

# Laser in Dentistry



**Dr. Aditya Dupare**



LASER

WHAT COMES TO YOUR MIND??



SO FAR LASER IS CONSIDERED AS SUBSTITUTE FOR  
SCALPEL AND BLADE

WHAT THE WORLD DOES NOT  
KNOW ABOUT THIS BEAUTIFUL  
SCIENCE.....

**LIGHT AS MEDICINE**

**LaserVEDA**

Heal • Educate • Inspire



# LASER APPLICATIONS IN DENTISTRY

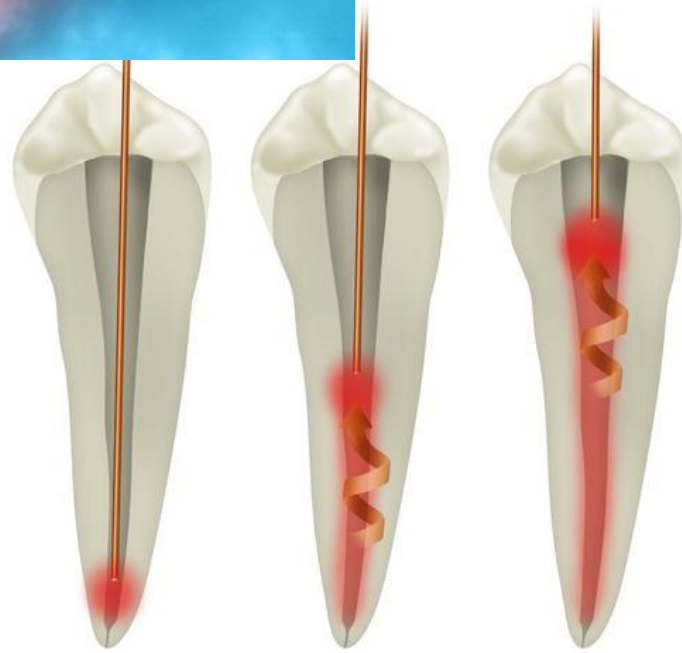
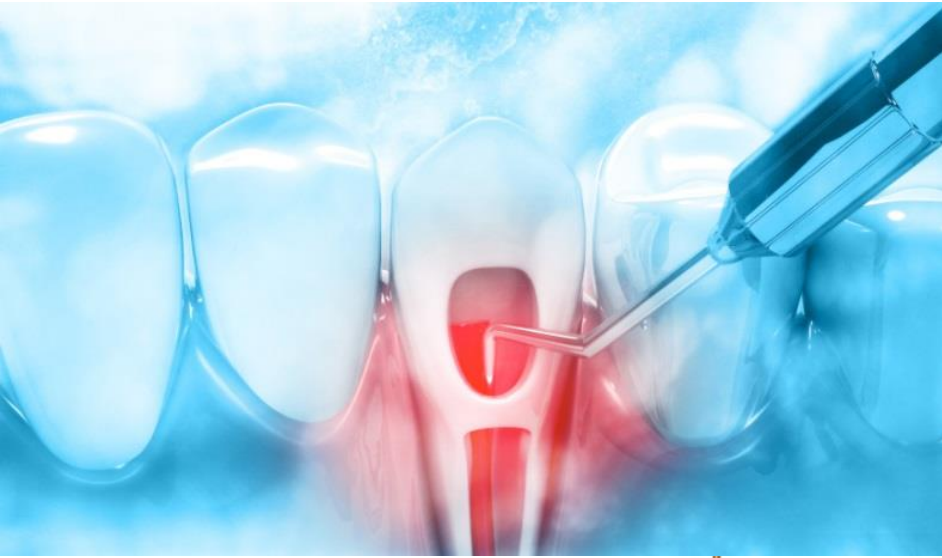
## PERIODONTOLGY

- Gingivitis
- Periodontitis
- Periodontal abscess
- Pericoronitis
- PDT- Non-surgical pocket therapy
- Implant exposure
- Peri-implant mucositis
- Peri-implantitis

## MUCOGINGIVAL SURGERY

- Frenectomy
- Operculectomy
- Gingivectomy
- Smile designing
- CLP
- FGG
- CTG

# ENDODONTICS



- Painless single sitting RCT
- Peri-apical abscess
- 3 D Root Canal Sterilization
- Pediatric Endodontics
- Re-RCT

# Orthodontics



- Orthodontic pain
  - Reduced pain
  - faster remodeling
- Orthodontic (Titanium) implants
  - Improved healing
  - Improved Osseo-integration
- Tooth movement
  - Accelerated tooth movement
  - Improved collagen deposition

# PEDIATRIC DENTISTRY



- Laser assisted painless extraction
- Pulpectomy
- Pediatric Trauma/ soft tissue injury
- TONGUE TIE

# ORAL SURGERY



- Painless extractions
- Coagulation
- Improved healing
- DRY SOCKET
- Surgical soft tissue excision - Biopsy
- Laser assisted impaction- reduced pain and swelling
- Parasthesia after disimpaction
- Dento-Alveolar trauma

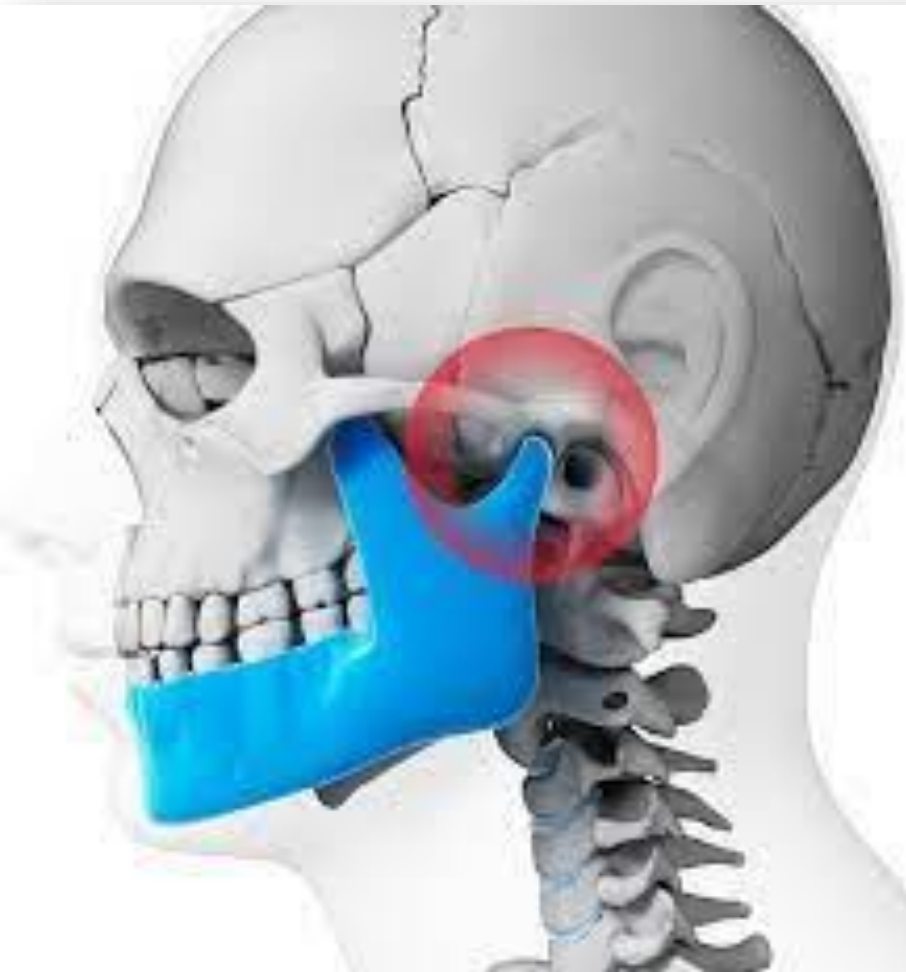


# AESTHETIC DENTISTRY



- Gummy smile correction
- Teeth whitening
- Depigmentation
- Facial Acne
- Hair Follicle Rejuvenation

# ORAL & MAXILLOFACIAL PAIN MANAGEMENT



- Non healing oral ulcers
- Premalignant lesions like leukoplakia
- Lichen planus
- OSMF
- TMJ Pain
- MPDS
- Craniofacial pain

# Panacea.....(remedy for all )



- Neuralgias
- Migraine
- Trismus
- Depression
- Anxiety
- Insomnia
- Radiation dermatitis
- Burning mouth syndrome .....many more...

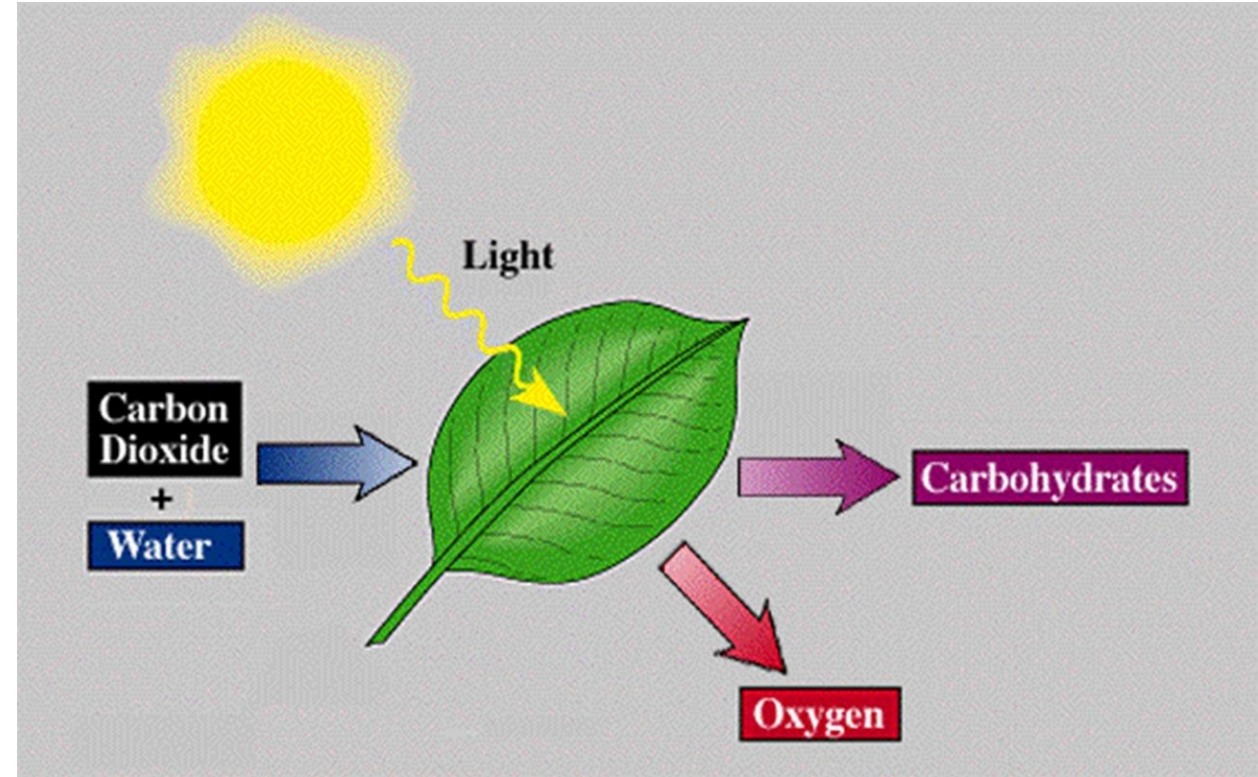


# LIGHT AS A MEDICINE IN ACTION

Around us !

