**Photodynamic Therapy**

**Introduction**

Photodynamic Therapy (PDT) is a type of phototherapy where three factors act simultaneously: the photosensitizer, light source, and oxygen. Oscar Raab in 1900 was the first researcher who described the action of the dye acridine on a species of protozoa (Paramecia) that causes malaria, demonstrating its awareness of the dye’s lethal effects. Trappeiner in medicine was in 1903 that used the eosin dye and exposure to light for the treatment of skin cancer.

In the 1990s Dobson & Wilson have shown good results in bacterial reduction using He-Ne laser (Helium Neon), $\lambda = 632.8 \text{ nm}$ and 7.3 mW of power, associated with the photosensitizers toluidine blue (TBO), blue methylene (MB), phthalocyanine and hematoporphyrin.

In recent decades, local antimicrobials have been used in an attempt to treat periodontal infections by local irrigation and controlled release devices with antibiotics and antiseptics associated with mechanical treatment (scaling and root planing).

The use of antimicrobials as a local treatment option would bring the following benefits: increased drug concentration, reduction of systemic effects, decreased risk of resistance in other parts of the body, besides being an option for patients with systemic antibiotic therapy not cooperating. On the other hand, the effectiveness of the antimicrobial site is dependent on contact time between the drug and the target microorganism and the appropriate concentration present in the periodontal pocket.

Photodynamic therapy may be a new way, as an effective technique is painless and does not promote microbial resistance.

Professionals who use photodynamic therapy have in their hands an excellent tool for the local periodontal infection control, endodontic and perimplants.

The use of antibiotics in the treatment of periodontal disease, endodontic and peri-implant is based on the infectious nature of these. However, there is always a difficulty in this decontamination performed by existing antimicrobials. So there is a need to develop new therapies and photodynamic therapy thus becomes a viable alternative for local action and restricted. Remember that the indiscriminate use of antibiotics can lead to genetic recombination creating highly resistant microorganisms.

Photochemotherapy presents itself as a viable technique, effective against various types of microorganisms, safe for the fabric, and do not provide microbial resistance.

**Benefits**

- Reduction of microorganisms in periodontal pockets and peri-implant
- Intracanal microbial reduction
- Highly effective bactericide in the operative field
- Noninvasive technique
Photodynamic Therapy (PDT), called worldwide as Photodynamic Therapy (PDT), is a therapy where a substance photoabsorbing is deposited at sites of infection, being absorbed by these damaging agents (bacteria, fungi, viruses) and subsequently subjected to irradiation monochromatic light generated by lasers and LEDs, conducted by fiber optics or not. The light provides the excitement of the substance photoabsorbing and generation of toxic oxygen species that affect or kill the microorganisms.

Any light source can be used?
The ideal is monochromatic light sources such as lasers and LEDs with wavelengths resonant with the substance used photoabsorbing. For example, methylene blue as a photosensitizer require light sources with wavelengths between 630 to 670nm (nanometers).

As the photosensitizing agent is administered to the patient?
In the dentistry, it is topically administered via syringe and tube, where it is deposited on the infected site, for example, within the peri-implant and periodontal pockets in the root canal system, surgical stores, Stomatological lesions, among other. After deposition of the substance photoabsorbing, it is recommended to wait 5 minutes before starts the irradiation.

What equipment MM Optics can be used in the PDT?
The red laser equipment Twin Flex Evolution, with unique optical fiber coupled kit.
Can I use my LED curing light?
Not for the methylene blue. The light curing unit by unit is blue (470nm) and agents (dyes) photosensitizers used commercially must be activated by red light (630nm to 670nm). We would have to have a dye that absorbed at 470nm.

What are photosensitizing agents (dyes) more used in the dentistry?
Methylene blue | DYE PHOTOABSORbing CHIMIoLUX

What are the indications for the use of methylene blue in PDT in dentistry?
Periodontics:
- Prior to scaling and root planing;
- As antimicrobial therapy in periodontal maintenance or support;
- As adjuvants in acute processes;
- (abscesses, Guna, pericoronitis, periodontitis and other aggressive).
- In active sites of special patients, (heart disease, immunosuppressed, diabetic, respiratory and other changes).
  Note: The presence of bleeding at the site may interfere with the effectiveness of the dye photoabsorbing.

