European Journal of Ophthalmology / Vol. 16 no. 1, 2006 / pp. 134-137

Anomalous vitreoretinal adhesions in patients with exudative age-related macular degeneration: An OCT study

M. QUARANTA-EL MAFTOUHI, M. MAUGET-FAŸSSE

Centre Ophtalmologique Rabelais, Lyon - France

PURPOSE. *To analyze the relationship between the retina and the vitreous in patients with exudative age-related macular degeneration (ARMD).*
METHODS. *Consecutive patients with exudative ARMD, proven by fluorescein angiography, were recruited. Fundus biomicroscopic examination, color and red-free fundus photographs, and serial scans of the macular region using optical coherence tomography (OCT3, Carl Zeiss) were performed before and after photodynamic therapy (PDT) with verteporfin (Visudyne, Novartis Ophthalmics). Vitreoretinal relationships have been described and compared with fundus photographs and data of fundus biomicroscopy examination.*
RESULTS. *Sixty-six eyes of 52 consecutive patients (33 women, 19 men; mean age 75 years, range 64 to 89 years) with exudative ARMD were studied. Analysis of serial OCT scans showed that 13 eyes (20%) did not present any visible vitreous structures. Two eyes (3%) had the appearance of a complete posterior vitreous detachment (PVD). Fifty-one eyes (77%) exhibited some abnormalities of the vitreoretinal interface including 12 eyes with epiretinal membrane and retinal thickening and distortion. Among the 39 eyes examined before and after PDT with Visudyne, only 3 eyes developed a partial vitreous detachment and 1 eye progressed to a complete PVD.*
CONCLUSIONS. *Eyes with exudative ARMD exhibit a high prevalence of abnormalities of the vitreoretinal interface similar to that observed in many chronic inflammatory diseases. PDT with verteporfin does not modify the observed vitreoretinal adhesions. (Eur J Ophthalmol 2006; 16: 134-7)*

KEY WORDS. *Age-related macular degeneration, Vitreoretinal adhesions*

Accepted: July 7, 2005

INTRODUCTION

Inflammatory and immune-mediated chronic processes are incriminated in the pathogenesis of age-related macular degeneration (ARMD). The inflammatory cycle (including immune-complex formation, complement activation, extracellular matrix proteolysis, and activation of choroidal T-cells or other phagocytic cells) damages the retinal pigment epithelium (RPE) with concomitant degeneration of the photoreceptor cells that may lead to gliotic changes in the inner retina (1, 2). This cascade of degenerative events can finally reach the vitreoretinal interface.

The in vivo relationships between the posterior vitreous and the retina have been poorly described in exudative ARMD (3). Anomalous adhesions of the posterior hyaloid to the macular region could contribute to maintaining retinal inflammation and thus play a role in the pathogenesis of ARMD. A recently introduced clinical instrument, the optical coherence tomograph (OCT3, Carl Zeiss Meditech, Dublin, CA), allows a precise and high-resolu-

1120-6721/134-04$15.00/0
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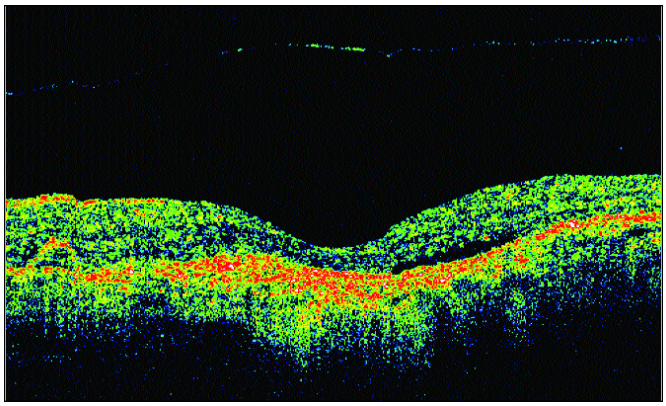

Fig. 1 - *Optical coherence tomography scan of a Group 1 eye: the posterior hyaloid is visualized as a thin and moderately reflective line floating in front of the inner retina and without any visible attachment.*

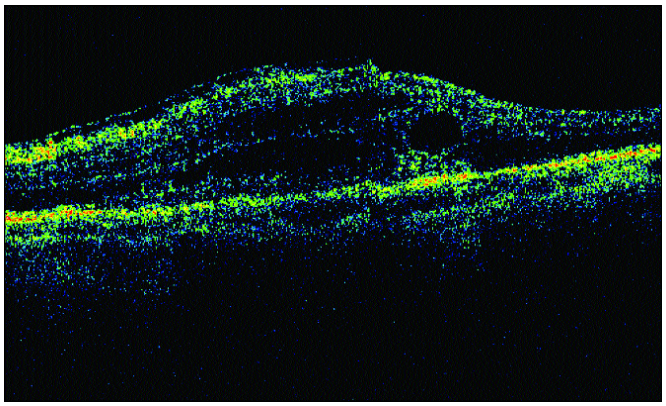

Fig. 2 - *Optical coherence tomography scan of a Group 2A eye: the posterior hyaloid is seen as a low-reflective line attached to the retina in multiple, non-contiguous sites and giving a wavy appearance to the underlying inner retinal profile.*

tion visualization of the normal and anomalous vitreoretinal junctions. We used OCT technology to determine if exudative ARMD could modify the relationship between the vitreous and the retina and, thus, have a role in changing the shape and thickness of the macular retina. We postulated that such changes could result in the persistence of functional macular symptoms even after the post-treatment resolution of neovascular exudation and also help to maintain the inflammatory circle due to vitreoretinal traction.