????

????



# BLUE LIGHT THERAPY FOR NEONATAL JAUNDICE

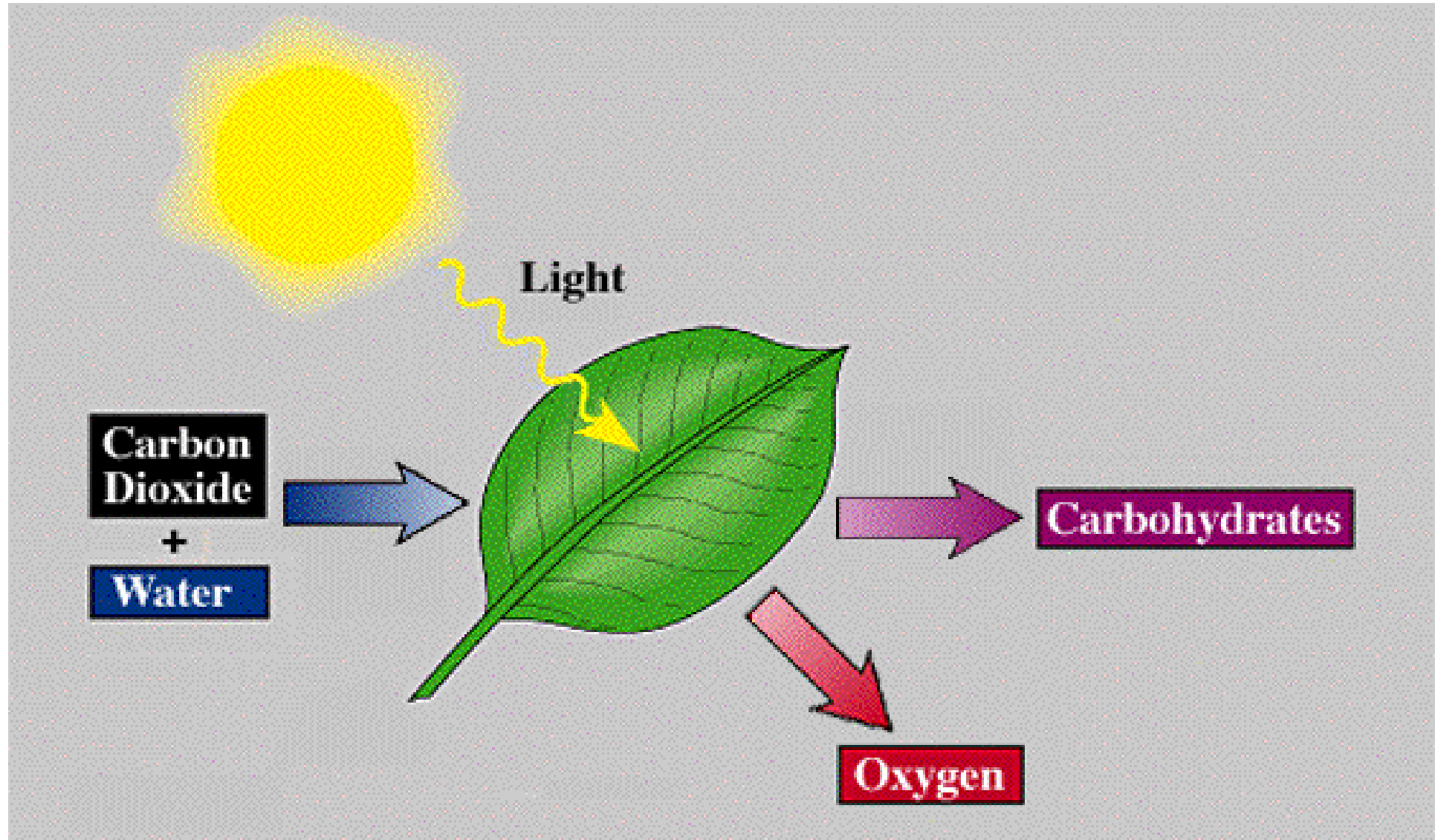


Excess bilirubin leads to yellow skin

blue light therapy @ 420-470nm

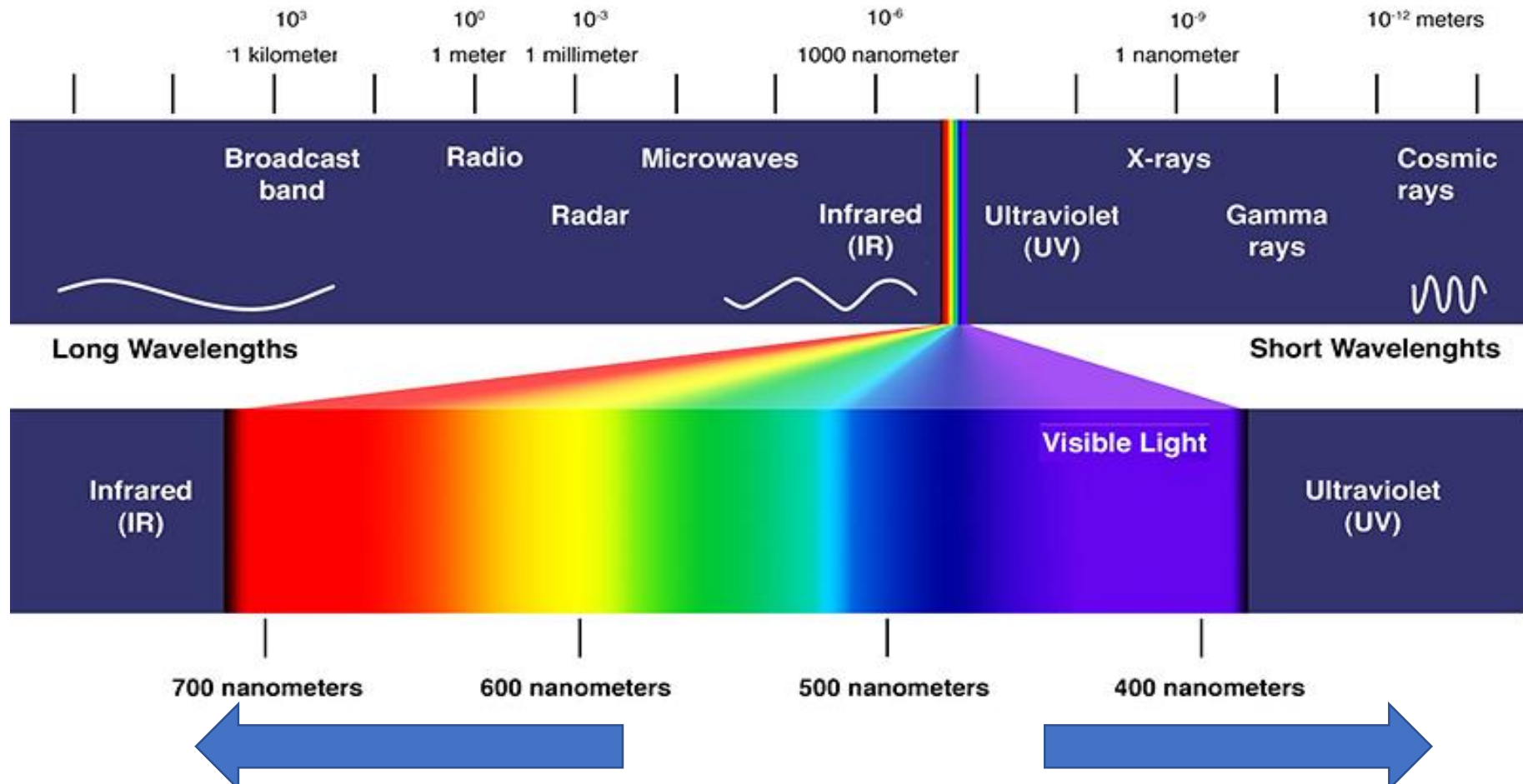


# photosynthesis



# Spectrum of light

## The Spectrum of Light



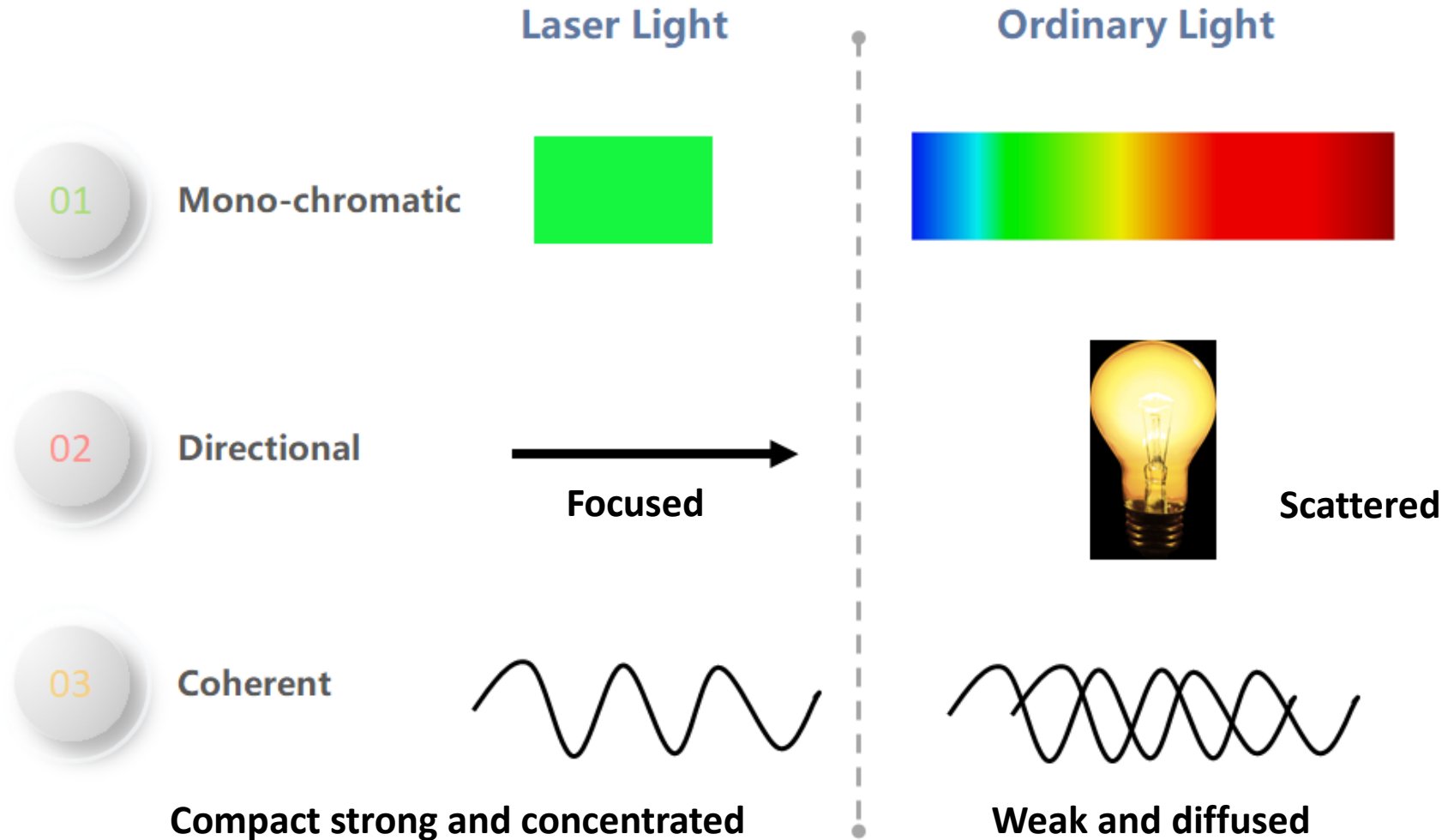
# 3 MOST IMPORTANT POINTS ABOUT LASER

**1. Wavelength**

**2. Wavelength**

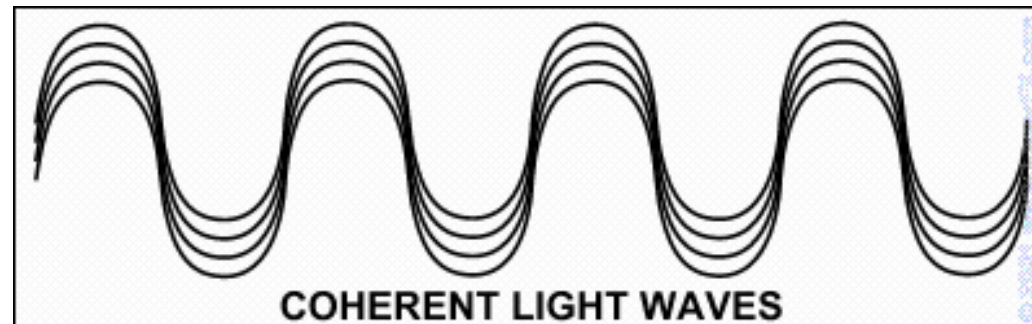
**3. Wavelength**

# Ordinary light Vs LASER



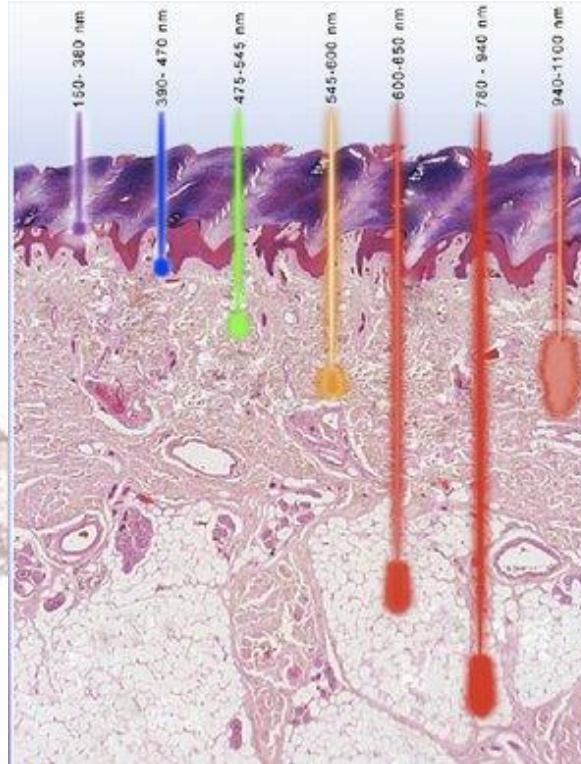