In Implant Dentistry:
- As an adjunct in the treatment of perimplantites, working to disinfect the surface of the implants;
- In the decontamination of surgical stores prior to installation of immediate implants.

In endodontics:
- Decontamination of the root canal system after biomechanical preparation;
- In lesions with refractory periraculares fistula;
- In paraendodontics surgery, the disinfection of surgical stores.

What is the recommended dose of energy for each site (site of irradiation)?
90J/cm²
PHOTODYNAMIC THERAPY

PHOTODYNAMIC THERAPY IN TRANS-SURGICAL PERIODONTAL LESION PERSISTENT

Clinical cases kindly provided by Prof. Dr. Livio de Barros Silveira | www.aptivalux.com.br

1 AND 2 - 9 MM PROBING DEPTH AND RADIOLUCENT AREA
THE MESIAL ROOT AFTER ENDODONTIC AND PERIODONTAL SURGERY

3 - PICTURE OF THE SURGICAL FIELD
OPEN AFTER DEBRIDEMENT
AND SCALING AND ROOT PLANING

4 - APPLICATION OF CHIMIOLUX

5 - IMAGE AFTER 5 MINUTES
(PRE-IRRADIATION TIME)

6 - 660 NM LASER IRRADIATION
DOSE OF 90J/CM²

7 AND 08 - 4 MONTHS POST OP

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PHOTODYNAMIC THERAPY ENDOPERIO INJURY IN PERSISTENT

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PHOTODYNAMIC THERAPY

CLINICAL CASES

AUXILIANDO NA DESINFECÇÃO DE SÍTIOS PERIODONTAIS EM ATIVIDADE ANTES DA RASPAGEM E ALISAMENTO RADICULAR

Presence of edema and gingival exudate
Special Patient: Cardiac and Heart Valve
Irradiation with red laser 660nm by 90J/cm² (90 seconds with 40MW) for each papilla before the RAR

Palatal view of the laser beam
Initial photo - before PDT and RAR
60 days after PDT and RAR

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PHOTODYNAMIC THERAPY SYSTEM FOR THE DISINFECTION OF ROOT CANALS IN ENDODONTIC RETREATMENT

Initial radiographic
Chimiolux being collected
Deposition of Chimiolux intracanal disinfection after the PQC root canal system
Fiber optics positioned respecting the established CT to conduct

 Irradiation with red laser 660nm with 120J/cm² (2 minutes with 40MW) for each conduit
Irrigation with sodium hypochlorite and drying of the conduits
Obturation of the canal system root and temporary restoration
Final radiographic

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If you buy quality, you only cry once!

SWEDE DENTAL
CONVENTIONAL ENDODONTIC TREATMENT WITH MANUAL INSTRUMENTATION

PULP NECROSIS IN TOOTH 46

APPLIED TO ANTIMICROBIAL PDT AT THE END OF ENDODONICS

DIODE LASER IRRADIATION OPTICAL FIBER COUPLED TO µM (TWIN LASER - MMO)

INTRACANAL MEDICATION FOR 7 DAYS APPLIED SECOND SESSION OF PDT

FINAL LOOK AFTER 7 DAYS CHANNEL WITH THE SHUTTER

Clinical cases kindly provided by Prof. Dr. Aguinaldo Silva Garcez

PHOTODYNAMIC THERAPY

CLINICAL CASES

PDT IN THE ENDODONTIATT

HERPES LABIALIS DURING GALLBLADDER

DRAINAGE OF THE VESICLES WITH A STERILE NEEDLE

APPLICATION OF THE DYE METHYLENE BLUE

IRRADIATION WITH LASER LOW POWER

APPEARANCE AFTER 72 HOURS

REPAIR OF COMPLETE LESION AFTER 1 WEEK


SWEDE DENTAL

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## Photodynamic Therapy

### Application Protocol

#### Application Protocol in Endodontics
- Chemo-mechanical preparation of root canal system;
- Application photosensitizers agent (dye) based on methylene blue syringe and cannula;
- Wait 5 minutes of the period (the period prior to irradiation PPI);
- Irradiation with 660 nm laser (red) for a period of 90 seconds for each root canal keeping the fiber within the duct;
- If there is staining in the pulp chamber using EDTA solution or sodium hypochlorite 5.2%;
- The fiber should be 2 mm from the apex of the root canal, there is no need to get to the total length of the conduit;

