Effectiveness of Adhesives (9/05)


Three mechanisms of adhesion are currently in use with modern adhesives (i.e., etch-and-rinse, self-etch, glass ionomer). Etch-and-rinse (aka total etch) adhesives include a separate phosphoric-acid gel while self-etch adhesives condition and prime simultaneously without rinsing. Glass-ionomers are still considered the only materials that are self-adhering to tooth structure. There is an obvious trend to develop adhesives with a simplified and more user-friendly application procedure.

The purpose of this paper was to review the current literature on the clinical effectiveness of contemporary adhesives when used to restore cervical non-carious class-V lesions. Retention rates of restorations per adhesive published from January 1998 to May 2004 in peer-reviewed papers as well as IADR-AADR and ConsEuro abstracts were included. The annual failure rate was determined per class of adhesive (i.e., three- and two-step etch-and-rinse; two- and one-step self-etch; glass-ionomers). Kruskal-Wallis analysis and Dwass-Steel-Chritchlow-Finger pairwise comparisons were used to determine statistical differences between the annual failure percentages of the five adhesive categories. Eighty-five clinical trials were published in the studied time frame. The annual failure rate for each type of adhesive system is shown in the graph. The best clinical performance was recorded for the glass ionomers. Most of them were actually restorative materials. Fuji Bond LC (GC America, Alsip, IL) is the only commercially-available resin-modified glass ionomer adhesive. The three-step etch-and-rinse and two-step self-etch adhesives showed a reliable and predictable clinical performance, while the two-step etch-and-rinse performed less favorably. A poorer clinical performance was noted for the one-step self-etching bonding agents.

DECS Comment: Although there is a trend towards adhesives with simplified application procedures, simplification so far appears to induce loss of effectiveness and increased technique sensitivity. The simplified adhesives (i.e., two-step etch-and-rinse, one-step self-etch) were developed by combining steps (i.e., primer and adhesive of the three-step etch-and-rinse; conditioner/primer and adhesive of the two-step self-etch). Although this review of clinical studies was able to discover overall trends in the various classes of adhesives, the effectiveness of an individual adhesive may vary within the class. Specific formulation may result in a particular adhesive performing much better or poorer than average. The authors feel that the three-step etch-and-rinse adhesives remain the “gold standard” to compare the performance of new resin-based adhesives.

Although laboratory testing of contemporary adhesives has been shown to estimate clinical effectiveness, the ultimate test remains a clinical trial. Studies involving non-carious class V lesions are ideal because they are widely available with minimal preparation necessary and unforgiving (i.e., ineffective bonding results in loss of the restoration). Almost 60% of the published studies were abstracts, which may be due, in part, to the rapid evolution of dental adhesive technology. The authors feel that study methodology needs to be standardized better. In many studies, patient-related factors, such as age, oral hygiene, occlusal loading and dentin sclerosis are more important determinants than any material property. Also, longer observation times, up to 5 years and longer, are needed.