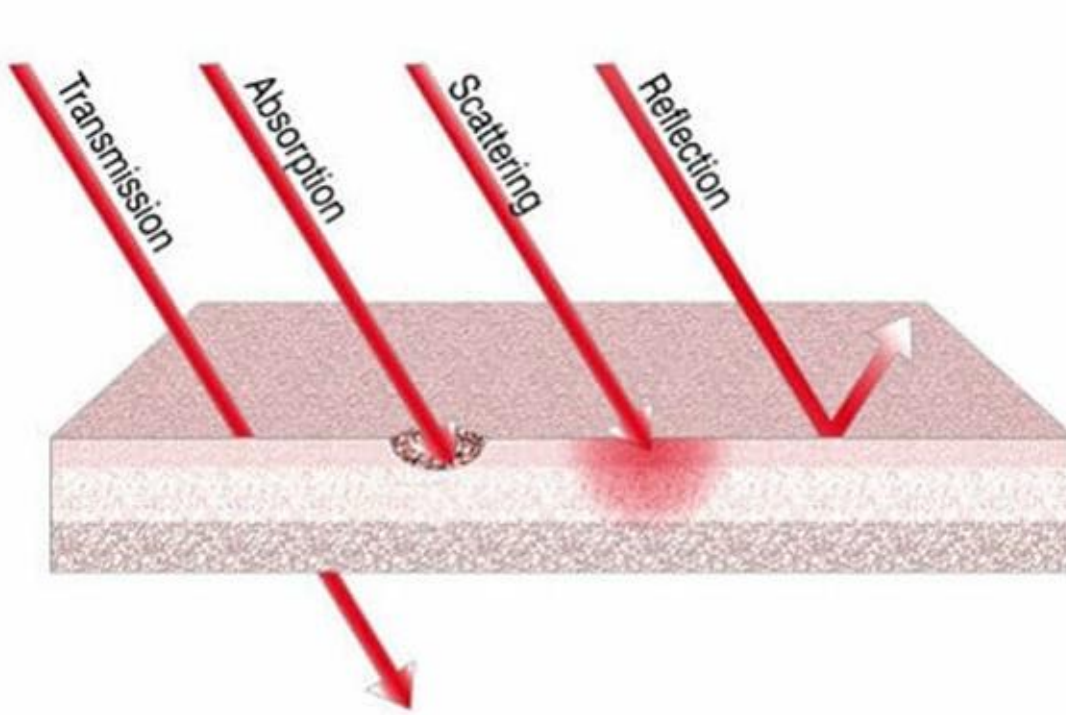
# Laser light properties

- **Monochromatic – Single color**
- **Coherent** - identical amplitude and identical frequency
- **Collimation** - beam having specific spatial boundaries
- Retains energy over considerable distances





# Laser-tissue interaction



Temperature (°C)	Effect
37-50	Hyperthermia
60-70	Coagulation
70-80	Welding
100-150	Ablation
>200	Carbonisation

# Laser tissue interaction



1. Reflection.

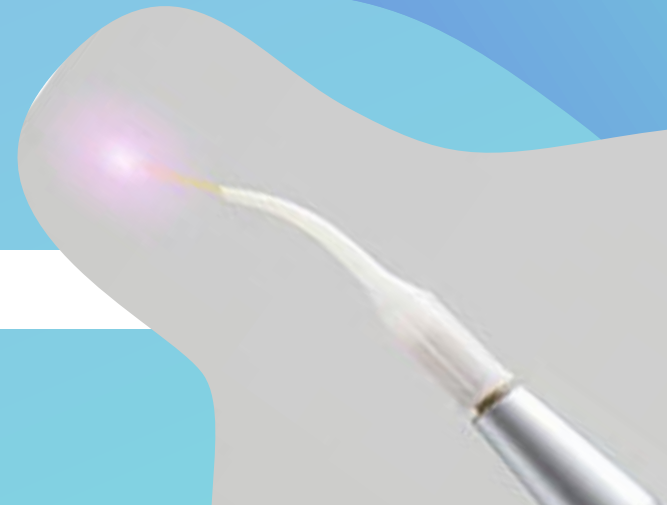
2. Transmission.

