

1



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Educational Objectives

- Angiography as a diagnostic tool
- Some circulatory anatomy and physiology
- Instrumentation
- Step by step procedure
- Angiographic Phases
- A bit about the Sodium Fluorescein dye
- Patient Management
- Adverse reactions
- Advanced techniques



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What Goes in the Soup ?

- Basic knowledge of Ocular Anatomy
- Basic knowledge of Ocular Disease
- Solid Knowledge of Camera Function
- A strong curiosity
- Desire to excel



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Disclaimers

- I have no financial interest in this topic
- I receive no pay for this presentation
- I am a paid speaker for Genentech
- I have my own consulting company, EyeEducateU.com
- Each one of these slides/sub subjects warrants more in depth study...Seek out additional webinars!
- There is an assumption that you already know how to use your camera for color imaging....
- Every mistake you think you'll make, I've already made them twice...



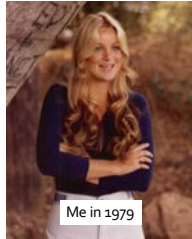
6

My Angiographic Pedigree

- First angiogram performed in 1979
- Earned CRA (Certified Retinal Angiographer) by OPS 1980. CRA #69
- Awarded “outstanding contributions to Ophthalmic Photography” OPS 2019
- Past president, Ophthalmic Photographers’ Society
- Over 40 years of angiography under my belt...



OPS Board of Directors 1994



Me in 1979

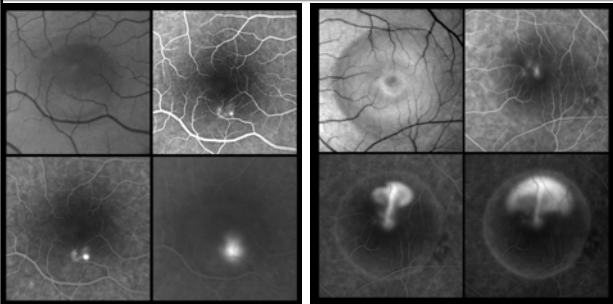
7

Denice’s Top FA Mistakes... Pre digital

- Accidentally exposed 20 rolls of FA film to light (1979) prompting 20 pts to return for repeat FA
- **Flooded the darkroom (top floor) , resulting in a complete flooding of the entire two story clinic (1980)**
- Performed Angiography on the wrong twin..
- Started angiogram “earlies” on wrong eye (many many times...)
- Mixed up wrong film with wrong patient (more than once...)
- Forgot to load film into the FA camera- did entire FA without film (a few times)
- Loaded COLOR film into the FA camera... more than a few times!

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54 years of Fluorescein Angiography



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Reprinted from CIRCULATION
Vol. XXIV, No. 1, July, 1961
Printed in U.S.A.

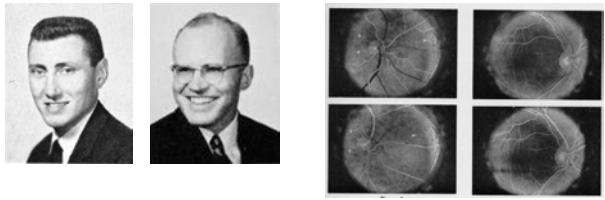
**Paper originally rejected as being interesting,
but not important"**

A Method of Photographing Fluorescence in Circulating Blood in the Human Retina

By HAROLD R. NOVOTNY, B.S., AND DAVID L. ALVIS, M.D.

THE PHYSIOPATHOLOGY of the retinal vasculature would be better understood if more were known about blood flow in these vessels. Because of the unique quality of transparency in the eye, methods depend-

exciting wave length was 520 m μ , in the green. Kodak wratten filters no. 47 and no. 58, combined with a 3-mm. layer of 0.25 M copper sulfate, were accordingly inserted into the optical system (figs. 1 and 2) at appropriate points. In order to modify the activating light, the



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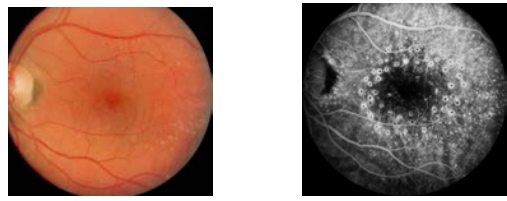
What is Fluorescein Angiography?

- A diagnostic test that documents the dynamic flow of dye in the blood vessels in the eye
- A record of the hemodynamics of retinal blood vessels
- Details precise areas of vascular leakage or absence of dye flow
- Used as a guide for both diagnosis and treatment

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How is Fluorescein Angiography Different From Color Retinal Photography?

Color Fundus	Fluorescein Angiography
Non invasive	Invasive- venipuncture & dye administration
No side effects to the flash	Possible reactions to the sodium fluorescein
Images may be taken slowly & out of order	Images are transit phase dependent
Documentation	Diagnostic



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Camera vs. SLO

Fluorescein angiography is performed using either a digital retinal camera or a scanning laser imaging system.



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Indications and Uses of FA

- To elicit and define conditions that leak, plug up or are inflamed
- Diagnostic for Retinal / retinochoroidal vascular diseases
- Used to determine the extent of damage, to develop a treatment plan, or monitor results of a treatment
- To document a condition at a particular place in time
- Used in clinical trials

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FUNDamental Questions

- Is there leakage?
- Is there occlusion or obstruction?
- If leakage, does leak get larger with time?
- Does the pathology stain?
- Do the images fundamentally change from first image to last?



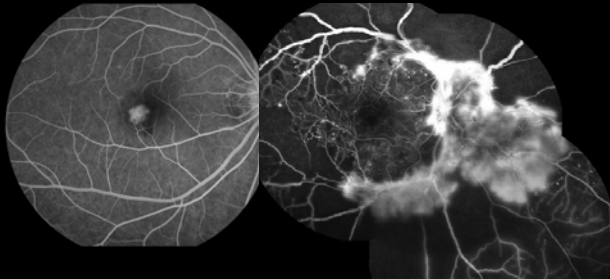
15

Most Common Applications

- Diabetic Retinopathy
- Age Related Macular Degeneration
- Occlusive Diseases
- Inflammatory Diseases
- Dystrophies
- Tumors

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Prime Contenders for FA

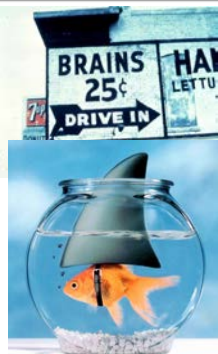


Current SD-OCT systems do not have the resolution to see abnormal vessels in CNVM. In Diabetes, the leakage, blockage and new vessel growth demands a good hemodynamic study

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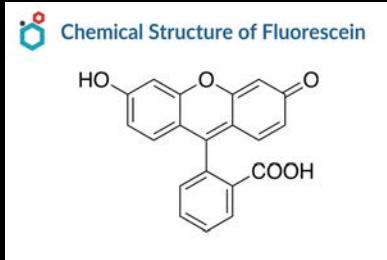
Who Can Perform Angiography?

