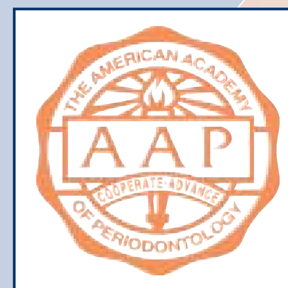
Final Program

New Concepts and Optimal Dental Practice

June 10–13, 2004
The Westin Hotel
Copley Place
Boston

The 8th International Symposium on Periodontics & Restorative Dentistry

Co-chairs
Myron Nevins, DDS and Michael K. McGuire, DDS



Sponsored by
The International Quintessence Publishing Group and The American Academy of Periodontology

No. 1 ***E. Reyes, A. Elías, W. Psoter, M. de los A Loza***
Río Piedras, Puerto Rico

Accuracy of Two Impression Techniques in the Transfer of Dental Implants with Different Angulations: A Three-Dimensional Study

Contradictory evidence exists in the literature regarding the accuracy of direct vs indirect impression techniques in the transfer of dental implants. Distortion is defined as the difference in position of an implant in a working model to the referent implant on the master model. The specific aims of this study were: *(1)* to compare the accuracy of two impression techniques in the transfer of three different angulated Paragon dental implant master models to working casts, and *(2)* to compare the effect of implant position using the two impression techniques in each of the three angulation groups. Three acrylic master models were constructed, each containing five Paragon Screw Vent implant analogs placed at different angulations (mean angulation by model: 4.18˚, 7.43˚, and 12.56˚). For the fabrication of 60 working models, direct and indirect impression techniques were employed—10 impressions with each technique for each of the three angulation groups. The master model and working cast implant's positions were measured at random by a blinded technician using a 1-mm diameter spherical tip in a tridimensional measuring machine. Discrepancies between working and respective master models were calculated to evaluate the potential effect of impression technique, implant angulation, and implant position on the accuracy of reproduction. Two- and three-way analyses of variance (ANOVA) for coping position implant angulation and impression technique were not statistically significant (0.1 level). Distortion by impression technique for all eligible copings demonstrated a statistically significant difference ($P = .041$) in favor of the direct impression technique (0.0088 mm less distortion) for the concentricity measurement. The linear regression results, by implant angulation, showed statistically significant ($P < .010$) lower distortion for the 7.43˚ (SD 0.87) implant angulation group for perpendicularity and parallelism ($P = .01$). Distortional changes by coping position demonstrated a statistically significant difference ($P < .01$) for coping in position 5 referent to coping 2. From these results, it can be concluded that there is a statistically significant difference between impression techniques that favors direct impression for implant transfer procedures. Linear distortion appeared significantly greater between implants with a distance of 21 to 27 mm. This investigation suggests that for implants with angular inclinations of 15˚ or less, using the direct impression technique with a hydrophilic addition silicone transfers less distortion to the working cast for the concentricity and parallelism measurements than the indirect impression technique. However, when the distance between implants is less than 21 mm in length, a single unit implant framework may be used.

No. 2 ***I. Rocchietta, A. Pilloni, G. Rasperini, M. Simion***
Milan, Italy

Guided Tissue Regeneration with a Synthetic Copolymer of Polyglycolic and Polylactic Acid (Fisiograft Gel) in Fenestrations and/or Dehiscences Defects Around Implants: A Clinical Controlled Study at 1 Year

Insufficient bone volume is an unfavorable condition for implant therapy. In several experimental animal studies, guided tissue regeneration was used to enhance bone formation around dental implants and to exclude the invasion of nonosteogenic extraskeletal soft tissue cells. This clinical study was designed to evaluate the regenerative potential of a synthetic copolymer of polyglycolic and polylactic acid (Fisiograft gel) in conjunction with autogenous bone graft when used for the treatment of implant dehiscences and/or fenestrations. Autogenous bone with a nonresorbable expanded polytetrafluoroethylene membrane (e-PTFE) was used as a control. Forty titanium dental implants with exposed threads were studied: 32 in the maxilla and 4 in the mandible. The 40 patients were equally and randomly divided into the two groups. Twenty defects were treated with Fisiograft and an autogenous bone graft (test) and 20 were treated with e-PTFE membranes and an autogenous bone graft (control). The dehiscences and fenestrations varied from 1.0 to 7.0 mm. Second-stage surgery was performed after 24 weeks. In the control group, two of the 20 membranes perforated the overlying soft tissue during the healing time; one was removed prematurely, while a new one was substituted for the other at 9 weeks. The remaining sites healed uneventfully. Overall, the results of the regenerative therapy at the 20 test sites showed a highly significant resolution, with a 92.47% bone fill without significant complications. The e-PTFE group showed 94.94% bone fill, but the difference was not statistically significant ($P = .68$). This study demonstrated that a synthetic copolymer of polyglycolic and polylactic acid (Fisiograft gel), when used for the treatment of implant dehiscences and/or fenestrations, is an effective material in terms of regeneration and can be equally effective as e-PTFE when associated with autogenous bone grafts. However, further clinical studies are needed to confirm these results.

