John Ley, DDS, Editor

Implant Prosthodontics

"Effect of Implant Angulations Upon Retention of Overdenture Attachments," by M. Gulizo, J. Agar, J. Kelly, T. Taylor. J Prosthodont, 14:3–11, 2005.

This in vitro study compared the retention of ball matrices when implants were placed at angles up to 30° from the vertical axis. Four ball abutments were placed onto 4 ITI implants (Institute Straumann, Waldenburg, Switzerland), and these implants were then placed into an aluminum jig that allowed the implants to be placed at 0°, 10°, 20° and 30° from the vertical axis. Four gold and titanium matrices were encased in custom jigs and subjected to pull-tests on the ball abutments at the 4 angles. The results indicated that the gold matrices had significantly greater retention at 0° and 10° compared with 20° and 30°. In addition, significant differences were noted comparing the retention of the 4 ball abutments and the 4 matrices. The titanium matrices did not demonstrate a significant difference in retention at the 4 angles. A much larger variation in retention was noted among the 4 titanium matrices compared with the gold matrices. The conclusion of the study was that angulations up to 30° affected the retention of the gold matrices but not the titanium matrices. The titanium matrices displayed a much wider variation in retention values compared with the gold matrices. An interesting result was the difference in retention noted among the ball abutments themselves.

Bone Grafting

"A 3-Year Prospective Follow-up Study of Implant-Supported Fixed Prostheses in Patients Subjected to Maxillary Sinus Augmentation With a 80:20 Mixture of Deproteinized Bovine Bone and Autogenous Bone. Clinical, Radiographic and Resonance Frequency Analysis," by M. Hallman, Sennerby L., L. Zetterqvist, S. Lundgren. Int J Oral Maxillofac Surg, 34:273–280, 2005.

This prospective study examined the efficacy of sinus augmentation with an 80:20 mixture of Bio-Oss (Geistlich Pharma, Wolhusen, Switzerland) and autogenous bone. The study included 20 patients who received 30 sinus augmentation procedures. In addition to the Bio-Oss bone mixture, fibrin glue was added to the graft mixture to aid in graft handling and to prevent graft particle migration. The grafted sinuses were left for 6 months before implant placement. A total of 108 pure titanium screw implants with a machined surface were placed by a 2-stage procedure. The implants were left for 6 to 8 months before uncovery. The implants were followed for 3 years postloading. The implants and the graft were examined by clinical, radiographic, and resonance frequency analysis. Accepted failure criteria were used. The results indicated that 17 of the 20 patients were available for examination at 3 years. The implant failure rates were 8.3% at uncovery and 13.9% at 3 years. Of the 15 total implants that failed, 6 were in residual bone and 9 were in grafted bone. No significant difference was noted between implant failures in residual or grafted bone. A significant correlation was noted between smoking and implant failure. No significant difference was noted between implant stability when comparing implants placed into grafted or residual bone. Total graft resorption was noted to be less than 10%. The conclusion of the study was that an 80:20 mixture of Bio-Oss and autogenous bone is a reliable method for grafting the maxillary sinus.

"Does Platelet-Rich Plasma Promote Remodeling of Autologous Bone Grafts Used for Augmentation of the Maxillary Sinus Floor?" by G. Raghoebar, J. Schortinghuis, R. Liem, et al. Clin Oral Implant Res, 16:349–356, 2005.

This study examined the effect of platelet-rich plasma (PRP) on the healing of autogenous bone used to graft the maxillary sinus. Five consecutive patients had bilateral sinus grafts performed with iliac crest bone. In a random fashion, PRP was added to the graft in either the left or the right sinus. The PRP was collected by the Platelet Concentration Collection System (3i Implant Innovations Inc, Palm Beach, Fla). All grafts were placed before implant placement. Implants were placed into the grafted bone after at least 3 months of healing. At that time, 3 core biopsies were obtained bilaterally with a trephine drill. Implants were uncovered 6 months after placement. All patients received implant-retained overdentures, and the implants were followed for 20.2 ± 4.3 months. The patients were evaluated clinically, and the core biopsy samples were examined by microradiography and light microscopy. The amount of growth factors present in the blood and PRP was tabulated. Investigators who were blinded as to which side received the PRP performed

all the evaluations. The results indicated similar healing and complication rates for both sides. One implant (of 30) was lost on a side that received PRP. Histologic, histomorphometric, and radiographic assessment demonstrated no significant difference between the PRP and the non-PRP grafted sinuses. The conclusion of this study was that PRP had no effect on the healing of autogneous bone placed into the maxillary sinus. A weakness of this study is the small number of patients.

"Ectopic Bone Formation by Microporous Calcium Phosphate Ceramic Particles in Sheep Muscles," by D. Le Nihouannen, G. Daculsi, A. Saffarzdeh, et al. Bone, 36:1086–1093, 2005.

