Sudden Reversible Vitritis After Keratoprosthesis
An Immune Phenomenon?

Mahnaz Nouri, MD, Marlene L. Durand, MD, and Claes H. Dohlman, MD, PhD

Purpose: To report our experience with late vitritis associated with keratoprosthesis (KPro).

Methods: Between 1990 and 2003, 218 patients underwent an all-poly(methylmethacrylate), collar-button-shaped KPro surgery. Eight patients developed a total of 12 episodes of sudden, massive vitritis. Five of these patients had an Ahmed shunt implant, 3 had anterior vitrectomy during surgery, and 4 had a soft contact lens in place. Preoperative diagnoses were multiple graft failures, chemical burn, Stevens-Johnson syndrome, or ocular cicatricial pemphigoid. All patients were maintained on prophylactic topical ofloxacin 0.3% or polymyxin-B/trimethoprim, as well as prednisolone acetate 1% (in 2 cases, medroxyprogesterone 1%), at least twice daily. Vancomycin (14 mg/mL) was also given twice daily in 2 patients.

Results: Vitritis occurred in 8 patients (12 episodes), 2 to 23 months postoperatively. All patients presented with sudden, very marked decrease in vision, with little or no pain, tenderness, conjunctival redness, or discharge. Eight of the 12 events were subjected to vitreous tap and injection of antibiotics and steroids on the day of presentation. Cultures grew Staphylococcus epidermidis, only in liquid (broth) media, in 3 cases; the other 5 showed no growth. The vitritis episodes resolved after 2 to 9 weeks. Full recovery to pre-episode status of a quiet eye with clear vitreous was seen in all patients. Visual acuity recovered almost completely or completely (mental debilitation in one patient made accurate assessment uncertain).

Conclusions: This phenomenon of sudden vitritis after KPro, with few other symptoms and with complete recovery, would be uncharacteristic of a bacterial endophthalmitis. It may represent a uveitic immune phenomenon.

Key Words: keratoprosthesis, sterile vitritis
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8 patients with vitritis, 3 had no holes in the back plate; the rest had holes. Approximately 142 cases had glaucoma shunt tube devices implanted. Of the 8 patients who developed vitritis, 5 had also received an Ahmed shunt (S-2) implant during the initial surgery. Of the 8 patients who developed vitritis, the numbers of intraocular surgical procedures before the KPro surgery were as follows: patients 1 and 5 had none, patient 2 had 2, patients 3 and 6 had 1, patients 4 and 8 had 3, and patient 7 had 4.

Three patients had anterior vitrectomy. Five eyes were aphakic, and 3 were pseudophakic. The specifications of the intraocular lens are not known because they had been in place for a long time.

Four of the 6 patients with the type I device had a soft contact lens on the eye on presentation.

The preoperative diagnoses were multiple failed grafts in nonautoimmune, nonburn cases (5 patients), chemical burns (1), SJS (1), and OCP (1). The OCP and SJS patients had a through-the-lid (type II) KPro; the others had the standard (type I) device. The initial cohort of patients with SJS included a total of 24 cases; only the 1 included in the study had significant late vitritis.

All patients were maintained on prophylactic medication consisting of topical ofloxacin 0.3% or polymyxin-B/tri-methoprim, in addition to prednisolone acetate 1% (in 2 cases, medroxyprogesterone 1% was substituted for the prednisolone, at least twice daily. Vancomycin (14 mg/mL) eye drops were also given twice daily in 2 patients. Similar management was used in all 218 cases in terms of choice of antibiotic, steroids, and systemic antibiotics perioperatively.

In eight of the 12 episodes, intraocular tap, or vitrectomy, and injection of antibiotics and steroids were performed at the time of presentation with vitritis.

One case report will serve as an example. The patient was a 54-year-old man who had an acid burn in both eyes in 1990. He had undergone 3 prior penetrating keratoplasties in the right eye and was pseudophakic. He underwent type I KPro surgery in his right eye in 2001, including removal of intro-ocular lens (IOL). One month after surgery, his corrected vision was 20/60, and after 20 months, it was 20/50+ uncorrected. He was using ofloxacin 0.3% and prednisolone acetate 1% 4 times daily as chronic prophylaxis. Twenty months after surgery, he presented with history of intermittent discomfort in the right eye and decreasing vision. He was pain free on the day of presentation but was found to have hand movement–only vision. Examination was significant for a quiet conjunctiva, fibrin in the anterior chamber seen through a perfectly positioned KPro with soft contact lens in position, and normal intraocular pressure. Immediate anterior chamber aspirate for culture and antibiotic injection of vancomycin (1 mg) and amikacin (400 μg), as well as dexamethasone (400 μg) into the anterior chamber, were performed. He was admitted to the hospital for intravenous antibiotics (vancomycin 1 g every 12 hours and ceftazidime 1 g every 8 hours) and topical vancomycin and ofloxacin 0.3% eye drops. The following day, he still had fibrin in the aqueous and therefore 40 mg of triamcinolone as peribulbar injection was given. On post-vitritis day 2, the fibrin had cleared, and he was discharged from the hospital on vancomycin (14 mg/mL), ofloxacin 0.3%, and prednisolone acetate 1% drops (all 4 times daily). Cultures were negative.

