John Ley, DDS, Editor

Bone Grafting

"Man as Living Bioreactor: Fate of an Exogenously Prepared Customized Tissue Engineered Mandible" by P. Warnke, J. Wiltfang, I. Springer, et al. Biomaterials, 27:3163–3167, 2006.

This study reviews the results of a novel procedure that was used to grow new mandibular bone in a patient who had mandibular resection because of cancer. The outer scaffold of the mandibular replacement was custom fabricated out of titanium mesh. It was shaped based on computerized tomography data. This mesh was then loaded with hydroxyapatite blocks that were coated with recombinant human bone morphogenetic protein 7 and bone marrow–derived mesenchymal stem cells. This was then implanted into the patient's right latissimus dorsi muscle to allow for bone growth and blood vessel ingrowth. After 7 weeks the titanium mesh scaffold demonstrated osteoblast activity and was transplanted into the patient's mandible. The scaffold remained in function for a period of 13 months after transplantation. The patient died at this time because of a cardiac event. During the period of implantation, the scaffold demonstrated increasing bone density. However, there was a problem with the titanium becoming exposed, with resulting infection and areas of necrotic bone becoming evident. This was repaired by 2 procedures: the first involved localized curettage and grafting with iliac crest bone, and the second involved partially removing the mesh. In both cases, the wounds opened and required treatment with local antiseptics and systemic antibiotics. It should be noted that this patient was a smoker and drinker. The authors report that the use of an exogenous area to grow bone constructs is a procedure in its infancy and requires significant refinement to be a predictable treatment modality. They do report that they have performed this procedure on another patient with a midfacial defect. The prospect of using tissue engineering for bone reconstruction as reported in this study is an exciting and possibly significant advancement that may be used in implant dentistry in the near future.

Endosseous Implants

"Immediate Placement and Immediate Provisional Abutment Modeling in Anterior Single-tooth Implant Restorations Using a CAD/CAM Application: A Clinical Report" by N. Tselios, S. Parel, J. Jones. J Prosthet Dent, 95:181–185, 2006.

This study reports on a technique that was used to immediately restore a single-tooth implant that was placed at the time of tooth extraction. The patient had a failing maxillary right central incisor. The tooth had an apparent root fracture without any signs of infection and a normal bony and gingival architecture, with a moderately thick gingival biotype. There was no evidence of any parafunction. The tooth was extracted atraumatically, leaving the surrounding socket intact. Afterward, a 4.3- × 16-mm tapered implant was placed in the socket such that it engaged bone 5 mm beyond the root, and the final insertion torque was 45 N/cm. The implant engaged only palatal bone, had less than 2 mm of space between it and the buccal bone, and was placed 3 mm apical to the free gingival margin. A titanium abutment was then modified with acrylic resin such that it would mimic the contours of the extracted tooth and thus support the socket. The gingival margins were kept at the crest of the gingivae, and a temporary crown was fabricated such that it was not in contact. After 4 months of healing, the abutment was modified by lowering the gingival margins 1.5 mm apical to the free gingival margin. An implant-level transfer was then performed and the abutment was removed and scanned for duplication with a Procera scanner (Nobel Biocare, Yorba Linda, Calif). The final restoration consisted of a custom abutment (fabricated from the scanned temporary abutment) and a cemented crown. The results demonstrate an esthetic outcome.

"Minimally Invasive Extraction and Immediate Implant Placement: The Preservation of Esthetics" by K. Zeren. Int J Periodontics Restorative Dent, 26:171–181, 2006.

This study describes the author's technique for immediate implant placement after tooth extraction in the esthetic zone. The author stipulates that careful screening is critical for inclusion in the technique described. Included in the criteria are good systemic health and the absence of any acute infection at the surgical site. All patients are covered with antibiotics pre- and postoperatively. The procedure starts with atraumatic extraction of the failing tooth, socket debridement, and investigation of the state of the buccal plate. If 60% of the buccal

plate is intact, the procedure is performed as described. If more bone has been lost, a resorbable membrane is placed between the facial gingival tissues and the buccal plate. Then the implant osteotomy is performed along the palatal wall of the osteotomy (starting two thirds of the distance from the apex) and ensuring that the implant platform is at least 3 mm apical to the free gingival margin. Before implant placement the internal surface of the socket is laminated with a combination of freeze-dried bone allograft and enamel matrix derivative in a dimension that anticipates the amount of void between the implant and the buccal plate. The implant is then placed and the provisional appliance is modified to ensure that it supports the residual soft tissues. After 2 months of healing, a provisional crown is fabricated and worn for 2 to 3 months, after which a definitive crown is inserted. The author demonstrates 3 cases with this technique in the study, each with good esthetic results.

"Clinical and Radiographic Evaluation of Small-diameter (3.3 mm) Implants Followed for 1 to 7 Years: A Longitudinal Study" by E. Romeo, D. Lops, L. Amorfini, et al. Clin Oral Implants Res, 17:139–148, 2006.