No. 3 ***Z. Aleksic, V. Lekovic, N. Vasilic***
Belgrade, Serbia

Enamel Matrix Derivative with Coronally Advanced Flap vs Connective Tissue Graft Technique in Gingival Recession Treatment

In this controlled clinical study, results obtained using enamel matrix derivative (EMD) placed under a coronally advanced flap in the treatment of gingival recession were evaluated and compared with results achieved with the subepithelial connective tissue graft (CTG) procedure. Seventeen pairs of buccal gingival recessions were selected; experimental recession was treated by coronally advanced flap with EMD, while the control site was treated with CTG. Clinical parameters recorded at baseline and at 6 and 12 months included depth of recession, width of keratinized gingiva, distance from cementoenamel junction to the mucogingival line (CEJ-MGL), attachment level (CAL), and probing depth (PD). The experimental (EMD) and control (CTG) groups exhibited no statistical differences ($P > .05$) for gingival recession coverage, with success rates of 89.7% and 91.3%, respectively. The differences between CAL and PD in the EMD and CTG groups were not statistically significant ($P > .05$). In the CTG group, the mean gain of keratinized gingiva width (3.45 ± 0.62 mm) was significantly greater ($P < .001$) than in the EMD group (1.83 ± 0.41 mm). The difference between CEJ-MGL values in the EMD (3.11 ± 0.37 mm) and CTG (1.29 ± 0.45mm) groups also was statistically significant ($P < .001$). The results of this study indicate that the coronally advanced flap with EMD is a successful technique for gingival recession treatment; however, only the CTG technique resulted in a significant increase in the width of keratinized gingiva.

No. 4 ***D. Cardaropoli***
Torino, Italy

Bio-Oss Collagen and Orthodontic Movement for the Treatment of Infrabony Defects in the Esthetic Zone

This study demonstrates the clinical application of a protocol in which orthodontic movement was used to alter infrabony pockets following application of bone regenerative procedures. Adult periodontal patients presenting tooth migration with flaring of the anterior teeth and radiological evidence of infrabony defects adjacent to the maxillary central incisors were treated. Scaling and root planing were performed during the cause-related therapy phase. Study participants were required to have an initial probing pocket depth (PPD) of 6 mm or greater on the infrabony defect. PPD and clinical attachment level (CAL) were measured at baseline, and vertical and horizontal dimensions of the infrabony defects were assessed on standardized intraoral radiograms. After elevating a full thickness flap according to the modified papilla preservation technique, the granulation tissue was removed, the radicular surface was scaled and planed, and the defects were filled with collagen bovine bone mineral. The flaps were closed with a combination of interrupted and mattress sutures. After 2 weeks, active orthodontic movement was begun to close spaces and move

the teeth into the defects. Treatment time varied from 4 to 9 months. After removal of orthodontic appliances, patients received a fixed retention. Final assessments of PPD, CAL, TD-BD, and BC-TD were recorded 6 months after the end of the orthodontic therapy. Plaque control was optimal at all sites and no bleeding on probing was reported. Mean PPD at baseline was 7.0 mm. Mean residual PPD was 3.33 mm with a mean PPD reduction of 3.67 mm. Mean initial CAL value was 9.33 mm, and final CAL gain was 4.67 mm. Mean radiological vertical bone fill was 3.17 mm (baseline 4.5 mm), while mean horizontal bone fill was 2.0 mm (baseline 2.67 mm). The radiological resolution in the vertical component was 70.44% of the original dimension, while the resolution in the horizontal component was 74.90%. From a clinical point of view, all patients benefited from the treatment performed. Six months after the end of the combined therapy, pocket closure and healthy periodontal conditions were obtained with PPD reduction and CAL gain in absence of bleeding on probing. Radiological examination showed bone fill with a decrease in both vertical and horizontal defect dimensions.

No. 5 ***N. Matsumoto***
Tokyo, Japan

Immediate Implant Loading in the Partially Edentulous Region: 37 Case Reports Since 2000

One remaining problem of implant treatment is immediate loading in the partially edentulous region. This report evaluates the implant success rate, peri-implant tissue response, and esthetic outcome of immediate loading in the mandibular partially edentulous region, anterior to posterior, and protocols are proposed. Twenty-seven patients (7 men, 20 women) an average of 64 years of age (range, 37 to 74) were included in this study. Seventy-six implants were placed in the posterior region and 10 implants were placed in the anterior region. In most cases, three teeth were lost, including those that were removed simultaneously and had implants loaded. A total of 37 patients received ITI SLA implants and solid head abutment. Initial preparation of periodontics was done completely. Implant placement surgery, including tooth removal and loading, was performed and provisional restorations were cemented on the abutments. After two months, osseointegration was assessed for each implant and the final restorations were placed. Patients were evaluated clinically and radiographically at implant placement and at 2.6 and 12 months. Inflammation of the gingiva, radiographics, and Periotest values were assessed, and patients were placed in the following categories: excellent (all conditions were satisfactory); good (two conditions were satisfactory); fair (one condition was satisfactory); and poor (implants were lost and reoperation was necessary). At 2 months, 98.8% of the implants remained osseointegrated. Twelve months after surgery, 77 implants (89.53%) were evaluated as "excellent" (70 posterior, 7 anterior), 4 implants (4.65%) were rated "good" (2 posterior, 2 anterior), 4 implants (4.65%) were rated 'fair" (3 posterior, 1 anterior), and 1 posterior implant (1.16%) was rated "poor." The "good" group showed gingival recession, the "fair" group showed recession of both the bone and the gingiva, and the "poor" group was lost because of gingival inflammation and the implants were replaced. A rough surface seemed to stop bone recession. All patients were satisfied with this treatment. Minor alternation of both the bone and the gingiva continued for 1 year, but the alternation did not progress. In conclusion, immediate implant loading in the partially edentulous region is a successful method for patients who have lost function and esthetics of their teeth. Well-developed surgical techniques and sophisticated prosthetic treatment are key to a successful outcome; anatomical diagnosis, implant designs, and prosthetic plans are also very important. The following protocols are proposed: *(1)* Insertion 35N over; *(2)* long, wide implants; *(3)* one more placement implant; *(4)* solid abutment and cementation; *(5)* strong provisional restorations; *(6)* parallel implants; *(7)* control of minimum movement: Periotest value < +5; *(8)* careful occlusal correction 4 weeks after surgery; *(9)* professional mechanical tooth cleaning at any time; and *(10)* enough time allowed before the final restorations are placed.

