



Periodontology- Fifth stage

Second semester-Lasers and its application in periodental therapy

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Introduction

Laser is an acronym for

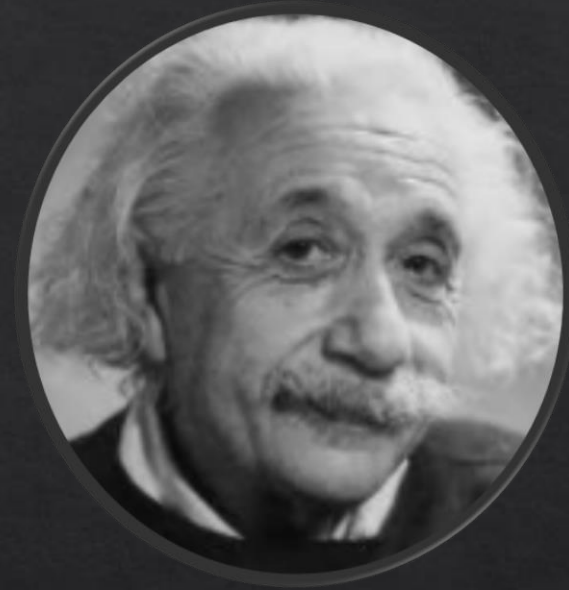
L- Light

A- Amplification

S- Stimulated

E- Emission

R- Radiation.


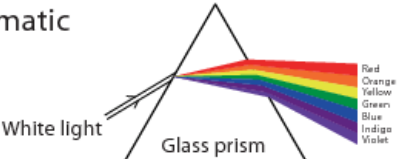

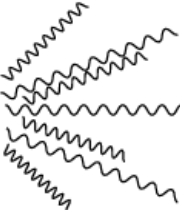

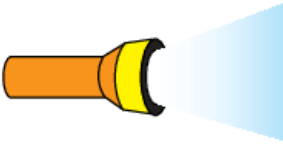


Typical lasers used in dentistry include:

- ❖ **Carbon dioxide (CO₂)**
- ❖ **Neodymium-doped: Yttrium-Garnet (Nd:YAG)**
- ❖ **Semiconductor diode lasers**
- ❖ **Erbium: yttrium Aluminum- Garnet (Er:YAG)**