PATIENTS AND METHODS

Consecutive patients with exudative ARMD, proven by fluorescein angiography (FA), were recruited. Fundus biomicroscopic examination, color and red-free fundus photographs, and serial scans of the macular region using OCT3 were performed. Patients treatable by photodynamic therapy (PDT) with verteporfin (Visudyne, Novartis Ophthalmics, Basel, Switzerland) received OCT examination before and after treatment (3 or 6 months). Vitreoretinal relationships revealed on OCT scans were compared with fundus photographs and the data of fundus biomicroscopic examination.

RESULTS

Sixty-six eyes of 52 consecutive patients (33 women, 19 men; mean age 75 years, range 64 to 89 years) with

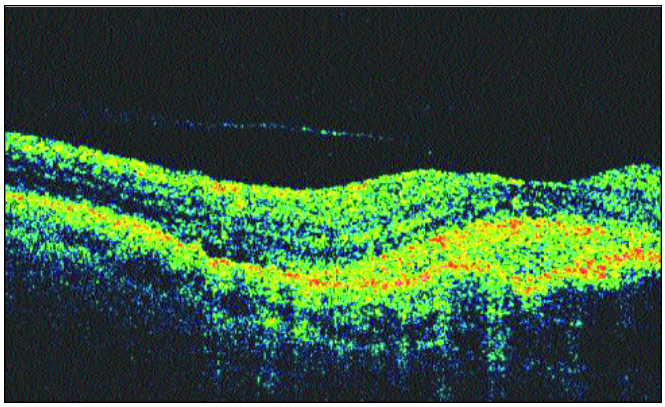

Fig. 3 - *Optical coherence tomography scan of a Group 2B eye: the posterior hyaloid appears as a thin low-reflective line converging on the retina and forming a more or less acute angle. The retina underlying the vitreous attachment is thickened without any vitreous traction.*

exudative ARMD were studied. Analysis of serial OCT scans showed that 13 eyes (20%) did not present any visible vitreous structures (Group 0). Two eyes (3%) had the appearance of a posterior vitreous detachment (PVD, Group 1); the posterior hyaloid was visualized as a thin and moderately reflective line floating in front of the inner retina and without any visible attachment to the scanned zones (Fig. 1).

In 51 eyes (77%) the scanned zone exhibited some abnormalities of the vitreoretinal interface (Group 2). In 26 (52%) of these 51 eyes, the posterior hyaloid was visualized as a low-reflective line attached to the retina in multiple, non-contiguous sites, giving a wavy appearance to the underlying inner retinal profile (Group 2A; Fig. 2). In 13 (25%) out of these 51 eyes, the posterior hyaloid

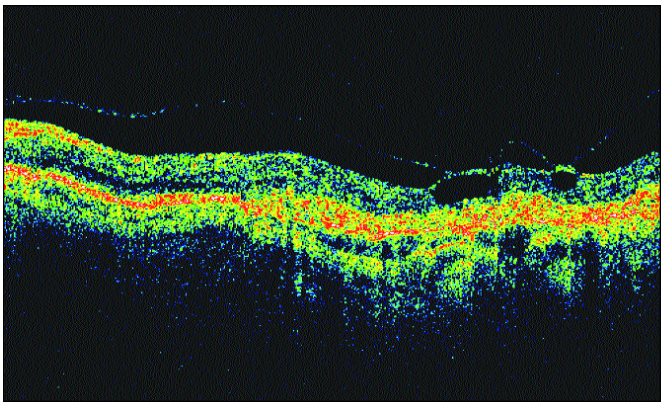

Fig. 4A - *Optical coherence tomography scan of a Group 2C eye: the posterior hyaloid is attached to a small surface of the inner retina and seems to drag the inner retinal layers forming optically empty, tractional lacunae.*