Follow-up examination 1 month later revealed visual acuity of 20/60 with correction and no cells in the anterior chamber. Six weeks after the vitritis event, his vision with correction was 20/40+. His last examination in February 2003 revealed stability with maintained vision, normal intraocular pressure, an uninflamed eye, and perfectly positioned KPro. He was using levofloxacin 0.5% and prednisolone acetate 1% eye drops twice daily.

**RESULTS**

Eight patients had a total of 12 episodes of sudden severe vitritis from 2 to 23 months after surgery. Significant past medical histories for each patient were reviewed, and there was no common predisposing factor identified. The patients were from different categories as described above.

Presentation of the vitritis was acute in onset, with 1 to 2 days of marked decrease in visual acuity but with minimal (if any) ocular discomfort or redness. All episodes occurred while patients were on topical antibiotics and steroids (or medroxyprogesterone in 2 cases of type II KPro) as noted in Table 1. Slit lamp examination in all patients was significant for a minimally inflamed conjunctiva (in type I), with anterior chamber inflammation, cellular reaction, and flare, but no hypopyon. There was a massive, almost “snowflake” vitritis that obscured the view of the fundus (Fig. 1).

Eight of the 12 episodes were treated like bacterial endophthalmitis. These patients underwent intraocular tap and injection of vancomycin (1.0 mg), amikacin (0.4 mg), and dexamethasone (0.4 mg). Intravenous antibiotics were started on 4 patients, and the frequency of topical antibiotic eye drops was increased in all patients.

The summary of the gram stain and cultures is listed in Table 1. There were no organisms isolated on solid culture media. Three patients’ anterior chamber tap cultures revealed Staphylococcus epidermidis from meat broth only. One patient (1) did not have a tap on 3 episodes and was treated with triamcinolone peribulbar injection only. Another patient (6) was initially seen elsewhere, and no intraocular tap or antibiotic injection was done.

The recovery of vision to the pre-episode level was seen in all 7 patients who could be assessed (mental debilitation precluded assessment in one patient). The severe vitritis cleared in all cases within a few days. Visual rehabilitation was complete in 2 to 9 weeks.

No immediate relapse or recurrence of inflammation on steroid taper was seen in any of the patients. However, there were 2 patients who later had multiple, yet similar, inflammatory episodes. The patient with SJS, patient (1), had 3 such vitritis episodes, with a sudden decrease in vision while on prophylactic antibiotic regimen (Table 1). The keratoconus patient (8) had 3 brief vitritis episodes while on vancomycin, ofloxacin, and prednisolone drops (Table 1). The patients have been regularly followed over periods between 3 months and 4 years.

**DISCUSSION**

We report our experience with this phenomenon of sudden, severe intraocular inflammation resulting in massive
vitritis several months postoperatively in 8 patients. They presented with externally quiet eyes and minor ocular complaints but a sudden decrease in vision caused by flocculent “snowflake” vitritis. This is markedly different from the slower and usually milder uveitis sometimes experienced after other types of eye surgery. Aside from the fact that these eyes had undergone previous eye surgeries in the past, the patients were generally healthy at the time of presentation, with the exception of 1 patient reporting flu-like illness a few days before the vitritis episode. The vitritis was a one-time event with full recovery of vision and without immediate recurrence on tapering of steroids, with the exception of 2 patients who had additional milder episodes at later dates while on prophylactic antibiotic (and in one case, steroid) regimens.

There do not seem to be any device-related factors contributing to this phenomenon, because similar material and techniques were used in all 218 cases. Different designs, such as presence or absence of holes in the back plate, do not seem contributory.

Studies have been noted in the literature, for the development of intraocular lenses, in terms of the choice of the biomaterial as well as the presence of sharp edges and the intraocular response to inflammation. It has been noted that with certain designs (ie, sharp vs. smooth edges), there are different types of reactions in terms of posterior capsular opacification. Memory lens has also been cited in the literature to be associated with postoperative sterile endophthalmitis.

There is a serious question of whether bacteria may have played a role in these cases. Although S. epidermidis was isolated in 3 cases, it only grew from the meat broth, and the primary plates were negative. These culture results would have been considered “equivocal” rather than positive in the Endophthalmitis Vitrectomy Study. They could have been the result of contamination during the tap.

