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Vitritis after Boston Keratoprosthesis Type 1 Implantation

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Purpose: To describe the incidence, presentation, and clinical course of vitritis occurring after Boston keratoprosthesis type 1 implantation.

Design: Retrospective chart review.

Participants: Medical records of all patients undergoing type 1 Boston keratoprosthesis implantation over a 4-year period were reviewed.

Methods: Cases of vitreous inflammation were classified as either postoperative (within 1 month after surgery without endophthalmitis), reactive (secondary to ocular surface inflammation), idiopathic, or infectious endophthalmitis. The presenting features and postoperative course of all patients were reviewed.

Main Outcome Measures: Postoperative inflammation.

Results: A total of 110 eyes underwent type 1 Boston keratoprosthesis implantation with a median follow-up of 5.6 years. Overall, there were 21 episodes of vitritis occurring in 17 patients; 6 cases of vitritis were postoperative, whereas 5 were reactive, 7 were idiopathic, and 3 were infectious endophthalmitis. Patients with vitritis sought treatment a median of 10 months after surgery (range, 1 week−7 years). Compared with patients in whom vitritis did not develop, those with vitritis were younger (50.8 years of age vs. 62.2 years of age; $P = 0.01$), but with a similar prevalence of autoimmune disease ($P = 1.00$). Eyes with postoperative vitritis had a benign and short course, and were all managed with topical medications. Reactive vitritis occurred in association with infectious keratitis (4 cases) or corneal melting (1 case). Patients with idiopathic vitritis and endophthalmitis demonstrated similar symptoms of pain and severe vision loss. The mean duration of inflammation in patients of idiopathic vitritis was 3.3 months; all patients later demonstrated retroprosthetic membrane, and 2 patients (29%) demonstrated retinal detachment. Three of 7 patients with idiopathic vitritis underwent a vitreous tap, which showed negative results in all cases. The 3 cases of infectious endophthalmitis had a prolonged and severe course, with only 1 eye retaining functional vision.

Conclusions: Patients undergoing type 1 Boston keratoprosthesis implantation are at risk of postoperative vitreous inflammation, which may present in the immediate postoperative period or years later. Cases of idiopathic inflammation may present similarly to infectious endophthalmitis, and a low threshold should be taken for performing vitreous tap and injection of antimicrobials. Caution should be exercised using sub-Tenon corticosteroids, given the high prevalence of glaucoma and possibility of exacerbating fungal infections. *Ophthalmology Retina 2018;2:1050-1055 © 2018 by the American Academy of Ophthalmology*

The Boston keratoprosthesis is an artificial cornea with a collar-button design used worldwide to restore a clear visual axis in patients who otherwise would have a poor prognosis with standard corneal transplantation. Although the device has good short-term results, long-term results are limited by a number of potentially serious complications, including glaucoma, retroprosthetic membrane, corneal melting, and vitritis.[1,2] Vitritis after Boston keratoprosthesis surgery is a poorly understood condition that has been reported to occur in 3.7% to 14.5% of patients after surgery.[3–7] Multiple causes have been identified, although few reports have discussed the condition in detail, including its classification and treatment recommendations.

Recently, Grassi et al[7] reported their experience with postoperative vitritis at the Massachusetts Eye and Ear Infirmary over a 14-year period, encompassing both type 1 and type 2 devices. They classified vitritis cases into 7 categories, including immediate postoperative inflammation, keratitis, infectious endophthalmitis, reaction to vitreous hemorrhage, ocular trauma, aqueous leak, or idiopathic sterile inflammation. The authors made a number of important recommendations, including differentiation of infectious from idiopathic inflammation and the role of corticosteroids in managing cases of idiopathic vitritis.

The purpose of our study was to describe our experience with vitritis after type 1 Boston keratoprosthesis surgery at the Université de Montréal (Quebec, Canada), where a large number of Boston keratoprosthesis devices are implanted. Based on clinical experience and the results of our study, we also propose a simplified classification scheme for the condition as well as our perspective on treatment recommendations.

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Methods

We conducted a retrospective chart review of all patients undergoing type 1 Boston keratoprosthesis implantation at the Centre Hospitalier de l'Université de Montréal between July 2008 and June 2012. Clinical and operative notes were reviewed in detail for all patients. Demographic data collected included gender, age at surgery, medical history, underlying diagnosis, previous ocular surgery, lens status (pseudophakia vs. aphakia), type of corneal graft (fresh vs. frozen), and occurrence of complications after surgery. This research adhered to the tenets of the Declaration of Helsinki. Research ethics board approval was obtained through the Centre Hospitalier de l'Université de Montréal. Considered minimal-risk research, a waiver of informed consent was granted by the research ethics board.

All Boston keratoprosthesis surgeries at our center are performed by a single surgeon (M.H.-D.) using a standard surgical technique that has been described elsewhere.[8] Briefly, we perform anterior vitrectomy in all patients without an intact posterior capsule and iridectomy in all nonaniridic patients. Standard postoperative drops at our center include topical moxifloxacin and prednisolone 1% drops 4 times daily and oral antiviral medications in patients with a history of herpetic eye disease. Patients are seen routinely on postoperative day 1; weeks 1, 2, and 4; and every 3 months thereafter.

