NORMAL VITREOUS ATTACHMENTS

Previous notions

Current thinking

Mueller cells and biological adhesive keep the retina and vitreous together.

CLINICAL VITREOUS ANATOMY

- Molecular composition
  - Water (99%)
  - Solids
- Interfaces
  - Cloquet's canal
  - Hyaloid
  - Lacunae
  - Fibrils

ANATOMY & PHYSIOLOGY

- Abnormal clinical attachments
  - posterior pole — "ERM", macular hole
  - blood vessels — radial lattice
  - between ILM & hyaloid face — cystic tuft, lattice retinal degeneration


RADIAL “LATTICE”
Examining the Vitreous

- At slit lamp – anterior vitreous
  - Hyaloid membrane
  - Compacted fibers
- At slit lamp with PCL – posterior vitreous
  - Weiss ring *
  - Hyaloid
  - Detached
  - Remaining attachments
- OCT!!!
No surgical recommendation
Stable at follow-up 09/05

63 F  C/O VA; 20/30
Observe drusen
Case courtesy Diana Shechtman, OD

TD OCT
Normal foveal contour
Intact RPE

SD OCT
How can this be the same eye?
Significant VMT
Intact IS/OS line [“P I L”]

PVD w/ continued macular traction

Weiss Ring
Clinical Management of PVD

- Stereoscopic examination for complications (breaks, blood)
- 95% of PVD are uncomplicated!!!
- 50% of patients w/ acute PVD are asymptomatic

Suggested Approach for Referral of Patients With Presumed Posterior Vitreous Detachment - Clinical Scenario Recommended Action

- New-onset floaters and/or flashes without high-risk features
  - Dilated eye examination within 1 to 2 weeks; counsel patient regarding high-risk features that should prompt urgent reassessment.

By whom????


Suggested Approach for Referral of Patients With Presumed Posterior Vitreous Detachment - Clinical Scenario Recommended Action

- Recently diagnosed uncomplicated posterior vitreous detachment with out new retinal tear or detachment.
  - New shower of floaters
  - New subjective visual reduction

Rule out high risk features

The retinal surgeon or your clinical judgment should determine urgency.


Patient education (S & R of RD) and reassurance

Follow-up in 2-6 weeks

95% of PVD are uncomplicated!!!

Clinical Management of PVD

Clinical Management of PVD

Clinical Management of PVD
• Stable symptoms of floaters and/or flashes for several weeks to months, not particularly bothersome to the patient and without high-risk features.

Elective referral to retinal surgeon; counsel patient regarding high-risk features that should prompt urgent reassessment.

**SYMPTOMS and RISKS of RETINAL DETACHMENT**

**Vitreoretinal Disorders**

**Macular membrane**
- Natural history
  - VA – stable
  - Macular appearance changes
- Surgical alternative
  - Same VA pre and post OP W or W/O pseudohole


**Acquired Vitreoretinal Disorders**

**Posterior pole (con’t)**
- Macular hole
  - Pathogenesis
  - Staging / clinical observations
  - Management options

**Vitreoretinal Disorders**

- Macular hole – Pathogenesis (current evidence)
  - Hyaloid detachment (perimacularly)
  - Attachment persistent at foveal center
  - Intraretinal split ⇒ cystic space
  - Lifting of outer retina ⇒ opening of foveal floor
  - ! Full-thickness macular hole …

Macular Hole – Pathogenesis & Staging

Evolution of MH – 2 months

Cystic formation @ foveal center (anterior posterior traction by posterior hyaloid)

Note: convex posterior hyaloid (anterior-posterior traction)

Evolution of MH – 5 months

A. Impending: Perifoveal detachment intraretinal split

B. X 2 mo: Intrafoveal cysts, increased perifoveal detachment

C. X 5 mo: single, large cyst, Stage 2 hole with thickened edge

Evolution of MH (Asymptomatic fellow of a patient with macular hole)

