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IMPLANT PROSTHODONTICS

"Stability of the Screw Joints in Patients With Implant-supported Fixed Protheses in Edentulous Jaws: A 1-Year Follow-up Study" by A. Ekfeldt, A. Eriksson, L.-A. Johansson. *Int J Prosthodont*, 17:177-180, 2004.

The purpose of this study was to examine the stability of screw joints in edentulous patients with implant-supported fixed protheses. The study examined 20 patients treated at 1 clinic over a 2-year period. All patients were treated with Branemark implants (Nobel Biocare, Goteborg, Sweden) in a 2-stage fashion. In each patient there were 4 to 8 implants placed in an edentulous jaw. All protheses were cantilevered (from 3 to 16 mm) and were fabricated of either metal/acrylic resin or metal/ceramic. Ten of the patients had a prosthesis placed in the mandible, and 10 were placed in the maxilla. Teeth opposed of all the maxillary protheses, whereas 7 of the 10 mandibular cases were opposed by a removable denture. All patients had their protheses attached to abutments using gold screws torqued to 10 Ncm. The stability of the prosthesis screws and the abutment screws were evaluated by 1 examiner using a standardized protocol for screw tightness approximately 12 months (range 9 to 13 months) after insertion. The results indicated that 4% of the gold screws (6% mandible and 2% maxilla) and 29% of the abutment screws (16% mandible and 36% maxilla) were considered unacceptably loose. There was no correlation between abutment type (3 different types were used) and cantilever length. This study suggests

that the abutment to implant joint is weaker than the prosthesis to abutment connection.

"The Influence of Occlusal Loading Location on Stresses Transferred to Implant-supported Protheses and Supporting Bone: A Three-dimensional Finite Element Study" by G. Eskitascioglu, A. Usumez, M. Sevimay, et al. *J Prosth Dent*, 91:144-150, 2004.

This in vitro study examined the effect of loading an implant-supported, single-tooth, fixed partial denture (FPD) in 1 to 3 locations on the stress distribution on the FPD and the surrounding bone. The study employed a 1-piece 4.1 × 10 mm ITI solid implant (ITI Instut Straumann AG, Waldenburg, Switzerland) with cemented porcelain fused to a metal crown (premolar with a porcelain occlusal surface) placed in a block representing mandibular bone. The implant/crown and bone block were then simulated using the 3-dimensional finite element method and were tested for stresses when 3 different vertical load distributions were applied: a single 300 N force at the buccal cusp tip, a 150 N force at the buccal cusp tip and 150 N at the distal fossa, and a 100 N force at the buccal cusp tip and 100 N at both the mesial and distal fossas. The results indicated that a 1-point contact resulted in higher stress values in both the surrounding bone and within the implant. Loading at 2 to 3 points reduced stresses on the bone and concentrated stresses within the framework and occlusal surface of the FPD. These results suggest that at least 2 occlusal contacts are desirable on posterior single-

tooth implants in order to decrease stress at the implant-bone interface.

BONE GRAFTING

"Evaluation of Platelet-rich Plasma in Combination With Anorganic Bovine Bone in the Rabbit Cranium: A Pilot Study" by T. Aghaloo, P. Moy, E. Freymiller. *Int J Oral Maxillofac Implants*, 19:59-65, 2004.

This study examined the efficacy of using platelet-rich plasma (PRP) in combination with a xenograft (Bio-Oss, Osteohealth, Shirley, NY) in a rabbit model. Fifteen rabbits had four 8-mm diameter defects created in the cranial bone. In each rabbit the defects were treated 4 different ways: Bio-Oss alone, Bio-Oss mixed with PRP, autogenous bone, and no graft (control). The rabbits were then separated into 3 groups of 5 and sacrificed at 1, 2, or 4 months after grafting. The cranium was removed and studied radiographically and histologically. The average platelet count in the PRP was 960,300/mm³. Radiographic bone density demonstrated no significant difference when comparing the PRP/Bio-Oss to Bio-Oss alone. Histologic and histomorphometric analysis demonstrated that the autogenous bone had significantly greater bone ingrowth than either Bio-Oss group. The PRP/Bio-Oss sites demonstrated greater bone ingrowth than the Bio-Oss alone. The Bio-Oss alone suffered from much greater fibrous connective tissue ingrowth compared with the PRP/Bio-Oss group. These results suggest that in the rabbit model, PRP combined with a xenograft enhanced bone ingrowth compared with

a xenograft alone. Autogenous bone demonstrated better results than either xenograft mixture.