3. Scattering.

4. Absorption.

# Lasers in Periodontics & Implantology

An interaction between **Light-Bacteria-Immune** cells



At the end of this interaction, you would know;  
Use of LASERS in,

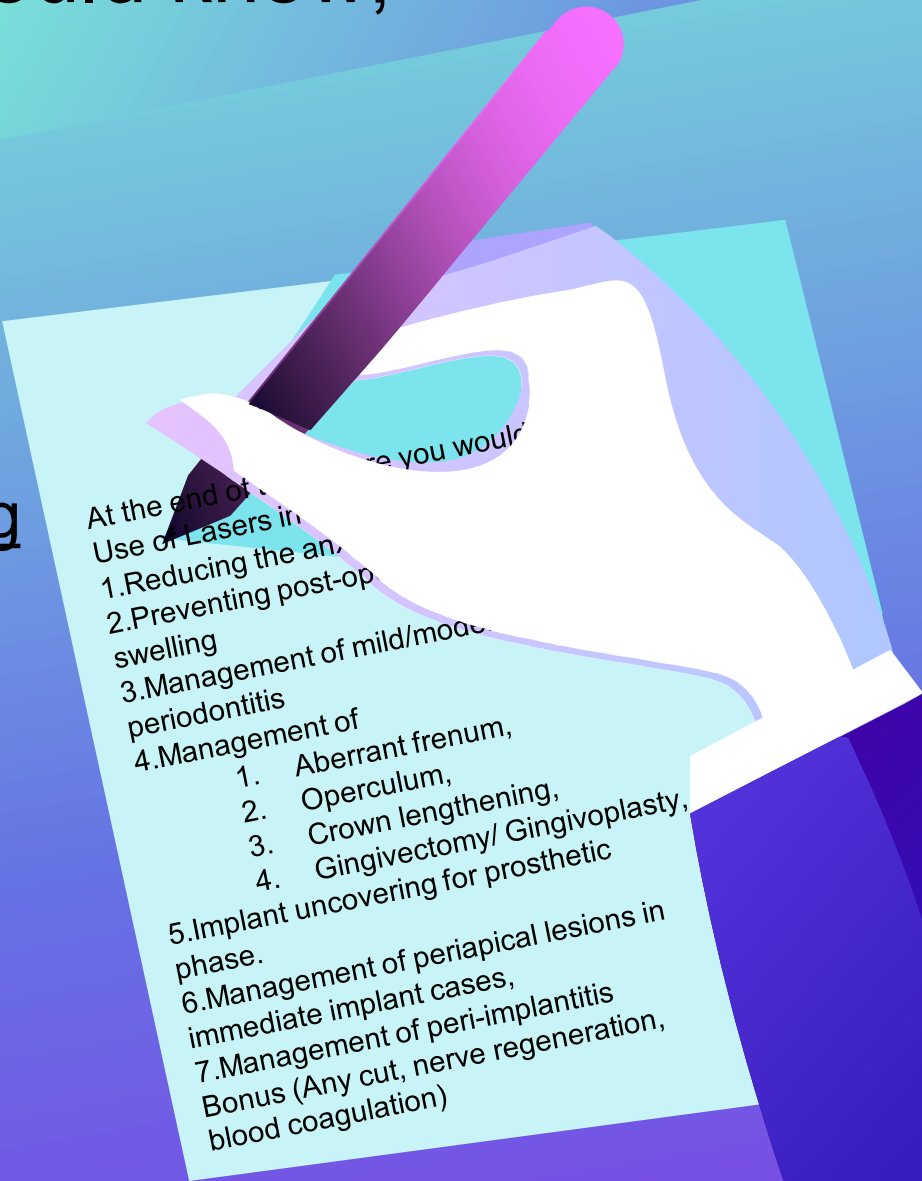
Reducing the anxiety of the patient

Preventing post-operative pain and swelling

Management of

1. Aberrant frenum,
2. Operculum,
3. Crown lengthening,
4. Gingivectomy/ Gingivoplasty

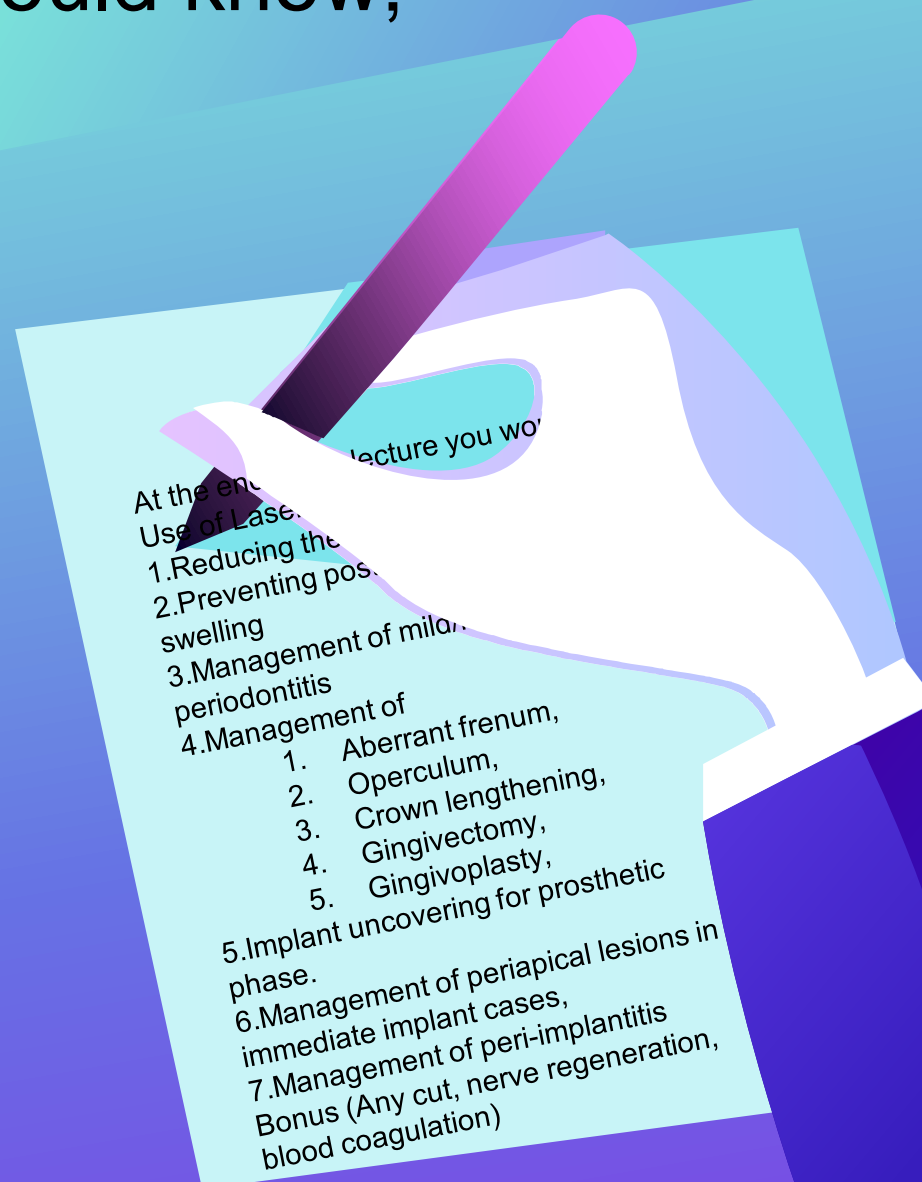
Management of periodontal diseases



At the end of this interaction, you would know;  
Use of Lasers in,  
1.Reducing the anxiety of the patient  
2.Preventing post-operative pain and swelling  
3.Management of mild/moderate periodontitis  
4.Management of  
1. Aberrant frenum,  
2. Operculum,  
3. Crown lengthening,  
4. Gingivectomy/ Gingivoplasty,  
5.Implant uncovering for prosthetic phase.  
6.Management of periapical lesions in immediate implant cases,  
7.Management of peri-implantitis  
Bonus (Any cut, nerve regeneration, blood coagulation)

At the end of this interaction, you would know;  
Use of LASERS in,

- Implant uncovering for prosthetic phase.
- Management of periapical lesions in immediate implant cases
- Management of peri-implantitis
- Bonus ( if time permits, Teeth whitening, Any cut, nerve regeneration)



At the end of this interaction, you would know;  
Use of LASERS in,  
1.Reducing the  
2.Preventing post-operative swelling  
3.Management of mild periodontitis  
4.Management of  
1. Aberrant frenum,  
2. Operculum,  
3. Crown lengthening,  
4. Gingivectomy,  
5. Gingivoplasty,  
5.Implant uncovering for prosthetic phase.  
6.Management of periapical lesions in immediate implant cases,  
7.Management of peri-implantitis  
Bonus (Any cut, nerve regeneration, blood coagulation)



Surgery is the first and foremost branch of medicine.

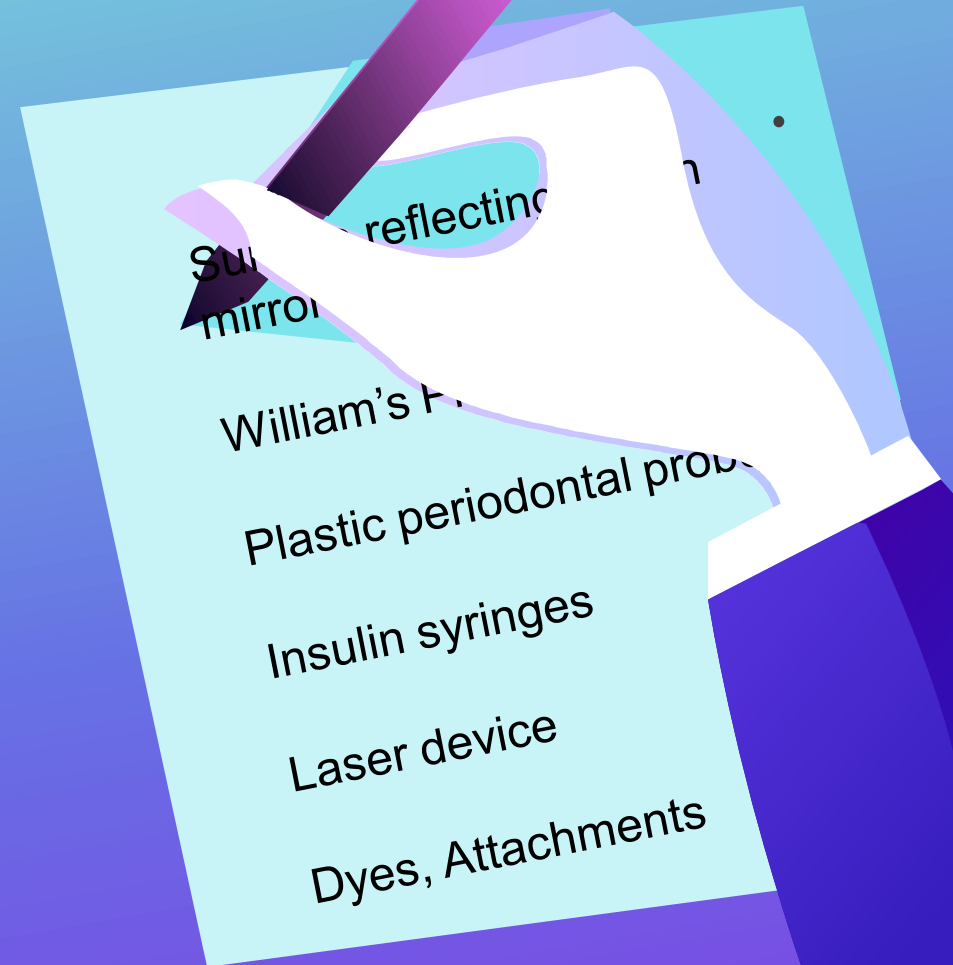
Surgery has the superior advantage of producing instantaneous effects by means of surgical **instruments and appliances** and hence is the highest in value of all the medical tantras.

