



Al-Mustaqbal University

Department (الأجهزة الطبية)

Class (الرابعة)

Subject (نظم الليزر الطبية)

Lecturer (أ.د. علاء حسين علي)

2nd term – Lect. (Medical laser applications part 2)

Types of Medical Lasers and Their Applications

Laser Type	Wavelength	Common Uses
CO ₂ Laser	10,600 nm (infrared)	Precise cutting and vaporization in dermatology, gynecology, ENT, general surgery
Er:YAG Laser	2,940 nm	Skin resurfacing, dental hard tissue procedures
Nd:YAG Laser	1,064 nm	Vascular lesions, tumor ablation, ophthalmology, urology
Diode Laser	800–980 nm	Hair removal, dental and soft tissue surgery, varicose vein treatment
Argon Laser	488–514 nm (blue-green)	Retinal photocoagulation, treatment of vascular lesions
Excimer Laser	193 nm (UV)	LASIK, corneal reshaping
Pulsed Dye Laser (PDL)	585–595 nm	Vascular lesions, port-wine stains, scars
Q-Switched Lasers	Various	Tattoo removal, pigmented lesions
Femtosecond Lasers	Ultrafast (10^{-15} sec pulses)	LASIK flap creation, cataract surgery, corneal transplants



Advanced and Emerging Applications

Photodynamic Therapy (PDT)

Combines a **photosensitizing drug** and a **laser** to selectively kill abnormal cells (e.g., in skin cancer, esophageal cancer).

Minimally invasive and highly targeted.

Neurosurgery

Laser interstitial thermal therapy (LITT) for:

Brain tumors

Epilepsy (ablation of seizure foci)

Allows deep tissue ablation via a small probe under MRI guidance.

Respiratory Tract

Bronchoscopic laser resection of airway tumors or obstructions (e.g., Nd:YAG lasers).

Neonatology & Pediatrics

Laser treatment of retinopathy of prematurity (ROP).

Correcting tongue-tie (ankyloglossia) in infants.



Laser Ablation in Genomics & Biotech

Precision dissection of cells or tissues.

Microarray scanning and DNA analysis using fluorescence lasers.

Advantages of Laser Use in Medicine

High precision with minimal damage to surrounding tissue.

Reduced bleeding due to coagulation effects.

Lower infection risk (sterilizing properties).

Faster recovery and reduced hospital stay.

Less postoperative pain



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