### Table 1. Summary of Cases

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Diagnosis</th>
<th>Shunt</th>
<th>Pre-episode Topical Medications</th>
<th>VA Before Episode</th>
<th>VA at Episode</th>
<th>Occurrence Months After Surgery</th>
<th>Treatment Beyond Eye Drops</th>
<th>Weeks to Clear Vitritis</th>
<th>Best Post Episode VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Graft failure</td>
<td>Yes</td>
<td>Erythromycin ung Ciprofloxacin Ciprofloxacin Ofloxacin po</td>
<td>20/40 HM</td>
<td>3 No</td>
<td>Triamcinolone IV Abx IV Abx Terso over KPro</td>
<td>Rapid Good</td>
<td>7</td>
<td>20/80</td>
</tr>
<tr>
<td>2</td>
<td>Graft failure</td>
<td>Yes</td>
<td>Medroxyprog prost Ofoxacin</td>
<td>20/30 HM</td>
<td>23 Yes, negative, Re-KPro Vitrectomy Vitreal vanco AC Inj</td>
<td>2</td>
<td>20/100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Graft failure</td>
<td>No</td>
<td>Medroxyprog prost Ofoxacin</td>
<td>20/25 HM</td>
<td>6 Yes, negative, Vitrectomy Abx/Inj</td>
<td>?</td>
<td>20/40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Chemical bum</td>
<td>Yes</td>
<td>Ofloxacin Prednisolone acet</td>
<td>20/50 HM</td>
<td>9 Yes, negative, AC Inj</td>
<td>3</td>
<td>20/40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Edema uveitis</td>
<td>No</td>
<td>Prednisolone acet Polymixin-trimeth.</td>
<td>20/70 HM</td>
<td>7 Yes, Staph Epl (broth)</td>
<td>2–4 CF</td>
<td>2</td>
<td>20/30</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>OCP</td>
<td>Yes</td>
<td>Vanco, medroxyprog prost Ofoxacin</td>
<td>20/100 CF @1’</td>
<td>4 No</td>
<td>Cefteaz AC Infect Vanco, dexameth. IV Abx</td>
<td>3</td>
<td>20/30</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Trauma graft fail</td>
<td>No</td>
<td>Prednisolone acet Polymixin-trimeth.</td>
<td>20/50 HM</td>
<td>2 Yes, Staph Epi (broth)</td>
<td>9</td>
<td>20/50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Keratocon graft fail</td>
<td>Yes</td>
<td>Prednisolone acet Ofoxacin</td>
<td>20/30 HM</td>
<td>2 Yes, Staph Epi (broth)</td>
<td>2</td>
<td>20/30</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prednisolone acet Ofoxacin Vancomycin</td>
<td>20/200 HM</td>
<td>13 Yes, negative, AC Inj</td>
<td>2</td>
<td>20/60</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prednisolone acet Ofoxacin Vancomycin</td>
<td>20/60/125</td>
<td>16 Yes, negative, AC Inj</td>
<td>2</td>
<td>20/30</td>
<td></td>
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</tr>
</tbody>
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symptoms of pain, redness, or discharge and the rapid clearing without immediate recurrence. This is in contrast to the more gradual and less dramatic uveitis seen late after other types of eye surgery (eg, keratoplasty after herpes simplex keratitis). It is possible that proteins that are not normally recognized by the intraocular structures may be released by the corneal tissue around the KPro (ie, through holes in the back plate), leading to the development of the sudden inflammation with outpouring of plasma elements into the vitreous. An additional factor may be predisposition of some patients from an immunologic stand point. The keratoconus and SJS patients who had 3 such episodes may have some immunologic factor contributing to more severe reactions to such proteins while these patients were maintained on prophylactic antibiotics. There did not seem to be an association with any chronic comorbid condition.

An observation that also may have some connection to our findings has been reported by Ching et al. They encountered episodes of violent vitritis after implantation of glaucoma tube devices in 4 patients: 2 with Ahmed and 2 with Baerveldt implants. Two cases were treated as bacterial endophthalmitis with injection of antibiotics, and 2 received no treatment. All 4 cases resolved. Glaucoma shunts cannot be fully blamed in our series, however, because 3 of our 8 patients had no shunt. Thus, we have not been able to identify the cause(s) of our vitritis events with certainty, although an immune mechanism is most probably a contributing factor.

An interesting aspect was the occurrence of 6 episodes while patients were maintained on prophylactic doses of topical prednisolone acetate 1% 2 to 3 times daily. Thus these reactions had broken through the prophylactic regimen. This also raises the question of treatment. Because of the uncertainty of etiology in the individual cases, we still recommend KPro patients who present with sudden vitritis to be treated for possible bacterial endophthalmitis. In these cases, we recommend an immediate anterior chamber or vitreous tap for gram stain and culture, followed by injection of the standard combination of 1.0 mg vancomycin, 0.4 mg amikacin, and 0.4 mg dexamethasone, as well as systemic antibiotics. In externally relatively quiet eyes, without pain, we advise only peribulbar injection of 40 mg triamcinolone followed by topical vancomycin (14 mg/mL), a fluoroquinolone and prednisolone acetate, at least 4 times daily.

Patients should be warned of possible sudden adverse events and should be told to report them immediately at the first notice of change in visual acuity. Patients may be assured that, based on the clinical appearance or culture results, visual acuity will most likely be recovered. However, these vitritis episodes cannot be dismissed as completely harmless and nonthreatening. More must be learned about their prevention.

REFERENCES