John Ley, DDS, Editor

BONE GRAFTING

"A new 'platinum' standard for bone grafting: autogenous stem cells," by M. Soltan, D. Smiler, F. Gailani. Implant Dent, 14:322–327, 2005.

This article describes the use of autogenous bone marrow as a source for stem cells to aid in bone grafting. The article first describes the 3 mechanisms by which bone grafts can heal: osteoconduction, osteoinduction, and osteogenesis. The "gold standard" of bone grafting is autogenous bone because it can be formed by all 3 modalities. In addition, it carries no risk of disease transmission. The major disadvantage of autogenous bone grafts is the potential morbidity associated with its harvesting. Bone marrow can be used as a source for osteoblasts and stem cells. The stem cells can differentiate into osteoblasts, which act to form bone through the process of osteogenesis. The authors state that bone marrow can be safely harvested from 3 sources: the anterior iliac crest, the posterior illium, and the sternum. In general, it is desirable to acquire 2 mL of bone marrow by a needle biopsy technique described in the article. Amounts above 2 mL result in dilution of the marrow cells. Approximately 36 million marrow cells and 360 stem cells can be found in 2 mL of bone marrow. The authors recommend mixing the bone marrow with an osteoconductive scaffold such as hydroxylapatite or beta-tricalcium phosphate and a membrane to effect guided bone regeneration. The article does not give any clinical or histologic examples of using bone marrow as a grafting adjunct.

"Bone quality at the implant site after reconstruction of a local defect of the maxillary anterior ridge with chin bone or deproteinised cancellous bovine bone," by L. Meijndert, G. Raghoebar, P. Schupbach, et al. Int J Oral Maxillofac Surg, 34:877–884, 2005.

This study examined the quality of the bone when 2 different methods were used to augment alveolar ridges deficient in the buccal-lingual dimension. Fifteen patients who required augmentation of single-tooth sites in the esthetic zone of the anterior maxilla were included in the study. Five of the patients had the site augmented with a monocortical bone block obtained from the chin, 5 patients had the site grafted with monocortical blocks obtained from the chin and covered with a collagen membrane (Bio-Gide, Geistlich, Wolhussen, Switzerland), and 5 patients had the site grafted with a mixture of blood and Bio-Oss (Geistlich) and covered with a Bio-Gide membrane. The sites grafted with the chin bone were allowed to heal for 3 months before implant placement, and the sites grafted with Bio-Oss were allowed to heal for 6 months before implant placement. In all cases a bone sample from the implant osteotomy site was obtained with a 2-mm-diameter trephine drill. The implants were uncovered 6 months after placement. They were restored with a temporary crown at the time of uncovery and a final crown 1 month later. The patients were followed for an additional 12 months. The results indicated that all the implants survived. At the time of implant placement, the Bio-Oss sites were subjectively inferior in quality. Histomorphometric analysis demonstrated that the chin bone sites had significantly more bone formation compared with the Bio-Oss sites. The majority of the Bio-Oss particles did not resorb.

"Onlay augmentation versus sinuslift procedure in the treatment of the severely resorbed maxilla: a 5-year comparative longitudinal study," by J. Wiltfang, S. Schultze-Mosgau, S. Nkenke, et al. Int J Oral Maxillofac Surg, 14:885–889, 2005.

This study compared the efficacy of 2 different techniques to augment the severely resorbed maxilla before implant reconstruction. One hundred patients were included in the study. In 39 patients, the maxillary ridge was augmented with onlay bone grafts obtained from the iliac crest. Within this group, 25 patients were partially edentulous and 14 were completely edentulous. The second group of 61 patients had their ridges augmented with sinus grafts. The grafts were obtained from the iliac crest and particulated before placement. In this group, 27 patients were partially edentulous and 34 were completely edentulous. In both groups, implants were inserted 4 months after grafting. After 6 months, the implants were uncovered and restored with either a fixed bridge or a removable prosthesis. The mean period of observation after prosthetic loading was 4½ years. The bone graft levels were monitored radiographically. The results indicated that 91.5% of the implants survived in the onlay group and 94.6% of the implants survived in the sinus lift group.

This difference was statistically significant. The initial bone resorption was slightly greater after the first year in the onlay group (20%) compared with the sinus lift group (17%). The amount of resorption decreased after the first year in both groups. The authors conclude that the sinus lift operation had greater implant survival and less graft resorption.

"De novo bone induction by recombinant human bone morphogenetic protein-2 (rhBMP-2) in maxillary sinus floor augmentation," by P. Boyne, L. Lilly, R. Marx, P. Moy, et al. J Oral Maxillofac Surg, 63:1693–1707, 2005.