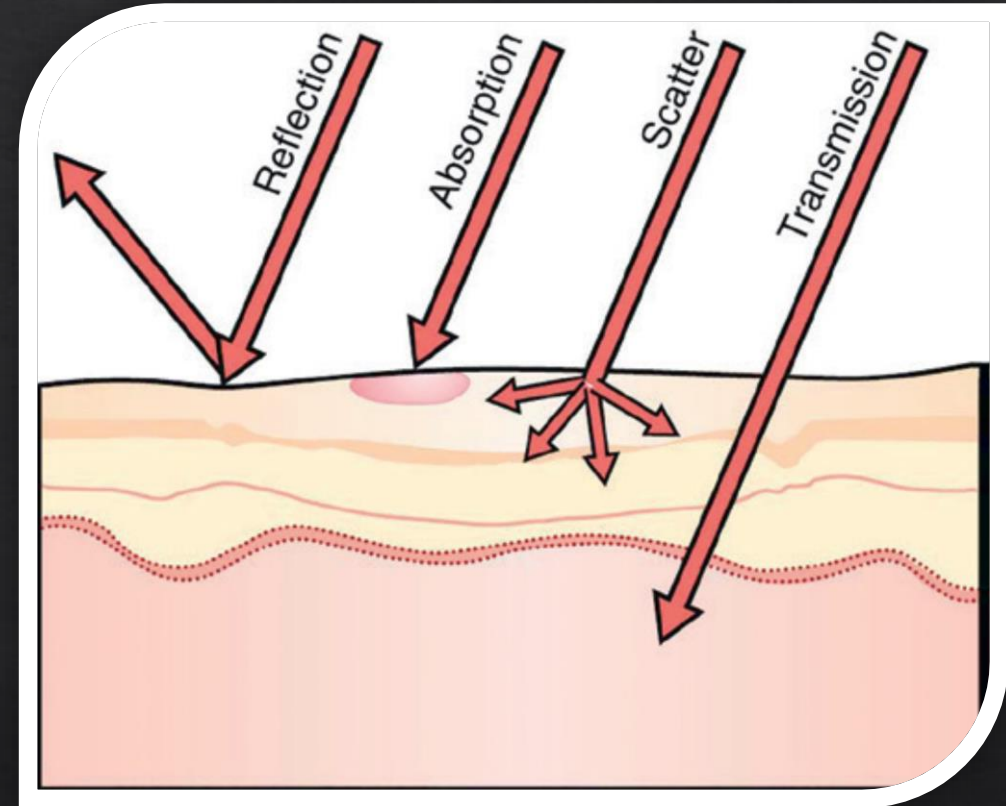
Characteristics of laser

- **Monochromatic**
- **Coherent**
- **Collimated**

Laser light	Non-laserlight (e.g. flashlight)
Monochromatic 	Polychromatic 
Coherent 	Incoherent 
Collimated 	Divergent 

