Contemporary Management of Retinal Detachment Repair - What are We Doing Now?

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History

- 1938: Rosengren intraocular air without SB
- 1949: Custodis: first SB
- 1970: Machemar: PP Vitrectomy
- 1973: Norton: intraocular air/gas
- 1975: Cibis: Silicone Oil
- 1982: Escoffery: Primary Vitrectomy for RD
- 2002: Eugene DeJuan 25 gauge
- 2004: Claus Eckardt 23 gauge
- 2007: Tano: 27G
Contemporary Management of Retinal Detachment: ASRS 2010

- Kevin Blinder (St Louis)
- Pravin Dugel (Phoenix)
- Dean Eliott (Los Angeles/Boston)
- Mike Jumper (San Francisco)
- Steve Kim (Nashville)
- Tom Aaberg (Grand Rapids)
- Rob Mittra (Minneapolis)
- Gaurav Shah (St Louis)
- Asheesh Tewari (Detroit)
Yes: If we don’t do them or teach them
Estimated Retinal Holes, Tears, and Detachments

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>414,000</td>
<td>417,711</td>
<td>421,455</td>
<td>425,233</td>
<td>429,044</td>
<td>432,890</td>
<td>436,770</td>
</tr>
<tr>
<td>Western Europe</td>
<td>702,320</td>
<td>717,665</td>
<td>733,346</td>
<td>749,368</td>
<td>765,741</td>
<td>782,472</td>
<td>799,568</td>
</tr>
<tr>
<td>Other Industrialized</td>
<td>220,161</td>
<td>228,277</td>
<td>236,692</td>
<td>245,417</td>
<td>254,464</td>
<td>263,844</td>
<td>273,570</td>
</tr>
<tr>
<td>Global</td>
<td>3,610,488</td>
<td>3,743,581</td>
<td>3,882,459</td>
<td>4,027,399</td>
<td>4,178,691</td>
<td>4,336,641</td>
<td>4,501,569</td>
</tr>
</tbody>
</table>

Retinal detachments are considered an ocular emergency requiring immediate attention and surgery.

Source: MarketScope Disease Model, 2009
Retinal Detachment Repair

- **Options for repair**
  - Pneumatic Retinopexy
  - Scleral Buckle
  - Primary Vitrectomy
  - Combined Buckle/Vitrectomy

- **Pre-operative factors**
  - Extent of Retinal Detachment
  - Location of Retinal Breaks
  - Lens Status
  - Myopia
  - Lattice Degeneration
  - Status of Fellow Eye
Pneumatic Retinopexy

- Uncomplicated retinal detachments
  - Retinal break located superior 8 clock hours
  - Able to maintain specific head posture
Pneumatic Retinopexy

- **Procedure**
  - Retinopexy
    - Cryo
    - Laser
  - Gas injection

- Retinal Break
- Detached Retina
- Gas bubble
Pneumatic Retinopexy

- Review of >4,000 eyes over 21-year period
  - Single operation success 75%
    - New retinal breaks 12%
    - PVR 5%
  - Final operation success 96%
    - Final anatomic and visual outcomes are not disadvantaged by initial pneumatic retinopexy

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Clement K. Chan, MD, FACS, Steven G. Lin, MD, Asha S.D. Nuthi, DO, and David M. Salib, MD
Pneumatic Retinopexy

- Factors affecting single operation success
  - Lens status
    - Phakic 71-84%
    - Psuedophakic 41-67%
  - Extent of detachment
    - Inverse relationship
  - Number of breaks
    - Inverse relationship
Pneumatic Retinopexy

- Largest series by one surgeon (302 eyes)
  - Subgroup had 97% single operation success
    - Lens status - phakic
    - Extent of detachment - one quadrant
    - Number of breaks - one
    - Location of break - upper two-thirds
Pneumatic Retinopexy

- Reported success with more complex detachments
  - Large breaks
  - Multiple breaks
  - Posterior breaks (macular holes)
  - Inferior breaks
  - Giant retinal tears/dialyses
  - PVR
Pneumatic Retinopexy

- Reported success with more complex detachments
  - Large breaks
Pneumatic Retinopexy

- Reported success with more complex detachments
  - Multiple breaks
Pneumatic Retinopexy

- Reported success with more complex detachments
  - Posterior breaks (macular holes)
Pneumatic Retinopexy

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  - Inferior breaks
Pneumatic Retinopexy

- Reported success with more complex detachments
  - Giant retinal tears/dialyses
Pneumatic Retinopexy

- Reported success with more complex detachments
  - PVR

A - Pigment clumps  B - Rolled edge  C - Star fold
Pneumatic Retinopexy

• Highest single operation success
  • Phakic
  • One quadrant detachment
  • One break
  • Located upper 8 clock hours
Pneumatic Retinopexy

• Other arguments for pneumatic retinopexy

  • Avoids complexities and complications of scleral buckling surgery

Does anybody really use all of these?

Ouch!
Pneumatic Retinopexy

- Other arguments for pneumatic retinopexy
  - Avoids *complications* of vitrectomy surgery

Retained anterior chamber PFCL

Subretinal PFCL
Pneumatic Retinopexy

- **Highest single operation success**
  - Phakic
  - One quadrant detachment
  - One break
  - Located upper 8 clock hours

- **Avoid eyes with high risk of redetachment**
  - RD’s associated with high myopia, trauma, uveitis, vitreous hemorrhage, choroidal detachment
SBP < PPV/SBP > PPV
# The Dilemma: SB or PPV or Both

## Comparison of scleral buckling with pars plana vitrectomy

<table>
<thead>
<tr>
<th></th>
<th>Scleral buckling</th>
<th>PPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relief of vitreous traction</td>
<td>Indirect</td>
<td>Direct</td>
</tr>
<tr>
<td>Effectiveness for superior compared with inferior breaks</td>
<td>Equally effective</td>
<td>More effective for superior breaks</td>
</tr>
<tr>
<td>Positioning after surgery</td>
<td>Not required</td>
<td>Required</td>
</tr>
<tr>
<td>Pain after surgery</td>
<td>More</td>
<td>Less</td>
</tr>
<tr>
<td>Equipment costs</td>
<td>Lower</td>
<td>Higher</td>
</tr>
<tr>
<td>SOSR</td>
<td>92–94%</td>
<td>85–90%</td>
</tr>
<tr>
<td>Potential complications</td>
<td>Refractive change</td>
<td>Induced cataract</td>
</tr>
<tr>
<td></td>
<td>Motility disturbances</td>
<td>Elevated IOP</td>
</tr>
<tr>
<td></td>
<td>Vitreous or retinal incarceration</td>
<td>New breaks</td>
</tr>
<tr>
<td></td>
<td>Suprachoroidal or subretinal hemorrhage</td>
<td>Retinal trauma</td>
</tr>
<tr>
<td></td>
<td>Migration of buckling elements</td>
<td>Optic nerve trauma</td>
</tr>
<tr>
<td>Miscellaneous advantages</td>
<td>Supports ‘missed’ breaks</td>
<td>Clears media opacities</td>
</tr>
<tr>
<td></td>
<td>Allows early air travel</td>
<td>Giant retinal tears</td>
</tr>
<tr>
<td>Miscellaneous disadvantages</td>
<td></td>
<td>Moisture condensation on silicone IOLs during fluid-air exchange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clouting of LASIK flap</td>
</tr>
</tbody>
</table>

PPV, pars plana vitrectomy; SOSR, single-operation success rate; IOP, intraocular pressure; IOL, intraocular lens; LASIK, laser-assisted in-situ keratomileusis.
Surgical Operating Room Experience (Second Year VRF)

- Primary on Vitrectomy
  - 370(200-800)
  - 10% perform >500 PPV

- Primary on Scleral Buckle:
  - 40(5-250)
  - 10% perform >100 buckles
  - 10% perform <15 buckles

- GS Wills Eye (345 scleral buckles)
Practice Patterns – RD  
(Second Year VRF)

• Majority PPV - 55%  
• Majority PPV/SB - 45%  

• 80% use SB <5%  
• 85% use PR <5%
Decline in Scleral Buckling

- Wide angle Viewing Systems
- High speed Cutters and diffusion lights
- Lack of confidence in indirect skills
- Economic and time factors
- Mentors and training programs doing less buckles
- No industry involvement
Scleral Buckling: Here to Stay?
YES...
If We Do Them / Teach Them!

The Smithsonian
Vitrectomy is a very effective procedure for appropriate cases but so is scleral buckling surgery.
Decline in Scleral Buckling

- Wide angle Viewing Systems
- High speed Cutters and diffusion lights
- Lack of confidence in indirect skills
- Economic and time factors
- Mentors and training programs doing less buckles
- No industry involvement
Why don’t people do them

- “Harder”
- “I don’t want to miss any breaks”
- “I want all the fluid gone”
- “I feel uncomfortable with external drainage”
- “It’s painful for the patient”
- “It takes a lot longer”
- “Primary vit is easier and quicker” (Big Pneumatic)
- “I am worried about the refractive status of the eye”
- “People at meetings don’t talk about them” (Not sexy, no companies involved, no podium time)
Scleral Buckling: Misconceptions

- Success rate of scleral buckle is less than vitrectomy
- Choice of initial treatment does not make a difference in outcome of failures
- Scleral buckles have a high incidence of complications of extrusion, diplopia, etc.
- Massive amount of induced myopia occurs after SBP
- PVR Rates are much higher in buckles versus vitrectomy
## Misconception 1:
**SBPs are Less Successful**

### Retrospective Comparative Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>SB</th>
<th>PPV</th>
<th>SB/PPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oshima et al., 2000</td>
<td>91%</td>
<td>91%</td>
<td></td>
</tr>
<tr>
<td>Miki et al., 2001</td>
<td>92%</td>
<td>92%</td>
<td></td>
</tr>
<tr>
<td>Roider et al., 2001</td>
<td>98%</td>
<td></td>
<td>93%</td>
</tr>
<tr>
<td>Afrashi et al., 2004</td>
<td>80%</td>
<td></td>
<td>90% *</td>
</tr>
<tr>
<td>Wickham et al., 2004</td>
<td></td>
<td>89%</td>
<td>73%</td>
</tr>
<tr>
<td>Mansouri et al., 2010 (phakic subgroup)</td>
<td>86.2%</td>
<td>77.8%</td>
<td>83.8%</td>
</tr>
<tr>
<td>Mansouri et al., 2010 (pseudophakic subgroup)</td>
<td>80.0%</td>
<td>86.5%</td>
<td>80.3%</td>
</tr>
</tbody>
</table>

* statistically significant
Misconception 1: SBPs are Less Successful

Propective Comparative Studies

<table>
<thead>
<tr>
<th></th>
<th>Single Operation Success Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SB</td>
</tr>
<tr>
<td>Tewari et al., 2003</td>
<td>70%</td>
</tr>
<tr>
<td>Ahmadieh et al., 2005</td>
<td>68%</td>
</tr>
<tr>
<td>Stangos et al., 2004</td>
<td></td>
</tr>
<tr>
<td>Sharma et al., 2005</td>
<td>76%</td>
</tr>
<tr>
<td>Brazitikos et al., 2005</td>
<td>83%</td>
</tr>
<tr>
<td>Weichel et al., 2006</td>
<td></td>
</tr>
<tr>
<td>Heimann et al., 2007 (phakic subgroup)</td>
<td>63.6%</td>
</tr>
<tr>
<td>Heimann et al., 2007 (pseudophakic subgroup)</td>
<td>53.4%</td>
</tr>
</tbody>
</table>

* statistically significant
Success Rates: **PSEUDOPHAKIC** Studies

<table>
<thead>
<tr>
<th>RETROSPECTIVE</th>
<th>SB</th>
<th>PPV</th>
<th>SB/PPV</th>
<th>Total eyes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shah et al., 2010</td>
<td>80%</td>
<td>86.5%</td>
<td>80.3%</td>
<td>118</td>
</tr>
<tr>
<td>Shah et al RD study group, 2008</td>
<td>80%</td>
<td>87%</td>
<td>80%</td>
<td>286</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROSPECTIVE</th>
<th>SB</th>
<th>PPV</th>
<th>SB/PPV</th>
<th>Total eyes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stangos et al., 2004</td>
<td></td>
<td>98%</td>
<td>92%</td>
<td>71</td>
</tr>
<tr>
<td>Sharma et al., 2005</td>
<td>76%</td>
<td>84%</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Brazitikos et al., 2005</td>
<td>83%</td>
<td>94%</td>
<td></td>
<td>150</td>
</tr>
<tr>
<td>Weichel et al., 2006</td>
<td></td>
<td>93%</td>
<td>94%</td>
<td>152</td>
</tr>
<tr>
<td>Heimann et al., 2007 (pseudophakic group)</td>
<td>53%</td>
<td>72%</td>
<td></td>
<td>265</td>
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</tbody>
</table>

