SURGEON’S CORNER

Combined Posterior Chamber Intraocular Lens, Vitrectomy, Retisert, and Pars Plana Tube in Noninfectious Uveitis

Zaaira M. Ahmad, MD; Bret A. Hughes, MD; Gary W. Abrams, MD; Tamer H. Mahmoud, MD, PhD

Objective: To assess the safety and efficacy of combined cataract extraction, posterior chamber intraocular lens placement, pars plana vitrectomy, fluocinolone acetonide intravitreal implant (Retisert), and Ahmed valves with pars plana tube (CPR-PT) in eyes with chronic, posterior, noninfectious uveitis.

Methods: Retrospective study of patients who underwent CPR-PT. Outcome measures included visual acuity, intraocular pressure, inflammation, and complications.

Results: Eight eyes were included, with a mean follow-up of 18 months. Mean visual acuity improved from 1.89 to 0.14 logMAR (Snellen, counting fingers at 2 ft [0.6 m] to 20/30; \( P = .01 \)). Mean intraocular pressure remained stable at 16 to 17 mm Hg (\( P = .35 \)). The number of glaucoma medications per eye decreased from 2.9 to 0.25 (\( P = .01 \)). Systemic prednisone therapy was discontinued in all patients by 9 months postoperatively. Inflammation was well controlled in all eyes.

Conclusion: The CPR-PT procedure allows rapid visual rehabilitation without major short-term complications.

Arch Ophthalmol. 2012;130(7):908-913

METHODS

This retrospective interventional study was undertaken with institutional review board approval obtained by the Wayne State University Human Investigation Committee. All eyes with combined CPR-PT procedures performed at Kresge Eye Institute between September 1, 2007, and May 31, 2009, were included. All patients had at least 1 year of follow-up. Patients were considered for CPR-PT if they had chronic, recurrent, noninfectious posterior uveitis with advanced cataract and elevated intraocular pressure (IOP) requiring medical management (Table 1). All patients had extensive laboratory workups to rule out an infectious etiology of uveitis. Patients included were receiving a combination of periocular and/or systemic corticosteroids and immunomodulatory drugs before surgery.
Table 1. Preoperative Patient Characteristics

<table>
<thead>
<tr>
<th>Eye</th>
<th>Cataract</th>
<th>C/D Ratio</th>
<th>CME</th>
<th>Vitreous Cell</th>
<th>AC Cell</th>
<th>AC Flare</th>
<th>Duration of Uveitis, y</th>
<th>Previous Corticosteroid Injections</th>
<th>Choriretinal Lesions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4+ PSC</td>
<td>Unable</td>
<td>Prominent on B-scan</td>
<td>Opacities on B-scan</td>
<td>3+</td>
<td>3+</td>
<td>&gt;5</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>4+ PSC</td>
<td>Unable</td>
<td>Prominent on B-scan</td>
<td>Opacities on B-scan</td>
<td>3+</td>
<td>3+</td>
<td>&gt;5</td>
<td>Many PSTKs</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>5+ PSC</td>
<td>None</td>
<td>None on B-scan</td>
<td>Opacities on B-scan</td>
<td>3+</td>
<td>3+</td>
<td>32</td>
<td>1 PSTK for CME</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>2+ PSC</td>
<td>0.8</td>
<td>CME on SDOCT</td>
<td>2+ Vitreous cell and haze, snowballs</td>
<td>2+</td>
<td>2+</td>
<td>4</td>
<td>1 PSTK for CME</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>3+ PSC</td>
<td>0.75</td>
<td>CME on SDOCT</td>
<td>2+ Vitreous cell and haze, snowballs</td>
<td>2+</td>
<td>2+</td>
<td>4</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>3+ PSC</td>
<td>None</td>
<td>None on B-scan</td>
<td>Opacities on B-scan</td>
<td>2+</td>
<td>2+</td>
<td>&gt;2</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>3+ PSC</td>
<td>None</td>
<td>None on B-scan</td>
<td>Opacities on B-scan</td>
<td>2+</td>
<td>2+</td>
<td>&gt;2</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>4+ PSC</td>
<td>None</td>
<td>None on B-scan</td>
<td>Opacities on B-scan</td>
<td>2+</td>
<td>2+</td>
<td>&gt;1</td>
<td>None</td>
<td>No</td>
</tr>
</tbody>
</table>

