Clinical Decisions in Retina

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Examining the Retina

Assess the optic nerve
- What is the cup to disc ratio
- Is there good coloration and perfusion
- Is it flat
- Choroidal or scleral crescent

Mark Dunbar: Disclosure

- Consultant for Allergan Pharmn
- Optometry Advisory Board for:
  - Allergan
  - Carl Zeiss Meditec
  - Alcon Nutritional Advisory Board
  - ArticDx

Examining the Retina

What is the caliber of the retinal vessels
- Make sure you look and consciously take not of what the caliber is
- Narrowing of the vessels requires checking the blood pressure
- Normal A/V ratio is 2/3, ¾
- What about the arterial light reflex?

Examining the Retina

- Don’t forget to look at the anterior vitreous
- Needs to be done on every dilated patient
- Done at the slit lamp, looking posterior to the lens
- Retroillumination may help if you suspect vitreous cell

More on this later

Examining the Retina

The Macula
- Is there a foveal light reflex (FLR)?
- Is it flat?
- Is there any fluid, hemorrhage, or exudate
- Presence of drusen
- RPE mottling
Examining the Retina

The peripheral retina
- It has to be done through a dilated pupil
- Don’t substitute imaging for indirect ophthalmoscopy
  - Use Imaging as a compliment, but not substitute
- Be systematic in your examination
- You should be able to see ora on “all” gazes
  - It’s all about technique

PVD

- 65% of individuals > 65 have PVD
- More common in women
- More common following intraocular surgery
- More common following inflammation
- More common in aphakes

59 y/o White Male

- CC of new onset flashes RE X 3 wks
  - See’s them only at night
  - Does not seem to affect vision
- VA: Best-corrected 20/20 (-3.50 OU)
- Motility, CVF, Pupils – all normal
- Anterior Segment – unremarkable
- Posterior Segment -

PVD

- Retinal tears occur 8-15% of eyes with symptomatic PVD
  - 90% are superior
- VH occurs in 13-19% of symptomatic PVD’s
- VH + PVD -> 70% will have a retinal break
- PVD No VH -> 2-4% will have retinal break

59 y/o White Male

What are you suspicious of?
What are you looking for?

Posterior Vitreous Detachment

Exam of a Pt with Symptomatic PVD

- Should have a high suspicion of detecting Weis ring
- Should have a high index of suspicion of a possible retinal break
- Clinical exam should be conducted with these suspicions
Clinical Exam of a Patient with A Symptomatic PVD
- All the testing and procedures that you would normally do with any patient
- Dilated fundus exam
- Look specifically at the anterior vitreous
  - Note presence or absence of pigment or cells in the anterior vitreous -> tobacco dust, schafer’s sign
- Peripheral extended ophthalmoscopy including scleral depression

Management of Acute PVD
With Symptoms
- Educate about the Si/Sx of RD
- Return in 4-6 weeks, then 3-4 months, then annually

PVD is Seen
What is your management?
Do you bring him back for follow up?

PVD NOT Seen
but has symptoms…
What is your management?
Return with in 3-4 weeks

Management of Acute PVD
No Symptoms
- Educate about the Si/Sx of RD
- Return in 1 yr

Lattice Degeneration as a Routine Finding?
Is this any cause for concern?
How do you manage it?
Lattice Degeneration

- Present 5-20% of the general population
- Localized area of retinal thinning associated with a fluid pocket in the overlying cortical vitreous

Lattice Degeneration and Risk of RD

- RD develop in 0.7% of eyes with lattice degeneration followed for 10.8 yrs
- Eyes with lattice that developed tractional retinal tears
  - 40% occurred in areas not associated with lattice...normal-appearing retina

Byer NE, Ophthalmology. 1989; 96:1401-1402

Indications for Prophylactic Treatment of Peripheral Retinal Tears and Holes in Asymptomatic Patients

