



# Columbia St. Mary's Laser Credentialing

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# Basic Laser Safety

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- The basic laser safety practices covered here are applicable to most laser types, but not all
- Some of what is covered here is not directly the physician's responsibility, but it is important that everyone is aware of basic safety practices

# Summary

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- This module will cover all aspects of basic laser safety, including –
  - eye protection
  - fire safety
  - miscellaneous basic safety



# Eye Protection

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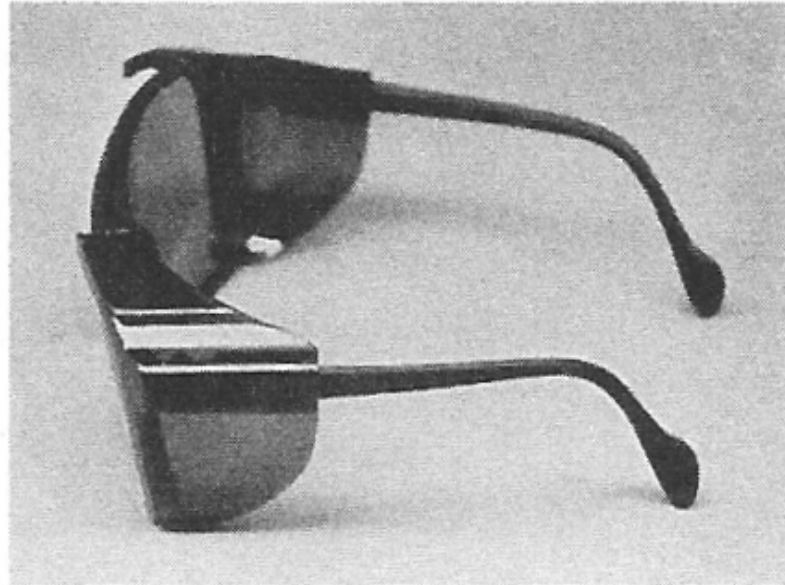
- First, we will discuss eye protection
- Eye protection for staff is required for most laser procedures



# Eye Protection

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- It is important to use the correct eyewear
- Eyewear is specific to laser type
- Regular eyeglasses or contact lenses do not provide adequate protection from lasers



Side shields prevent the laser beam from affecting the eye from the side.



# Eye Protection

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- Retinal damage can result from an acute incident or from slow degeneration caused by chronic low-power exposures to the beam; both types may go unnoticed



# Eye Protection

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- A direct accident (i.e. exposure) can damage a small area of the retina and can result in a scotoma (i.e. blind spot in the field of vision)

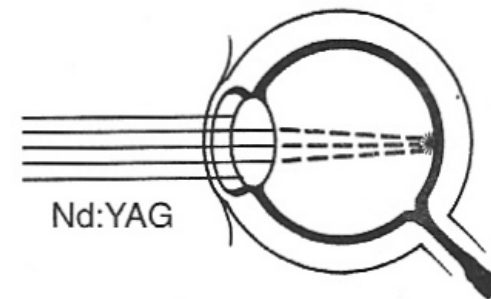
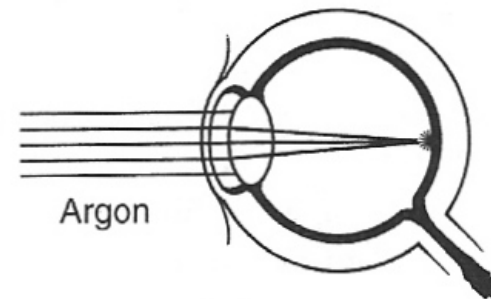
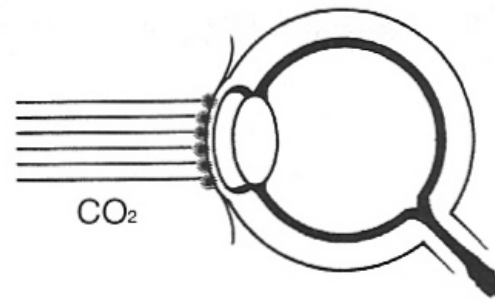




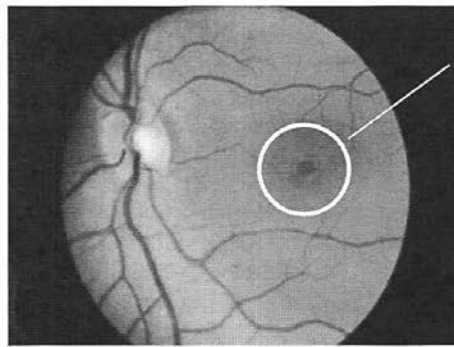
# Eye Protection

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- As shown on the next slide, different types of lasers can damage different parts of the eye
- For example, a CO<sub>2</sub> laser can cause corneal damage

