Frequency of ciliary body or retinal breaks and retinal detachment in eyes with atopic cataract

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Aim: To determine the frequency of ciliary body or retinal breaks and retinal detachment in eyes with atopic cataract.

Methods: The records of 106 eyes (74 patients) with atopic cataract that underwent cataract extraction were reviewed. The frequency of ciliary body or retinal breaks and retinal detachment was classified by their presence preoperatively and postoperatively, and by cataract type.

Results: Breaks were detected preoperatively in 27 eyes (25.5%) of 17 patients in the ciliary body (20 eyes, 18.9%), near the ora serrata (five eyes, 4.7%), and in undefined locations (two eyes, 1.9%). Among these, 16 eyes (15.1%) had already developed retinal detachment. After surgery, a ciliary body break occurred in one eye (0.9%) and retinal detachment in four eyes (3.8%) of three patients. The breaks that caused postoperative retinal detachment were in the ciliary body. When classified by cataract type, the highest frequency of breaks was associated with mature cataracts (35.0%), and all eyes with breaks developed retinal detachment.

Conclusions: One fourth of eyes with atopic cataract had breaks in the ciliary body or ora serrata, or retinal detachment preoperatively. The highest frequency of either breaks or retinal detachment was associated with mature cataract. The frequency of breaks or detachment that occurred postoperatively (approximately 5%) was lower than that present preoperatively.

Patients with atopic dermatitis frequently develop cataract and retinal detachment. Previous studies reported that the frequency of cataract in patients with atopic dermatitis was approximately 10–20%,^{1–5} while that of retinal detachment was 8%.⁵ Because the number of patients with atopic dermatitis is increasing in Japan, surgeons are routinely performing many surgeries for atopic cataract.

Both cataract and retinal detachment of the patients with atopic dermatitis have been reported to have specific features. Atopic cataract is generally classified into four types^{1–3, 5–6}: (1) anterior subcapsular opacity including fibrous plaque formation, (2) posterior subcapsular opacity, (3) mixed subcapsular opacity, or (4) mature opacity. Retinal detachment is generally caused by breaks in the ciliary body or the retina near the ora serrata.^{7–12} These specific characteristics of atopic cataract and retinal detachment are assumed to be related to their aetiology.^{7–12}

When performing cataract surgery for patients with atopic cataract, surgeons must be aware of the possibility of breaks and detachment. However, the frequency of breaks and detachment that coexists with cataract is still unclear. The objective of this study was to examine the frequency of ciliary body or retinal breaks and retinal detachment in eyes with atopic cataract. To determine if breaks and detachment tend to develop after cataract surgery, the frequency was evaluated based on their presence before or after surgery.

PATIENTS AND METHODS

We reviewed the medical records of all patients with atopic cataract who underwent cataract extraction at Hayashi Eye Hospital between April 1996 and March 2001. All patients had been diagnosed with atopic dermatitis by a dermatologist and also had visually significant cataract (decimal visual acuity of 0.4 or less). Any patients who did not undergo a fundus examination within 6 months were excluded from this study. A total of 106 eyes of 74 patients who met the inclusion criteria were analysed.

In this study, we implanted an intraocular lens (IOL) at the time of cataract extraction using a standard technique, unless ciliary body or retinal breaks or retinal detachment were detected before surgery. When breaks or detachment were detected, they were treated first as long as the fundus could be adequately observed. When the fundus examination was difficult because of the cataract, standard cataract surgery was performed first. In four eyes with proliferative vitreoretinopathy or giant retinal breaks, pars plana lensectomy was performed without IOL implantation. Until April 1996, one piece poly(methylmethacrylate) IOLs (MZ60BD; Alcon Surgical, Fort Worth, TX, USA) were implanted in most cases. After May 1996, three piece acrylic IOLs (MA60BM; Alcon Surgical) were implanted in most cases.

All cataract surgeries except for pars plana lensectomy were performed by a single surgeon (KH) using a standard surgical procedure and medications. Firstly, a scleral pocket incision was made. A continuous capsulorhexis measuring about 5.5 mm in diameter was created using a 25 gauge bent needle. In cases of mature cataract in which creating a capsulorhexis using a needle was difficult, capsular diathermy (Tagawa Electronic, Tokyo, Japan) was used. Following thorough hydrodissection, the nucleus was emulsified when necessary, and the cortical material aspirated. The lens capsule was reformed with 1% sodium hyaluronate, and the IOL was placed into the capsular bag.

