OPHTHALMIC PHOTOGRAPHY

- Ophthalmic photography provides information essential for diagnosing and treating ocular conditions.
- Various equipment and cameras are used to provide the required information by the physician.
- Photography requires an adequate knowledge of ocular anatomy and an understanding of how images are captured.
- A photographer also should know the elements of a useful image with minimal artifacts.
MANY, MANY TYPES OF CAMERAS
CLINICAL TRIAL

STUDY: Pfizer 3H14/003

NAME: __________________________

STUDY NUMBER: ____________________

DATE: ____________________________

REVIEWED: ____________________________

PHOTOGRAPHER: ____________________________

AUTOFLUORESCENCE: OD OS OU

BE: Field 1/1000 High Speed Single Image

RE: Field 1/1000 High Speed Single Image

NF: Field 2/100 Field 1/100 Field 1/1000 High Speed ART mean of 15

SPECTRAL IODOT: OD OS OU (ALWAYS DO 73 LINE SCAN FIRST)

Volume scan: 30° image with a 30x30° 73 line square at 8 frames High Resolution

Volume scan: 30° image with a 20x20° 73 line square at 9 frames High Resolution

STEREO COLOR FUNDS PHOTOS:

Modified 3-M standard Fields: OD OS OU

Funus Reflex Photographs: OD OS OU

STEREO RED-FREE FUNDS PHOTOS:

Field 2: OD OS OU

FLUORESCEN: Transmit OD OS

1. Control F2, Study Eye, Start inj. (Timer starts)
2. Control F2, Study Eye, End Injection
3. F2, Study Eye Transit single images
4. F2 Study Eye stereo pair: 30 seconds
5. F2 Fellow Eye stereo pair: 30 seconds
6. F2 Study Eye stereo pair 1 minute
7. F2 Fellow Eye stereo pair 1 minute
8. F2 OU stereo pairs (study eye first): 2-3 minutes
9. F2 and OU stereo pairs (study eye first): 5 minutes
10. F2 OU stereo pairs (study eye first): 10 minutes

9/21/2017
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WHAT’S YOUR GAME PLAN?
OPTICAL COHERENCE TOMOGRAPHY (OCT)

- OCT is a technique used to image ocular tissues, such as the retina, in vivo.
  - Non-invasive
  - Non-contact
  - Painless
  - Reliable
  - Fast
OPTICAL COHERENCE TOMOGRAPHY (OCT)

- Retina
- Optic Disc
- Anterior Segment
OPTICAL COHERENCE TOMOGRAPHY (OCT)

- Two types of OCT technology:
OPTICAL COHERENCE TOMOGRAPHY (OCT)

- Two types of OCT technology:
  - Time Domain
    - Introduced in 1996
    - Compares a reflected beam of light to light reflected from a reference mirror
    - The delay in time between the two beams is measured
    - Eye movement can easily degrade the image
OPTICAL COHERENCE TOMOGRAPHY (OCT)

• Two types of OCT technology:
  • Spectral Domain
    • Introduced in 2006
    • Uses a spectrophotometer to detect a difference in wavelength between the reflected and referenced beam of light
    • Eye movement artifacts are at a minimum
    • More scans per second can be acquired, and 3D imaging is possible
WHAT CAN OCT DO?

• Measure retinal thickness
• Measure the thickness of the retinal nerve fiber layer (RNFL)
  • Measure the volume of the retina
  • Measure the optic disc
• Measure and identify choroidal lesions
  • En-face imaging
  • OCT Angiography
ANATOMY OF A RETINAL OCT

• Foveal Depression
• Retinal Nerve Fiber Layer (RNFL)
• Photoreceptors
• Retinal Pigment Epithelium (RPE)
• Choroid
WHAT MAKES A GOOD OCT IMAGE?

- Scan placement
- Focus
- Illumination
- Proper alignment
- Signal strength
- Minimal artifacts
OCT ARTIFACTS
CUTTING OFF THE EDGE
INVERTED OCT
SHADOW OF AN OPACITY
SHADOW OF AN OPACITY
CATARACT
TIPS FOR CAPTURING A GREAT OCT IMAGE

• Plan ahead. Know what scanning protocols the physician needs and what pathology you are trying to capture.
• Refer to previous OCTs and other imaging such as color photos and FAs to identify the type of pathology.
• Explain to the patient that they must keep their forehead against the bar and chin on the chinrest. Patients tend to lean or fall back which will create an unsteady, “bouncing” OCT.
• Use the canthus markers to align the patient vertically.
• Use artificial tears when necessary. Dry eyes will obscure and degrade OCT image quality.
FUNDUS PHOTOGRAPHY

- Fundus photography documents the retina.
- A fundus camera is essentially a microscope with an attached camera.
- The pupil is similar to a window in which light can both enter and exit. Light emitted from the flash enters the pupil and is reflected back towards the camera.
THE FIRST HUMAN FUNDUS PHOTO

• There is some debate over who historically captured the first successful human fundus photo.