- License not necessary, not available
- CRA not required but desired
- Trained technician or dedicated photographer is most common
- More laws govern dilation of pupil than performance of angiography !



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Some of the common synonyms of fluorescein sodium are Fluorescein (Sodium Salt), Uranine, Resorcinolphthalein, Nafluor, Acid Yellow 73, D&C Yellow #8, and Yellow No. 8. It can also be identified by its CAS no. which is 518-47-8.



The Contrast Medium

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The Pharmacology of Sodium Fluorescein

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Sodium Fluorescein

- Fluorescein sodium comes in concentrations of 10% 5ml and 25% 2ml- choice is up to institution
- With modern digital imaging devices, chip is sensitive- very small amount of dye is needed
- More than 25% is not useful as fluorescence is lost through a process called extinction by concentration...
- There are no systemic contraindications to the use of sodium fluorescein, i.e. high blood pressure,



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What is Sodium Fluorescein?

- **NOT:** sugar-based dye, vegetable dye, seaweed extract
- Derived from a Mineral (naphthalene or “tar camphor”) which is oxidized into salts.
- Dependent on pH values. Normal blood pH of 7.38-7.44 is best for maximal fluorescence to occur
- Does **NOT** contain iodine
- Absorbs blue light at 465-490 nm After injection into the bloodstream through a vein in the arm, 80% of the dye is bound to plasma proteins, primarily albumin
- The dye is metabolized through both the liver and kidneys and is eliminated in the urine

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NOT a Vegetable Dye!

The screenshot shows a webpage with a navigation menu (HOME, LOCATIONS, OUR DOCTORS, PATIENT EDUCATION, FOR PATIENTS, RESEARCH) and a graph of % Fluorescence vs Wavelength. A red circle highlights the following text: "is usually performed with a dilated pupil. The dye used is a vegetable based dye and rarely causes serious reactions. After the dye is injected in a vein, a photograph is taken using blue light (wavelength 465-490 nm) which is absorbed by the fluorescein molecules. The molecules fluoresce and emit light with a longer wavelength in the yellow-green spectrum (520-530nm). A barrier filter blocks any reflected light so that the images capture only light emitted from the fluorescein. Images are acquired immediately after injection and continue for ten minutes depending on the pathology being imaged."

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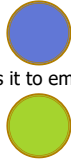
How Does Sodium Fluorescein Work?

- Most common dosage 2ml of 25% injected intravenously (old school- 5ml 10%)
- 80% of molecules bind to proteins in the blood
- Remaining 20% of unbound molecules “glow” or “excite” when exposed to light of 520-530 nm wavelength
- Dye is metabolized by the kidneys and eliminated within 24-26 hours
- Can interfere with clinical laboratory tests

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What is Fluorescence?

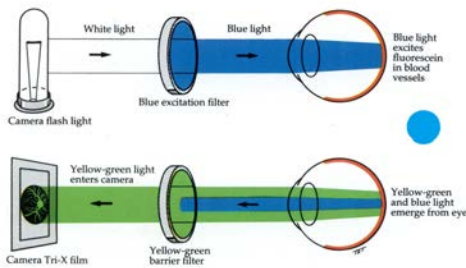
- Fluorescence occurs when sodium fluorescein is excited by light of a specific wavelength in the blue spectrum (465nm to 490nm),
- which causes it to emit light in the green spectrum (520nm to 530nm)
- Fluorescein angiography requires the use of two filters, an exciter filter that transmits the blue light and a barrier filter that transmits the emitted green light
- These filters are delivered in matched sets, allowing the most efficient excitation and transmission of the dye in the eye



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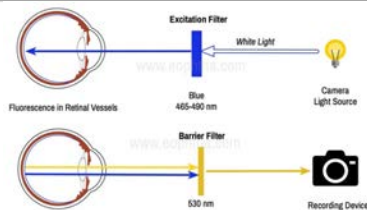
Fluorescein Filters

When illuminated using a retinal camera with a blue filter, the dye fluoresces and emits light in the yellow-green spectrum.



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The Blue Filter: Exciter Filter

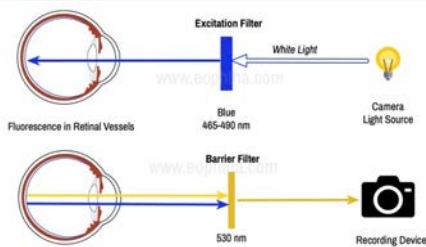


Placed in optical pathway in FRONT of the light source
 Insures that the retinal illumination is only within the wavelength range that maximally EXCITES the circulating sodium fluorescein

E for Exciter, E for ENTER

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The Yellow Filter: Barrier Filter



B for Barrier= B for Blocking all but excited light from entering the recording device (computer sensor)

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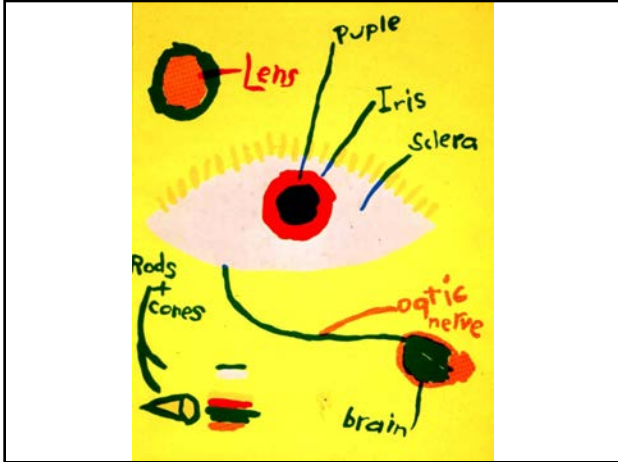