- Sushruta, The Father of surgery (600 BC)



# . Appropriate tools for practicing Lasers in Periodontics

- Surface reflecting mouth mirror
- William's Probe
- Plastic periodontal probe
- Insulin syringes
- Explorers/probes



**Photobiomodulation therapy**



**Photodynamic  
therapy**



**Photothermal  
therapy**



**Laser Healing Triangle®**



Any similarities?? Any Differences??







## **Light Source (Laser wavelength)**

*810/980/450*

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## **Burning Glass principle**

*Photoablative effect with a coolant  
Bactericidal effect  
Haemostasis*

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## **Chromophores**

*Haemoglobin  
Melanin*

2.

# PHOTO THERMAL THERAPY

Hot tip Phenomena

## Applications



*Incisions*

65



*Excisions*

50



*Revisions*

80

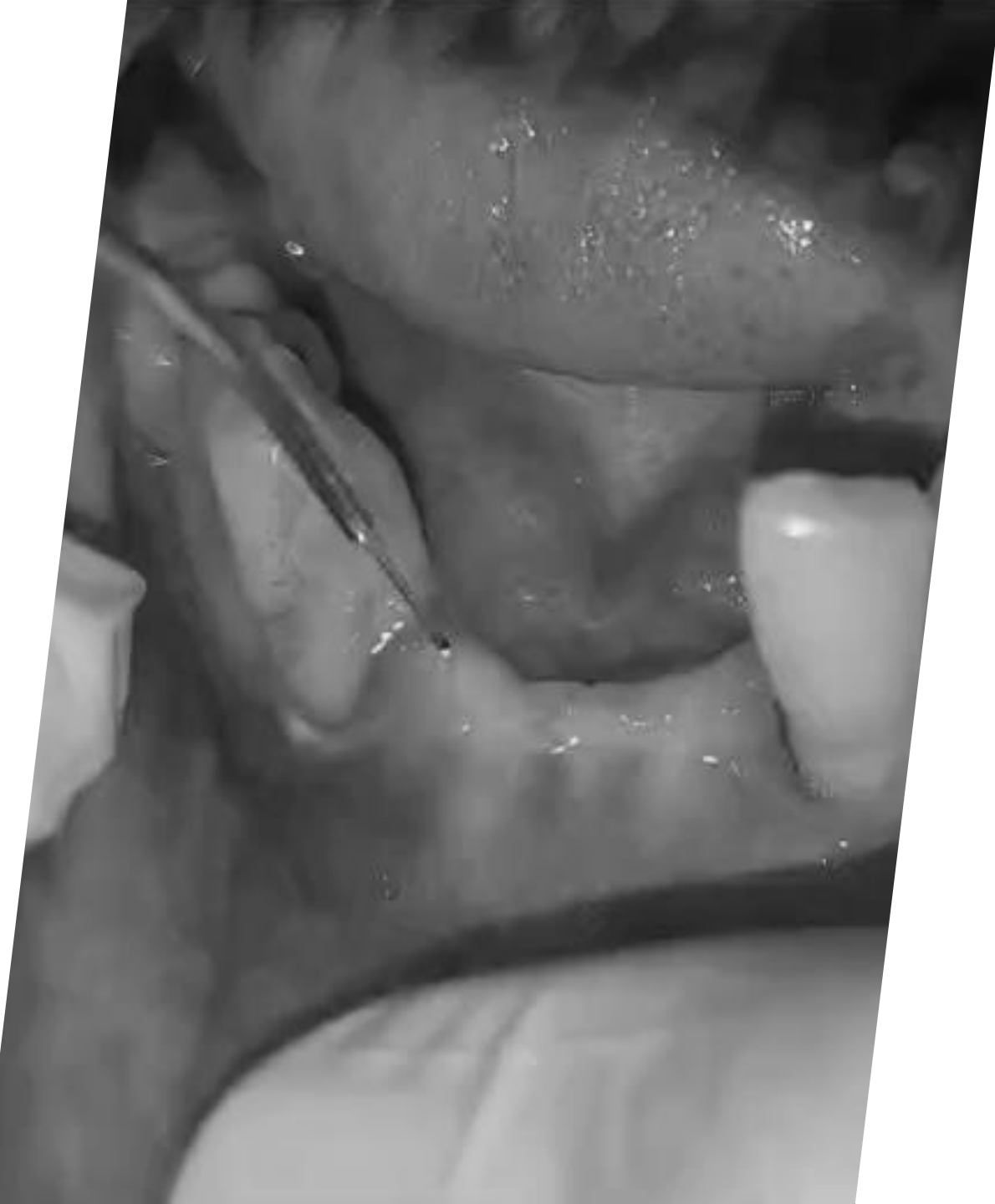
%

## Light Source (Laser wavelength)

980/810/450

## Handspeed

## Depth

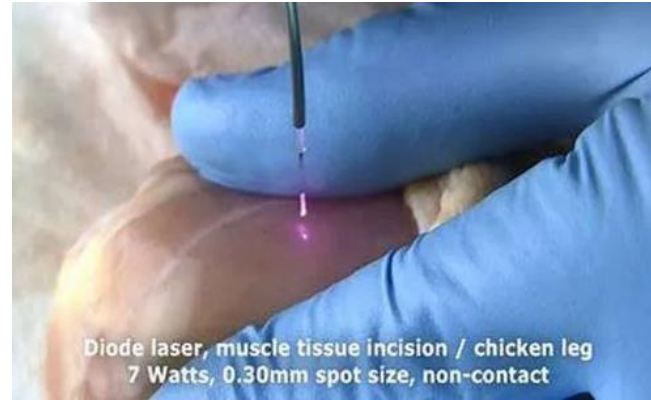


# ‘hot-tip surgery’

LET'S DIVE IN



# 'Hot tip surgery'



## Cutting & Coagulation

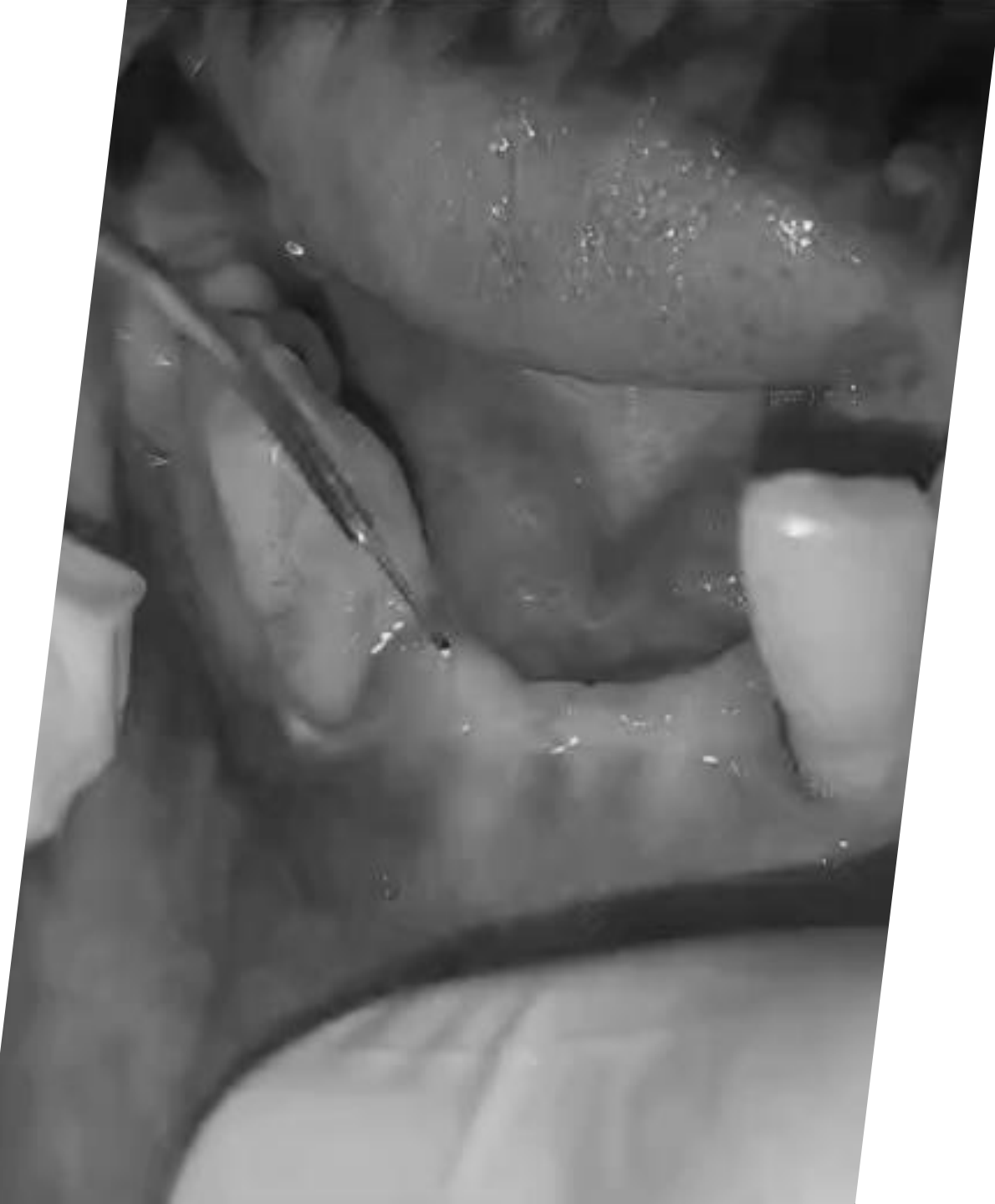
- Erbium vs Diode
- Photo-thermal Coagulation & Ablation efficiencies

