

Adhesive Dentistry – What’s all the fuss?

Tremendous attention and effort continue to be directed to the study of dental adhesion. But haven't we come far enough? Isn't the bond to tooth structure adequate for clinical success? Some may think so, but obviously a journal dedicated to dental adhesion believes we still have much yet to be achieved. As one of the few truly disruptive technologies in dentistry,¹ adhesive dentistry, through reliable bonding to tooth structure in all its various forms and conditions, can provide minimally invasive restorative, reparative and preventive services. With all the possible treatment options adhesive dentistry brings, the greatest need for society comes from the global burden of dental caries. This challenge requires effective, low-cost services; adhesive dentistry, especially direct dental restorations, can meet such a demand.

My interest in adhesive dentistry was formed in 1991 when I attended the International Symposium on Adhesives in Dentistry hosted by Creighton University. The symposium was held in honor of Ralph Phillips of Indiana University. Dr. Rafael "Ray" Bowen, arguably the father of adhesive dental composites, who we lost in April at the age of 94, presented on the chemical interactions with the tooth substrate and described the mechanism of adhesion as chemomechanical. This symposium made clear that we were just beginning to appreciate the complexity of the dental substrate, especially dentin, and our limited understanding of chemical interactions with the tooth.

During this time period as well as thereafter, regardless of knowledge gaps, some stated that bonding agents were "good enough". When dentin shear bond strength approached that of enamel, or when dentin cohesive failures occurred during testing, then surely it was "good enough". Later came a better appreciation of testing mechanics and the need to evaluate bonding, if we are to make advances in clinical success from the perspective of durability. Continued investigations have led to a better understanding of the mechanisms of adhesive degradation, the dentin extracellular matrix and pulpal biology. This work has helped put the "bio" in adhesive biomaterials. Working toward an even deeper understanding of the biology of the pulp, the dentin extracellular matrix and dental repair can lead to improved dentin adhesion, and may provide scientific

advances beyond the field of dentistry. However, that said, I would contend that the past 30 years have shown only incremental improvements in dental adhesive development. The currently marketed multi-mode, multi-substrate universal dental adhesives, although certainly better than earlier self-etch adhesives, have not proven to provide superior, or even equivalent, adhesion to enamel and dentin compared to the gold-standard multi-step adhesives available in the 1990s.

We are not there yet; improvements are needed in longevity, technique sensitivity, and application in non-ideal isolation and non-traditional patient-care settings. Dental adhesion is not just for replacement of tooth structure lost due to disease and trauma, or for esthetic services; research developments are needed for dental repair and prevention. It is not yet good enough, and continued research and development is required to achieve our goals.

"Those who are governed by reason desire nothing for themselves which they do not also desire for the rest of humankind." (Baruch Spinoza)

A handwritten signature in cursive script that reads "Steve Armstrong".

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REFERENCE

1. Bayne S. Beginnings of the composite revolution. JADA 2013;144: 880-884.