29

Rembrandt's
"The Anatomy Lesson"
15th Century

But First! A Bit of Circulatory Anatomy & Physiology

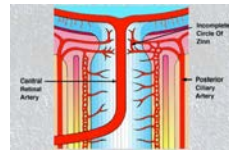
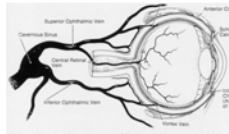
30



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The Circulatory Pathway

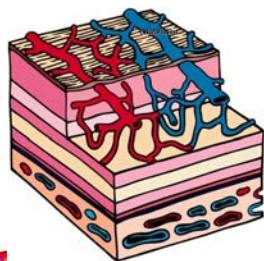
- Dye from arm through venous system to heart
- From heart into the cardiopulmonary circuit
- Up through the carotid arteries to ophthalmic arteries
- Some circulate into choroid/ some through central retinal artery to retina



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Blood Retinal Barrier

- Normal retinal vessels are impermeable to almost all solutions and dye
- This function is unique and has led to the use of the term blood-retinal barrier
- When the blood retinal barrier is breached, you have leakage



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Latin "Vena" for vein.

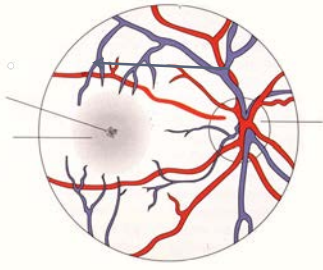
Arteries

Veins

Veins carry deoxygenated blood **TOWARD** the heart; Look for darker blood color.

Arteries carry oxygenated blood **AWAY** from the heart.

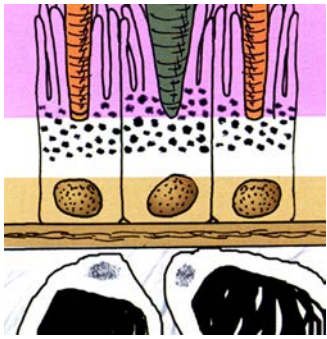
Arteries are larger, "more muscular".
Arteries supply arterioles, which in turn supply capillaries.



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Retinal Pigment Epithelial Barrier

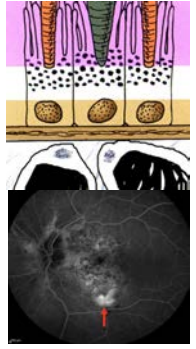
- Vessels forming the choriocapillaris are permeable to a variety of substances but their passage to the retina is halted by the tight junction of the RPE.
- This forms a separate blood-retinal barrier between the choriocapillaris and the retina



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The RPE as A Barrier

- The sodium fluorescein molecule is half the molecular size as ICG medium
- Thus, unless there is a breach in the "RPE wall" sodium fluorescein stays in the retina
- This phenomenon is crucial to the diagnostic value of fluorescein angiography



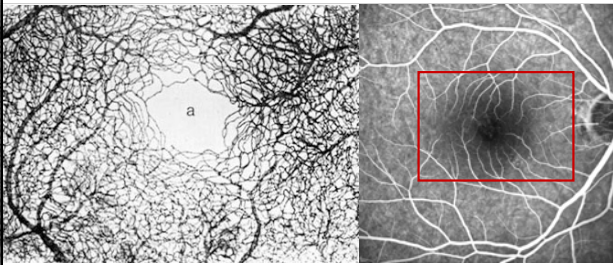
36

"Normal" Circulatory Filling

Approximate Time	Filling Phase / Stage
9-5 seconds	Posterior Ciliary Arteries
10-11 seconds	Pre Arterial Phase (Choroidal Flush)
12-13 seconds	Retinal Arterial Phase
13-14 seconds	Capillary Transition Phase
14-16 seconds	Early Venous Stage or Arterial Venous Phase - "Lamellar Flow"
16-18 seconds	Venous Phase
18-20 seconds	Mid Venous Stage
1-3 minutes	Full Filling, Mid Phase
5-10 minutes	Late Phase (How "late" is "late" is constantly evolving and depends on who you refer to, and what the condition is.

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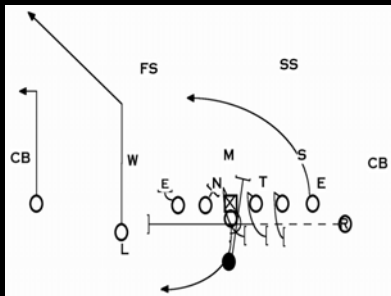
The Foveal Avascular Zone



Scanning Electron Micrography

Mid Phase Fundus Camera

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Let's Get Going: The Game Plan

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Sequencing: The Game Plan

- Many ophthalmologists have developed disease specific protocols for sequencing, field of view and areas of the retina to be obtained during an angiogram
- Direction should come from the ophthalmologist as to which protocol they require done on their patients
- Adjustments to the protocol should be made by the ophthalmic imager based on any findings made during the angiographic process

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BASIC PHOTOGRAPHIC PLAN FOR FLUORESCIN ANGIOGRAPHY

Inject Fluorescein Youth: 10 sec Adult: 12-20 sec Mac and Disc	Pre-injection photograph with fluorescein fillers in place	Stereo pair, Primary Red Free, OD or OS	Stereo pair, macula and disc	Stereo Pair, Primary Red Free, Fellow Eye	Stereo pair, macula and disc
Earliest Area of interest	Earliest Area of interest	Earliest Area of interest	Earliest Area of interest	Earliest Area of interest	Stay on area of interest-eye first entering
Mid Phase Superior Primary Eye	Stereo pair of Mac and Disc Fellow eye	Stereo pair of Mac and Disc Primary eye	Stereo pair of Mac and Disc Primary eye	Stereo pair of Mac and Disc Primary eye	Full filling should now be evident
Mid Phase Inferior Fellow Eye	Mid Phase Nasal Fellow Eye	Mid Phase Superior Fellow Eye	Mid Phase Temporal Primary Eye	Mid Phase Inferior Primary Eye	Mid Phase Nasal Primary Eye
Late Phase Area of Prime Interest Primary Eye	Late Phase Stereo Pair Mac and Disc Fellow Eye	Late Phase Stereo Pair Mac and Disc Fellow Eye	Late Phase Stereo Pair Mac and Disc Primary Eye	Late Phase Stereo Pair Mac and Disc Primary Eye	Mid Phase Temporal Fellow Eye

Essential Fluorescein Angiography. A compendium of 100 classic cases
Howard Schatz, MD 1983

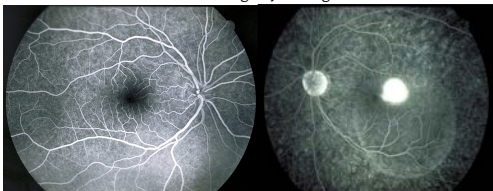
41

Unilateral or Bilateral FA?