Perifoveal posterior hyaloid detachment adherent at edge of macula

Vitreous detachment (up to OD) w/symmetrical separation to macula

Evolution of MH

Asymmetric posterior hyaloid detachment w/adherence @ nasal macula

Convex perifoveal posterior hyaloid detachment adherent at clivus

Fellow eye of MH

Posterior hyaloid attached at OD; detached over posterior pole

Complete posterior hyaloid separation @ posterior pole with attachment remaining at OD; pseudo operculum

Evolution of MH – Impending in fellow eye

Foveal thickening w/cystic space & intraretinal split (inner retina)

Cyst extends to RPE but roof (inner retina) remains intact


Staging of MH (Stage 2)

6 different cases with posterior hyaloid adherent to operculum incompletely detached (paradoxically) from the hole edge to which it seems to belong


Staging MH (Stage 3)

Opeculum (►) attached to posterior hyaloid;
Edge of hole is thickened by cystic spaces and detached from RPE (▲▲)

Complete (from p pole) posterior hyaloid detachment


Macular Hole – Pathogenesis & Staging

Macular pseudohole (MPH) vs. lamellar hole (LMH) – DDx by OCT

VA range 20/20 – 20/100 (median 20/40)

Macular pseudohole (MPH) vs. lamellar hole (LMH) – DDx by OCT

Note irregular foveal floor in LMH

V A range 20/20 – 20/200 (median 20/40)


MH – Prognosis & Management

- Macular hole - Management options
  - Surgical for impending (stages I & II)
    - Membrane peel (dissection of posterior hyaloid face from ILM @ macula)
    - Injection of gas bubble between hyaloid face and ILM to induce PVD

Pre-op

Intra-op

Apple Peel Technique

Films - Fluidic Internal Limiting Membrane Separation
Prognosis based on imaging studies (Severe and Moderate)

- Stage “0” MH
- Persistent traction @ one (moderate) or both (severe) sides


Prognosis based on imaging studies (Mild)

Lowered risk if NO clear point of insertion is evident; posterior hyaloid is imaged but no PVD on clinical examination


Clinical example – Stage 0 to 2
59 F 20/20

Normal appearing macula and OCT with persistent vitreous insertion (inferior)


Clinical example – Stage 0 to 2 to resolution with surgery (PPV)

At 6-mo FU, Stage 2 hole


At 2-mo Post-op, Resolved MH and normal foveal contour 20/20

MH – Prognosis & Management

- Macular hole: Management options - Observation (? PVD)
  - prognosis for involved eye is dependent on spontaneous PVD if "impending" (stage 1 or 2)
  - follow-up monthly if VA is stable for up to 6 months
  - prognosis for fellow eye (regardless of stage) may be dependent on presence/absence of PVD; risk is ~15% over 5 years

Spontaneous Resolution of MH (OD)

Stage 1 (OD 20/20) X 6 mo (20/20)


Spontaneous Resolution of MH (OS) !!!

Stage 1 (OS 20/30) X 10 mo (20/20)

Time lapse Macular hole repair

55 BF presents for follow-up (x 4 mo.)

[Macular hole]

VA 20/200 OD
20/25 OS

The left eye appears to be uninvolved

VA 20/200 OD
20/25 OS

Correlation between clinical and OCT
The LEFT eye is normal except for vitreo-macular traction.

Management and follow-up

- Visit of 14 March 2012
- VA
  - 20/80 OD!
  - 20/25 OS – no change in OCT

- Further update: seen 6/19/2012
- Scheduled for mac hole repair (OD)

Post-op OD

Note:
- relatively normal macular contour & thickness
- But absence of PRL
GP: S/P vitrectomy, IOL (OD) (9/18/12); VA = 20/400

High-definition images

Note absence of photoreceptor layer.

High-definition images

Fellow eye with remaining VMT but no retinal defect.