## Hot tip properties

- Creating optically dark char
- 900° C heat diffusion
- Contact- thermal device
- Hand speed

## Important factors with 810/980nm

- Maintaining a char layer
- Optically leaky tip
  - Initiation
  - Maintenance
  - Control effectiveness
- Sub-surface thermal Necrosis



# Oral Surgical applications

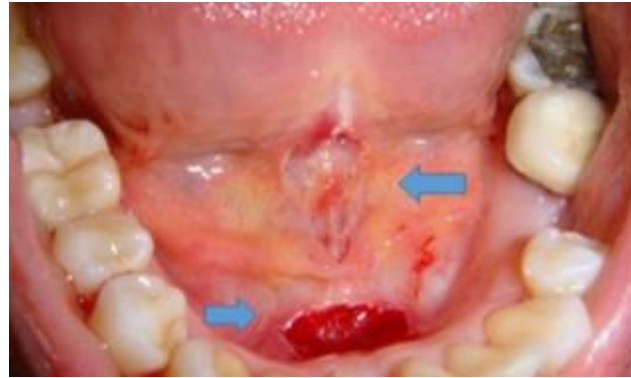
LET'S DIVE IN



# Frenectomy

LOOKING AHEAD





# Frenectomy

Mode: Cutting/ Hot tip

Power: 900 mW

Tip: Initiated

Wavelength: 810 nm

Cutting process and depth

Avoid : Charring

Preferably Pre-cool tissues





# Frenectomy

Mode: Cutting/ Hot tip

Power: 900 mW

Tip: Initiated

Wavelength: 810 nm

Cutting process and depth

Avoid : Charring

Preferably Pre-cool tissues



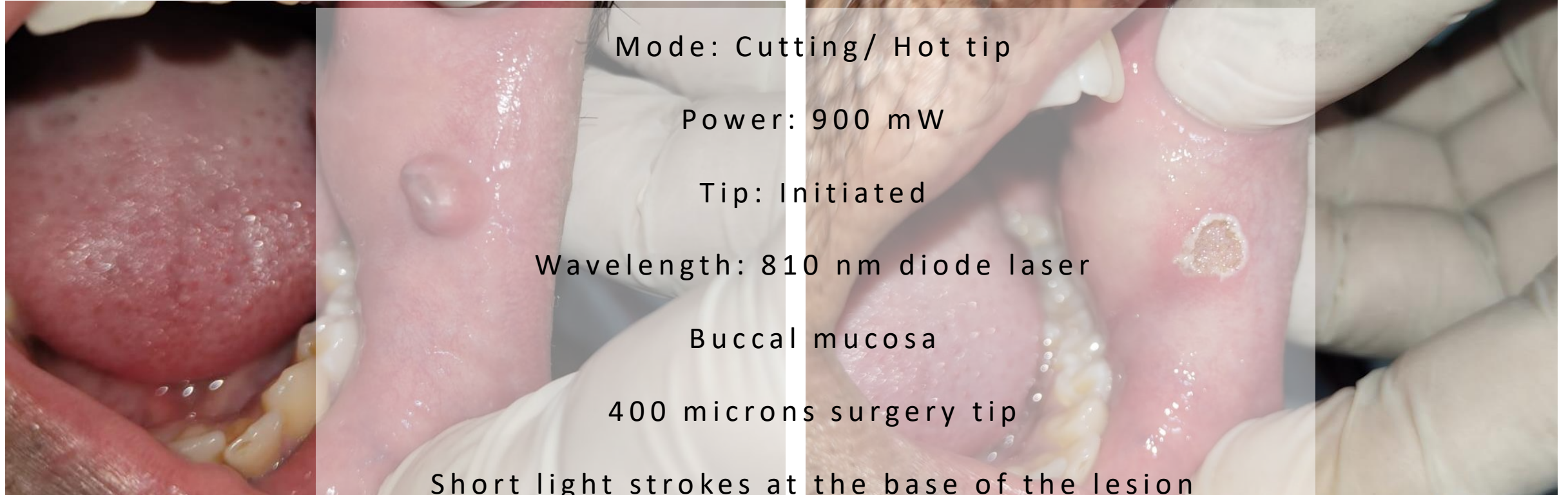




# Mucocele Excision

LOOKING AHEAD

# MUCOCELE EXCISION



Pre-operative

IMMEDIATE POST-OPERATIVE





# Tooth exposure

LOOKING AHEAD

# TOOTH EXPOSURE

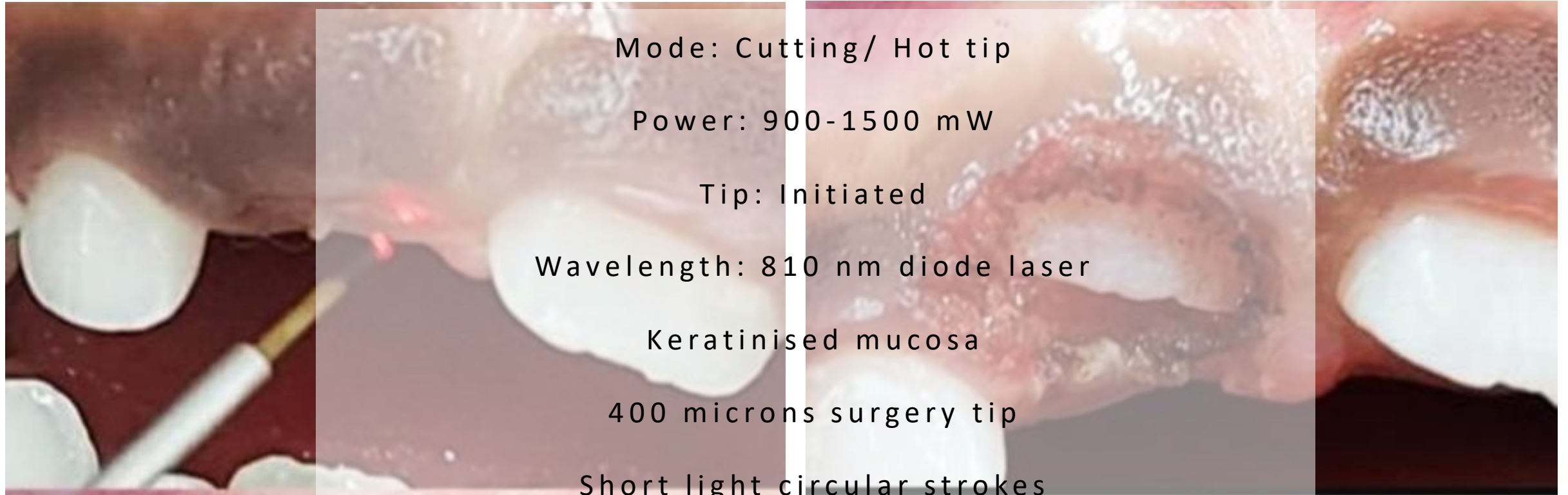


Pre-operative



IMMEDIATE POST-OPERATIVE

# TOOTH EXPOSURE



Pre-operative

IMMEDIATE POST-OPERATIVE





# CLP

LOOKING AHEAD

# CROWN LENGTHENING



Mode: Cutting/ Hot tip

Power: 900 mW

Tip: Initiated

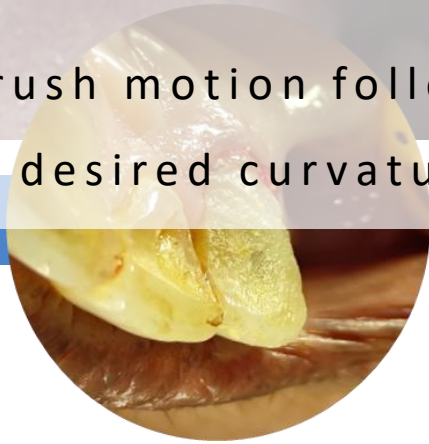
Wavelength: 810 nm diode laser

Marginal gingiva

400 microns surgery tip

Paint brush motion following the bleeding points to achieve desired curvature

Pre-operative



POST-OPERATIVE







# Implant uncovering

LOOKING AHEAD

# IMPLANT UNCOVERING



Pre-operative



IMMEDIATE POST-OPERATIVE

# IMPLANT UNCOVERING



Mode: Cutting/ Hot tip

Power: 900 mW

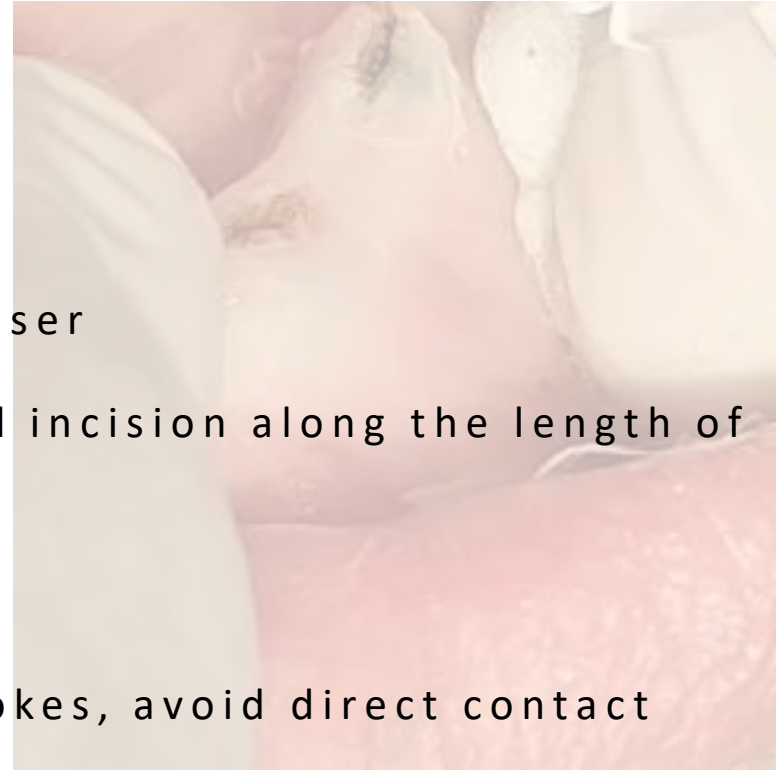
Tip: Initiated

Wavelength: 810 nm diode laser

Locate the implants-I shaped incision along the length of ridge

400 microns surgery tip

Paint brush motion light strokes, avoid direct contact with implant/bone



Implant 2 nd stage

UNCOVERING





## Question??

- "Take a look at this picture of an extraction socket. Can you guess how many days it's been since the tooth extraction took place?"