In most instances, both eyes of the patient are routinely imaged during the angiogram even though one of them might be completely normal.

This is done to have an image of a non-affected eye to compare to the affected eye and in some cases to confirm whether or not the disease process present in one eye is present in the fellow eye.

One or both? Depends on many factors- MD preference, disease process and allowable billing in your region



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Preparing for the Procedure

- Check for signed consent
- Educate patient
- Perform Color Fundus Photography
- In general, perform FAF before FA because they share the same wavelength
- Engage proper angiography filters
- Double check everything
- Prepare for injection



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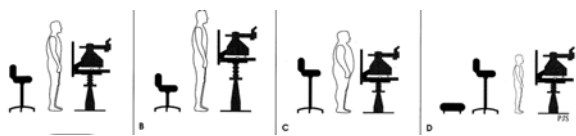
Prepare the Photographer



Get Comfortable- It Could Be a Long Day

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Patient Variability: Be Prepared



Proper ergonomics will start the session set up for success

Diagram: Saine, Tyler, et.al "Ophthalmic Photography"

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Prepare the Camera

- Enter patient information into your retinal imaging capture software
- Set the retinal camera eyepiece for your refractive error
- Make sure the system is set to do color photography first
- Have the correct angle of view set relative to the pathology you are going to photograph
- Set flash intensity for color photographs
- Adjust the viewing illumination to a low, comfortable level
- Clean the chinrest and headrest

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Prepare the Injection

- Injection supplies should be prepared before bringing the patient into the room for photography. This helps to reduce patient anxiety.
- Collect and assemble the injection, alcohol wipes, cotton, band aide and tourniquet into an area easily accessible by the individual tasked with performing the injection



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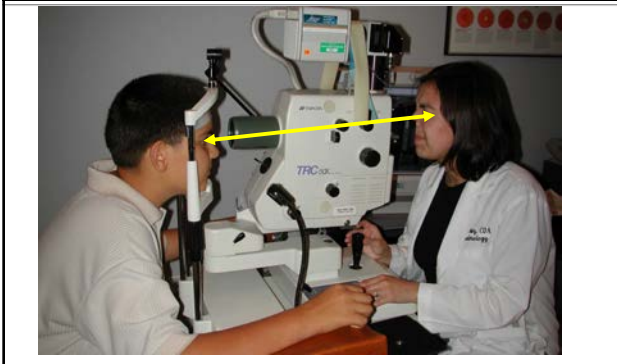
Prepare the Patient

- Confirm the patient is adequately dilated or dilate based on written orders from the ophthalmologist
- Explain the diagnostic process and what role the patient will play in obtaining the best possible images- encourage questions
- Review the informed consent form, answer any questions and have the patient sign the form (more on this!)
- Get the patient positioned comfortably for photography

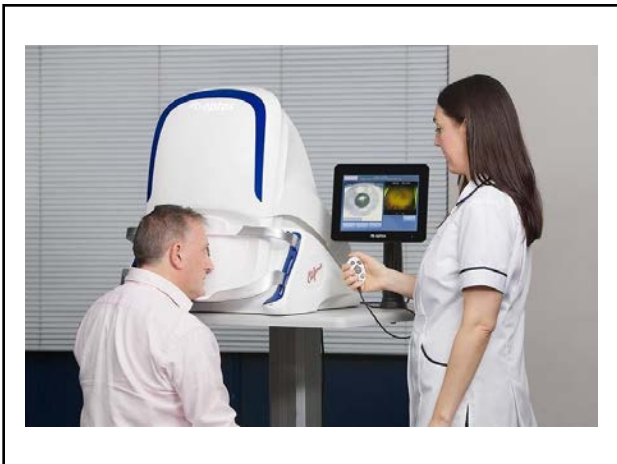


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The Working Distance



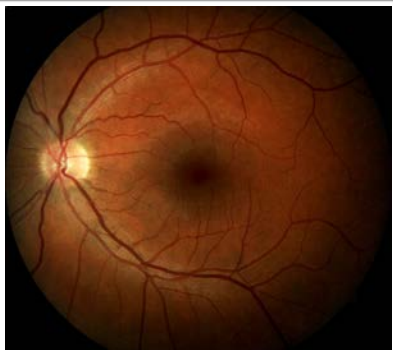
52



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Color Retinal Imaging

- Fine tune focus on the area of interest
- Take color photographs of the first eye, reviewing the images on the monitor as they are made and making any necessary adjustments to focus, distance and view of the pathology
- Confirm you have color retinal photographs of adequate quality before starting the angiographic process




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Why is this called the "Control Photo"

What are we controlling?

What is the purpose of this?

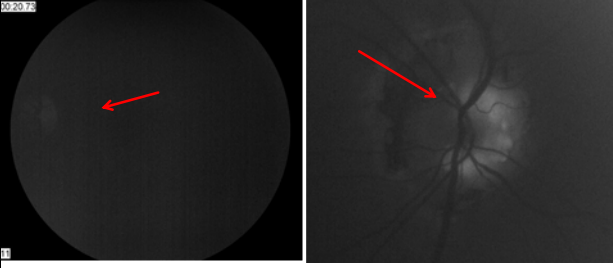
Why do they call it "Red Free?"



