Abstracts

The following is a record of the Poster Presentations held at the 5th Meeting of the Asian Pacific Society of Periodontology

Guided Bone Regeneration Technique for Optimal Implant Placement

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The success of implants are influenced by the bony conditions of the recipient site. As the success rates of implants have been high in recent years, methods to modify bony conditions of the recipient site have been developed in order to install implants with proper esthetics and function. Adapting the principles of guided tissue regeneration, a guided bone regeneration (GBR) technique was developed to promote selective proliferation of osteoblasts with the insertion of a membrane. The membrane increases the proliferation of epithelial cells and fibroblasts and makes space for bone regeneration.

The indications for GBR are fenestration defects, dehiscence defects, localized ridge augmentation and immediate implant placement following extraction. The method for GBR is classified as a simultaneous and staged approach. To reduce surgery and healing times a simultaneous approach is recommended. However initial stability, prosthetic location and size of defect must be considered.

Regulation of Matrix Metalloproteinase-3 Production by Prostaglandin E_2 in Interleukin-1β-stimulated Human Gingival Fibroblasts

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PGE_2 exerts its biological effects on cells through specific prostaglandin receptors, called EP_1, EP_2, EP_3 and EP_4. Matrix metalloproteinases (MMPs) including MMP-3 (stromelysin-1) are a family of zinc endopeptidases that play key roles in extra cellular matrix turnover. Recent studies have shown that gingival crevicular fluid MMP-3 levels are associated with periodontal disease progression. The aim of this study was to investigate whether PGE_2 regulated interleukin (IL)-1β-induced MMP-3 secretion in human gingival fibroblasts (HGF).

HGF were obtained from periodontally healthy and diseased gingival tissues, and designated H-HGF and P-HGF, respectively. The cells were stimulated with buffer or IL-1β in the presence or absence of indomethacin, PGE_2, 17 phenyl-trinor PGE_2 (EP_1 agonist), butaprost (EP_2 agonist) and ONO-AE1-329 (EP_4 agonist), alone or in combination. Conditioned medium was collected and analyzed for PGE_2 and for MMP-3 levels.

IL-1β induced a significant increase in MMP-3 and PGE_2 production in H-HGF. In the cells, indomethacin significantly increased IL-1β-induced MMP-3 production, whereas IL-1β-induced PGE_2 was completely inhibited. Exogenous PGE_2 inhibited IL-1β-induced MMP-3 production. The EP_2 and EP_4 agonists reduced IL-1β-induced MMP-3 secretion, whereas the EP_1 agonist increased it. On the other hand, in P-HGF, indomethacin significantly decreased IL-1β-induced MMP-3 production. In the cells, exogenous PGE_2 and the EP_1 agonist enhanced IL-1β-induced MMP-3 production, whereas EP_2 and EP_4 agonists showed little or no effect.

From these data, we suggest that IL-1β-induced MMP-3 production is differently regulated in H-HGF and P-HGF. Regulation of MMP-3 levels via EP receptors by PGE_2 in HGF may control tissue breakdown in periodontal diseases.

Recipient of Best Poster Presentation Award - First Place

Accelerated Bone Healing After Er:YAG Laser Irradiation

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The aim of this study was to analyze the early healing process of bone tissue irradiated by Er:YAG laser and compare it with that treated by mechanical drilling and CO_2 laser. Er:YAG laser has a potential for hard tissue cutting due to its high ability of ablation and less thermal damage.

Twenty-four male Wistar rats were subjects in this study. The calvarial bone of rats was exposed and straight grooves were prepared by Er:YAG laser, CO_2 laser and mechanical drill. Four rats were sacrificed at each of six time intervals: 10 minutes, 6 and 24 hours, 3, 7, and 14 days post-surgery and sections were prepared for light and transmission electron microscope (TEM) observation.

Unlike the mechanical bur and CO_2 groups, early inflammatory cell infiltration adjacent to the irradiated bone surface increased fibroblastic reaction, and revascularization were more pronounced in the Er:YAG laser irradiated tissues. A cell-rich granulation tissue with fibroblasts and osteoblasts was predominant in Er:YAG 7-day specimens. Histopathological analysis of 14-day specimens in Er:YAG group also exhibited significantly higher new bone formation compared with the CO_2 laser and the mechanical bur groups ($p<0.001$). The early bone healing process following Er:YAG laser was found to be superior than that of CO_2 laser and mechanical bur. No adverse effects were observed on the bone tissue after Er:YAG laser irradiation. The present study indicates osseous resection with Er:YAG laser may be more advantageous compared with a mechanical bur or CO_2 laser.

Recipient of Best Poster Presentation Award - Second Place

Periodontal Mesenchymal Cells Differentiation by Porcine Enamel Extracts

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The purpose of this study was to investigate osteogenic factors in fractionated porcine enamel proteins. Porcine enamel proteins were separated into 4 fractions (fr.1 - fr.4) by gel filtration chromatography. These four fractions, as well as exogenous growth factors (BMP-2 and TGF-β1) were tested for osteogenic activities on human periodontal ligament (HPDL) cells in vitro. Osteogenic activities were assessed by alkaline phosphatase (ALP) activitiy, mitogenic assay, arizarin red staining, calcium content assay and RT-PCR for osteogenic marker proteins. In HPDL cells, osteoinductive activities was enhanced by TGF-β1 and fr.3 and ALP activity was blocked in both cases by anti-TGF-β antibody. Furthermore, we showed using a dual-luciferase reporter assay that the plasminogen activator inhibitor type-I (PAI-1) promoter activity, which was normally up-regulated by TGF-β stimulation was induced by fr.3. These results indicate that the enamel matrix contains TGF-β which may control the periodontal mesenchymal cells differentiation.

