Disclosures

- None

Objectives

- To understand the common and serious issues after retina surgery
- To review recent literature on the complication rate after vitrectomy

The “routine” postoperative course

- Vitrectomy for epiretinal membrane
  - No tamponade or air (partial)
- Vitrectomy for macular hole
  - Gas complete fill
- Vitrectomy for retinal detachment
  - Gas complete fill
- Scleral buckle for retinal detachment
  - Sometimes small air or 100% gas bubble
- Vitrectomy for vitreous hemorrhage
  - No tamponade or air
- Vitrectomy for diabetic tractional detachment
  - Air, gas, or oil complete fill

POD 1

- Pain level
- IOP
  - Hypotony 1-5% for sutureless small gauge surgery
  - Elevated >30 mm Hg in 3-5%
- Vision
- Inflammation
- Hemorrhage and choroidals
- Tamponade
  - Gas or oil fill
  - Positioning
POW 1-2

- IOP
- Vision
- Should be improving with all but C3F8
- Conjunctiva
- Inflammation
- Should be minimal to no intraocular cell
- Lens status
- IOL positioning
- Posterior capsule lens “feathering”
- Macular status
- Hemorrhage/tears/RD
- Tamponade

POW 1

- Vision
- IOP
- Macular status
- Retinal tear/detachment
- Inflammation
- Lens status
- Other eye

POM 3-12

- Vision
- Macular architecture
- Lens status
- Refractive evaluation
- Other eye

Potential complications

- Macular surgery
- Retinal detachment repair
- Diabetic surgery
- Lens-related
- Glaucoma
- Gas and silicone oil
- Rare complications

Potential complications

- Macular surgery (MH, ERM, VMT repair)
- Generally fast recovery and limited postoperative restrictions
- 1 week free of heavy lifting/straining
- Take off 2-7 days from work
- Shield for a week, drops for a few week
- Majority get vision back, 3-6 months for full improvement
Intraoperative retinal tear

- 2-15%
  - Generally reported to be higher with macular holes – more likely to have to induce PVD at time of surgery
  - Reported rates declining over last decade (improved instrumentation/platforms?)
- Frequently adjacent to sclerotomies
- Typically easy to treat with laser at the time

Postoperative retinal detachment

- 1-15% in existing series
- Majority in first year after surgery
- Either unrecognized tears from time of surgery or postoperative contraction of vitreous base
- Gas fill can exert traction on vitreous base, especially inferiorly

Macular hole non-closure

- Failure to close, 4-15%
  - Usually evident at POW1 visit
  - Sometimes may be patent at day 1 but closes by day 3-4
- Re-opening, 1-2%
  - At any time, but usually in first year

Recurrent ERM

- 5-10% symptomatic recurrence in earlier series
- <5% symptomatic recurrence with ILM peeling in recent series
- ILM peeling reduces incidence

Return to the O.R. after Macular Surgery: IRIS Registry Analysis

D. Wilkin Parke III, M.D.
Flora Lum, M.D.

Question

- What is the postoperative complication rate after macular hole (MH) and epiretinal membrane (ERM) repair?
  - How often do eyes that undergo MH and ERM repair require additional surgery within one year?
Postoperative complications with MH and ERM repair

<table>
<thead>
<tr>
<th>Study</th>
<th>No. of eyes</th>
<th>Details</th>
<th>RD rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sjaarda et al, 1995</td>
<td>181 MH</td>
<td>1.1%</td>
<td></td>
</tr>
<tr>
<td>Banker et al, 1997</td>
<td>95 MH</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>Tabandeh et al, 1999</td>
<td>438 MH</td>
<td>1.8%</td>
<td></td>
</tr>
<tr>
<td>Guillaubey et al, 2007</td>
<td>634 ERM and MH</td>
<td>6.6% in MH, 2.5% in ERM</td>
<td></td>
</tr>
<tr>
<td>Haas et al, 2010</td>
<td>231 ERM 20g vs 23g</td>
<td>1.8% in 20g, 1.6% in 23g</td>
<td></td>
</tr>
<tr>
<td>Rizzo et al, 2010</td>
<td>2,432 ERM and MH</td>
<td>1.7%</td>
<td></td>
</tr>
<tr>
<td>Tadayoni et al, 2011</td>
<td>69 MH</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Parravano et al, 2015</td>
<td>266 MH</td>
<td>Meta-analysis 5%</td>
<td></td>
</tr>
<tr>
<td>Tosi et al, 2016</td>
<td>254 ERM and MH</td>
<td>360 laser retinopexy 0.7%</td>
<td></td>
</tr>
</tbody>
</table>

Results

• 223,205 eyes in 209,915 patients underwent vitrectomy associated with ERM or MH between January 1, 2013 and June 30, 2017
• After applying the ICD-9-COM / ICD-10-COM code prioritization process and exclusion criteria:
  – 41,475 eyes underwent vitrectomy for MH (362.54/H35.349 and 67042)
  – 73,219 eyes underwent vitrectomy for ERM (362.56/H35.379 and 67041)

