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Proliferative vitreoretinopathy shows predilection for the inferior fundus*

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Abstract. We reviewed 112 consecutive cases of retinal detachment associated with grade C-1 proliferative vitreoretinopathy (PVR) to assess the initial location of the full-thickness retinal folds. A total of 47 eyes had PVR preoperatively, and 65 eyes demonstrated PVR postoperatively. Of the eyes affected preoperatively, 29 (56%) developed PVR in the inferior retina, as did 58 (74%) of the eyes affected postoperatively for a total of 87 eyes (67%). Eyes treated with cryoretinopexy had a higher incidence of PVR in the inferior retina (87.5%) than did those undergoing diathermy (57.6%) or photocoagulation (80%). Our findings suggested that the location of PVR may be influenced clinically by gravity. This tendency was more apparent after surgery, especially after cryoretinopexy, than preoperatively.

Introduction

Proliferative vitreoretinopathy (PVR) is the leading cause of failure after retinal detachment surgery [11]. It has been suggested that this recurrent detachment process involves the dispersion of cells, such as retinal pigment epithelial cells, their settling, proliferation, and contraction with extracellular matrix [5, 7–9]. Previous laboratory studies have shown the effect of gravity on the settling of cells and the subsequent location of PVR [13]. We have studied PVR to evaluate the effect of gravity on its location.

Materials and methods

We retrospectively reviewed 112 consecutive cases of rhegmatogenous retinal detachment associated with grade C-1 PVR, based on the classification of the Retina Society Terminology Committee [11]. According to this classification, grade C-1 PVR is characterized by full-thickness retinal folds in one quandrant of the retina. The judgement of PVR was based on fundus drawings and the description on charts.

Among the 112 eyes, 47 initially presented with grade C-1 PVR and had no history of retinal surgery. The remaining 65 demonstrated grade C-1 PVR after retinal reattachment surgery. We excluded from our study any patient with diabetic retinopathy and/or traumatic retinal detachment.

The fundus was divided into five segments: superotemporal, superonasal, inferotemporal, inferonasal, and posterior pole which is inside the arcade. The macula was considered the center. We demonstrated in which of these segments the full-thickness fixed retinal folds initially occurred. Lesions covering more than one segment were counted twice, one for each segment involved. We also compared the location of retinal breaks with that of PVR and the type of retinopexy used postoperatively.

Results

The locations of grade C-1 PVR and retinal breaks are shown in Figs. 1 and 2. Grade C-1 PVR initially occurred in the inferior retina in 87 eyes (67%) and in the superior half in 21 eyes (16%). On the other hand,

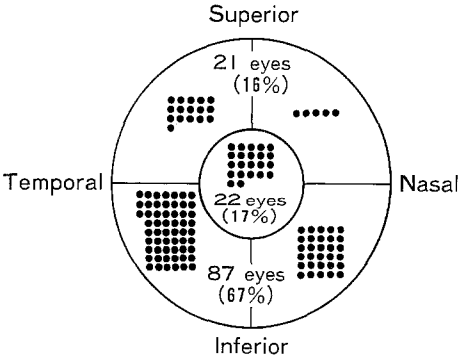

Fig. 1. Distribution of grade C-1 proliferative vitreoretinopathy (PVR). It occurred more often in the inferior retina than in the superior retina, despite the distribution of retinal breaks

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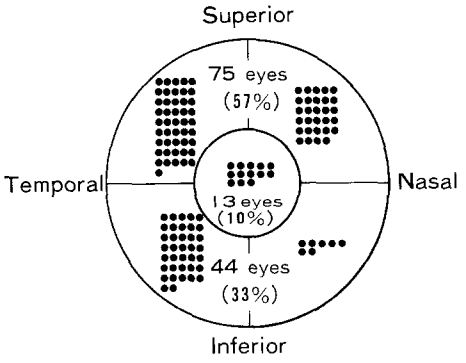

Fig. 2. Distribution of retinal breaks. Breaks found in more than one segment in one eye or extending over more than one quandrant were counted once for each segment. Retinal breaks occurred more often in the superior retina (75 eyes, 57%) and on the temporal side than in the inferonasal region

Table 1. The relationship between retinal break location and proliferative vitreoretinopathy (PVR) location

Retinal break location	PVR location (no. of eyes)		
	Superior	Posterior	Inferior
Superior	18	15	57
Posterior	0	6	9
Inferior	6	5	38

retinal breaks showed a predilection for the superior half of the fundus (75 eyes, 57%), with a higher incidence on the temporal side, which is consistent with previous data [14]. Of the 21 eyes that had PVR in the superior fundus, 3 had retinal breaks in both the superior and inferior halves. Including these 3 eyes, 86% of the eyes with PVR in the superior retina also had retinal breaks in the superior half of the retina. These findings suggest that there is little chance of finding PVR superiorly unless a retinal break exists in the superior retina (Table 1). Of the 87 eyes that exhibited PVR inferiorly, 66% had retinal breaks in the superior half and 44% had breakes in the inferior half, indicating that PVR in the inferior half could result from a retinal break in either the superior fundus or the inferior fundus.