This study examined the efficacy of using recombinant human bone morphogenetic protein-2 (rhBMP-2) as a bone grafting material in maxillary sinus augmentations. Three groups of patients were studied. The first group of 18 patients had grafts performed with rhBMP-2 in a concentration of 0.75 mg/mL in a resorbable collagen sponge. The second group of 17 patients were grafted with a resorbable collagen sponge mixed with rhBMP-2 in a concentration of 1.5 mg/mL. The third group of 13 patients had the sinus grafted with autogenous bone. The implants were placed at least 4 months postgrafting. The patients were followed for 36 months postloading. The grafted regions were compared for ridge height, width, and density with the use of computerized tomography scans. In addition, core bone samples were obtained at implant placement. Intraoral films monitored crestal bone levels around the implants. Any immune response to the rhBMP-2 was also monitored at set intervals. The results indicated that at 4 months of healing there were no significant differences in gain in bone height among the 3 groups. The bone graft group had significantly greater increases in bone width compared with both rhBMP-2 groups. In addition, the bone graft group had significantly greater increases in bone density at 4 months compared with both rhBMP-2 groups. The 1.5 mg/mL rhBMP-2 group showed significantly greater density than did the 0.75 mg/mL group. At the time of implant placement (mean 6.9 months after grafting), histologic examination of the bone cores demonstrated bone induction by both rhBMP-2 groups. At implant placement, the bone graft was subjectively denser in the 1.5 mg/mL group compared with the 0.75 mg/mL group, which resulted in a delay in prosthetic connection. At 6 months postfunctional loading, the bone density of the rhBMP-2 groups increased to be statistically similar to the bone graft group. The percentage of patients who received dental implants that remained functional at 36 months was 62% for the bone graft group, 67% for the 0.75 mg/mL group, and 76% for the 1.5 mg/mL rhBMP-2 group. The dental implant survival rate was 81% for the bone graft group, 88 % for the 0.75 mg/mL group, and 79% for the 1.5 mg/mL group. The authors conclude that rhBMP-2 acted to induce bone formation in an amount adequate for implant placement.

"Radiographic evaluation of alveolar distraction osteogenesis: analysis of 60 cases," by R. Mazzonetto, M. Maurette. J Oral Maxillofac Surg, 63:1708–1711, 2005.

This paper examined the efficacy of using alveolar distraction to increase alveolar ridge height before implant placement. Fifty-five patients underwent a total of 60 alveolar ridge distraction procedures. The distraction procedures were performed with the use of an extraosseous distractor. A latency period of 7 days was used, and the bone was distracted at a rate of 1 mm/d. After 90 days of consolidation, implants were placed and prosthetic restoration proceeded 6 months later. The amount of distraction was obtained by panoramic radiographs before and just after distraction. The procedure was performed in the posterior mandible (51.6%), anterior maxilla (36.66%), anterior mandible (8.33%), and posterior maxilla (3.33%). The mean vertical bone gain was 5.99 mm. The mean vertical bone gain was 4.6 mm in the posterior mandible, 6.73 mm in the anterior mandible, 7.46 mm in the anterior maxilla, and 6.32 mm in the posterior maxilla. The incidence of major complications was 8.44%. This resulted in problems with activating the distractor, resulting in less than 1 mm of bone gain. The authors report the need to use onlay bone grafts after distraction in 20 cases because of a knife-edged ridge. No reports are given on the rate of implant or prosthesis survival.

"Alveolar width distraction osteogenesis for early implant placement," by Z. Laster, A. Rachmiel, O. Jensen. J Oral Maxillofac Surg, 63:1724–1730, 2005.

This paper describes the use of alveolar distraction osteogenesis for increasing alveolar bone width before implant placement. The authors used 4 prototype distractors in 9 patients who required alveolar ridge width increase before implant placement.

The technique involves a midcrestal incision in the region to be distracted. Vertical incisions are made mesial and distal to the distraction zone. The crest is minimally exposed and cuts are made at the crest and through the mesial and distal vertical incisions. By using an osteotome, the buccal plate is green-stick fractured bucally, after which the distractor is tapped into place. After 1 week of healing, the distractor is activated at 0.4 mm/d. After a 7- to 10-day consolidation period, the device is removed and implants are placed 1 day later. The implants are exposed 3 to 4 months later, followed by prosthetic restoration. The results indicated an increase in width of 4 to 6 mm. No infections occurred. Of the 23 implants placed, 22 survived. The failed implant was later replaced successfully. In one case where a buccal flap was raised at the time of distractor placement, buccal bone was lost, which resulted in exposed implant threads. Marginal bone loss around the implants was within established limits. The results of this paper suggest that this technique can be used as an effective method to widen alveolar ridges before implant placement.

Endosseous Implants

"Dental implant failure rates and associated risk factors," by P. Moy, D. Medina, V. Shetty, et al. Int J Oral Maxillofac Implants, 20:569–577, 2005.

This paper examined the relationship between various patient factors and implant success. The study included consecutively treated patients by a single surgeon during a 21-year period. A total of 4680 implants were placed in 1140 patients. The results demonstrated that implants placed in the maxilla had almost twice the failure rate of those placed in the mandible (8.16% vs 4.93%). Patients aged 60 to 79 years had a significantly greater risk of failure compared with those younger than 40 years. In addition, patients with diabetes or previous head and neck radiation treatment, patients who smoked, and postmenopausal women who were on hormone replacement therapy had significantly greater chances of implant failure. Interestingly, medically compromised patients had no increases in implant failures. The conclusion of this study is that implant failure is low and there are no absolute contraindications to implant placement. Persons with increased failure risk factors should be informed of this at the consent stage.