<table>
<thead>
<tr>
<th>Condition</th>
<th>Phakic</th>
<th>Highly Myopic</th>
<th>Fellow Eye (RD in other)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atrophic Holes</td>
<td>No</td>
<td>No</td>
<td>Rarely</td>
</tr>
<tr>
<td>Operculated Holes</td>
<td>No</td>
<td>Rarely</td>
<td>Rarely</td>
</tr>
<tr>
<td>Lattice with or without Holes</td>
<td>No</td>
<td>Rarely</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Flap Tears</td>
<td>Sometimes</td>
<td>Sometimes</td>
<td>Usually</td>
</tr>
</tbody>
</table>

48 y/o Asymptomatic Pilot

- VA 20/15 OU
- Anterior Segment: Unremarkable
- Fundus

Indications for Prophylactic Treatment of Peripheral Retinal Tears and Holes in Symptomatic Patients

- Horseshoe tears: Yes
- Dialysis: Usually
- Operculated holes: Rarely
- Atrophic holes: No
**Choroidal Nevi**
- < 3 mm elevation
- < 3 DD in size
- 95% are less than 2 DD
- Slate gray
- Drusen
- SRF associated with drusen
- CNVM

**Management**
- Flat choroidal nevi: follow yearly
- Suspicious nevi:
  - photo
  - follow in 6 wks, 3 mo, then 6 mo
  - evidence of growth -> early melanoma
- Lesions > 3 mm thickness: probably early melanoma

**Features Suggesting Nevi**
- Drusen
- Overlying neurosensory detachment
- Choroidal neovascular membrane
- Circinate exudate
- Bony pigment spiculing
- Zones of RPE atrophy

**Choroidal Melanoma**
- >3 mm elevation
- Variable pigment
- Multiple areas of orange pigment (lipofuscin)
- Serous fluid (detachment) in absence of drusen
  - Unequivocal evidence of growth

**Systemic Interactions**
- At least 76 classes of systemic drugs have been associated with ocular side effects
- Drug can interact with and disrupt any step of the biochemical process resulting in deleterious effects to the ocular tissues
- Drugs may incite an exaggerated immune response within the eye
  - Uveitis or retinitis
- Penetration by certain systemic meds may cause deposition of the solidified form of the molecule

**Do any of the medications that I am taking affect my eyes?**

“I am having blurry vision – could this be from any of the medications that I am taking?”
Systemic Interactions

- Medications may cause alteration of the pigment
  - Plaquenil -> Bull's eye maculopathy
  - Pharmacologic toxicity can occur leading to cell death and loss of function
    - Can affect the optic nerve
  - Patient variability may influence and cause unexpected effects
    - Pharmaceutical studies provide statistical evidence supporting appropriate dosage for meds, however individual variation can result in unexpected results

Ethambutol Toxic Neuropathy

- 1st described by Leibold in the 1960's
- Dose dependent
- Risk is 6-18% for pts with dose > 30 mg/kg/day (18% at 35 mg/kg/day)
- Develops in 1-3% at dose 15-25 mg/kg/day

What are your/our obligations in deciding if certain medications that a patient is taking are affecting the patients vision?

57 y/o White Female

- Presented on 2/29/08 with decreased vision, near > distance
- 2° CC: can my medicine affect my eyes?
- LEE: 1970's

Ethambutol

- TB regimens begin at either 50 mg/kg/day (maximum 4 grams) for 2 weeks or 25-30 mg/kg/day (maximum 2 grams) for 3 weeks, and then maintained at 15-20 mg/kg/day (max 2 grams)
- For MAC regimens the maintenance dose is 15 mg/kg/day (maximum 2.5 grams).
  - Depending on the species of mycobacteria pts, may be treated with a loading dose of 25 mg/kg/day for the first two months of therapy (Mandell et al., 2005; Micromedex 2007).