Evaluation of Alveolar Bone Resorption Among Different Fimbriae Type *Porphyromonas Gingivalis* Infection in Hamsters

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Porphyromonas gingivalis, one of the causative bacteria for periodontitis, has many virulence-associated factors, including fimbriae, hemagglutinin, protease and lipopolusaccharides. Recently, fimbriae genes (*fin A*) were classified into 5 different types (Type I-V).

The purpose of this study was to determine the distribution of *P. gingivalis* which had different fimbrae genes in periodontitis patients and compare alveolar bone resorption on the animal model among the different fimbriae types. Type II fimbriae was the most common, followed by Type IV. The activity of alveolar bone resorption on the animal model in Type I had the highest levels. These results suggest that the pathogenicity of *P. gingivalis* differs in the isolates but not in the fimbriae types.

PCR Detection of Selected Periodontal Pathogens in Filipinos With Chronic Periodontitis

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The aim of this study was to identify the culture-different strains of a recently proposed assaccharolytic anaerobic gram-positive rod (AAGPR), *Mogibacterium*, by specific PCR primers which were designed based on the sequence analysis of their 16S rDNA. Out of the 41 primer combinations examined, two were found to be genus-specific for *Mogibacterium* (247F-567R and 247F-809R) and produced a band with an appropriate size of ca 300 bases and 550 bases respectively when used with the DNA of the 5 *Mogibacterium* species but not with other AAGPR species. Thirteen (40.6%) of the 32 subgingival plaque samples from 10 chronic periodontitis patients (1st time visit, pocket depth > 6 mm) yielded positive to *Mogibacterium* by the developed PCR method. *P. gingivalis* was detected in 87.5% of the subgingival plaque samples while *A. actinomycetemcomitans* was detected in 37.5% of samples.

Recipient of Best Poster Presentation Award - Third Place

A Clinical Evaluation of the Use of Demineralized Bone Matrix & Bioactive Collagen Membranes in Peri Implant Bone Regeneration

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The importance of having a stable osseointegrated environment around an implant is critical to implant longevity and success. The quantum of available bone is but one aspect of this requirement due to implants making functional demands on the bone which support them. This naturally demands a certain quality of bone as well.

In scenarios where there is a deficiency in bone or the quality of bone is suspect even if the quantum seems adequate the periodontist is faced with a challenging situation. Occasionally the periodontist may have to consider implant placement secondary to osseous regenerative procedures or even abort an implant treatment plan.

Several solutions have been offered over the years with regards to osseous grafting. The identification of successful techniques and materials have remained elusive at best and the periodontist has gambled with several solutions. Consistent predictability and treatment longevity have defied many of these attempts and we have sought better alternatives on the basis of our understanding of bone healing for some time now. Since Hegedus first placed an autograft in 1924 we have come full circle and are again examining options in autogenous grafting as potential solutions for predictable regenerative therapy. A detailed grasp of the cascade of biochemical events that contribute to wound healing and regeneration has also refocused interest on some of the techniques that evolve autogenous bone. In addition, the advent of tissue engineering has contributed to accelerating the regenerative process as well. At last we seem to be getting closer to our goal, by an effective clinical technique combination, that harnesses these advances.

This presentation will focus on the success of autogenous grafting in combination with the use of a new demineralized bone matrix (Osseograft DMBM) and a new bioactive collagen membrane (Healiguide) for use in implantology. A few case reports are presented to illustrate the effective use of these materials.

An Assessment of the Use of a New Bioactive Resorbable Collagen Membrane & Demineralized Bone in the Treatment of Class II Furcation Defects: A Comparative Clinical Study

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Collagen has found innumerable applications in dentistry in the form of membranes, gels, fibrillar local drug delivery devices and extraction socket implantable devices. The use of collagen in guided tissue regeneration, particularly because of its resorbability, has been extensively documented. Studies have also demonstrated that the adjunctive use of osseous grafts in guided tissue regeneration may be an advantage.

The present study assessed the efficacy of use of a new bioactive collagen membrane (Healiguide) which is claimed to enhance the pace and quality of the regenerative process, in comparison to a commercially available membrane (BioMend, Centerpulse, USA) in the treatment of Class II periodontal furcation defects. The study also assessed a new osseous xenograft consisting of demineralized bone (Osseograft DMBM) in the treatment of Class II periodontal furcation defects.

Results at 12 months indicated that there were significant probing depth reductions, from baseline, for the control group and all three tests ($P<0.007$ - Group 1, $P<0.005$ - Group II, $P<0.005$ - Group III and $P<0.005$ - Group IV), however the differences between groups were not significant. Changes in gained attachment level were also significant in all groups whilst not being significant between groups.

The results suggest that guided tissue regeneration using collagen membranes is an effective technique for the treatment of Class II furcation defects. The use of bioactive membranes may however accelerate the regenerative process and offer an additional advantage over currently available commercial collagen membranes. The additional use of xenogeneic osseous graft, while not significantly affecting treatment outcomes, is nevertheless recommended.