Contrast this to the next case with lamellar macular hole

**MH – Prognosis & Management**

- Macular hole - Surgical
  - Surgery for stages III and IV
  - Membrane peel (dissection of posterior hyaloid face from ILM @ macula) plus gas bubble

  (surgical prognosis is better than 50/50 for stages III and IV
  (posterior segment complications occur in 41% of cases; mainly due to RD and disruption of RPE which may be due to light toxicity or surgical trauma)

  Nonsurgical complication includes ulnar neuropathy

**MH Diagnosis – Watzke-Allen**

Beams positioned vertically & horizontally

- ERM (pseudohole)
- ARM
**Macular Hole - Prognosis**

- 60% of stage 1 holes abort (thought to be due to spontaneous PVD)
- Progression of the reminder to stage 4 is from 1-4 mo.
- Initial VA predicts outcome (i.e., better VA better prognosis; if VA 20/50-20/80, 2/3 will progress to full-thickness hole)

**Macular Hole - Prognosis**

- Risk Factors: female gender, age > 55 years
- Majority of stage 2 hole progress (best case - 33% resolve)
- Spontaneous resolution of stage 3 or 4 holes is < 10%
- Fellow-eye involvement - between 3 and 22%; PVD - ? protective

**Macular Hole - Prognosis**

- Surgical intervention is better in early low-stage cases
  - vitrectomy with gas bubble placement - (growth factors confer no improvement in outcome)
  - WHAT ABOUT TRAUMATIC MACULAR HOLE???

**Peripheral VRT**

- Retinal breaks
  - Round (Hole)
  - Linear (Tear)
- Lattice retinal degeneration
- Retinoschisis
- Retinal detachment

**Retinal Breaks**

- I. Operculated holes
  - Probably arise from cystic retinal tufts
  - Generally asymptomatic and stable
  - Always secondary to vitreous detachment (local or general)
Operculated Break

Operculated Breaks

Large flap tear @ indentation

Retinal Breaks

- II. Atrophic holes
  - Small (< 1 DD) and stable
  - Asymptomatic
  - Pigment and/or fluid surround
  - Management: Observation for progression

Atrophic Round Break
Atrophic Round Break - Repaired

Retinal Breaks

III. Tears
- Arise secondary to PVD
- May be symptomatic and require consideration for prophylaxis
- Margins are: anteriorly – vitreous base; posteriorly – hyaloid

“Flap Tears”
(linear retinal breaks)

???
- Obscured choroidal vasculature
- Retinal vessels change course
- Pigment at margin

Retinal Erosion at Ora Serrata
- Intrabasal location
- Asymptomatic
- Seen on indentation
- Observe

Retinal Dialysis
- Secondary to trauma
- Safe to indent?
Lattice Retinal Degeneration

- Prevalence: 10% maximum
- The disorder most frequently associated with RD
- BUT... only about 1% of all lattice will result in RD

Clinical appearance
- Circumferential arrangement parallel to equator
- 2/3 within 1 clock hour of 12 or 6 o'clock positions
- Size ranges from .16 to 12 DD in length and 0.1 to 2.5 DD in width
- Average number of lesions = 2/eye (range: 1-19)
- Usually (always?) Bilateral...

Clinical appearance (con't)
- Thinned retina due to loss of inner layers
- Liquefied vitreous complementary to thinned retina
- Surround of vitreous adherent to the retina

Characteristic Clinical appearance (con't)
- 20/62 lesions were found to have holes
  - Of 31 patients, 19 (61.3%) bilateral
  - Other studies reported 33.7 – 51.6%

Clinical characteristics in a Primary Care Population
- Prevalence consistent with other studies from selected populations (6-8%)
- No gender predilection compared to general clinic population
- Lesions (n = 62) in all cases were within 1 clock hour of 12 or 6 O’clock and
  - 42/62 (77%) inferiorly

Clinical characteristics in a Primary Care Population (600 consecutive patients; n= 31 subjects [5.2%])
- Prevalence consistent with other studies from selected populations (6-8%)
- No gender predilection compared to general clinic population
- Lesions (n = 62) in all cases were within 1 clock hour of 12 or 6 O’clock and
  - 42/62 (77%) inferiorly

Lattice Retinal Degeneration

- Clinical appearance (Con't)
  - Pigment alterations
  - Whitish-yellow surface flecks (best seen in profile or with fundus biomicroscopy; “Snowflake”)
  - Round, oval, or linear red craters
  - Small atrophic holes
  - Branching white lines