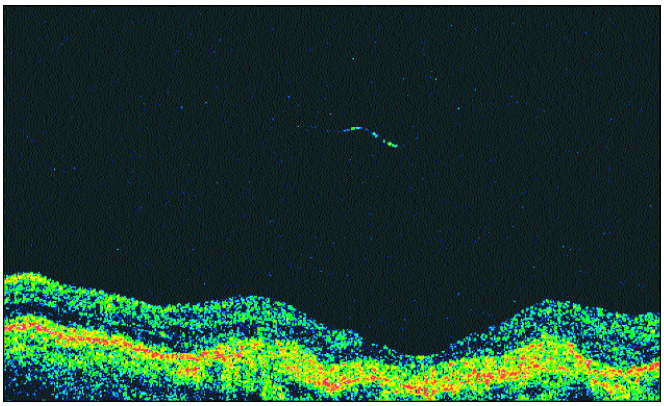

Fig. 4B - *Optical coherence tomography scans of the same eye 9 months after photodynamic therapy with verteporfin: the vitreoretinal adhesion has resolved and the tractional, cystoid lacuna has disappeared.*

appeared as a thin low-reflective line converging onto the retina and forming a more or less acute angle. The zone or the point of contact between the posterior hyaloid and retina were always located in the macular region. In 8 of these eyes, the retina underlying the vitreous attachment was thickened by edema and retinal detachment but without any visible vitreous traction (Group 2B; Fig. 3). In the remaining 5 eyes, the posterior hyaloid was attached to a small surface of the inner retina and seemed to drag the inner retinal layers forming optically empty, tractional, and cystoid lacunae (Group 2C; Fig. 4A). Twelve (24%) of these 51 eyes presented clinical evidence of an epiretinal membrane visualized on OCT scans as a hyperreflective straight-line adherent to the retina and sometimes bridging to non-contiguous retinal areas (Group 2D). The retina was thickened and distorted by the epiretinal membrane (Fig. 5).

Among the 39 eyes examined before and after PDT with verteporfin, only 3 Group 2A eyes progressed to Group 2B while one Group 2C eye progressed to a complete PVD (Fig. 4B).

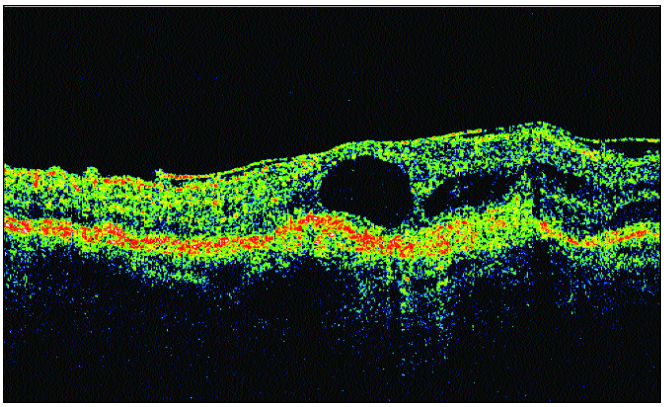

Fig. 5 - *Optical coherence tomography scan of a Group 2D eye: an epiretinal membrane visualized as a hyperreflective straight line adherent to the retina and sometimes bridging to non-contiguous retinal areas. The retina is thickened and distorted by the membrane.*

DISCUSSION

The role played by the vitreoretinal interface in the causation and progression of the degenerative diseases of the retina has been poorly investigated. In normal subjects, complete PVD increases with age but is not as common as actually thought. In ARMD patients, partial vitreous detachment presents a higher prevalence than in age-matched normal subjects (4, 5). Our study is consistent with these findings but in addition, owing to the OCT technique, it has been possible to define the finer details of the vitreoretinal interface and also the coexistence of epiretinal membranes. Moreover, the impact of vitreous motion on the retina can be observed using OCT, giving a precise idea of the dynamic relationships between the posterior hyaloid and the inner retina.

Whether vitreoretinal abnormalities in ARMD represent a cause or a consequence of ARMD remains unclear. There are important similarities in molecular composition and structural organization of the interface between the vitreous and the retina and that between the retina and the RPE (3). These similarities justify the hypothesis that the two interfaces can be subject to the same aging processes and that the abnormalities of the first one can alter and amplify the degenerative processes of the second one and vice versa.

In ARMD, some authors have suggested a role for chronic inflammation as one of the more important factors of this degenerative process. The abnormalities of the vitreoretinal interface found in Group 2 patients can therefore produce static or dynamic tractions on the macular region leading to chronic inflammation. This inflammation could alter the abnormal adhesions of the vitreous to the retina but also modify the inner retinal/RPE interface thus contributing to the pathogenesis of ARMD.

PDT with verteporfin does not modify the observed vitreoretinal adhesions; this finding may explain the occasional persistence of metamorphopsia even after the resolution of exudative retinal changes.

The results of this study are suggestive of the role of vitreoretinal adherences in the pathogenesis of exudative ARMD, when comparing our data with the literature. However, further investigations on a larger group of ARMD and normal patients will better clarify the role of vitreoretinal adhesions in ARMD.

None of the authors have a commercial or proprietary interest in the products or companies mentioned in this study.

Reprint requests to:
Maddalena Quaranta-El Maftouhi, MD
Centre Ophtalmologique Rabelais
12/14 rue Rabelais
69003 Lyon, France

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