When a Macular Hole Is Not A Macular Hole

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Contents

• Vitreomacular Traction
• Epiretinal Membrane
• Lamellar Hole
• Macular Hole
• (Myopic macular schisis)

OCT Anatomy

Vitreomacular Traction
Defined

- Incomplete posterior vitreous separation with preretinal tissue proliferation and associated macular traction distributed in the zone of persistent vitreous attachment.

- Key Features:
  1. Prominent vitreoretinal attachment at the posterior pole.
  2. Peripheral vitreous detachment.
  3. Epiretinal membrane proliferation.

- Persistent vitreomacular attachment may assume a variety of configurations.
- Clinically the condition often mimics ERM or macular hole.

Pathogenesis

- Firm posterior hyaloid attachment stimulates cell proliferation.
- Preretinal tissue proliferation limits normal posterior vitreous separation.

Natural History

- The vitreoretinal adhesions transmit tractional forces to the retina from the vitreous.
- Potential tensile deformation, foveal cavitation, CME, limited macular detachment, or macular hole formation.

- Symptoms develop over weeks.
- Mild symptoms and stability.
- Slow progression of traction:
  - VA loss to 20/200
  - 95% with CME
- Risk of developing FTMH is low.
- Spontaneous resolution is possible.
Spontaneous Resolution

Possible with Small Adhesion  
Unlikely with Broad Adhesion

Treatment

• Vitrectomy with membrane peel:
  – 8/10 OSL: n=20, mean pre vs. post op VA 20/122 vs. 20/68.
    • No VA ↑ in eyes with lamellar separation of fovea.
    • Significant VA ↑ in eyes with CME or perifoveal traction.
  – 10/08 Retina: n=24, 54% had ≥ 2 line ↑ VA, 87.5% had ≥1 line ↑ VA.
    • Duration of symptoms and degree of CMT inversely correlated with post-op VA.

Results

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Pre-Op VA</th>
<th>Mean Post Op VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20/89</td>
<td>20/45</td>
</tr>
<tr>
<td>2</td>
<td>20/70</td>
<td>20/59</td>
</tr>
<tr>
<td>3</td>
<td>20/59</td>
<td>20/46</td>
</tr>
</tbody>
</table>

Introduction

• Age < 60 yrs incidence 3.7%. Age 60-69 yrs incidence 6.6%. Age 70-79 yrs incidence 6.1%. Age > 80 yrs incidence 1.1%.
• Primary idiopathic.
• Secondary: vascular disease, tumors, inflammation, trauma, surgery, retinal dystrophies.
Pathogenesis

- Defects in ILM allow glial cell proliferation on the retina.
- Typically preceded by PVD.
- Surface wrinkling by contraction of myofibroblasts.

Presentation

**Symptoms**
- Most often asymptomatic.
- <5% VA < 20/200
  - 85% VA ≥ 20/70
  - 67% VA ≥ 20/30
- Metamorphopsia, micropsia, diplopia.

**Findings**
- Glinting light reflex
- Macular striae
- Vascular tortuosity/straightening
- Foveal ectopia
- Chronic:
  - Punctate IRH
  - CWS
  - Neurosensory detachment

Pseudoholes

- ERM and ILM contracture pulls the clivus towards the fovea.
- Deepening the foveal depression, ± red foveal light reflex.
- Darker-red fovea reflex and the apparent increased distance from the foveal base to the surrounding gives the impression of a macular hole.
- Described in 8% to 20% of eyes.

Natural History

- Majority remain stable after initial period of growth (several months).
- Vision rarely dramatically worsens/improves.

Visual Changes

- Retinal folds
- Foveal distortion
- Vascular leakage/edema
- Photoreceptor damage

Vitrectomy with Membrane Peel

**Visual Outcomes**

- Mean 3 line improvement in BCVA
- 83% improve ≥ 2 lines vision
- 16% retain ≥ 1 line vision
- 1% lose ≥ 2 lines vision
- 93% report improvement in functional vision

**Outcome Predictors**

- Pre-op VA
- Poor pre-op VA assoc. with greater improvement in VA.
- Macular thickness
- Integrity of IS/OS photoreceptor junction.
• Prospective, interventional, randomized series
• n= 101
• Outcome: BCVA
• Variables:
  1. integrity of junction between inner and outer segments of photoreceptors
  2. Macular thickness
  3. Foveal contour

OCT Anatomy

Results

• No difference in pre-op VA for intact vs. disrupted IS/OS photoreceptor groups (20/72 vs. 20/81).

• Mean post-op VA intact IS/OS: 20/30.
• Mean post-op VA disrupted IS/OS: 20/60.

Results

• Preop macular thickness was negatively correlated with preop and postoperative BCVA, but were positively correlated with BCVA differences (p <.05).
• Eyes with disrupted photoreceptor showed no correlation with BCVA differences.
• Postop foveal contour showed no correlation with BCVA.
Conclusions

• “Thus, early membrane removals may beneficially prevent further progression of photoreceptor damage in ERM patients with photoreceptor disruption.”

Lamellar Macular Hole

Defined

• A lamellar macular hole is a partial thickness macular hole where the inner layers of the fovea are involved with traction and detached from the underlying cellular layers of the fovea.

