

COURSE OUTLINE
AESTHETIC LASERS & IPL
Physics, Applications, Safety

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I. Visible Light Spectrum

- A. Visible Light
 - 1. Frequency
- B. Biophysics of Light
 - 1. Photobiological Process of Cells
 - a. Aesthetic Medicine
 - 2. Health Sciences
 - a. Indications
 - 3. Types of Light Therapy
- C. Wavelengths of Visible Light/Infrared Light Spectrum
 - 1. Blue
 - 2. Red
 - 3. Intense Pulsed Light
 - 4. Laser
- D. Part I Recap/Discussion

II. Laser Physics

- A. Laser History
- B. Physics/Laser Physics
- C. Characteristics of Laser Light
 - 1. Laser Physics
 - a. Atoms, Electrons
 - b. Photons
- D. Laser Mediums
 - 1. The Emission Absorption Principle
 - a. Spontaneous Emission
 - b. Stimulated Emission
- E. Laser Beam
 - 1. Optical Amplification
 - 2. Spot Size

- F. Components of a Laser System
 - 1. Lasing Medium/Active Medium
 - a. Active Lasing Mediums
 - (1) Gas
 - (2) Solid
 - (3) Liquid
 - b. Characteristics of Active Medium
 - 2. Excitation Mechanism
 - a. Excitation Mechanisms
 - (1) Optical Pumping
 - (2) Electron Collision Pumping
 - (3) Chemical Pumping
 - b. Characteristics of Excitation Mechanism
 - 3. Optical Cavity/Resonator
 - a. Optical Cavity Resonators
 - (1) High Reflectance Mirror
 - (2) Output Coupler Mirror
 - b. Characteristics of Optical Cavity/Resonator
 - 4. Summary; Fundamentals of Laser Operation/Generation
- G. Characteristics of Laser Light
 - 1. Diffraction
 - 2. Coherent
 - 3. Coherent vs. Incoherent Light
 - 4. Monochromatic Wavelength
- H. Laser Chromophores
 - 1. Water
 - 2. Melanin
 - 3. Hemoglobin
- I. Light Spectrums
 - 1. Visible Light
 - a. Laser Chromophores
 - 2. Infrared Light
 - a. Laser Chromophores
 - b. Chromophore Absorption
 - (1) Laser Wavelengths

- J. Selective Photothermolysis
 - 1. Photothermolysis
 - 2. Selective Photothermolysis
 - a. Electromagnetic Spectrum
 - b. Absorption Coefficient
 - 3. Parameters of Selective Photothermolysis
 - a. Fluence
 - b. Pulsed Width
 - c. Thermal Relaxation Time
 - (1) Fitzpatrick Phototypes III-VI
 - d. Wavelength
 - (1) Chromophores
 - (2) Absorption Curve, Selected Chromophore
 - (3) Wavelength Depth of Penetration
- K. Part II Recap/Discussion

III. Laser Applications; Physiology, Ethnicity

- A. Laser Applications in Aesthetic Medicine
- B. Cutaneous Physiology
- C. Ethnicity
 - 1. Fitzpatrick Skin Phototype
 - a. Parameters of Selective Photothermolysis
 - b. Laser Parameter Sheet
 - c. Fitzpatrick Evaluation
 - d. Patient Selection
 - e. Fitzpatrick Ethnic Classification
 - (1) Asian Skin
 - (2) African Skin
 - 2. Lancer Ethnicity Scale
 - a. Determining Lancer Rating
 - 3. Genetico Racial Classification
 - a. Genetico Racial Classifications
- D. Part III Recap/Discussion

IV. Types of Lasers, Laser Applications

- A. Types of Lasers
 - 1. Continuous Wave Laser
 - 2. Pulsed Laser
 - 3. Q-Switched Laser
- B. Types of Cosmetic Lasers
 - 1. Resurfacing Lasers
 - a. Non-Ablative
 - b. Ablative
 - 2. Summary Resurfacing Lasers
- C. Non-Ablative Lasers
 - 1. KTP Laser
 - a. Physics
 - b. Indications
 - c. Green Light/Blue Light Comparison
 - 2. Pulsed Dye Laser
 - a. Physics
 - b. Indications
 - 3. Red Light Lasers
 - a. Q-Switched Ruby Laser
 - (1) Physics
 - (2) Biophysics
 - b. Q-Switched Alexandrite Laser
 - (1) Physics
 - (2) Biophysics
 - 4. Diode Laser
 - a. Physics
 - b. Indications
 - 5. Picosecond Laser
 - a. Physics
 - b. Indications
 - 6. Q-Switched 1064 Nd:YAG Laser
 - a. Physics
 - b. Indications
 - c. Treating Fitzpatrick III-VI
 - 7. Microsecond Pulsed 1064 Nd:YAG Laser
 - a. Physics
 - b. Indications
 - c. Parameter Sheet