No. 6 ***M. Simion, F. Fontana, G. Rasperini, C. Maiorana***
Milan, Italy

A Retrospective Study of Osseointegrated Implants Inserted in Sites Augmented with Sinus Floor Elevation Associated with Vertical Ridge Augmentation

The aim of this clinical study was to evaluate retrospectively (after 1 to 7 years of prosthetic loading) 38 Branemark implants consecutively placed in 16 surgical sites where the severe atrophy of the superior posterior maxilla was treated by combining the sinus elevation with the vertical ridge regenerative procedure. In this study, 14 partially edentulous patients were selected based on the following criteria: *(1)* severe crestal atrophy and significant pneumatization of the maxillary sinus and *(2)* implant placement by combining a guided bone regeneration technique for vertical ridge augmentation and sinus floor elevation. Two different surgical techniques were adopted. In seven patients (16 implants) the fixtures were placed at the same stage of the regenerative process, while in the other seven patients (22 implants), the fixtures were placed during a second surgery after 6 to 13 months of submerged membrane healing. Titanium-reinforced expanded polytetrafluoroethylene (e-PTFE) membranes associated with autogenous bone graft from the ramus or from the symphysis of the mandible and anorganic bovine bone were used for the regenerative procedures. After the final prosthetic restoration, each patient underwent a maintenance program consisting of oral hygiene and clinical evaluation every 6 months and x-ray examination once a year. Each implant was classified as a success, a survival, or a failure according to the Albrektsson-Zarb criteria. Two membranes (12.5%) became exposed during the healing process. One exposure happened after 1 week; the other occurred after 5 weeks. In the remaining 14 sites (87.5%), the membrane remained covered for a 6- to 13-month healing period. During removal, no signs of inflammation of the surrounding tissues were present, and the membrane was firmly attached to the underlying newly formed hard tissue with a clinical appearance identical to bone. The sinus augmentations were uneventful in all cases, without any sinusitis or loss of bone graft. The survival rate of the implants was 92.1%, and the success rate was 76.3% during the 1- to 7-year postloading follow-up period. Three implants (7.9%) failed; all were associated with the two surgical sites where membrane exposure occurred. At the first-year examination, six implants demonstrated a crestal bone loss superior to the normal value of 0.5 to 2 mm. Because of the absence of clinical signs of marginal inflammation or purulent exudates, the augmented bone loss may be ascribed to excessive remodeling of the immature regenerated bone after prosthetic loading. The vertically regenerated bone showed the same biologic behavior as native nonregenerated bone; however, in a few cases, its remodeling pattern indicated a slightly higher bone crest resorption.

No. 7 ***C. Shapoff***
Fairfield, Connecticut

Clinical and Histological Evaluation of PerioGlas as a Bone Graft Extender in Sinus Elevation Surgeries: A Case Series

During sinus elevation surgery, the floor of the maxillary sinus is raised superiorly by the incremental addition of bone graft material. The subantral space is augmented with a bone graft or bone graft substitute to increase the vertical dimension of the alveolar process, facilitating the subsequent placement of dental implants. Although autologous grafts are considered the "gold standard," availability issues have resulted in the frequent use of allogenic, xenogenic, or alloplastic graft materials. This study histologically and radiologically evaluated sinus elevation surgery performed with PerioGlas as a bone graft extender in combination with either autogenous or freeze-dried bone allograft (FDBA). This case series consisted of 37 implant surgeries performed on 27 patients under the auspices of the author's clinic. Five patients received a bilateral sinus augmentation; the remainder received a unilateral augmentation. PerioGlas was mixed with autogenous bone or FDBA in a 1:1 ratio and placed at the implant site. No complications were reported, and all sinuses healed uneventfully. Histological samples were obtained from several patients as part of the subsequent implant

placement procedure. Bio-Lok implants ranging from 10 to 13 mm in length were implanted in all patients, and an effort was made to keep 40% to 50% of the implant length in the native alveolar bone. All implantations were successful, showing good bone regeneration. Average bone gains at 6 months were 5.6 mm when PerioGlas was used with autogenous bone graft and 7.4 mm when PerioGlas was mixed with FDBA. There was no statistical difference between using PerioGlas with autograft or with FDBA, indicating that a second surgery to obtain an autogenous graft can be completely eliminated. From the results of this study, it can be concluded that PerioGlas, with its excellent handling characteristics and inherent hemostatic, anti-inflammatory, and osteostimulatory properties, forms an excellent bone graft extender for sinus elevation surgeries.

