



Evidence-Based Dentistry, Dentists, and Dental Materials

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The profession of dentistry has changed dramatically in the 39 years since I graduated from dental school in 1967. Some of the changes have been wonderful and include the well-documented reduction in dental caries amongst large segments of the population, the development of predictable adhesive restorative dentistry permitting minimally invasive procedures, and the discovery of predictable osseointegration with titanium implants, which has significantly changed approaches to treatment planning.

In my opinion, other changes have had a negative contribution. Some of these include the increase in advertising and direct marketing by professionals to the public, and the frank commercialization of dentistry that has become apparent in recent years. Other changes have been equivocal, with both benefits and negative effects. The tremendous emphasis on esthetics that has consumed both society in general and the dental profession specifically has both

a positive and a dark side. Practitioners are thrilled and gratified by being able to dramatically improve a patient's smile and overall esthetic appearance, often in a minimally invasive manner. With proper data collection, diagnoses, treatment planning, and execution, it is possible to take very difficult clinical situations and transform them into smiles of beauty through complex multidisciplinary therapy that may take many months or even years of treatment. On the other hand, we have seen "complete makeover" treatment plans that represent unacceptable compromises in the long-term quality of care. We also have witnessed atrocities of unnecessary treatment trumpeted in some of the trade publications where patients receive 28 units of unneeded bonded ceramic restorations in two appointments based on a misguided preconceived notion of an optimal occlusal position that is not supported by the scientific literature. One wonders if adequate informed consent was given by patients in these situations.

One area that has become a source

of considerable confusion for practicing dentists is that of selection and manipulation of contemporary dental materials. Many years ago when I first began practice, there were only a handful of materials to choose from. Manufacturing firms were managed by scientists and generally, products had considerable clinical testing prior to being brought to market. Today, most of the dental manufacturers are part of a large multinational conglomerate, and most are dominated by marketers who are primarily responsible for the financial bottom line. Products are being brought to the market with virtually no clinical testing. In fact, general dentists are doing the clinical trials for the manufacturers, without the protection normally afforded by industrial review boards.



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Practitioners must be cautious of claims made by manufacturers or manufacturer's skills and must demand that appropriate "evidence" be generated before using new products. For most restorative materials, that "evidence" should come from properly conducted clinical trials. The reality is these clinical trials are rarely, if ever, conducted. This is partially because of the inherent expense involved, and partially because of the time required to generate meaningful data. By the time the trial is conducted and the article describing data from the study submitted for publication, most materials will have evolved into a substantially different product, and the generated data will be of minimal value.

For example, the exponential development of dental cements has caused considerable confusion amongst many practitioners. Several years ago, a number of manufacturers introduced new resin-modified glass ionomer cements to the profession with the usual accompanying claims and marketing hype. Several brands have now stood the test of time and are used extensively for the cementation of cast gold and porcelain fused-to-metal restorations. However, one specific brand, introduced by a reputable manufacturer, had a significant problem of postcementation expansion. This was caused by the hydrophilic nature of one of the cement's components, and water sorption resulted in postcementation fracture of all-ceramic crowns and some teeth restored with cemented dowels and cores. (Resin-modified glass ionomer cements should really not be used in these specific situations). Needless to say, both the manufacturer of the cement and the general dentists have been subject to a considerable amount of litigation, which is time-consuming, costly, and emotionally draining.

There is plenty of blame to share in this example. The manufacturer should not have brought the product to market without more extensive testing,

and should have recalled it as soon as anecdotal reports of catastrophic failure began to appear. Gurus should not have recommended use of this cement in the absence of any amount of clinical evidence. And finally, dentists should not have been using that type of cement in those specific clinical situations, and certainly should not have been using a new type of cement that had virtually zero clinical documentation. At the time, there were plenty of reliable, time-tested cements available.

Today, we have a similar situation with adhesive bonding agents. Dentists and manufacturers seem to have lost sight of the fact that the most critical bond in adhesive restorative dentistry is the acid-etched enamel-resin

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bond. Many contemporary (sixth or seventh generation) dentin bonding agents seem to have solved the problem of postoperative sensitivity, but don't provide an adequate bond to uncut enamel (which is responsible for sealing the margins). Technique modifications can likely solve this problem, but in the meantime, dentists who have used these agents are anecdotally reporting staining of the enamel margins as a function of time. This, of course, is a sign of microleakage that will likely eventually lead to recurrent caries.