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"Control Photo": Vestigial Hold Over

Control Photograph: Should the filters be worn out we see Pseudo fluorescence or Autofluorescence in the presence of optic nerve head drusen



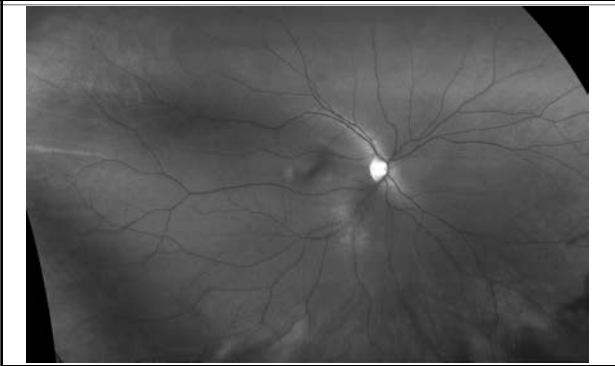
56

The "Red Free" Photograph

- Old school holdover from the days of Kodachrome color slides
- Wavelengths:
 - 380-420 nm — wavelength of violet
 - 420-440 nm — wavelength of indigo
 - 440-500 nm — wavelength of blue light
 - 500-520 nm — wavelength of cyan light
 - 520-565 nm — wavelength of green light
 - 565-590 nm — wavelength of yellow light
 - 590-625 nm — wavelength of orange light
 - 625-740 nm — wavelength of red light

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Red Free: Scanning Laser (SLO)



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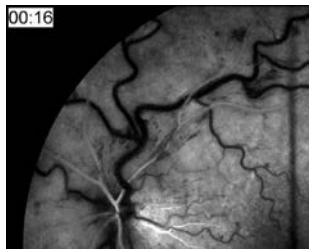
The Actual Angiogram

- Since you have ended your monochrome photography on the eye you need to do the initial phase of the angiogram on, you don't have to reposition the camera or fixation again. In fact, once you have adjusted the focus for monochromatic images on this eye, you shouldn't have to refocus again even if the patient sits back from the camera to take a break before the injection.
- Change your software setting for fluorescein angiography
- Adjust the flash setting for angiography. Depending on retinal camera model, age of the flashtube, condition of the angiogram filters and the concentration of sodium fluorescein used, this setting is typically in the range of ¼ of the upper limit of power available.

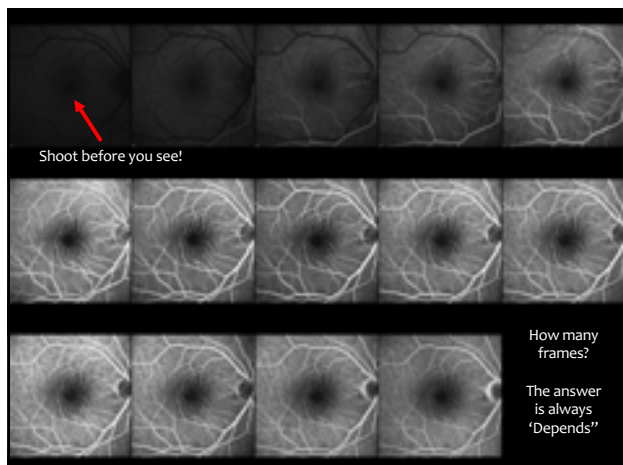
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Fluorescein Timing

- Timing is the essence of the study
- "Earlies" are often the most important phase of FA
- "Earlies" come and go within 30 seconds
- **Shoot before you see dye**
- Mid phase is measured in minutes, not seconds
- Be consistent!



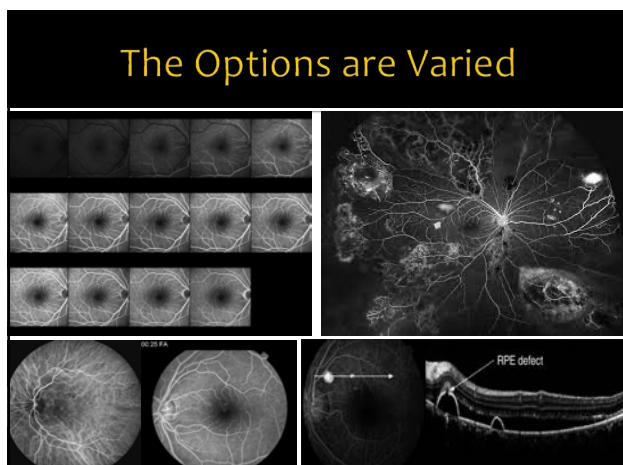
60



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And We're Off!.....

- Engage proper filters
- Check your settings one last time
- Signal injector
- Begin series-shoot earlies- shoot before you see!
- Pictures at 1,3,5 and 10 minutes
- Close the session, take a deep breath, check on your patient... Como se Siente?

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Angiographic Phases

- Choroidal (pre arterial)
- Arterial
- Venous (Lamellar)
- Arteriovenous
- Recirculation (Mid Phase)
- Late ("Late" being a relative term....)

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Circulation Times

- 8-10 sec Choroidal filling ("flush")
- 10-12 sec Retinal Arteriolar filling
- 11-13 sec Retinal Capillary filling
- 12-14 sec Retinal Venous filling
- 3-5 mins Recirculation
- 5-20 mins Staining of Sclera, Cribosa
- 10-60 mins Removal of dye from choroid

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The Choroidal Phase

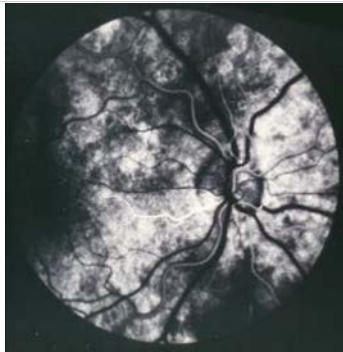
In a normal fluorescein angiogram, the first fluorescence begins to show in the choroid approximately 10 – 12 seconds after injection. If a cilioretinal artery is present, it will fill at this time also



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The Choroidal "Flush"

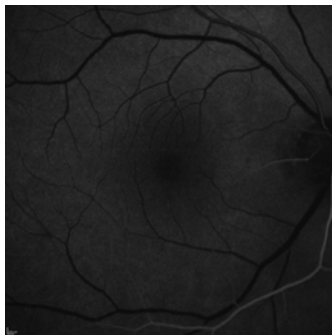
- The ophthalmic artery supplies the choroid via the short posterior ciliary arteries and the retina via the central retinal artery, however, the route to the choroid is typically less circuitous than the route to the retina.
- This accounts for the short delay between the "choroidal flush" and retinal filling.



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The Choroidal Phase

- In a normal fluorescein angiogram, the first fluorescence begins to show in the choroid approximately 10 – 12 seconds after injection.
- If a cilioretinal artery is present, it will fill at this time also.



