·Clinical Research·

Risk factors related to chronic rhegmatogenous retinal detachment

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Abstract

• AIM: To evaluate the clinical factors related to chronic rhegmatogenous retinal detachment (RRD).

• METHODS: A retrospective case-control study. A total of 103 consecutive patients (103 eyes) with primary RRD were studied to evaluate the clinical factors related to chronic RRD.

• RESULTS: Chi-square test was used to sift out the following associated factors with chronic RRD: younger patients(P=0.0028), better preoperative best corrected visual acuity (BCVA, P=0.0316), atrophic retinal break (P<0.0001), inferior retinal break (P<0.0001), smaller break (P=0.0005); then the independent risk factors related to chronic RRD was determined by stepwise logistic regression analysis as following: atrophic retinal break (odds ratio (OR)=7.997, P=0.007), inferior retinal break (OR=14.127, P<0.0001) and better preoperative BCVA (OR=1.636 P<0.0722) .

• CONCLUSION: Atrophic retinal break, inferior retinal break and better preoperative BCVA are the independent risk factors related to chronic RRD.

• KEYWORDS: retinal detachment; chronic; related factors; risk factors

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INTRODUCTION

Primary rhegmatogenous retinal detachment (RRD) is defined as a group of diseases in which detachment occurs between the retinal neurosensory layer and pigment epithelial layer, caused by a primary retinal break. The annual incidence of RRD in China is 7.98 in 100 000 persons, with the onset peak at 60-69 years[1]. RRD could be divided into two subgroups according to the onset features and progressive rate. Patients with non-chronic RRD take a major proportion, with a precisely onset time and definite symptoms that progress rapidly, and a promptly operation is often suggested; while chronic RRD usually associates with unclear onset time, delayed severe symptoms, gradual progression and much poorer visual function after operation, which covers about only 4.5% (127/2800) of all retinal detachments [2]. Recently there has been a lot of literature published on the clinical characteristics and surgical outcomes of chronic RRD [2-5]. However, clinical factors related to chronic RRD have not been reported through Pub Med.In this study we object to identify these risk factors.

MATERIALS AND METHODS

Subjects A total of 103 consecutive hospitalized patients were treated at Ophthalmology Center of Sir Runrun Shaw hospital between June 2008 and November 2010. The inclusive criterion was any patient with symptomatic primary RRD defined as retinal detachment extending more than two disc diameters (DD) posterior to the equator with definite retinal breaks observed by ophthalmoscope or during operation. While the exclusive criteria included secondary retinal detachment such as tractional, traumatic or exudative retinal detachment, macular hole induced RRD, recurrent RRD, asymptomatic RRD (including subclinical and clinical RRD). Patients with vitreoretinal surgery histories or incomplete clinical datum were also excluded. RRD was classified as chronic (study group) if associated with one or both of the following criteria: a history of definite vision loss or visual field defect corresponding with the fundus finding at least more than three months (A), and subretinal demarcation lines which were confirmed by an unrelated experienced attending (B) [2,6]. Patients not matching any of those criteria were placed in the non-chronic group (control group).

Methods Clinical factors included sex, affected eye, age, preoperative best-corrected visual acuity (BCVA), retinal

Table1 Chi-square analysis of all values between the two groups *n*(%)

