A Revolution in Implant Dentistry

The world experienced the Industrial Revolution in the late 18th and early 19th centuries. Society moved from domination by manual labor and agriculture to domination by industry and manufacturing. With this came the regrowth of cities and new concentrations of wealth and power.

One of the primary factors that led to the Industrial Revolution was the recognition that interchangeable parts were necessary to allow the mass production of virtually any product. This was particularly true in the 2 disparate industries of sewing machinery and firearms, where previous generations of equipment had been created by hand. Not only did interchangeable parts allow for the more rapid fabrication of devices, it also allowed easier repair, improved maintenance, and higher overall reliability.

And so it is in the dental implant industry that we are witnessing the early phases of our own industrial revolution. Today the commitment to artistic, handmade devices is limited to implant-supported prostheses, while mass production is used in the fabrication of implants and related implant components. This dichotomous approach, with custom-made definitive restorations being placed on manufactured implants, is probably a necessity given the nature of human anatomy. Having said this, it certainly is the goal of the clinician to provide as many machined solutions as possible. Today this means that the use of robotics, imaging, rapid tissue prototyping, computer-assisted design, and computer-assisted manufacturing create the promise of interchangeable parts even when custom designs are required.

Perhaps the biggest obstacle facing implant dentistry is simply its massive nature. Around the world there are literally hundreds of companies fabricating dental implants or associated components. If the auto industry had as many manufacturers relative to units sold as the implant industry has, there would be about ten thousand auto manufacturers worldwide. The disadvantage of having so many manufacturers relates to the novelty of the designs employed by the manufacturers, which can result in diminished ability to repair components damaged in function.

How often does a patient present to an office for the management of an implant-related complication only to find that the clinician can not identify the implant or the components associated with that implant? The patient looks at the implant as a simple device that should be amenable to management from any knowledgeable clinician. Conversely, clinicians demonstrate knowledge of some implant systems but clearly cannot be the masters of hundreds of systems and thousands of designs. Thus a patient seeking care may not be able to identify an individual who is familiar with his or her specific implant needs. In such a situation the patient is left without an advocate. It may not be possible for the individual to return to the initial practitioner, who may have retired or moved. Even if the practitioner can be located, he or she may have changed implant manufacturers without having stockpiled sufficient inventory to manage previously treated patients. In these situations the patient feels abandoned by the individual practitioner and may also feel frustration toward the profession in general.

As I look through my boxes of implant prosthetic supplies I am able to reminisce about the various designs that have come and gone. A great example is found in the way we connect prostheses to implants. In the early days most implant-supported prostheses could be managed with simple slotted screwdrivers. Clinicians, however, quickly saw that slotted screwdrivers exhibited no link between the driver and the screw and demanded that the industry create screws with internal orientations that would hold to the driver. (Although a little wax on the driver was quite effective at uniting driver and screw, this was not deemed acceptable by the clinicians.) Soon after the development of the internal connectors on retentive screws, the industry created a plethora of geometric shapes to address the concerns of the clinicians. It appears that industry was very successful in creating new shapes and dimensions that were mutually incompatible with previous generations of shapes and dimensions. As the designs change, the number of boxes of nearly obsolete screws and drivers continues to grow. Today I have a cornucopia of components that may, upon my retirement, make a nice museum of implant industry antiquities.

The most disturbing part of this inventory nightmare comes from the relative lack of interchangeability even among parts with identical labels. I recently

treated a patient who had an internally hexed prosthetic retaining screw that required a 0.050" driver. Unfortunately my box of 0.050" drivers has some that are 0.048" and others that are actually 0.0535". Fortunately for the patient our office maintains a collection of all of these slightly different driver dimensions. Had this not been the case the patient and practitioner might have fallen into fits of despair.

This example may seem trivial to some, but I disagree. I see issues such as this as examples of needless complexity and wonder whether the compartmentalizing of implant components on the basis of brand retards the general acceptance of implant dentistry within the larger dental community. Through information presented in journals such as this one, we know that dental implants are at least as successful as traditional dental care—if not more. Yet the use of implants to support dental prostheses is far less common than traditional methods. Would the situation improve if there were more standardization within the industry?

What does this portend for the industry? Looking back a few hundred years we saw an awakening of society when industry made it easier to produce the necessities of life. Perhaps this industry could work toward standardized components to further the spread of implant dentistry. In the interim, implant societies such as the Academy of Osseointegration and the Association of Dental Implantology (United Kingdom) are collaborating to identify databases that may be useful to practitioners who encounter implants of unknown origin in clinical practice.

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