Pars plana vitrectomy versus combined pars plana vitrectomy-scleral buckle versus scleral buckle for repair of primary rhegmatogenous retinal detachment

Thomas Wubben, MD, PhD
University of Michigan, Kellogg Eye Center
Financial Disclosures

• Wubben
  • Allergan: consulting

• Moinuddin, Chen, Sathrasala, Hwang
  • None

• Johnson
  • Serves on Data and Safety Monitoring Committees for trials sponsored by:
    • Pfizer
    • Syneos Health
    • Amgen
    • Aura Biosciences
  • Clinical trial support from:
    • Apellis

• Zacks
  • ONL Therapeutics: equity, consulting, royalties

• Besirli
  • ONL therapeutics: royalty
  • iRenix Medical: equity, consulting, royalty
  • Janssen: consulting
  • CureVac: consulting
Summary

• Retrospective, interventional case series from a multi-surgeon, single academic setting between 2011-2019

• Evaluate the anatomical and functional outcomes of PPV vs PPV/SB vs SB in the treatment of primary, noncomplex RRD

• No significant differences in single surgery success rates between PPV, PPV-SB, or SB

• PPV provides excellent results irrespective of lens status, macular involvement, or location of pathology with no added benefit from SB
Introduction

• Rhegmatogenous retinal detachment (RRD) is an important cause of vision loss and its incidence is increasing

• Fundamentals for RRD repair using any method:
  • Find the breaks
  • Seal the breaks
  • Plug the breaks

• Recent studies suggest that SB alone or the addition of SB improves outcomes in RRD over PPV alone
Purpose

• To compare anatomic and visual outcomes in eyes undergoing PPV with eyes undergoing PPV/SB or SB alone performed by a single group of experienced vitreoretinal surgeons at an academic institution
Methods

• Retrospective review of primary, non-complex, RRD cases that underwent PPV, SB, or PPV/SB
  • 12 vitreoretinal surgeons operating between 2011 and 2019

• Inclusion:
  • Minimum follow up of 3 months

• Exclusion:
  • Trauma, PDR, ROP, sickle cell retinopathy, exudative retinal detachment, myopic traction maculopathy, dialysis, dense cataract, PVR (any grade), endophthalmitis, GRT, posterior staphyloma, choroidal detachment, Stickler syndrome, intraocular malignancy, any history of intraocular surgery except cataract surgery.
  • RRD managed with pneumatic retinopexy, laser barricade, or observation

• Outcomes:
  • Single surgery anatomic success (SSAS)
  • Visual acuity (VA)
Results: demographics

- 751 eyes included
  - PPV - 89%
  - PPV/SB - 7%
  - SB - 4%

- Mean age was 55 years
  - SB: 33 ± 15 years (p<0.001)

- Mean length of post-op follow up was 30 months

- No significant difference in macular status, location, number of breaks, or lens status between PPV and PPV/SB
  - Size of RD was greater in PPV/SB (p=0.009)

### Table 1. Demographics of overall patient cohort and compared by surgical group.

<table>
<thead>
<tr>
<th></th>
<th>Total (N=751)</th>
<th>PPV (N=668)</th>
<th>PPV/SB (N=51)</th>
<th>SB (N=32)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>55 (±12)</td>
<td>56 (±11)</td>
<td>50 (±14)</td>
<td>33 (±15)</td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td>506 (67%)</td>
<td>452 (68%)</td>
<td>32 (63%)</td>
<td>22 (69%)</td>
</tr>
<tr>
<td><strong>Right Eye</strong></td>
<td>405 (54%)</td>
<td>362 (54%)</td>
<td>22 (43%)</td>
<td>21 (66%)</td>
</tr>
<tr>
<td><strong>Follow up (months)</strong></td>
<td>30 (±24)</td>
<td>32 (±25)</td>
<td>18 (±10)</td>
<td>12 (±6)</td>
</tr>
</tbody>
</table>