Factor	*n*	Control group	Study group	χ^2	*P* value
Sex					0.6192
Male	52	38 (52.05)	14(46.67)		
Female	51	35 (47.95)	16(53.33)		
Age (years)				11.7606	0.0028[c]
<30	20	8 (10.96)	12(40.00)		
30~	55	42 (57.53)	13(43.33)		
60~	28	23 (31.51)	5(16.67)		
Affected eye				1.2883	0.2564
OD	57	43 (58.90)	14 (46.67)		
OS	46	30 (41.10)	16 (53.33)		
Preoperative				8.8350	0.0316[c]
BCVA					
<0.02	40	35 (47.95)	5 (16.67)		
0.02~	13	8 (10.96)	5 (16.67)		
0.1~	31	19 (26.03)	12 (40.00)		
0.5~	19	11 (15.07)	8 (26.67)		
Detached quadrants				3.3205[a]	0.3448
1	17	13 (17.81)	4 (13.33)		
2	56	37 (50.68)	19 (63.33)		
3	14	9 (12.33)	5 (16.67)		
4	16	14 (19.18)	2 (6.67)		
Break type				33.1499	<0.0001[c]
Atrophic hole	33	11 (15.07)	22 (73.33)		
Retinal tear	70	62 (84.93)	8 (26.67)		
Break position				37.7828	<0.0001[b]
Superior	67	61 (83.56)	6 (20.00)		
Inferior	36	12 (16.44)	24 (80.00)		
Break number				0.2198	0.6392
Single	62	45 (61.64)	17 (56.67)		
Multiple	41	28 (38.36)	13 (43.33)		
Break size（DD）				15.0390	0.0005[b]
<1	42	21 (28.77)	21(70.00)		
1~	24	20 (27.40)	4(13.33)		
2~	37	32 (43.84)	5(16.67)		
Axial length (mm)				0.5394	0.4627
<26	63	43 (58.90)	20 (66.67)		
26~	40	30 (41.10)	10 (33.33)		
Lens status				0.7146[a]	0.3979
phakic	92	64 (87.67)	28 (93.33)		
pseudophakic	11	9 (12.33)	2 (6.67)		

Five factors were sifted out at the statistic significant level: age, preoperative best corrected visual acuity (BCVA), break type, position and size. [a] 25% of expected values are<5, Chi-square test: 0; [c]*P*<0.05 by Chi-square test.

detachment extension (numbers of quadrants), retinal break properties (type, position, size, numbers), eyeball axial length and lens status (phakic or pseudophakic) were studied. The retinal break was classified as retinal tear and atrophic hole. Retinal tear included horseshoe tear, "L" type tear or operculated tear, while the latter included atrophic round, oval holes or non-traumatic retinal dialysis. Break position was classified as superior and inferior by the retinal horizon. If more than one break was observed then the principal break was defined as which associated with the initial visual field defect or conformed to the appearance of retinal detachment.

Statistical Analysis Software SAS 9.1 was used to analyze the data. The first step involved the comparison, by chi-square test with significant level at 0.05, of all the studied factors between the chronic and non-chronic groups. Stepwise logistic regression was then used to determine the independent clinical risk factors of chronic RRD, with significant entry level 0.1 and removal level 0.15. Odds ratios (ORs) for significant factors and a risk predicting model were also calculated.

RESULTS

Of all the 103 patients 103 eyes, there were 52 men and 51 women, with a mean age of 48.0±16.7 years (±standard deviation), ranging from 14 to78 years. The study group has 30 eyes with two age distribution peaks at 20-30 years and 50-60 years, while the control group had only one peak at 50-60 years (Figure 1). Eight patients were diagnosed based on criterion A, 18 patients on criterion B and 4 based on both criteria. Chi-square test showed five significant factors

Table 2 stepwise logistic analysis of sifted factors

	B	SE	OR	OR 95% CI	*P*
Atrophic hole	2.0791	0.6144	7.997	2.399-26.661	0.0007
Inferior break	2.6481	0.6381	14.127	4.045-49.344	<0.0001
Preoperative BCVA	0.4920	0.2737	1.636	0.957-2.796	0.0722
Constant value	-4.2950	0.9897			<0.0001

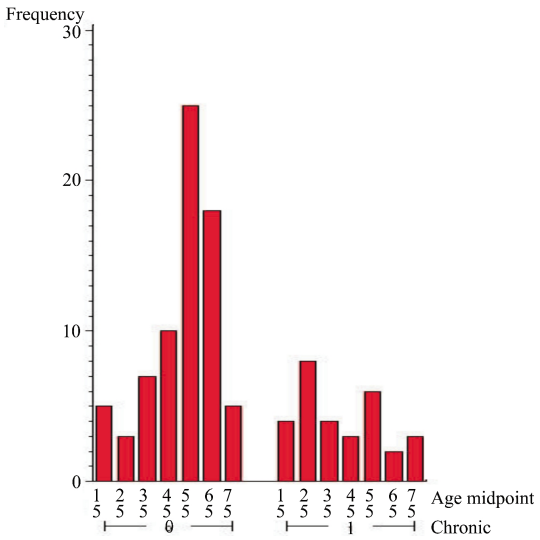

Figure 1 Age distribution of study group and control group. 0=control group 1=study group.