Patient History

- Meds
  - Pegasys
  - Copegus
  - Visine prn
- Social Hx
  - 1 pack/day tobacco usage X 40 yrs
- Family Hx
  - None
- IV drug usage X 10 yrs, quit 1970
- 20 drinks/day x 40 yrs, quit 2007 in AA
Interferon Retinopathy

- 1990: Ikebe reported the first case
- 1992: IFN therapy widely used in Japan for hepatitis C patients
- 1993: Ocular complications from IFN increasingly reported from Japan
- 1998: Review of early reports by Hayasaka

Review of Early Reports
Typical Findings

- CWS
- Hemorrhages: flamed shaped or white centered
- Posterior pole or around the optic disc
- Occurred alone or together
- Unilateral or bilateral
- Subjective complaints are uncommon
- Visual acuity not usually impaired

57 y/o Hispanic Female

- Was told by her rheumatologist to have her eyes checked
  - He wants to put her on a new medication but told her it can affect her eyes.
- Medical history of severe rheumatoid arthritis
  - Currently on Prednisone 20 mg/day
  - Wants to start her on plaquenil

Plaquenil
(Hydroxychloroquine)

- Prescribed in 200 mg tablets
  - Dose is 200mg or 400mg daily
- Risks for macular damage include
  - Cumulative dose of 1000g
  - 5-7 years or more of use
    - 1% risk after 1000g total dose (7 years)
- Renal or hepatic dysfunction (both)
- Pre-existing macular pathology
- Short stature / obesity

What are your obligations for managing a patient on plaquenil?

- What is the risk of having ocular problems from plaquenil?
- What testing is necessary?
- How often do you need to follow her?

Plaquenil Screening:
Traditionally

- Baseline macula photos
- Color vision testing
- Amsler grid
- 10-2 Visual fields
- Yearly exams
Revised Recommendations on Screening for Plaquenil Toxicity

- Amsler grid testing removed as an acceptable screening technique
  - NOT equivalent to threshold VF testing
- Strongly advised that 10-2 VF screening be supplemented with sensitive objective tests such as:
  - Multifocal ERG
  - Spectral domain OCT
  - Fundus autofluorescence

Tests Not Recommended for Screening:
- Fundus photography
- Time domain OCT
- Fluorescein angiography
- Full-field ERG
- Amsler grid
- Color vision screening
- EOG
Revised recommendations on screening for retinopathy

- Older literature focused on daily dose/kg
- Newer literature emphasizes cumulative dose as the most critical factor
- Initial baseline
  - Within 1 year of beginning medication
  - Then screening for toxicity should be initiated no later than 5 years after starting the medication

HIGH RISK PATIENTS

<table>
<thead>
<tr>
<th>Factors Increasing Risk of Retinopathy</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Duration of use</td>
<td>&gt; 5 years</td>
</tr>
<tr>
<td>Cumulative Dose</td>
<td>&gt; 1000 g (total) = 400 mg/day x 7 yr</td>
</tr>
<tr>
<td>Daily Dose</td>
<td>&gt; 400 mg/day</td>
</tr>
<tr>
<td>Age</td>
<td>Elderly</td>
</tr>
<tr>
<td>Systemic Disease/high BMI</td>
<td>Kidney or liver dysfunction</td>
</tr>
<tr>
<td>Ocular Disease</td>
<td>Retinal disease or maculopathy</td>
</tr>
</tbody>
</table>

Previously believed highest risk of maculopathy was based on low body mass was 6 mg/kg/day

Isolated/Flame Hemorrhages Isolated Cotton Wool Spot

Management Implications

26 y/o Asian Female

- 2nd Year Med Student
- Healthy
- Routine exam – no complaints
- 6 mo ago, nonspecific episodes weakness and not feeling right
- Myopic – 20/20 OU

26 y/o Asian Female

Assessment and Plan?

What is your management of an isolated CWS in absence of anything else?