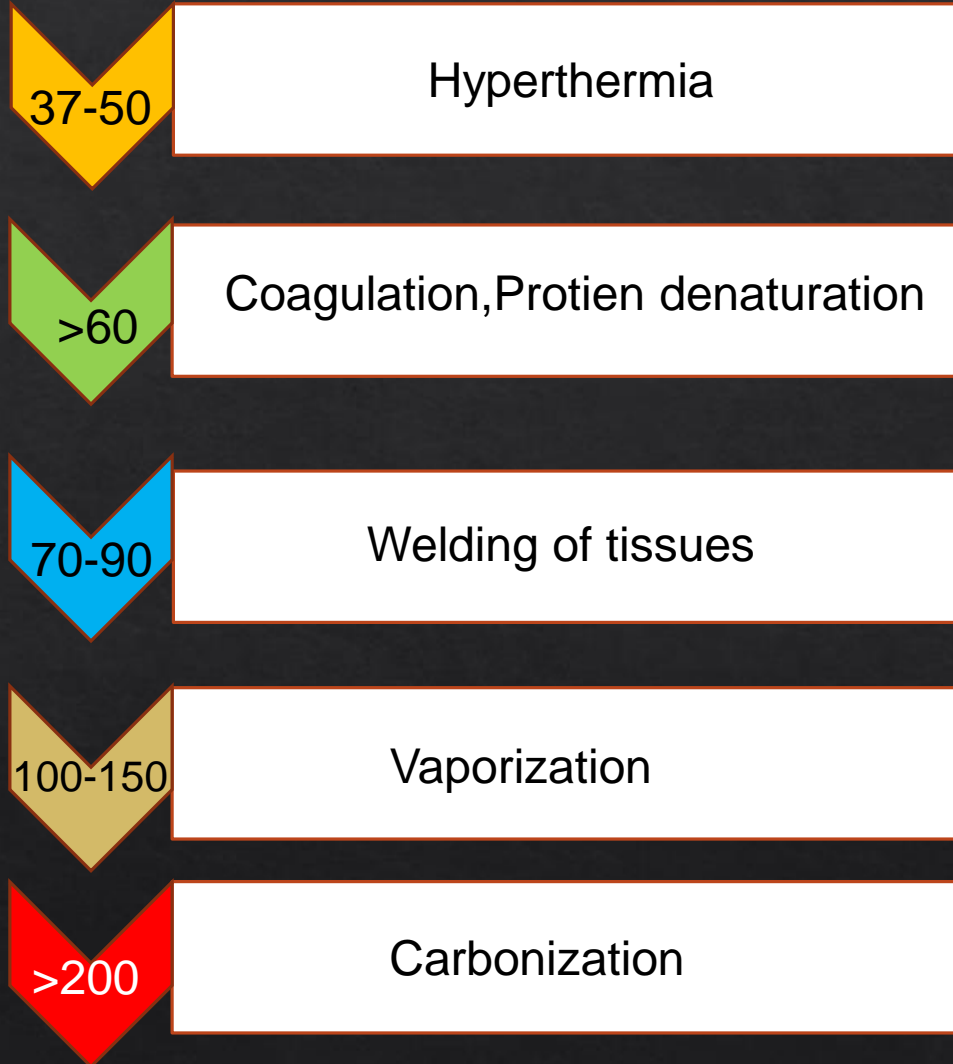
Laser effects on tissue

- Scattering
- Transmission
- Reflection
- Absorption



- ✓ Lasers function by stimulating the emission of light energy from a given medium in a collimated, focused monochromatic ray of light. The energy beam reacts with a target tissue by being absorbed, reflected, or scattered depending on wavelength and absorption characteristics

Effects on tissues on certain temperatures

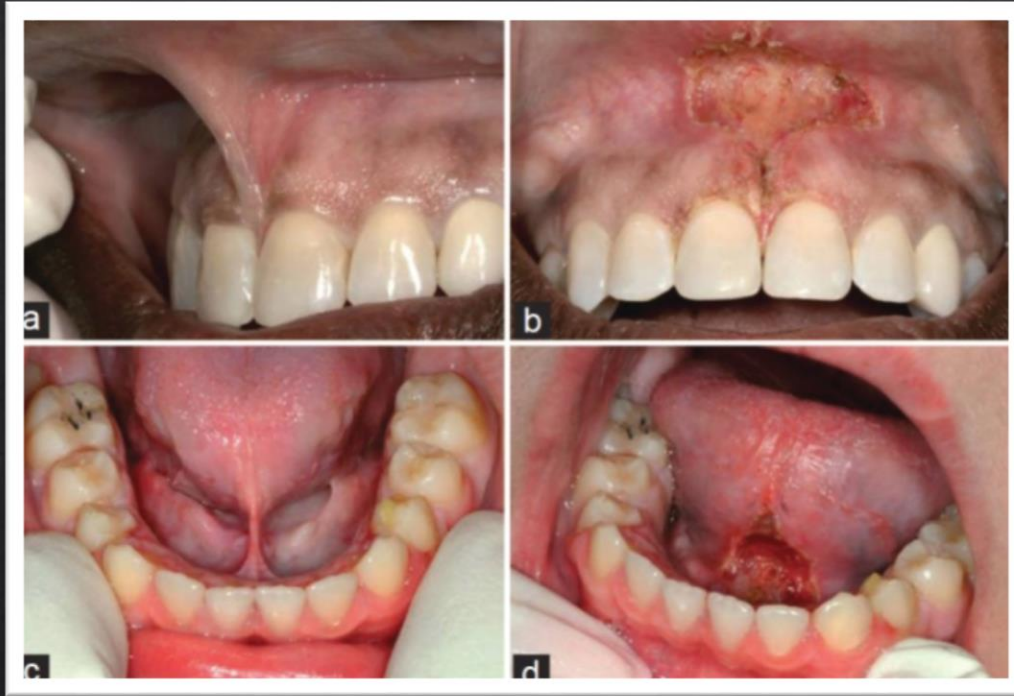


Laser Applications in Periodontics

Lasers are used in periodontal therapy for

- (1) Aesthetic surgical procedures such as gingivectomy, osseous crown lengthening, and depigmentation.
- (2) Nonsurgical therapy
- (3) Decontamination and antimicrobial therapy
- (4) Biomodulation.