Conclusion about success: **PPV > (SB = SB/PPV)**
## Success Rates: PHAKIC Studies

### RETROSPECTIVE

<table>
<thead>
<tr>
<th>Study</th>
<th>SB</th>
<th>PPV</th>
<th>SB/PPV</th>
<th>Total eyes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miki et al., 2001</td>
<td>100%</td>
<td>96%</td>
<td></td>
<td>225</td>
</tr>
<tr>
<td>Mansouri et al., 2010 (phakic subgroup)</td>
<td>86%</td>
<td>78%</td>
<td>84%</td>
<td>168</td>
</tr>
<tr>
<td>TRI recurrent RD study group, 2008</td>
<td>86%</td>
<td>78%</td>
<td>84%</td>
<td>286</td>
</tr>
</tbody>
</table>

### PROSPECTIVE

<table>
<thead>
<tr>
<th>Study</th>
<th>SB</th>
<th>PPV</th>
<th>SB/PPV</th>
<th>Total eyes studied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heimann et al., 2007 (phakic subgroup)</td>
<td>63.6%</td>
<td>61.8%</td>
<td></td>
<td>416</td>
</tr>
</tbody>
</table>

**Conclusion about success:** SB > SP/PPV > PPV
# Misconception 1: SBPs are Less Successful

European Vitreo-Retinal Society Retinal Detachment Study Report 1: Sept 2013, Ophthalmology

- Nonrandomized, retrospective study
- 7678 RRD repairs
- 176 contributors from 48 countries on 5 continents

## Single Operation Success Rate

<table>
<thead>
<tr>
<th></th>
<th>PPV (with or without SB)</th>
<th>SB</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phakic</td>
<td>88.6%</td>
<td>86.7%</td>
<td>0.029</td>
</tr>
<tr>
<td>Pseudophakic</td>
<td>89.5%</td>
<td>76.6%</td>
<td>3x10⁻⁸</td>
</tr>
</tbody>
</table>

## Final Success Rate

<table>
<thead>
<tr>
<th></th>
<th>PPV (with or without SB)</th>
<th>SB</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phakic</td>
<td>98.7%</td>
<td>99.5%</td>
<td>0.028</td>
</tr>
<tr>
<td>Pseudophakic</td>
<td>98.9%</td>
<td>99.1%</td>
<td>0.812</td>
</tr>
</tbody>
</table>
Misconception #2: Initial Treatment Doesn’t Matter

- TRI Study: 1402 eyes (8/2012 AAO, 2012 BJO)

- Patients failing SBP required about 30% fewer secondary retinal procedures compared to PPV groups and 1/3 less use of silicone oil.

- Easier to fix a buckle failure versus vitrectomy failures with less number of operations and the need for silicone oil.
Misconception 3:
SBPs Have High Complication Rates

- Diplopia (10-24%)
- Strabismus (4-8%)
- Extrusion (3-8%)

Literature that is about 15 years old
Misconception 3: SBPs Have High Complication Rates

Most PubMed series on intractable diplopia & strabismus following scleral buckling relate to hydrogel buckling elements vs.

or

Miragel
## Misconception 3: SBPs Have High Complication Rates (AAO: 2010)

<table>
<thead>
<tr>
<th>Complication</th>
<th>All SB (n =1182)</th>
<th>PPV-SB (n=877)</th>
<th>SB (n=305)</th>
<th>PPV (n=220)</th>
<th>P-value All SB vs. PPV (2-tail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-detachment</td>
<td>169 (14.3%)</td>
<td>126 (14.4%)</td>
<td>43 (14.1%)</td>
<td>25 (11.4%)</td>
<td>0.2473</td>
</tr>
<tr>
<td>-Secondary to PVR</td>
<td>104 (9.0%)</td>
<td>91 (10.4%)</td>
<td>13 (4.3%)</td>
<td>14 (6.4%)</td>
<td>0.2335</td>
</tr>
<tr>
<td>CME</td>
<td>64 (5.4%)</td>
<td>54 (6.2%)</td>
<td>10 (3.3%)</td>
<td>13 (5.9%)</td>
<td>0.7672</td>
</tr>
<tr>
<td>-Requiring surgery</td>
<td>2 (0.2%)</td>
<td>2 (0.2%)</td>
<td>1 (0.3%)</td>
<td>0 (0%)</td>
<td>0.1572</td>
</tr>
<tr>
<td>Visually significant ERM</td>
<td>58 (5.0%)</td>
<td>46 (5.3%)</td>
<td>12 (3.9%)</td>
<td>7 (3.2%)</td>
<td>0.2640</td>
</tr>
<tr>
<td>-Requiring surgery</td>
<td>43 (3.6%)</td>
<td>32 (3.6%)</td>
<td>11 (3.6%)</td>
<td>5 (2.3%)</td>
<td>0.3068</td>
</tr>
<tr>
<td>PVR without detachment</td>
<td>24 (2.0%)</td>
<td>22 (2.5%)</td>
<td>2 (0.7%)</td>
<td>3 (1.4%)</td>
<td>0.4501</td>
</tr>
<tr>
<td>Choroidal detachment/Hemorrhage</td>
<td>17 (1.4%)</td>
<td>15 (1.7%)</td>
<td>2 (0.7%)</td>
<td>6 (2.7%)</td>
<td>0.1670</td>
</tr>
<tr>
<td>Postoperative iritis/uveitis</td>
<td>17 (1.4%)</td>
<td>17 (1.9%)</td>
<td>0 (0%)</td>
<td>2 (0.9%)</td>
<td>0.4678</td>
</tr>
<tr>
<td>Macular hole</td>
<td>12 (1.0%)</td>
<td>10 (1.1%)</td>
<td>2 (0.7%)</td>
<td>0 (0%)</td>
<td>0.0006</td>
</tr>
<tr>
<td>Open angle glaucoma/Increased IOP</td>
<td>16 (1.4%)</td>
<td>14 (1.86%)</td>
<td>2 (0.7%)</td>
<td>3 (1.4%)</td>
<td>0.9906</td>
</tr>
<tr>
<td>Angle closure glaucoma</td>
<td>7 (0.6%)</td>
<td>7 (0.8%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0.008</td>
</tr>
</tbody>
</table>
## Misconception 3:
SBPs Have High Complication Rates (AAO: 2010)

Yes, risks exist like in any surgery
However, diplopia, migration, and infections are **RARE!**

<table>
<thead>
<tr>
<th>Complication</th>
<th>All SB (n =1182)</th>
<th>PPV-SB (n=877)</th>
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<th>PPV (n=220)</th>
<th>P-value All SB vs. PPV (2-tail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diplopia/Strabismus</td>
<td>63 (5.3%)</td>
<td>47 (5.4%)</td>
<td>16 (5.2%)</td>
<td>8 (3.6%)</td>
<td>0.2928</td>
</tr>
<tr>
<td>Buckle Migration</td>
<td>1 (0.1%)</td>
<td>0 (0%)</td>
<td>1 (0.3%)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Buckle removal</td>
<td>1 (0.1%)</td>
<td>1 (0.1%)</td>
<td>0 (0%)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Note: AAO: American Academy of Ophthalmology
Misconception 4: Significant Myopia after SBP, but None after PPV

Functional and anatomic outcome of scleral buckling versus primary vitrectomy in pseudophakic retinal detachment

Yog Raj Sharma, Sathiyan Karunanithi, Raj Vardhan Azad, Rajpal Vohra, Nikhil Pal, Deependra Vikram Singh and Prijat Chandra

Vitreo-Retina Services, Dr Rajendra Prasad Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, India

Acta Ophthalm,

Scleral buckle group: -1.38
Vitrectomy group: -0.85 D
Scleral Buckling: Advantages

- Preservation of crystalline lens/accommodation for the young
- Preservation of vitreous for the elderly
- 360 support of vitreous base in patients with extensive lattice or abnormal VR interface
- Lower cost / instrumentation requirements
- No travel restrictions if done without gas
Concerns with PPV:

- Glaucoma
- Some evidence that post-PPV PVR may be more severe
- Post-op positioning
- Equipment and personnel cost differences
## PVR: Retrospective Comparison Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>SB</th>
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<th>SB/PPV</th>
<th>Total eyes studied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oshima et al., 2000</td>
<td>3.6%</td>
<td>4.2%</td>
<td></td>
<td>167</td>
</tr>
<tr>
<td>Miki et al., 2001</td>
<td>0%</td>
<td>4%</td>
<td></td>
<td>225</td>
</tr>
<tr>
<td>Afrashi et al., 2004</td>
<td>3%</td>
<td>9%</td>
<td></td>
<td>52</td>
</tr>
<tr>
<td>Wickham et al., 2004</td>
<td></td>
<td>5%</td>
<td>20%</td>
<td>86</td>
</tr>
<tr>
<td>Mansouri et al., 2010 (phakic subgroup)</td>
<td>14%</td>
<td>22%</td>
<td>16%</td>
<td>168</td>
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<tr>
<td>Mansouri et al., 2010 (pseudophakic subgroup)</td>
<td>20%</td>
<td>17%</td>
<td>18%</td>
<td>118</td>
</tr>
<tr>
<td>TRI study group, 2010</td>
<td>5.0%</td>
<td>7.8%</td>
<td>12.9%</td>
<td>1402</td>
</tr>
<tr>
<td>Study</td>
<td>PVR Rate</td>
<td>Total eyes studied</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------</td>
<td>--------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tewari et al., 2003</td>
<td>5% SB, 10% PPV</td>
<td>44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ahmadieh et al., 2005</td>
<td>29.4% SB, 35.35% PPV</td>
<td>225</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stangos et al., 2004</td>
<td>2.2% SB, 7.7% PPV</td>
<td>71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharma et al., 2005</td>
<td>20% SB, 4% PPV</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brazitikos et al., 2005</td>
<td>5.3% SB, 4% PPV</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weichel et al., 2006</td>
<td>5.2% SB (overall)</td>
<td>152</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heimann et al., 2007 (phakic subgroup)</td>
<td>12.4% SB, 16.4% PPV</td>
<td>416</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heimann et al., 2007 (pseudophakic subgroup)</td>
<td>22.6% SB, 15.2% PPV</td>
<td>265</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Supply & Total Cost Comparison

$105 vs $540

TABLE 2. Total Per-Patient Cost of Scleral Buckling versus Vitrectomy for Retinal Detachment Repair

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Initial Surgical Cost</th>
<th>Average Per-Patient Cost of Retina-Affecting Procedures</th>
<th>Average Per-Patient Cost of Silicone Oil Removal</th>
<th>Average Per-Patient Cost of Cataract Extraction</th>
<th>Average Total Per-Patient Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phakic scleral buckle</td>
<td>$2923.32</td>
<td>$1622.73</td>
<td>$134.88</td>
<td>$780.73</td>
<td>$5461.66</td>
</tr>
<tr>
<td>Phakic vitrectomy</td>
<td>$3201.73</td>
<td>$1313.64</td>
<td>$286.61</td>
<td>$1314.82</td>
<td>$6116.80</td>
</tr>
<tr>
<td>Pseudophakic/aphakic scleral buckle</td>
<td>$2923.32</td>
<td>$1983.34</td>
<td>$210.74</td>
<td>$0.00</td>
<td>$5117.40</td>
</tr>
<tr>
<td>Pseudophakic/aphakic vitrectomy</td>
<td>$3201.73</td>
<td>$1107.58</td>
<td>$190.51</td>
<td>$0.00</td>
<td>$4499.82</td>
</tr>
</tbody>
</table>

“Cost Comparison of Scleral Buckle versus Vitrectomy for RRD Repair” (AJO, 2013. Seider, Naseri, Stewart)
Positioning (Torturing) Your Patients...

vs.