Results – Macular hole repair

• 41,475 eyes underwent MH repair
• 7,573 eyes (18.3%) received a second surgery within one year
  – 2,827 (6.8%) received a non-cataract procedure

<table>
<thead>
<tr>
<th>Additional procedure</th>
<th>Number of eyes</th>
<th>% of eyes that underwent original MH repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitrectomy/macular hole repair (67042)</td>
<td>1,899</td>
<td>4.6</td>
</tr>
<tr>
<td>Retinal detachment repair (67108)</td>
<td>432</td>
<td>1.0</td>
</tr>
<tr>
<td>Complex retinal detachment repair (67113)</td>
<td>418</td>
<td>1.0</td>
</tr>
<tr>
<td>Vitrectomy/membrane stripping (67041)</td>
<td>217</td>
<td>0.5</td>
</tr>
<tr>
<td>Vitrectomy/panretinal laser (67040)</td>
<td>84</td>
<td>0.2</td>
</tr>
<tr>
<td>Vitrectomy/focal laser (67039)</td>
<td>47</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Results – Epiretinal membrane repair

• 73,219 eyes underwent ERM repair
• 12,433 eyes (17.0%) received a second surgery within one year
  – 4,022 (5.5%) received a non-cataract procedure

<table>
<thead>
<tr>
<th>Additional procedure</th>
<th>Number of eyes</th>
<th>% of eyes that underwent original ERM repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitrectomy/membrane stripping (67041)</td>
<td>1,049</td>
<td>1.4</td>
</tr>
<tr>
<td>Complex retinal detachment repair (67113)</td>
<td>1,048</td>
<td>1.4</td>
</tr>
<tr>
<td>Vitrectomy/macular hole repair (67042)</td>
<td>944</td>
<td>1.3</td>
</tr>
<tr>
<td>Retinal detachment repair (67108)</td>
<td>820</td>
<td>1.1</td>
</tr>
<tr>
<td>Vitrectomy/panretinal laser (67040)</td>
<td>524</td>
<td>0.7</td>
</tr>
<tr>
<td>Vitrectomy/focal laser (67039)</td>
<td>131</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Conclusions

• After MH repair, excluding cataract procedures:
  – 4.6% of eyes underwent another MH repair
  – 2.0% of eyes underwent RD repair (67108 and 67113 are combined)
  – Under 1% of eyes underwent vitrectomy for another reason
• After ERM repair, excluding cataract procedures:
  – 1.4% of eyes underwent another ERM repair
  – 1.3% of eyes underwent MH repair
  – 2.5% of eyes underwent RD repair (67108 and 67113 combined)
  – Under 1% of eyes underwent vitrectomy for another reason

Macular phototoxicity and dye toxicity

• Uncommon, 1% of cases involving ICG in one study
• ICG concentration, osmolarity, duration, surgery time, light absorption
• RPE and outer retinal atrophy
Iatrogenic retinal trauma

- Lifting the hyaloid, forceps impact, air/fluid injection

Potential complications

- Macular surgery
- Retinal detachment repair
- Diabetic surgery
- Lens-related
- Glaucoma
- Gas and silicone oil
- Rare complications

Retinal re-detachment

- 5-20% rate of re-detachment in literature
  - Development of proliferative vitreoretinopathy
    - Most common cause
    - 3-8 weeks usually, occasionally up to a year later
  - Secondary breaks or failure of break to close
  - Risks may include chronicity of detachment, poor preoperative vision, high myopia, trauma, presence of preoperative PVR, uveitis, smoking, ROP, aphakia, number or size of retinal tears
  - Dr. Ryan's multicenter study

Retinal re-detachment

Post-scleral buckle

- Diplopia, usually resolves
- Subretinal hemorrhage, 3-4%
- Retinal incarceration, 1-2%
- Ocular surface irregularity
- Anterior segment ischemia

Post-scleral buckle

- Fish-mouthing
- Poorly supported break
- Persistent/worsening subretinal fluid
Post-scleral buckle

- **Buckle**
  - **Extrusion/Infection:**
    - Abscess formation in subconjunctival space, sclera, choroid, or retina
    - Subconjunctival hemorrhage, granuloma
    - Infections typically occur 2-8 months post-op, but up to 30 yrs
    - Instruct: conjunctiva for erosions, purulent discharge
    - Pain
    - Usually requires removal of buckle

Cystoid macular edema

- 10-30% of PPV for ERM on OCT
  - Usually transient and inconsequential
- 2-10% of PPV for RD on OCT
  - 20% with silicone oil
  - Higher risk for PVR formation
  - ILM peeling may reduce risk

Potential complications

- Macular surgery
- Retinal detachment repair
- Diabetic surgery
- Lens-related
- Glaucoma
- Gas and silicone oil
- Rare complications