All patients underwent fundus examinations periodically using indirect ophthalmoscopy and slit lamp biomicroscopy with a three mirror or wide field panfundus contact lens (Ocular Instrument, Bellevue, WA, USA). The presence of breaks and retinal detachment, the location of predominant breaks, and the appearance of the detachment were recorded. Before cataract surgery and within 1 week after surgery, the fundus was examined by a vitreoretinal specialist (HH) who used a scleral depressor when necessary. When breaks or detachment were detected during these examinations, they were regarded as being present before cataract surgery. Breaks or detachments that were detected after these examinations

Table 1 Number (%) of eyes in which breaks were detected before and after cataract extraction (n=106 eyes)

Location of breaks	Before surgery	After surgery	p Value
Ciliary body	20 (18.9%)	5 (4.7%)	-
Retina			
Ora serrata	5 (4.7%)	0	-
Equator	0	0	-
Undefined	2 (1.9%)	0	-
Total	27 (25.5%)	5 (4.7%)	<0.0001*

*The frequency of breaks detected before surgery was significantly higher than that which occurred after surgery.

were regarded as having occurred after surgery. Decimal visual acuity was also determined at each visit and converted to logarithm of the minimum angle resolution (logMAR) scale for statistical analysis.

The type of atopic cataract was classified into four groups— anterior subcapsular cataract including fibrous plaque formation, posterior subcapsular cataract, combined subcapsular cataract, or mature cataract. The frequency of breaks and detachment was also determined according to the type of cataract.

Statistical analyses were performed to compare the frequency of breaks and retinal detachment before surgery with that which occurred after surgery using the χ^2 test and logMAR visual acuity before and after surgery using the Mann-Whitney U test. The frequency of breaks or detachment based on the type of cataract was also compared using the χ^2 test for independence. A value less than 0.05 were considered statistically significant.

RESULTS

A total of 106 eyes of 74 patients (53 men, 21 women) were included. Forty two patients had cataract in one eye, and 32 patients had cataract in two eyes. The average patient age was 72.0 (SD 8.1) years, with a range of 12–52 years.

Table 1 shows the number of eyes in which breaks were detected before and after cataract surgery. Of the 106 eyes, breaks were present preoperatively in 27 (25.5%) of 17 patients; nine were bilateral cases. The breaks were located in the ciliary body in 20 eyes (18.9%), in the retina near the ora serrata in five eyes (4.7%), and in undefined locations in two eyes (1.9%).

Table 2 shows the number of eyes in which retinal detachment developed before and after cataract surgery. Among the eyes with breaks, 16 eyes (15.1%) had already developed retinal detachment; three patients were affected bilaterally. Preoperatively, the appearance of retinal detachments was a

Table 2 Number (%) of eyes in which retinal detachment was detected before and after cataract extraction (n=106 eyes)

Appearance of retinal detachment	Before surgery	After surgery	p Value
Localised			
Shallow	11 (10.4%)	4 (3.8%)	-
Bullous	1 (0.9%)	0	-
Total			
Shallow	1 (0.9%)	0	-
Large retinal break with rolled edge	1 (0.9%)	0	-
PVR	2 (1.9%)	0	-
Total	16 (15.1%)	4 (3.8%)	0.0036*

*The frequency of retinal detachments present before surgery was significantly higher than that which occurred after surgery. PVR = proliferative vitreoretinopathy.

Table 3 Number (%) of eyes with breaks or retinal detachment classified according to the type of cataract

Type of cataract	Number	Break	Retinal detachment
ASC	37	11 (29.7%)	4 (10.8%)
PSC	11	2 (18.2%)	1 (9.1%)
ASC + PSC	38	12 (31.6%)	8 (21.0%)
Mature	20	7 (35.0%)	7 (35.0%)
p Value	-	0.7981*	0.1231*

*No statistically significant difference between groups (χ^2 test for independence).

ASC = anterior subcapsular cataract; PSC = posterior subcapsular cataract.

localised shallow detachments in 11 eyes (10.4%), a localised bullous detachment in one eye (0.9%), a total shallow detachment in one eye (0.9%), a large retinal break with rolled edge in one eye (0.9%), and proliferative vitreoretinopathy in two eyes (1.9%).