VS.
Flying

Scleral Buckles Rock!
Conclusions:

Atrophic holes in lattice

Inferior dialysis

Extensive lattice with abnormal VR interface inf tears
Scleral Buckles

- Scleral Buckling surgery is the treatment of choice for most phakic retinal detachments
- Many training programs are moving away from SB techniques
- Retina fellowships and mentors have a **obligation** to do and teach scleral buckling surgery for appropriate patients
- Can’t blame the fellows if we don’t do it ourselves
- If the decline in buckles is not corrected, this skill will be lost in our profession
Conclusions

- Myths about scleral buckling surgery are simply not true
- Decisions driven by perceptions, economic, time, and convenience factors
- Must tailor treatment (SB, SB/vit, or Vit) rather than one approach (Vit) to the patient and to that particular pathology
**ASRS PAT Survey**

Phakic, macula-on RD
Inferior tear

<table>
<thead>
<tr>
<th>Surgical choice</th>
<th>2006</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB</td>
<td>70%</td>
<td>42%</td>
</tr>
<tr>
<td>PPV</td>
<td>13%</td>
<td>27%</td>
</tr>
<tr>
<td>PPV + SB</td>
<td>16%</td>
<td>31%</td>
</tr>
</tbody>
</table>
### ASRS PAT Survey

#### Surgical choice

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SB</td>
<td>40%</td>
<td>31%</td>
<td>🔻</td>
</tr>
<tr>
<td>PPV</td>
<td>23%</td>
<td>27%</td>
<td>🔺</td>
</tr>
<tr>
<td>PPV + SB</td>
<td>17%</td>
<td>23%</td>
<td>🔺</td>
</tr>
</tbody>
</table>

**Phakic, macula-off RD**

**Superior tear, high myope, extensive lattice**
## ASRS PAT Survey

Pseudophakic, macula-on RD
Inferior tear

<table>
<thead>
<tr>
<th>Surgical choice</th>
<th>2006</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB</td>
<td>38%</td>
<td>22%</td>
</tr>
<tr>
<td>PPV</td>
<td>25%</td>
<td>34%</td>
</tr>
<tr>
<td>PPV + SB</td>
<td>37%</td>
<td>44%</td>
</tr>
</tbody>
</table>
Retinal Detachment: Misconceptions

- Success rate of scleral buckle less than vitrectomy
- Choice of initial treatment does not make a difference in outcome of failures
- Scleral Buckles have a high incidence of complications of extrusion, diplopia etc
Treatment of RD

• Scleral Buckle
• Pneumatic Retinopexy
• Vitrectomy

Questions:
• Should pneumatic retinopexy or vitrectomy replace SB as the preferred standard of care in the repair of RD?
• Is SB destined to fade into obscurity like the ICCE?
Pneumatic Retinopexy for Primary RD Repair

Dean Eliott
Professor
Director, Doheny Retina Institute
Los Angeles, CA
Continued Role for SB in the PPV Era

Robert A. Mittra, MD
Treatment of Retinal Detachments: Should I Know How to Buckle and Why?

Gaurav K. Shah, M.D.
The Retina Institute
Washington University
St Louis, Missouri
YES!
## Retinal Detachment Repair

<table>
<thead>
<tr>
<th></th>
<th>Eyes</th>
<th>Mean Follow-Up</th>
<th>Lens Status</th>
<th>SOSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schwartz SG</td>
<td>227</td>
<td>20 years</td>
<td>all</td>
<td>82% SB</td>
</tr>
<tr>
<td>2002</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Richardson EC</td>
<td>171</td>
<td>29 months</td>
<td>all</td>
<td>85% PPV</td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Campo RV</td>
<td>275</td>
<td>19 months</td>
<td>pseudo</td>
<td>88% PPV</td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brazitikos PD</td>
<td>150</td>
<td>1 year</td>
<td>pseudo</td>
<td>83% SB 94% PPV</td>
</tr>
<tr>
<td>2005</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharma YR</td>
<td>50</td>
<td>6 months</td>
<td>pseudo</td>
<td>76% SB 84% PPV</td>
</tr>
<tr>
<td>2005</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weichel ED</td>
<td>152</td>
<td>10 months</td>
<td>pseudo</td>
<td>93% PPV 94% PPV/ SB</td>
</tr>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stangos AN</td>
<td>71</td>
<td>12 months</td>
<td>pseudo</td>
<td>98% PPV 92% PPV/ SB</td>
</tr>
<tr>
<td>2004</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Retrospective Comparison Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Single Operation Success Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oshima et al., 2000</td>
<td>SB: 91% PPV: 91%</td>
</tr>
<tr>
<td>Miki et al., 2001</td>
<td>SB: 92% PPV: 92%</td>
</tr>
<tr>
<td>Roider et al., 2001</td>
<td>SB: 98% PPV: 93%</td>
</tr>
<tr>
<td>Afrashi et al., 2004</td>
<td>SB: 80% PPV: 90% *</td>
</tr>
<tr>
<td>Wickham et al., 2004</td>
<td>SB: 89% PPV: 73%</td>
</tr>
<tr>
<td>Mansouri et al., 2010 (phakic subgroup)</td>
<td>SB: 86.2% PPV: 77.8% PPV: 83.8%</td>
</tr>
<tr>
<td>Mansouri et al., 2010 (pseudophakic subgroup)</td>
<td>SB: 80.0% PPV: 86.5% PPV: 80.3%</td>
</tr>
</tbody>
</table>

* statistically significant
<table>
<thead>
<tr>
<th>Study</th>
<th>Single Operation Success Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tewari et al., 2003</td>
<td>SB 70% PPV 80%</td>
</tr>
<tr>
<td>Ahmadieh et al., 2005</td>
<td>SB 68% PPV 63%</td>
</tr>
<tr>
<td>Stangos et al., 2004</td>
<td>SB 98% PPV 92%</td>
</tr>
<tr>
<td>Sharma et al., 2005</td>
<td>SB 76% PPV 84%</td>
</tr>
<tr>
<td>Brazitikos et al., 2005</td>
<td>SB 83% PPV 94% *</td>
</tr>
<tr>
<td>Weichel et al., 2006</td>
<td>SB 92.6% PPV 94%</td>
</tr>
<tr>
<td>Heimann et al., 2007 (phakic subgroup)</td>
<td>SB 63.6% PPV 63.8%</td>
</tr>
<tr>
<td>Heimann et al., 2007 (pseudophakic subgroup)</td>
<td>SB 53.4% PPV 72.0% *</td>
</tr>
</tbody>
</table>

* statistically significant
SB versus PPV

- Arya et al.
  - Metanalysis
    - 2230 pseudophakic eyes
    - Studies published from 1966-2004 (n=29)
  - Anatomic reattachment
    - SB/PPV and PPV > SB
    - No difference between PPV vs. SB/PPV

SB versus Vitrectomy

- Is there a randomized study?
- Surgical studies are difficult to do since skill and experience is quite variable unlike ARMD or DME studies.
SPR Study

- Scleral Buckling versus Primary Vitrectomy in Rhegmatogenous Retinal Detachment
  - Prospective
  - Randomized
  - Multicenter
  - Controlled
SPR-Study: Inclusion Criteria

- Complex primary rhegmatogenous detachment
- Treatment with a single meridional 7.5 mm episcleral sponge not possible, Not suitable for pneumatic retinopexy
- *Pseudophakic patients (amendment)*: No break visible preoperatively
  - No PVR B or C,
  - No myopia >-7 diopters
  - No giant retinal tear, no macular hole

![Multiple breaks](image1)
![Marked vitreous traction](image2)

- [Large breaks](image3)
- [Different a/p localization](image4)
- [Bullous detachment](image5)
- [Tear < 2h](image6)
- [Breaks central to equator](image7)
Study Endpoints

• **Main endpoint**
  - Change in best corrected visual acuity
  - Last observation carried forward (LOCF)

• **Secondary endpoints**
  - Primary success (retinal reattachment without additional retinal surgery including photocoagulation and macular pucker surgery)
  - Number of retina-related secondary surgery
  - Final success
  - PVR
SPR-Study - Study Groups

Complex retinal detachment

ETDRS Visual Acuity
9 field photodocumentation
LOCS III
Review by endpoint committee

Randomization per surgeon

Pseudophakic

- Scleral buckling
  - Randomization per surgeon
  - 134
  - Follow-up 1 year
    - 236 (88.7%)

Phakic

- Primary vitrectomy ± buckle
  - Randomization per surgeon
  - 209
  - 207
  - 386 (92.7%)

Primary vitrectomy ± buckle

Follow-up 1 year

266

416
Results-
Phakic Subgroup
# Phakic Patients: Main Endpoint – Change in Visual Acuity

<table>
<thead>
<tr>
<th></th>
<th>Scleral Buckling N = 209</th>
<th>Primary Vitrectomy N = 207</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial VA Mean</strong></td>
<td>LogMar</td>
<td>1.04 (SD 0.74) 20/200</td>
<td>1.05 (SD 0.789) 20/200</td>
</tr>
<tr>
<td><strong>Final VA Mean</strong></td>
<td>LogMar</td>
<td>0.33 (SD 0.35) 20/40</td>
<td>0.48 (SD 0.51) 20/63</td>
</tr>
<tr>
<td><strong>Change in VA</strong></td>
<td>LogMar</td>
<td>-0.71 (SD 0.68)</td>
<td>-0.56 (SD 0.76)</td>
</tr>
<tr>
<td></td>
<td>Snellen</td>
<td>(+ 7 lines)</td>
<td>(+ 6 lines)</td>
</tr>
</tbody>
</table>

**P-value**: 0.0005
Phakic Patients – Secondary Endpoint

<table>
<thead>
<tr>
<th></th>
<th>Scleral Buckling N = 209</th>
<th>Primary Vitrectomy N= 207</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redetachment</td>
<td>26.3% (55)</td>
<td>26.6% (51)</td>
<td></td>
</tr>
<tr>
<td>Primary success</td>
<td></td>
<td></td>
<td>0.6609</td>
</tr>
<tr>
<td>No additional retinal surgery</td>
<td>63.6% (133)</td>
<td>61.8% (128)</td>
<td></td>
</tr>
<tr>
<td>Final success</td>
<td>95.7% (200)</td>
<td>94.7 (196)</td>
<td>0.5847</td>
</tr>
<tr>
<td>PVR B/C</td>
<td>12.4% (26)</td>
<td>16.4% (34)</td>
<td>0.2812</td>
</tr>
<tr>
<td>Retinal surgery</td>
<td>0.63 (SD 1.02)</td>
<td>0.51 (SD 0.85)</td>
<td>0.1713</td>
</tr>
<tr>
<td>Mean number</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cataract progression</td>
<td>45.9% (96)</td>
<td>77.3% (160)</td>
<td>&lt;0.00005</td>
</tr>
<tr>
<td>Phako &amp; IOL</td>
<td>20.6% (43)</td>
<td>58.0% (120)</td>
<td></td>
</tr>
</tbody>
</table>
An additional buckle was used in 50.7% of phakic patients treated with PV.

<table>
<thead>
<tr>
<th></th>
<th>Primary Vitrectomy No Additional Buckle N = 102</th>
<th>Primary Vitrectomy with Additional Buckle N = 105</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redetachment</td>
<td>20.6% (21)</td>
<td>29.5% (31)</td>
</tr>
<tr>
<td>PVR B/C</td>
<td>10.8% (11)</td>
<td>21.9% (23)</td>
</tr>
</tbody>
</table>
Results -
Pseudophakic Subgroup
## Pseudophakic Patients: Main Endpoint – Change in Visual Acuity

<table>
<thead>
<tr>
<th></th>
<th>Scleral Buckling N = 133</th>
<th>Primary Vitrectomy N = 132</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial VA Mean</strong></td>
<td>LogMar</td>
<td>1.02 (SD 0.69) 20/200</td>
<td>1.02 (SD 0.74) 20/200</td>
</tr>
<tr>
<td><strong>Final VA Mean</strong></td>
<td>LogMar</td>
<td>0.46 (SD 0.51) 20/63</td>
<td>0.38 (SD 0.48) 20/50</td>
</tr>
<tr>
<td><strong>Change in VA</strong></td>
<td>LogMar</td>
<td>-0.56 (SD 0.78)</td>
<td>-0.65 (SD 0.69)</td>
</tr>
<tr>
<td></td>
<td>Snellen</td>
<td>(+ 6 lines)</td>
<td>(+ 6 lines)</td>
</tr>
</tbody>
</table>
# Pseudophakic Patients – Secondary Endpoints

<table>
<thead>
<tr>
<th></th>
<th>Scleral Buckling N = 133</th>
<th>Primary Vitrectomy N = 132</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redetachment</td>
<td>39.8% (53)</td>
<td>20.4% (27)</td>
<td></td>
</tr>
<tr>
<td>Primary success</td>
<td>53.4% (71)</td>
<td>72.0 (95)</td>
<td>0.0020</td>
</tr>
<tr>
<td>No additional retinal surgery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final success</td>
<td>93.2% (124)</td>
<td>95.5% (126)</td>
<td>0.9686</td>
</tr>
<tr>
<td>PVR B/C</td>
<td>22.6% (30)</td>
<td>15.2% (20)</td>
<td>0.1073</td>
</tr>
<tr>
<td>Retinal surgery</td>
<td>0.77 (SD 1.08)</td>
<td>0.43 (SD 0.85)</td>
<td>0.0032</td>
</tr>
<tr>
<td>Mean number</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusion

Phakic patients: *Complex retinal detachment*

- Surgical method
  No difference in redetachment rate or PVR
- Advantage scleral buckling:
  Higher functional success
  Lower rate of cataract developement

**Recommendation:**
*Scleral buckling surgery*
Conclusion

Pseudophakic patients: *Complex retinal detachment*

- **Surgical method**
  - No difference in VA
  - but anatomical difference

- **Advantage primary vitrectomy (with buckle)**
  - lower rate of redetachment
  - lower rate of retinal re-operations
  - lower rate of PVR

