTS of  $\geq 3$ . No improvement was observed in the PPV (0.83) or NPV (0.88) values. However, the fact that the TTS is directly correlated to pain intensity raises the question of what is clinically more important: how many muscles are involved or how tender they are?

In defining a “case,” TTS seems no better than three tender muscles or zones. The fact that in MMP patients TTS is significantly related to reported pain intensity suggests that it would be a valuable parameter for treatment evaluation and follow up, as in headache practice.<sup>6</sup> Only extensive collection of TTS data would allow for the study of the true value of TTS in defining a “case” and in patient follow up. As we have consistently encouraged,<sup>7</sup> this would also bring the orofacial pain field in line with headache methodology and allow us to integrate classifications and compare similar entities such as MMP and tension-type headache. A reevaluation, and certainly a discussion, of the definition of MMP seem to be called for.

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