“Localized Ridge Augmentation With a Block Allograft Followed by Secondary Implant Placement: A Case Report” by J. D. Keith. Int J Periodont Rest Dent, 24:11–17, 2004.

This paper describes the use of an allograft bone block to affect alveolar ridge augmentation prior to implant placement. A 37-year-old woman presented for implant replacement of a missing mandibular first molar. Clinical examination revealed a deficient bony ridge that prohibited implant placement without preimplant ridge augmentation. The procedure consisted of exposing the edentulous ridge, which was found to be 3 mm in width. An allograft block (Puros J-Block, Centerpulse Dental) was first rehydrated in sterile saline for 3 to 5 minutes and then contoured to fit the recipient bone. The recipient bone was perforated with multiple small holes, and the bone block was secured to the recipient site with 2 miniscrews. The graft was then covered with platelet-rich plasma (PRP) and covered with a collagen membrane. A tension-free primary soft tissue closure was then achieved. After 4 months of uneventful healing, the ridge was exposed, revealing a 9-mm wide firm ridge with the graft well incorporated into the surrounding host bone. A 6 × 13 mm implant was placed in a 1-stage fashion. The implant was restored after 4 months of healing. No long-term follow-up, radiographs, or histology were provided. The use of allograft blocks for ridge augmentation has not been well studied in the implant literature, but these results are promising.

“Platelet-rich Plasma: Ready or Not?” by E. Freymiller, T. Aghaloo. J Oral Maxillofac Surg, 62:484–488, 2004.

This review article examined the efficacy of platelet-rich plasma (PRP) when used as an adjunct in bone grafting. The authors reviewed the literature and presented results from human and animal bone grafting studies employing PRP with autogenous, anorganic bone mineral and organic bone matrix as grafting materials. The studies with autogenous bone showed favorable results in 1 human study in which there was significantly greater bone growth with the addition of PRP. Several animal/autogenous bone studies that were cited failed to demonstrate any significant effect when PRP was employed.

When combined with anorganic bone mineral such as Bio-Oss (Osteohealth, Shirley, NY), PRP displayed mixed results. The animal studies quoted also displayed mixed results with PRP. The human studies cited were limited with PRP, demonstrating either no or small improvements with the addition of PRP. The addition of PRP with either demineralized freeze-dried bone or mineralized bone demonstrated ineffective results in the majority of studies quoted. Finally, the authors reviewed the results of using PRP alone and referenced several studies that failed to show PRP's efficacy. The authors did acknowledge that various methods to produce PRP may affect the quality of PRP used in the various studies cited. They also suggest that PRP's effectiveness may be due to its adhesive nature making graft material easier to manipulate. The conclusion of the article was that the use of PRP could not be justified at this point in time.

“Platelet-rich Plasma: Evidence to Support Its Use” by R. E. Marx. J Oral Maxillofac Surg, 62:489–496, 2004.

This paper presented the arguments for the use of platelet-rich plasma (PRP). It began with a review of the constituents of PRP, which include 7 growth factors actively secreted by platelets to initiate all wound healing. The author cautions that there is a great variability in the ability of various methods to concentrate platelets and that those studies that suggest inferior results with PRP could be attributed to poor-quality PRP. Ninety-five percent of the growth factors in PRP are released in the first hour after clot initiation. The PRP must therefore be developed in an anticoagulated state and be used within 10 minutes of clot initiation. The growth factors released from PRP are thought to bind to receptors on osteoblasts, fibroblasts, and several other cells important in wound healing. The author pointed to several studies that demonstrated the efficacy of PRP in bone graft healing, skin graft healing, and facelift surgeries. Those articles that do not demonstrate a benefit to PRP “do not use real PRP, use damaged platelets, may not have activated the platelets, or have statistically insufficient data to draw a valid conclusion.” Several articles were reviewed to demonstrate these conclusions. The author states that PRP is valuable in any bone graft with as little as 20% autogenous bone present. In addition, PRP may enhance implant osseointegration and is valuable in aiding soft tissue healing. The author then reviewed the safety of PRP and refuted those who suggest that PRP promotes infection. The conclusion of this review is that PRP

is a safe, cost-effective method to enhance bone grafts when it is developed by a system that has been documented to properly concentrate platelets.