**Recommendation:**

*Primary vitrectomy (combined with scleral buckle)*
SPR Study

Limitations:

• Variable scleral buckling techniques
• Significant number of PPV cases also received an encircling scleral buckle
• Study not completely randomized
Comparison of Scleral Buckling vs. Vitrectomy in Retinal Detachment Repair
Scleral Buckling

- Anatomic reattachment after first surgery
  - Halberstadt et al.
    - 190 eyes
    - Success rate = 89%
  - Salicone et al.
    - 318 eyes
    - Success rate
      - 81% (phakic eyes)
      - 73% (pseudophakic eyes)
  - Hassan et al.
    - 94 eyes
    - Success rate = 89.4%

Pars Plana Vitrectomy

- Anatomic reattachment after first surgery
  - Campo et al.
    - 275 pseudophakic eyes
    - Success rate = 88%
  - Mendrinos et al.
    - 100 pseudophakic eyes
    - Success rate = 92%

# Pars Plana Vitrectomy

## Table 2 Pars plana vitrectomy for rhegmatogenous retinal detachment

<table>
<thead>
<tr>
<th>Study</th>
<th>Number of patients</th>
<th>SOSR (%)</th>
<th>Visual outcomes</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escoffery et al., 1985 [20]</td>
<td>29</td>
<td>79</td>
<td>≥20/50 in 81%</td>
<td>Phakic and pseudophakic</td>
</tr>
<tr>
<td>Campo et al., 1999 [21]</td>
<td>294</td>
<td>86–91</td>
<td>Median 20/40</td>
<td>Pseudophakic</td>
</tr>
<tr>
<td>Speicher et al., 2000 [22]</td>
<td>78</td>
<td>94</td>
<td>≥20/50 in 87–88%</td>
<td>Pseudophakic</td>
</tr>
<tr>
<td>Schmidt et al., 2003 [23]</td>
<td>205</td>
<td>71</td>
<td>≥20/50 in 11%</td>
<td>Included PVR</td>
</tr>
<tr>
<td>Sharma et al., 2004 [24]</td>
<td>48</td>
<td>81</td>
<td>Mean 20/66</td>
<td>Inferior breaks</td>
</tr>
<tr>
<td>Heimann et al., 2006 [25*]</td>
<td>512</td>
<td>71</td>
<td>≥20/50 in 48%</td>
<td>Included PVR</td>
</tr>
<tr>
<td>Martinez-Castillo et al., 2005 [26]</td>
<td>15</td>
<td>93</td>
<td>Mean 20/30</td>
<td>Inferior breaks, pseudophakic, air as tamponade</td>
</tr>
<tr>
<td>Martinez-Castillo et al., 2005 [27]</td>
<td>40</td>
<td>90</td>
<td>Mean 20/33</td>
<td>Inferior breaks, pseudophakic, no facedown positioning</td>
</tr>
</tbody>
</table>

SOSR, single-operation success rate; PVR, proliferative vitreoretinopathy.
SB versus PPV

- Anatomic reattachment after first surgery
  - Brazitikos et al.
    - 150 pseudophakic eyes
    - PPV > SB (94% vs. 83%)
    - No difference in visual acuity
  - Sharma et al.
    - 50 pseudophakic eyes
    - PPV ~ SB (84% vs. 76%)
    - Vision better in PPV group

Brazitikos et al. Retina 2005;25:957-64. 43.
SB versus PPV

- Anatomic reattachment after first surgery
  - Ahmadieh et al
    - 225 pseudophakic eyes randomly assigned to SB or PPV
    - PPV ~ SB (63% vs. 68%)
    - No difference in visual acuity
  - Heimann et al.
    - 634 eyes (369 phakic, 265 pseudophakic)
    - PPV = SB (64%)

SB versus PPV

- Anatomic reattachment after first surgery
  - Lai et al.
    - 66 macula-on RD repairs
    - SB±PPV ~ SB (97% vs. 86%)
    - No difference in visual acuity

# SB versus PPV

## Table 3  Comparative studies for retinal re-attachment surgery (retrospective)

<table>
<thead>
<tr>
<th>Study</th>
<th>Scleral buckling</th>
<th>PPV</th>
<th>Scleral buckling and PPV</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oshima et al., 2000 [34]</td>
<td>55</td>
<td>47$^a$</td>
<td>0</td>
<td>Macula-off, equal SOSR (91% scleral buckling, 91% PPV)</td>
</tr>
<tr>
<td>Miki et al., 2001 [35]</td>
<td>138</td>
<td>87$^a$</td>
<td>0</td>
<td>Superior breaks, equal SOSR (92% scleral buckling, 92% PPV)</td>
</tr>
<tr>
<td>Roider et al., 2001 [36]</td>
<td>60</td>
<td>10</td>
<td>30</td>
<td>‘Difficult’ retinal detachments, equivalent SOSR (98% scleral buckling, 93% PPV and scleral buckling/PPV combined)</td>
</tr>
<tr>
<td>Afrashi et al., 2004 [37]</td>
<td>30</td>
<td>0</td>
<td>22$^b$</td>
<td>Multiple breaks, higher SOSR for scleral buckling/PPV (80% scleral buckling, 90% scleral buckling/PPV, $P = 0.001$)</td>
</tr>
<tr>
<td>Wickham et al., 2004 [38]</td>
<td>0</td>
<td>41</td>
<td>45</td>
<td>Inferior breaks, equivalent SOSR (89% PPV, 73% scleral buckling/PPV, $P = 0.11$)</td>
</tr>
</tbody>
</table>

PPV, pars plana vitrectomy; SOSR, single-operation success rate.

---

<table>
<thead>
<tr>
<th>Study</th>
<th>Scleral buckling</th>
<th>PPV</th>
<th>Scleral buckling and PPV</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tewari <em>et al.</em>, 2003 [39]</td>
<td>20</td>
<td>0</td>
<td>20</td>
<td>Randomized, no visible breaks, equivalent SOSR (70% scleral buckling, 80% scleral buckling/PPV, ( P = 0.72 )), equivalent visual results (median 20/120 scleral buckling, 20/200 scleral buckling/PPV, ( P = 0.4 ))</td>
</tr>
<tr>
<td>Ahmadieh <em>et al.</em>, 2005 [40]</td>
<td>126</td>
<td>99</td>
<td>0</td>
<td>Randomized, pseudophakic/aphakic, equivalent SOSR (68% scleral buckling, 63% PPV, ( P = 0.24 )), equal visual results (mean 20/182 scleral buckling, 20/182 PPV)</td>
</tr>
<tr>
<td>Stangos <em>et al.</em>, 2004 [41]</td>
<td>0</td>
<td>45</td>
<td>26</td>
<td>Nonrandomized, pseudophakic, equivalent SOSR (98% PPV, 92% scleral buckling/PPV, no ( P ) value reported), equivalent visual results (improvement at least three lines in 60% PPV, 69% scleral buckling/PPV, no ( P ) value reported)</td>
</tr>
<tr>
<td>Sharma <em>et al.</em>, 2005 [42]</td>
<td>25</td>
<td>25</td>
<td>0</td>
<td>Randomized, pseudophakic, equivalent SOSR (76% scleral buckling, 84% PPV, ( P = 0.48 )), better visual outcome with PPV (20/108 scleral buckling, 20/71 PPV, ( P = 0.034 ))</td>
</tr>
<tr>
<td>Brazitkos <em>et al.</em>, 2005 [43]</td>
<td>75</td>
<td>75</td>
<td>0</td>
<td>Randomized, pseudophakic, higher SOSR for PPV (83% scleral buckling, 94% PPV, ( P = 0.037 )), equivalent visual results (20/50 scleral buckling, 20/43 PPV, ( P = 0.26 ))</td>
</tr>
</tbody>
</table>

PPV, pars plana vitrectomy; SOSR, single-operation success rate.
PPV versus SB+PPV

• Anatomic reattachment after first surgery
  • Weichel et al.
    • 152 pseudophakic eyes
    • PPV ~ SB+PPV (92.6% vs. 94.0%)
    • Visual acuity better in PPV group

References

References

Introduction

- Scleral buckling: most common operation during the last 40 years for the repair of rhegmatogenous retinal detachments
- Ophthalmologists in training today may look back on scleral buckling as an antiquated and non-physiological operation
- Is scleral buckling obsolete?
Surgical Experience - Office

- **Intravitreal/Periocular Injections**
  - Average of 490 injections

- **Retina Lasers (focal,PRP,retinopexy,PDT)**
  - Average of 405 lasers
  - Focal: 10-280
  - PRP: 0-320
  - Retinopexy: 5-210
  - PDT: 0-55

90% perform less than 10 PDT lasers
Why is Scleral Buckling Falling Out of Favor?

- Long learning curve
- Confidence that fluid will resorb
- Takes longer (not much!)
- Complications (infrequent!)
- Pays less!!
Scleral Buckles (Whispers)

- Why don’t people do them
  - “Harder”
  - “I don’t want to miss any breaks”
  - “I want all the fluid gone”
  - “I feel uncomfortable with external drainage”
  - “It’s painful for the patient”
  - “Primary Vit is easier and quicker” (Big Pneumatic)
  - “I am worried about the refractive status of the eye”
  - “People at meetings don’t talk about them” (Not sexy, no companies involved, no podium time)
Scleral Buckle

- Local Anesthesia
- Minimize inflammation and pain
  - Orbital surgery
  - Gentle handling of conj and muscles
  - Minimize amount of retraction during surgery
  - Pre op Torodol
  - Intraoperative Solumderol,
  - Post operative Medrol dose pack
Introduction

• Surgery for repair of RD addresses two primary goals:
  1) closing retinal breaks, and
  2) releasing vitreoretinal traction.

• From a purely mechanical standpoint, the concept of distorting the outer wall of the eye to close retinal breaks and relieve vitreoretinal traction is hardly elegant.

• A fanciful analogy: attempting to repair the wallpaper of one's living room which has peeled off the wall by using a bulldozer to push the living room wall into the detached wallpaper, rather than repositioning and gluing the paper from the inside of the room (like SB)
A. Disadvantages of pneumatic retinopexy
   • Need for postoperative positioning: Advantage - buckling
   • Infection risk with high morbidity: Advantage - buckling
   • Vitreous traction not relieved: Advantage - buckling
   • New tear formation up to 23 %: Advantage - buckling
   • Need for more than 1 surg (27% of cases): Advantage – buckling

B. Alleged advantage of pneumatic retinopexy regarding visual results
   • 1. For macula-on RD : No difference
   • 2. For macula-off RD: Pneumatic > SB
   • 3. Ease of treating a RD on weekend: Advantage – Pneumatic R

Total tally:
   • Buckling: Advantage 5
   • Pneumatic retinopexy: Advantage 1
   • Draw: 2
Presumed Advantages of PPPV:
- Improved primary success rate in complex situations
- Improved final success rate in complex cases
- Improved functional results in complex cases
- Improvement of cystoid macular edema in pseudophakia

Disadvantages of PPPV
- Higher rate of cataract formation in phakic patients
- Special equipment and training needed
- Higher cost for single operation
- Need for qualified assistance
- Higher rate of iatrogenic breaks
- Higher rate of missed/new breaks postoperatively
- Higher rate of persistent postoperative pressure rise
- Unsolved issues:
  - PVR-rate
  - Macular pucker
  - Need for additional scleral buckling/360° laser
  - Type of tamponade
Retinal Implant Catalogue

Cross Reference Chart

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Tel: (905) 829-3305
Fax: (905) 829-3306
email: info@lartician.com
website: www.lartician.com

ISO 13485
Scleral Buckle

- Keep it simple and not complicated
- Straight Buckle 277/40/70
- Buckle with Vit no PVR 41/72
- Buckle with Vit PVR 40-50/82
- Try not to use segmentals or sponges
- Broad, medium height buckle
Pseudophakic Retinal Detachment
CME & Retinal Detachments

Incidence almost certainly > post-cataract extraction

Slower response to tx

Not previously suspected
CME & RD
Scleral Buckle: Recent Studies

• Is there anything new?
Recurrent Retinal Detachment: Does Initial Treatment Matter? (BJO)

Department of Ophthalmology and Visual Sciences, Washington University School of Medicine, St. Louis, Missouri

Arghavan Almony, MD
Azad Mansouri, MD
Kevin J. Blinder, MD
Sanjay Sharma, MD
Gaurav K. Shah, MD

Department of Ophthalmology and Visual Sciences, Washington University School of Medicine, St. Louis, Missouri

The Retina Institute, St. Louis, Missouri

Supported in part by a Heed Foundation Fellowship
To identify differences among eyes that failed initial surgical repair of rhegmatogenous retinal detachment (RRD)
Methods

