Technology promises to be the driver of medical and dental advances in the years to come. New imaging modalities, better diagnostic and therapeutic strategies and even improvements in data storage and the implementation of electronic medical records are all changing health-care delivery as we know it. Beyond novel ultrasonic scaling devices and cone-beam computed tomography, however, lies the next phase of innovation, pioneered by scientists in a lab working on what once might have been described as science fiction. Their use in modern implant dentistry is not too far off. Here’s what lies ahead...

New drug slows alveolar bone loss in the jaw

A 2010 New England Journal of Medicine article highlighted a new concept to approach to alveolar bone loss seen in patients with chronic, severe periodontitis.1 Teriparatide—a parathyroid hormone (PTH) analog and a drug more commonly used in the treatment of osteoporosis—used daily for six weeks was shown to increase alveolar bone volume, strength and density. The drug stimulates osteoblasts that will elicit osteoconductive phases of healing and bone mass. The drug had already been shown to decrease fractures in postmenopausal women with osteoporosis.

The impact of this type of discovery on the world of dental implants is not small: that it might be used to enhance osseointegration and reduce failure rates or reduce recovery time or even, perhaps, make implants available to those who might otherwise not be thought of as good potential candidates for the therapy are all concepts for further study.

Nanodentistry

Nanotechnology is the science of small: the study of matter and its application on scales of one billionth of a meter. It is what has allowed for the development and use of smaller and smaller cellular telephones and computer processors; items that were once the size of a room are now so minuscule that they could fit into a shirt pocket. Nanodentistry has its promises as well.

On the nanoscale, drug delivery is a very different concept; coatings are particularly relevant and tissue engineering can occur at the level of an individual’s DNA. Some scientists have heralded nanodentistry as the opportunity for individuals to achieve near-perfect oral health.

Indeed, implant experts are particularly interested in what is to come in this field as it pertains to improved osseointegration of implants with various new surface technologies and preimpregnation of growth factors and mineral proteins at the level of the implant itself. The modification of osteoplastic and osteoconductive phases could yield a shorter peri-implant period and better overall outcomes. Elsewhere in dentistry, nanotechnology may be the solution to widespread oral issues such as dentine hypersensitivity and periodontitis, with novel approaches to the interception of pain receptors and the assessment of dentin tubules as well as the application of antimicrobial compounds at the precise local microenvironment.

Growing dental implants with stem cells

The debate over the use of stem cells remains somewhat controversial; still, their application in the medical and dental sciences is evolving and holds promise for the future of biotechnology and, for this reason, stem cells are of special import. Dr. Jeremy Mao and fellow scientists at Columbia University are particularly interested in growing teeth, which might one day make the traditional metal-based implants obsolete.

Mao designed an experiment using growth factors, a tooth-shaped scaffold and stem cells to see if tooth regeneration was possible with only the raw materials. In fact, results were positive and de novo alveolar bone was present with evidence of neovascularization and mineralization at the scaffold.2

All told, there are great things on the horizon for the future of implant dentistry. What will and won’t change the mainstay of functional restoration for edentulous patients remains to be seen, though these concepts certainly hold tremendous opportunity to modernize current dental care.

References
