What's New in Dentistry

Vincent Kokich, DDS, MSD

Magnesium deficiency associated with periodontal disease. Periodontitis is an inflammatory disease of the gingival tissue induced by bacteria residing in the plaque on the subgingival tooth surface. The inflammation leads to pocket formation and bone destruction. In the late 1980s, some observational studies suggested beneficial effects of magnesium on periodontitis. In fact, magnesium is one of the most abundant cations present in living cells. Is magnesium deficiency associated with periodontal disease? A study published in the *Journal of Dental Research* (2005;84: 937–941) investigated the association between magnesium status and periodontal health in a population-based analysis. The sample consisted of 4290 subjects aged 20 to 80 years. Specially trained dentists assessed periodontal status. Assessment included probing depth, attachment loss, and the number of remaining teeth. The determination of serum magnesium was performed by absorption spectroscopy. In a matched-pair study, 60 subjects using oral magnesium-containing drugs were compared with 120 subjects who did not use such drugs. In subjects aged 40 years and older, increased serum magnesium was significantly associated with reduced probing depths, less attachment loss, and a higher number of remaining teeth. Subjects taking magnesium drugs showed less attachment loss and more remaining teeth than did their matched counterparts. These results suggest that nutritional magnesium supplements may improve periodontal health.

Immediately loaded implants have high level of bone-to-implant contact. Immediate loading has become a developing paradigm after placement of dental implants. During osseointegration, bone cells migrate onto the implant surface and establish a stable anchorage on titanium. On the basis of histologic observations from animal studies, the interface of immediately loaded implants can have a direct bone-to-implant connection without any fibrous tissue formation. A recent study published in the *Journal of Periodontology* (2005;76:1823–1832) evaluated the histologic status of retrieved, clinically stable, immediately loaded implants in humans. A total of 29 implants were retrieved from patients who were treated with implants by an immediate loading protocol and fixed immediate restorations placed the same day after surgery. The loading period was between 2 and 10 months. The bone-implant interface was examined histologically and istomorphometrically. The results of this study showed that a high bone-to-implant percentage of 66.8% was found in the examined, retrieved implants. The authors conclude that the observations of the interface of retrieved, clinically stable, and immediately occlusally loaded implants showed that independent of where they were placed in the maxilla or mandible, the concept of immediate loading allows new bone formation at the interface of oral implants and a high level of bone-to-implant contact in humans.

Immune response is key to bone resorption in periodontal disease. Periodontal disease infection initiates a host immune response and bone resorption. A review of the host immune response was defined and published in the *Journal of Periodontology* (2005; 76:2033–2041). Activated T lymphocytes have been historically implicated in periodontal bone resorption. Experiments with rats have shown that periodontal disease requires antigen-specific T lymphocytes for bone resorption. Receptor activation of nuclear factors, a critical osteoclast differentiation factor, is expressed on T lymphocytes in human periodontal disease as determined by immunohistochemical analysis. Researchers have shown that T cell–mediated bone resorption is dependent on the receptor activator of NF-B ligand (RANKL). In humans, prominent T lymphocytes have been identified in periodontal disease, and diseased tissues have shown elevated RANKL expression. Mononuclear cells from periodontal lesions involving T lymphocytes induced osteoclastogenesis in vitro. In summary, a biofilm interface initiates immune cell infiltration, resulting in stimulation of osteoclastogenesis and bone resorption in periodontal disease. This resorption can be ameliorated by inhibition of RANKL activity or by diminishing immune cell stimulation.

Bisphosphonates can induce osteonecrosis of the jaws. Bisphosphonates inhibit bone resorption and thus bone renewal by suppressing the recruitment and activity of osteoclasts, thereby shortening their life span. Today, bisphosphonates are commonly prescribed to stabilize bone loss caused by osteoporosis in millions of postmenopausal women. The strategy in

the treatment of osteoporosis is to inhibit the resorption of trabecular bone by osteoclasts and hence preserve bone density. Therefore, oral bisphosphonates are routinely prescribed in women. Recently, however, painful bone exposure has been reported in this patient population who routinely take bisphosphonates. A review article published in the *Journal of Oral and Maxillofacial Surgery* (2005;63:1567–1575) evaluated 119 total cases of bisphosphonate-related bone exposure. These individuals received three different brands of bisphosphonate: Aredia, Zometa, and Fosamax. The mean induction time for clinical bone exposure and symptoms was 14.3 months for those who received Aredia, 9.4 months for those who received Zometa, and 3 years for those who received Fosamax. Eighty-one bone exposures occurred in the mandible alone, 33 occurred in the maxilla, and 5 occurred in both jaws. In the sample, 31% of the subjects presented with asymptomatic exposed bone discovered during a routine dental examination. However, 68% presented with an area of exposed bone and pain. The article concludes that complete prevention of osteonecrosis with bisphosphonates is not currently possible. For those patients who present with painful exposed bone, effective control to a pain-free state without resolution of the exposed bone is 90% effective when using a regimen of antibiotics along with chlorhexidine antiseptic mouth rinse.

Stem cells can be recovered from cryopreserved periodontal ligament. Postnatal stem cells have been successfully isolated from a variety of human tissues, including bone marrow, peripheral blood, neural tissue, skeletal muscle, epithelium, dental pulp, and periodontal ligament. Recently, human periodontal ligament stem cells were isolated and characterized as a population of multipotent stem cells capable of forming cementum and periodontal ligament tissues upon in vivo transplantation. Periodontal ligament tissue collected from extracted teeth would be an easily accessible human tissue that may serve as a practical resource for potential stem cell–mediated therapies. In a recent study published in the *Journal of Dental Research* (2005;84:907–912), researchers tested the hypothesis that cryopreserved human periodontal ligament contains retrievable postnatal stem cells. Normal human impacted third molars and attached bone chips were collected immediately after extraction from a total of 10 adults between the ages of 19 and 29 years. Periodontal ligaments were gently separated from the surface of the root and then minced into tiny pieces. This half of the sample was utilized for the isolation of fresh stem cells, whereas the remaining half of the sample was directly stored in liquid nitrogen and frozen for 3 and 6 months. After that time, these tissues were thawed rapidly and then incubated. The sample was assessed for its colony-forming capability after thawing. Then the cryopreserved periodontal ligament stem cells were transplanted subcutaneously into the dorsal surfaces of rats. This study showed that these cryopreserved periodontal ligament stem cells maintained normal periodontal ligament stem cell characteristics, multipotential differentiation, and cementum-like and periodontal-ligament–like tissue regeneration. The authors conclude that the present study demonstrates that human postnatal stem cells can be recovered from cryopreserved human periodontal ligament, thereby providing a practical clinical approach for the utilization of frozen tissues for stem cell isolation.