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CLINICAL STUDY

Characteristics and surgical outcomes of paediatric retinal detachment

T Yokoyama, T Kato, A Minamoto, A Sugihara, M Imada, R Kuwabara, H Mizote, K Yamane, K Jian, H Tamura, H Noma and HK Mishima

Abstract

Purpose **To report the clinical features and surgical and visual outcomes of rhegmatogenous retinal detachment (RRD) in the paediatric population.**

Methods **A retrospective review of children (aged 0–15 years) who underwent primary surgical repair for RRD at the Hiroshima University Hospital between 1988 and 2001.**

Results **In all 53 eyes of 49 patients were identified; paediatric RRD accounted for 3.1% of 1779 eyes with RRD operated on during this period. The causes of RRD included blunt trauma (27%), myopia (25%), idiopathic (20%), familial exudative vitreoretinopathy (13%), and others. Among 55 eyes, 12 (22%) already had proliferative vitreoretinopathy (PVR) of grade C or D preoperatively. The median initial visual acuity (VA) was 0.3. Retinal reattachment was achieved with a single operation in 78%. Final retinal reattachment was achieved in 87%. Retinal reattachment rates with and without PVR were 42% and 100%, respectively ($P<0.01$). Median final VA was 0.7. Final VA was $\geqslant 0.1$ in 73% and $\geqslant 0.5$ in 53%; four eyes had a final VA of no light perception. The presence of preoperative PVR ($P=0.03$) and the initial VA ($P<0.0001$) significantly affected final VA.**

Conclusions **Paediatric RRD is characterised by a delay in diagnosis, as evidenced by the high rate of PVR at presentation. Retinal reattachment was adversely affected by the presence of PVR. Final VA correlated with the initial VA and was significantly affected by preoperative PVR. Early diagnosis may improve the visual prognosis of paediatric retinal detachment.**

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Introduction

Rhegmatogenous retinal detachment (RRD) may occur at any age, but it has been infrequent during childhood; the reported incidence of childhood RRD is 1.7–5.9%[1–3] of all retinal detachments. Clinical features of paediatric RRD are different from those of adults because of delayed diagnosis due to poor subjective complaints[4,5] and an association with various complicating entities.[1–3,5] Extrapolation of data obtained from adult cases, therefore, may be inappropriate for the management of paediatric RRD. Instead, data from clinical study focusing on paediatric cases are required.

We retrospectively studied the medical records of patients who had undergone surgical treatment for RRD in our hospital over a 14-year period, to report on the clinical features and long-term functional and anatomic results of paediatric RRD.

Patients and methods

We retrospectively reviewed the clinical records of 49 patients (55 eyes) aged 0–15 years, who underwent primary surgical repair for RRD at the Hiroshima University Hospital between January 1988 and December 2001. Patients with exudative and tractional retinal detachment, retinal detachment related to globe-disrupting trauma, retinal detachment secondary to retinopathy of prematurity, and retinal detachment in the mentally retarded were excluded from this study. During this period, a total of 1779 eyes with RRD were operated on. Paediatric RRD accounted for 3.1% of the retinal detachment surgeries. Clinical records of these

Department of Ophthalmology and Visual Science
Graduate School of Biomedical Sciences
Hiroshima University, Japan

Correspondence:
A Minamoto
Department of Ophthalmology and Visual Science
Graduate School of Biomedical Sciences
Hiroshima University
1-2-3, Kasumi Minami-ku
Hiroshima 734-8551
Japan
Tel.: +81-82-257-5247
Fax: +81-82-257-5249
E-mail: amina@hiroshima-u.ac.jp

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patients were reviewed and the data collected included age at presentation; sex; affected eye; local and systemic aetiological factors; duration of detachment; initial visual acuity (VA); number, type, and site of retinal break(s); attachment or detachment of the macula; extent of detachment; presence and grade of proliferative vitreoretinopathy (PVR) based on the Retina Society classification of 1983;[6] type of surgery performed; reoperations; final VA; final reattachment status; and length of follow-up. Anatomical success was defined as persistent retinal reattachment at the last follow-up visit (at least 12 months postoperatively) in the absence of silicone oil.