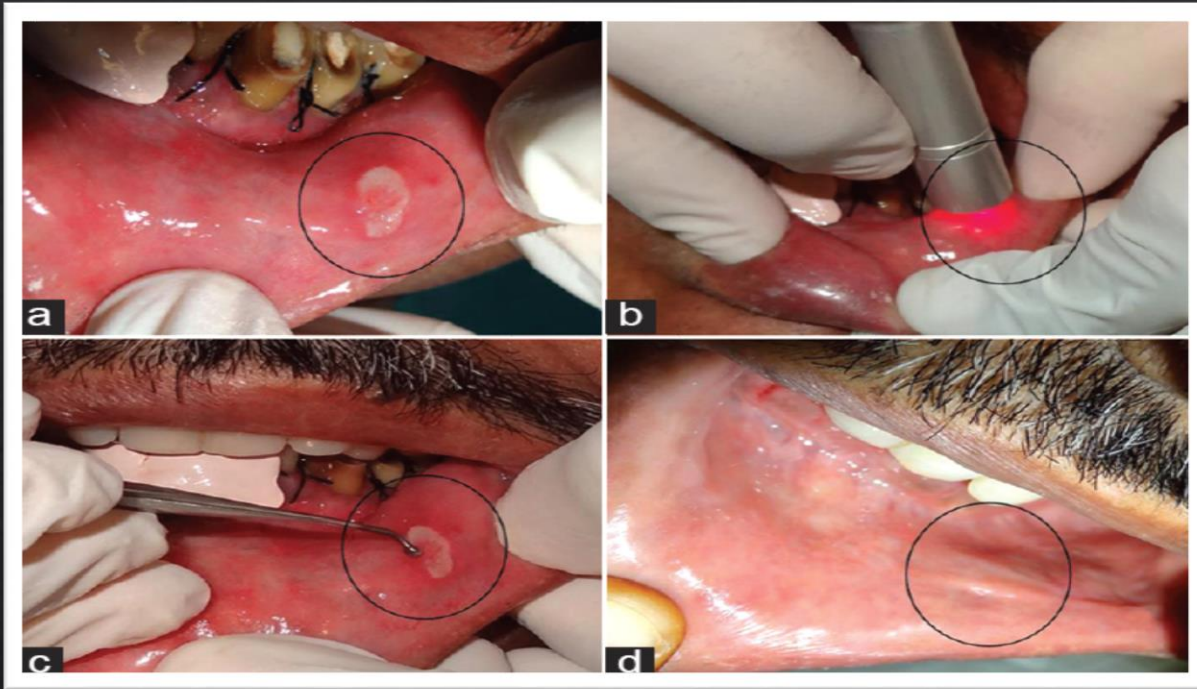
Aesthetic and Pre-Prosthetic Surgical Applications



