John Ley, DDS, Editor

IMPLANT PROSTHODONTICS

"The Effect of Fatigue Damage on the Force Required to Remove a Restoration in a Cement-Retained Implant System," by D. Kaar, Y. Oshida, C. Andres, et al. J Prosthodont, 15:289–294, 2006.

This paper evaluated the effect of cyclic loading on the retention of cemented abutments using 3 different cements: ImProv (Noble Biocare, Yorba Linda, Calif), TempBond (Kerr, Romulus, Mich) and UltraTemp (Ultradent, South Jordan, Utah). Twelve regular platform Branemark implants (Nobel Biocare) were divided into 3 groups of 4 implants and fixed in resin blocks. Each implant had a Cera-One abutment (Nobel Biocare) tightened to 32 Ncm. Gold cylinders with soldered loops were cemented to the abutments using 1 of the 3 cements. Initial testing was performed to deduce removal force prior to any other forces being applied to the abutments. After this the abutments were cleaned and recemented. The abutments were then subjected to standardized cyclic loading for a total of 50 000 cycles. After this the force required to remove the abutments was again measured. The abutments were cleaned and recemented, and the test was repeated for a total of 300 000 cycles. Thus 3 results were obtained for each cement: force to remove before cyclic loading, after 50 000 cycles, and after 300 000 cycles. The results indicated no abutment screw loosening or failure of prosthesis cement. The most retentive cement was ImProv followed by UltraTemp and then TempBond. At each of the 3 measurements, the differences between the cements were significant except for UltraTemp and TempBond after 300 000 cycles, which had insignificant differences. Before cyclic loading, Improv was 85% more retentive than TempBond and 25% more retentive than UltraTemp. After cyclic loading, the retention levels dropped for all cements. UltraTemp suffered the most loss in retention after cyclic loading. TempBond had no significant loss in retention after loading. The authors concluded that TempBond is the cement of choice because it offers the easiest removal but did loosen or weaken significantly during the test.

ENDOSSEOUS IMPLANTS

"Bone Regeneration in Dehiscence-Type Defects at Chemically Modified (SLActive) and Conventional SLA Titanium Implants: A Pilot Study in Dogs," by F. Schwarz, M. Herten, M. Sager, et al. J Clin Periodontol, 34:78–86, 2007.

This paper examined bone regeneration around 2 types of implants. Four beagle dogs had their maxillary and mandibular 3 premolars and first molar extracted bilaterally. After 4 months of healing, 6 implants were placed into osteotomies with standardized crestal buccal dehiscence defects in each animal. One half of the implants placed were roughened titanium implants (sandblasted, acid-etched), and the other half had the same sandblasted, acid-etched surface modified to create a chemically active surface. Two dogs were sacrificed after 2 weeks of healing, and the other 2 dogs were sacrificed after 12 weeks of healing. The jaws were removed and subjected to histologic and histomorphometric analysis. The results indicated that the defects adjacent to the conventional roughened implants consisted of connective tissue at both healing times. The chemically modified implants had complete bone fill at 12 weeks. The conclusion of the study was that the chemically modified implant surface may promote bone regeneration of buccal defects.

"Prevalence and Risk Variables for Peri-implant Disease in Brazilian Subjects," by S. Ferreira, G. Silva, J. Cortelli, et al. J Clin Periodontol, 33:929–935, 2006.

This study evaluated the risk variables associated with peri-implant disease in a group of partially edentulous patients. A total of 212 patients who were partially edentulous and had a total of 578 root form implants (from 3 different manufacturers) were included in the study. Smokers and those who were recently on antibiotics were excluded from the study. Patients were examined clinically and radiographically using pre-established criteria. Peri-implant mucositis was defined as the presence of bleeding on probing (BOP). Peri-implantitis was defined as probing depths of $\geq$5 mm in association with either BOP or suppuration. Radiographs were taken in those implants with probing depths of $\geq$5 mm. The results indicated that the mean loading time of the implants was 42.5% months. Peri-implantitis was present in 8.9% of patients. Peri-implant BOP was present in 73.5% of patients. The risk of peri-implantitis was associated with high plaque scores, periodontitis, and poorly controlled diabetes. In addition, healthy implants were found in females younger than 46 years of age. The time elapsed since suprastructure placement and frequency of maintenance visits did not seem to influence the results. These results suggest that poor oral hygiene, the presence of periodontitis, and diabetes play the most important role in the development of peri-implantitis.

"Modeling of the Buccal and Lingual Bone Walls of Fresh Extraction Sites Following Implant Installation," by M. Araujo, J. Wennstrom, J. Lindhe. Clin Oral Impl Res, 17:606–614, 2006.