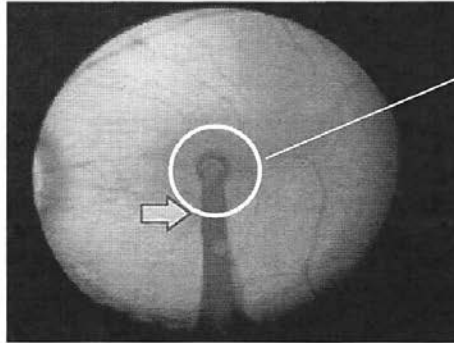


The CO<sub>2</sub> laser can cause corneal damage; the argon and Nd:YAG-lasers can cause retinal damage.



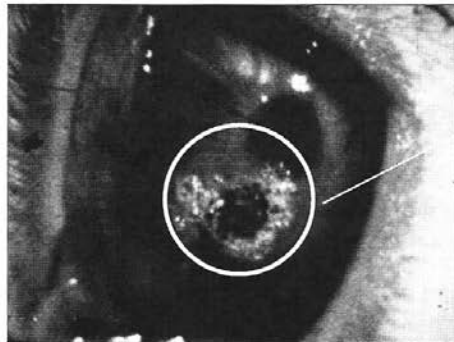
Region of  
retinal burn

Figure 9a. Large retinal burn from diffuse laser exposure. Note that the retinal damage threshold level for large sized retinal exposures is significantly lower than the threshold for point source exposures due to the greater heat buildup in the larger spot size.



Retinal  
hemorrhage

Figure 9b. Injury due to Q-switched Nd:YAG laser pulse. In this test on a primate, much of the energy was absorbed by the retinal pigmented epithelium, which lies behind the sensory retina. In this case the result was a hemorrhage, where blood from behind the retinal pigmented epithelium entered the vitreous body.



Region of  
corneal burn

Figure 9c. Corneal burn from a CO<sub>2</sub> laser exposure of rabbit eye.



# Eye Protection

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- Continual low-power exposure can promote cataract formation in the lens of the eye and also can damage the retina
- Retinal cones, the structures that detect color, are usually the first to be affected; difficulty in distinguishing between blue and green can indicate early retinal cone damage



# Eye Protection

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- Extra eyewear must be hung outside the door, for anyone who might enter the room after the procedure has started



# Eye Protection

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- For most laser procedures, the patient's eyes must also be protected



# Eye Protection

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- At the end of the procedure, the eyewear must be properly cleaned and stored



# Eye Protection

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- The lenses of protective eyewear should not have significant scratches, and any protective coating should be intact





# Fire Safety

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- Now we will discuss fire safety
- A basin of saline must be available, in order to douse small fires



# Fire Safety

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- The location of the nearest fire extinguisher, and its proper use, must be known



# Fire Safety

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- Sponges and towels must be kept wet
- Dry combustibles should never be placed in the immediate vicinity of the laser target area



# Fire Safety

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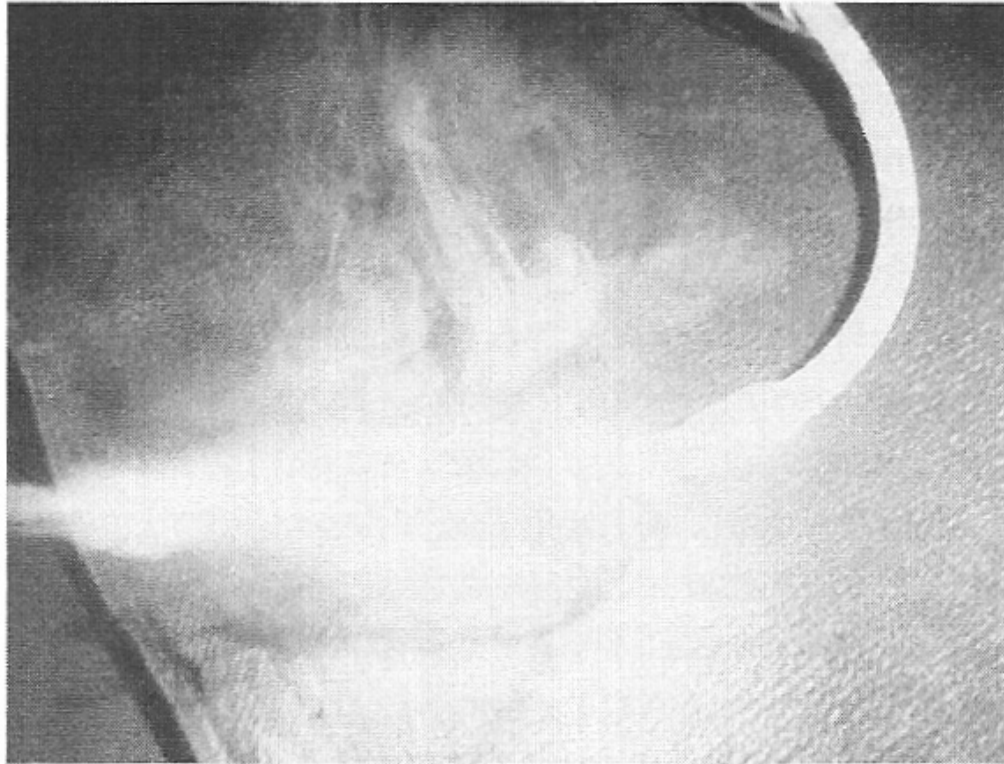
- Flammable prep solutions must be allowed to dry completely before laser use (e.g. alcohol based prep solutions)
- Prep solutions should not be allowed to pool