Abbreviations: AC, anterior chamber; C/D, cup to disc; CME, cystoid macular edema; PSC, posterior subcapsular cataract; PSTK, posterior subtenon triamcinolone acetonide; SDOCT, spectral-domain optical coherence tomography.

a Degree of inflammation is reported using Standardization of Uveitis Nomenclature.10

SURGICAL TECHNIQUE

The operation was performed under monitored anesthesia care, with intravenous sedation and local anesthesia in the form of a retrobulbar block (50/50 mixture of lidocaine, 4%, and bupivacaine, 0.75%). Cataract extraction with synchielosis, capsular tension ring placement in some eyes, and PCIOL placement was performed through a clear corneal approach. A 10-0 nylon suture was used to close the corneal wound to help maintain chamber stability during vitrectomy. A 360° peritomy was then performed. An infusion cannula was placed in the inferotemporal quadrant and 20-gauge PPV was carried out, during which care was taken to detach the posterior hyaloid and shave the vitreous base, which care was taken to detach the posterior hyaloid and shave the vitreous base, relieving any peripheral traction. The sclerotomies sites were then plugged. Attention was turned to the fluocinolone acetonide implant, using the previously described surgical technique. Briefly, the implant was prepared on a dry surface by passing a single 8-0 double-armed polypropylene suture (Prolene; Ethicon) through the hole in the strut of the implant and tying it with a single throw. A 19-gauge microvitrectinal blade was used to create a scleral wound inferonasally 3.5 mm posterior to the limbus and 3.5 mm wide. The implant was inserted into the vitreous cavity, and the 8-0 polypropylene suture was passed on either side of the sclera and tied in place. The implant was visualized to be inside the vitreous cavity. The sclerotectomy was closed with interrupted 0-0 polypropylene sutures over the remaining long tails of the 8-0 polypropylene suture. An anterior chamber tube (Ahmed valve; New World Medical, Inc) was then secured in the superotemporal quadrant with insertion of the tube into the pars plana (PPT). The model FP7 Ahmed valve, which has a clip to angle the tube 90° for scleral insertion into the vitreous cavity, was used in some eyes. The tube was covered with a sterile pericardial patch graft (Tutoplast; Tutogen Medical). Both the fluocinolone acetonide implant and PPT were visualized in the vitreous cavity. The sclerotomies were sutured with 7-0 polyglactin 910 (Vicryl; Ethicon), and the conjunctiva was closed with 6-0 plain gut. Subconjunctival cefazolin sodium and dexamethasone sodium phosphate were administered. Postoperatively, topical and systemic corticosteroids and immunomodulatory drug therapies were slowly tapered and discontinued as tolerated.

STATISTICAL ANALYSIS

Statistical analysis was performed using commercial software (PASW Statistics, version 18; SPSS, Inc). A Wilcoxon signed rank test was used to determine statistical significance.

RESULTS

Eight eyes (5 patients) with panuveitis10 with mean follow-up of 18 months (range, 13-27 months) were included in the study. All 8 eyes received a single procedure consisting of synchielosis, CE/PCIOL, PPV, fluocinolone acetonide implant, and Ahmed valve with PPT placement. One eye had a sulcus intraocular lens placed because of a posterior capsular tear, 4 eyes had prophylactic capsular tension rings placed, and 3 eyes had a PPT clip placed. Two eyes had preexisting anterior chamber tubes (Ahmed valves) that were diverted to the pars plana secondary to corneal erosion (Table 2).

VISUAL ACUITY

All eyes had improved visual acuity after the procedure (Table 3). All 8 eyes improved 3 or more lines, and no eyes had worsened visual acuity at any time. Mean (SD) visual acuity improved significantly from preoperative 1.89 (0.93) logMAR (Snellen, approximately counting fingers at 2 ft [0.6 m]) to postoperative 0.14 (0.15) logMAR (Snellen = 20/30) (P = .01). All 8 eyes had a visual acuity of 20/200 or worse (range, 20/200 to hand motions) preoperatively and improved to 20/40 or better (range 20/20 to 20/40) at final follow-up. Six eyes had visual acuity of 20/30 or better at final follow-up. All patients showed an intact outer segment/inner segment photoreceptor junction on postoperative spectral-domain optical coherence tomography corresponding to the recovery of visual acuity.