• Characteristic features:
  1. Irregular foveal contour
  2. Break in the inner fovea
  3. Intraretinal split
  4. Absence of a full-thickness foveal defect with intact foveal photoreceptors

Pathogenesis

Tangential Traction
• Concentric contraction of epimacular membrane (ERM).

Antero-posterior Traction
• VMT produce an incomplete macular hole and intraretinal dissociation.

Degeneration of CME
• With chronic macular edema, unroofing of foveal cystoid changes.

Subtypes

2. Lamellar Macular Holes (LMH): thin irregular foveal floor overlying the RPE. Defect extended laterally, resulting in a split between the inner and outer retinal layers.
3. Foveal Pseudocysts (FP): Cystoid space in inner fovea with perifoveal detachment of the posterior hyaloid.
• VA significantly differed between subtypes. The MPH group had avg. VA of 20/25 compared with 20/40 for the LMH and the FP group.
• Significant correlation between ↓ VA and ↑ depth of the lamellar macular defect.

<table>
<thead>
<tr>
<th>Type of lamellar macular defect</th>
<th>MPH (n=12) (SD)</th>
<th>LMH (n=25) (SD)</th>
<th>FP (n=22) (SD)</th>
<th>F and p Values*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner VA (logMAR)</td>
<td>0.10 (0.19)</td>
<td>0.24 (0.20)</td>
<td>0.33 (0.24)</td>
<td>F = 5.12, p = 0.03</td>
</tr>
<tr>
<td>Outer diameter (mm)</td>
<td>4.02 (0.11)</td>
<td>3.85 (0.11)</td>
<td>3.62 (0.10)</td>
<td>F = 11.19, p = 0.0003</td>
</tr>
<tr>
<td>Defect depth (mm)</td>
<td>1.41 (0.50)</td>
<td>1.94 (0.77)</td>
<td>1.87 (0.37)</td>
<td>F = 12.75, p = 0.0001</td>
</tr>
<tr>
<td>Central foveal thickness (mm)</td>
<td>1.11 (0.35)</td>
<td>1.00 (0.21)</td>
<td>1.04 (0.14)</td>
<td>F = 15.29, p = 0.0001</td>
</tr>
<tr>
<td>Peripheral thickness (mm)</td>
<td>2.22 (0.31)</td>
<td>2.19 (0.22)</td>
<td>2.31 (0.22)</td>
<td>F = 16.20, p = 0.0001</td>
</tr>
</tbody>
</table>

Treatment

• Vitrectomy with membrane peel ± GFE:
  – 12/11 CJO: n=12, 75% ≥ 2 lines, 25% stable VA.
    • 2 full thickness macular holes
  – 10/11 Retina: n=45, 58% ≥ 2 lines, mean 2.7 line improvement. No loss of VA.
  – 8/10 OSL: n=16, no statistical improvement VA.
    • 2 full thickness macular holes
  – 9/09 AJO: n=22, mean 2.6 line improvement. 15% stable VA.

Full Thickness Macular Hole

Introduction

• Prevalence of 0.3%:
  – 0.0% age 43-54.
  – 0.8% age > 75.
• 72% women.
• 83% idiopathic, 15% (blunt) trauma, 2% other.
Natural History

- **Presentation**
  - Asymptomatic
  - Decreased BCVA
  - Metamorphopsia
  - Central scotoma
- **Second Eye**
  - 15% @ 5 yrs.

Stage 1 MH

- Impending macular hole
- VA: 20/25-20/60
- Metamorphopsia
- On exam:
  - Loss of foveal depression
  - Small yellow spot\(\Rightarrow\) ring
- 60% spontaneous resolution
- Remainder progress in months
- VA predictive of progression

Stage 1 MH

- Foveal Pseudocyst
- Vitreous detachment from perifovea, but not foveal center.
- Progression to outer foveal break with centrifugal retraction of photoreceptors.

Stage 2 MH

- Progression to a full thickness hole.
- >70% lose ≥ 2 lines VA
- 96% progression to stage 3/4.
- Clinical appearance of small hole.
- ± Prefoveal cortical translucency.

Stage 2 MH

- Full thickness foveal dehiscence.
- Break is central or eccentric (<400 μm).
- Posterior hyaloid may remain attached to foveal center.

Stage 3-4 MH

- Fully developed hole
- VA 20/100-20/400
- Retain peripheral VA
- ± ring of SRF, glial cells at base of hole.
- Photoreceptor atrophy w/out intervention.
- RRD in myopes of ≥ 6 D.
Stage 3-4

- Full thickness hole (>400 μm)
- Complete vitreo-foveal detachment.
- ± Total PVD (Stage 3 vs. 4)

Treatment

- Vitrectomy with ILM peel, gas fluid exchange, postoperative face down positioning.
- Single surgery anatomic success rates ~ 90%.
- Size and duration of hole are inversely correlated with postop VA outcomes.

Face Down Position

- 3 days adequate for majority of patients.
- Hole size dictates.
- Advocates of no positioning requirements:
  - Slightly decreased success rate?
  - Hole size dictates.

Take Home?

- Treat the Patient First
  - Are they symptomatic?
  - Are they progressing?
- OCT
- Vitrectomy with ILMP
  - ± face down position
- VA improves