The Dogma of occlusal paradigms: What do we really have figured out?

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Dogma – a principle or set of principles laid down by an authority believed to be incontrovertibly true.

Since graduating from dental school in 2005, I have been searching for the Occlusion guru. To say my dental school education in occlusion was less than satisfactory is an understatement. While clinical practice would be kind. Like many dentists, I have happily skipped down the yellow brick road, enthusiastic to reach the Emerald City and soak in the wisdom of the all-knowing Oz. I thirst for knowledge because anything I can learn to bring better treatment to my patients is worth the investment. Too many times I have experienced the shock and disappointment like Dorothy did when she realized the guy behind the curtain was … just a guy. In occlusion, there are many gurus to choose from: centric relation, neuromuscular, biopsychosocial, joint-based occlusion, including a few gurus that state occlusion is not important to TMD. It is true that all the philosophies bring information forward and all can help patients some of the time, but none can help every patient, every time.

Whether you are a general dentist, pedodontist, periodontist, endodontist, orthodontist, oral surgeon, or a prosthodontist, the forces and principles of occlusion are at work in your practice, regardless of the importance you place on them. In fact, the only dentists who do not have to concern themselves with occlusal forces are oral and maxillofacial radiologists and pathologists.

Although occlusion is passionately debated, it tends to be more defined by “this is what works in my hands,” rather than a common unifying concept that holds true across the profession. What do you believe to be true? Are you sure what you believe is the truth, or do you believe it to be so because you were taught it was true and never looked any further? The question is not meant to be judgmental, but rather to inspire in you a moment of professional reflection. We have all experienced cases that, when completed, worked without a hitch, while others, when completed, we struggled to gain occlusal acceptability and comfort in the patient, wishing we could have a “do over.” Patients may have fractured porcelain, or developed symptoms after the restorations were delivered, where it was the “lab’s fault,” right? And all of these post-insertion complications arose despite using the same lab, occlusal materials, and clinical protocol.

Analog occlusal indicators like shim stock, articulating papers, waxes, and bite registration materials are used throughout all of dentistry. Articulating paper is, arguably, the most ubiquitous. It is considered the “standard of care” for how dentists gather data about the occlusion. I remember being taught in dental school how to “read the marks.” The bigger or darker the mark, the higher the bite force. And a bulls-eye shaped mark indicated even more force was present because some of the ink got wiped away. Unfortunately, there is nothing published to scientifically support what I was taught. Importantly, one might be surprised to know there is a limited amount of published literature describing articulation paper’s use as a viable occlusal indicator. In fact, the literature does not support articulating paper as being accurate or reliable. Carey et al. [1], using 600 paper marks, showed no direct relationship could be found between paper mark size and applied occlusal load. The authors concluded when clinicians select teeth to adjust, they should not assume the size of paper markings can reliably describe a contact’s force content [1]. Qadeer et al. [2] showed that the largest paper mark in a quadrant was on the most forceful tooth in that quadrant only 38.3% of the time. These findings indicate that the majority of the time, the largest paper mark in a quadrant is not the most forceful contact. Schelb et al. [3] found that paper mark size is proportional to paper thickness, not to the applied occlusal load. Similarly, Saad et al. [4] used articulated epoxy casts to crush articulating paper at three distinct loads (50 N, 100 N, and 150 N), where the resultant paper mark sizes did not appreciably increase, despite the load doubling and tripling. The authors found that as the load doubled and tripled, the paper mark sizes decreased, instead of going up in size. The study reported that paper thickness was taught. Importantly, one might be surprised to know there is nothing published to scientifically support what I was taught. Ent because some of the ink got wiped away. Unfortunately, there is nothing published to scientifically support what I was taught. Importantly, one might be surprised to know there is a limited amount of published literature describing articulation paper’s use as a viable occlusal indicator. In fact, the literature does not support articulating paper as being accurate or reliable. Carey et al. [1], using 600 paper marks, showed no direct relationship could be found between paper mark size and applied occlusal load. The authors concluded when clinicians select teeth to adjust, they should not assume the size of paper markings can reliably describe a contact’s force content [1]. Qadeer et al. [2] showed that the largest paper mark in a quadrant was on the most forceful tooth in that quadrant only 38.3% of the time. These findings indicate that the majority of the time, the largest paper mark in a quadrant is not the most forceful contact. Schelb et al. [3] found that paper mark size is proportional to paper thickness, not to the applied occlusal load. Similarly, Saad et al. [4] used articulated epoxy casts to crush articulating paper at three distinct loads (50 N, 100 N, and 150 N), where the resultant paper mark sizes did not appreciably increase, despite the load doubling and tripling. The authors found that as the load doubled and tripled, the paper mark sizes decreased, instead of going up in size. The study reported that paper thickness resulted in the different paper mark size differences, which is unrelated to the applied load. Confounding things further, articulating paper demonstrates a high degree of making false positive markings [5].

Kerstein and Radke [6] asked 295 dentists to look at the same paper markings, and found clinician interpretation of the paper marks varied widely. Their study revealed the 295 dentists chose correct contacts only 12.8% of the time when using the principles of mark size and color-depth as indicators of occlusal force levels. Importantly, 95% of all participants scored 3 or less correct out of a possible 12, where many of those participants scored 0 out of 12 correct.

No literature exists that supports the measurement of occlusal force or occlusal timing can be accomplished with
When Kepler found his long-cherished belief did not agree with the most precise observation, he accepted the uncomfortable fact. He preferred the hard truth to his dearest illusions. That is the heart of science. (Carl Sagan)

Disclosure statement
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References

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The entire dental marketplace is changing from analog systems to digital. One example of this transition is dentistry moving away from 2-D film-based x-rays towards 3-D digital cone beam radiographs. This allows computer guided implant surgery using milled stents for greater control. This change has occurred because those placing implants wanted a better result for their patients by embracing the advantages of technology.

If I were to advocate a common unifying concept, it would be to measure occlusion as much and as often as you can, regardless of your occlusal paradigm. Once you do this, you will be left with the uncomfortable realization that some of what we were taught is not correct.