الكلية التقنية الطبية
جامعة ساوه الأهلية

laser tissue interaction

fourth lecture
third class

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Laser

Introduction to Laser Principles and Applications in Ophthalmology

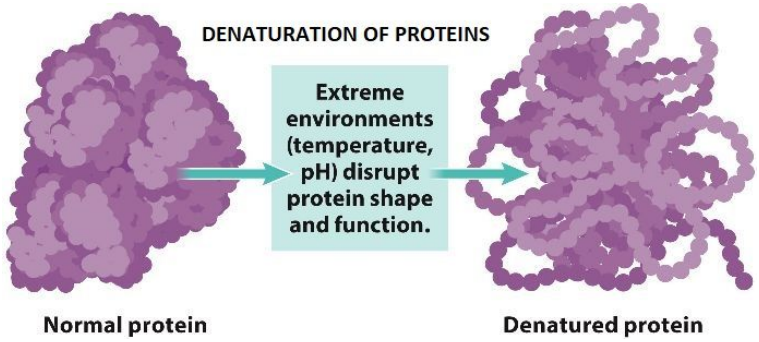
Overview of Laser–Tissue Interactions

- Lasers interact with tissues depending on energy, wavelength, and exposure time.

- Mechanisms: photocoagulation, photothermal, photodisruption, photoablation, photomechanical.

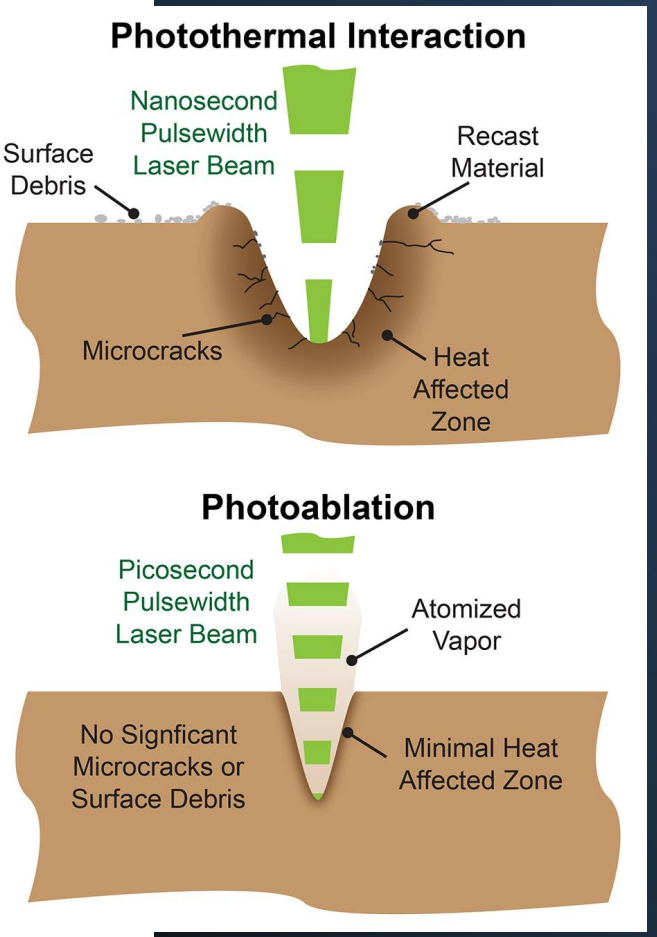
Photocoagulation

- - Goal: Seal or destroy small blood vessels.
- - Mechanism: Denaturation of proteins due to heat.
- - Laser Used: Argon or Diode lasers.
- - Example: Retinal photocoagulation in diabetic retinopathy.



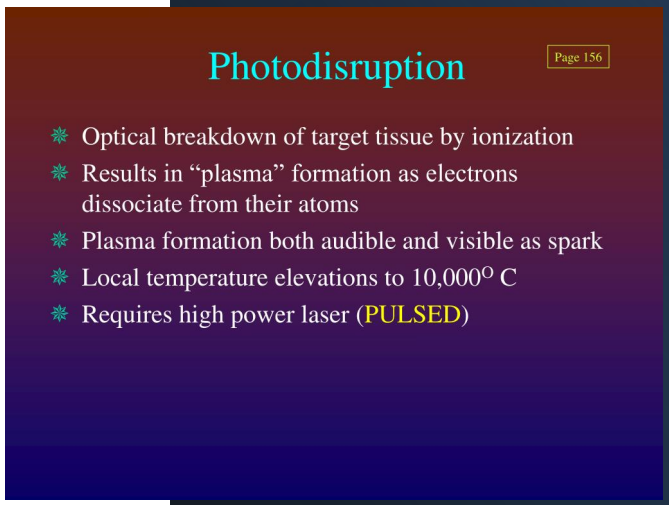
Photothermal Interaction

- - Goal: Controlled heating to damage or shrink tissue.
- - Effect: Gradual heating → cell death or atrophy.
- - Laser Used: Diode.
- - Example: Laser therapy for glaucoma.



