

John Ley, DDS, Editor

REVIEWS

"Photoelastic Stress Analysis of Various Retention Mechanisms on 3-Implant-Retained Mandibular Overdentures," G. Celik, B. Uludag. *J Prosthet Dent*, 97:229–235, 2007.

This study compared the load transfer characteristics of 4 different attachment systems on a 3-implant mandibular overdenture model. Two photoelastic mandibular models were fabricated with 3 root form implants placed in the interforaminal region. In one model the implants were placed parallel to each other, and in the other model the middle implant was placed vertically and the two outer implants were divergent 20° from the middle implant. Four different attachment systems were used to retain the overdentures: ball with plastic matrices and metal housings (Swissplus, Zimmer Dental, Carlsbad, Calif), locator abutments and green attachments (Locator, Attachments International Inc, San Mateo, Calif), bar with yellow clips (Bredent, Senden, Germany), and bar with yellow clips and ball attachments (Bredent). To study photoelastic stress at the implants, a vertical force of 135 N was applied to the right and left first molar of the overdentures, and the results were observed using a digital camera in the field of a circular polariscope. The results grouped the stress data into low-, moderate-, and high-stress categories. The results indicated similar stress on the right and left sides. Only the results for right-side force were reported. The results indicated that the bar systems transferred the lowest stress to the implants. The locator system exhibited the greatest stress for the vertically oriented implants. All except the ball system exhibited similar stress levels to all the implants. The ball system exhibited little stress to the contralateral implant. With the inclined implants the unsplinted systems demonstrated greater stress (moderate) compared with the bar systems, which exhibited low stress on the loaded side. All systems exhibited little stress on the contralateral implant. These results suggest that the bar systems distribute less stress to the implants than individual attachments.

"Surgical Treatment of Peri-implantitis Using a Bone Substitute With or Without a Resorbable Membrane: A Prospective Study," A. Roos-Jansake, H. Renvert, C. Lindahl, S. Renvert. *J Clin Periodontol*, 34:625–632, 2007.

This clinical study examined the effect of using a bone substitute with and without a membrane to repair

defects associated with ailing implants. Of the 38 patients studied, all had at least 1 implant with progressive bone loss (≥ 3 threads) after the first year of healing and bleeding or pus on probing. The patients were divided into 2 groups: in group 1 ($n = 19$) defects were repaired with a combination of a bone substitute (Algipore, Friadent, Malmo Sweden) and a resorbable membrane (Ossequest, W.L. Gore and Associates, Flagstaff, Ariz); in group 2 ($n = 19$) defects were repaired with Algipore alone. All of the implants but one were machine-surfaced screw-type implants; the remaining implant had a roughened surface. Pre- and postoperatively, patients were examined clinically and radiographically in a standardized fashion. Medical and dental questionnaires were completed, including a smoking history. Results were compared statistically after 1 year of follow-up. The majority of the patients were either former or current smokers. The majority of the patients had periodontitis. The results showed no significant differences between the groups. The mean defect fill was 1.5 mm in group 1 and 1.4 mm in group 2. One implant demonstrated progressive bone loss after treatment. Both groups demonstrated marked improvements in probing depth reduction, attachment gain, and mucosal recession. The results indicate that use of a bone substitute is an effective method to treat peri-implantitis with or without a membrane.

"Overcorrection in Vertical Alveolar Distraction Osteogenesis for Dental Implants," T. Kanno, M. Mitsugi, Y. Furuki. *Int J Oral Maxillofac Surg*, 36: 398–402, 2007.

This article examined the decrease in bone height that can occur after vertical alveolar distraction osteogenesis (DO) is performed. Thirty-five patients had 38 distraction procedures followed by the placement of 141 implants. Patients were divided into 2 groups. Group A had DO performed on an alveolar ridge in which no surgical procedure (eg, tooth extraction, removal of a failed implant, tooth avulsion, bone fracture) had been performed within 6 months of the distraction. The second group had DO performed less than 6 months after some form of surgical intervention. Using radiographic analysis the alveolar ridge height was recorded at defined intervals: at the end of activation (T1), 3 months after consolidation (before distractor removal; T2), 1 month after distractor removal (before implant placement; T3) and after implant placement (T4). Results indicated that mean

bone gain was 9.9 and 9.5 mm in groups A and B, respectively. No significant differences were found between the groups. Total bone loss was 2.1 mm at T2 and 3.6 mm at T3. The group with prior surgical intervention had significantly greater loss. The results suggest that at least 6 months should be allowed for ridge healing before DO and that an overcorrection of at least 25% should be obtained with DO in case of relapse.