No. 8 ***M. Landolt, S-H Park, D. Galasso, S-C Cho, S. Elian, S. Froum, D. Tarnow***
New York, New York

Survival Rates of Transitional Implants Supporting Screw-Retained Restorations

Transitional implants have been shown to be a viable method of providing fixed provisional restorations for the implant patient who wishes to avoid the use of removable temporary appliances during implant healing. Most commercially available transitional implants were designed to support a cementable restoration. The main advantage of the new screw-retained transitional implant (SRTI) system is the avoidance of macro-movement during the removal of the provisional appliances in the implant healing phase. In this study, 15 patients (10 male, 5 female) received a total of 56 SRTIs between March 2001 and December 2003. Forty of the SRTIs were placed in the mandible, of which 34 SRTIs in 9 patients were used to support provisional prostheses and 6 SRTIs in 2 patients were planned to support a long-term restoration. Of the 16 SRTIs placed in the maxilla, 13 were used to support provisional prostheses, and 3 were planned to support a long-term transitional restoration. At the time of evaluation, the SRTIs had been functioning for an average of 9.7 months (range, 2 to 31 months). In the mandible, 2 SRTIs in 2 patients became mobile (95% survival rate). In the maxilla, 4 SRTIs in 2 patients became mobile (75% survival rate). With one exception, all prosthetic complications were corrected without loss of function. The cumulative survival rate of the fixed restorations supported by the SRTI system was 93.3%, and the overall survival rate of all SRTIs placed was 89.3%, demonstrating the successful use of an SRTI system for the support of fixed provisional prostheses.

No. 9 ***A. Clark***
Charleston, South Carolina

Analysis of the Envelope of Function

The controversy over the static posterior border of functional mandibular movement has detracted from the importance of the dynamic aspect of the envelope of function. In an era of increased cosmetic restorative procedures that lengthen and change the contours of anterior teeth, there has never been a more important time to analyze its dynamic nature. A thorough analysis of the envelope of function is multifaceted, complex, and specific to each patient. The analysis begins with the posterior border, because it is most easily repeated and allows harmony of the neuromusculature. Under normal function the posterior border is accessed only during deglutition and the briefly occupied, static end of the masticatory power stroke. It is the only position of the envelope of function at which the teeth should touch; therefore, it must be repeated to an accuracy dictated by the mechanoreceptors in the periodontal ligament and the pulp/dentin complex. Defective contacts that distract the condyle from its functional posterior border can also lead to a pseudo–envelope of function that creates a neuromuscular cycle of compensation and dysfunction. The second aspect that merits evalation is the relationship of the maxillary anterior and mandibular incisal edge positions. Evaluation of the patient's closest speaking space during sibilant sounds and examination of the maxillary incisal edge position esthetically give a starting point for the vertical relationship of the incisal edge positions toward the less-fixed anterior border of the envelope of function. The anterior-posterior relationship of the lingual surfaces of the maxillary anterior teeth vs the facial surfaces of the mandibular anterior teeth during phonation and mastication should also be assessed. Closest speaking space is of value if the sibilant sounds are performed at a more retruded position, as is the case with many Class II patients. A chew-in method can be used to give a starting point for eliminating interferences in the anterior-posterior component of the envelope of function. In conclusion, the complexity of the envelope of function is inherent in the various anatomic structures coupled with the intricacies and variability of the different functions involved in its development and maintenance. A violation of the envelope of function can be recognized by various signs and symptoms of force overload in one or more of the analyzed components.

No. 10 ***J. Dias da Silva, F. Peres***
Porto, Portugal

Implants and Orthodontics

Several different appliances are used to provide the full anchorage needed in most orthodontic treatments, but in the majority of cases, small losses are registered. Many of these appliances depend on patient cooperation and are not comfortable for all-day wear. Specific palatal implants provide the desired full anchorage assured by osseointegrated implants, are more comfortable for patients than most of the orthodontic appliances that they replace and are more esthetic, allowing continuous use. Recently, anchorage screws or micro-implants have also been used for that purpose. Two clinical cases illustrate the use of these systems. In the first case, a palatal implant (Orthosystem) was used to provide anchorage for the retraction of anterior teeth. Using this device and technique allowed the six anterior maxillary teeth to be easily retracted all at once. After the orthodontic treatment, the palatal implant was removed and the socket filled with plasma rich in growth factors. The advantages of this system and technique are: *(1)* full anchorage 24 hours a day, *(2)* no dependence on patient cooperation, *(3)* replacement of extraoral appliances and elastics, *(4)* esthetics, *(5)* shorter and more predictable treatments, and *(6)* the possibility of better final results. The disadvantage is the need for two minor surgeries. In the second clinical case, micro-implants were used in an adult patient who had been missing the right maxillary second molar and left maxillary third molar for several years. The extrusion of the right mandibular second molar did not allow the prosthetic rehabilitation of the maxilla. The patient underwent a partial orthodontic treatment to intrude the right mandibular second molar back to its normal position. This is a difficult movement requiring strong anchorage, which was achieved using two micro-implants (Spider Screw) placed under the roots of the tooth. Two ITI implants were placed in the right maxilla, and after the intrusion of the right mandibular second molar, the prosthetic height was freed for the rehabilitation of the first quadrant. In conclusion, micro-implants provide the necessary anchorage for orthodontic movements. They can be inserted in several sites as long as they do not interfere with the roots or movement of the teeth, and the surgical procedure is simple and inexpensive.