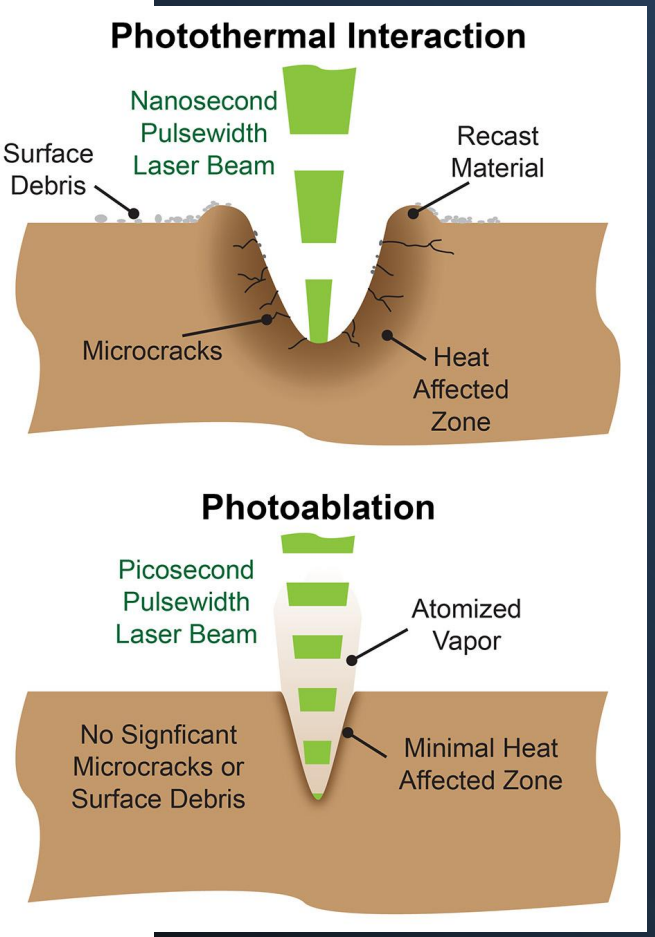
Photodisruption

- - Mechanism: High-energy pulse forms plasma → shockwave tears tissue.
- - Effect: Tissue disruption or bursting.
- - Laser Used: Nd:YAG.
- - Example: Posterior capsulotomy after cataract surgery.



Photoablation

- - Mechanism: UV laser removes tissue layer-by-layer by breaking molecular bonds.
- - Effect: No heat or shockwave; precise sculpting.
- - Laser Used: Excimer.
- - Example: LASIK corneal reshaping.

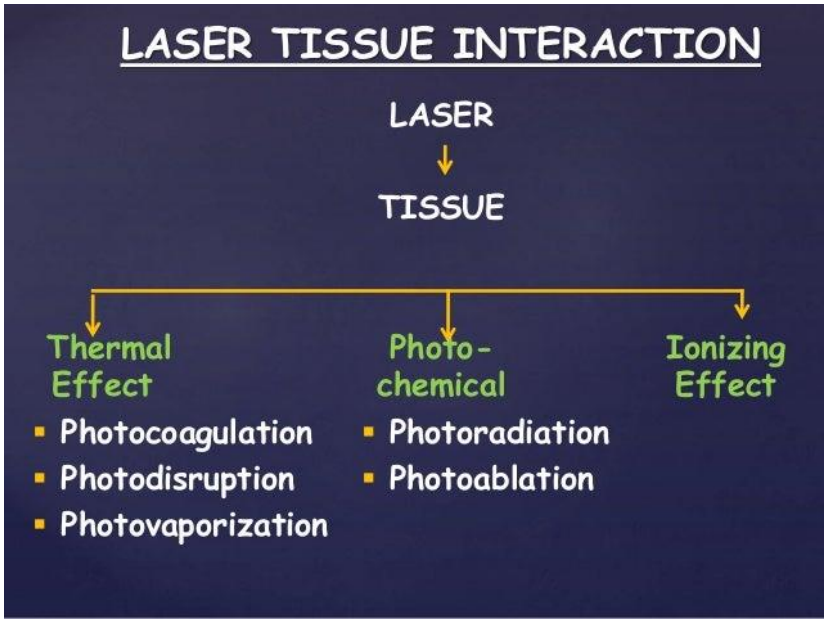


Photomechanical Interaction

- - Mechanism: Ultrashort laser pulses cause mechanical cutting.
- - Effect: Clean tissue splitting (no burn or explosion).
- - Laser Used: Femtosecond.
- - Example: Corneal flap creation in LASIK.

Comparison of Laser–Tissue Interactions

- Photocoagulation – Heat & seal vessels
- Photothermal – Gradual heating
- Photodisruption – Burst tissue
- Photoablation – Remove tissue
- Photomechanical – Cut tissue cleanly



Simplified Analogy

- Photocoagulation = Heat tool
- Photothermal = Slow cooker
- Photodisruption = Bomb
- Photoablation = Eraser
- Photomechanical = Scalpel

Summary

- - Lasers can Heat (Coagulate), Cut (Disrupt), or Remove (Ablate) tissue.
- - Each mechanism has unique ophthalmic applications.
- - Understanding interactions ensures safety and precision.