John Ley, DDS, Editor

BONE GRAFTING

"Ten-Year Follow-Up of Onlay Bone Grafts and Implants in Severely Resorbed Maxillae," by E. Nystrom, J. Ahlqvist, J. Gunne, K-E Kahnberg. Int J Oral Maxillofac Surg, 33:258–262, 2004.

This paper reports on the 10-year results of autogenous bone grafts fixed to severely resorbed maxillae by using root-form implants. Thirty patients who were deemed to have severely resorbed maxillae were included in the study. The first 10 patients treated were the development group and the last 20 were the routine group. In each patient, the maxilla was grafted with autogenous iliac crest bone, which was shaped into a horseshoe before fixation. The grafts were fixated to the underlying host bone with 4 to 6 root-form implants. After a suitable healing period, fixed-detachable hybrid prostheses were fabricated. The patients were examined clinically and radiographically every 6 months for the first 5 years and then at the final 10-year visit. Of the 177 implants inserted, 48 implants failed. Three patients in the development group lost all their implants. Two of the routine-group patients were excluded from this study because one moved away and the other required further bone grafting. The success rate at 10 years was 72.8% and was 50.9% for the development group and 83.1% for the routine group. The increased success in the routine group was attributed to improved postoperative handling of the grafted tissues. When both groups were combined, a significantly greater implant loss was found in females compared with males. This was not evident in the routine group. Of the surviving implants, continual marginal bone loss was present for up to 3 years, after which bone levels remained stable. An average of 4.74 mm of bone loss was observed for both groups at 10 years. The high level of bone loss was attributed to a 3.6-mm nonthreaded conical portion on the implant type that was used. These results suggest that with operator experience (the routine group), this 1-stage grafting technique can result in acceptable long-term results.

"Tissue-Engineered Bone for Maxillary Sinus Augmentation," by R. Schimming, R. Schmelzeisen. J Oral Maxillofac Surg, 62:724–729, 2004.

This paper reports on the use of tissue-engineered bone to augment the maxillary sinus. The term *tissue engineering* describes the in vitro fabrication of a bone-graft transplant by using the patient's own cells and a suitable extracellular matrix. In this paper, tissue-engineered bone grafts were fabricated by obtaining periosteal cells from periosteal tissues harvested from each patient's mandibular angle. Periosteal cells were retrieved from the periosteum and cultured to make a cell suspension. This cell suspension was then soaked into Ethisorb fleece (Ethicon, Norderstedt, Germany) and polymerized with bovine thrombin. The cell-polymer transplant was cultured for 1 week before grafting (7.5 weeks after harvesting of the periosteum). The tissue-engineered grafts were used to augment the maxillary sinuses of 27 patients by a traditional lateral wall approach. Twelve of the patients had simultaneous grafting and implant insertion (a 1-stage procedure). The remaining 15 patients had the sinuses grafted before implant placement (a 2-stage procedure). The grafts were followed clinically and radiographically, and, in the case of the 2-stage grafts, biopsy samples of the grafted tissues were obtained for histologic examination. The results were tabulated after 3 months of healing. Good bony dimensions were obtained in 18 of the 27 patients. Histologic samples demonstrated mineralized bone tissues in the grafted areas. In 1 patient, an infection resulted in loss of the graft. No bone formation was found in the remaining 8 patients. The authors postulated that this was because of the large area grafted, because all of these failures occurred in the 2-stage patients who required larger grafted tissue. Alternatively, different cell-polymer constructs may be more viable in these situations. These results suggest that tissue engineering may, in the future, provide an excellent method to augment alveolar bone before dental implant placement.

"The Effect of High Concentrations of Antibiotics on Demineralized Bone Induction in Rats," by S. Kim, T. Chung, M. Kim, S. Lim. J Oral Maxillofac Surg, 62:708–713, 2004.