- 286 consecutive cases
  - During 2006 to 2008 at Barnes Retina Institute

- Initial Surgical Repair of RRD
  - Determined by surgeon preference
  - Proliferative vitreoretinopathy excluded
  - Scleral Buckle Procedure (SBP): 63 eyes
  - Pars Plana Vitrectomy (PPV): 88 eyes
  - Combined SBP/PPV: 135 eyes

- Mean follow-up: 12 months
## Demographics

<table>
<thead>
<tr>
<th></th>
<th>Age (years)</th>
<th>M/F ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPV/SB</td>
<td>60.5</td>
<td>1.68</td>
</tr>
<tr>
<td>PPV</td>
<td>61</td>
<td>2.26</td>
</tr>
<tr>
<td>SB</td>
<td>49.8</td>
<td>1.26</td>
</tr>
</tbody>
</table>
## Demographics

<table>
<thead>
<tr>
<th></th>
<th>Phakic</th>
<th>Macula Off</th>
<th>Extent of RRD (clock hours)</th>
<th>Inferior Break</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPV/SB</td>
<td>55%</td>
<td>66%</td>
<td>5.8</td>
<td>37%</td>
</tr>
<tr>
<td>PPV</td>
<td>41%</td>
<td>45.5%</td>
<td>4.9</td>
<td>34%</td>
</tr>
<tr>
<td>SB</td>
<td>92.1%</td>
<td>38%</td>
<td>4.4</td>
<td>30%</td>
</tr>
</tbody>
</table>
## Demographics

<table>
<thead>
<tr>
<th></th>
<th>Lattice</th>
<th>High Myopia</th>
<th>RRD in fellow eye</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPV/SB</td>
<td>17%</td>
<td>8.8%</td>
<td>11%</td>
</tr>
<tr>
<td>PPV</td>
<td>16%</td>
<td>10%</td>
<td>8%</td>
</tr>
<tr>
<td>SB</td>
<td>24%</td>
<td>11%</td>
<td>8%</td>
</tr>
</tbody>
</table>
Single Operation Success Rate

<table>
<thead>
<tr>
<th>Operation</th>
<th>Phakic</th>
<th>Pseudophakic</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPV/ SB</td>
<td>84%</td>
<td>80%</td>
<td>84%</td>
</tr>
<tr>
<td>PPV</td>
<td>87%</td>
<td>83%</td>
<td>86%</td>
</tr>
<tr>
<td>SB</td>
<td>80%</td>
<td>80%</td>
<td>86%</td>
</tr>
</tbody>
</table>

n = 135, n = 88, n = 63

% of Eyes

- PPV/ SB: 84%, 80%, 82%
- PPV: 87%, 83%
- SB: 80%, 86%

Legend:
- Yellow: Phakic
- Orange: Pseudophakic
- Green: Total Rate
Recurrent Retinal Detachment

Days to First Recurrence

- PPV/SB: Number of Procedures 1.5
- PPV: Number of Procedures 1.47
- SB: Number of Procedures 1.1
### Extent of Retinal Detachment

<table>
<thead>
<tr>
<th>Extent of RRD (clock hours)</th>
<th>PPV/SB</th>
<th>PPV</th>
<th>SB</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Eyes</td>
<td>5.8</td>
<td>4.9</td>
<td>4.4</td>
</tr>
<tr>
<td>Eyes that failed initial repair</td>
<td>5.4</td>
<td>4.9</td>
<td>5.0</td>
</tr>
</tbody>
</table>
### Secondary Repair

<table>
<thead>
<tr>
<th>Secondary Treatment</th>
<th>Failed PPV/SB N = 24</th>
<th>Failed PPV N = 15</th>
<th>Failed SB N = 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPV/SB/SO</td>
<td>-</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>PPV/SO</td>
<td>20</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>PPV/SB</td>
<td>-</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>PPV</td>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Pneumatic</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
### Secondary Cataract

<table>
<thead>
<tr>
<th>Phakic Patients</th>
<th>Failed PPV/ SB N = 12</th>
<th>Failed PPV N = 8</th>
<th>Failed SB N = 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed ≥3+ Cataract</td>
<td>100%</td>
<td>100%</td>
<td>50%</td>
</tr>
<tr>
<td>Require PPL</td>
<td>42%</td>
<td>25%</td>
<td>12.5%</td>
</tr>
</tbody>
</table>
Patients that fail a primary scleral buckle:
- Require fewer number of secondary procedures
- Require a lower rate of silicone oil injection
- Have a lower incidence of cataract formation
- Require a lower rate of PPL

Overall
SOSR = 86%
Postoperative Complications of Retinal Detachment Repair with Scleral Buckles (AAO 2010)

- Retrospective comparative case series of 1402 consecutive rhegmatogenous retinal detachments requiring surgical repair at Barnes Retina Institute, St. Louis, MO.
  - Detachments of all complexities were included
  - 57% of studied cases were macula-off

- Primary endpoint: Incidence of post-operative complications
Methods

- Surgical interventions included
  - scleral buckling (n = 305)
  - scleral buckling + vitrectomy (n = 877),
  - primary vitrectomy (n = 220)

- A 360° encircling band was used in all scleral buckle procedures
  - 97.7% of procedures used a 40, 240, or 40-50 silicone band

- Patients were stratified into two groups: All SB (SB + SB/PPV) and PPV.

- Charts were reviewed for postoperative complications, pre- and postoperative VA, type of retinal reattachment surgery and number of subsequent retina-affecting procedures.
Results

- No difference between the All SB and PPV groups in the incidence of:
  - Redetachment
  - Cystoid macular edema
  - Diplopia/strabismus
  - Visually significant epiretinal membrane
  - Proliferative vitreoretinopathy
  - Choroidal detachment
  - Open angle glaucoma
  - Postoperative uveitis

- Statistically significant difference in the incidence of:
  - macular hole (1% SB group vs 0% PPV group, P = 0.0006)
  - angle closure glaucoma (0.6% SB group vs. 0% PPV group, p = 0.008)
<table>
<thead>
<tr>
<th>Complication</th>
<th>All SB (n=1182)</th>
<th>PPV-SB (n=877)</th>
<th>SB (n=305)</th>
<th>PPV (n=220)</th>
<th>P-value All SB vs. PPV (2-tail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-detachment</td>
<td>169 (14.3%)</td>
<td>126 (14.4%)</td>
<td>43 (14.1%)</td>
<td>25 (11.4%)</td>
<td>0.2473</td>
</tr>
<tr>
<td>-Secondary to PVR</td>
<td>104 (9.0%)</td>
<td>91 (10.4%)</td>
<td>13 (4.3%)</td>
<td>14 (6.4%)</td>
<td>0.2335</td>
</tr>
<tr>
<td>CME</td>
<td>64 (5.4%)</td>
<td>54 (6.2%)</td>
<td>10 (3.3%)</td>
<td>13 (5.9%)</td>
<td>0.7672</td>
</tr>
<tr>
<td>Diplopia/Strabismus</td>
<td>63 (5.3%)</td>
<td>47 (5.4%)</td>
<td>16 (5.2%)</td>
<td>8 (3.6%)</td>
<td>0.2928</td>
</tr>
<tr>
<td>-Requiring surgery</td>
<td>2 (0.2%)</td>
<td>2 (0.2%)</td>
<td>1 (0.3%)</td>
<td>0 (0%)</td>
<td>0.1572</td>
</tr>
<tr>
<td>Visually significant ERM</td>
<td>58 (5.0%)</td>
<td>46 (5.3%)</td>
<td>12 (3.9%)</td>
<td>7 (3.2%)</td>
<td>0.2640</td>
</tr>
<tr>
<td>-Requiring surgery</td>
<td>43 (3.6%)</td>
<td>32 (3.6%)</td>
<td>11 (3.6%)</td>
<td>5 (2.3%)</td>
<td>0.3068</td>
</tr>
<tr>
<td>PVR without detachment</td>
<td>24 (2.0%)</td>
<td>22 (2.5%)</td>
<td>2 (0.7%)</td>
<td>3 (1.4%)</td>
<td>0.4501</td>
</tr>
<tr>
<td>Choroidal detachment/Hemorrhage</td>
<td>17 (1.4%)</td>
<td>15 (1.7%)</td>
<td>2 (0.7%)</td>
<td>6 (2.7%)</td>
<td>0.1670</td>
</tr>
<tr>
<td>Postoperative iritis/uveitis</td>
<td>17 (1.4%)</td>
<td>17 (1.9%)</td>
<td>0 (0%)</td>
<td>2 (0.9%)</td>
<td>0.4678</td>
</tr>
<tr>
<td>Macular hole</td>
<td>12 (1.0%)</td>
<td>10 (1.1%)</td>
<td>2 (0.7%)</td>
<td>0 (0%)</td>
<td><strong>0.0006</strong></td>
</tr>
<tr>
<td>Open angle glaucoma/Increased IOP</td>
<td>16 (1.4%)</td>
<td>14 (1.86%)</td>
<td>2 (0.7%)</td>
<td>3 (1.4%)</td>
<td>0.9906</td>
</tr>
<tr>
<td>Angle closure glaucoma</td>
<td>7 (0.6%)</td>
<td>7 (0.8%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td><strong>0.008</strong></td>
</tr>
<tr>
<td>Buckle Exposure</td>
<td>1 (0.1%)</td>
<td>1 (0.1%)</td>
<td>0 (0%)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Buckle Migration</td>
<td>1 (0.1%)</td>
<td>0 (0%)</td>
<td>1 (0.3%)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Buckle removal</td>
<td>1 (0.1%)</td>
<td>1 (0.1%)</td>
<td>0 (0%)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Conclusions

• Scleral buckling and primary vitrectomy have comparable rates of most postoperative complications.

• Scleral buckling may pose a slightly increased risk of postoperative macular hole and angle closure glaucoma.
  • However, the overall rates of macular hole and angle closure glaucoma remain low.
Scleral Buckling Remains Valuable for Retinal Reattachment

Edwin H Ryan Jr MD
Robert A Mittra MD
Steven R Bennett MD
Current Study

- Review of all RRDs managed by 3 surgeons who use these principles
  - 2008-09, primary RDs
  - Previous OR surgery for RD, and diabetic rheg/TRD excluded
  - All other RDs included (trauma, prior vit, CMV, ROP, GRT, etc.)
Summary of Cases

- 440 primary RDs identified
- 24 office mgmt; 9 PR, 15 laser
- 416 taken to OR
  - 129 SB alone
  - 261 vit/SB; 26 vit alone
Scleral Buckling Demographics

- Average age = 50, range 13-83
- 82/129 (64%) male
- 123/129 (95%) phakic
- 83/129 (65%) mac on
Scleral Buckling - Typical Patient

- 50 year old myope
- Partial PVD
- Phakic
- Macula on
- Encirclage, drainage
SB - Anatomic Outcomes

- Overall 117/129 (90.6%) 1 surgery
  - Mac-on 94%, mac-off 85%
- With 1 re-op - 100%
- 11/11 segmental SB successful
SB - Visual Outcomes

- Overall - 20/34, avg f/u - 6 mo.
  - Mac-on - 20/29
  - Mac-off - 20/42
- 9 had later vitrectomy, not for RD
  - 5 vit opacities, 4 ERM
SB - Complications

- Buckle erosion - 0%
- Submacular hemorrhage - 0%
- Strabismus surgery - 0%
- Spectacle prisms - 1%
Vitrectomy + Scleral Buckle

- Average age 61, range 17-96
- 174/287 (60%) male
- 166/287 (57%) pseudophakic
- 166/287 (57%) macula off
Vitrectomy + Scleral Buckle

- Nearly all pseudophakic RDs
- Simplest RDs vit alone (10%)
- Complex RDs in phakic patients
Vit/SB - Anatomic Outcomes

- Overall 276/287 (96.2%) 1 surgery
  - Mac-on 98%, mac-off 94%
- With 1 re-op - 99%
  - 2 patients 2+ reops, 100%
- No buckle erosions, 2 req. prisms
Vit/SB Visual Outcomes

- Overall - 20/44, avg f/u - 6 mo.
  - Mac-on - 20/34
  - Mac-off - 20/53
• SB developed in 1949 and popularized in the 1950’s
• PPV added significant benefit when introduced in the 1970’s especially for cases of
  • Trauma
  • PVR
  • Pseudophakia
25 Gauge Trocar Set
Primary Vitrectomy for Rhegmatogenous Retinal Detachment Repair

The UAB-RCA Series and Literature Report

John O. Mason, III, MD
Director, Retina Service
Retina Consultants of Alabama, P.C.
The University of Alabama at Birmingham
School of Medicine-Department of Ophthalmology
Primary PPV for RD Repair