Frenectomy



Gingival depigmentation



Treatment of Aphthous ulcer

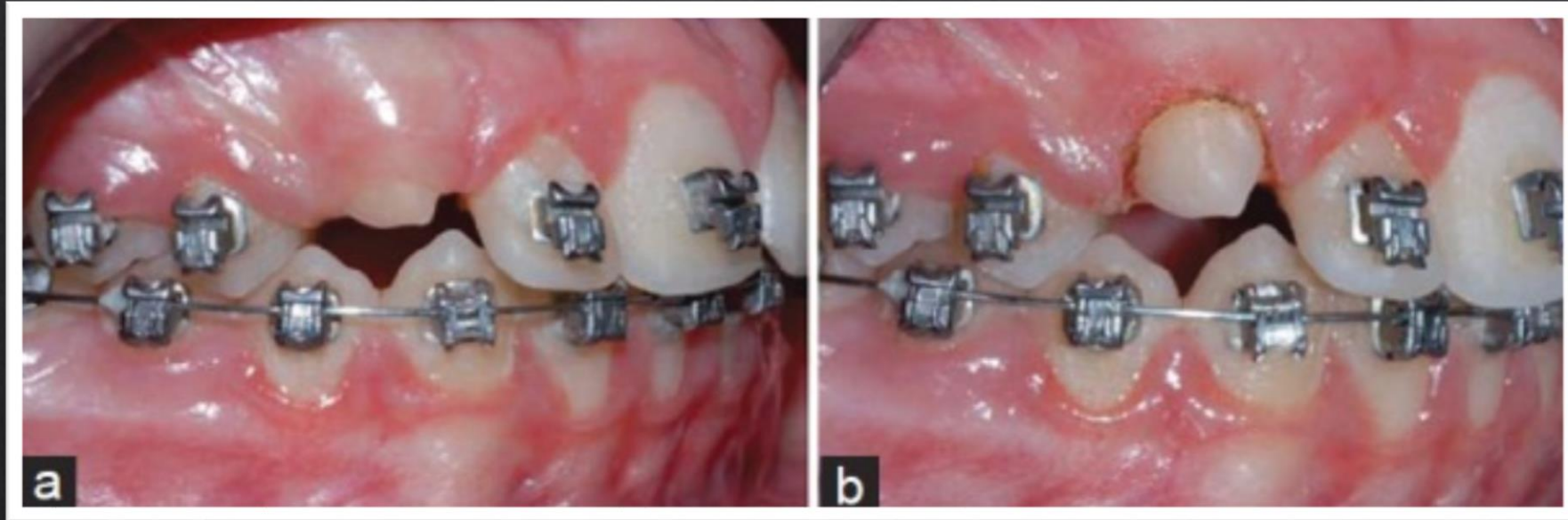


pericoronitis

Gingivectomy/gingivoplasty



Exposure of unerupted and partially erupted teeth



Nonsurgical Periodontal Therapy

- ✓ Laser therapy used to treat moderate to advanced chronic periodontitis is one of the more prevalent applications of this technology.

The purported benefits of lasers for nonsurgical periodontal therapy include

- Subgingival curettage.
 - Minimally invasive access for scaling and root planning.
 - Calculus removal.
 - Detoxification and killing of subgingival periodontal pathogens.
- ✓ Laser therapy may reach difficult-to-access areas more effectively than conventional therapy.

Specific Laser Types

○ *Diode Laser*

- The diode laser uses an electrically pumped semiconductor to produce a laser beam with wavelengths in the range of 655 to 980 nm.
- Tissue penetration ranges from approximately 0.5 to 5 mm.
- Diode lasers are used in two clinical fashions. The first is used as an adjunct initial therapy to reduce the gingival inflammatory response. This is called **low-level laser therapy (LLLT)**.
- The second use of diode laser therapy is as an adjunct to scaling and root planing (SRP).
- Diode lasers can be used to ablate soft tissues in procedures such as frenectomy, gingivectomy, aphthous ulcers.

○ ***Neodymium: Yttrium-Aluminum-Garnet Laser***

- The Nd:YAG laser uses a neodymium doped yttrium-aluminum-garnet medium to produce a laser beam with a 1064-nm wavelength.
- Tissue penetration is approximately 2 to 5 mm or greater.
- In vitro studies using the Nd:YAG at a low power setting (used in clinical situations) reported calculus ablation without resulting in cementum or dentinal changes

○ ***Erbium: Yttrium-Aluminum-Garnet Laser***

- The Er:YAG laser uses an erbium doped yttrium-aluminum-garnet medium to produce a laser beam with a 2940-nm wavelength.
- Clinical trials with the Er:YAG laser in the treatment of chronic periodontitis have provided more consistent results
- In vitro studies indicate that Er:YAG laser can effectively achieve bacterial ablation at energy levels that do not result in heat-associated damages to the root surface

○ ***CO2 laser***

- The CO2 laser uses a carbon dioxide medium to produce a laser beam with a 10,600-nm wavelength. Tissue penetration is approximately 0.03 to 0.10 mm.
- The CO2 laser is most effective for soft tissues but also ablates hard tissues