Statistical analysis was performed with StatView software (SAS Institute Inc.). Decimal visual acuities were converted to LogMAR values for the following analyses. Spearman's rank-order correlation coefficient was calculated to assess the relationship between initial and final VA. Analysis of covariance (ANCOVA) was used to determine the effect of sex, history of blunt trauma, preoperative macular detachment, and preoperative PVR on final VA, with initial VA as covariate. A *P*-value of less than 0.05 was considered statistically significant.

Results

Among 49 paediatric patients who ranged in age from 0 to 15 years (mean = 12 years), 42 (86%) were boys (45 eyes) and seven (14%) were girls (10 eyes). Follow-up ranged from 12 to 170 months (mean = 80 months). Aetiological factors included, in order of frequency, blunt trauma in 15 eyes (27%), myopia greater than −4.00 D in 14 (25%), familial exudative vitreoretinopathy (FEVR) in seven (13%), atopic dermatitis in five (9%), aphakia due to congenital cataract surgery in one (2%), lens subluxation due to Marfan's syndrome in one (2%), and congenital rubella syndrome in one (2%). In all 11 eyes had no known aetiological factors. PVR of grade C or D had already developed preoperatively in 12 eyes (22%). The duration of RRD was known in 34 eyes, ranging from 4 days to 5 months, with a mean of 30 days.

Round retinal holes were most frequently identified (22 eyes, 40%). Oral dialysis was identified in 15 (27%), in which seven were associated with blunt trauma and three with atopic dermatitis. Six eyes had no retinal breaks detected preoperatively (Table 1).

Of the 43 eyes (78%) without PVR, 39 eyes had undergone conventional scleral buckling surgery as the first procedure. The remaining four eyes had primary vitrectomy, in which two eyes had dense vitreous haemorrhage (one due to FEVR and the other to blunt trauma) and no visible retinal break, one had a rolled-over giant retinal tear, and one had a small posterior retinal tear after pars plicata lensectomy for congenital cataract. In the 12 eyes (22%) with PVR, three eyes with grade C2 PVR had undergone scleral buckling and nine eyes with grade D PVR had primary vitrectomy.

Anatomical success, with complete retinal reattachment in the absence of silicone oil, was achieved in 48 of the 55 eyes (87%). Of the 43 eyes without PVR, 40 eyes (93%) achieved initial reattachment; 37 of 39 eyes reattached after a buckling procedure (18 eyes with segmental scleral buckling alone, and 21 eyes with encircling or encircling plus segmental buckle), and three of four eyes reattached after vitrectomy. Three eyes without initial reattachment underwent a second surgery and achieved reattachment with scleral buckling in one eye and vitrectomy in two eyes. Reattachment was eventually obtained in all operated eyes without PVR. Among 12 eyes associated with PVR, three eyes (25%) achieved initial reattachment (one with scleral buckling and two with vitrectomy), and two of the remaining nine eyes achieved reattachment after vitrectomy as the second surgery, excluding three eyes with reattached retina posterior to the encircling buckle with retained silicone oil. Silicone oil has not been removed in these eyes because of persistent hypotony, which suggests the

Table 1 Aetiology of retinal detachment and type of retinal breaks

		Type of retinal breaks				
	No. of eyes (%)	*Round holes*	*Oral dialysis*	*Horseshoe tear*	*Giant tear*	*Undetected*
Blunt trauma	15(27)	5	7	2	0	1
Myopia (> −4 D)	14(25)	6	1	5	1	1
Idiopathic event	11(20)	3	4	2	0	2
FEVR[a]	7(13)	5	0	1	0	1
Atopic dermatitis	5(9)	2	3	0	0	0
Subluxed lens	1(2)	1	0	0	0	0
Aphakia	1(2)	0	0	1	0	0
Congenital rubella	1(2)	0	0	0	0	1
Total no.of eyes	55(100)	22(40)	15(27)	11(20)	1(2)	6(11)