Are you obligated to work it up?
Cotton Wool Spots

24 consecutive patients presenting with multiple or single CWS were worked up - Known diabetic patients excluded

- 5 patients were found to be undiagnosed diabetes
- 5 patients HTN
- 2 pts with cardiac valvular disease
- 2 pts with radiation ret
- 2 pts with severe carotid artery obstruction
- 1 Dermatomyositis
- 1 SLE
- 1 Polyarteritis nodosa
- 1 Leukemia
- 1 AIDS
- 1 Purtscher's retinopathy
- 1 Metastatic carcinoma,
- 1 IV drug abuse,

Basic Work Up for CWS

- HTN
- Fasting blood glucose
- CBC
- ANA
- HIV testing

The Moral of the Story

- What’s common….is common
- Make sure you LOOK at the retinal vessels
  - Note the caliber and the presence of crossing changes
- Blood pressures are important
- You have the potential to save lives
- You would be surprised how many people are out there with dangerously high BP

Systemic workup failed to reveal an underlying cause in only 1 patient

The presence of even 1 CSW spot in an otherwise normal fundus necessitates an investigation to ascertain systemic etiologic factors

The Diabetic Patient

What are the questions that you ask yourself when examining a diabetic?

- Look at the disc – specifically look for subtle NVD
- Are there hemorrhages or microaneurisms?
- Exudated, cotton wool spots?
- Look for the presence of NVE, traction, or VH
- Macular involvement?
What is the extent of the involvement?
That is the basis for classification

**Diabetic Retinopathy Classification**
Mild to Moderate Nonproliferative (NPDR)
- Hemorrhages, microaneurysms
- Hard exudate
- Cotton wool spots (CWS)
- Minimal venous beading/IRMA
- Macular edema

**Severe Nonproliferative Diabetic Retinopathy**
4-2-1 Rule
- Hemorrhages & Ma in 4 quadrants -or-
- Significant venous beading in 2 quadrants -or-
- IRMA in 1 quadrant

**Risk for Developing PDR in 1 yr**
- Mild NPDR: 5%
- Moderate NP: 12%
- Severe NPDR: 52%
- Very Severe NPDR 72%

**Is there Macular Involvement?**
- Are there hemorrhage or exudates in close proximity to the macula?
- Is it within 500 µ (1/3 DD)?
- Is there associated retinal thickening?
- By definition – that is clinically significant macular edema (CSME)

**CSME**
- Retinal thickening within 500 microns from the center of the FAZ
- Hard exudates associated with retinal thickening 500 microns from center of FAZ
- Zones of retinal thickening > 1 DD in area, any part of which is 1 DD from the center of the fovea
How Does Macular Edema Manifest Itself?
In what forms can macular edema present?

Diabetic Retinopathy
- Clinically significant macular edema (CSME)
  Retinal thickening which involves or threatens the center of the macula

Diabetic Macular Edema
It can’t be diagnosed with a direct ophthalmoscope
You need a 3D view of the macula

Diabetic Retinopathy
Pathologic process
- Microaneurysms
- Vascular permeability
- Ischemia
- Proliferation
- Cicatization

Is there CSME?
If yes – referral to retinal specialist is recommended
Optometric Management of Diabetic Patient

- No diabetic retinopathy
  - Educate and follow yearly
- Early or moderate NPDR
  - Establish presence of CSME
    - If CSME refer to retina specialist
- No CSME
  - Educate
  - Follow yearly

Asymptomatic Hollenhorst Plaques

When do you initiate a work up?

1. Never
2. Always
3. Only when symptoms such as TIA’s or amaurosis fugax

Optometric Management of Diabetic Patient

- Severe NPDR
  - Follow every 4 months
- PDR: refer to retina specialist

Asymptomatic Hollenhorst Plaques

Important Questions to Ask

- Any TIA’s?
  - Occurs in 30-50% of pt with severe CAD
  - 50-75% of stroke pts have had TIA’s
- Any amaurosis fugax?
  - Retinal TIA’s
  - Lasts up to 2 minutes (can be up to 2 hrs)
  - Numbness/weakness in parts of their body

Proliferative Retinopathy

PDR

- Vitreous hemorrhage
- NVD
- NVE
- Fibrovascular proliferation
- Retinal detachment

Work Up of Retinal Plaques

- Misconception:
  That Asymptomatic plaque(s) in retinal arteries do not require a detailed evaluation

SS Hayreh:

“This misconception may result in a patient later developing retinal artery occlusion and visual loss, or a cerebral vascular accident. Thus it is prudent to evaluate the source of all asymptomatic plaque(s)...”
Suspicious Optic Nerves

Pseudoedema vs. True Optic Nerve Edema

What goes into your decision making process when you decide if this patient has true disc edema vs. anomalous nerve?

