Osseointegration: Have We Tinkered with the Process Too Much??

Recently, a group of clinicians gathered at a consensus conference convened to evaluate the state of osseointegration and pertinent literature relating to osseointegration and implant survival. The original smooth surfaced machined implant proved to be very successful over the long term with survival rates of 95% over 5 years.[1] Plasma-sprayed implants were likewise reported to have excellent survival rates.[2] It has been estimated that there are over 600 implant types. Seemingly, there is a new implant company every few months. With the rush to restore implants that traditionally required 4 to 6 months of healing, implant surfaces and shapes were modified for the primary purpose of decreasing osseointegration time and improving osseointegration. Originally, oral surgeons and periodontists were trained in the principles of osseointegration, while prosthodontists were primarily responsible for the restorative phase of implant dentistry. In North America, after the first Toronto Symposium, there was an explosion of interest in all phases of implant dentistry. Implant companies, as well as educational entrepreneurs, expanded the number of dentists involved with implant dentistry. Three- to 4-day implant courses exploded and exponentially increased the number of dentists placing and restoring implants. Today, dental school undergraduate curriculums often include courses in implant dentistry. We are at the point where almost all dental specialties are involved with implant dentistry. During this same period, use of barrier membranes and a seemingly endless number of grafting materials and biologic additives came on the market. These materials were used for implant site augmentation, socket preservation, and ridge dimension preservation.[3–9] Do these materials interfere with normal wound healing or enhance the osseointegration process? Most graft materials are not resorbable or are resorbed and replaced very slowly. While many of these materials look good on postoperative radiographs, what do they do and are they the cause for loss of osseointegration years after implants were placed? These factors, as well a host of others, have led to multiple confounding factors that call to question whether some implants may be more susceptible to loss of integration and the likelihood that one surface may be less beneficial than others. Confounding factors such as smoking, bacterial plaque (biofilm), oral hygiene, implant maintenance, diabetes, bisphosphonate therapy, and a host of other factors may contribute to initiating the inflammatory process and subsequent loss of implant integration.

The concept of socket preservation has led to a host of materials being placed into extractions sockets at the time of tooth removal. There is insufficient data relating to the long-term survival of implants placed into grafted sites. These materials may also play an undetermined role in loss of implant integration. Do these materials provide an environment for bacterial multiplication that might nurture colonization of aggressive bacteria within the biofilm?

From the podium, without concrete data or long-term evidence from studies, thought leaders have raised suspicions about the reliability of unspecified implant surfaces and to their susceptibility to infection (so called peri-implantitis). This attitude should be challenged.

The consensus group questioned use of peri-implantitis as an inaccurate description for loss of osseointegration. A disturbance of osseointegration, leading to bone loss adjacent to a previously integrated implant is likely related to inflammation and, in some cases, may lead to a disturbance of bone to implant relationship resulting in loss of integration. Peri-implant bone loss might be related to implant placement error, graft materials, and possibly the existence of a large gap between the host bone and the implant surface.

Osseo separation has been suggested as the replacement term to describe this process; however, this term is a somewhat vague. We suggest using easily understandable terms such as peri-implant bone loss (localized or generalized) as replacement terms for peri-implantitis. To date, there is an absence of convincing evidence pointing to specific bacteria and their being a causative

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factor for loss of integration. Smoking, radiation to the jaws, inadequate bone volume, trauma resulting from over instrumentation during implant placement, early implant overloading, inadequate implant maintenance, placement of implants in poorly controlled diabetics, and other factors may lead to increased inflammation and, ultimately, to loss of bone or implant loss.[10,11]

The role of dental implant maintenance should include an annual implant and surrounding tissue evaluation including a periapical radiograph. The consensus was that the periapical radiograph remains the standard method for evaluating crestal bone maintenance or bone loss. The likelihood of determining the status of crestal implant loss with panograms or computerized tomography technology is likely to produce exaggerated distortion and lead to incorrect evaluation inadequacies.[12]

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