No. 11 ***K. Wada, H. Mizuno, K. Hata, M. Ueda***
Nagoya, Japan

A Novel Approach to Regenerating Periodontal Tissue Using Cultured Periosteum

Periodontal disease causes severe destruction of periodontal tissue, including the alveolar bone. For more than a decade, efforts have been made to develop treatments and materials that promote periodontal wound healing. In this study, we attempted to regenerate canine periodontal tissue defects by grafting autologous cultured membrane derived from the periosteum. Periosteal cells produce enough extracellular matrices to form sheets under appropriate culture conditions. Periosteum specimens were peeled from the mandibular body of adult hybrid dogs and cultured until the cells formed a membrane. Alkaline phosphatase activity was measured to determine an optimal time for grafting. The cultured periosteum (CP) was

grafted and sutured on a mechanically made Class III furcation defect in the fourth mandibular premolars. After 3 months, the samples were harvested and radiologically and histologically observed. In the CP cases, the bone defects were regenerated and filled with newly formed hard tissue, whereas in the controls, the defects remained. The regenerated alveolar bone tissue showed a lamellar structure with lacunae of osteocytes. In the CP graft, regenerated structures such as cementum and ligament were observed. Connective tissue between the cementum and regenerated alveolar bone seemed like ligament. This area was highly cellular and composed of many fibers with random orientation. In this study, alveolar bone defects were successfully regenerated by grafting autologous CP, showing that this treatment may be effective in regenerating alveolar bone for the treatment of periodontal disease.

No. 12 M. Bittencourt, C Ferreira, V. Haraszthy, R. Rocha, M. Leal
Vitória, Brazil

Improving "Gummy Smile" Using the Principles of Guided Bone Regeneration

This study evaluated the effectiveness of guided bone regeneration (GBR) using xenogenic bone substitute (Bio-Oss) and collagen resorbable membrane (Bio-Gide), to improve "gummy smile" in patients with excessive vertical maxillary growth (EVMG). Ten healthy women aged 20 to 49 years (mean, 26 years) with 5 mm or more of gingiva showing during full posed smile (FPS) due to EVMG were asked during preliminary examinations to give full smiles until they were able to reproduce the FPS three times. Baseline digital pictures were taken using standardized head position at rest and FPS. Bone graft mockup was done by placing a piece of cotton under the patient's lip, in the vestibule, above the apex of the teeth, extending from the nasal spix to the second premolars on both sides. The improvement was shown to the patients. After local anesthesia, a sulcular incision was made from the right first upper molar to the equivalent molar on the left side. Vertical incisions were usually done at the mesial surface of the second molars. A full thickness flap was raised, exposing the bony area between the apex of the teeth and the nasal cavity along with the lateral wall of the sinus. Using GBR principles, bone perforations were made and microscrews and/or titanium mesh were placed to keep the space under the membrane. The space was filled with Bio-Oss, covered by Bio-Gide membrane, and stabilized with tacks. The flap was sutured to the original position. Patients were directed to take amoxicillin and to rinse with chlorhexidine for 10 days, at which point the sutures were removed. Recall appointments were scheduled at 1, 6, and 12 months, when standardized extraoral pictures were again taken, as previously described. A CT scan was also taken 1 year later. The University of Texas Health Science Center at San Antonio's free ImageTool program was used to measure the "gum area displayed" (GAD) during FPS from the standardized close-up smile pictures at baseline and 6 and 12 months after the surgery. GAD mean was 275.44 mm^2 at baseline and 108.43 mm^2 after 6 to 12 months. The GAD decrease of 60% ($\Delta = 167.01$ mm^2) was statistically significant ($P = .012$). Moreover, a remarkable enhancement on the nasolabial fold depth and upper lip posture was observed. The CT scan showed perfect accommodation of the Bio-Oss in the grafted area. The preliminary results of this study indicate that 60% improvement in "gummy smile" associated with EVMG can achieved using GBR principles.

No. 13 A. Ho
Taichung, Taiwan

Sinus Lifting with Implant Placement—A Case Report with 20-Month Reentry and Histological Observation

Insufficient vertical bone height is often encountered in the rehabilitation of the edentulous posterior maxilla in implant dentistry because of postextraction alveolar bone resorption and/or sinus pneumatization. Based on the literature, the sinus lifting procedure was recommended as one of the predictable techniques for increasing the vertical bone height below the sinus area. Summer's osteotome technique and the Caldwell-Luc window technique were tested clinically and proven effective. Bovine porous bone mineral (BPBM) was recognized as one of the osteoconductive grafting materials when applied in periodontal regenerative therapy because of its good space-making ability. This case report is based on the use of the sinus-lifting procedure with BPBM and the Caldwell-Luc technique, followed by a two-stage implant placement. Twenty-month post–sinus lifting reentry was performed and two bone cores of 2 x 2 x 10 mm^3 (A and B) were obtained simultaneously at different levels of the sinus wall for further histological observation. The reentry procedure showed the complete healing of window defect compared to the finding observed under tomography. Histological findings indicated that the grafted area located at sinus base A was remodeled completely into ordered, living bone with evident osteocytes within the lacunae. The grafted area at the central portion of sinus graft B showed natural, living bone infiltrated with BPBM. Osteoclasts and osteoblasts were also found near the border of natural bone and BPBM, indicating that the replacement of BPBM in the central portion of the sinus graft still continued at the end of 20 months after the procedure.

