

The dawn of adhesive dentistry

Dear Reader,

Minimally invasive adhesive restoration has now become the standard means of treating carious lesions. Adhesive resin materials are used in routine dental practice every day. This tooth-substance saving approach is believed to have been first established by Dr. Takao Fusayama (1916–2003).

Now, almost 38 years have passed since Dr. Takao Fusayama published his novel paper on the total-etching technique in the *Journal of Dental Research* (vol 58, 1979). Dr. Fusayama introduced the total-etching technique with phosphoric acid to achieve enamel and dentin bonding, with Clearfil Bond being expected to chemically bond to the dental tissues. It is considered to be the first product combining the etching and rinsing steps, now called the “etch-and-rinse” technique. Another very important innovation which appeared at the same time was the technique of removing the outer carious lesion of dentin, but leaving the inner carious dentin in place. Dr. Fusayama divided the dentin carious lesion into two layers, that is, the outer lesion and the inner lesion. In his several papers on dentin caries, the outer lesion was defined the layer with bacterial invasion and irreversible deterioration of collagen, while the inner layer was defined as that part of the lesion without penetration of bacteria. Collagen in the inner layer was also confirmed to be slightly damaged, but reversibly so. Demineralization and softening, as well as morphological change including occlusion of tubules, are typical characteristics of the inner lesion. As a consequence of these insights, the clinical procedure of removing the outer lesion after its identification with a caries-disclosing dye was developed. Dr. Fusayama used to say that his research on dentin caries was initiated by a question from a student: “Which part of carious dentin should be removed?”

The establishment of the clinical procedure to selectively remove outer carious dentin increased the value of

adhesive dentistry. If caries removal in adhesive dentistry were the same as in the conventional approach, and the cavity walls consisted of intact dentin, adhesive dentistry would not be the overwhelming success it is today. Thanks to this technique, the sensitivity of the tooth during preparation was drastically reduced and the injection of anesthetic was not required in most cases.

Post-operative tooth sensitivity is still discussed among clinicians. However, if the tooth is not sensitive during cavity preparation, it is also not observed postoperatively. Thus, in most elderly patients, the injection of anesthetic will also not be necessary, which is a great advantage for both patients and dentists.

We should bear in mind that dentin as the adherend is highly variable. In fact, dentin is modified by many factors such as caries, aging, erosion, etc. The literature repeatedly reports the difficulty of bonding to altered dentin. Furthermore, clinical factors influence bonding, even with the latest, excellent adhesives. For the improvement of minimally invasive adhesive dentistry, I believe we should solve these problems.

There is no doubt that implantology and adhesive dentistry have provided innovation in dental treatment. The achievement of Dr. Takao Fusayama was not only the development of adhesive materials, but also establishing the minimally invasive adhesive restoration technique.

In keeping with his ground-breaking ideas, the *Journal of Adhesive Dentistry* continues to promote adhesive dentistry and the respective developments in clinical treatment.



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