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Review of sterile, postoperative, anterior segment inflammation following cataract extraction and intraocular lens implantation

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PURPOSE. *To evaluate unexpected, acute intraocular anterior segment inflammation following uneventful cataract extraction by phacoemulsification and foldable posterior chamber intraocular lens (PCIOL) implantation.*
METHODS. *This retrospective study evaluated five cases of postoperative inflammation that occurred after cataract extraction with foldable PCIOL implantation. Medical records were reviewed to analyze the unexplained postoperative inflammation.*
RESULTS. *The five patients who developed inflammatory activity during the postoperative period responded well to corticosteroid treatment. Toxic maculopathy developed in one patient after aggressive antibacterial therapy. Vitrectomy was performed for one patient with prolonged vitreal inflammatory activity.*
CONCLUSIONS. *Noninfectious endophthalmitis developing upon surgery may be caused by a multifactorial process or an interindividual variable response to a common factor as a hypersensitivity reaction. It should be remembered in inflammatory cases after surgery in order to prevent the toxic, irreversible side effects of bacterial endophthalmitis treatment. (Eur J Ophthalmol 2005; 15: 224-7)*

KEY WORDS. *Postoperative endophthalmitis, Sterile endophthalmitis, TASS*

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INTRODUCTION

One of the most devastating and vision-threatening complications of cataract surgery is postoperative endophthalmitis. Recent advances in surgical technique and prophylaxis have reduced incidence, affecting 0.1% of cataract operations, with severe loss of vision occurring in 40 to 60% (1, 2).

The causes of postoperative endophthalmitis can be infectious or noninfectious or the two kinds of inflammation may overlap. Prompt diagnosis and adequate therapy are major concerns for any ocular surgeon, but the initial clinical features are indistinguishable and may not be differentiated. For this reason, sterile type endophthalmitis is usually diagnosed and treated as infectious endophthalmitis. The clinical signs of infectious endophthalmitis appear during the initial 24 to 72 hours postoperatively. If the etiologic agent of infectious endophthalmitis is fungal or less virulent microorganisms, the presentation of the clinical features is more gradual, weeks or months after surgery. On the other hand, the onset of sterile endophthalmitis is usually during the first 24 hours although late onset is also a possibility. Negative cultures and improvement despite discontinuation of antibiotics are the two most important criteria that can help rule out infection and suggest a noninfectious etiology (3, 4).

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Toxic anterior segment syndrome (TASS) is another term used for acute, sterile, postoperative anterior segment inflammation in which no cause for the inflammation can be found (3, 4). This entity is being evaluated by Intermountain Ocular Research Center, Salt Lake City, UT. The causative factors leading to this entity are reported as intraocular irrigation solutions used in eye surgery (5), preservatives used in various ophthalmic medications (6) and some drugs (4), intraocular lenses (IOL) (7), endotoxins produced by bacteria that are destroyed in the sterilization process but are introduced by instruments during surgery (8), and residual chemical materials and residual denaturated viscoelastics (9).

The acute onset (12 to 24 hours after surgery), decreased visual acuity, limbus to limbus corneal edema, irreversible corneal decompensation, nonreactive dilated pupilla, moderate to severe anterior chamber reaction with cells, flare, hypopyon, and especially fibrin are the main clinical presentations of TASS (3).

In this study, we report five cases of TASS after cataract surgery and IOL implantation performed by two ophthalmologists.

PATIENTS AND METHODS

Five cases of unexplained postoperative inflammation were retrospectively reviewed. Age and sex of the patients, the surgical procedure, anesthesia type, IOL type and serial number, clinical course of inflammation, and outcome are all summarized in Table I. Three of the patients were female and two were male. The age range of the patients was 62 to 77 years. No ocular pathology was recorded other than cataract in all the patients. The preoperative consultation results were insignificant. The surgery was phacoemulsification and foldable posterior chamber IOL (PCIOL) implantation in five patients. One of the patients (Case 1) was operated on at Gümüşsuyu Military Hospital by one surgeon (Ü.A.) and the others (Cases 2 to 5) at GATA Haydarpasa Training Hospital by another surgeon (A.H.B.).

TABLE I - PATIENT CHARACTERISTICS AND CLINICAL FEATURES

Case	Age/ sex	Surgery	IOL type/lot no.	Anesthesia	Clinical features	Diagnosis treatment	Outcome
1	68/M	OD phaco IOL implantation	MA50BM SN:593114.012	Topical	PO:4, corneal edema, pain, redness, AC/vitreus: cells/flare: +4, x VA:HM	AC/vitreus culture(-), systemic/topical/ subconjunctival/IV corticosteroids, antibiotics	PO:25, macular degeneration (drug toxicity), VA:20/200
2	64/F	OS phaco IOL implantation	MA60BM SN:557787.074	Topical	PO:9, AC/vitreus, cells: +3, VA: 20/100	AC culture (-), systemic/topical corticosteroids	PO:11, VA:20/20
3	68/F	OD phaco IOL implantation	SA30AL SN:719435.0414	Topical	PO:7, AC: flare +2, pupillary membrane, VA: 20/200	AC culture (-), topical corticosteroid	PO:9, VA:20/25
4	77/F	OS phaco IOL implantation	MA60BM SN:719114.039	Topical	PO:1, AC: flare +3, pupillary membrane, VA: 20/200	AC culture (-), topical corticosteroids	PO:3, VA:20/32
5	62/M	OD phaco IOL implantation	MA50BM SN:600034.027	Topical	PO:7, corneal edema, hypopyon, VA: HM	AC culture (-), topical/subconjunctival corticosteroids, vitrectomy (PO:53), vitreal culture (-)	PO:60, VA:20/63