Vitreous hemorrhage

- After 5-30% of vitrectomies for diabetic vitreous hemorrhage
- Entry site neovascularization
- Most clear within 1-2 months
- 1/3 may need additional surgery
- Pre- or intraoperative anti-VEGF reduces risk
- Usually full PRP placed during surgery
- In-office air exchange, more anti-VEGF may attempted

After TRD repair

- Residual traction or reproliferation
- Iatrogenic breaks / combined detachment
- Rubeosis
- Progressive ischemia
- Glaucoma
- Macular edema
- Visual outcomes vary
Potential complications

- Macular surgery
- Retinal detachment repair
- Diabetic surgery
- **Lens-related**
  - Glaucoma
  - Gas and silicone oil
  - Rare complications

Cataract

- 80-100% within 2 years after vitrectomy
- Cataract *progression* is near universal
- Cataract *development* from a clear lens, especially in the young, is variable
- Post-vitrectomy: may be higher risk for capsular rupture, zonule loss, and CME

Posterior capsular changes

- “Feathering”
- Posterior capsular trauma
  - Rapid cataract formation
- Nonsupine with gas

Open angle glaucoma

- Up to 30% may have short term postop IOP spike > 30 mm Hg
- Inflammation, lens status, silicone oil, hemorrhage, oxidative stress

Angle closure

- Up to 5% after scleral buckle (vitreous displacement, venous congestion, choroidals)
- Vitrectomy with heavy PRP
- Gas expansion, anterior displacement of lens-iris diaphragm
  - May need gas aspiration through pars plana
Potential complications

- Macular surgery
- Retinal detachment repair
- Diabetic surgery
- Lens-related
- Glaucoma
- Gas and silicone oil
- Rare complications

Air/gas duration

Gas lasts longer in myopes, aphakes, uveitics, poor circulation, hypotony

- **Air**
  - Non-expansile
  - Full air fill lasts 7-10 days
- **SF6**
  - 2-2.5x expansion over 24-48 hours
  - 20% SF6 fill lasts 3 weeks
- **C3F8**
  - 3-4x expansion over 72-96 hours
  - 14% C3F8 fill lasts 6-8 weeks

Gas avoidsances

- Altitude, hyperbaric chambers, inhalational anesthetic gases
- Prolonged supine positioning
  - Gas cataract
  - Angle closure

Gas and air travel

- Commercial airliner cabins usually pressurize to 7500-8000 feet
- Pressure chamber flight simulator
  - 10% gas fill, IOP increased 109% over baseline at 7400 feet
- Some reports indicate 0.5-1 mL gas may be safe for flight (no compromised perfusion)
- Rate of ascent, scleral rigidity, accuracy of estimate of remaining gas, altitude of departure airport all play a role

Silicone oil considerations

- 1000 and 5000 centistoke
  - Emulsification
- 1/3-1/2 the surface tension of gas
  - Inferior traction -> detachment
- Bactericidal effect, suppression of neovascularization

Silicone oil considerations

- Oil in AC:
  - Emulsification and reverse hypopyon
  - Central bubble in pupil
  - Filling AC
    - Iris sheen
    - Blunting of iris contour
Unexplained vision loss after silicone oil removal

- Pan-American Collaborative Retina Study (PACORES) Group
- 6% of eyes >2 lines vision loss
- Associated with higher IOP and longer duration of oil tamponade

Potential complications

- Macular surgery
- Retinal detachment repair
- Diabetic surgery
- Lens-related
- Glaucoma
- Gas and silicone oil
- Rare complications

Post-vitrectomy endophthalmitis

- Very uncommon (0.03-0.14%)
- 30% are LP or worse
- Wound construction, hypotony, vitreous incarceration, fluid vs gas
- CN Staph, Pseudomonas, Propionibacterium, enterococci
- May be later presentation and less obvious – no vitreous gel

Suprachoroidal hemorrhage

- 0.4-1.1% of vitrectomy
- Risks: age, myopia, aphakia, retinal detachment, scleral buckle, dropped lens, blood thinners
- Postoperative SCH has better prognosis than intraoperative SCH

Suprachoroidal air

- Presumed Air by Vitrectomy Embolus (PAVE)
- Rapid air absorption into vortex ampullae
- Relationship of air infusion pressure to venous pressure – Up to 350 mL/min at 40mm Hg

Suprachoroidal oil

- Infusion cannula re-orientation into suprachoroidal space
- Usually requires surgical removal if large
Subretinal gas

- Most common after pneumatic retinopexy or primary scleral buckle
- Drags retina towards lens in supine position
- Must be removed or pushed back through break into vitreous if preventing retinal reattachment

Perfluorocarbon liquid in the wrong place

- Retinal toxicity
- Removal within 3 months

Subretinal silicone oil

- Lower surface tension than gas, goes through breaks if kept open by traction

Retrobulbar block complications

- 1/12,000 globe penetration
- Myopia, staphyloma, buckle, multiple eye surgeries

Thank you