- Retrospective case series
  1996-2010, UAB/RCA
- All cases: Fluid-air-exchange
- SF$_6$ or C$_3$F$_8$
- 360° Laser retinopexy
- +/- drainage retinotomy
- Silicone oil reserved for severe PVR
Advantages of SB

- Phakic patient success
- Better vision in phakic patients
- Avoid cataract in young patients
Disadvantages of SB

- Increased operative time
- Can develop the following:
  - Anisometropia
  - Astigmatism
  - Diplopia
  - Anterior segment ischemia
  - Decreased retinal blood flow
  - Suprachoroidal hemorrhage
  - SB extrusion, infection, and/or erosion
  - Postop myopic shift
23 Gauge Trocar Set
Advantages of PPV

- Identify and treat all retinal breaks
- Release vitreous traction on the retina
- Remove posterior capsular & vitreous opacities that impede the view of peripheral retina
- Internal drainage of SRF allows intraoperative retinal reattachment
Advantages of PPV RD Repair

- Reproducible (good for patient, and for training residents and fellows)
- Efficient, quick surgery
- Minimal patient discomfort
- Decreased postop recovery time
Primary PPV for RD Repair

• 884 Cases of primary PPV and RD repair
  • 88% Reattached with 1 surgery
  • 99% Final reattachment
  • 12% PVR redetachment rate
  • 111 Scleral buckles (no PPV) over the same time period
• SB for young phakic patients
## Literature Review of Primary PPV for RD Repair

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<th>Incidence of Recurrent Retinal Detachment</th>
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Primary PPV for RD Repair in Pseudophakic Patients

- Weichel et al, 2006
  - Pseudophakic RD
  - Primary PPV vs PPV with scleral buckle
  - Equal efficacy in both groups
  - 93% vs 94% Single-operation success rate (SOSR)
  - PPV Group – better vision
Primary PPV for RD Repair in Pseudophakic Patients

- **Stangos et al 2004**
  - Prospective comparison of PPV with PPV/SB in primary repair of pseudophakic RRD
    - 71 Eyes
    - 98% SOSR – PPV
    - 92% SOSR – PPV/SB

- **Arya et al 2006**
  - Surgical management of pseudophakic RDs: a meta-analysis
    - 1,232 Papers
    - 29 Had sufficient data
    - PPV with or without SB has high anatomic success and better visual outcome than SB alone
Schwartz and Flynn 2008 – Comprehensive Review:

- Single-operation success rate (SOSR) after PPV alone is similar to that after combined PPV and SB in several retrospective and prospective comparative trials.
PPV: Does Small Gauge Surgery Result in Good Outcomes?

- Use of 25-ga vitrectomy in the management of primary RRD
  - 131 Patients, consecutive case series
  - 92% Anatomic success

Is 20-ga PPV Equal to 25-ga PPV?

- Retrospective comparison of 25-ga transconjunctival sutureless vitrectomy to 20-ga vitrectomy for the repair of pseudophakic primary inferior RRD
  - Single operation success:
    - 25-ga = 83%
    - 20-ga = 89%
    - Final success = 97%
    - 78 Eyes

Colyer M.H., et al. Retina 2010
Does Simple PPV Without Additional Procedures Work?

- PPV without adjuvant procedures for repair of primary RRD
  - 93 Eyes with consecutive retrospective review:
    - 96% Success with single operation
    - No 360° laser
    - No SB
    - No perfluorocarbon

Schneider E.W., et al. Retina 2011

YES
What about Inferior Breaks?

- Sharma et al 2004
  - PPV alone – 48 patients with primary RD a/w inferior breaks
  - Matched control group of 48 patients without inferior breaks
    - 81% SOSR with inferior breaks
    - 85% SOSR without inferior breaks
    - 96% Final anatomic success rate in both groups

- Wickham et al 2004
  - Retrospective review of 86 inferior-break RRDs
    - 89% SOSR – PPV
    - 73% SOSR – PPV/SB
    - 95% Final attachment rate – PPV
    - 93% Final attachment rate – PPV/SB

PPV good for inferior RD
Do SBs Result in Better Vision?

- Surgical outcomes for primary RRD in phakic and pseudophakic patients: the Retina 1 Project-Report No. 2
  - 546 Phakic and pseudophakic primary RRDs
  - PPV or SB
  - 94% Success

- Conclusions:
  - No differences in anatomic success between phakic & pseudophakic eyes
  - PPV performed most often in pseudophakic eyes & had > probability of worse final VA than SB

Do SBs Result in Better Vision?

- Scleral buckling versus primary vitrectomy in RRD: a prospective randomized multicenter clinical study
  - 681 Patients
  - **Phakic trial:** SB better vision than PPV
    - 74% SB Success
    - 75% PPV Success
  - Pseudophakic trial: SB & PPV same vision
    - 60% SB Success
    - 80% PPV Success
  - Primary success:
    - 54% SB
    - 72% PPV

- Helmann H., et al. *Ophthalmal 2007*

**YES in Phakic Patients**
Do Phakic Patients Need SB?

- PPV versus combined PPV and SB for primary repair of RRD
  - 105 Phakic patients
  - Single-surgery anatomic success rates:
    - 83% PPV
    - 97% PPV/SB
  - PPV/SB may be associated with a decreased risk for RD when compared to PPV for repair of phakic RD


MAYBE
• PPV versus combined PPV and SB for primary repair of RRD
Repair of RD with PPV?
Advantages of PPV

- Sutureless surgery
- Minimal disruption of the conjunctiva
- Potentially faster surgical time and recovery time
Purpose

• To compare anatomic and visual outcomes of pars plana vitrectomy versus pars plana vitrectomy and scleral buckle for primary repair of rhegmatogenous retinal detachments.
Co-authors:

- Sachin Mehta
- Gaurav Shah
- Gil Grand
- Mary C. Rybak
Methodology

- Reviewed pts dxed with primary RRD between Dec, 2004 and Dec, 2006
- 219 pts were identified
  - Repaired via
    - PPV
    - SBP plus PPV
  - Surgeries performed by one of eight surgeons at the BRI
Inclusion Criteria

- Rhegmatogenous RD
- Known duration
- 18 years of age or older
- 3 or more months follow-up
Exclusion Criteria

- Prior ocular conditions limiting visual prognosis
- PVR grade C or worse
- History of prior RD
- Retinal tear > 3 clock hours
- Combined traction/rhegmatogenous RD
- Vitreous hemorrhage
- Lensectomy at the time of RRD repair
- Incomplete or inaccurate charting
Statistical Analysis

- The paired, two-tailed Student’s t-test was used to statistically analyze differences in logMAR of Snellen VA.
- The two-tailed Fisher’s exact test was used to compare baseline characteristics and to calculate differences in anatomic outcomes in all groups.
- A p-value less than 0.05 was considered to be significant.
Results

- 219 eyes were identified:
  - PPV 85 patients
    - Phakic 37
    - Pseudophakic 48
  - PPV/SB 134 patients
    - Phakic 68
    - Pseudophakic 66
- Mean overall follow-up was 13.2 months
  (range = 3-32)
• Baseline characteristics were similar in both surgical groups among phakic eyes.

• Among pseudophakic eyes, PPV was performed more routinely in eyes with superior breaks only.
## Baseline Characteristics of Phakic Eyes

<table>
<thead>
<tr>
<th>Variable</th>
<th>PPV (n=37)</th>
<th>PPV/SB (n=68)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age ± SD years</td>
<td>53.3 ± 11.5</td>
<td>54.0 ± 13.3</td>
<td>0.9273</td>
</tr>
<tr>
<td>Male, no. (%)</td>
<td>18 (48.6)</td>
<td>45 (66.2)</td>
<td>0.0971</td>
</tr>
<tr>
<td>Mean symptom duration (days)</td>
<td>15.5</td>
<td>17.6</td>
<td>0.7493</td>
</tr>
<tr>
<td>Macula-off RD, no. (%)</td>
<td>12 (32.4)</td>
<td>29 (42.6)</td>
<td>0.4028</td>
</tr>
<tr>
<td>Mean size RD (clock hours)</td>
<td>4.4</td>
<td>4.7</td>
<td>0.6682</td>
</tr>
<tr>
<td>Mean no. of breaks</td>
<td>1.7</td>
<td>1.7</td>
<td>0.6609</td>
</tr>
<tr>
<td>Superior breaks only, no. (%)</td>
<td>24 (64.9)</td>
<td>34 (50.0)</td>
<td>0.1568</td>
</tr>
<tr>
<td>Inferior breaks only, no. (%)</td>
<td>5 (13.5)</td>
<td>16 (23.5)</td>
<td>0.3084</td>
</tr>
<tr>
<td>Lattice Degeneration, no. (%)</td>
<td>14 (37.8)</td>
<td>28 (41.2)</td>
<td>0.8358</td>
</tr>
<tr>
<td>Proliferative Vitreoretinopathy, no. (%)</td>
<td>2 (5.4)</td>
<td>2 (2.9)</td>
<td>0.6121</td>
</tr>
</tbody>
</table>

PPV = Pars Plana Vitrectomy; SB = Scleral Buckle
## Baseline Characteristics of Pseudophakic Eyes

<table>
<thead>
<tr>
<th>Variable</th>
<th>PPV (n=37)</th>
<th>PPV/SB (n=68)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age ± SD years</td>
<td>64.6 ± 12.6</td>
<td>61.0 ± 14.0</td>
<td>0.0609</td>
</tr>
<tr>
<td>Male, no. (%)</td>
<td>36 (75.0)</td>
<td>41 (62.1)</td>
<td>0.1620</td>
</tr>
<tr>
<td>Mean symptom duration (days)</td>
<td>15.6</td>
<td>14.1</td>
<td>0.9729</td>
</tr>
<tr>
<td>Macula-off RD, no. (%)</td>
<td>23 (47.9)</td>
<td>40 (60.6)</td>
<td>0.1885</td>
</tr>
<tr>
<td>Mean size RD (clock hours)</td>
<td>4.8</td>
<td>5.9</td>
<td>0.0863</td>
</tr>
<tr>
<td>Mean no. of breaks</td>
<td>1.5</td>
<td>1.5</td>
<td>1.0000</td>
</tr>
<tr>
<td>Superior breaks only, no. (%)</td>
<td>33 (68.8)</td>
<td>29 (43.9)</td>
<td>0.0130</td>
</tr>
<tr>
<td>Inferior breaks only, no. (%)</td>
<td>9 (18.8)</td>
<td>18 (27.3)</td>
<td>0.3736</td>
</tr>
<tr>
<td>Lattice Degeneration, no. (%)</td>
<td>13 (27.1)</td>
<td>13 (19.7)</td>
<td>0.3744</td>
</tr>
<tr>
<td>Proliferative Vitreoretinopathy, no. (%)</td>
<td>4 (8.3)</td>
<td>5 (7.6)</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

PPV = Pars Plana Vitrectomy; SB = Scleral Buckle
Results Cont…

- **Single surgery anatomic success:**
  - **Phakic eyes:**
    - PPV: 83.8%
    - PPV/SB: 97.1%  \( p = 0.0216 \)
  - **Pseudophakic eyes:**
    - PPV: 87.5%
    - PPV/SB: 93.9%  \( p = 0.6952 \)

- **Final reattachment rate:** 100%
<table>
<thead>
<tr>
<th></th>
<th>Phakic (n=37)</th>
<th>PPV/ SB (n=68)</th>
<th>p-value</th>
<th>Pseudophakic (n=48)</th>
<th>PPV/ SB (n=66)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Reattachment no. (%)</td>
<td>31 (83.8)</td>
<td>66 (97.1)</td>
<td>0.0216</td>
<td>42 (87.5)</td>
<td>62 (93.9)</td>
<td>0.6952</td>
</tr>
<tr>
<td>Final Attachment no. (%)</td>
<td>37 (100)</td>
<td>68 (100)</td>
<td>1.0000</td>
<td>48 (100)</td>
<td>66 (100)</td>
<td>1.0000</td>
</tr>
<tr>
<td>Redetachment no. (%)</td>
<td>6 (16.2)</td>
<td>2 (2.9)</td>
<td>0.0216</td>
<td>6 (12.5)</td>
<td>4 (6.1)</td>
<td>0.3175</td>
</tr>
<tr>
<td>Mean VA Improvement (logMAR Snellen)</td>
<td>0.2758</td>
<td>0.2518</td>
<td>0.4898</td>
<td>0.6617</td>
<td>0.5448</td>
<td>0.2465</td>
</tr>
</tbody>
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PPV = Pars Plana Vitrectomy;  SB = Scleral Buckle
• Visual acuity results:
  • Phakic eyes:
    • VA improvement was 0.02 logMAR units greater in the PPV group (p=0.4898)
  • Pseudophakic eyes:
    • VA improvement was 0.12 logMAR units greater in the PPV group (p=0.2465)
• There was no statistically significant difference in VA improvement between the surgical groups, regardless of phakic status
Pre- and Post-Treatment Best Corrected Visual Acuity (logMAR)

- **PPV / SB-Pseudophakic**
  - Pre-surgical BCVA: 0.94
  - Post-surgical BCVA: 0.98

- **PPV-Pseudophakic**
  - Pre-surgical BCVA: 0.76
  - Post-surgical BCVA: 0.88

- **PPV / SB-Phakic**
  - Pre-surgical BCVA: 0.51
  - Post-surgical BCVA: 0.88

- **PPV-Phakic**
  - Pre-surgical BCVA: 0.61
  - Post-surgical BCVA: 0.88
Retinal Redetachment Rates

- **PPV-Phakic**: 16.2
- **PPV / SB-Phakic**: 2.9
- **PPV-Pseudophakic**: 12.5
- **PPV / SB-Pseudophakic**: 6.1
Surgeon’s Choice of Gas Tamponade with Perfluoropropane Versus Sulfur Hexafluoride

- PPV-Phakic
- PPV / SB-Phakic
- PPV-Pseudophakic
- PPV / SB-Pseudophakic

Perfluoropropane (%): 80, 60, 40, 20
Sulfur Hexafluoride (%): 40, 20, 0, 0
Conclusion

• PPV/SB associated with a decreased risk of retinal redetachment and a higher initial reattachment rate when compared to PPV-alone for primary repair of phakic RRD.