[a]FEVR: familial exudative vitreoretinopathy.

presence of anterior PVR change. Overall, complete retinal reattachment was obtained only in five of 12 eyes (42%) with PVR (Table 2), in the absence of silicone oil. Thus, retinal reattachment was adversely affected by the presence of preoperative PVR ($P<0.01$, Mann-Whitney's *U*-test).

Median initial VA was 0.3, and median final VA was 0.7. Initial VA was $\geqslant$0.1 in 29 eyes (53%) and $\geqslant$0.5 in 19 eyes (35%). Final VA was $\geqslant$0.1 in 40 eyes (73%) and $\geqslant$0.5 in 29 eyes (53%); four eyes (7%) had a final VA of no light perception. After surgery, VA improved in 33 eyes, deteriorated in seven eyes, and was unchanged in 11 eyes. Of the 55 eyes included in the study, initial VA data were not available for four eyes because of age or examination difficulties. Figure 1 compares initial and final VA in 51 eyes after at least 12 months of follow-up. Final VA was significantly correlated with initial VA ($\rho=0.904$, $P<0.01$; Spearman's rank-order correlation coefficient). From the result of ANCOVA, the presence of preoperative PVR ($P=0.03$) and initial VA ($P<0.0001$) significantly affected the final VA.

None of the eyes underwent amblyopia treatment. Four patients were younger than 10 years old. Two of them, age of 0 and 8, did not need amblyopia treatment, because they had good postoperative visual acuity (1.0). Another two patients, aged 6 and 8 years, had macula detached RRD preoperatively. The patient 8 years old had a history of FEVR with dragging of the macula, and the patient 6 years old was RRD after contusion injury with choroidal rupture at the macular area. Therefore, there was no indication for amblyopia treatment in these two patients.

Table 2 Anatomic results

	PVR[a]	
	−	+
First operation		
Scleral buckling	37/39	1/3
Pars plana vitrectomy	3/4	2/9
Second operation		
Scleral buckling	1/1	0/0
Pars plana vitrectomy	2/2	2/6
Total	43/43	5/12
(%)	(100)	(42)

[a]PVR: proliferative vitreoretinopathy.

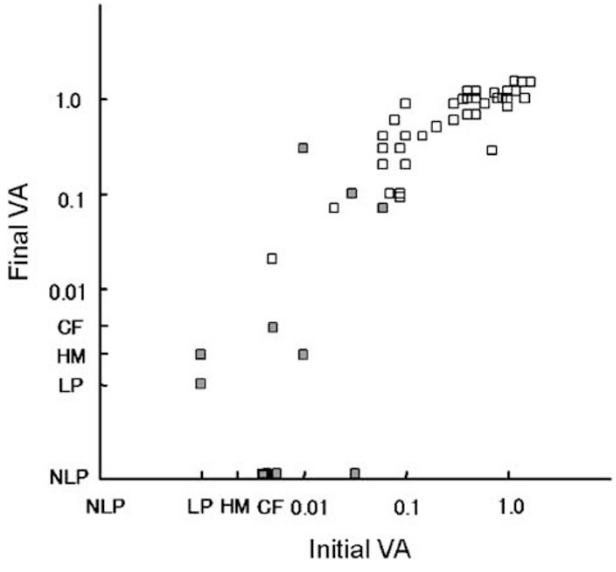

Figure 1 Scatter graph compares initial VA and final VA in 51 eyes. Open squares indicate eyes without advanced PVR; closed squares, advanced PVR (grade C or D); NLP, no light perception; LP, light perception; HM, hand motions; CF, counting fingers. VA of LP was arbitrarily defined as 0.001, that of HM as 0.002, and that of CF as 0.004.