PPV - pars plana vitrectomy; PPV/SB - pars plana vitrectomy in combination with scleral buckle; SB - scleral buckle

### Table 2. Retinal detachment size, location, macular status, number of retinal breaks, & lens status

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>PPV</th>
<th>PPV/SB</th>
<th>SB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size (clock hours)</strong></td>
<td>4.8 (±2.0)</td>
<td>4.8 (±2.0)</td>
<td>5.6 (±2.0)</td>
<td>4.2 (±1.1)</td>
</tr>
<tr>
<td><strong>Hemisphere</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superior</td>
<td>385 (56%)</td>
<td>348 (57%)</td>
<td>19 (41%)</td>
<td>18 (56%)</td>
</tr>
<tr>
<td>Inferior</td>
<td>222 (32%)</td>
<td>192 (32%)</td>
<td>19 (41%)</td>
<td>11 (34%)</td>
</tr>
<tr>
<td>Equatorial</td>
<td>78 (11%)</td>
<td>67 (11%)</td>
<td>8 (18%)</td>
<td>3 (10%)</td>
</tr>
<tr>
<td><strong>Macula status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On</td>
<td>335 (45%)</td>
<td>303 (45%)</td>
<td>15 (29%)</td>
<td>17 (53%)</td>
</tr>
<tr>
<td>Off</td>
<td>416 (55%)</td>
<td>365 (55%)</td>
<td>36 (71%)</td>
<td>15 (47%)</td>
</tr>
<tr>
<td><strong>No. of retinal breaks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>293 (41%)</td>
<td>263 (41%)</td>
<td>19 (38%)</td>
<td>11 (37%)</td>
</tr>
<tr>
<td>2-4</td>
<td>208 (29%)</td>
<td>189 (30%)</td>
<td>15 (30%)</td>
<td>4 (13%)</td>
</tr>
<tr>
<td>&gt;4</td>
<td>215 (30%)</td>
<td>184 (29%)</td>
<td>16 (32%)</td>
<td>6 (19%)</td>
</tr>
<tr>
<td><strong>Lens status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phakic</td>
<td>441 (60%)</td>
<td>378 (58%)</td>
<td>35 (69%)</td>
<td>28 (90%)</td>
</tr>
<tr>
<td>Pseudophakic</td>
<td>295 (40%)</td>
<td>276 (42%)</td>
<td>16 (31%)</td>
<td>3 (10%)</td>
</tr>
</tbody>
</table>
Results: anatomic success

- SSAS:
  - PPV – 91.2%
  - PPV/SB – 84.3%
  - SB – 93.8%
  - Macula status, inferior retinal breaks, total number of retinal breaks, or lens status had no effect on SSAS within each surgical group

- PPV vs PPV/SB vs SB:
  - No differences in overall SSAS (p=0.27)
  - No difference in SSAS when controlling for presence of inferior breaks (p=0.73)

- PPV SSAS superior to PPV/SB
  - Phakic (92% vs 80%, p=0.02)

Table 3. Anatomic outcomes by surgery.

<table>
<thead>
<tr>
<th></th>
<th>PPV N (%)</th>
<th>PPV/SB N (%)</th>
<th>SB N (%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSAS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>609/668 (91%)</td>
<td>43/51 (84%)</td>
<td>30/32 (94%)</td>
<td>0.267</td>
</tr>
<tr>
<td>Macula On</td>
<td>281/303 (93%)</td>
<td>11/15 (73%)</td>
<td>15/17 (88%)</td>
<td>0.026</td>
</tr>
<tr>
<td>Macula Off</td>
<td>328/365 (90%)</td>
<td>32/36 (89%)</td>
<td>15/15 (100%)</td>
<td>0.201</td>
</tr>
<tr>
<td>Inferior breaks</td>
<td>233/262 (89%)</td>
<td>17/20 (85%)</td>
<td>14/15 (93%)</td>
<td>0.732</td>
</tr>
<tr>
<td>Non-inferior breaks</td>
<td>376/406 (93%)</td>
<td>26/31 (84%)</td>
<td>16/17 (94%)</td>
<td>0.283</td>
</tr>
<tr>
<td>Phakic</td>
<td>349/378 (92%)</td>
<td>28/35 (80%)</td>
<td>26/28 (93%)</td>
<td>0.044</td>
</tr>
<tr>
<td>Pseudophakic</td>
<td>248/276 (90%)</td>
<td>15/16 (94%)</td>
<td>3/3 (100%)</td>
<td>0.633</td>
</tr>
</tbody>
</table>
Results: visual outcomes