- Other clinical characteristics
  - Begins early in life (greatest number of new cases is discovered between the ages of 10 and 20 years)
  - 95% of changes occur before the age of 19 years
  - Tears result secondary to PVD
    - Frequency is between 1.0% and 2.4%
  - May have a hereditary component
    - Transmittance = AD
  - No gender or race bias

- Clinical management – basis for observation
  - History of prophylactic treatment
  - Natural history studies of Byer and Hyams et al.
  - Indications for prophylactic consideration (fellow eye RD *; See Tables)
  - Risk factors for retinal break predisposing to RD

- Yellow atrophic spots (depigmentation of the RPE)
- Tractional tears at the ends or posterior margins of lesions (with PVD)
Lattice Retinal Degeneration

- Risk factors for retinal breaks predisposing to retinal detachment (RD)
  - Myopia > 3.00D + age < 30 years (when associated holes within lattice lesions); Myopia > 6.00D (any age)
  - PVD in myopic patients over the age of 49 years (acute retinal tear and subsequent RD)
  - Fellow-eye detachment due to LRD

- Additional risk factors for retinal breaks predisposing to retinal detachment (RD)
  - Lattice > 6 clock hours (180 degrees)
  - Application of miotics
  - Intraocular surgery (cataract extraction); YAG capsulotomy

Lattice Retinal Degeneration

- Management of LRD
  - Observation
  - Documentation
  - Education (Symptoms & precautions RD; E&U)

62 WM, Symptomatic

S/P buckle
Other disorders/degenerations

Retinoschisis

- more prevalent > 40
- inferior temporal
- breaks (holes may be in either layer i.e., outer [next to the RPE], or inner, [next to the vitreous])

Retinoschisis

- Definition: a split between the inner (neural) and outer (epithelial) retinal layers with potential for breaks in either layer;
- elevated, bullous appearance
- DDx: retinal detachment

Retinoschisis (49 M) OD: -6.50D

Note wrinkled inferior retina

Retinoschisis

- RD is unlikely; greatest probability is with holes in both layers
- histopathology -
Retinoschisis

- Rare under the age of 40
- Generally stable but distinct appearance
- Inferior temporal quadrant most frequent site
- Breaks in both layers increase risk for RD
- Management is observation with photo documentation and visual fields
**Retinoschisis**

- Recent correlations between OCT and histology
- Note retinal cysts, SRF, vitreous [in OCT image], sensory retina separated from RPE

**Localized retinal detachment**

- Inner layer (arrows)
  - Arrowhead attached and detached outer layer
  - Arrow shows edge of outer layer break
  - * is detached inner layer

### Atrophic Retinal Hole w/o significant SRF w/in WWOP

**Management?**

### Prophylaxis Guidelines - **Symptomatic** Patients

<table>
<thead>
<tr>
<th>Lesion</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flap Tear</td>
<td>Frequently</td>
</tr>
<tr>
<td>Operculated Holes</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Atrophic Holes</td>
<td>NO</td>
</tr>
</tbody>
</table>

### Prophylaxis Guidelines - **Asymptomatic** Patients

<table>
<thead>
<tr>
<th>Lesion</th>
<th>Circumstance</th>
<th>Treatment</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flap Tear</td>
<td>Fellow Eye/Cataract Sx</td>
<td>Frequently</td>
<td>Rarely otherwise</td>
</tr>
<tr>
<td>Operc. Holes</td>
<td>Regardless</td>
<td>Rarely</td>
<td>Rarely (Fellow Eye)</td>
</tr>
<tr>
<td>Atr. Holes</td>
<td>NONE</td>
<td>NO</td>
<td>Rarely (Fellow Eye)</td>
</tr>
<tr>
<td>Subclinical RD*</td>
<td>Fellow Eye/Cataract Sx</td>
<td>Frequently</td>
<td>Sometimes if Phakic Hi Myopia, Pseudophakia</td>
</tr>
</tbody>
</table>

*2% will progress to RD and 2% will spontaneously regress (8 mo – 33 yr F/U) (Byer NE. Ophthalmology 2001; 108:1499-1504)

### Final Thought...

Always assess the status of the vitreous (i.e., “attached or detached”; “clear or cloudy”)

And examine the retina in profile.

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**Thank You**