This study examines the success rates of small-diameter implants in function from 1 to 7 years. For inclusion in this study, patients who had both small-diameter (3.3 mm) and regular-diameter (4.1 mm) implants were excluded. Thus, the study was divided into 2 groups: those who received small-diameter implants only (68 patients with a total of 122 implants) and those who received regular-diameter implants (120 patients with a total of 208 implants). The prostheses consisted of both single-tooth and fixed partial dentures. The length of implants used was either 10 or 12 mm. There were 27 patients classified as "drop outs" who were excluded because of death or an inability to be followed up appropriately. All implants were placed in a single-stage fashion and were restored after 3 to 6 months of healing. The implants and prostheses were followed by using both clinical and radiographic criteria. Established criteria were used to define failures. The success rate for the small-diameter implants was 96.1% in the maxilla and 92% in the mandible. The success rate for the regular platform implants was 97.6% in the maxilla and 93.8% in the mandible. These differences were not statistically significant. The presence of type 4 bone was determined to be a factor in failure. Implant diameter was not related to marginal bone loss. These results demonstrate similar success rates for regular- and small-diameter implants.

"Soft Tissue Around Three Different Implant Types After 1.5 Years of Functional Loading Without Oral Hygiene: A Preliminary Study in Baboons" by G. Watzak, W. Zechner, S. Tangl, et al. Clin Oral Implants Res, 17:229–236, 2006.

This study investigates the reaction to peri-implant plaque in 3 different implant types in a baboon model. Nine baboons had their maxillary and mandibular first and second molars extracted bilaterally. After 7 months of healing, 3 implants were placed in each quadrant. The implants were of 1 of 3 types: screw-shaped machined surface (Nobel Biocare, Gothenberg, Sweden), screw-shaped sandblasted acid-etched surface (Friatec, Mannheim, Germany), or titanium plasma-sprayed cylinders (Friatec). Only 1 of a particular type of implant was placed in each quadrant. The implant lengths varied between 10 and 13 mm. The implants were placed in a 2-stage fashion with the uncovery surgery 8 months after placement. Screw-retained splinted crowns were then inserted and left in function for 18 months without hygiene measures, after which the animals were killed and the jaws were harvested and subjected to histologic and histomorphometric analysis. The results indicated that all implants and prostheses survived and osseointegrated at 18 months. Histologic analysis demonstrated bone-to-implant contact with all implant designs. Analysis of sulcus depth, junctional epithelium, and connective tissue contacts did not demonstrate any difference among the implant types. Peri-implant bone loss was similar for each implant type. These results demonstrated that each implant type experienced similar soft and hard tissue reaction to plaque in this animal model.

Implant Prosthodontics

"Implant-supported Mandibular Overdentures Retained With Ball or Telescopic Crown Attachments: A 3-year Prospective Study" by G. Krennmair, M. Weinlander, M. Krainhofner, E. Piehslinger. Int J Prosthodont, 19:164–170, 2006.

This study compares the efficacy of 2 different attachment systems for retaining mandibular overdentures on 2 nonsplinted root-form implants. Twenty-five patients received 2 implants in the interforaminal region of the mandible. In a random fashion, 13

patients received ball attachments and 12 received resilient telescopic crowns to retain their overdentures. The patients were evaluated by clinical and radiographic parameters. Results indicated no difference in implant survival and soft tissue health. The telescopic crown attachments, however, required significantly less maintenance or repairs compared with the ball attachments.

"Platform Switching: A New Concept in Implant Dentistry for Controlling Postrestorative Crestal Bone Levels" by R. Lazzara, S. Porter. Int J Periodontics Restorative Dent, 26:9–17, 2006.

This study discusses a factor in submerged 2-stage implant-abutment design that may result in less crestal bone loss. Traditional thinking suggests that after implant-abutment connection, the crestal bone resorbs to the level of the first thread or approximately 1.5 to 2 mm from the implant-abutment junction (IAJ). This phenomenon occurs routinely in implants in which the abutment is the same width as the implant. The authors report that this phenomenon does not occur when the abutment is of a smaller diameter compared with the implant. This finding was discovered by accident: when larger-diameter implants (5 and 6 mm) were first introduced, similarly wide abutments were not available and 4.1-mm diameter abutments were placed on these wider implants (platform switching). Longitudinal radiographs taken on patients with these ''narrow'' abutments do not demonstrate the expected bone loss at the crest. The authors postulate reasons for this phenomenon. One speculated reason for the bone loss at the IAJ in implants in which the implant and abutments are the same diameter is that a zone of abutment inflammatory cell infiltrate (ICT) exists at the IAJ and that this ICT must be separated from the crestal bone by a zone of healthy connective tissue. Those implants with a medialized IAJ thus move the ICT inwards and reposition the ICT in a horizontal dimension to the implant platform and away from the bone, thus reducing bone loss at the crest.