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Laser and its application in dentistry

Introduction

- Laser is an acronym for **L**ight **A**mplification by **S**timulated **E**mission of **R**adiation
- Nowadays, various laser systems are being using in dentistry
- Carbon dioxide (CO_2)
- Neodymium-doped: Yttrium-Garnet (Nd-YAG)
- Semiconductor diode lasers
- Erbium doped: Yttrium Aluminium- Garnet (Er:YAG)

In 1997, the food and drug administration cleared the first Er:YAG laser system, in the use for

- Preparation of dental cavities
- Incisions
- Excisions
- Vaporization
- Ablation
- Haemostasis of soft and hard tissues in the oral cavity

Properties of laser

Monochromatic: concentrate in a narrow range of wavelengths (one specific colour)

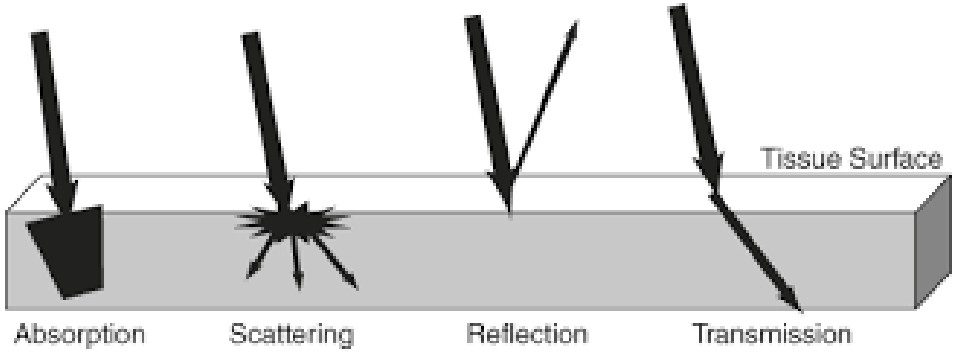
Coherent: all the emitted photons bear a constant phase relationship with each other in both time and phase

Collimated: perfectly parallel beam of directional light

Directional: a very tight beam which is very strong and concentrated

Laser effects on tissue

1. Scattering
2. Transmission
3. Absorption
4. Reflection



Classification of lasers

1- Classification based on light spectrum

2- Classification according to the material used

Classification according to material used

1- Gas
2- Liquid
3-Solid

Parts of laser machine

- Active medium/gain: gas, solid, liquid suspended in an optical cavity
- Power supply: external energy source, flash lamp/ electrical energy
- Optical resonator: mirrors for amplification
- Cooling system, control system, delivery system

Laser dentistry

(Less pain, less discomfort)

Uses of laser in Dentistry

- Periodontics
- Bone surgery
- Soft tissue surgery
- Root canal treatment
- Other uses

1- Periodontics

Graft

Frenectomy

- Depigmentation

Gingivectomy

- Crown lengthening

2- Hard tissue

3- Root canal

Treatment of aphthous ulcer

Advantages of laser

1. Greater haemostasis
2. Bactericidal effect
3. Minimal wound contraction
4. Periodontal microsurgery benefit
5. Soft tissue surgery with CO_2 laser reduces the surgery time to about (1/4)

Disadvantages of laser

1. Requires precautions
2. Laser irradiation can interact with tissues even in the noncontact mode
3. Clinicians should be careful to prevent inadvertent irradiation to these tissues, especially to the eyes
4. Laser beams can be reflected by shiny surfaces of metal dental instruments, causing irradiation to other tissues
5. Previous laser systems have strong thermal side effects
6. Can not overlook the disadvantage of loss of tactile sensation

Precautions before and during irradiation

1. Prevent inadvertent irradiation (action in noncontact mode)
2. Protect the patient's eyes, throat and oral tissues outside the target site
3. Using wet gauze packs to avoid reflection from shiny metal surfaces
4. Ensure adequate high speed evacuation to capture the laser plume

Benefits of laser

- The use of laser can decrease morbidity after surgery
- Reduces the need for anaesthetics
- Some of the risks of alternative electrosurgery procedures are avoided