• In pseudophakic eyes, the anatomic success rate between the two techniques appears similar.

• Mean VA improvement was comparable in both surgical groups
PPV RD Repair with Drainage Retinotomy

- Drainage retinotomy enlarged over time
- This patient had RD repair 5 years prior to this photo
- No increased risk of PVR with retinotomy
- We had no cases of symptomatic visual field defects
- Can do inferior retinotomy as shown
iMARC™ Design

The micro-needle penetrates the retina to aspirate subretinal fluid.

The annulus aspiration grasps and stabilizes the retinal surface.
Attach the aspiration source to the main Luer.

Apply vacuum.

Vacuum picks up & stabilizes retinal surface.
Benefits of Use

- Enables a traumatic sub-retinal fluid aspiration for improved retinal apposition during detachment repair
- Eliminates need for PFCL and multiple gas exchanges in many detachments
- Utilizes small self-sealing retinotomy to eliminate need for sealing of access retinotomy with laser or cryo
- A traumatic retinotomy allows for multiple treatment sites to treat complex detachments or large sub-retinal hemorrhages
- Compatible with standard vitrectomy vacuum sources and back flush instruments
iMARC™
Set Up for Sub-Retinal Aspiration

1) Remove Luer cap from side arm - Do Not Discard

2) Grasp protective sleeve from proximal end and carefully remove from shaft

3) Attach 0.2 µm syringe filter to side arm Luer

4) Connect Main Luer to aspiration source (vitrectomy or extrude)

Vent

Vacuum
“I know you are going to ask me what I am going to do about it, and I am going to tell you right now….I’M DOING VIT!!!”
Primary Vitrectomy for Retinal Detachment Repair
Primary PPV for RD Repair

- Retrospective Case Series 1996-2010
- All Cases: Fluid-Air Exchange
- $\text{SF}_6$ or $\text{C}_3\text{F}_8$
- 360° Laser Retinopexy
- Usually Drainage Retinotomy
- Silicone Oil Reserved for Severe PVR
Primary PPV for RD Repair

- 884 Cases of Primary PPV and RD Repair
  - 88% Reattached with 1 Surgery
  - 99% Final Reattachment
  - 12% PVR Redetachment Rate
  - 111 Scleral Buckles (No PPV) Over the Same Time Period
Advantages of Primary Vitrectomy

- Improved visualization of peripheral retina and identification of breaks
- Removal of vitreous/capsular opacities
- Removal of V-M traction in patients with vitreous incarceration
- Internal photocoagulation or cryotherapy for the treatment of breaks
- Drainage of suprachoroidal fluid if present
- Avoidance of the hazards of drainage (IO/reti/Chor. hge, vitr/retinal incarceration, and retinal perforation) *
- Lower incidence of refractive changes, choroidal detachments, infections intrusions, muscle imbalance buckle extrusion/infection, CME
Advantages of PPV RD Repair

- Reproducible (Good for Patient, and for Training Residents and Fellows)
- Efficient, Quick Surgery
- Minimal Patient Discomfort
- Decreased Postop Recovery Time
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Primary PPV for RD Repair

- Brazitikos et al, 2005
  - PPV vs. Scleral Buckle
  - PPV better single surgery rate
- Weichel et al, 2006
  - Primary PPV vs. PPV with Scleral Buckle
  - Equal Efficacy in Both Groups
Primary Vitrectomy

- Is there anything new?
Drainage retinotomy enlarged over time

This patient had RD repair 5 years prior to this photo

No increased risk of PVR with retinotomy

We had no cases of symptomatic visual field defects

Can do inferior retinotomy as shown
Scleral Buckling versus Primary Vitrectomy in Rhegmatogenous Retinal Detachment

A Prospective Randomized Multicenter Clinical Study

Heinrich Heimann, MD,1 Karl Ulrich Bartz-Schmidt, MD,2 Norbert Bornfeld, MD,3 Claudia Weiss, MD,4 Ralf-Dieter Hilgers, PhD,4 Michael H. Foerster, MD,5 for the Scleral Buckling versus Primary Vitrectomy in Rhegmatogenous Retinal Detachment Study Group

Objective: To compare scleral buckling surgery (SB) and primary pars plana vitrectomy (PPV) in rhegmatogenous retinal detachments of medium complexity.

Design: Prospective randomized multicenter clinical trial (the Scleral Buckling versus Primary Vitrectomy in Rhegmatogenous Retinal Detachment Study), separated into phakic or aphakic/pseudophakic eyes. Patients were enrolled over a 5-year period. There was 1-year follow up in the study, and the primary outcome was assessed at 1 year.

Participants: Forty-five surgeons (25 centers, 5 European countries) recruited 416 phakic and 265 pseudophakic patients. Completion of follow-up was achieved in 93% of the phakic and 89% of the pseudophakic patients.

Intervention: Scleral buckling surgery with the potential use of multiple sponges, encircling elements, drainage, and intraocular injections. Primary vitrectomy included 3-port vitrectomy with sulfur hexafluoride-air tamponade; additional SB was left to the surgeon’s decision.

Main Outcome Measures: Primary study end point: change in best-corrected visual acuity (BCVA); secondary end points: primary and final anatomical success, proliferative vitreoretinopathy, cataract progression, and number of reoperations.

Results: In the phakic trial, the mean BCVA change was significantly ($P = 0.0005$) greater in the SB group (SB, $-0.71$ logarithm of the minimum angle of resolution [logMAR], standard deviation [SD] 0.68; PPV, $-0.56$ logMAR, SD 0.76). In the pseudophakic trial, changes in BCVA showed a nonsignificant difference of 0.09 logMAR. In phakic patients, cataract progression was greater in the PPV group ($P < 0.00005$). In the pseudophakic group, the primary anatomical success rate (defined as retinal reattachment without any secondary retina-affecting surgery; SB, 71/133 [53.4%]; PPV, 95/132 [72.0%]) was significantly better ($P = 0.0020$), and the mean number of retina-affecting secondary surgeries (SB, 0.77, SD 1.08; PPV, 0.43, SD 0.85) was lower ($P = 0.0032$) in the PPV group. Redetachment rates were 26.3% (SB; 55/209) and 25.1% (PPV; 52/207) in the phakic trial and 39.8% (SB; 53/133) and 20.4% (PPV; 27/132) in the pseudophakic trial.

Conclusions: The study shows a benefit of SB in phakic eyes with respect to BCVA improvement. No difference in BCVA was demonstrated in the pseudophakic trial; based on a better anatomical outcome, we recommend PPV in these patients. Ophthalmology 2007;114:2142–2154 © 2007 by the American Academy of Ophthalmology.
Secondary endpoints

1. *Proliferative vitreoretinopathy rate.* Postoperative occurrence of PVR grade B or C.
2. *Primary anatomical success.* Retinal reattachment was defined as attachment of the retina central to the equator at the final follow-up visit without any retina affecting the procedure. Procedures considered to be retina affecting were laser photocoagulation, cryopexy, intraocular gas injection, SB or revisional SB, and vitrectomy or revisional vitrectomy, including macular pucker surgery.
RD after Refractive Surgery

- LASIK
- Premium IOLs
LASIK

• Is it a risk factor for RD?
• Annual incidence RD after LASIK
  • 0.032% (32 out of 100,000)
  • All myopic patients
• Annual incidence RD general public
  • 10.5 out of 100,000
  • Myopes, Hyperopes, Emmetropes
• Potential causes?
  • Microkeratome --> high suction pressures
  • New Femtosecond lasers may change things?
LASIK

• What to look for?
  • Review ocular history
  • Look for flap and “hinge”

• Surgical Tips
  • Work efficiently
    • Longer case times, greater likelihood of epithelial edema and decreased view
  • Watch the flap!
    • Iatrogenic flap dislocation
    • Aggressive BSS
    • Try to use viscous agent for cornea
    • Try to avoid scraping cornea -- RISKY
LASIK

• SB
  • Will impact refraction
  • May need enhancement if RD repair goes well and central macular function restored
  • Risk Flap Dislocation (Up to 5 yrs post-lasik)
  • Visualization risk because of case duration (in combined SB/PPV)
Lasik

- PPV
  - Relatively little impact on refractive state (especially with small gauge)
  - Gas tamponade --> cataract --> another sx likely
  - Risk Flap Dislocation (5 yrs)
  - Not always best option
    - Young myopic person (your typical LASIK pt)
Premium IOLs

- **Premium IOLs**
  - Presbyopia Correcting IOLs
    - Accomodative IOLs
      - Crystalens and Crystalens HD
    - Multifocal IOLs
      - ReStor
      - ReZoom
      - Technis
  - Astigmatic Correcting IOLs
    - Toric IOLs
  - Phakic IOLs
    - Verisyse (attaches front of iris) PMMA
    - Visian Implantable Collamer Lens (ICL) (positioned behind iris)

- As population ages, we will see more of these IOLs
  - Prevalence AMD 0.2 % age 55-64; 13% age 85 and older
Premium IOLs

- **Patient Issues:**
  - Visual Disturbance
  - Decreased contrast sensitivity
  - Out of pocket cost / unhappy patients

- **Surgeon Issues**
  - Impaired visualization during PPV
  - Concentric rings in multifocals
  - Lens material (Silicone)
  - Need exact lens placement (displacement tolerated in monofocal IOL)
    - Especially in multifocals
Crystalens

- Accomodating monofocal plate IOL
- Need large capsulorhexis (6mm)
- Explantation can be challenging
- Very sensitive to PCO formation (silicone IOLs in general)
- Silicone IOL
  - Adherence of silicone oil
  - Condensation during fluid-air exchange
  - Need exact placement in bag
  - Vaulting of lens is concern (axial displacement)
Crystalens
ReStor/ReZoom

- Acrylic multifocal IOLs; 6mm optic
- ReStor: 12 zones
- ReZoom: 5 zones
RD Issues

- Air Fluid exchange
  - Decentration of IOL
    - Vaulting (especially with Crystalens)
  - Condensation
- Tamponade
  - Silicone oil can adhere to Crystalens and Technis version
RD Issues

• Macular Work
  - Multifocal zones make membrane peeling difficult in PVR cases
  - Posterior drainage retinotomies
  - Risk for iatrogenic trauma

• Limited visualization
  - Crystalens: smaller optic 5mm
  - Phakic IOLs: limited pupillary dilation; cornea decompensation; cataract formation
Surgical Tips

• Pre-op evaluation
  • Evaluate the IOL closely for type and location (bag or sulcus)
  • Ask pt or referring doctor for details
• Minimize intraoperative contact with IOL
• Laser before doing air-fluid exchange in case view is lost
• Condensation
  • Silicone brush
  • Viscoelastic
  • Humidified air / “cold” air
Clinical Scenarios Where SB Superior?

- Young pt, vitreous attached, localized detachment with lattice
- Myopic, middle-aged person, phakic, single tear
- Young patient, phakic with dialysis
Why Do I Still Do SB?