IOL = Intraocular lens; OD = Right eye; PO = Postoperative (day); AC = Anterior chamber; VA = Visual acuity; HM = Hand motions; OS = Left eye

The five surgeries were performed over a 35-month period from February 2000 to January 2003. The total number of cataract surgeries performed during this period is 1630 by one surgeon (A.H.B.) and 165 by the other surgeon (Ü.A.). All patients received standard preoperative medications including broad-spectrum fluoroquinolone antibiotics, cycloplegics, mydriatics, and antiinflammatory agents. All cases included standard patient preparation, operating room preparation and cleaning, and instrument sterilization. Draping was only performed in Case 5. All cases were operated under topical anesthesia. The five cases were performed through a clear corneal incision and received an acrylic foldable IOL. Each IOL had a different lot number. Intraoperatively, all patients received balanced salt solution (BSS-Plus). No additional pharmacologic agent was used in the irrigating solution. No patients received intraocular miotics. The viscoelastic agents used were sodium hyaluronate (Healon) and sodium chondroitin sulfate–sodium hyaluronate (Viscoat). All cases were uneventful.

Data were carefully reviewed retrospectively for potential causes of postoperative inflammation, including predisposing ocular diseases, infectious causes, intraoperative trauma, toxic effects of intraocular fluids or medications, instruments or tubings used during surgery, and problems with the IOL itself.

RESULTS

Table I summarizes the patients and outcomes. Five cases were reviewed. All the cases were culture negative and the clinical course in these cases was consistent with delayed-onset, acute, sterile TASS. The mean time between surgery and clinical presentation was 5.6 days (range 1 to 9 days). Presenting symptoms in the five patients included diminished visual acuity and mild ocular pain and mild to moderate ciliary injection in Case 5. Snellen visual acuities on presentation ranged from 20/100 to hand motions. Clinical signs included increased anterior chamber inflammation that ranged from 2+ cell and flare to plasmoid aqueous and one patient presenting with hypopyon. None of the patients presented with increased IOP. Two patients had 2+ to 4+ vitreous cells.

Treatment of the patients differed widely. Two patients (Cases 1 and 5) were diagnosed initially as postoperative bacterial endophthalmitis and standard therapy was started following vitreous tap for cultures. In Case 1, the inflammatory activity decreased beginning from the third week but the visual acuity was permanently decreased as a result of toxic maculopathy. One patient (Case 5) had a vitrectomy for nonclearing vitreous haze 5 weeks postoperatively. The vitreal culture of this patient was negative and final visual acuity was 20/63. Treatment of the other three patients included topical and systemic steroids and cycloplegic-mydriatics.

DISCUSSION

There are several possible causes of noninfectious sterile postoperative inflammation. The ionic content or pH abnormalities of the irrigation solution, denaturation of the viscoelastic material after resterilization for reuse, intraocular inoculation of the retained material in the disposable cannula or tubing systems, immune reaction to residual lens cortex, some preserving materials contained in various ophthalmic solutions, endotoxins retained on surgical instruments, and reaction to IOL are some of the causes (5-9).

The inability to define a common etiologic agent in cases diagnosed as TASS has a twofold cause: first, the presence of multifactorial agents causing the same clinical entity, and second, the interindividual variable response to a single agent (hypersensitivity reaction), which we could not define. It seems reasonable to conclude that a single common etiologic agent could not be responsible for this syndrome because of the randomized distribution of the cases. There are some excellent reports revealing the causal relationship in the literature (4-9).

All the cases in our series presented with one of the manifestations of TASS. Acute anterior segment inflammation was present in all patients and careful review of these surgeries did not reveal any common element. For this reason we conclude that preventive measures must be taken to prevent contamination with the materials that have a toxic potential.

The presence of mild to severe aqueous cell and flare and the efficacy of antiinflammatory drugs in all the cases reveals that blood-aqueous barrier disruption as a result of acute toxic reaction in the anterior segment is a common mechanism in this syndrome.

If the cultures are negative in patients with inflammatory activity, antiinflammatory drugs alone can be used successfully and the toxic posterior segment complications resulting from aggressive endophthalmitis treatment can be eliminated. We routinely use topical intensive corticosteroid treatment on an hourly basis for 1 week and then taper the treatment to four times a day during the following week to prevent TASS.

The presentations of the inflammatory process described above share the common elements of delayed-onset, acute sterile TASS. This sterile inflammatory reaction to an unknown agent or hypersensitivity reaction of some patients to various agents after surgery should be remembered in order to prevent the toxic, irreversible side effects of bacterial endophthalmitis treatment.

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