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The Arterial Phase

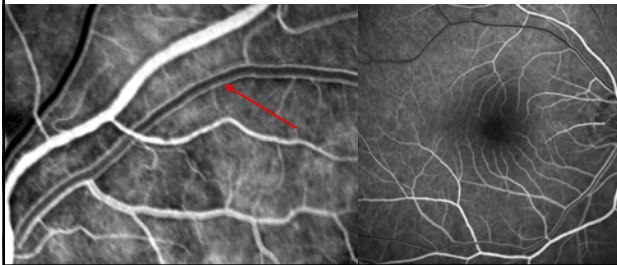
Along with a patchy filling of the choroid, the dye enters the retinal arteries



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Venous Phase/ Laminar Flow

As the dye flows through the small capillaries into the veins, the dye is pulled along the side of the vessel walls characterized by a striping affect called laminar "flow" Dye fills the side of the veins first because circulation enters the large veins from the vessel wall

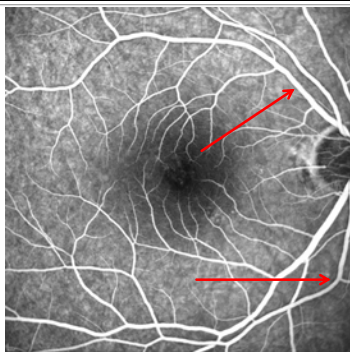


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Full Arterial Venous Phase

Equal amounts of dye are visible in both the veins and arteries.

This is the phase of the angiogram where the small capillaries around the fovea are most visible



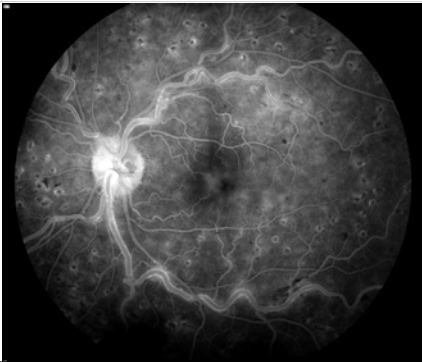
72

Sequencing: The Mid Phase

- Since the early phase of dye entering the eye is the most critical part of the angiogram and usually lasts less than a minute, continue photographing until you see maximum fluorescence (45 seconds to a minute) and then quickly switch the camera to the fellow eye
- Capture photographs of any areas of interest there.
- At this point, not much will change in appearance until a few minutes have passed, giving the dye a chance to collect, pool or leak into compromised areas of the retina.

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Full Filling Phase, Mid Phase....



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Mid Phase

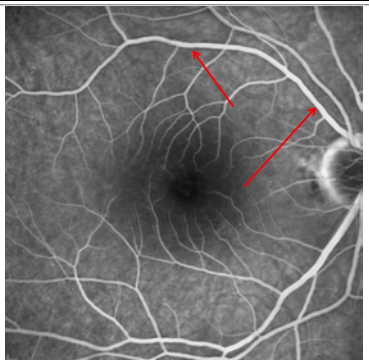
- Get curious-look around!
- Check in with your patient-How ya doin?
- Switch over to the fellow eye



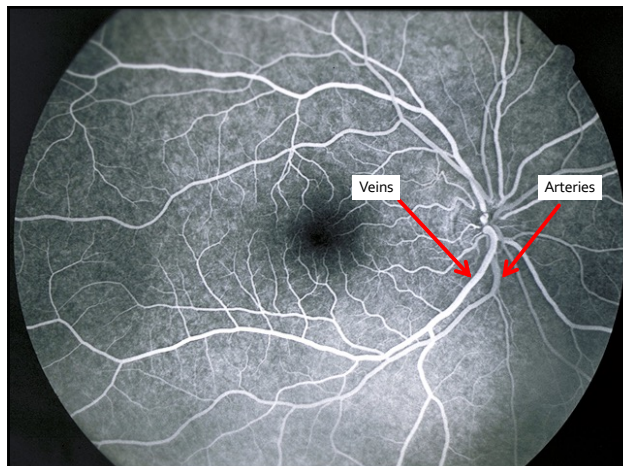
75

Late Venous Phase

As the dye leaves the arteries, the veins become brighter in appearance



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Transit Phase Done: Take a Break!



78

The "Late" Phase

After the initial 1 – 2 minutes of photographs are taken, a waiting period of 3 – 10 minutes takes place before a few images are taken of each eye to show dye that has leaked or pooled



Early phase of the angiogram with small area of leakage



10 minute late phase of the angiogram with area of dye leaking/pooling

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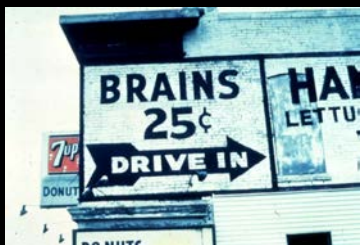
80

When You Can't See Any Dye

- Circulation may just be sluggish
- Keep your cool, keep shooting!
- Check for:
 - Extravasation?
 - Arterial injection?
 - FA Filters not engaged??
 - Medial opacities?



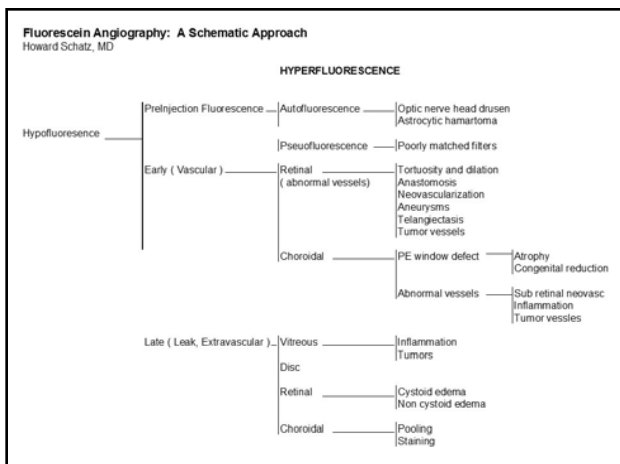
81



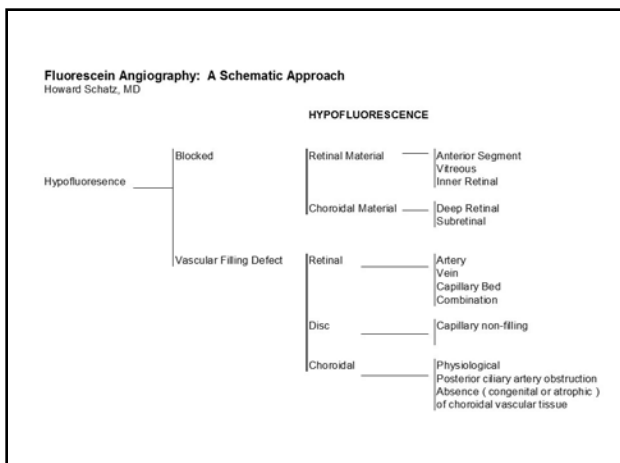
Remember! We describe, not interpret....