- They work
- No intraocular surgery
- No cataract/Positioning
- Quicker vision
- Failures do better!
- Economically cost effective (equipment cost)
Status of the Vitreous

- **Key element - vitreous separation**
  - Pseudophakic RD can be managed by PPV alone but vitreous separation is key

- **Age of patient**
  - Pseudophakia (<60), residual vitreous adherence in periphery
    - Later contraction and lead to new tears/ PVR

- **Lattice Degeneration**
  - Significant Lattice,
    - Especially posterior
    - Significant factor in inability to separate vitreous into the far periphery
SB Helpful in Addition to PPV

- PVR on presentation
- Poor visualization of the periphery
  - Dense vitreous hemorrhage
  - Significant peripheral cortical spokes
  - Peripheral capsular opacification
Discussion

- Phakic eye PPV/SB success
  - Difficulty in shaving vitreous base in phakic eyes
  - Possible vitreous incarceration
  - Buckle provides support to vitreous base:
    - Support unrecognized tears
    - Decrease secondary tear formation
Surgical Principles: Bottom Line

- Very simple phakic RD - office
- Non-complex, phakic RD - SB
- Non-complex, pseudo RD – SB, vit/SB, vit
- Complex RD - vit/SB
## Average Costs & Reimbursements

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Minutes</th>
<th>Supply Cost</th>
<th>Staff Cost</th>
<th>Total Cost</th>
<th>Surgery Center Fee</th>
<th>Net Fee</th>
<th>Surgeon Reimbursement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scleral Buckle</td>
<td>46 min</td>
<td>$145.00</td>
<td>$280.00</td>
<td>$425.00</td>
<td>$1134.87</td>
<td>$885.00</td>
<td>$1310.00</td>
</tr>
<tr>
<td>Vitrectomy</td>
<td>38 min</td>
<td>$540.00</td>
<td>$240.00</td>
<td>$780.00</td>
<td>$1223.68</td>
<td>$510.00</td>
<td>$1585.00</td>
</tr>
<tr>
<td>Buckle + Vitrectomy</td>
<td>68 min</td>
<td>$580.00</td>
<td>$400.00</td>
<td>$980.00</td>
<td>$1482.34</td>
<td>$480.00</td>
<td>$1780.00</td>
</tr>
</tbody>
</table>
Conclusions

- Good anatomic and visual outcomes with this strategy for primary RD
- SB alone avoids cataract
- SB+vit for more complex cases
- Very few complications due to SB
Surgical Principles

- Phakic RD treated by SB alone, unless other problems (media, blood, PVR, posterior tear) necessitate Vit
- Pseudophakic RD treated with Vit/SB. Vit alone OK in some settings
- Simple RDs only for office management
Conclusions

- Challenge to vitrectomy-only for RD advocates
- Review all your cases
- Show us better results
Appropriate Timing of RRD Repair
# Estimated Retinal Holes, Tears, and Detachments

<table>
<thead>
<tr>
<th>Retinal Holes, Tears and Detachments</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>CAGR (’09-’14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>414,000</td>
<td>417,711</td>
<td>421,455</td>
<td>425,233</td>
<td>429,044</td>
<td>432,890</td>
<td>436,770</td>
<td>0.9%</td>
</tr>
<tr>
<td>Western Europe</td>
<td>702,320</td>
<td>717,665</td>
<td>733,346</td>
<td>749,368</td>
<td>765,741</td>
<td>782,472</td>
<td>799,568</td>
<td>2.2%</td>
</tr>
<tr>
<td>Other Industrialized</td>
<td>220,161</td>
<td>228,277</td>
<td>236,692</td>
<td>245,417</td>
<td>254,464</td>
<td>263,844</td>
<td>273,570</td>
<td>3.7%</td>
</tr>
<tr>
<td>Global</td>
<td>3,610,488</td>
<td>3,743,581</td>
<td>3,882,459</td>
<td>4,027,399</td>
<td>4,178,691</td>
<td>4,336,641</td>
<td>4,501,569</td>
<td>3.8%</td>
</tr>
</tbody>
</table>

Lifetime risk estimated at 1 in 170 (0.58%)
Categorization

Often described as macula-on or macula-off

WHY?

Prognosis

• Macula-on: 80% with final BCVA of ≥ 20/40
• Macula-off: 30% with final BCVA of ≥ 20/40

• Preoperative visual acuity (VA) is the strongest prognostic indicator of postoperative visual outcome
Experimental Models

- Animal models – specific cellular morphologic and functional changes occur within minutes of RD.
- Mueller and microglial cells seem to have central role in proinflammatory changes and evolve over hours to days.
- Eventually spread to involve areas of nondetached surrounding retina.
- Hypoxia of retina in areas of both detached and nondetached retina may have a role in retinal degeneration and glial cell activation.
Clinical Reality

- Multiple, large, well-designed studies have shown that time to surgical repair may be less urgent than commonly believed

- For macula-off RD: No difference in VA outcomes among patients who underwent repair within the first week of onset

- For macula-on RD: Emerging body of evidence that for some patients, waiting up to several days can be acceptable
Ross and Kozy (Ophthalmology, 1998):

- 104 patients with mac-off detachments
- 3 groups analyzed by time to surgery
- However, no final VA results differences between patients in the 1-10 day sub-groups (see chart below)

### Table 1. Recovery of Snellen Visual Acuity in the Three Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>≥20/50 (%)</th>
<th>20/60–20/200 (%)</th>
<th>&lt;20/200 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–2 days</td>
<td>52</td>
<td>42</td>
<td>6</td>
</tr>
<tr>
<td>3–4 days</td>
<td>65</td>
<td>32</td>
<td>3</td>
</tr>
<tr>
<td>5–7 days</td>
<td>61</td>
<td>34</td>
<td>5</td>
</tr>
</tbody>
</table>
Macula-off Studies and Evidence


- 457 patients with mac-off detachments
- No prognostic difference between patients repaired within 30 days (lower LogMAR = better)
Hartz, Burton, Gottleib (Ophthalmology, 1992):

- 137 macula-on RRDS
- Comparison of emergency vs scheduled surgery
- No outcome difference (none of 18 delayed patients progressed to macula off)
- 25% more cost for emergency surgery

- 199 macula-on RRDs
- 85% repaired within 3 days
- Only 1 patient progressed to macula-off status (4 days after presentation)

| TABLE 2. Visual Acuity of Patients With Fovea-Sparing Rhegmatogenous Retinal Detachments |
|---------------------------------|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                                 | Preoperative n = 199            | Postoperative n = 172 | Postoperative Vision According to Time From Initial Evaluation to Surgery<sup>a</sup> |
|                                 | All Patients | All Patients | < 12 h (n = 46) | 12-24 h (n = 47) | 1-3 d (n = 53) | > 3 d (n = 26) |
| Median                          | 20/25        | 20/30        | 20/25           | 20/30            | 20/30           | 20/30           |
|                                 | 108 (54%)    | 77 (45%)     | 24 (52%)        | 20 (43%)         | 22 (42%)        | 11 (42%)        |
| ≥ 20/25                         | 20/25        | 20/30        | 20/30           | 20/30            | 20/30           | 20/30           |
| ≥ 20/25                         | 108 (54%)    | 77 (45%)     | 24 (52%)        | 20 (43%)         | 22 (42%)        | 11 (42%)        |
| 20/30-20/40                     | 58 (29%)     | 48 (28%)     | 12 (26%)        | 17 (36%)         | 15 (28%)        | 4 (15%)         |
| 20/30-20/40                     | 58 (29%)     | 48 (28%)     | 12 (26%)        | 17 (36%)         | 15 (28%)        | 4 (15%)         |
| ≤ 20/50                         | 33 (17%)     | 47 (27%)     | 10 (22%)        | 10 (21%)         | 16 (30%)        | 11 (42%)        |

Postoperative visual acuities are from postoperative visits at 2 months.

<sup>a</sup>There was no statistical difference among postoperative visual acuity outcomes by time from initial evaluation to surgery. $P = .20$ (by median visual acuity, Kruskal-Wallis test); $P = .33$ (by visual acuity groupings, $\chi^2$ test).
Macula-on Progression

Ho, Fitt, Frimpong, Benson, et al (Eye, 2006):

- 82 macula-on RRDs
- Only 11 (13%) had progression of posterior border prior to surgery. 3 (3.7%) progressed to macula-off.
- Among those that progressed, average rate: 1.8 disc diameters per day (range 0.125-4.5)

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Characteristics of three patients in whom macula was detached by the time of operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Patient 1</td>
</tr>
<tr>
<td>Age (years)</td>
<td>59</td>
</tr>
<tr>
<td>Duration of symptom</td>
<td>1 day</td>
</tr>
<tr>
<td>Location of subretinal fluid (in clock hour positions)</td>
<td>11.30–1.45</td>
</tr>
<tr>
<td>U-tear/hole</td>
<td>1 U-tear (12.15)</td>
</tr>
<tr>
<td>Distance of subretinal fluid from fovea at presentation (in disc diameter)</td>
<td>4</td>
</tr>
<tr>
<td>Days after presentation in which macular detachment was found</td>
<td>1 (macula split)</td>
</tr>
<tr>
<td>Posturing performed 6/52 postoperative best-corrected visual acuity</td>
<td>Yes</td>
</tr>
<tr>
<td>Posturing performed</td>
<td>6/18</td>
</tr>
</tbody>
</table>
FAF can serve as an indicator of retinal function by characterizing lipofuscin buildup in regions of increased oxidative stress and metabolic activity.

Bullous detached retina is dark due to blockage. A leading hyperfluorescent edge is usually seen at the border of RRD.

Clinical Correlate (Eye, 2012: Witmer, et al)
Clinical Correlate (Eye, 2012: Witmer, et al)

- Another example using multimodal imaging:
Suggested Approaches

- If unsure of macular status, consider OCT (often shallow macula-off RDs are mistaken as macula-on)
- May advise patient remain NPO, but also stress that retinal surgeon will determine timing of repair
- Remember that a surgeon operating emergently without the best equipment or team may not get as good of an outcome as a surgeon who is operating later in optimal and more controlled setting
Problem... Tools?
Summary

- Many training programs are moving away from educating fellows in SB techniques. Retina fellowships have an obligation to do and teach scleral buckling surgery (Can’t blame the fellow).
- During Primary Vitrectomy repair it is important to do a meticulous vitreous base dissection.
- Combined SB and PPV can be a highly effective treatment modality when used with complex or non-complex vitreoretinal pathology.
- Decisions driven by economic and time factors.
- Must tailor treatment to the patient and to the particular pathology.
- Timing of retinal detachment repair continues to evolve.
Thank You!
Discussion
Thank You
Categorization

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- For macula-on RD: Emerging body of evidence that for some patients, waiting up to several days can be acceptable.
Macula-off Studies and Evidence

Ross and Kozy (Ophthalmology, 1998):
- 104 patients with mac-off detachments
- 3 categories (1-10 days, 10 days to 6 weeks, >6 weeks)
- Best outcomes within 1-10 day group
- However, no significant final VA results within patients in the 1-10 day group
- Poor outcomes in >6 week group

- 457 patients with mac-off detachments
- No prognostic difference between patients repaired within 30 days
• 199 macula-on RRDs
• 85% repaired within 3 days
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- Prospective, multicenter, observational study
- Only 13% had progression of posterior border prior to surgery
- Among those that progressed, average rate of 1.8 disc diameters per day (range 0.125-4.5)
Suggested Approaches

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• May advise patient remain NPO, but also stress that retinal surgeon will determine timing of repair

• Remember that a surgeon operating emergently without the best equipment or team may not get as good of an outcome as a surgeon who is operating later in optimal and more controlled setting
Conclusion

- Many training programs are moving away from SB techniques
- Retina fellowships have a **obligation** to do and teach scleral buckling surgery
- Can’t blame the fellows if we don’t do it ourself
- If the decline in buckles is not corrected, this skill will be lost in our profession
Conclusion

- Myths about scleral buckling surgery are not true
- Decisions driven by economic, time, and convenience factors has affected management decisions
- Must tailor treatment to the patient and to the particular pathology
Current Therapeutic Options:

- SB
- Pneumatic retinopexy
- Pars plana vitrectomy
- All have similar final anatomic success rates and similar rates of PVR.

- So, is scleral buckle obsolete?

NO!
Scleral buckling surgery still remains an integral part of retinal detachment repair surgery.
Limitations of Study:

- Retrospective, nonrandomized design
- Subjective decision-making process of choice of surgical technique
- Lack of standardized protocol for surgical techniques
- Snellen visual acuities
SB Complications

- Myopia
- Extra time
- Extrusion/intrusion/infection
- Strabismus
RD Repair - Two Beliefs

- RRD very heterogeneous condition, and an individualized approach to repair is preferable
- Encircling scleral buckling is a valuable component for repair of RD, because it supports the tears, and the vitreous base
Thank you
Thank you
Conclusions

- Pseudophakic RRDs do excellent with primary PPV
- Young phakic patients can do well with primary PPV but SBs should be considered
- Small-gauge PPV is as effective as 20-gauge

- Inferior RRDs can be repaired with primary PPV
- Great advantages of primary PPV for RRD Repair as previously mentioned:
  - Reproducible
  - Shorter operative time
  - Less pain
  - Quick postop recovery