#### Technique for Endodontics
- **Healthy Teeth**
- **Tooth with Channels Infected**
- **Endodontic Access to the Cavity**
- **Mechanical/Chemical Preparation of Root Canal**
- **Bacteria in the Root Canal After Mechanical/Chemical Preparation**
- **Placing the Methylene Blue**
- **Application of Laser Through the MMO Fiber Optic Kit**
- **Root Canals Are Practically Bacteria Free**

#### Application Protocol in Periodontics
- Should be performed prior to scaling, root planing and polishing (RAP) following the protocol listed below:
- Relative isolation of the area to be irradiated;
- Deposit the photosensitizing agent methylene blue (dye) into the periodontal pocket with the help of syringe and cannula.
- Wait for 5 minutes, this being the period prior to irradiation (PPI);
- Irradiate for 90 seconds with 660 nm and 40 mW laser power;
- Scaling, root planing and polishing;

#### Technique for Periodontics
- **Placement of Methylene Blue**
- **Application of Laser Through the MMO Fiber Optics**
Photodynamic Therapy

General Characteristics

Equipment

Laser Therapy System

The MMO introduces the FLEX TWIN EVOLUTION. Modern Laser therapy system equipped with clear roles and objectives and establish a new reality for dental professionals, with much greater efficiency, convenience and flexibility. Laser therapy system equipment provides a quick repair tissue with anti-inflammatory and analgesic.

**TwinFLEX**

LED LASER strategically positioned at the end of the pen. This unique system allows total use of the power transmitted without losses.

**Modo Assistido e Modo Programado**

Assisted mode and the programmed mode. Lets you use the settings pre-programmed or custom.

**Differential**

- Unique system of light emission
- Pens with higher power
- Autoclavable tips
- Adaptation Kit fiber PDT
- Drive attached to pen buttons
- Ergonomic Design

Optional equipment and LASER HAND FLEX TWIN EVOLUTION.

- The newest therapy for the treatment of periodontal diseases
- Efficiency and safety
- Effective bacterial reduction
- Indications: Endodontics, Periodontics and Implantology

**SWEDE DENTAL**

If you buy quality, you only cry once!
Photodynamic Therapy

Photo Absorbing Dye • Methylene Blue

The Chimiolux fotoabsorvedor is a dye base of methylene blue for the photodynamic therapy in dentistry. It is a national product registered with the Ministry of Health and ANVISA, made with raw materials of high purity, with high quality control, tested successfully in infectious processes related to periodontal disease, refractory apical periodontitis and peri-implantitis. It is fully compatible with the lasers and fiber optics system developed by the MMO.

Testimonials

"I consider photodynamic therapy an efficient method of microbial reduction, and its use in dentistry properly indicated, since it shows very efficient in localized infections, of little depth and known microflora. The studies in the literature show the feasibility of using this therapy as an adjunct in the treatment of infections and I believe that science is gaining ground in health centers and dental offices, mainly in the treatment of special patients."
Prof. Dr. Roberto de Sousa Gerdal
PhD in Bioengineering - DEMEC-UFMG, Master of lasers by IPEN / FOUSP specialist in Periodontics and the MG-FOUI

"Photodynamic therapy has become a great ally in the clinical practice of dentistry, it can be used in any procedure where there is a need for reduction of microorganisms, painlessly, practical and effective."
Prof. Juliana Marotti - PhD, Department of Prosthodontics FOUSP | LELO Collaborator

"I recognize that photodynamic therapy is now a reality in dentistry. This technique is present in my clinical practice I need and always have used, obtaining favorable results in combating localized infections."
Prof. Dr. Livio Silveira de Barros - Ph.D. in Mechanical Engineering - Bioengineering - UFMG | Master of Laser Dentistry - IPEN / USP | Specialist in Periodontics - PUCMG

"The scientific literature has shown that the association of PDT with conventional endodontic treatment has achieved significant microbial reduction when compared to endodontic treatment only. Unlike treatment with the use of antibiotics and antimicrobials, there is currently in the literature reports of bacterial resistance to PDT, indicating this therapy as an important adjunct to conventional treatment."
Prof. Dr. Aguinaldo Silva Garcez
Ph.D. in Sciences IPEN / CNEN-SP, Master in Lasers in Dentistry IPEN / FOUSP, a specialist in dentistry EAP / APCD
Photodynamic Therapy

BIBLIOGRAPHY