• In 1886, T. Jackman & JD Webster were the first to publish their technique and a reproduction of a fundus image in two different periodicals.
  
  • *Photographing the Eye of the Living Human Retina. Photographic News, England May 7, 1886*
  
  • *On Photographing the Eye of the Living Human Retina. Philadelphia Photographer, June 5, 1886*
THE FIRST HUMAN FUNDUS PHOTO

• The *Philadelphia Photographer* described a “2 1/2 minute exposure resulting in an image with a prominent corneal reflex, but a faintly visible optic disc”.

• The reproduction in the periodical was created by an engraving which only simulated the original photo.
WHERE WE ARE TODAY
When capturing images for studies, the two most important landmarks are the OPTIC DISC and FOVEA.
• Fundus photos are described by the angle of view.
  • $\leq 20^\circ$ - narrow angle
  • $30^\circ$ - normal
  • $\geq 50^\circ$ - widefield
THE KEY TO CAPTURING 7- FIELDS

- Many clinical trials will require multiple fields.
- The most common requirement is the standard 7-fields.
THE KEY TO CAPTURING 7- FIELDS

- The optic disc and fovea are the most useful landmarks when capturing various fields.
THE KEY TO CAPTURING 7- FIELDS

• **Field 1M- Optic Disc**: Center the temporal edge of the optic disc at the intersection of the cross hairs. The optic disc will be off center providing a partial view of the macula.

• **Field 2-Macula**: Center the macula near the intersection of the cross hairs in the ocular. A suitable position can often be obtained by rotating the camera temporally from the Field 1M position, without vertical adjustment being necessary.

• **Field 3M-Temporal to Macula**: Position the intersection of the cross hairs in the ocular 1.0-1.5DD temporal to the center of the macula. In this position, the macula will appear mid-way between the edge and the center of the monitor view.
THE KEY TO CAPTURING 7- FIELDS

- **Field 4-Superior Temporal**: The lower edge of the field is tangent to a horizontal line passing through the upper edge of the optic disc, and the nasal edge of the field is tangent to a vertical line passing through the center of the disc.

- **Field 6-Superior Nasal**: The lower edge of the field is tangent to a horizontal line passing through the upper edge of the optic disc, and the temporal edge of the field is tangent to a vertical line passing through the center of the disc.

- **Field 5-Inferior Temporal**: The upper edge of the field is tangent to a horizontal line passing through the lower edge of the optic disc and the nasal edge of the field is tangent to a vertical line passing through the center of the disc.

- **Field 7-Inferior Nasal**: The upper edge of the field is tangent to a horizontal line passing through the lower edge of the optic disc and the temporal edge of the field is tangent to a vertical line passing through the center of the disc.
DON’T FORGET THE RED REFLEX!

• Have a habit of capturing the red reflex FIRST as soon as you start shooting your fundus photos.
LET’S SEE SOME FUN FUNDUS PHOTOS!
FUNDUS AUTOFLUORESCENCE

• If you can capture a fundus photo, you can capture a fundus photo with AUTOFLUORESCENCE!
FLUORESCEIN
ANGIOGRAPHY
FLUORESCEIN ANGIOGRAPHY

• An FA of the retina is essentially a dynamic fundus picture.
  • Clinical trial FAs are all about TIMING!
  • Make sure you know the plan before shooting!
  • If you make a mistake or miss a check point, KEEP SHOOTING until the end of the protocol.
THE PHASES OF A FLUORESCEIN ANGIOGRAM

• There are SIX distinct phases of the transit of fluorescein in a retinal angiogram.
THE PHASES OF A FLUORESCEIN ANGIOGRAM

- CHOROIDAL FLUSH
- 10 – 20 seconds after injection
THE PHASES OF A FLUORESCEIN ANGIOGRAM

• ARTERIAL PHASE
• 20 – 25 seconds after injection
THE PHASES OF A FLUORESCEIN ANGIOGRAM

- ARTERIOVENOUS PHASE
- ~25 seconds after injection
The phases of a Fluorescein angiogram:

- Venous phase
- ~30 seconds after injection
• MIDPHASE
• ~1 minute after injection
THE PHASES OF A FLUORESCEIN ANGIOGRAM

• LATE PHASE
• >3 minutes after injection
THE PHASES OF A FLUORESCEIN ANGIOGRAM
REFERENCES

• Modified 7-Standard Fields [Digital Image]. University of Wisconsin Fundus Photograph Reading Center (Jun 1, 2012). Retrieved May 19, 2017 from http://eyephoto.ophth.wisc.edu/photography/PDFs/7M-D.pdf
REFERENCES


MANY THANKS
& BEST OF LUCK