No. 14 H. Eymer
Hamburg, Germany

Minimally Invasive Augmentation Treatment in the Maxillary Sinus: Data and Experience After 500 Internal Sinus Lifts with Different Grafting Materials and the Use of Activated Platelet-rich Plasma

The aim of this study was to analyze internal sinus lift procedures with different grafting materials. Activated platelet-rich plasma (PRP) was used in 500 internal lifts from 1999 to 2003; all of the implants were placed simultaneously. In this study, the procedure was done with mixtures of 20% to 40% autologous bone and different grafting materials with PRP. Biogran, Bio-Oss, Cerasorb, and demineralized freeze-dried bone allograft (DFDBA) were used as grafting materials. The PRP was produced by a local certified blood bank, an in-office laboratory centrifuge, the PCCS System, and the Smart PReP System. Different concentrations of the systems ranging from 450% to 1200% with different vitalities of the thrombocytes could be found. The grafting materials absorbed various volumes of PRP, from 0.5 mL (Biogran) to 1.23 mL (DFDBA) per 1 ccm of grafting material. The mixtures of the grafting materials with the autologous bone from a bone collector or local harvested bone chips were made extraorally and combined with PRP, which had to be activated with calcium chloride and thrombin. The jelly mixtures were then filled and carefully condensed with osteotomes in the prepared locations of the sinus floor. Simultaneous implants were done in every case. The residual bone heights in this study, from 1 to 2.5 mm (group 1) to 11 to 12.5 mm (group 6), were measured with Denta-CTs before treatment. In the different groups, additional bone heights of 11.8 mm (group 1) to 3.7 mm (group 6) were achieved. The loading times of the different grafting materials (evaluated by the bone density with radiographs before treatment) were 11 weeks for DFDBA, 19 weeks for Bio-Oss, 26 weeks for Cerasorb, and 28 weeks for Biogran after lifting and implantation. There were no statistically significant differences in implant loss. Fifty-five implants were lost, 46 of them within 4 weeks of loading. The 46 implants lost during the first 4 weeks could not be treated with the full torque during abutment fixation, which may be an indicator for early loss. More than 5 years and 500 internal sinus lift procedures with these grafting materials mixed with autologous bone and activated PRP have shown this procedure to be a successful method to reduce the local and total operative stress of augmentations and implantations in the sinus lift. Residual sinus bone heights as small as 1 to 2.5 mm can be treated and simultaneous implantations can be done to reduce the patient's total treatment time. In this study, 89% of the implants placed were functional after 5 years.

No. 15 ***L. Tsong-Hseine***
Taipei, Taiwan

The Modified Ridge-Split Technique for Bone Augmentation at the Anterior Maxillary Region

The traditional ridge-split technique or guided bone regeneration (GBR) at maxillary ridges that have moderate to advanced atrophy can regain only limited bony volume because of the difficulty in achieving the required technical skills. The newer and easier modified ridge-split technique was developed to solve the problems and enhance the predictabilities of the traditional ridge-split technique and GBR at anterior maxillary regions. The modified ridge-split technique consists of the following steps: *(1)* Preserve the gingival ridge with a palatal bevel incision; *(2)* Perform flap operation from palatal to mucogingival junction; *(3)* Section the ridge from the edge into the basal bone 5 mm deeper than the mucogingival junction with high speed; *(4)* Separate the facial bony plate from the ridge and keep it with the facial flap; (the key point of the technique); *(5)* Release the facial flap to create an adequate volume for ridge augmentation; *(6)* Fill the volume with graft (inserting a pin to maintain the volume if necessary): If the basal bone is abundant enough, insert the implant(s) simultaneously; *(7)* Finish with a tension-free closure. The modified ridge-split technique can increase bony volume enough for implant therapy. Histological analysis shows no significant differences between the traditional and modified ridge-split techniques. In addition, the modified method is more predictable than GBR according to histological analysis and clinical findings. The advantages of the modified ridge-split technique are that the regained bony volume is larger and more predictable than with the traditional methods and that the modified technique preserves the original facial cortical bony plate, which is beneficial to the implants. This new modified technique can be used to maintain the attached gingiva after surgery. Otherwise, the attached gingiva will regionally decrease after GBR, especially in those with a thin gingiva, such as Asian patients.

No. 16 ***J. Neves, M. Soares, L. Marinho***
Belo Horizonte, Brazil

Increase of the Edentulous Mandibular Alveolar Ridge with Distraction Osteogenesis

Rehabilitation of the atrophied edentulous mandible has been a challenge for oral and maxillofacial surgeons. Alveolar augmentation using bone grafts shows resorption superior to 60%. This study presents results obtained using distraction osteogenesis to augment the atrophic edentulous mandible. Eighty-seven patients with class V and VI mandibles were selected. The vertical lengthening was an average of 4.94 mm on the symphyses, 4.29 mm on the left canine, and 4.34 on the right canine. The results obtained showed the feasibility of mandibular augmentation using distraction osteogenesis to provide the ridge height necessary for patient rehabilitation.

No. 17 ***J. Tinschert, G. Natt, K. Schulze, H. Spiekermann***
Aachen, Germany

Three-Year Clinical Results of Zirconia-Based All-Ceramic Bridges

Preliminary investigations indicate that zirconia ceramics are potential candidates for high-performance all-ceramic dental restorations because of their outstanding mechanical properties, esthetic appearance, and proven biocompatibility. With modern computer-aided design/computer-assisted manufacture (CAD/CAM) systems, zirconia ceramics can be used to fabricate all-ceramic crowns and fixed partial dentures. The purpose of this prospective study was to evaluate the clinical performance of anterior and posterior fixed partial dentures containing a substructure made of DC-Zirkon. Patients with severe parafunctions, periodontitis, or poor oral hygiene were excluded from the study. From December 1998 to September 2003, a total of 65 fixed partial dentures were placed in 46 patients. All abutments were prepared for full crowns with a chamfer preparation of 0.6 to 0.8 mm depth. The substructures of the restorations with produced with the Precident DCS system and veneered with Vita D veneering porcelain according to manufacturer instructions. The wall thicknesses of the zirconia core were a constant 0.6 mm and the connector area was designed with a 16-mm^2 cross-sectional plane. For placement, a self-curing resin cement (Panavia) was used for the anterior bridges and a conventional zinc-oxide-phosphate cement was used for the posterior bridges. Recall appointments were made after 2 weeks and every 6 months, respectively. Ten anterior bridges with one (11), two (2), three (1), and five (1) pontics and 50 posterior bridges with one (33), two (14), and three (3) pontics were evaluated. The mean observation period was 28 (± 18.0) months for the anterior bridges and 27 (± 15.5) months for the posterior bridges. No total failures were observed, but in three cases, chipping of the veneer occurred in the posterior region. Two bridges were replaced after loss of retention and three teeth required endodontic treatment. No allergic reactions or negative influences at the gingival margin were observed. The results of approximately 3 years of clinical evaluation demonstrate that zirconia-based all-ceramic bridges are suitable for application under clinical conditions; however, long-term studies are needed to confirm this conclusion. Further studies should also analyze which factors caused the veneering porcelain to chip.