INTRAOCULAR PRESSURE

Intraocular pressure remained stable after surgery in all eyes (Table 4). Mean postoperative IOP (17 [5] mm Hg; range, 12-24 mm Hg) was similar to mean preoperative IOP (16 [6] mm Hg; range, 11-25 mm Hg) (P = .35). All patients were receiving fewer glaucoma drops postoperatively (mean, 0.25 [0.46] drop) than preoperatively (mean, 2.9 [0.8] drops) (P = .01). Acetazolamide was required in 1 patient (2 eyes) preoperatively and successfully discontinued after surgery. Two eyes devel-
oped pupillary block and iris bombe, which were successfully relieved with peripheral laser iridotomy. No other glaucoma procedures were required to control IOP.

**CONTROL OF INFLAMMATION**

Uveitis was graded using Standardization of Uveitis Nomenclature. There was a statistically significant decrease in the number of uveitis flares postoperatively compared with the year before surgery (P = .02). All patients had at least 1 flare (mean, 1.9 flares) in the year before surgery, but in our study group, no patient experienced a flare postoperatively.

Inflammation was well controlled (trace anterior vitreous and/or anterior chamber cell or less) in all eyes postoperatively, with no eyes requiring periocular or intraocular corticosteroid injections, systemic corticosteroids, or immunomodulatory drugs once systemic and topical medications were tapered to discontinuation (Table 5). This was in stark contrast to preoperative conditions in which all 8 eyes required systemic prednisone (mean dosage, 48 [34] mg/d; range, 5-80 mg/d; P = .01), with 5 eyes requiring large dosages of 60 to 80 mg/d, and 3 eyes required systemic immunomodulatory drugs (methotrexate sodium or azathioprine) for adequate inflammatory control. Oral prednisone was restarted postoperatively in 1 patient for treatment of nephropathy. Inflammation was well controlled in all eyes at the final follow-up visit.

**COMPLICATIONS**

Two eyes developed pupillary block because of 360° of posterior synechiae, which was relieved with peripheral laser iridotomy. Three eyes experienced a transient vitreous hemorrhage immediately postoperatively, which resolved within 3 weeks without sequelae. Two eyes with epiretinal membranes developed mild choroidal effusion without hypotony that spontaneously resolved within 2 weeks. One eye with lower initial IOP without hypotony showed a longer tube crossing behind the PCIOL, and this retracted slightly to a more peripheral position with normalization of the IOP. After that, we preferred an Ahmed valve with a pars plana clip to control the length of the tube in the pars.
plana, maintain good positioning and curvature in the vitreous cavity to avoid occlusion by the iris, and avoid tube kinking through the sclera that could reduce long-term control of IOP. Two eyes of 1 patient (patient 3) developed mild cystoid macular edema associated with epiretinal membrane at 1 year but maintained good visual acuity and did not require treatment. There were no other complications related to the surgical procedure. Of note, there were no cases of hypotony, retinal detachment, suprachoroidal hemorrhage, exposure of the tube or fluocinolone acetonide implant, or endophthalmitis. No patient required additional surgical procedures during the follow-up period.

**COMMENT**

The standard of care in the treatment of chronic noninfectious posterior uveitis has consisted of intraocular and periocular corticosteroid injections and systemic corticosteroid, immunomodulatory, and cytotoxic agents. These treatments are fraught with limitations. Systemic adverse effects (including hyperglycemia, blood dyscrasias, malignant neoplasm, sterility, and gastrointestinal ulceration) and minimal delivery to target intraocular tissue due to the blood ocular barrier limit the usefulness of systemic medications. Periocular and intraocular corticosteroid injections are limited by their relatively short duration requiring repeated injections and the risk of local complications, including endophthalmitis and globe