This paper examines the effect of adding antibiotics to demineralized freeze-dried bone allograft (DFDBA) in a rat model. In 72 rats, 8-mm diameter defects were created in the calvarium. The rats were then assigned to 1 of 4 groups: group 1 received no graft material, group 2 received DFDBA + saline, group 3 received

DFDBA + gentamycin, and group 4 received DFDBA + tetracycline. The rats were killed at 3, 8, and 12 weeks postgrafting. The grafted areas were then analyzed by histology and histomorphometry. The results indicated new bone formation in all the DFDBA groups compared with the control group. Little difference was noted among the DFDBA groups at 3 and 8 weeks. At 12 weeks, significantly greater bone was noted in group 2 (saline) compared with either the tetracycline or the gentamycin groups. These results suggest that DFDBA performs better when not mixed with an antibiotic in this rat model.

"Effect of Autogenous Harvest Site Location on the Outcome of Ridge Augmentation for Implant Dehiscences," by A. Veis, A. Tsirlis, N. Parisis. Int J Periodont Restor Dent, 24:155–163, 2004.

This paper compares the efficacy of 3 different harvest sites when guided bone regeneration (GBR) was used around root-form implants. Thirty-seven patients with thin ridges were assigned to 1 of 3 groups: group A = ramus, group B = mandibular symphysis, and group C = tuberosity. These patients received screw-type root-form implants in a 2-stage fashion. In each case after the implant was placed, a crestal dehiscence was present, which required GBR with bone obtained from either the ramus, symphysis, or tuberosity, depending on which group the patient had been assigned to. In each case the defect was measured (range 3–7 mm) before covering it with autogenous bone. After the bone was placed, an expanded polytetrafluoroethylene membrane was used and the tissues were closed primarily. Five of the 37 patients experienced infection and required early membrane removal. Of the remaining 32 patients, 46 implants were available for evaluation. The implants were uncovered after 6 months of healing, and after membrane removal the size of the dehiscence remaining (if any) was recorded and compared statistically with the original defect. The results indicated that both the ramus and the symphysis groups had significantly better results than did the tuberosity group. No significant difference was found between the ramus and the symphysis groups. The conclusion of the study is that when GBR is used, bone obtained from the mandibular symphysis and ramus offers better results than does tuberosity bone.

"Histomorphometric Analysis of Natural Bone Mineral for Maxillary Sinus Augmentation," by H-D. John, B. Wenz. Int J Oral Maxillofac Implants. 19:199–207, 2004.

This study examines the efficacy of using a Xenograft (Bio-Oss, Geistlich Pharma, Wolhusen, Switzerland) to augment the maxillary sinus. Thirty-eight patients were included in the study. Bio-Oss alone was used to augment the sinus of 21 patients. In 13 patients the Bio-Oss was mixed with autogenous bone harvested from the chin, and in the remaining 4 patients autogenous bone was used alone. Root-form implants were placed either at the time of augmentation or after 5 to 7 months of healing. The implants were uncovered 5 to 7 months after placement. After prosthetic loading, the implants were followed for 18 months. In all patients, a biopsy of the grafted bone was obtained 3 to 8 months postgrafting with a trephine drill. The cores were subjected to histologic and histomorphometric analysis. The results indicated that new bone was seen in all 3 groups. Biopsy samples obtained at later dates had more bone present. Slightly less bone was evident in smokers. No significant difference was found in the amount of bone formed when comparing the Bio-Oss alone with the Bio-Oss and autogenous-bone combination. Patients treated with autogenous bone alone had a greater percentage of bone present within the grafted areas. However, the volume of the graft was less than in the Bio-Oss groups. No infections occurred in the grafted bone. Of 103 total implants, 4 were lost, which were in the patients who had the implants placed at the time of grafting. These results demonstrate that Bio-Oss alone is an acceptable grafting material for the maxillary sinus.

Implant Prosthodontics

"Photoelastic Analysis of the Effect of Palatal Support on Various Implant-Supported Overdenture Designs," by K. Ochiai, B. Williams, S. Hojo, R. Nishimura, A. Caputo. J Prosthet Dent, 91:421–427, 2004.

