



## Visual outcomes after management of bilateral cataract and retinal detachment in atopic dermatitis

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### ABSTRACT

**Background:** Atopic dermatitis (AD) is a chronic pruritic inflammatory skin disorder of childhood with a broad spectrum of ocular manifestations, including keratoconjunctivitis, keratoconus, cataract, and rhegmatogenous retinal detachment (RRD). This study was aimed at reporting the visual outcomes in patients with bilateral cataract and RRD in the context of AD.

**Methods:** This was a retrospective, observational case series. A thorough history, clinical features, and surgical management of seven consecutive patients who presented to the Birmingham and Midland Eye Centre with bilateral cataract and RRD secondary to severe AD were investigated.

**Results:** Fourteen eyes of seven patients with AD were analyzed. Twelve of the 14 eyes had cataract (85.7%). Seven patients had anterior or posterior subcapsular cataract (58.3%); 13 of the 14 eyes had RRD (92.8%). Most cases were bilateral or simultaneous (85.7% and 71.4%, respectively). Eight eyes had involvement of the temporal quadrant (61.5%): three eyes had giant retinal tears (23%) and five eyes with proliferative vitreoretinopathy (38.5%). Three eyes underwent scleral buckle surgery with or without cryotherapy (21.4%), and eight eyes had PPV (57.1%) combined with other procedures. Two eyes (15.4%) had persistent RRD postoperatively. The latest recorded postoperative best-corrected distance visual acuity was 6/36 or better in 10 (71.4%) eyes.

**Conclusions:** Temporal RRD was commonly observed in retinal detachment secondary to AD. Surgical repair was often challenging because of proliferative vitreoretinopathy and significant cataract. A further multidisciplinary study involving dermatologists would be helpful in identifying a larger high-risk population for AD and earlier detection of asymptomatic retinal tears or holes, which would allow preventive treatment and limit sight-threatening complications.

### KEY WORDS

atopic dermatitis, cataract, retinal detachment, best-corrected distance visual acuity, scleral buckle, proliferative vitreoretinopathy

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## INTRODUCTION

Atopic dermatitis (AD) is a chronic, pruritic inflammatory skin disorder of childhood that usually starts in early infancy, but can also affect adults. It has been estimated to affect approximately 11–20% of children and 5–10% of adults in the United Kingdom [1].

AD is associated with a wide spectrum of ocular manifestations, including keratoconjunctivitis, keratoconus, cataract, and rhegmatogenous retinal detachment (RRD) [2]. These ocular conditions have a significant long-term impact on the visual function and quality of life of patients with AD because many of these patients are adolescents or young adults [1, 3, 4]. Andogsky first reported an association between AD and cataract (Andogsky syndrome) in 1914 [2]. The incidence of cataract in patients with AD is reported to be approximately 5–38% [6]. Later, Balyeat proposed a correlation between AD and RRD [7]. Current evidence regarding this association has mostly been derived from case reports and small observational studies [8-13].

A possible mechanism of RRD in these patients is trauma caused by repeatedly rubbing the eyes to relieve itching. In addition, ocular inflammation present in AD, which leads to an abnormal immune reaction, can cause RRD [8-13]; cataract surgery can cause RRD [14, 15]. The incidence of AD-associated RRD is 0.5–11% [11]. The rising prevalence of AD worldwide [16, 17], together with a reported risk of bilateral RRD in patients with AD [18], suggests that recognizing RRD as a sight-threatening complication of AD is crucial for these patients.

These ocular conditions are rarely recognized by other specialties, leading to delayed ocular assessment and poor long-term visual prognosis even after surgical treatment. Therefore, this retrospective case series was aimed at reporting the clinical features, management, and outcomes of patients with AD who were diagnosed with bilateral cataract and RRD.

## METHODS

This retrospective observational case series was conducted at a tertiary care center (Birmingham and Midland Eye Centre, Birmingham, UK) between 2014 and 2016. The study adhered to the tenets of the Declaration of Helsinki, and all patient data were extracted and anonymized for analyses. Data collection was approved by our local institution (Audit No. 1593; BMEC). Clinical information was collated through our in-house electronic patient records (EPR, Medisoft Ophthalmology, Medisoft Limited, Leeds, UK).