Descriptive Terminology

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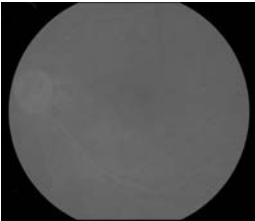
84



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The Poor FA: Was it You?

- Did you forget the filters?
- Have your filters degraded?
- Was there a filter blocking the optical pathway?
- Incorrect computer setting?
- Improper exposure?
- Did enough dye make it into the vascular system?



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Factors Affecting Image Quality

- Skill level of the ophthalmic imager
- Presence of media opacities
- Absorption of blue excitation light by yellow cataracts
- Residual topical fluorescein staining of the cornea and reducing contrast in the image
- Inadequate pupillary dilation
- Poor fixation
- Inadequate patient cooperation
- Only partial injection of the entire amount of dye
- An extremely slow injection
- Extravasation of the dye
- Optical or mechanical problems within the retinal camera

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Angiography in Children
Iris Angiography
Widefield Angiography
OCT Angiography



A Few Specialized Techniques

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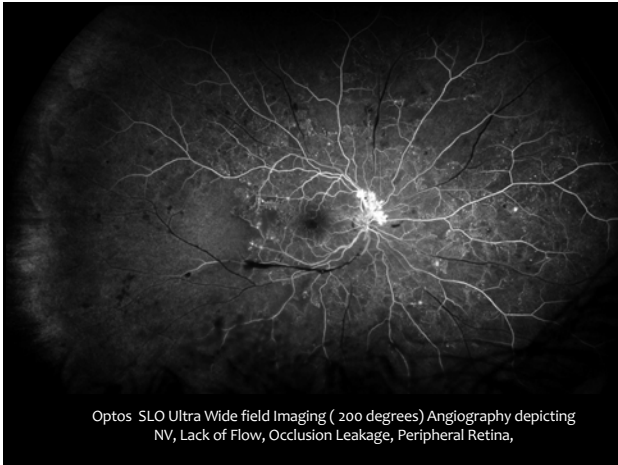
Wide Field Angiography



89



90



91

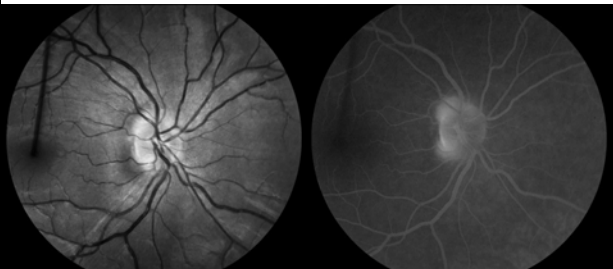
Impossible Venipuncture: Oral FA

- When venous injection is impossible
- Results are equivalent to taking only very late photos of a venous injection
- Mix 2 vials of fluorescein with 6 fluid oz of a soft drink (diet!) or tomato juice
- Use a straw to avoid staining teeth
- Use high flash setting starting 15 min after drinking. Best photos about 30 min later
- Much less time with a cSLO



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Impossible Venipuncture: Oral FA



Pre FA Red Free

Oral FA. 2cc 25%. Image 20 min After ingestion of dye cocktail

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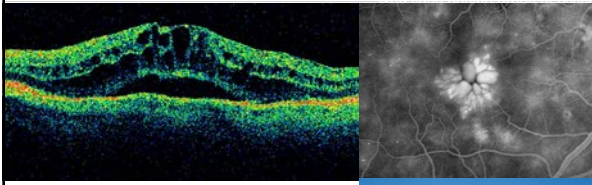
Impossible Venipuncture: OCTA

Obese patient with impossible venipuncture
Monocular- information imperative
Oral FA inconclusive- but! OCTA showed CNV




94

5 yo with CME- Who Wants to do FA?



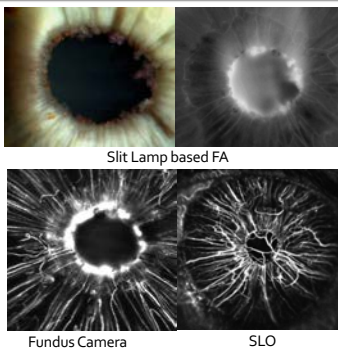
Use 100 lb. rule- 5mg per lb.
50lb child would be approx. 1ml 25%
Think small adult same as a child...



95

Digital Iris Angiography Options

- Slit Lamp camera best? But not practical...
- Focal plane is very flat with fundus camera or SLO- both have very shallow depth of field
- Not so clinically useful as other diagnostic modalities- the “no duh” angiogram



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Reactions to the PROCEDURE
Reactions to the INJECTION OF DYE
Reactions to the DYE ITSELF

Complications & Adverse Reactions

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Normal After Effects of FA

- Discolored urine 24-36 hrs.
- Yes, more drinking expels the dye faster..
- “Suntanned” skin in fair skinned patients
- Advise breast feeding women to bank their milk..see next slide



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Fluorescein and Breast Feeding

Fluorescein sodium injection has been demonstrated to be excreted in human milk for up to 4 days. Following fluorescein angiography, **breast-feeding should therefore be discontinued for at least 4 days** and the milk should be pumped off and discarded during this period.



Administration of contrast media to breastfeeding mothers. In: Manual on contrast media, version 7. Reston (VA): American College of Radiology; 2010. p. 61-2. Available: www.acr.org/SecondaryMainMenuCategories/quality_safety/contrast_manual/FullManual.aspx (accessed 2012 Apr. 13).