# Fire Safety

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- Prevention of airway fires:
  - A laser-safe ET tube must be used
  - Inspired O<sub>2</sub> level cannot be excessive



A polyvinyl chloride endotracheal tube can become a blow torch if ignited by a laser beam.



# Basic Laser Safety

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- Now we will finish by discussing some miscellaneous basic safety
- All windows must be covered



# Basic Laser Safety

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- During the procedure, the laser must be put into **STANDBY** whenever it is not being used





# Basic Laser Safety

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- Electrical safety must be observed – no extension cords, no fluids placed on the laser or on the floor, no frayed cables on the laser



# Basic Laser Safety

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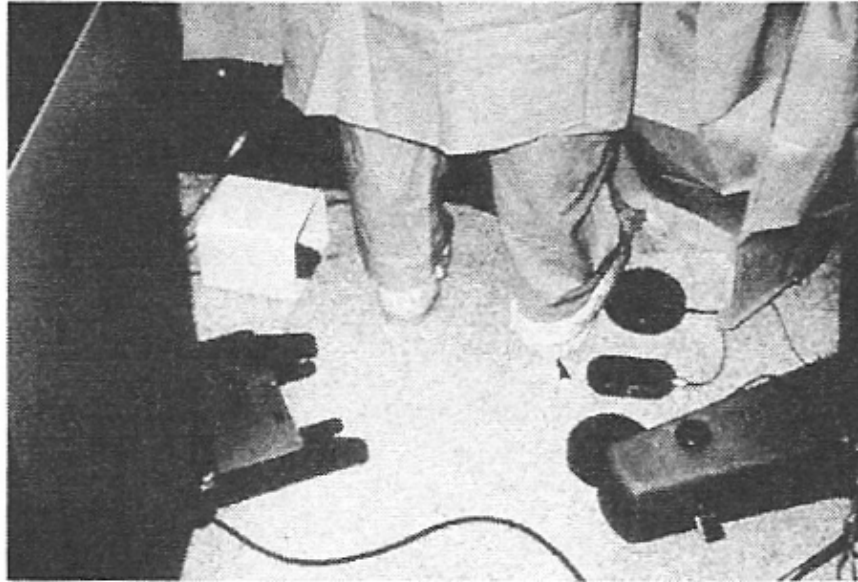
- Every laser has an emergency stop button



# Basic Laser Safety

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- The laser foot pedal should be placed as far away from other foot pedals as possible



Numerous technical devices operated by foot pedals can be hazardous if mistakenly activated.



# Basic Laser Safety

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- For procedures which generate smoke, proper masks must be worn, and a smoke evacuator must be used
- Laser plume includes: formaldehyde, ethanol, isopropyl alcohol, toluene, benzene, and cyanide, among other substances



# Basic Laser Safety

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- The aim of the laser must be verified, if applicable



# Basic Laser Safety

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- A dedicated laser operator should be used whenever possible
- Clear and ongoing communication between the physician and the laser operator is important



# Basic Laser Safety

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- The maximum Watts (i.e. power) setting allowed for a specific fiber must not be exceeded





# Laser Credentialing

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- An excellent reference for further reading on lasers:
  - “Lasers - The Perioperative Challenge” by Kay Ball



# Laser Credentialing

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- Any questions regarding laser safety (or radiation safety) can be directed to the Laser Safety Officer:
  - Jeff Harrington, M.S., DABMP  
Medical Physicist  
414-291-1283