No. 18 ***E. Funakoshi, K. Maki, N. Nonoshita, Y. Ishikawa, S. Horita***
Fukuoka, Japan

Extraction Site Reconstruction and Alveolar Ridge Augmentation Using Nonporous Polytetrafluoroethylene Membranes and Enamel Matrix Derivatives with or without Bone Graft Material

More than 20 extraction sites were treated with membranes and enamel matrix derivatives (EMD) and bone graft materials (demineralized freeze-dried bone allograft [DFDBA] and freeze-dried bone allograft [FDBA]) for implants. The membrane was made from nonexpanded and nonporous polytetrafluoroethylene (PTFE). Extraction sites of gingivae were reflected with full-thickness flaps buccal and lingual. All soft tissue remnants were thoroughly removed with a curette. Extraction sites were treated with neutral buffer ethylenediaminetetraacetic acid (EDTA) for 2 minutes. Bone graft materials were mixed and moisturized with EMD for implantation into extraction sockets. At the same time, extraction sockets were filled with EMD remnants after moisturizing of graft materials. A membrane was placed to cover the materials and the flaps were secured with a suture. No intentional primary closure was attempted; therefore, membrane exposure was possible. The membrane was removed 4 to 6 weeks after surgery without anesthesia. (During membrane placement, infection control should be monitored with meticulous care.) All of the experimental sites showed excellent healing with these materials and techniques compared with the conventional technique. The healing period was shorter than that with the conventional technique due to EMD's properties, enhancing bone formation with DFDBA, growth factors, cell differentiation, cell proliferation, etc. The regenerated sites showed hard bone surfaces compared with those without EMD material. Implants were placed an average of 6 months after surgery. The width of keratinized gingival tissue was preserved or increased rather than lost compared with the conventional technique. Most patients did not complain of swelling, pain, or discomfort because there were no intentional periosteal-releasing incisions. Less plaque accumulation and bacterial contamination were observed due to the properties of the membrane and EMD. The prevention of extraction-site alveolar ridge resorption and implant-site ridge augmentation using bone graft materials, EMD, and PTFE membrane is predictable, convenient, and available at a reasonable cost.

No. 19 D. Choi, J. Park
Seoul, Korea

Block Bone Grafts with Immediate Implant Placement

Implants have developed for a long time and have become a primary tool for the treatment of missing teeth. Various types of implants have been developed to overcome unfavorable situations. Sometimes the sites of the bone for implantation are suitable for immediate surgery, but in many cases, the condition of the bone is not so good. Bony defects are usually observed and may occur vertically, horizontally, or in the middle of the bone. Various bone grafting techniques and materials have been discovered and continue to be developed to solve these problems. We designed the block bone graft to augment bony sites with vertical defects. To minimize visit time for a physically handicapped patient, the implant and bone graft were performed simultaneously. Simultaneous bone grafts and implants are not uncommon, but in this case, the chin bones were used for the donor sites and the bones were fixed simultaneously using implants. The defects around the block bones were filled with cancellous bone obtained from the chin. The grafted bones were well seated with little resorption, and the implanted sites healed nicely. Crowns were made for the implants 4 months after the first surgery.

No. 20 R. Yukna
New Orleans, Louisiana

Cementum-Mediated New Attachment in Humans Following the Laser Assisted New Attachment Procedure (LANAP)

The Laser Assisted New Attachment Procedure (LANAP) using the Nd:YAG laser has been developed for the sulcular debridement of periodontal pockets with the goal of obtaining new attachment. Favorable clinical results have been reported, but human histologic proof of new attachment or regeneration is limited. To evaluate histologic wound healing in periodontal pockets in humans following treatment with the LANAP protocol, six pairs of single-rooted teeth with moderate to advanced chronic periodontitis associated with subgingival calculus deposits were treated. Occlusal adjustment and direct bond extracoronal splinting were performed. Under local anesthesia, a ¼ round bur notch was placed at the apical extent of calculus as carefully as possible. One tooth from each pair received pulsed free-running Nd:YAG laser treatment of the inner pocket wall to remove the pocket epithelium (3 watts, 150 pulses/second, 10 hz). Both teeth were then aggressively scaled and root planed with an ultrasonic scaler and hand instruments. The pockets of the test teeth were lased again to help coagulate any blood that was present and to form a fibrin seal. Triple-antibiotic ointment and a light-cured dressing was placed. The control teeth received all of the above treatments except the laser treatment. The patients were seen every 10 days for the first month and then at 2 and 3 months, at which time the treated teeth were removed en bloc for histologic processing. Decalcified step serial sections were stained with hematoxylin-eosin (h&e). All six of the LANAP-treated specimens showed new cementum and new connective tissue attachment (and in two cases, new bone and new periodontal ligament) in and coronal to the calculus notch. New cementum length averaged 1.2 mm. The control teeth had a long junctional epithelium with no evidence of regeneration. There was no evidence of any adverse pulpal or tooth surface changes in any specimen. This case series supports the principle that LANAP can be associated with cementum-mediated new attachment (and ocasionally true periodontal regeneration) on a diseased root surface in humans. Consistently positive histologic results were found in all six of the LANAP-treated teeth.