namely age, preoperative BCVA, break type, position and size (Table 1). Atrophic retinal hole, inferior break and better preoperative BCVA were the three independent risk factors according to stepwise logistic regression analysis (Table 2), and their OR values were 7.997, 14.127 and 1.636, respectively.

Three risk factors related to chronic retinal detachment was identified by stepwise logistic analysis at significant entry level 0.1 and removal level 0.15: atrophic hole, inferior break and better preoperative best-corrected visual acuity (BCVA).

DISCUSSION

Primary RRD originates from the full thickness retinal break formation, followed by qualified vitreous entering the space between neurosensory layer and pigment epithelial layer [7]. So from the mechanism of RRD occurrence, it could be inferred that the vitreous status and retinal break formation style play an important role. The rapidity and magnitude of retinal detachment depend mainly on the rate of retinal break formation, liquefied vitreous outflow passing through the break and spread of subretinal fluid. Retinal break is the result of mutual interaction of degenerated vitreous and retina. To our knowledge, retinal tear (mainly horseshoe tear) is usually caused by posterior vitreous detachment (PVD) and vitreoretinal traction, usually in non-chronic RRD (37.2%) [5]. However atrophic retinal hole usually associates with non-PVD, and mainly in chronic RRD. In this study atrophic holes took about 73.33% (22/30, $P<$ 0.0001, chi-square test) in chronic RRD, similar to the 80% reported by Yao *et al.* [3] During the formation of atrophic hole, retinal degeneration performs a more important role, resulting in round retinal holes with sharp margins in most cases. Such as in Ung *et al*'s report[8], PVD was only found in 14% of patients with round retinal breaks. So that RRD with atrophic holes usually appears no acute process because of lacking acute PVD. In summary, patients with retinal tears usually have a sudden onset, obvious initial symptom and exacerbate more rapidly than those with retinal atrophic holes, because of massive vitreous liquid outflows into subretinal space with higher speed of subretinal spreading. Besides, smaller retinal break is conducive to slowly liquefied vitreous outflowing.

Meanwhile in this study retinal breaks in most chronic RRD were found to be inferior (80%, 24/30), while superior in non-chronic RRD (83.56%, 61/73, $P<0.0001$, chi-square test), compared to Chou's 52.8%[11].It was explained by, due to body position and gravity, more slowly spreading of subretinal fluid of inferior detachment than the superior one, which might be another important reason for the gradual progress of chronic RRD. Besides, patients with relatively better preoperative BCVA were not positive to seek treatment, so they were prone to chronic processes.

In our study, chronic RRD covered about 29.1%, much more than 4.5% reported by Yang's *et al* [2]. This huge discrepancy was mainly explained by two reasons. First, the studied patients selected here had excluded many non primary RRD cases, while in Yang's study the compared control group contained all those retinal detachments. So it was just a consisting ratio of this study. Second, there is currently no standard agreement on diagnostic criteria. In this study we chose two items to define chronic RRD: duration of visual loss more than three months which should correspond to fundus appearance, and subretinal demarcation lines. Demarcation lines are caused by proliferation of retinal pigment epithelia at the junction of flat and detached area, pigmented or not [7], usually in linear or curved form and concentric around the initial break (Figure 2). These lines may limit subretinal fluid spreading, which is a typical

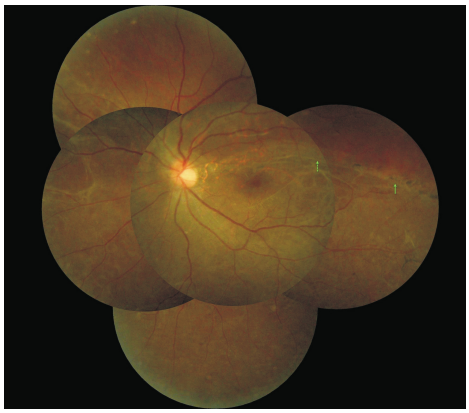

Figure 2 Case 30, a pigmented demarcation line (solid arrow) caused by pigment epithelia proliferation on the border of flat and detached area. Virtual arrow showed the depigmented part.