This paper examined the bone response to immediate implants in a dog model. The third premolar and first molar of 6 dogs were used in this study. The mesial roots were treated with root canal therapy. Subsequently, full-thickness buccal and lingual flaps were raised, the teeth were hemi-sected, and the distal roots on the right mandible were removed. The buccal-lingual (B-L) dimension was then measured, and 4.1-mm-wide Straumann implants (Straumann, Waldenberg, Switzerland) were placed into the sockets. Healing caps were placed, and the flaps were sutured to allow a semisubmerged position of the implants. The roughened surface (SLA) of the implants was placed apical to the buccal bone crests. After 2 months, the identical procedure was performed on the left mandible. After 1 month of healing, the dogs were killed and the mandibles were subjected to histologic and histomorphometric analysis. The results indicated that healing was uneventful. After extraction, the B-L dimension was 3.8 $\pm$ 0.3 mm in the premolar and 5.8 $\pm$ 0.2 mm in the molars. After healing, the crestal bone healed apical to its original position and apical to the SLA surface. The gap between the implant and bone was filled in, but this was much more apical to the original crestal position. The B-L dimension was also decreased. Bone loss at molar sites was greater than at premolar sites. These results suggest that bone fill in gaps around immediate implants may occur at the expense of the crestal bone. Immediate implants failed to preserve B-L ridge dimension.

"Probe Penetration in Periodontal and Peri-implant Tissues: An Experimental Study in the Beagle Dog," by I. Abrahamsson, C. Soldini. Clin Oral Impl Res, 17:601–605, 2006.

This study examined the efficacy of probing the tissues adjacent to dental implants in a dog model. Four dogs had all their mandibular premolars and the first 3 maxillary premolars extracted bilaterally. After 3 months, 4 implants were placed in each mandibular edentulous region in a nonsubmerged fashion. The tissues were allowed to heal for 6 months, during which time plaque control was effected on a regular basis. At this time, 2 of the implants and the first mandibular molars were probed at set locations using a pressure-controlled probe. After measuring the probing depth, a metal probe tip was placed into the sulcus at the measured depth, and this probe was attached to the molar teeth and implants with a light cured composite. The animals were then sacrificed and subjected to histologic and histometric analysis. The levels of the probe depth, the levels of the junctional epithelium, bone crest, and gingival margins were quantified. The results indicated that peri-implant and gingival tissues were devoid of inflammation at the time of examination. In the implants the distance from the gingival crest to the bone was an average of 2.9 mm high. The sulcus depth was 1.7 mm, and the connective tissue 1.2 mm. The mean probe extension was 1.86 mm, 0.16 mm more than the sulcus depth. In the molar teeth the gingival height was 2.67 mm, sulcus depth was 1.74 mm, and the connective tissue 0.93 mm. The probing depth was 1.64 mm or just above the sulcus depth. The authors concluded that the probe measured similar depths in both implants and teeth and that this depth corresponded to the histologic epithelial barrier extension in the sulcus. From this they concluded that with healthy implants, probing with a moderate force is a valuable diagnostic tool.

Basic Science

"The Use of Tissue-Engineered Bone With Human Bone Morphogenetic Protein-4 Modified Bone-Marrow Stromal Cells in Repairing Mandibular Defects in Rabbits," by X. Jiang, S. Gittens, Q. Chang, et al. Int J Oral Maxillofac Surg, 35:1133–1139, 2006.

This paper describes the use of genetic engineering to modify cells in order to increase the amount of bone morphogenetic protein they produce. Bone marrow stromal cells were transfected with a plasmid containing either enhanced green fluorescence protein gene (*pEGFP*) or *pEGFP*–human bone morphogentic protein-4 genes (*pEGFP-hBMP-4*). Gene transfer efficacy was evaluated by evaluating the percent expression of *pEGFP* at 3, 7, 14, 21, and 28 days following transfer. The expression of *hBMP-4* in transfected and untransfected cells was assessed using Western-blot analysis. The 3 groups of bone stromal cells (untransfected, transfected with *pEGFP*, transfected with *pEGFP-hBMP-4*) were combined with natural nonorganic bone (NNB) and placed into standardized mandibular defects in 12 rabbits. In addition, a negative control of NNB alone was used. After 4 weeks of healing, the rabbits were killed and subjected to histologic/histometric analysis. The results indicated that the gene transfer efficiency reached a maximum of 38.2 $\pm$ 9.4%. The percent bone fill was 8.8 $\pm$ 3.1% in the NNB sites, 22.5 $\pm$ 8.2% in the untransfected cells, 18.1 $\pm$ 9.0% in the cells transfected with the marker *pEGFP*, and 32.5 $\pm$ 6.1% in the cells transfected with *pEGFP-hBMP-4*. The EGFP-hBMP group had significantly greater bone fill than the other two bone marrow stromal cell grafts. These results suggest that transfecting bone marrow stromal cells enhances their osteogenic capability by increasing *hBMP-4* production.