“Cyclooxygenase-2 Inhibitor Reduces Simvastatin-Induced Bone Morphogenetic Protein-2 and Bone Formation in vivo,” J. Bradley, D. Cleverly, A. Burns, et al. J Periodont Res, 42:267–273, 2007.

This study used an animal model to analyze the effects of topical simvastatin on bone growth. A total of 70 rats were used in the study. In each animal, polylactic acid domes were placed suprapariosteally bilaterally in the mandible. The domes were filled with 30 μ L methylcellulose gel with or without 0.5 mg simvastatin in a random fashion. In phase 1, 20 rats were assessed for bone morphogenetic protein-2, cyclooxygenase-2, and nitric oxide activity after being killed at 3, 7, and 14 days after implantation. In phase 2, cyclooxygenase-2 activity was blocked in 10 rats and nitric oxide activity was blocked in 10 rats. These rats were killed 7 and 14 days after implantation. In phase 3, bone formation was assessed in 30 rats by calcein labeling at 17 and 24 days after implantation and then killed at 27 after implantation. Quantities of bone morphogenetic protein-2, cyclooxygenase-2, and nitric oxide were assessed via tissue extraction, enzyme activity, or immunoassay tests. Bone formation was assessed via histomorphometry. Results indicated that simvastatin stimulated nitric oxide, bone morphogenetic protein-2, and regional bone formation. Inhibitors of cyclooxygenase-2 inhibited bone morphogenetic protein-2 and reduced bone formation. Inhibition of nitric oxide activity did not reduce bone formation.

“Autogenous Bone Graft Alone or Associated With Titanium Mesh for Vertical Alveolar Ridge Augmentation: A Controlled Clinical Trial,” M. Rocuzzo, G. Ramieri, M. Bunino, S. Berrone. Clin Oral Impl Res, 18:286–294, 2007.

This study evaluated the effect of using titanium (Ti) mesh membranes over monocortical autogenous bone grafts. Study participants were 23 partially edentulous patients. All planned to receive an autogenous bone graft to effect vertical augmentation. Twelve sites received the monocortical graft

alone (control; ramus donor) and 12 sites received monocortical grafts, which were then covered with a Ti-mesh membrane (test). In both cases the bone was secured with bone screws and voids were filled with autogenous chips. No prostheses were allowed during the healing period (4- to 6-month period). Pre- and postgrafting measurements were compared and statistically evaluated. Results indicated that the test group had an average graft resorption of 13.5%, and the control sites suffered 34.5% resorption. This was statistically significant. The Ti-mesh became exposed in 4 of 12 sites. These were handled with chlorhexidine gel application and, in one case, early membrane removal. Two cases presented required additional graft placement at the time of implant placement. In the control group, 2 cases suffered $\geq 50\%$ graft resorption. These results suggest that the use of the Ti-mesh membrane decreased monocortical autogenous graft resorption.

“Osseointegration of Anodized Titanium Implants Under Different Current Voltages: A Rabbit Study,” K. Park, S. Heo, J. Koak, et al. J Oral Rehabilitation, 34:517–527, 2007.

This study examined how anodization of the implant surface affects its ability to osseointegrate. Experimental screw-type implants were fabricated from commercially pure titanium. Control implants (group 1) were machine surfaced, and experimental implants were anodized in an electrolyte solution under increasing voltages (groups 2, 3, and 4). The implants were analyzed for morphology and pore characteristics, crystal structure, surface roughness, surface chemistry, and oxide thickness. Four implants (one from each group) were inserted into each of 20 rabbits. At 4 weeks, 10 rabbits were killed, and the implants were subjected to removal torque testing. The remaining rabbits were killed at 6 weeks and subjected to histomorphometric analysis. The results indicated that increasing voltage increased the thickness of and porosity of the oxide layer. The anodized implants had a greater surface roughness compared with the machined implants. Increasing voltage increased surface roughness of the anodized implants. Removal torque testing revealed that the rougher anodized implants had significantly greater values. Histomorphometric analysis revealed increasing bone-to-implant contact with increasing anodizing voltage. The highest-voltage group (group 4) had significantly greater bone-to-implant contact than the other groups. The results suggest that anodized implants have increased oxide layers and improve osseointegration.