Editorial

**Change is Inevitable:
make it evidence-based improvement rather than convenience-based**

Clinical care delivery in dentistry continues to evolve and progress through advances introduced by new or adapted hardware technologies with examples such as high-speed contra-angle handpieces, lasers, CAD-CAM, digital dentistry among many other devices and processes. These innovations, once proven to be cost-effective, reliable and not to mention well-accepted by patients, typically are implemented fairly quickly and widely throughout the profession. This rational ability to accept changes that better the patient's oral health is critical for dentistry to stay relevant. My own area of expertise is polymer-based materials science and while dentistry has embraced many preventative aspects of oral healthcare, the clinical practice of dentistry still remains heavily dependent on direct-placement, resin-based composite materials that can immediately restore or even improve a patient's dental form and function. Obviously, there are many situations where implants or an array of prosthodontic interventions are required to provide the successful indirect structural restoration of teeth. However, there is a broad palate of direct filling composite materials available and it may provide an informative example to consider what prompts changes in these materials as well as how the institution of those changes affects the practice of dentistry.

The enabling pioneering advances that launched composites as practical restorative materials were the demonstration of acid-etched bonding to enamel by Buonocore combined with Bowen's development of BisGMA as a monomer for high-strength, moisture tolerant, filled polymers. While a range of sometimes subtle to more dramatic changes have occurred in the resins and fillers used, let me use the polymerization initiation process as a focal point here, early versions of these esthetic materials were two-part, self-curing formulations that later gave way to single-part, UV-cured composites, which then progressed to the now ubiquitous visible light-activated restoratives. Each of these evolutionary changes in the curing reaction process occurred with sound scientific rationale as well as the aim of simplifying and/or speeding up placement process. The initial redox initiation system was not ideal because of inconsistencies associated with mixing-induced porosity, lack of precision when combining two pastes and limited working times. With the advent of photo-activation, the need for mixing was replaced by an on-command curing process; however, the UV exposure was a concern for soft tissue and ocular damage as well as its modest depth of cure potential. Visible light irradiation solved these problems reasonably well but the photocuring process continues to be refined based on new initiating systems and more powerful LED outputs that can be matched to particular photoinitiator strategies in composite formulations with good light transmissive properties. The success achieved with the photopolymerization of dental composites has now led to an interesting quandary of how far this process can be pushed. Manufacturers are clearly interested in devising and marketing composites and curing lights capable of very rapid curing of thick layers or bulk placements. Dentists want time saving convenience but certainly not at the expense of their patients. Some companies are more aggressively pursuing this open-ended quicker/deeper photocuring target while others are demonstrating a more cautious approach while nevertheless also moving towards the same goal. Reputable quick and deep curing materials are being developed and evaluated *in vitro* and *in vivo* but at this stage, the wise assumption would be healthy skepticism in the absence of compelling, relevant clinical trial results.

The Minamata Convention on world-wide use of mercury singled out dental amalgam as the only mercury-added product subject to a phase-down rather than an outright ban or a stipulated phase-out period. This mandated mercury phase-down statute only accelerated the transition that was already well

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underway towards composite restoratives. The reasons for the shift to composites includes practitioners' comfort level working with the fairly complex bonding and curing techniques, continued material improvements and the fact that patients have developed esthetic expectations even regarding the placement of posterior restorations. While convenience and efficiency promoted by rapid/bulk fill photocuring options from the practitioner's perspective are clearly a positive consideration, unless companies can convincingly provide relevant clinical trial data, a dentist following some of the claims currently being made would be undertaking their own poorly controlled clinical trial with a lack of informed patient consent. This is not a defensible position in any case but surely not when justified by faster turnaround times in the clinic.

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