# Gingivoplasty

LOOKING AHEAD



# ENHANCED OSSEOINTEGRATION



Pre-operative



IMMEDIATE POST-OPERATIVE



# Gummy smile correction

LOOKING AHEAD



# GUMMY SMILE CORRECTION



Pre-operative

POST-OPERATIVE



# Gingivoplasty

LOOKING AHEAD



# PARAMETERS??



Mode: Cutting/ Hot tip

Power: 900 mW

Tip: Initiated

Wavelength: 810/980 nm diode laser

Mark the bleeding points, Light brush Strokes along the margin

400 microns surgery tip

Avoid direct contact with Bone/ Avoid exposing Bone



Pre-operative

IMMEDIATE POST-OPERATIVE



# Non contact laser cutting

LOOKING AHEAD



# Non Contact Surgery with TriBLU

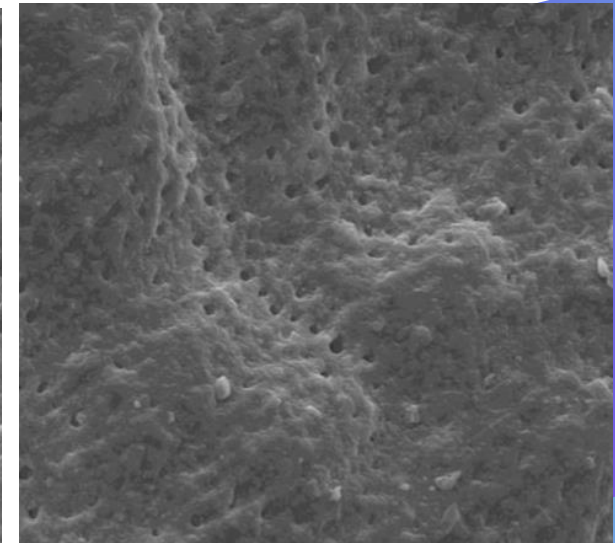
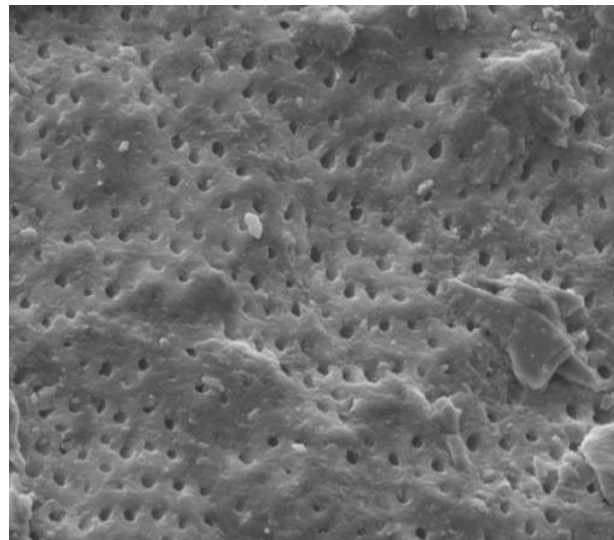


# PHOTO THERMAL THERAPY

## Management of Dentinal Hypersensitivity



### Mechanism of action-





# PHOTO THERMAL THERAPY

- Management of Dentinal Hypersensitivity
- Mechanism of action-**



# 1 PHOTO DYNAMIC THERAPY

Antimicrobial Disinfection.

## Applications



*aPDT-Monotherapy*

65



*Photo Activated  
Disinfection (Pre-  
procedural)*

50



*80  
%  
Post-procedural  
Surface Detoxication/  
Implant Maintenance*

## Light Source (Laser wavelength)

*810/640/450*

## Photosensitizer Dyes

*Indocyanine GREEN dye  
Methylene BLUE dye  
Curcumin dye*

## Molecular oxygen

*Singlet oxygen radicals and Triplet  
Oxygen molecules*

3.

# PHOTO BIO MODULATION

Antimicrobial Disinfection.

## Applications



*Analgesic*

65



*Host-modulation*

50



*Anti-inflammatory*

80

%

# 1 PHOTO DYNAMIC THERAPY

Antimicrobial Disinfection.

## Applications



*aPDT-Monotherapy*

65



*Photo Activated Disinfection (Pre-procedural)*

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80

%

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Methylene BLUE dye  
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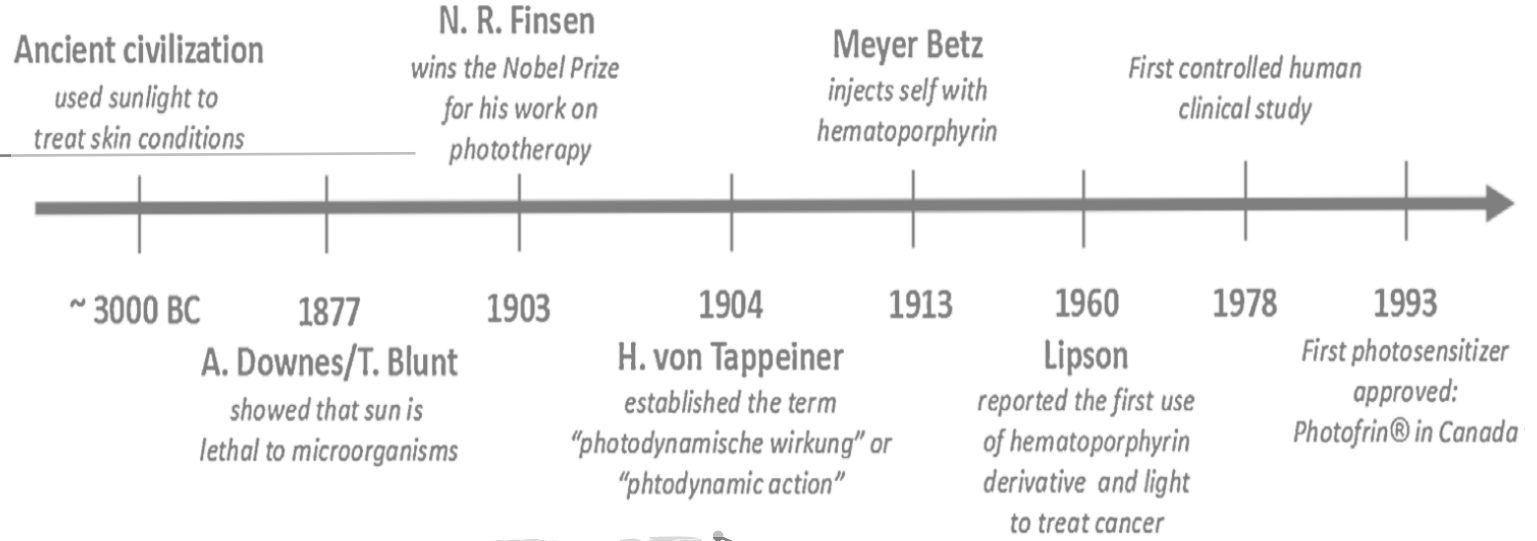


# PHOTO DYNAMIC THERAPY

N.R. Finsen



## Story time...



“photodynamische wirkung” or “photodynamic action” was established in 1904 by Hermann von Tappeiner.

**"I don't understand it Dr. von Tappeiner, the paramecia were all wiggling just fine a minute ago, but now these over by the window seem to be dead."**

