Lasers in Periodontology

Thursday, 7:50 a.m. - 10:00 a.m. Salons 4-5

Adapting Current Laser Technology to Periodontal Patient Management

Samuel Low, DDS, MS, MEd
Professor Emeritus, University of Florida, College of Dentistry, Gainesville, Florida, USA

Fundamental periodontal therapy seeks a primary goal of health determined by maintenance and/or increase in clinical attachment level of the periodontium. Several system dynamics have been instituted to assist in achieving this objective. Because of the microbial etiology, therapies have been developed to reduce or change pathogenic microflora including removal of calculus and endotoxin associated with the toxicity of tooth root surface. However, recent emphasis has been placed on the host response with anti-inflammatory modalities. Moreover, surgical procedures to modify wound healing and alter repair as to enhance new attachment via cementogenesis have been introduced in recent years. The introduction of laser technology that considers the adaptation of different wavelengths to particular therapeutic rationales will be explored using diode and Er,Cr:YSGG laser wavelengths. Both research and anecdotal observations will be utilized to determine a basis for implementation of laser systems with an analysis of positive outcomes. Dr. Low's Thursday opening Keynote presentation will be followed by a 3-hour Hands-on Workshop on Friday afternoon 2:00 p.m. - 5:00 p.m.

Educational Objectives

1. Explore current periodontal pathogenesis as related to both microbial and inflammatory/host etiologies.
2. Describe periodontal wound healing and bio-modifying manipulation that can create new attachment.
3. Determine the relationship of laser wavelength to enhanced wound healing.

Thursday, 10:30 a.m. - 11:00 a.m. Salon 4

STUDENT SCHOLAR

Antimicrobial Effect of a-PDT Using High-Power Blue LED and Red Dye Agent on *Porphyromonas gingivalis*

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Introduction

Antimicrobial photodynamic therapy (a-PDT), using a combination of red-colored laser/light and blue dye, has been employed for periodontal therapy and the bactericidal effect seems promising. Considering the wavelength property, a blue light-emitting diode (LED) would be a more promising light source for a-PDT since the LED itself has been shown to possess an antimicrobial effect (Feuerstein O, Persman N, Weiss EI. Phototoxic effect of visible light on *Porphyromonas gingivalis* and *Fusobacterium nucleatum*: An *in vitro* study. *Photochem Photobiol* 2004;80(3):412-415). This study investigates the effect of a-PDT using a combination of high-power blue LED (a device modified from FlashMax2, CMS Dental, Copenhagen, Denmark, 425-500 nm, 4 W/cm^2 power density) and red dye agent as well as gene expression profiling after blue or red LED (FotoSan, CMS Dental, Copenhagen, Denmark, 625-635 nm, 2 W/cm^2 power density) irradiation on *Porphyromonas gingivalis in vitro*.

Materials

P. gingivalis was irradiated with a blue or red LED, or mixed with the Rose Bengal (RB) stain with/without following blue LED irradiation. Secondly, *P. gingivalis* was irradiated with a blue or red LED anaerobically, incubated, and then the total ribonucleic acids (RNAs) were isolated. RNA degradation was measured by using a Bioanalyser. Microarray analysis was performed using custom-made *P. gingivalis* arrays (NimbleGen). Additionally, real-time quantitative polymerase chain reaction (RT-PCR) (qPCR) was done to validate changes in gene expression.

Results

The combination of blue LED and RB exhibited significantly higher bacterial reduction compared to other groups. In anaerobic irradiation, blue LED inhibited the bacterial growth. No RNA degradations were observed in either LED. Microarray analysis showed a different gene expression profile with/without blue LED. Blue LED irradiation affected the gene expressions associated with DNA replication and cell division.

Conclusions

Blue LED has a growth inhibition effect on *P. gingivalis*. a-PDT using a combination of blue LED and RB shows promise as a new modality for bacterial elimination in periodontal therapy.

This presentation discusses investigational devices that have not yet received U.S. FDA approval or clearance for the specified clinical indications, or describes off-label uses.

Educational Objectives

1. Identify the antimicrobial effect of a-PDT using a combination of a high-power blue LED and a red dye agent on *Porphyromonas gingivalis in vitro*.
2. Specify the effect of high-power blue and red LEDs on *Porphyromonas gingivalis* and the gene expression profiling after blue and red LED irradiation.

Thursday, 11:00 a.m. - 12:00 p.m. Salon 4

Advanced Concepts in Periodontal Laser Surgery

Robert Convissar, DDS, New York Hospital, Department of Dental and Oral Medicine, New York, New York, USA

Since its invention in 1964, the CO_2 laser has had considerable peer-reviewed literature to justify its use on oral mucosa. This presentation will discuss the use of the CO_2 wavelength for periodontal surgical procedures including regeneration of hard and soft periodontal tissues. The procedures presented will be supported by peer-reviewed histological proof if its efficacy in periodontal regeneration. A simple protocol for reproducible osseous and soft tissue regeneration will be discussed. By the end of the presentation the attendees will understand the histological evidence of CO_2 laser periodontal tissue interaction.

Educational Objectives

1. Evaluate the histological evidence of CO_2 laser periodontal tissue regeneration.
2. Specify the biological rationale for the use of the CO_2 laser for periodontal treatment.
3. Outline a simple protocol for CO_2 laser periodontal regeneration surgery.

Thursday, 2:00 p.m. - 2:30 p.m. Salon 4

Periodontal Therapy in Everyday Practice: A Combined Therapeutic Approach

Arthur B. Levy, DMD
Private Practice, Chester, New Jersey, USA

This presentation will review the diagnosis, treatment, and monitoring of periodontal disease in the general practice. Through the use of a systematic protocol of diagnostic tools, coupled with treatment modalities, it is possible and effective to keep patients from suffering from advanced periodontal disease in most cases within the general practice. The use of dental lasers such as an Nd:YAG at 1064 nm (dLase 300, American Dental Technologies, Birmingham, Mich., USA) and diode at 980 nm (Curative980® Diode Laser, OroScience, Palo Alto, Calif., USA) has enhanced our effectiveness and given dentists a tool to increase our success rate while reducing patient discomfort. Coupling this with support of the immune system, the use of time-released locally applied antibiotics, and low-level laser therapy using multiwavelength diodes (Q1000, QLasers, Rapid City, S.D., USA) as well as the 660 nm and 808 nm enhancers, we are now able to maximize our results and reduce the rate of recurrence in the periodontal patient.

After this presentation, practitioners will have a systematic program to help their patients manage early-to-moderate periodontal disease. They can then decide if it is in their capabilities to treat advanced disease or opt to refer to a qualified specialist for localized, isolated procedures where necessary. This program will give new laser users a treatment approach that will expand their capabilities on the first day after the program in their own office. It will also refresh experienced laser users on the tools they have in treating one of the most insidious diseases that we face in the dental office on a daily basis.

Educational Objectives

1. Diagnose and recognize periodontal disease at its early stages.
2. Help promote a reduction in tissue destruction through early intervention.
3. Treat and reduce the symptoms of periodontal disease.
4. Prevent long-term destruction by the progression of more advanced disease.
5. Enhance and stimulate repair of the destructive potential through support of the immune system as well as stimulation of healing at a cellular level.
6. Monitor and reduce the potential of recurrence of the disease through effective home care and recare visits.