Cases of vitritis were identified based on the presence of documented cell, significant debris, or both, consistent with standardization of uveitis nomenclature (SUN). Additional data collected included timing and duration of inflammation, current drops being administered, presenting best-corrected visual acuity (BCVA), treatment, results of ultrasound and vitreous tap (if performed), BCVA at recovery of inflammation, final BCVA (BCVA at the last follow-up visit), and presence of associated complications.

Based on anecdotal clinical experience, we classified vitritis cases occurring after Boston keratoprosthesis implantation into 1 of 4 categories, which represents a simplified classification scheme of the one described by Grassi et al[7]: (1) postoperative vitritis, vitritis within 1 month of surgery in the absence of infection; (2) reactive vitritis, vitritis secondary to ocular surface inflammation (e.g., keratitis, corneal melting); (3) idiopathic vitritis, vitritis in the absence of a secondary cause; and (4) infectious endophthalmitis, vitritis in the setting of positive vitreous cultures or, in the absence of culture results, a clinical course that is highly suspicious for infection.

Statistical Analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences version 13.0 (SPSS Inc., Chicago, IL). The primary aim of the study was to describe the incidence and clinical course of patients demonstrating vitritis after Boston keratoprosthesis implantation. To identify potential risk factors for vitritis, we compared baseline demographics and potential risk factors between patients with and without vitritis. Baseline demographics as well as clinical course also were compared among the 4 categories of vitritis.

For the purpose of data analysis, visual acuities were converted to logarithm of the minimum angle of resolution (logMAR) values using assigned values for counting fingers, hand movements, light perception, and no light perception vision.[9,10] Paired *t* tests were used to compare means between 2 samples, whereas analyses of variance were used to compare among the various groups. All tests were 2 tailed, and statistical significance was considered for $P < 0.05$. We also performed post hoc testing with Bonferroni correction to detect differences when comparing the various vitritis groups.

Results

A total of 110 eyes (97 patients) underwent Boston keratoprosthesis type 1 implantation during the study period, with a median follow-up of 5.6 years (range, 6 months−8.0 years). Overall, there were 21 episodes of vitritis occurring in 17 patients for an incidence of 3.7 episodes per 100 patient-years. Six cases of vitritis were postoperative, whereas 5 cases were reactive, 7 cases idiopathic, and 3 cases were infectious endophthalmitis. All but 2 episodes (2 patients) occurred in aphakic eyes.

Table 1 displays baseline demographics as well as rates of complications for patients with and without vitritis. Patients experiencing 1 or more episodes of vitritis were significantly younger (50.8 years of age vs. 62.2 years of age; $P = 0.012$) and had significantly longer follow-up (78.1 months vs. 60.0 months; $P = 0.0047$) compared with those without vitritis. There was no difference in the prevalence of autoimmune disease between the 2 groups. Although there was a trend toward an increased incidence of postoperative complications in the vitritis group, the difference was not statistically significant ($P = 0.10$).

A total of 6 cases of postoperative vitritis occurred within 1 month of surgery. All patients were taking standard prednisolone 1% drops 4 times daily at the time. Three patients demonstrated vitreous haze, whereas 2 patients demonstrated both haze and cells and 1 patient demonstrated vitreous cells only. None of the patients showed a hypopyon, and only 2 of 6 patients reported pain on presentation. All patients were managed with an increased frequency of topical corticosteroids and had a relatively short and benign course. One patient later experienced 2 separate episodes of idiopathic vitritis.

A total of 5 patients demonstrated reactive vitritis in association with ocular surface inflammation. Four cases were in the setting of infectious keratitis, and 1 was in the setting of corneal melt. In 2 cases of infectious keratitis, corneal scrapings showed positive results for *Staphylococcus aureus*; 1 case with multifocal corneal infiltrates was presumed to be fungal and responded to topical and systemic antifungal agents. In all patients, vitritis improved with resolution of the underlying cause, without the need for supplementary corticosteroids.

Seven patients demonstrated idiopathic vitritis a mean of 24.2 months after surgery. Most patients reported pain and vision loss, although 1 patient reported painless vision loss and 1 patient reported pain only. No patients showed a hypopyon on presentation. Patients demonstrated a mean vision loss of 11.3 lines compared with the previous visit, and vision loss persisted after inflammation had resolved. Three patients underwent a vitreous tap, which showed negative results in all cases. Initial treatment consisted of vitreous tap and injection in 3 eyes (vancomycin plus ceftazidime in 2 eyes and vancomycin plus ceftazidime plus dexamethasone in 1 eye), topical corticosteroids and antibiotics in 3 eyes, and drops and oral prednisone in 1 eye. Two patients later also received oral prednisone. All 7 eyes later demonstrated retroprosthetic membranes, and 3 eyes progressed to light perception or no light perception vision (Table 2).

A total of 3 cases of infectious endophthalmitis occurred between 7 and 62 months after surgery, for an incidence of 0.0052 cases per patient-year. In 2 patients, endophthalmitis occurred after an infectious corneal infiltrate, and in the other patient, endophthalmitis occurred in the setting of a corneal melt. All patients demonstrated