Table 2. Type of retinopexy and PVR location

	PVR location (no. of eyes)		
	Superior	Posterior	Inferior
Cryoretinopexy	1	0	7
Cryoretinopexy and diathermy	1	1	16
Diathermic retinopexy	8	6	19
Photocoagulation	0	1	4

The cases were also divided into postoperative and preoperative PVR groups (Fig. 3). In both groups, PVR occurred more often in the inferior retina; however, the tendency was more distinct in the postoperative cases, which had a 74% incidence of PVR in the inferior retina.

The types of retinopexy performed in our hospital were cryoretinopexy, diathermic retinopexy, a combination of the two, and photocoagulation. Postoperatively, PVR tended to occur in the inferior retina in all treatment groups, with an incidence that was higher with cryoretinopexy (88%) than with diathermy (58%, Table 2).

Discussion

Previous laboratory studies indicated the effect gravity and the postoperative position of the patient have on the distribution of retinal pigment epithelial cells and the subsequent location of PVR [13]. In the present study, PVR occurred more frequently in the inferior fundus than in the superior retina, suggesting that gravity might influence the PVR location clinically.

In reviewing our cases, we noticed the following features; 1. PVR occurred most often in the inferior retina, regardless of where the retinal breaks were located. This tendency was more evident in the postoperative group than in the preoperative group. 2. In the postoperative group, cryoretinopexy was highly associated with inferior PVR, especially when compared with eyes treated with diathermic retinopexy.

The procedure by which PVR developed is believed

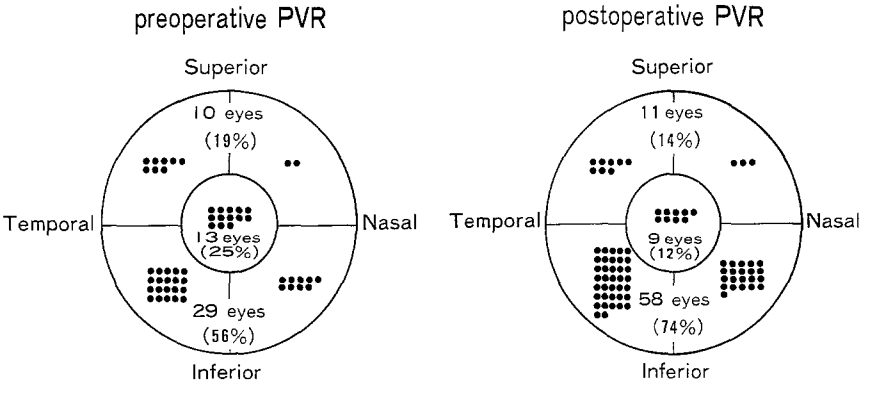

Fig. 3. Tendency of PVR to occur in the inferior retina was more apparent in the group of postoperative eyes than in the group of preoperative eyes

to consist of the release and settlement of cells on the retina that further proliferate to form a contractile membrane [3, 5, 9, 12]. Studies conducted on human vitreal specimens have revealed the presence of retinal pigment epithelial cells, glial cells, and fibroblasts, which are often associated with blood cells [7, 8], and intraocular inflammation, which is also an important factor in the formation of periretinal and intravitreal membrane [2, 10]. Since the operated patients were usually allowed to be in the standing position once the retina was found reattached, our study suggests that gravity may cause released cells such as those from the retinal pigment epithelium to settle down on the inferior retina, as has been shown experimentally [13]. The increased incidence of inferior PVR after surgery or cryoretinopexy may be due to two factors. First, surgery or cryoretinopexy itself may enhance the dispersion of cells, making them more susceptible to gravity. Second, the enhanced breakdown of the blood-retinal barrier after surgery and cryotherapy stimulates intravitreal chemotactic and mitogenic activity, which accelerates proliferation in the inferior retina [1, 2, 4, 15]. The preoperative condition of eyes treated with cryoretinopexy, however, may not have been equal with that of eyes treated with diathermic retinopexy. Further studies are required to conclude that cryoretinopexy actually enhances the possibility of inferior PVR.

The configuration of vitreous gel also influences the location of the proliferative process [6]. Cells released in the subhyaloidal space may accumulate between the vitreous gel and the retina at the posterior border of the vitreous base. This factor as well may explain why proliferation tends to occur more often in the inferior fundus than in the posterior pole.

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