Patients younger than 35 years of age with eczema, cataract, and primary bilateral retinal detachment were included. Final visual outcomes were assessed at a minimum of 3 months postoperatively. The outcome measures were the anatomical outcome of RRD repair based on a detailed examination of the fundus and the latest recorded postoperative best-corrected distance visual acuity (BCDVA) using Snellen notation. All surgeries were performed by different consultant ophthalmologists or vitreoretinal fellows under supervision, following the same surgical method. All pars plana vitrectomies (PPVs) had transconjunctival 23-gauge-PPV with fluid air exchange and a vitreous-base trim. Retinopexy of retinal breaks was achieved using a combination of external cryotherapy and laser retinopexy. Cataract surgery was performed concurrently with PPV when required. Scleral buckling was performed with retinal cryotherapy and segmental silicone tires or sponges depending on the location of the retinal tears.

Data collected using electronic patient records (EPR, Medisoft Ophthalmology, Medisoft Limited, Leeds, UK) included the demographics, clinical features, surgical management, and final BCDVA outcomes. The presentation, clinical features, and surgical management of patients with cataract and RRD secondary to severe AD are thoroughly discussed. Data are expressed as median (range) or frequency (percentage).

## RESULTS

Fourteen eyes of seven patients, including four (57.1%) men and three (42.9%) women, were analyzed. All patients had a medical history of AD. The median age at presentation was 19 years (range, 13–31 years).

Table 1 describes the demographics and clinical presentation of our patients. Twelve of the 14 eyes had cataract (85.7%). Seven of these patients had anterior or posterior subcapsular cataract (58.3%); 13 of the 14 eyes had RRD (92.8%; Table 2). Most cases were bilateral or simultaneous (85.7% and 71.4%, respectively). In 8 eyes the temporal quadrant was involved (61.5%): three with a giant retinal tear (GRT) (23%) and five with proliferative vitreoretinopathy (38.5%) (Table 2).

**Table 1. Demographics and clinical presentation of patients with atopic dermatitis and retinal detachment**

Patient	Age (y)	Gender	Ethnicity	Treatment for AD
1	25	Male	British Pakistani	Steroid creams/ointments (current)
2	16	Female	White British	Steroid creams (current) Tacrolimus ointment (current) Cyclosporine (stopped)
3	15	Male	British Bangladeshi	Topical steroids and ointment (current)
4	31	Female	Caribbean	Steroid and emollients (current) Cyclosporine (stopped)
5	13	Male	British Pakistani	Steroid ointment (current) Tacrolimus ointment (current) Cyclosporine (current)
6	15	Male	British Indian	Steroid creams/ointments (current)
7	18	Female	Chinese	Topical steroids, tacrolimus and cyclosporine (current)

Abbreviations: y, years; AD, atopic dermatitis.

Table 2 shows the management and final outcomes of patients. Three patients received laser treatment (21.4%). Three eyes underwent scleral buckle surgery with or without cryotherapy (21.4%), and eight eyes had PPV (57.1%) combined with other procedures (Table 2). Two eyes (15.4%) had persistent RRD postoperatively. The latest BCDVA recorded postoperatively was 6/36 or better in 10 eyes (71.4%).

## DISCUSSION

Our case series found the characteristics of AD-associated RRD, including higher rates of bilaterality and the presence of coexistent GRTs and cataract. The predilection for temporal quadrant involvement with the proposed mechanism of self-inflicted trauma through directional eye rubbing highlights the need for patient education.

AD-related cataract and RRD have been reported in the literature, but their etiology and mechanism remain unspecified. There are many theories regarding the underlying cause of RRD and cataract in AD, but self-inflicted mechanical trauma through repetitive eye rubbing or slapping has gained popularity in recent years [2, 12, 19, 20]. This is supported by the frequent involvement of the temporal retina in atopic RD and is thought to be due to the directional forces applied during eye rubbing. Our cohort of patients also demonstrated the characteristic features of AD-associated RRD, which has a predilection for temporal retinal quadrant involvement and high concurrent rates of GRT [19, 21, 22], proliferative vitreoretinopathy [19, 21, 22], and bilateral cataract [2, 22]. However, Choi et al. [11] found a consistent and robust association between RRD and AD even after excluding cataract surgery from the analysis. They found an association between the severity of AD and the increased risk of RRD with an odds ratio of 2.88 (95% confidence interval: 2.25–3.68).

