Complications and Management of Post-vitrectomy Circumferential Retinal Detachment
Yu-Chi Lin,1,2 Wen-Huei Chang,2 Chung-May Yang2*

Four consecutive patients with chronic peripheral circumferential detachment developed vision-threatening complications requiring further treatment. All four cases had more than one previous vitreoretinal surgery; two cases had silicone oil intravitreally and three had crystalline lens removed. The main complications included chronic hypotony (1 case), rubeosis iridis (4 cases), intraocular hemorrhage (1 case), neovascular glaucoma (1 case), and cataract (1 case). Retinectomy with peripheral traction release and silicone oil infusion resulted in improvement or stabilization of visual function in all four cases. [J Formos Med Assoc 2009;108(4):333–336]

Key Words: anterior proliferative vitreoretinopathy, hypotony, peripheral circumferential detachment, rubeosis iridis

Pars plana vitrectomy with gas or silicone oil tamponade and endolaser photocoagulation is a common surgical procedure for managing complicated rhegmatogenous retinal detachment (retinal break-induced separation of the sensory retina and the underlying retinal pigment epithelium). Post-vitrectomy recurrent retinal detachment by peripheral breaks with or without anterior proliferative vitreoretinopathy may be limited in the peripheral area by the equatorial laser-induced chorioretinal scar. This peripheral circumferential detachment (PCD) may involve mainly the inferior retina, especially when the upper retina has obtained long-term tamponade from silicone oil, or may extend annularly to create a tube-shaped detachment. Because the posterior retina including the macula is attached, central vision remains unaffected initially. However, complications may develop later and cause significant vision loss.1 We report the complications and management of four cases of recurrent detachment with such configurations.

Case Reports

From June 1999 to March 2005, four consecutive cases of PCD that developed complications causing decrease in visual acuity were managed with vitreoretinal surgeries. A chart review was done to record pre- and postoperative visual acuity, intraocular pressure, and ophthalmologic findings. Data regarding the onset time of eye symptoms and types of complications, treatment methods, follow-up duration, and outcomes were compiled.

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All four patients were men with their right eye involved. Their ages were 46, 60, 39 and 40 years, respectively, for Cases 1, 2, 3 and 4. All patients had undergone more than one vitreoretinal operation for repairing rhegmatogenous retinal detachment. Crystalline lens removal had been done in Cases 2, 3 and 4. Cases 3 and 4 had silicone oil filled. All four cases had attached posterior retina. Blurred vision was noticed in the first three patients, with Case 3 experiencing eye pain. Case 4 had only mild eye discomfort. The onset time of symptoms was 12 and 14 weeks after the last operation in the two patients with no intraocular silicone oil (Cases 1 and 2), and 22 and 24 weeks in the other two.

Preoperative visual acuity before PCD surgery ranged from light perception to 10/200; Case 2 was hypotonic and Case 3 had high intraocular pressure. Hyphema and dense cataract were found in Case 1; silicone oil migrating to the anterior chamber was noted in Case 3; and all four cases had rubeosis iridis. During operation, PCD for at least 180° was noted in all four patients; retinal-ciliary adhesion was noted in Cases 2, 3 and 4. Perioperative visual acuity before PCD surgery ranged from light perception to 10/200. Case 2 had rubeosis iridis. In Case 2, intravitreal silicone oil injection was done in all four eyes. After surgery, the retina was completely attached in three eyes and stabilized at about 5 mmHg in the eye with preoperative hypotony (Case 1). Silicone oil migrated to the anterior chamber was noted in Case 3. All four patients developed iris rubeosis. Rubeosis iridis usually develops in extensive, extensive hemorrhage, neovascular glaucoma, and cataract.

The characteristics of the four cases are summarized in the Table. An example (Case 3) is shown in Figures 1–3.