### Table 4. Preoperative and Postoperative IOP and Glaucoma Medication Therapy

<table>
<thead>
<tr>
<th>Patient No./ Eye</th>
<th>Preoperative IOP, mm Hg/Medications</th>
<th>Postoperative IOP/Medications by Month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>1/OD</td>
<td>19/Timolol maleate, brimonidine tartrate, brinzolamide</td>
<td>24/Timolol</td>
</tr>
<tr>
<td>1/OS</td>
<td>24/Timolol, brimonidine, brinzolamide</td>
<td>18/None</td>
</tr>
<tr>
<td>2/OD</td>
<td>14/Brimonidine/timolol</td>
<td>20/Brimonidine</td>
</tr>
<tr>
<td>3/OD</td>
<td>11/Brimonidine, dorzolamide hydrochloride</td>
<td>15/None</td>
</tr>
<tr>
<td>3/OS</td>
<td>12/Brimonidine, dorzolamide, timolol, bimatoprost, brinzolamide, acetazolamide</td>
<td>17/None</td>
</tr>
<tr>
<td>4/OS</td>
<td>12/Brimonidine, timolol, bimatoprost, brinzolamide, acetazolamide</td>
<td>12/None</td>
</tr>
<tr>
<td>5/OS</td>
<td>25/Timolol, dorzolamide, brimonidine</td>
<td>13/None</td>
</tr>
</tbody>
</table>

**Table 5. Preoperative and Postoperative Corticosteroid and Immunomodulatory Drug Therapy**

<table>
<thead>
<tr>
<th>Patient No./ Eye</th>
<th>Preoperative Medications, Dosage</th>
<th>Postoperative Medications by Month, Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>1/OD</td>
<td>Prednisone, 80 mg/d</td>
<td>Prednisone, 40 mg/d</td>
</tr>
<tr>
<td>1/OS</td>
<td>Prednisone, 80 mg/d</td>
<td>Prednisone, 40 mg/d</td>
</tr>
<tr>
<td>2/OD</td>
<td>Prednisone, 80 mg/d</td>
<td>Prednisone, 60 mg/d</td>
</tr>
<tr>
<td>3/OD</td>
<td>Prednisone, 60 mg/d</td>
<td>None</td>
</tr>
<tr>
<td>3/OS</td>
<td>Prednisone, 60 mg/d Methotrexate 20 mg/wk</td>
<td>Prednisone, 60 mg/d</td>
</tr>
<tr>
<td>4/OD</td>
<td>Prednisone, 10 mg/d</td>
<td>None</td>
</tr>
<tr>
<td>4/OS</td>
<td>Prednisone, 10 mg/d</td>
<td>None</td>
</tr>
<tr>
<td>5/OS</td>
<td>Azathioprine, 50 mg, 3 times/d Prednisone, 10 mg, every other day</td>
<td>None</td>
</tr>
</tbody>
</table>

**Table 4. Preoperative and Postoperative IOP and Glaucoma Medication Therapy**

**Table 5. Preoperative and Postoperative Corticosteroid and Immunomodulatory Drug Therapy**

**Abbreviations:** ellipses, information not available; IOP, intraocular pressure; OD, right eye; OS, left eye.

<sup>a</sup> Prednisone therapy was restarted for treatment of nephropathy; there was no intraocular inflammation.
perforation. Intravitreal fluocinolone acetonide implants circumvent these limitations by providing release of corticosteroid medication directly into the vitreous cavity, where it is most effective. In complicated cases of uveitis in which there is a preexisting cataract and elevated IOP or a history of strong corticosteroid response, it makes sense to address the cataract and elevate IOP at the time of fluocinolone acetonide implant insertion, particularly given the high rate of postimplant cataract and glaucoma.

Our study shows that CE and Ahmed valve PPT placement can be combined with a fluocinolone acetonide implant and PPV in a single surgical procedure with good anatomic and functional outcomes and no serious adverse effects. In fact, these patients may do better than those in whom the procedures are performed separately. Patients are spared the risks of anesthesia associated with multiple procedures as well as the inconvenience and cost. More important, the concomitant anti-inflammatory effects of fluocinolone acetonide implants may allow for more successful outcomes with both the CE/PCIOL and PPT, since many of the postoperative complications associated with these procedures are secondary to inflammation. These complications are largely avoided with the addition of fluocinolone acetonide implants, which provides excellent control of postoperative inflammation and significantly reduces the need for systemic, periocular, and topical corticosteroid therapy. For example, a high percentage (12%-46%) of patients with uveitis develop cystoid macular edema after CE, particularly when there is a recurrence of inflammation. Fluocinolone acetonide implants can reduce cystoid macular edema in up to 73% of eyes that receive them.