No. 21 R Suresh, K. Santosham
Chennai, India

Assessment of Bone After Grafting Using Spinal/Helical CT

With the advent of the helical CT scanner, new inroads have been made to the world of imaging. Three-dimensional volume rendering and multiplanar imaging provide clinician-friendly images. This imaging modality can be a great boon to the periodontist, as regeneration of bone can be assessed on all four walls of the tooth, something that is not possible with other conventional imaging techniques. This study assessed the quantitative and qualitative changes in bone around a tooth after bone grafting procedure with the help of helical CT. Surgery was performed on a 27-year-old patient with aggressive periodontitis. Preoperative intraoral periapical radiographs showed arc-shaped bone loss in all of the first molar regions. Labial and lingual bone loss was assessed using spiral CT. A flap was raised in the lower right first molar region, and a bone graft was placed. Postoperative follow-up was done at 9 and 15 months with the use of helical CT. Because attachment and stability are better if the bone around the tooth is denser, density (Hounsfield units) was measured at 22 predetermined sites around the lower right first molar. These values were plotted on a graph. Seventeen of the 22 sites showed an increase in density; four sites showed a decreased density at the 15-month postoperative CT scan, compared with the 9-month postoperative CT scan; and one site showed the same density in both postoperative periods. From these results, it can be concluded that spiral CT is a useful tool for assessing preoperative bone loss and quantitative and qualitative increase in bone after surgery.

No. 22 Y.E. Yoon, M.G. Kim, M. Bloom, S.C. Cho, S. Froum, N. Elian, D. Tarnow
New York City, NY

Evaluation of Implants Restored by Predoctoral Students

The purpose of this investigation was to evaluate the survival rates of dental implants that were surgically placed by postgraduate dental implant residents and then restored prosthetically by predoctoral dental students. Data in this retrospective study was obtained from ongoing postoperative treatment disposition forms of patients who were surgically treated at the New York University Kriser Dental Center by postgraduate implant students in the Ashman Department of Implant Dentistry from October 28, 1999, to July 30, 2003. A total of 291 implants were placed in 224 patients (average age, 56 years). A total of 91 implants were placed in maxillary sites: 26 anterior sites (8.9%) and 65 posterior sites (22.4%). A total of 200 implants were placed in mandibular sites: 5 anterior sites (1.7%) and 195 posterior sites (67%). All of the implants were placed in alveolar bone that did not require augmentation. The implants were restored by undergraduate dental students in their third or fourth year of dental studies. Two hundred eighty-four implants (97.6%) underwent successful osseointegration and survived, while 7 implants failed (2.4%). The survival rate when categorized by location was 99% in the maxilla (90/91 implants) and 97% in the mandible (194/200 implants). After loading, these implants were followed from 6 months to 3 years. The overall survival rate (97.6%) of implants in this study supports the predictability and efficacy of dental implants restored as part of a predoctoral dental implant component within the clinical curriculum.

No. 23 ***D. Monteiro, B.S. King, S.C. Cho, S. Wallace, N. Elian, S. Froum, D. Tarnow***

New York City, NY

Comparison of Absorbable and Nonresorbable Membranes on Vital Bone Formation and Implant Survival in Sinus Augmentation Surgery

The early techniques for sinus augmentation utilized autogenous bone with a lateral window approach. Since then, different techniques and other materials have been studied and used. One of the modifications to the early protocol is the introduction of membrane barriers, used commonly in periodontics for tissue regeneration, to cover the access window grafting of the sinus surgeries. Recently, absorbable membranes have been reported to have comparable results to nonabsorbable membranes in treating the periodontal and alveolar ridge defects. In cases of sinus augmentation, successful results with absorbable and nonresorbable membranes can be compared by measuring vital bone in the healed sinus and evaluating the survival of implants placed in areas where the sinuses had been augmented. The purpose of this study was to evaluate differences in augmented sinuses with absorbable and nonresorbable membranes, as measured by vital bone formation and implant survival rates. Sixty-seven postoperative sinus augmentation forms were compiled specifying graft material and type of membrane utilized, ie, absorbable or nonresorbable. These were combined with implant surgical success forms and histologic data from cores removed from these sinuses at time of implant placement. Data analysis of the cores was performed to determine vital bone formation (%). The implant monitoring forms tracked the percentage of successful and unsuccessful implant osseointegration (implant survival rate) in these grafted sinuses. A minimum of 1 year of implant loading was used to evaluate survival rates. Forty-three sinus procedures in 43 patients utilized absorbable membranes to cover the lateral window. The average vital bone formation was 17.6% (range 3% to 51%). Twenty-six sinuses in 26 patients received nonresorbable membranes. The average vital bone formation was 18.4% (range 3% to 53%). The survival rate of implants placed in augmented sinuses utilizing a nonabsorbable membrane barrier was 98.1% (51/52 survived). In comparison, when an absorbable membrane was used to cover the window, the survival rate was 97.6% (81/83 survived). No difference was observed in implant survival rate and vital bone formation following sinus lift procedures when utilizing an absorbable versus a nonresorbable membrane barrier.