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.

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VEITIS ACCOUNTS FOR UP to 10% of blindness in the United States.1 Until recently, treatment options for posterior uveitis were largely limited to short-lived periorcular and intraocular corticosteroids or systemic corticosteroids and immunomodulatory drugs, which have significant potential systemic adverse effects.2,3 Intravitreal fluocinolone acetonide implants (Retisert; Bausch and Lomb Inc) allow for localized sustained release of a corticosteroid into the vitreous cavity, thus maximizing efficacy while minimizing systemic adverse effects.3,5 Ocular adverse effects commonly seen with fluocinolone acetonide implants include visually significant cataracts requiring surgery (93% of patients) and glaucoma (75% of patients, with 37%-40% requiring surgery).3,6,7 There have been reports8,9 of combined fluocinolone acetonide implantation and cataract extraction (CE), as well as reports of combined fluocinolone acetonide implant and glaucoma tube shunt placement; however, to our knowledge, there have been no reports to date of the 3 procedures combined. Patients with noninfectious uveitis complicated by advanced cataract and glaucoma represent an extremely challenging situation. For these complicated cases, we describe our experience with a single combined procedure of CE, posterior chamber intraocular lens (PCIOL) placement, pars plana vitrectomy (PPV), intravitreal fluocinolone acetonide implant placement (Retisert; Bausch & Lomb Inc), and pars plana tube (PPT) placement (CPR-PT). Outcome measures included visual acuity, intraocular pressure, inflammation, and complications.

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.
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 synchiaeolysis, 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 tying it with a single throw. A 20-gauge PPV was carried out, during which care was taken to detach the posterior hyaloid and shave the vitreous base, ensuring any peripheral traction. The sclerotomies were sutured with 7-0 polyglactin 910 (Vicryl; Ethicon), and the conjunctiva was closed with 6-0 plain gut.

A sterile pericardial patch graft (Tutogen Medical) was used to create a scleral wound inferonasally 3.5 mm posterior to the limbus and tied in place. The tube was covered with 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 fluorocinolone 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 panuveitis were included in the study. All 8 eyes received a single procedure consisting of synchiaeolysis, CE/PCIOL, PPV, fluorocinolone 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.

### INTRAOCULAR PRESSURE

Intraocular pressure remained stable after surgery in all eyes. 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. Periorcular and intraocular corticosteroid injections are limited by their relatively short duration requiring repeated injections and the risk of local complications, including endophthalmitis and globe

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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>...</td>
</tr>
<tr>
<td>3/OS</td>
<td>12/Brimonidine, dorzolamide</td>
<td>...</td>
</tr>
<tr>
<td>4/OD</td>
<td>14/Brimonidine, timolol, bimatoprost, brinzolamide, acetazolamide</td>
<td>...</td>
</tr>
<tr>
<td>4/OS</td>
<td>12/Brimonidine, timolol, bimatoprost, brinzolamide, acetazolamide</td>
<td>...</td>
</tr>
<tr>
<td>5/OS</td>
<td>25/Timolol, dorzolamide, brimonidine</td>
<td>13/None</td>
</tr>
</tbody>
</table>

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

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>Methotrexate 20 mg/leq</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</td>
<td>None</td>
</tr>
</tbody>
</table>

Abbreviations: ellipses, information not available; OD, right eye; OS, left eye.

*Prednisone therapy was restarted for treatment of nephropathy; there was no intraocular inflammation.*

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perforation. Intravitreal fluocinolone acetone 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 elevated IOP at the time of fluocinolone acetone implant insertion, particularly given the high rate of postimplant cataract and glaucoma particularly given the high rate of elevated IOP at the time of fluocinolone acetone implantation.3,6,7

Our study shows that CE and Ahmed valve PPT placement can be combined with a fluocinolone acetone 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 acetone 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.9,11 These complications are largely avoided with the addition of fluocinolone acetone 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.12-16 Fluocinolone acetone implants can reduce cystoid macular edema in up to 73% of eyes that receive them.7

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 acetone 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 acetone 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.17-19

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.

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REFERENCES


Cotton-Wool Spot and Optical Coherence Tomography of a Retinal Nerve Fiber Layer Defect

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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 limiting 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.