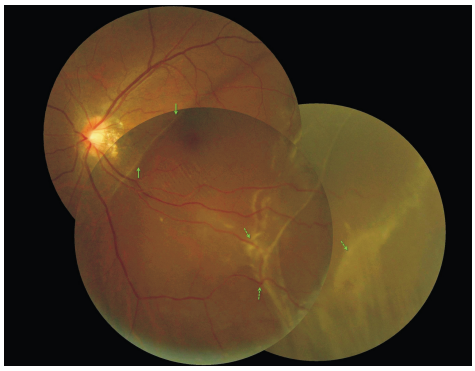

Figure 3 Case 19, a sloping depigmented demarcation line (solid arrows). The subretinal fluid was prevented spreading to superior -nasal direction. Virtual arrows showed the irregular subretinal proliferation that elevated the retina, forming a crest appearance.

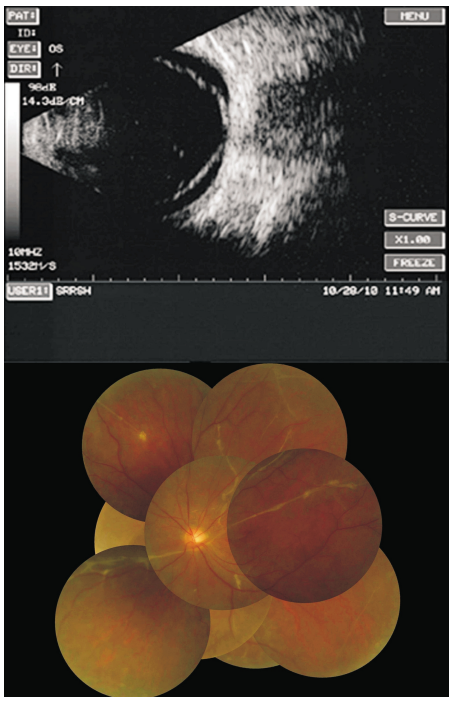

Figure 4 Case 27, a chronic retinal detachment patient with a history of one year gradually enlarged superior black curtain covering.B scan showed a complete shallow retinal detachment and a relatively smooth surface. Fundus photo showed lots of subretinal lines without obvious preretinal proliferation.

feature of chronic RRD. It should be differentiated from subretinal proliferation, which usually has irregular appearance and often elevate the detached retina (Figure 3), in variable forms typically as annular strand near disc, linear strands, motheaten-apearing sheets(Updated PVR Contraction Type classification, 1991). The risk factors related to subretinal proliferation is atrophic break, younger patient's age, long duration of detachment and greater extension, however, they could exist together. The detached retina in chronic RRD usually shows a smooth surface, and severe proliferative vitreoretinopathy (PVR) is rarely observed (Figure 4). As in this study, PVR D1 or severer (Retina Society PVR Classification, 1983) was found in 8 patients of the control group (10.96 percents, 8/73), but none in the study group.

Besides, Orucov *et al* [10] reported that the detection rate of asymptomatic retinal detachment (ARD) before laser-assisted *in situ* keratomileusis was 1/2563 in patients with myopia, and its fundus appearance was also characterized by atrophic hole and inferior retinal break, but with much better visual function and a slower progression, and some even stay stable through decades. Byer *et al* [11] followed up 19 cases of subclinical RRD for 13.5 years, finding only 2 cases progressing into clinical RRD. In contrast, most chronic RRD had much poorer visual function, surgical outcome and relatively shorter courses at presentation. It is still unknown whether chronic RRD and subclinical RRD are two subtypes of RRD or they are just the same subtype but on two different development stages. So further research needs to be performed.

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