One additional contemporary area of confusion is that of all-ceramic

crowns. Currently there are a myriad of all-ceramic systems available, and all are being aggressively marketed with undocumented claims of superiority and longevity. Most dentists in North America continue to utilize porcelain-fused-to-metal restorations, PFMs, as the predominant esthetic restoration in their practices because these restorations provide the best combination of reasonable esthetics with maximum longevity. However, because of the intensity of the marketing for all-ceramic restorations, many of these same dentists feel somewhat insecure about the decision to continue to use PFMs. While a few of the contemporary all-ceramic systems can provide a superior esthetic result, and most are stronger than a traditional feldspathic porcelain jacket crown, the truth is that an all-ceramic restoration will generally have a shorter life span than a PFM.

Practitioners must understand that the primary mode of failure for all-ceramic crowns is fracture, and that providing a stronger material does not necessarily improve the rate of survival. This is because ceramic restorations fail due to propagation of microscopic defects (Griffith's flaws) that are inherent in the restoration due to the fabrication process. Thus, a material may possess dramatically superior physical properties such as compressive strength, flexural strength, fracture toughness, etc., but this will not automatically translate into superior clinical performance unless the fabrication process results in the elimination of flaws.

It has been proposed that clinicians should only consider using an all-ceramic system when clinical trials have established a survival rate of 95 percent at five years.¹ Almost none of the currently available all-ceramic systems can satisfy this criterion, especially if posterior tooth restorations are considered.

The current call for practitioners to practice evidence-based dentistry is laudable and must continue. The evidence base available is sadly defi-



cient and not readily accessible to the average practitioner. What evidence is available must be conceptualized into a working philosophy for the general practitioner. And, it should be clearly understood that the general practitioner is faced with additional overwhelming challenges.

First, they find themselves managing a serious small business, which they were never educationally trained to manage. This is extremely stressful, and is only complicated by the myriad of bureaucratic regulations that have been enacted in recent years. In addition, the practitioner often must also manage a large staff with emotional differences that Freud could not comprehend, and these practitioners also have nondental lives where they attempt to be exemplary husbands/wives, mothers/fathers, coaches, scout leaders, etc. Given that these significant demands are a reality for most dentists, it seems unreasonable to expect that they can keep pace with the current epidemic of peer-reviewed literature. Thus, practitioners must adopt a strategy that will allow them to provide dental care that is reasonably evidence-based.

It is clear that clinicians must adopt a cognitive strategy to survive in the contemporary environment. First, general dentists should make the conscious decision that they do not want to practice "at the leading edge." This is a role that should be played by researchers and universities. New products should be tested in well-designed clinical trials where patients give true informed consent, and both the treating dentists and patients are protected by trial reviews by existing IRBs.

Second, dentists must become skeptical consumers of information provided by manufacturers and lecturers, who are often simply shells for industry. They

must demand valid clinical evidence for materials and procedures, and in the absence of such data, should refrain from using the recommended products. Quality continuing dental education is important in this process, and practitioners should listen to the "experts." Again, the dentist is cautioned not to accept blindly the recommendations of lecturers, and to learn to listen to the

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"experts" with a healthy level of skepticism. It must be sadly noted that many so-called "experts" are simply paid shells for manufacturers and the fact that they are being paid to deliver a specific message is often not disclosed.²

Once dentists have decided to utilize a new product or material in the practice, it is incumbent upon them to be certain they understand the nature of the product. Is there a specific preparation design essential to success? Is there a specific required margin configuration or luting protocol? Finally, the clinician has the responsibility of introducing the new product/material into the practice in a graduated sequence. Wherever possible, the product should be used experimentally on an extracted tooth, so that the clinician becomes familiar with the manipulative characteristics of the material. It should be used in a

few situations where it is clearly indicated and the results evaluated. If the initial results are positive, then it might be tried in a few situations where the envelope of comfort is being pushed. After evaluation of the clinical results, coupled with evidence external to the practice, the intelligent clinician will then establish the utility of the product in their practice.

In summary, the contemporary dentist has an exciting armamentarium of materials and techniques with which to help patients. New materials and techniques are being introduced at an exponential rate. Manufacturers have the responsibility to adequately test materials before introducing them to the market, and also have the responsibility to factually represent their products in their marketing.

Lecturers have the responsibility to research the facts regarding materials and clearly indicate to their audience what statements are supported by evidence and which statements are merely opinions. They also must disclose any financial connections they have with manufacturers or with specific products. Dentists cannot afford to be passive consumers of information from either manufacturers or "experts." They must exercise healthy skepticism, and demand that information providers support their recommendations with reliable clinical evidence. We can only continue to provide ethical, evidence-based dentistry for our patients if all parts of the "team" live up to their clearly defined responsibilities. **CDA**

References / 1. Schärer P, All-ceramic crown systems: Clinical research versus observations in supporting claims. *Signature* 1-3, 1996.

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