This study examined the osteoinductivity of microporous biphasic calcium phosphate (MBCP) in a sheep model. The MBCP mixture is composed of hydroxyapatite and beta-tricalcium phosphate in a 60:40 ratio. The MBCP granules were implanted intramuscularly into the lumbar regions of 8 adult sheep. Each sheep had 1 implant placed bilaterally. Six months after placement, the sheep were killed and the tissues and graft were subjected to histologic and histomorphometric examination. This analysis revealed that the grafts were well encapsulated by normal muscle tissue. Bone formation was noted in close contact with the MBCP granules, with bridging of the granules by trabeculae of the ectopic bone. The quality of the bone present was comparable with spongious bone. The conclusion of this study was that MBCP is osteoinductive and therefore capable of inducing bone formation in ectopic sites. The mechanism of this phenomenon by synthetic biomaterials is not known, but the authors propose different hypotheses in their discussion.

"Promotion of Bone Formation by Simvastatin in Polyethylene Particle-Induced Osteolysis" by F. von Knock, C. Wedemeyer, A. Heckelei, et al. Biomaterials, 26:5783–5789, 2005.

This study examined the ability of a cholesterol-lowering drug, simvastatin (Zocor, Merck, Rahway, NJ), to inhibit osteolysis in a mouse model. Wear debris present in failing hip replacements are known to activate macrophages, which induce peri-implant granulomas and lead to osteolysis at the bone-implant interface. Ultrahigh molecular weight polyethylene (UHMWPE) particles are known to cause this phenomenon. In this study, 21 mice were separated into 3 groups. All groups had calvarial defects created. Mice in group 1 received surgery only, whereas mice in groups 2 and 3 had UHMWPE placed into the defects. In addition, mice in group 3 were given simvastatin in their diets (120 mg/kg body weight). The mice were sacrificed at 2 weeks, and the calvaria were subjected to histologic and histomorphometric analysis. The results indicated that simvastatin significantly enhanced bone formation compared with both groups 1 and 2. The conclusion of this study was that simvastatin appears to both reduce osteolysis and induce new bone formation in the mouse model.

Endosseous Implants

"Oxidized Titanium Implants (Nobel Biocare TiUnite) Compared With Turned Titanium Implants (Nobel Biocare Mark III) With Respect to Implant Failure in a Group of Consecutive Patients Treated With Early Functional Loading and 2-Stage Protocol," by M. Junger, P. Lundqvist, S. Lundgren. Clin Oral Implant Res, 16:308–312, 2005.

This study compared the success rates of two types of implants in both early functional loading and traditional 2-stage implant placement and healing times. A total of 394 implants were placed into 136 consecutively treated patients. Of these implants, 199 had an oxidized surface (TiUnite, Noble Biocare, Gothenburg, Sweden) and 195 had a machined surface (Branemark Mark III, Nobel Biocare). Sixty-three patients underwent a 1-stage placement protocol, and the remaining implants were placed by a 2-stage procedure. Of the 63 patients who had the implants placed by the 1-stage method, 24 had an early functional loading protocol where implants were loaded after a mean healing time of 25 days. The remaining patients in the 1- and 2-stage groups had a mean of 17 weeks of healing before loading. All patients received fixed full arch, partial arch, or single tooth prostheses. All were followed for a minimum of 5 months postloading. The implant success rate was 100% for the TiUnite implants and 96.4% for the Mark III implants. All the failures (in 5 patients) occurred in implants placed by a 2-stage procedure. The authors postulated that the roughened surfaces may have played a role in the lack of failures with the TiUnite implants, although other factors could not be ruled out. Because 5 of the 7 failures occurred after 23 weeks of loading, the difference noted in success may have been because the TiUnite

implants were, as a group, loaded for less time. A weakness of this study was that no analysis was conducted as to whether the different success rates were statistically significant.

CASE REPORT

"The Application of Alveolar Distraction Osteogenesis Following Nonresorbable Hydroxyapatite Grafting in the Anterior Maxilla: A Case Report," by C. Aragon, R. Bohay. J Prosthet Dent, 93:518–521, 2005.

This study presents a case report of the use of alveolar distraction to correct an alveolar defect in the anterior maxilla. A 21-year-old man presented at a graduate prosthodontic clinic for restoration of his anterior maxilla. He was missing his 2 central incisors and his left lateral incisor. All had been avulsed after he was in a motor vehicle accident at the age of 13. The patient had 2 previous grafting procedures to this region at ages 15 and 18. Despite this, the region still presented with a vertical defect that would have compromised the final prosthesis. After reviewing his treatment options, the patient chose to have alveolar distraction to correct the defect. An extraosseous device was used to effect distraction (KLS Martin, Jacksonville, Fla). At the time of the osteotomies and placement of the distractor, particulate granules of hydroxyapatite were noted to be integrated in the residual ridge. A temporary prosthesis was fabricated with denture teeth attached to the surrounding dentition by using orthodontic brackets. After 7 days of healing, the distractor was activated over a 10-day period. Three months was then allowed for consolidation of the transported bony segment. Afterward, 2 root-form implants were placed in the position of the central incisors by a 2-stage procedure. Six months postplacement, implant uncovery was performed, and after a transitional phase the definitive prosthesis was delivered. The patient was followed for 12 months, at which time no esthetic or functional problems were noted. An omission in this study was a lack of radiographs both during and after distraction was performed.