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Homework: Most Recent Article(s)



100

Mild Reactions (Approx 1%)

- Most common: nausea and/or emesis within first few minutes of injection
- Occurs most often in agitated or nervous patients
- Increased heart rate
- Metallic taste in mouth
- Dry mouth or increase salivation
- Dizziness or fainting (can be true syncope or vaso vagal response)
- Sneezing



Definition: transient and resolves spontaneously without treatment

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Moderate Reactions < 1%)

- Urticaria (Hives)
- Skin eruptions
- Usually occur 3-10 minutes after injection
- An allergic reaction that release histamine
- Thus, use an ANTI-histamine to counteract (25-50% oral Benadryl)
- Injectable antihistamine is rare
- Monitor patient for 20 minutes



Definition: Medical Intervention is needed

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Severe Reactions < 0.05%

- Laryngeal edema
- Bronchospasm
- Syncope (strong vasovagal)
- Anaphylaxis
(a true allergic response)
- Myocardial infarction
- Cardiac arrest



Definition: Emergency Medical Care.
May require intensive intervention
and the patient may have a poor
recovery

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Severe Reaction: Activate EMR



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Death: 1 : 222,000



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Rare: Arterial Injection



Arteries carry blood from your heart to other parts of your body. The blood pressure in arteries is much higher than in veins. Blood will be bright red and "gushing"- a hallmark of arterial vs. vein injection

106



My husband, age 40, wearing his childhood Boy Scout uniform

Be Prepared !

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Is this your EMT Plan?

108

Crucial Conversations to Have

- Create a **WRITTEN** emergency plan-practice it.....
- Define specific responsibilities....
- Role of Angiographer in emergency: who calls 911 and when?
- What are the policies that govern where you work?.....
- Have checklist of emergency supplies....



"For the love of God, is there a doctor in the house?"

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Denice's Real Life List

- Two MD's fighting over whether to call 911 or not
- Oxygen tank found empty in crisis
- Patient refusing ambulance after MD called one
- Only act of CPR on criminal defense attorney
- Practice insisting I do own FA injections despite laws
- No emergency plan while patient's lips turning blue...
- Blood pressure cuff too small for large, obese patient
- Two Service Dogs in area got into a dogfight

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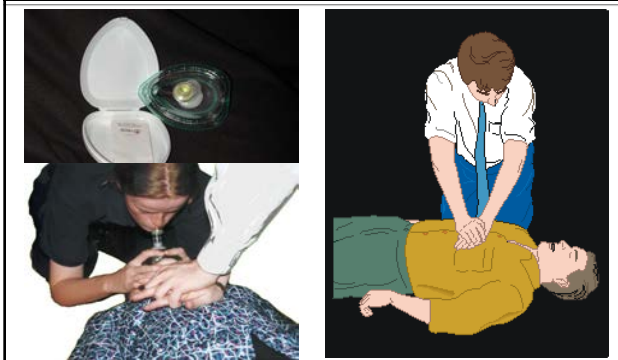
Minimal Emergency Supplies

- Oxygen Tank & Cannula
- Stethoscope & Cuff
- Pillow/Blanket if patient needs to be lowered to floor
- Ambu bag / CPR mouth filters



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Basic Life Support / CPR



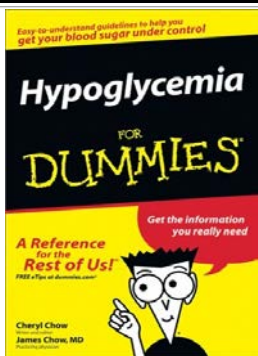
112



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Don't Forget Hypoglycemia !

- **Mild:** shaking, sweating, weakness, anxiousness
- **Moderate:** confusion, slurred speech, lack of concentration and coordination
- **Severe:** unresponsiveness, combativeness, convulsions, unconsciousness- **Life Threatening!**



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Great On Site Supplies

- Liquid glucose best- 10-20 grams..fastest response..
- Candy is easy, quick...
- Sugar won't hold... Always follow with at least 8 grams of protein like protein bars, cheese/cracker packages..



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Procedural Supplies

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FA Supply Check List Suggestions

- 18 gauge filling needle to fill syringe
- 3cc syringe with 2.5cc 25% sodium fluorescein or 5cc syringe with 4cc 10% sodium fluorescein
- 23 gauge butterfly with 1/2 inch tube 3/4 inch needle
- Adhesive bandage / hypoallergic tape
- 2x2 Gauze or cotton ball with paper tape
- Tourniquet
- Alcohol pads
- Gloves

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Safety Protocols / Safety Supplies

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Angiographic Safety Supplies

For the Patient	For the Imager
Stable chair	Handwashing facilities
Emesis basin or large bin	Proper syringe disposal unit
A safety plan- the EMT protocol	Gloves
Oxygen tank and canula	PPP: Masks, facial barriers
Blood pressure cuff, stethoscope	CPR mouth filters or Ambu bag
Hypoglycemia supplies	Exposure control plan

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Don't assume

This nice grandmother could be HIV positive , Hep C positive, have TB, etc. etc.....



120

Control Your Environment



121

Clean the Chin Rest!



122

Photographer/ MD Safety



123



124



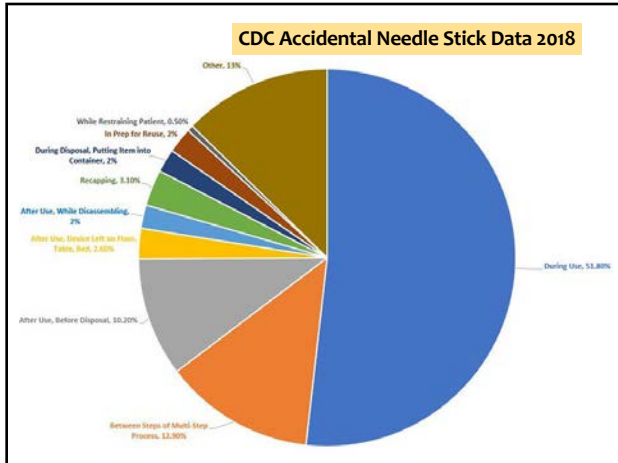
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Accidental Needlesticks

- Needlesticks are a serious problem for health care workers- high risk of infection
- During procedure- drawing blood or administering medications. While recapping needles, sloppy disposal
- Never downplay a needlestick injury- address it immediately!

- **CDC 2014: Over 600,000 accidental needlesticks ; 18% during phlebotomy procedures**

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References

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