“Maxillary Sinus Reconstruction With Calvarium Bone Grafts and Endosseous Implants” by M. Iturriaga, C. Ruiz. J Oral Maxillofac Surg, 62:344–347, 2004.

This is a retrospective study that examined the efficacy of using calvarium bone to augment the maxillary sinus. Seventy-nine sinuses in 58 patients were grafted using calvarium bone over a 10-year period. All sinus grafts were performed prior to implant placement. The bone was harvested from the right parietal scalp area and was obtained as a block. The sinus membrane was intact in 67% of the grafts, partially torn in 16% of sinuses, and totally torn in 16% of the sinuses. The torn membranes were either repaired with pericranium or a collagen membrane. In 35% of the sinuses, the bone graft was fixed using titanium screws. Platelet-rich plasma (PRP) was added to 45.5% of grafts. Although the majority of patients left the hospital the day after surgery, 15% of patients left the hospital on the day of surgery. A total 223 root-form implants from a variety of manufacturers were placed in a 2-stage fashion 3 to 11 months after graft placement. Implants were uncovered 5 to 9 months after implant placement. The majority of restorations were restored with fixed bridges, but 2 patients were restored with overdentures. Bone levels were measured after grafting and 2 to 8 years after prosthetic loading. The donor sites healed with no

major complications. Small hematomas that required drainage were found in 2 patients. The cranial cavity was penetrated in 3 patients. This was repaired with surrounding bone. Two patients suffered from a small zone of alopecia where the scar was located. All patients reported minimal postoperative pain at the donor site. Two sinuses suffered major infection, graft loss, and oral-antral fistula that required surgical closure. These patients were noted to have chronic sinus disease, which was not found on preoperative panoramic radiographs. As a result of this, the authors changed their protocol to require preoperative computed tomography (CT) scans prior to grafting. The remaining sinus grafts all healed well and had at least 15 mm of bone height. At time of uncovering, all implants were integrated, and 6% of implants had crestal bone loss from 1.5 to 2.5 mm. No further bone loss was noted after loading. The success rate of both the implants and the prostheses were 100%. Grafted bone levels remained stable during the follow-up period. The conclusion of the study was that the calvarium provided graft material of excellent quality and quantity.

IMPLANT ESTHETICS

“Connective Tissue Graft to Correct Peri-implant Soft Tissue Margin: A Clinical Report” by J. Shibli, S. d’Avila, E. Marcantonio. J Prosth Dent, 91: 119–122, 2004.

This paper describes the use of a connective tissue graft to correct an esthetic complication of an

anterior single-tooth, implant-supported crown. A patient presented to the authors with a single-tooth implant on the right maxillary central incisor that had been restored 10 years previously. The facial gingival margin was apical compared with the surrounding natural dentition, but the papillae were in an acceptable position. Radiographs and study models demonstrated that the implant shoulder was 5 mm apical to the cemento-enamel junction (CEJ) of the adjacent incisor, the abutment/crown margin was 4 mm apical to the CEJ, and the implant was labially inclined at 15°. A connective tissue graft was employed to correct the position of the facial gingival margin. Prior to the surgery, a new abutment that did not have an abutment margin shoulder was fabricated in order to minimize any influence of the abutment margin on the graft. A combination full- and split-thickness flap was elevated by employing vertical releasing incisions. The connective tissue graft was placed over the bone and up to the level of the adjacent free gingival margins. This was secured with resorbable sutures and then covered completely by coronally repositioning the flap. After this, an acrylic crown that did not contact the soft tissues was fabricated. After 6 weeks of healing, an implant-level transfer impression was taken. A new abutment that raised the abutment/crown margin but left it 2 mm apical to the free gingival margin was fabricated. The authors show an 18-month follow-up clinical photograph and radiographs that demonstrated both a much improved esthetic situation and stable bone levels.