Discussion

Paediatric RRD is a relatively rare condition. Only a few limited reports, therefore, have focused on these patients. In the present study of 1779 eyes of RRD repair carried out at our institution during a 14-year period (1988–2001), paediatric RRD accounted for only 3.1% of cases. Based on previous data from our institution, in paediatric patients (aged 0–15 years), RRD accounted for 10.2% (study period: 1956–1966),[7] 6.0% (1967–1973),[8] and 4.8% (1974–1984) of all operated cases of RRD. The decreasing incidence in these cases may be due to a decreasing birthrate and/or increasing elderly population in Japan.[9]

As in other reviews of paediatric retinal detachment, the majority (86%) of our patients were boys. Blunt trauma was the leading predisposing aetiological factor, with a frequency (27%) comparable to previous studies.[2,8,10] Oral dialysis was most frequently (47%) found in trauma-induced cases, as in other studies of traumatic RRD.[11,12] Atopic dermatitis, which has an increasing prevalence in Japan, is a known complication of RRD, whereas contusion from rubbing the eyes has been considered the cause of retinal breaks.[13] Oral dialyses were also found in three of five eyes with RRD associated with atopic dermatitis. FEVR composed 13% of paediatric RRD in our study, which is consistent with the 12–16% findings in other studies.[2,14] Careful attention should be paid to the detection of FEVR, because a high rate of PVR was found in those eyes.[2]

Conventional scleral buckling procedure was undertaken as the first operation in 42 of 55 eyes (76%), including three eyes with grade C2 PVR. This procedure is preferred for the first operation in RRD without advanced PVR, because the areas of posterior vitreous detachment are usually localised in paediatric RRD, making vitrectomy more difficult. In our study group,

retinal reattachment occurred in 38 of 42 eyes (90%) with the initial scleral buckling procedure. If the three eyes with PVR were to be excluded, the initial reattachment rate increased to 95% (37 of 39 eyes) when treated with scleral buckling. Two eyes without initial reattachment underwent a second surgery and reattached with scleral buckling in one and vitrectomy in the other. Scleral buckling demonstrated favourable anatomical results; therefore, it is recommended as the initial surgical procedure in paediatric RRD without PVR. Various buckling techniques were included in our study: 18 eyes had segmental scleral buckling alone, and 21 eyes had encircling or encircling plus segmental buckle. Although several reports have addressed the need for an encircling buckle in paediatric RRD cases,[4,15] our first choice is segmental buckle to minimise surgical trauma.

In all 22% of eyes in this study presented with grade C or D PVR. Likewise, several studies of paediatric RRD also reported a high rate of PVR, attributed to delayed diagnosis[4,5] and increased intraocular cellular activity.[2] Complete retinal reattachment was achieved only in 42% of PVR cases in this study, and the functional results were worser than the anatomical results. In 10 eyes for which VA data were available, VA improved in four eyes (40%) but only two eyes (20%) obtained a final VA of 0.1 or better (Figure 1). Four eyes with PVR had a final VA of no light perception.

Overall, functional results seemed to be relatively successful. Final VA was $\geqslant$0.1 in 40 eyes (73%) and $\geqslant$0.5 in 29 eyes (53%). However, improved VA was confined to 33 eyes (65%), when compared to the reattachment success of 48 eyes (87%). Our results showed that final VA correlated with initial VA, and was adversely affected by the presence of PVR. Although various possible negative factors such as macular damage due to blunt trauma could be associated with the functional results of paediatric RRD, we suggest that visual outcome would be improved by earlier diagnosis, before advanced PVR occurs.

Our study is limited by the small number of patients included and the retrospective nature of the study. In addition, a long study period (14 years) may obscure the efficacy of the latest surgical approach in evolving RRD surgery. However, we believe that the data shown here provide additional information about the characteristics of paediatric RRD, making it useful in the management of this relatively rare condition.

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