- 8. Fraxel Laser
 - a. Physics
 - b. Indications
- 9. Fraxel Dual Laser
 - a. Physics
 - b. Indications
- D. Ablative Lasers
 - 1. Erbium Laser
 - a. Physics
 - b. Micro Laser Peel
 - c. Indications
 - 2. CO2 Laser
 - 3. Fractional CO2 Laser
 - a. Dermal Layers of the Skin
 - b. Indications
 - c. Ablative
 - d. Non-Ablative
 - e. Percutaneous Collagen Induction
 - 4. Comparison; CO2 Laser/Fractional CO2 Laser
- E. Summary; Ablative Resurfacing Lasers
- F. Part IV Recap/Discussion

V. Tissue Regeneration

- A. Regenerating Therapy
 - 1. Ablative Laser
- B. GHK Copper Peptides
 - 1. Function
 - 2. Properties
 - 3. Bioactive Benefits
 - 4. Role of Copper in Skin Rejuvenation
 - a. Acute Phase Healing
 - b. Remodeling Phase Healing

- C. Human Growth Factors
 - 1. Function
 - a. Cytokines
 - b. Interleukins
 - c. Fibroblasts
 - d. Hyaluronic Acid
 - (1) Hyaluronan
 - (2) Synergistic Benefits
 - 2. Neonatal Stem Cells
 - a. Physiology
 - (1) Hypoxic Environment
 - (2) Normoxic Environment
 - 3. Skin Barrier
 - a. Hypoxic Environment
 - b. Skin Barrier Function
- D. Processed Skin Cell Proteins
 - 1. Physiology
 - 2. Benefits
- E. Atelocollagen
 - 1. Collagen
 - 2. Atelocollagen
 - a. Properties
 - b. Benefits
- F. Part V Recap/Discussion

VI. Lasers in Dermatology and Medicine

A. Cosmetic Lasers

1. Managing Skin Conditions

a. Melasma

(1) Laser Modalities to Manage Melasma

(2) Managing Darker Skin Tones

b. Extrinsic Aging/Scarring

(1) Laser Modalities to Manage Extrinsic Aging, Scars, Texture

c. Telangiectasia/Broken Capillaries

(1) Laser Modalities to Manage Telangiectasias

(2) Laser Modalities to Manage Melasma

(3) Laser Modalities to Manage Fitzpatrick III-VI

d. Sebaceous Glands

(1) Laser Modalities to Manage Enlarged Sebaceous Glands

2. Excimer Laser

a. Physics

b. Indications

B. Laser Applications in Medicine

1. Types of Laser Ablation

2. Various Cancer Indications

a. Treatment of Brain Tumors

3. Laser Induced Interstitial Thermotherapy

4. Photodynamic Therapy

a. Cutaneous Indications

b. Treatment of Dermatological Entities

c. Intrinsic Indications

d. Various Carcinomas

C. Part VI Recap/Discussion

VII. Laser Safety

- A. Legal Statues
- B. Regulatory Agencies
 - 1. Federal Laser Product Performance Standards
 - 2. Occupational Safety & Health Administration
 - 3. Joint Commission on Accreditation of Healthcare Organizations
 - 4. Accreditation Association for Ambulatory Health Care
 - 5. The International Electrotechnical Commission
 - a. Safety of Laser Products IEC 60825
 - 6. American National Standards Institute
 - 7. OSHA/ANSI Regulations/Litigation
- C. Health Care Delivery Organizations
 - 1. Medical Specialties
 - a. Association of Perioperative Registered Nurses (AORN)
 - b. Association of Surgical Technologies (AST)
- D. Safe Use of Lasers in a Healthcare Facility ANSI Z136.3
 - 1. Laser Safety Officer
 - 2. Safety Control Measures
 - a. Engineering Controls
 - b. Administrative Controls
 - c. Procedural Controls
 - (1) Standard Operating Procedures/Manual
 - 3. Laser Hazards
 - a. Maximum Permissible Exposure
 - (1) Assessable Emission Limit
 - (2) Limiting Aperture
 - b. Nominal Hazard Zone
 - 4. Laser Treatment Controlled Area
 - a. Laser Classification
 - b. Entry Warning Signs
 - 5. LTCA/Ocular Hazards
 - 6. Anatomy/Physiology of the Human Eye
 - a. Cornea
 - b. Iris
 - c. Lens
 - d. Vitreous Humor
 - e. Retina
 - (1) Retinal Periphery
 - f. Macula