The Typical Scenario...

- Disc elevation...looks like disc elevation
- Blurring of the disc margins
- No optic nerve dysfunction
- Often bilateral...but could be unilateral

How do you differentiate?

True Disc Edema vs. PseudoEdema

True Disc Edema
- Absent SVP

PseudoEdema
- SVP Present
  - Absent in 20% of normals
  - Anomalous branching pattern of the retinal vessels
  - Yellow hazy appearance in deep peripapillary tissue
  - Obscuring border b/w disc and retina
True Disc Edema vs. PseudoEdema

**True Disc Edema**
- Blurred disc margins
- Occurs at the level of RNFL
- Obscuring retinal vessels and junction b/w myelinated and nonmyelinated RNFL

**PseudoEdema**
- Blurring disc margins result from changes occurring at the RPE
- Thus retinal vessels are clearly seen as they cross the disc margin

Buried Disc Drusen

- Scalloped appearance to the disc margin
- Disc is not hyperemic
- No microvascular blood vessel abnormalities on the surface of the nerve

Papilledema

- Intracranial mass
- Hydrocephalus
- Idiopathic intracranial hypertension
- Meningitis or encephalitis
- CNS granulomatous or malignant transformation

Buried Disc Drusen

- Anomalous branching retinal vessels
  - Loops, trifurcations and increased branching
  - Gray/black change deep around the nerve

Optic Disc Edema with Optic Nerve Dysfunction

- AION
- Optic neuritis
- Leber’s hereditary optic neuropathy
- Intraorbital optic nerve compression
- Infiltrative optic neuropathy
- Toxic optic neuropathy

Hemorrhage or Subretinal Hemorrhage in the Macula?

- What are the implications?
- What clinical decisions do you make with regards to etiology?
72 y/o White Male
Blurred VA with Glasses R > L
RE: 20/30, LE 20/25

Diagnosis
◆ Age-Related Macular Degeneration

What are the questions that you ask yourself when you examine the macula of a patient like this?

The Questions
◆ Is there fluid in the macula?
◆ Do you see subretinal hemorrhage or exudate?
◆ Is the macula flat or is there any elevation?

Age-related Macular Degeneration (AMD)
◆ Degenerative disorder that affects the macula
◆ Leading cause of legal blindness in people > 65 yo
◆ 90% of vision loss is 2° to CNV

Dry ARMD
◆ Earliest clinically detectable feature
◆ Lie between BM of RPE and Bruch’s
◆ Hard drusen: smaller, calcified or ossified
◆ Soft drusen: ill-defined, larger, coalesce, resemble small serous detachments
Unexplained Vision Loss

Obeying the Fundamentals of the Complete Eye Exam is Important

It's not always what you see, but more what you don’t that makes it difficult....

When do you refer?

When should you refer?

Retinal Imaging and OCT has really helped us figure out many of these cases of unexplained vision loss

Unexplained Vision Loss

Causes
- Refractive
- Functional
- Lens Opacities
- Neurologic
- Occult Retinal/Macular Disease

Optical Coherence Tomography (OCT)
- Non-contact, non-invasive imaging device
- Produces high-resolution images of the posterior segment
- Optical biopsy
- Images are objective and quantifiable
Advantages of OCT

- Quick – takes less than five minutes to obtain images of both eyes
- Non-invasive and well tolerated by patients
  - No injection
  - No biohazard or blood-related risk
  - No medication reactions
- More readily interpreted and understood by patients

Main Clinical Utilities of OCT

- High resolution evaluation of retinal anatomy
- Diagnosis of macular conditions difficult to establish with biomicroscopy
- Quantitative assessment of retinal anatomic alterations
- Quantitative assessment of vitreoretinal interface
- Objective means for monitoring disease progression and/or therapeutic response