### Table. Characteristics of the four consecutive cases of peripheral circumferential detachment (PCD)

<table>
<thead>
<tr>
<th>Case</th>
<th>Age (yr)</th>
<th>Sex</th>
<th>Eye</th>
<th>Preop VA</th>
<th>Preop IOP (mmHg)</th>
<th>Hyphema</th>
<th>Iris rubeosis</th>
<th>Previous op procedures</th>
<th>Onset time (wk)</th>
<th>Management</th>
<th>Findings</th>
<th>Anterior adhesion</th>
<th>FU (mo)</th>
<th>Final VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>46</td>
<td>M</td>
<td>OD</td>
<td>LP</td>
<td>9</td>
<td>+</td>
<td>+</td>
<td>PPV*2</td>
<td>14</td>
<td>Lensectomy + 360° retinectomy + endolaser + oil</td>
<td>Peripheral 360° RD</td>
<td>–</td>
<td>9</td>
<td>HM/50 cm</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>M</td>
<td>OD</td>
<td>CF/40 cm</td>
<td>1</td>
<td>–</td>
<td>+</td>
<td>SB<em>1 PPV</em>1 Lens extraction</td>
<td>12</td>
<td>360° retinectomy + endolaser + oil</td>
<td>Peripheral 360° RD</td>
<td>+</td>
<td>12</td>
<td>20/200</td>
</tr>
<tr>
<td>3</td>
<td>39</td>
<td>M</td>
<td>OD</td>
<td>10/200</td>
<td>39</td>
<td>–</td>
<td>+</td>
<td>PPV*2 SB + oil + lensectomy</td>
<td>26</td>
<td>270° retinectomy + oil refill</td>
<td>Peripheral 225° RD</td>
<td>+</td>
<td>6</td>
<td>20/200</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>M</td>
<td>OD</td>
<td>5/200</td>
<td>WNL</td>
<td>–</td>
<td>+</td>
<td>PPV*1 SB + oil + lensectomy</td>
<td>22</td>
<td>180° retinectomy + PI + oil refill</td>
<td>Peripheral 180° RD</td>
<td>–</td>
<td>22</td>
<td>10/200</td>
</tr>
</tbody>
</table>

Preop = before operation for PCD; VA = visual acuity; IOP = intraocular pressure; Previous op = previous operative methods; FU = follow-up; OD = right eye; LP = light perception; CF = counting fingers; WNL = within normal limits; PPV = pars plana vitrectomy; SB = scleral buckling; oil = intravitreal silicone oil injection; PI = peripheral iridectomy; RD = retinal detachment; HM = hand motions.

**Discussion**

The main complications associated with PCD in this report include chronic hypotony, rubeosis iridis, intraocular hemorrhage, neovascular glaucoma, and cataract. All four patients developed iris rubeosis. Rubeosis iridis usually develops in extensive hemorrhage, neovascular glaucoma, and cataract.
long-standing retinal detachment; however, this complication has been noted in retinal detachment limited to the peripheral area. In the study of Barile et al, post-vitrectomy iris neovascularization was noted as early as 3 weeks after the onset of peripheral recurrent retinal detachment. Hyphema or glaucoma may occur subsequently. This neovascular complication is thought to be a result of the release of angiogenic factors from a detached and ischemic peripheral retina or the direct extension of new vessels from anterior proliferative vitreoretinopathy. Chronic intraocular inflammation may be another contributing factor. All four cases in this report had undergone more than one vitreoretinal operation, which is

Figure 1. Case 3: fundus picture in the right eye before the second operation shows severe proliferative vitreoretinopathy concealing the disc.

Figure 2. Case 3: (A) postoperative fundus picture shows attached retina under silicone oil; (B) temporal peripheral retina and inferior peripheral retina were detached.

Figure 3. Case 3, after definite surgery: (A) the posterior retina remained attached; (B) the temporal peripheral retina became reattached.
associated with persistent inflammation. In two silicone-filled eyes, the onset of symptoms and signs related to rubeosis (22 weeks and 26 weeks) was later than in the other two cases without intraocular silicone oil (12 weeks and 14 weeks). The reasons may be due to delayed dispersion of angiogenic factors to the anterior chamber or less extensive detachment in the silicone oil-filled eye.

In this study, hypotony was found in one case and high intraocular pressure in another. Van Meurs and associates demonstrated that hypotony occurred more frequently than neovascular glaucoma in patients with a detached peripheral retina with rubeosis iridis. Defective aqueous humor production secondary to ciliary detachment and increased posterior outflow through the subretinal space may explain the relatively frequent occurrence of hypotony. On the other hand, if aqueous outflow is blocked sufficiently by neovascularization, neovascular glaucoma may occur.

To prevent PCD, it is important in the primary operation to meticulously remove the peripheral vitreous, adequately support the vitreous base, and properly seal peripheral breaks. When complications associated with PCD develop, this case review showed that prompt retinectomy with intravitreal silicone oil reinfusion may be a helpful option to reverse the process. Attempting to preserve the peripheral detached retina during reoperation may result in recurrent peripheral detachment or incomplete removal of the sources of angiogenic factors. A peripheral retinectomy serves the dual purpose of decreasing the risk of persistent neovascular stimuli from devitalized tissue and releasing retinal-ciliary traction. Intravitreal silicone oil is used to tamponade the retina and decrease hypotony-induced macular striae. We assume that it may also prevent angiogenic factors from reaching the anterior segment. In this case review, the rubeosis iridis regressed and the retina remained attached. However, visual acuity improvement was hampered by the previous retinal conditions.

In summary, our small series suggests that PCD may lead to vision-threatening complications such as chronic hypotony, rubeosis iridis, intraocular hemorrhage, glaucoma and cataract. Early recognition and proper management may preserve some visual function.

References