Postoperatively, breaks in the ciliary body occurred in five eyes (4.7%) of four patients. Among these eyes, four eyes (3.8%) developed a localised shallow retinal detachment. The average interval between surgery and the occurrence of a break or detachment was 39.4 months. The frequency of either breaks or retinal detachments that were present before surgery was significantly higher than that occurring after surgery ($p < 0.0001$ for breaks and $p = 0.0036$ for retinal detachment).

Table 3 shows the number of eyes with breaks or detachment before and after surgery classified according to the type of cataract. Breaks coexisted with anterior subcapsular cataract in 11 eyes of 37 cases (29.7%), posterior subcapsular cataract in two of 11 cases (18.2%), mixed subcapsular cataract in 12 of 38 cases (31.6%), and mature cataract in seven of 20 cases (35.0%). Furthermore, retinal detachment was accompanied by anterior subcapsular cataract in four (10.8%), posterior subcapsular cataract in one (9.1%), mixed subcapsular cataract in eight (21.0%), and mature cataract in seven (35.0%). The frequency of either breaks or detachment was highest in eyes with mature cataract compared with other types of cataracts, followed by combined subcapsular cataract, anterior subcapsular cataract, and posterior subcapsular cataract. However, the difference was not statistically significant ($p = 0.7981$ for breaks and $p = 0.1231$ for retinal detachment).

Table 4 shows the surgical procedures performed during cataract extraction. Of 106 eyes, 101 eyes (95.3%) underwent standard phacoemulsification or aspiration surgery with IOL implantation, and four eyes (3.8%) underwent pars plana lensotomy during vitrectomy for proliferative vitreoretinopathy or giant oral dialysis. Intracapsular cataract extraction with scleral suturing of IOL was performed in one eye (0.9%) because of lens dislocation. During surgery, anterior capsule tears developed in eight cases and posterior capsule rupture occurred in one case.

Table 5 lists the treatment of breaks and retinal detachment. All breaks that were not accompanied by retinal detachment

Table 4 Cataract surgery technique and intraoperative complications (n = 106 eyes)

Technique	Number	Complications
Aspiration	91 (85.8%)	Anterior capsular tears 7 (6.6%)
PEA	10 (9.4%)	Anterior capsular tears 1 (0.9%)
		Posterior capsular rupture 1 (0.9%)
Lensectomy	4 (3.8%)	-
ICCE	1 (0.9%)	-

PEA = phacoemulsification; lensectomy = pars plana lensectomy during vitrectomy; ICCE = intracapsular cataract extraction.

Table 5 Treatment of breaks without detachment (n = 12 eyes) and retinal detachment (n = 20 eyes)

Treatment (n=20)	Number	Breaks closed	Surgery for retinal detachment (n = 20)	Initial	Second	Final reattachment
Photocoagulation	4 (33.3%)	4 (33.3%)				
Cryopexy	7 (58.3%)	7 (58.3%)				
Scleral buckling	1 (8.3%)	1 (8.3%)	Scleral buckling	14 (70.0%)	0	-
			Vitrectomy	6 (30.0%)	5 (25.0%)	20 (100.0%)

were treated successfully with laser photocoagulation in four eyes, cryopexy in seven eyes, and scleral buckling in one eye. Initial surgery for retinal detachment was scleral buckling in 14 eyes and vitrectomy in six eyes. Of the 20 eyes with retinal detachment, reattachment was obtained during the initial surgery in 15 eyes (75.0%). Additional surgery was required in five eyes (25.0%) for extensive subretinal strands or failure to close large breaks, and vitrectomy was performed. Retinal reattachment was finally obtained in 20 eyes (100.0%), while one eye had macular pucker and another had a localised retinal detachment. In addition, four eyes did not undergo IOL implantation because of severe retinal detachment, and the IOL was explanted in two eyes during vitrectomy. Finally, six eyes (5.7%) of 106 were aphakic.

The mean (SD) logMAR visual acuity before surgery was 1.33 (Snellen equivalent 20/177) (SD 0.75) and after surgery 0.12 (20/22) (SD 0.42) ($p < 0.0001$, Mann-Whitney U test). Furthermore, the visual acuity on the final visit in 12 eyes (11.3%) was worse than 0.5 because the macular function deteriorated after retinal detachment surgery in 10 eyes (9.4%) and keratoconus developed in two eyes (1.9%).

