

# **FUNDUS PHOTOGRAPHY: The Basics**

Laura Savage, COMT, CRA

Dartmouth-Hitchcock Clinic

Manchester, New Hampshire

- I.) What is fundus photography and why do we do it??
  - A.) contrary to popular belief - not to torture patients : )
  - B.) to document the retina and retinal structures
    - 1.) provide documentation to help Dr. diagnose and treat ocular pathology.
    - 2.) provide a baseline documentation and subsequently to follow-disease processes
    - 3.) pre & post treatment documentation
    - 4.) legal documentation (shaken baby, etc)
    - 5.) educational purposes
  
- II.) Anatomy of the fundus camera
  - A.) objective lens
  - B.) illuminations system
  - C.) filters & mirrors
  - D.) Interchangeable lenses
    - to obtain multiple angles of view
  - E.) recording media (film or digital)
  
- III.) Anatomy of the eye.
  - A.) Anterior/posterior Segment
    - 1.) anterior - media clarity important
  - B.) Posterior pole
  - C.) Seven fields
  - D.) layers of the retina
  - E.) layers of pathology
  
- .IV.) Photographic Procedure
  - A.) check doctor's orders
    - 1.) Make sure you understand them
    - 2.) check patient chart
      - a.) look at doctor's pictures and notes
      - b.) have they had photos before? check comments
      - c.) refractive error
    - 3.) Make plan - decide what images you will get
      - a.) magnification
      - b.) area of retina
      - c.) adapt the plan to the disease glaucoma vs. diabetes
      - d.) if doing a study follow the plan for the study
  - B.) focus the eye piece
    - 1.) turn eyepiece all the way to the left
    - 2.) look at distance and relax accommodation with non dominant eye
    - 3.) hold up a sheet of light paper to highlight the reticle

- 4.) slowly turn eyepiece to right until reticle is just in focus
- 5.) look at marks on the eye piece
- 6.) repeat 3 times to make sure focus is at the same place on the eye piece marks

C.) document the procedure date, patient, etc

- 1.) digital - input patient data

D.) prepare your camera - "zero it out"

- 1.) make sure filters are out
- 2.) check flash intensity setting
- 3.) set degree for image desired
- 4.) brightness adjustment -
  - a.) how many have had this done?
  - b.) don't blast patient with brightness before you have to

E.) prepare the patient

- 1.) patient must be fully dilated
  - a.) check pupils and angles
  - b.) dilate - check on patient - if necessary put in second set
  - c.) wait 30 minutes
- 2.) situate the patient comfortably
- 3.) explain the procedure
- 4.) adjust the chin rest
- 5.) recheck doctor's orders and make your plan

F.) adjust camera to patient

- 1.) line-up "donut" on pts eyelid
- 2.) present fixation target to patient
  - a.) inside fixation stick - canon
  - b.) external fixation light
  - c.) internal fixation stick
- 3.) move camera in slowly until you see retina
  - a.) in, out, side to side to get even illumination
- 4.) adjust brightness until just bright enough to see details in fundus
  - a.) I apologize to patient and tell them "I will turn light down once focused"
- 5.) focus on the retina at the appropriate layer
- 6.) what do you see?? make adjustments
  - a.) small pupil??
  - b.) dark or light fundus?
  - c.) clear media??
  - d.) diopter compensation
  - e.) astigmatism??
- 7.) line up pathology
- 8.) turn down brightness
- 9.) tell patient to blink and then open wide
  - a.) warn patient - shoot image.
  - b.) if digital. analyze image - make adjustments
  - c.) re-shoot until plan is complete

- d.) repeat process on other eye
- e.) if using film you need to take extra images to make sure you got what was needed with no blinks or movement also bracket your exposure to make sure you have a good picture - don't want the patient to have to come back.

Also always analyze your images to check on focus, exposure, etc and try to adjust your technique for future

\*\* If starting out take notes on the patients - exposure, etc to help with review

#### G. Presentation

- 1.) individual
- 2.) 4 up
- 3.) more-up

#### V.) Special Techniques

A.) stereo - two eyes separated horizontally observes images from slightly different point of view and provides us with stereo vision. Stereo photography provides two images from slightly different points of view and enables the images to be fused into a 3 D image

- 1.) maximum dilation is important for larger lateral movement of the camera
- 2.) Stereo is obtained by lateral movement on same horizontal plane
- 3.) first focus directly on the retina and with regular fundus photography
- 4.) move joy-stick to the left watching the retinal image. You will see a crescent of light and continue movement until the retinal image is evenly illuminated.
- 5.) shoot the image
- 6.) now move the joy-stick to the right watching the retinal image. When you see the crescent continue to move right until the retinal image is evenly illuminated.
- 7.) if using film you need to shoot right then left

#### B.) peripheral retina imaging

- 1.) is obtained by a combination of camera movements and off-center fixation by patient
- 2.) need well dilated pupils and patient cooperation
- 3.) have patient look in direction you want to image for superior area have them look up, for inferior patient look down the same with right to left
- 4.) the camera movement for superior lower camera and point it up for inferior raise camera and point it down
- 5.) nasal and temporal images combination up & down movement with side-to-side

#### C.) " the big picture"

- 1.) document different degrees and locations
- 2.) focus on different elevations of retina or pathology
- 3.) lesions - try and get all the margins and show elevation
- 4.) If you see something that the doctor hasn't documented - document it

#### D.) filters

- 1.) layers of the retina - light waves
  - a.) monochromatic green filter (540-575nm)
    - 1.) formerly called "red-free"

- 2.) enhances retinal vasculature and hemorrhages by increasing contrast between retinal blood vessels and RPE
- 3.) focus on central retina for vasculature
- b.) blue fluorescein exciter filter (490 nm)
  - 1.) highlights nerve fiber layer
  - 2.) focus on uppermost layer of the retina
- c.) monochromatic red filter (640nm)
  - 1.) highlights choroidal details - edges of choroidal lesions
  - 2.) focus on retinal veins and then down deeper into the choroid

#### VI.) Lens maintenance

- A.) importance of lens cap
- B.) cleaning lens
  - 1.) lens glass is a soft surface and can be easily scratched
  - 2.) first try brushing lint off with brush or bulb
  - 3.) use 100% ethyl alcohol on a cotton ball
    - rub from center out in circular motion
  - 4.) make sure you don't leave a film - repeat if necessary and use brush or bulb to remove any remaining lint

#### VII.) Archiving images

- A.) digital
- B.) preserving slides

#### VII.) Special tips

- A.) lids, lashes, hair
  - a.) hold lids, tape or get someone else to hold - not the patient
  - b.) don't be afraid to brush people's eyebrows out of the way
- B.) small pupils
  - a.) make sure fully dilated
  - b.) make sure area that is needed is as brightly illuminated as possible
- D.) the difficult patient
  - a.) get patient to laugh
  - b.) empathize
  - c.) explain before and during the procedure
  - d.) get the pictures that are needed
- E.) Hearing impaired
  - a.) same as above but explanation in the lighted room imperative
  - b.) set up a touch code for directions in the dark
- F.) children
  - a.) get children comfortable
  - b.) explain
  - c.) stand at camera
  - d.) don't let them touch the lens
  - e.) get the ONE shot necessary
- G.) try for perfection but realize you won't always get it.
  - 1.) if you don't have a doc that acknowledges your expertise - document blinks, media opacities and any other things out of your control