-Oscar Raab



H von Tappeiner

# PHOTO DYNAMIC THERAPY

## Mechanism of action

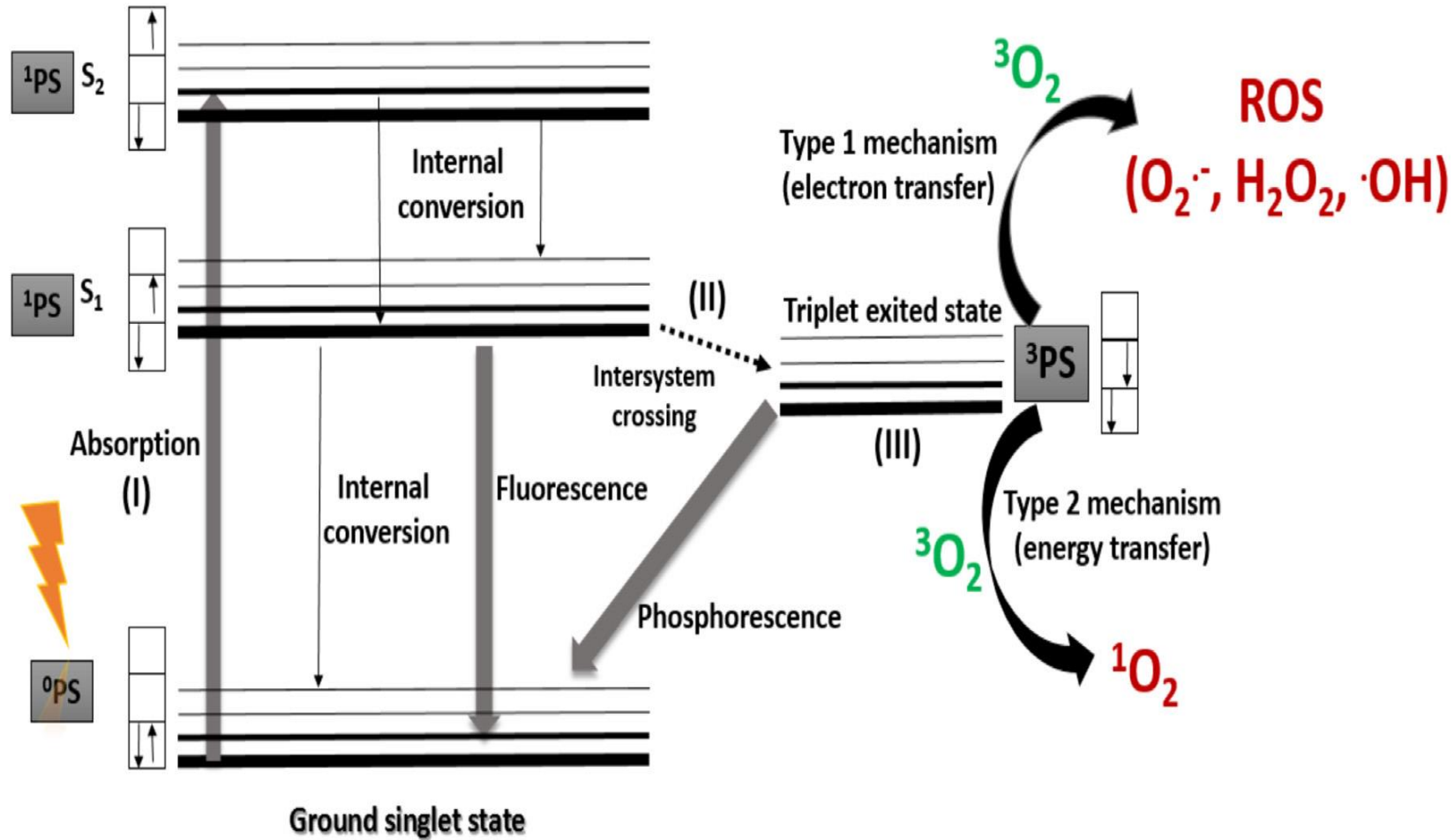
PHOTODYNAMIC THERAPY

**can be used for...**

- ✓ Periodontitis and peri-implantitis
  - ✓ Endodontics
- ✓ Bone disinfection and socket preservation
- ✓ Oral mucosa diseases (herpes, candida, suture dehiscence)

# PHOTO DYNAMIC THERAPY

## Mechanism of action



# PHOTO DYNAMIC THERAPY

## Procedure



Probing the pockets



Drying & Soaking the pocket 4 mins

Special Dyes for  
Specific Wavelength  
Laser Activation

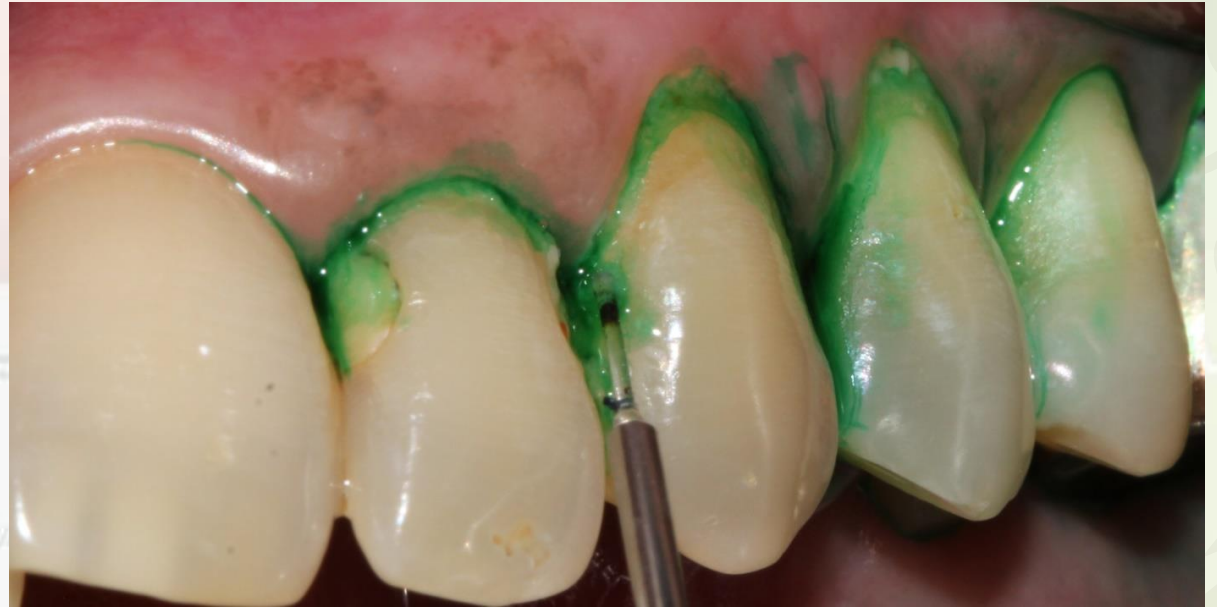
NovoGreen

NovoGreen



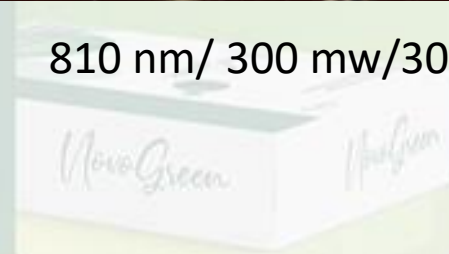
# PHOTO DYNAMIC THERAPY

## Procedure



⌚ Drying & Soaking the pocket 4 mins

810 nm/ 300 mw/30 secs



# PHOTO DYNAMIC THERAPY

## Procedure



mins



810 nm/ 300 mw/30 secs



@1 week follow up

Special Dyes for  
Specific Wavelength  
Laser Activation

NovoGreen

# PHOTO DYNAMIC THERAPY

## Parameters



### Indocyanine Green

30 seconds each pocket

EmunDo technique

### Methylene Blue

### Curcumin/Riboflavin

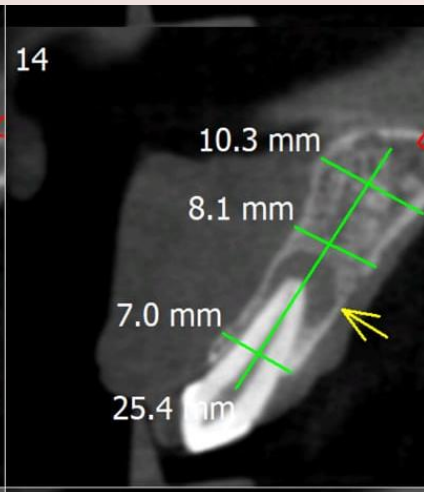
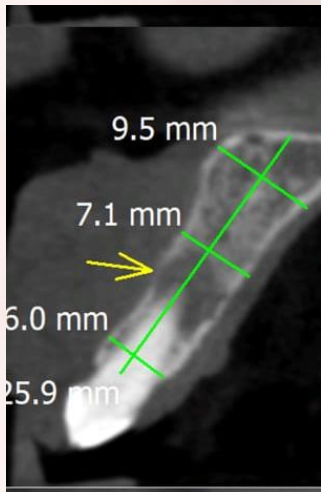
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Laser Wavelengths	810	640	450
Dye for PDT	Indocyanine green	Methylene blue	Curcumin
Resource			



# PHOTO DYNAMIC THERAPY

## Cases- Photo Activated Disinfection (PAD)





# PHOTO DYNAMIC THERAPY

Cases- Post-Procedural Surface Detoxication / Implant Maintenance



Pre- procedural status



Drying & Soaking the pocket 4 mins

# PHOTO DYNAMIC THERAPY

Cases- Post-Procedural Surface Detoxication / Implant Maintenance



3.

# PHOTO BIO MODULATION

Antimicrobial Disinfection.

## Applications



*Analgesic*

65



*Host-modulation*

50



*Anti-inflammatory*

80

%



Photobiomodulation video



# PHOTO BIO MODULATION

**Mechanism of action -  
Analgesia**



# PHOTO BIO MODULATION

## Mechanism of action – Host Modulation





# PHOTO BIO MODULATION

## Mechanism of action – Host Modulation



# PHOTO BIO MODULATION

## Mechanism of action – Anti-inflammatory





# PHOTO BIO MODULATION

## Mechanism of action – Anti-inflammatory



# PHOTO BIO MODULATION

## ○ Mechanism of action – Anti-inflammatory





# PHOTO BIO MODULATION

## Cases- Nerve Regeneration



Pre- procedural status



# PHOTO BIO MODULATION

## Cases- Nerve Regeneration



procedural status

# PHOTO BIO MODULATION

## Cases- Nerve Régénération



procedural status



# PHOTO BIO MODULATION

## Cases- Nerve Regeneration



Post procedural status and folloup





**Questions ???**

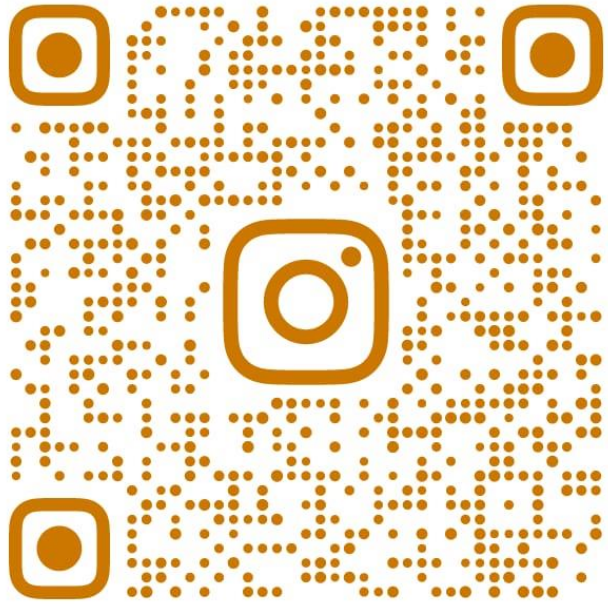
24



# Thank You

For being such a wonderful audience!





@DRSHASHANKV

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