Types of Lasers Currently Used in Dentistry

Laser Medium	Wavelength (nm)	Dental Uses
Argon	488–514	Tooth bleaching and advanced curing lights
Diode	655–980	Gingivectomy/gingivoplasty, oral medicine uses (aphthous ulcer therapy, biopsies, dentinal desensitizing), second-stage implant exposure, periodontal curettage (advocated but not evidence based)
Neodymium:yttrium-aluminum-garnet (Nd:YAG)	1064	Gingivectomy/gingivoplasty, oral medicine uses (aphthous ulcer therapy, biopsies, dentinal desensitizing), second-stage implant exposure, periodontal curettage (advocated but not evidence based)
Erbium, chromium:yttrium-scandium-gallium-garnet (Er,Cr:YSGG)	2780	Gingivectomy/gingivoplasty, oral medicine uses (aphthous ulcer therapy, biopsies, dentinal desensitizing), second-stage implant exposure, periodontal curettage (advocated but not evidence based), hard tissue cutting (dentin and osseous)
Erbium:yttrium-aluminum-garnet (Er:YAG)	2940	Gingivectomy/gingivoplasty, oral medicine uses (aphthous ulcer therapy, biopsies, dentinal desensitizing), second-stage implant exposure, periodontal curettage (advocated but not evidence based), hard tissue cutting (dentin and osseous)
Carbon dioxide (CO ₂)	10,600	Gingivectomy/gingivoplasty, second-stage implant exposure, periodontal curettage (advocated but not evidence based)

Advantages of laser therapy

- Including better visualization of cutting.
- Patient acceptance.
- Wound detoxification.
- Less invasive surgical access.
- Minimal wound contraction with less scarring.

Disadvantage of Laser Therapy

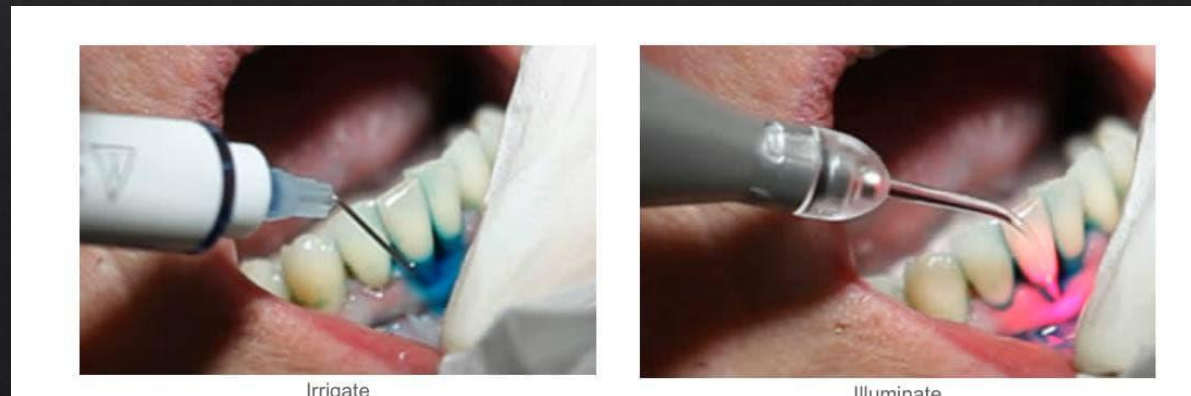
- Relatively high cost of the devices.
- A need for additional education (especially in basic physics).
- Lasers do not eliminate the need for anesthesia.
- Every wavelength has different properties.
- The need for implementation of safety measures (i.e., goggle use, etc.)

Recent Advances

- Water lase system is a revolutionary dental device that uses laser energized water to cut or ablate soft and hard tissue.



- Periowave, a photodynamic disinfection system utilizes nontoxic dye (photosensitizer) in combination with low intensity lasers enabling singlet oxygen molecules to destroy bacteria.



Thank
you!!