SCIENTIFIC REPORT

High incidence of vitreomacular traction in recurrent choroidal neovascularisation after repeated photodynamic therapy

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Br J Ophthalmol 2006;90:1361–1362. doi: 10.1136/bjo.2006.094201

Background: The causes of recurrent choroidal neovascularisation (CNV) after photodynamic therapy (PDT) remain controversial. Subretinal surgery was carried out after unsuccessful PDT.

Aims: To determine intraoperatively the status of the posterior vitreous interface.

Design: Interventional case series.

Methods: Conventional three-port vitrectomy was carried out in 10 eyes with CNV that had undergone 1–4 PDT sessions. The vitreous cutter was held close to the edge of the optic nerve to evaluate the status of the posterior vitreous.

Results: Lesion size showed an increase from 1.5 (standard deviation (SD) 0.53) to 2.3 (SD 0.83) macular photocoagulation study disc diameters, between the first and the last PDT. Intraoperative findings during vitrectomy showed little liquefaction of the vitreous gel and an incomplete posterior-vitreous detachment, with remarkably firm attachments at the macula in all cases (10/10).

Conclusion: We determined an abnormally high incidence of vitreous attachments in eyes with recurrent CNV. Vitreomacular attachments may trigger the progression or recurrence of CNV.

The causes of recurrent choroidal neovascularisation (CNV) after photodynamic therapy (PDT) remain controversial. Early after PDT, there is an upregulation of vascular endothelial growth factor (VEGF) accompanied by an increased macular oedema.¹ However, it remains elusive why some CNVs regress after one PDT, whereas other lesions increase in size although numerous sessions have been carried out.

Ageing affects not only the perfusion of the retina and choroid but also the preretinal structures such as the vitreous. A collapse of the collagen network (syneresis) and liquefaction (synchysis) of the vitreous may induce an incomplete posterior-vitreous detachment (PVD), inducing vitreomacular traction (VMT).^{2,3} Ultrasound studies of patients aged ≥ 80 years reported incomplete detached vitreous in only 11% of the patients, whereas patients with age-related macular degeneration (AMD) in the same age group have a considerably higher prevalence of detached vitreous.⁴

In this study, we assessed the status of the posterior vitreous during vitreoretinal surgery, in patients with recurrent CNV after PDT.

METHODS

This study included 10 patients with subfoveal CNV, who underwent subretinal surgery ($n = 9$) or macular translocation ($n = 1$) after numerous PDT sessions. Informed consent

was obtained from all patients before surgery. After a conventional core vitrectomy, the vitreous cutter was held close to the edge of the optic nerve and fovea to evaluate the status of the posterior vitreous by moderate aspiration (150 mm Hg) in a standardised manner. If the vitreous gel was visibly attached, a surgical separation was performed.

RESULTS

An average of 2.3 PDT sessions were carried out before subretinal surgery. The lesion size increased from the first to the last PDT from 1.5 (standard deviation (SD) 0.53) to 2.3 (SD 0.83) macular photocoagulation study disc diameters. Intraoperative findings during vitrectomy showed little liquefaction of the vitreous gel and an incomplete PVD with remarkably firm attachments at the macula in all cases (10/10; table 1). During a follow-up of 15 (SD 4.5) months, we saw no recurrent CNV, indicating a release of the proliferative stimulus after vitrectomy.

DISCUSSION

Patients with AMD have a higher prevalence of incomplete PVD (33.3%) compared with age-matched controls (66.6%; $p < 0.05$).⁵ Lambert *et al*⁶ found an attached vitreous in 80% of patients with CNV during vitrectomy and speculated that VMT may induce mechanical traction contributing to its progression. We previously described the progression from pigment epithelial detachments to acute retinal pigment epithelium tears in eyes with VMT.⁷ Similar VMTs may have triggered the progression or recurrence of CNV after PDT in this study.

The recurrence rate of CNV is also reduced by combining PDT with consecutive intravitreal triamcinolone injections. Augustin and Schmidt-Erfurth reported a considerably reduced retreatment rate, using this treatment regimen.⁸ We speculate that some patients with CNV and ambulatory VMT may benefit not only from PDT with intravitreal triamcinolone application but also from a surgical or pharmacological release of additional vitreous traction.

Mechanical stress on subconfluent retinal pigment epithelium cultures release higher VEGF levels, indicating that traction may upregulate the VEGF expression, possibly inducing CNV proliferation or recurrence.⁹ PVD may have a protective role against the development of AMD. Chronic VMT or continuous exposure to free radicals and cytokines may possibly be one of the causes of AMD in eyes with attached vitreous.

Abbreviations: AMD, age-related macular degeneration; CNV, choroidal neovascularisation; PDT, photodynamic therapy; PVD, posterior-vitreous detachment; VEGF, vascular endothelial growth factor; VMT, vitreomacular traction

Table 1 Grading of the size and type of the choroidal neovascularisation according to the subretinal surgery trials protocol

Patient	Age	Initial size of CNV	Initial type of CNV	Number of PDTs	Final size of CNV	Final type of CNV	Incomplete PVD	Presence of VMT	Presence of ERM
1	74	1	Occ	2	2	Min class	+	+	+
2	85	2	Prd class	4	4	Min class	+	+	–
3	62	1	Prd class	2	3	Occult	+	+	–
4	85	2	Prd class	2	2	Occ + blood	+	+	–
5	48	1	Prd class	2*	1	Prd class	+	+	–
6	71	2	Prd class	1	2	Occ	+	+	–
7	68	1	Prd class	2	2	Occ + PED	+	+	–
8	81	1	Prd class	2	2	Min class	+	+	–
9	26	2	Prd class	2	2	Min class	+	+	+
10	81	2	Prd class	1	3	Occ + blood	+	+	–

CNV, choroidal neovascularisation; ERM, epiretinal membrane; Min class, minimally classic CNV; Occ, occult; PDT, photodynamic therapy; PED, pigment epithelial detachment; Prd class, predominantly classic CNV; PVD, posterior-vitreous detachment; VMT, vitreomacular traction.
 Patient number 5 received one session of extrafoveal MPS laser photocoagulation before PDT.

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This study was supported by the Fehr Foundation, Marburg, and was presented in part at the Jules Gonin Meeting 2006, Cape Town.

Competing interests: None.

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Accepted 5 July 2006

Published Online First 19 July 2006

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