Patients with AD are at a high risk for cataract formation. Cataract in patients with AD can be anterior or posterior subcapsular [2, 23]. Posterior subcapsular cataract is the most common type and is thought to be a side effect of long-term topical or systemic corticosteroid treatment for AD [23, 24]. Anterior subcapsular cataract is characteristic of AD [23]. Atopic cataract usually presents bilaterally [2, 22], as observed in this study. Atopic cataract exists with elevated levels of ascorbate free radicals in the aqueous humor and major basic protein in tissues of the anterior capsule and aqueous fluid due to breakdown of the blood–aqueous barrier [18, 25]. The presence of high levels of aqueous flare and autoantibodies to lens epithelial cells in the serum in combination with genetic predisposition and use of corticosteroids appear to contribute to cataract formation [18, 25].

RRD has a higher incidence in patients with AD than in the healthy population, particularly when skin lesions are located in the periocular and facial area [2, 18, 26]. However, reduction in AD-associated RRD has been observed over two decades [17]. Myopia, a risk factor for RRD, appears more often in patients with AD than in healthy individuals [18, 27]. Approximately, 47–89% of retinal detachment cases in AD are associated with atopic cataract [18]. Several mechanisms have been proposed to explain the pathogenesis of RRD in AD. Early theories suggested a role of retinal edema and retinal vascular changes within the peripheral retina, leading to RRD [7, 9]. Coles and Laval proposed the “shock organ” theory [7], according to which the shared mesodermal components of the skin, vitreous, and crystalline lens confer similar susceptibility to the pathogenic inflammatory processes that underline atopy, ultimately leading to RRD and cataract. Another theory suggests the role of chronic cyclitis

Table 2. Management and visual outcomes of patients with atopic dermatitis and associated ocular comorbidities

Eye number	Lens status on presentation	Location of detachment	Retinal breaks		PVR	Management	Anatomical outcomes	Initial BCDVA	Final BCDVA
			Supero- and inferotemporal	Superotemporal					
1	PSC	Supero- and inferotemporal	GRT (temporal)	On	No	SB	Reattached retina	6/18	6/18
2	Mature/white	Superotemporal	Three temporal HST tears	On	No	Cataract surgery + PPV + cryotherapy + C3F8 gas	Reattached retina	HM	6/12
3	PSC	None present	Inferonasal holes	On	No	Indirect laser retinopexy + cryotherapy	Good barrier laser around retinal tears	6/9	6/12
4	Cortical (anterior capsular)	Supero- and inferotemporal	Three inferotemporal tears with early PVR	On	Yes	Failed SB followed by Cataract Surgery + PPV + laser + 5000 Cs SO and further PPV + retinectomy + 5000 Cs SO	Shallow RD inferiorly involving macula	HM	4/60
5	Cortical	Temporal	Temporal tears	Off	No	Laser retinopexy	Good barrier laser around retinal tears	6/9	6/9
6	PSC	Total RD with PVR	Two temporal HST and one superonasal	Off	Yes	PPV + SB encirclement + 360° laser retinopexy+ 1000 Cs SO	Reattached retina	HM	HM
7	Pseudophakic	Subtotal PVR detachment	Three superotemporal HST	Off	Yes	PPV + endolaser + relieving retinotomy+ cryotherapy+laser+5000 Cs SO. Followed by ROSO a year later.	Reattached retina	6/9	6/12
8	PSC	Superior	Two temporal retinal holes	Off	No	SB + cryotherapy	Reattached retina	6/6	6/6
9	PSC	Superotemporal	Superotemporal tears	Off	Yes	Cryobuckle which failed followed by cataract surgery + endolaser + SO then further PPV + retinectomy + densiron then ROSO	Detached retina Phthisical eye/ cosmetic shell	6/18	NPL
10	Cataract (unspecified)	Superotemporal	Superotemporal	Off	No	Laser retinopexy	Barrier laser around retinal detachment	6/18	6/36
11	White, intumescent	Unspecified (notes not located)	GRT (notes not located to specify position)	Off	Yes	PPV+ aspiration of lens + 360° laser retinopexy+ SO followed by further PPV + retinectomy + endolaser + densiron oil then ROSO with secondary IOL	Reattached retina. Also had Baerdveldt glaucoma tube	HM	6/18
12	Cataract (anterior and posterior subcapsular)	Unspecified (notes not located)	GRT (notes not located to specify position)	Off	No	Cataract surgery + PPV + laser + densiron oil followed by ROSO	Reattached retina. Also had Baerdveldt glaucoma tube	CF	6/18
13	Cataract (unspecified)	Superotemporal	Two superotemporal	Off	No	SB + cryotherapy	Reattached retina	6/12	6/5
14	Pseudophakic	Superotemporal	Two superotemporal	Off	No	SB + cryotherapy followed by PPV + endolaser + retinectomy + C3F8 gas then PPV+ washout of heavy liquid + capsulectomy	Reattached retina after redetachment from PVD but currently has opacified intraocular lens	6/9	HM