This in vitro study examines the effects of the presence or absence of palatal support on 3 different overdenture designs. A photoelastic model of an edentulous maxilla was fabricated that had 4 root-form implants placed into the anterior region. Three different attachment systems were then fabricated by using identical dentures. The attachment systems were (1) splinted Hader bar (Attachments International, San

Mateo, Calif) with 2 distal ERA attachments (ERA, Sterngold Attleboro, Mass), (2) 4 nonsplinted Zaag 4-mm high abutments (Zest Anchors, Escondido, Calif), and (3) 4 nonsplinted Locator 2-mm high abutments (Zest Anchors). Stresses on each design were then recorded after applying unilateral forces in the right and left molar areas as well as a central force in the incisive papilla region. The same tests were then performed after an identical amount of the palate was removed from each denture. The results indicated that with central loading, stresses were concentrated at the crestal of region of the implants in the anterior region. The highest stresses were in the Hader-bar design. Palate removal resulted in greater differences in stress among designs. The Hader bar had the greatest stress, followed by the Zaag and then the Locator. Unilateral loads concentrated forces in the implants on the side that the force was applied. Higher stresses were evident in the Hader bar compared with the nonsplinted designs. Removal of the palate increased stress on the most distal implant and as well as on the contralateral implants. The conclusion of the study is that palate removal resulted in the greatest effect on the stresses placed on the implants. The differences among the 3 different attachment system designs were less significant.

"Experimental Zirconia Abutments for Implant-Supported Single-Tooth Restorations in Esthetically Demanding Regions: 4-Year Results of a Prospective Clinical Study," by R. Galuser, I. Sailer, A. Wohlwend, S. Studer, M. Schibli, P. Scharer. Int J Prosthodont, 17:285–290, 2004.

This study reports on the results of treating a single-tooth implant with zirconia abutments and cemented all-ceramic crowns. Twenty-seven consecutively treated patients received a total of 54 single-tooth external hex implants in a 2-stage fashion in the anterior to premolar regions of the mouth. Custom-made zirconia abutments were attached to each of the implants with gold screws torqued to 32 Ncm. All-ceramic crowns were then cemented on the abutments with resin cement. The patients were then seen at 1 month, 12 months, and 4 years after restoration delivery. At each visit, the implants and restorations were evaluated by clinical and radiographic parameters. By the 4-year mark, 36 restorations in 18 patients were evaluated. The results indicated that no abutment fractures occurred. Screw loosening occurred in 2 restorations. Bone loss was within accepted limits, and soft tissues displayed no abnormal responses to the abutments. The conclusion of the study is that the zirconia abutments offered sufficient stability in single-tooth implant restorations in the premolar and anterior regions of the mouth.

"Evaluation of the Accuracy of 3 Transfer Techniques for Implant-Supported Prostheses With Multiple Abutments," by M. Naconecy, E. Teixeira, R. Shinkai, L. Frasca, A. Cervieri. Int J Oral Maxillofac Implants, 19:192–198, 2004.

This paper uses an in vitro model to compare the accuracy of 3 different implant position transfer techniques. An epoxy-resin master cast was created that had 5 implant abutment analogs attached to a passively fitted cast bar. Custom trays were then fabricated, and the position of the abutment analogues was transferred by 1 of 3 techniques. In group 1, the transfer copings were splinted with steel pins joined to the transfer copings with autopolymerizing resin. The splinted copings were then picked up by an open-tray technique. Group 2 used an open-tray pick-up technique of nonsplinted square transfer copings. In group 3, a closed-tray technique was used with tapered transfer copings that were repositioned into the impression after its removal. Five transfers were made for each group. After attaching abutment analogs, stone models were fabricated. Analysis of the accuracy of the models was accomplished with strain gauges attached to the cast bar to measure the level of deformation for each stone cast. The results indicated that the splinted technique (group 1) was significantly more accurate than the other 2 groups. No significant differences were found between the 2 nonsplinted groups. These results suggest that splinting transfer copings results in the most accurate master cast.