- **Overall Cohort**
  - No difference in final VA between PPV and SB (P = 0.598)
  - PPV/SB VA was inferior to PPV (p=0.001) and SB (p=0.014)

- **Macular Status**
  - Mac-on: PPV/SB < PPV (p=0.013) or SB (p=0.019)

- **Retinal break location**
  - Lack of inferior pathology: PPV/SB < PPV (p<0.001) or SB (p=0.009)
  - Inferior breaks: no difference among groups

- **Lens Status**
  - Pseudophakic at time of RD: PPV>PPV/SB (p=0.002)

### Table 4. Visual outcomes by surgery.

<table>
<thead>
<tr>
<th></th>
<th>PPV Mean (±SD)</th>
<th>PPV/SB Mean (±SD)</th>
<th>SB Mean (±SD)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Acuity (logMAR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>0.17 (±0.33)</td>
<td>0.29 (±0.34)</td>
<td>0.14 (±0.30)</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Macula On</td>
<td>0.12 (±0.31)</td>
<td>0.28 (±0.35)</td>
<td>0.09 (±0.29)</td>
<td>p=0.014</td>
</tr>
<tr>
<td>Macula Off</td>
<td>0.22 (±0.32)</td>
<td>0.29 (±0.35)</td>
<td>0.23 (±0.26)</td>
<td>p=0.351</td>
</tr>
<tr>
<td>Inferior breaks</td>
<td>0.18 (±0.35)</td>
<td>0.16 (±0.31)</td>
<td>0.12 (±0.31)</td>
<td>p=0.589</td>
</tr>
<tr>
<td>Non-inferior breaks</td>
<td>0.17 (±0.31)</td>
<td>0.39 (±0.33)</td>
<td>0.17 (±0.29)</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Phakic</td>
<td>0.18 (±0.33)</td>
<td>0.25 (±0.34)</td>
<td>0.13 (±0.29)</td>
<td>p=0.084</td>
</tr>
<tr>
<td>Pseudophakic</td>
<td>0.16 (±0.32)</td>
<td>0.36 (±0.35)</td>
<td>0.18 (±0.33)</td>
<td>p=0.002 (PPV &gt; PPV/SB)</td>
</tr>
</tbody>
</table>
Strengths and Limitations

• Strengths:
  • Largest single institution, primary RRD case series
  • Longest documented follow-up on surgical management of primary RRD

• Limitations:
  • Retrospective nature of study
  • No randomization or standardization of surgical technique
  • Cases dominated by PPV
Conclusions

- No significant differences were noted in single surgery success between PPV, PPV/SB, or SB for primary, non-complex RRD
  - PPV alone SSAS was comparable to recently reported PPV/SB SSAS from other groups

- PPV can provide excellent anatomical and functional results irrespective of lens status, macular involvement, or location of pathology with no added benefit from the addition of a SB
Acknowledgements

• Co-authors:
  • Omar Moinuddin, MD
  • Rebhi Abuzaitoun
  • Xing Chen, MD
  • Sanjana Sathrasala
  • Min W. Hwang
  • Joshua D. Stein, MD, MS
  • Mark W. Johnson, MD
  • David N. Zacks, MD, PhD
  • Cagri G. Besirli, MD, PhD