- g. Fovea
 - (1) Results of Injured Fovea
- 7. Laser Wavelengths/Optical Response
 - a. Ultraviolet Wavelengths
 - b. Visible Light Wavelengths
 - c. Near Infrared Wavelengths
 - (1) Optimal Gain
 - d. Far Infrared Wavelengths
 - e. Eye Injury Hazards
 - (1) Wavelength of Laser/Class of Laser
 - f. Laser Protective Eyewear
- 8. LTCA/Laser Hazards
 - a. Plume/Airborne Contaminants
 - b. Reflection
 - c. Protective Barrier/Curtains
 - d. Compressed Gases
 - (1) OSHA
 - (2) Compressed Gas Association
 - e. Explosion Hazards
 - f. Electrical Hazards
 - g. Flammability
- E. Mechanical Operating Safety
 - 1. Laser Testing
 - 2. Laser Calibration
 - 3. Laser Control Panel
 - a. Master Switch Control
 - b. Key Placement/Fines
 - c. Stand-By Mode/Beam Stop/Attenuator
 - 4. Foot Pedal Controls
 - 5. Electrical Controls
 - 6. Laser Maintenance
 - 7. Documentation
 - 8. Laser Safety Audits
- F. Liability
 - 1. Standard of Care/Tort Law
 - 2. Standard of Practice/ANSI
 - 3. National Standards/Regulations
 - 4. State Regulations
 - a. Medical Boards
 - 5. Liability Insurance
 - 6. Accident/Incident Investigation

- G. Training Requirements
- H. Practicing Safety, Safely
 - 1. ANSI/AORN Standards
 - 2. Knowledge of Laser Physics
 - 3. Knowledge of cutaneous Physiology
 - 4. Proper Patient Intake
 - 5. Preventing Side Effects
- I. Part VII Recap/Discussion

VII. Intense Pulsed Light

- A. Intense Pulsed Light
 - 1. Chromophores
 - 2. IPL/Radiofrequency
 - 3. Indications

VIII. Intense Pulsed Light Physics

- A. IPL Physics
 - 1. Incoherent Light Source
 - 2. Refraction of Light
 - a. Snell's Law of Refraction
 - b. Light Skin vs. Dark Skin
 - 3. Photothermolysis
 - a. Selective Photothermolysis
 - b. Fluence
 - c. Pulsed Width
 - d. Densely Pigmented Target/Skin
 - e. Wavelength
 - f. IPL Parameters
 - g. Comparison; IPL/Laser
- B. Part IX Recap/Discussion

VIII. Cutaneous Physiology

- A. Inflammation
 - 1. Melanogenesis
- B. Patient Selection
 - 1. Fitzpatrick Skin Phototype
 - 2. Lancer Ethnicity Scale
- C. Melanocytes/Tyrosinase
 - 1. Limiting Melanogenesis
 - 2. Pigment Inhibitory Agents
- D. Part X Recap/Discussion

IX. Managing Skin Conditions

- A. Biophysics
- B. Indications
- C. Factors to Consider
 - 1. Photosensitizers
 - 2. Skin Type/Ethnicity
 - 3. Cutaneous Physiology
 - 4. Severity of Pigmentation
 - 5. Parameter Sheet
 - 6. Patch Test/Tissue Response
- D. Hyperpigmentation
 - 1. Biophysics
 - 2. Cutaneous Conditions
 - a. Sun Damage
 - b. Pigmented Lesions
 - 3. Parameters

- E. Vascularities
 - 1. Biophysics
 - 2. Indications
 - 3. Parameters
 - a. Superficial/Smaller Vessels
 - b. Deeper/Larger Vessels
- F. IPL vs. Laser
 - 1. Vascular Parameters
- G. Part XI Recap/Discussion

X. IPL Safety

- A. FDA Regulations
- B. Standard of Practice
 - 1. ANSI
- C. Standard of Care
 - 1. Treatment Goals
 - a. Pre/Post-Operative Expectations
 - 2. Contraindications
 - 3. Informed Consent
 - 4. Medical/Health History
- D. Preventing Liability
 - 1. Training
 - a. ANSI/MLSO
 - 2. State Licensing Boards
 - 3. Liability Insurance
- E. Malpractice Case
 - 1. Discussion
- F. Part XII Recap/Discussion