Abbreviations: PVR, proliferative vitreoretinopathy; BCDVA, best-corrected distance visual acuity; PSC, posterior subcapsular cataract; GRT, giant retinal tear; SB, scleral buckle; HST, horse shoe tear; PPV, pars plana vitrectomy; HM, hand motion; NPL, no light perception; Cs, centistokes; SO, silicone oil; RD, retinal detachment; ROSO, removal of silicone oil; IOL, intraocular lens; CF, counting finger; C3F8, perfluoropropane gas, PVD, posterior vitreous detachment.

in inducing vitreous contraction and subsequent RRD secondary to vitreoretinal traction [7]. Hayashi et al. also supported the connection between chronic inflammation and RRD and noted that retinal breaks appeared in the ciliary body in 78% of their patients [28].

Our case series had a higher rate of bilateral RRD (92.8%) than that reported in the literature [2, 12, 17]. This may represent an inadvertent selection bias because our hospital is the main tertiary referral vitreoretinal center in the region. The longitudinal follow-up of our patients allowed us to capture sequential bilateral RRDs, whereas a cross-sectional study may have recorded such cases as unilateral. However, this study was limited by its retrospective nature, lack of a control group, and contribution of different surgeons. Nevertheless, in future studies, the presence of a control group along with more details about the interval between the time of diagnosis of AD and the development of cataract or RRD would provide more valuable information to calculate the risk of these conditions and recommend a safe monitoring period for patients with AD. Another limiting factor in our study was the lack of ethnic demographics of the patients. Emerging data reveal a spectrum of risk loci among different ethnic groups, which may, in part, explain the variability in the severity of the AD phenotype, including RRD rates, between different ethnic groups [29, 30]. Additionally, future multidisciplinary studies involving dermatologists would be helpful in identifying a larger population of patients with AD with these high-risk characteristics. These would enable earlier detection of asymptomatic retinal tears or holes, which would allow preventive treatment, such as barrier laser retinopathy, and prevent sight-threatening complications, such as RRD.

## CONCLUSIONS

This case series highlighted the characteristics of AD-associated RRD, including higher rates of bilaterality and the presence of coexistent GRTs and cataract. The predilection for temporal quadrant involvement along with the proposed mechanism of self-inflicted trauma through directional eye rubbing emphasize the need for patient education and aggressive treatment and management of AD by dermatologists to address its detrimental impact on patients' quality of life and help ameliorate the risk of potentially blinding ocular complications.

## ETHICAL DECLARATIONS

**Ethical approval:** The study adhered to the tenets of the Declaration of Helsinki, and all patient data were extracted and anonymized for analyses. Data collection was approved by our local institution (Audit No. 1593; BMEC).

**Conflict of interests:** None

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