All our patients achieved excellent postoperative inflammatory control with no recurrences. We opted for slow postoperative tapering of oral corticosteroid therapy given that all eyes in our study represented very complicated advanced cases of posterior uveitis and performing a combined surgical procedure would be expected to result in a more severe inflammatory response than would be seen with fluocinolone acetonide implants alone.

Only 2 eyes in our study required any IOP-lowering treatments. These were the first 2 cases, which had anterior chamber tubes diverted to the pars plana. This may be explained by initial encapsulation around those tubes that may have affected long-term outcomes and resulted in decreased success with regard to controlling IOP compared with primary PPTs. However, those 2 eyes had the longest follow-up, and other primary PPTs may eventually show similar IOP responses. Nonetheless, we believe that the proximity of the PPT to the fluocinolone acetonide implant in the vitreous cavity may have a better long-term IOP outcome than anterior chamber tubes or trabeculectomies. Moreover, PPTs have the added benefit of sparing corneal endothelium, the loss of which is commonly seen in anterior chamber tubes.

Limitations of our study include its small sample size, retrospective design with lack of a control group, and relatively short follow-up. Prospective studies with larger sample sizes and longer follow-up are needed. However, our results are promising. All our patients had significantly improved visual acuity (preoperative range, 20/200 to hand motions and postoperative range, 20/20 to 20/40), with excellent postoperative inflammatory control without the use of topical and systemic corticosteroids, immunomodulatory drugs, and IOP-lowering agents. The CPR-PT combined procedure seems to be a good surgical option for eyes with advanced chronic noninfectious uveitis, cataract, and elevated IOP. At least in the short term, there are no major complications.

Submitted for Publication: April 5, 2011; final revision received September 6, 2011; accepted September 7, 2011.

Correspondence: Tamer H. Mahmoud, MD, PhD, Vitreoretinal Surgery, Duke University Eye Center, Erwin Rd, Box 3802, Durham, NC 27710 (tamer.mahmoud@duke.edu).

Author Contributions: Dr Mahmoud had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Financial Disclosure: None reported.

Funding/Support: This work was supported by an unrestricted grant from Research to Prevent Blindness, Inc.

REFERENCES

12. Okhravi N, Lightman SL, Towler HM. Assessment of visual outcome after cataract surgery in...

Cotton-Wool Spot and Optical Coherence Tomography of a Retinal Nerve Fiber Layer Defect
Li Zhang, MD
Liang Xu, MD
Jing-Shang Zhang, MD
Ya-Qin Zhang, MD
Hua Yang, MD
Jost B. Jonas, MD

A 53-year-old woman with severe arterial hypertension was concerned about flashes and a shadow in her left eye. Perimetry revealed an arc-shaped visual field defect in the superior hemisphere. Ophthalmoscopy showed a large cotton-wool spot inferior of the optic disc (Figure 1, above). Optical coherence tomography showed an edema of the retinal nerve fiber layer in the area of the cotton-wool spot. One year later, perimetry was unchanged. On ophthalmoscopy, an inferior wedge-shaped defect of the retinal nerve fiber layer was detected (Figure 2A, right, white arrows), while the cotton-wool spot completely vanished. Optical coherence tomography revealed a marked reduction in the retinal nerve fiber layer thickness in the corresponding region (Figure 2B, black arrows; Figure 2C, green area). Consequences of severe arterial hypertension in the retina can be detected long after cotton-wool spots vanish by optical coherence tomography showing localized retinal nerve fiber layer defects.

G indicates global; ILM, internal limifying membrane; INF, inferior; N, nasal; NAS, nasai; NI, nasal inferior; NS, nasal superior; RNFL, retinal nerve fiber layer; RNFLT, retinal nerve fiber layer thickness; SUP, superior; T, temporal; TI, temporal inferior; TMP, temporal; and TS, temporal superior.