DISCUSSION

Our study clarified that the frequency of breaks that coexist with atopic cataract before surgery is approximately 25%. Furthermore, the preoperative breaks were in the ciliary body in about 19% of eyes and in the retina near the ora serrata in 5%. These results agree with previous reports that showed that the breaks in the ciliary body or ora serrata were characteristic of patients with atopic cataract.⁷⁻¹² Furthermore, 15% of eyes with breaks had already developed retinal detachment.

Retinal breaks or retinal detachment occurred in about 5% of the eyes after cataract surgery. All causative breaks were located in the ciliary body. Some previous reports assumed that breaks in the ciliary body developed because of traction resulting from contraction of the lens capsule following cataract surgery.¹³⁻¹⁴ However, in the present study, far fewer breaks or detachment occurred after surgery than before surgery. Furthermore, the breaks or detachment developed more than 3 years after cataract surgery. These results suggest that cataract surgery may not be a major predisposing factor for retinal detachment.

Regarding the type of cataract, breaks or retinal detachment were associated with mature cataract with the highest frequency. Many studies reported that lens opacity of atopic cataract begins in the anterior or posterior subcapsular region and consequently progresses to mature cataract.^{1-3, 5-6, 15} Thus, since mature cataract is considered to be an advanced stage of cataract, the occurrence of breaks and retinal detachment in patients with atopic cataract may be related to cataract progression.

All breaks were treated successfully with laser photocoagulation, cryopexy, or scleral buckling. Furthermore, reattachment occurred in all eyes with retinal detachment. Thus, despite the presence of an IOL, the surgical outcomes of retinal detachment surgery were considered satisfactory. Some surgeons still hesitate to implant primarily an IOL in patients with atopic cataract because of possible retinal

complications.³ However, since most of these patients have ocular surface disorders, implanting a contact lenses for aphakia may not be appropriate for some patients. Based on our results, we consider that primary IOL implantation at the time of cataract surgery is permissible as long as there is no retinal detachment. When the fundus cannot be observed properly and retinal detachment is suspected by echography, intraoperative examination of the peripheral retina is recommended.¹⁶

The pathogenesis of breaks and retinal detachment in patients with atopic cataract is controversial. Oka *et al*⁹ reported that retinal breaks and retinal detachment in these patients were similar to those in patients who sustained trauma. On the other hand, many investigators assumed that the ciliary body epithelium and the retina around the ora serrata are fragile, possibly as a result of chronic cyclitis.⁷⁻¹⁰⁻¹² Matsuo *et al* also found a higher level of aqueous flare in eyes of patients with atopic cataract probably resulting from chronic inflammation and blunt trauma.¹⁷ Our study clarified the coexistence of cataract and breaks or retinal detachment. Furthermore, 78% of the breaks were in the ciliary body, suggesting that the epithelium of both the lens and ciliary body may be affected by mild chronic inflammation in this patient population.

In this study, breaks and retinal detachment that were detected within 1 week after surgery were regarded as having been present before surgery. We cannot deny that some of the breaks or detachment occurred immediately after surgery. However, when cataract exists, complete visualisation of the ciliary body and peripheral retina is particularly difficult. In addition, a low percentage of breaks and detachment was detected during the postoperative examination. Furthermore, retinal breaks or retinal detachment around the vitreous base develop and progress slowly.¹²⁻¹⁸ Therefore, we believe that the frequency of breaks or detachment obtained in this study is close to actual frequency.

In conclusion, one fourth of eyes with visually significant cataract in patients with atopic cataract were accompanied by breaks in the ciliary body or ora serrata preoperatively. Mature cataract was especially associated with the highest frequency of either breaks or detachment compared with other types of cataract. Therefore, when surgeons perform cataract surgery in this population of patients, the preoperative fundus examination is important. When the fundus cannot be observed and retinal detachment is suspected by echographic examination, an intraoperative fundus examination is recommended.¹⁶ The frequency of breaks occurring after surgery was lower than before surgery. However, careful fundus examination should be continued even after cataract surgery, because the percentage of patients who develop breaks may be more than 5%.

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