Abstract. – Purpose and Method: To present a 60-year-old woman affected by bilateral full thickness macular hole, showing without surgery a spontaneous resolution of the disease in both eyes that remains unchanged during an eleven-year follow-up. To our knowledge, this clinical case is uncommon as no similar reports with such a long follow-up have been published in the scientific literature at this time.

Results and Conclusions: A spontaneous and bilateral closure of full thickness macular holes was detected, as a consequence of a complete posterior vitreous detachment documented by optical coherence tomography images. An initial reduction up to a complete resolution of the central macular scotoma was also observed by performing scanning laser ophthalmoscope microperimetry. Both these anatomical and functional results did not change during the whole period of follow-up. According to this study, the release or the weakening of the vitreous tractions at the foveal edges seems to play a key role in the spontaneous resolution of macular holes in not surgically treated patients.

Key Words: Macular hole, Posterior vitreous detachment, Retina, Optical Coherence Tomography (OCT), Scanning Laser Ophthalmoscope (SLO).

Introduction

Gass and Johnson were the first Authors who classified idiopathic macular holes into four clinical stages using biomicroscopic observations. Thereafter, many Authors focused their attention to the prefoveolar vitreous cortex and reported that the associated anterior-posterior vitreal tractions seem not only to play a primary role in the etiology of this severe ocular disease but also to be the initial event in the macular hole formation. However, it was also reported that the progression of the disease is generally characterized by increased cystic thickening of the fovea without evidence of further vitreofoveal traction suggesting that it might be due to a defect in the inner retina with secondary vitreous fluid accumulation into the middle and outer retinal tissue. Furthermore, although in a different kind of subjects (patients affected by retinitis pigmentosa), vitreoretinal interface alterations, cellophane maculopathy and cystoid macular oedema have also been reported to be main clinical mechanisms involved in the pathogenesis of macular holes.

In this paper, we present an unusual case of a 60-year-old woman affected by bilateral full thickness macular hole, showing without surgery a rare spontaneous resolution of the disease in both eyes that remains unchanged during an eleven-year follow-up. An updated review of this disease has also been done.

Case Report

A 60-year old woman came to our attention in June 1998 complaining for reduction of far and near visual acuity. Far best corrected visual acuity was 20/50 in the right eye (RE) and 20/70 in the left eye (LE) with a hyperopic refraction (two diopters) in both eyes (OU). Near visual acuity was reduced to J14 in the RE and J17 in the LE. Slit-lamp examination of the anterior segment as well as the intraocular pressure were within normal ranges in OU. A senile lens sclerosis was present in OU. Biomicroscopic examination of the fundus (+90 diopters lens, Volk Optical Inc., Mentor, OH, USA) detected the presence of a bilateral full-thickness macular hole with increased thickness of the surrounding retina and a ring-shaped appearance. Optical coherence tomography (OCT) examination (Humphrey Instruments, San Leandro, CA,
C. Scassa, M. Bruno, G. Ripandelli, C. Giusti, F. Scarinci, G. Cupo

USA) confirmed the presence in OU of a full-thickness macular hole (mean diameter: 220 microns in the RE and of 280 microns in the LE) (Figure 1). The retinal thickness of the peripheral retina was increased with a mean value of 385 microns in the RE and 450 microns in the LE. A condensed posterior hyaloid with a pseudo-operculum was documented in the scanning pictures as a highly reflecting band adjacent to the retina. A significant intraretinal oedema with cystic spaces surrounding the hole was also present. Scanning laser ophthalmoscope (SLO) microperimetry (Rodenstock, Düsseldorf, Germany) revealed the presence in OU of a central absolute scotoma, corresponding to the full-thickness macular loss of retinal tissue. The surrounding area presented low retinal sensitivity, with a mean value of 7 dB in the RE and of 9 dB in the LE (Figure 1). Argon laser ophthalmoscopy enhanced the appearance of the full-thickness macular hole and of the surrounding oedematous retinal detachment. The severe bilateral condition of the disease suggested a surgical approach in the LE, presenting the worst visual acuity. A prophylactic 360° argon laser treatment (Ophthalas 532 Eyelite, Alcon Laboratories Inc., Fort Worth, TX, USA) was then performed in this eye in September 1998, thus planning a pars plana vitrectomy one month after.

However, in October 1998, before undergoing surgery, the patient noticed a sudden improvement of visual acuity in OU. Best corrected visual acuity was then checked and found to be 20/25 in OU. Of course, no medical or surgical procedures were referred to have been done in the meantime by other ophthalmologists. OCT revealed the bilateral disappearance of the full-thickness macular hole, with a residual foveal detachment corresponding to an optical hypodense dome-shaped image beneath the foveal photoreceptor band. The hyperreflective line adjacent to the retina, corresponding to the condensed posterior hyaloid, was partially detached and more distant from the retinal surface. This tomographic feature was confirmed by argon laser ophthalmoscopy that enhanced the slit-lamp biomicroscopic examination, particularly showing the disappearance of the surrounding retinal detachment. SLO microperimetry reported in OU a significant reduction of the central scotomous area with an increase of mean retinal sensitivity surrounding the fovea, with a mean value of 9 dB in the RE and 10 dB in the LE.

In July 1999 best corrected visual acuity was 20/20 in OU with complete anatomical reconstitution of the macular area as shown by OCT (Figure 2). Foveal retinal thickness was 140 microns in the RE and 130 microns in the LE, while macular retinal thickness was 260 and 270 microns respectively. SLO microperimetry con-

![Figure 1. June 1998: SLO microperimetry (up) and OCT examination (down) revealed the presence of a full-thickness macular hole.](image1)

![Figure 2. July 1999: full spontaneous closure of the macular holes as shown by SLO microperimetry (up) and OCT examination (down).](image2)
firmed the functional recovery, showing a retinal sensitivity of approximately 16-18 dB in both eyes (Figure 2). Slit-lamp biomicroscopic examination highlighted the normal appearance of the macular region, with some remnants of the posterior hyaloid lying along the retinal surface, together with the presence of a posterior vitreous detachment.

Same microperimetric and tomographic features were present in October 2000 (Figure 3): at that time retinography and ultrasound examination were also performed, confirming the previously detected posterior vitreous detachment.

These functional and anatomical results remained unchanged in OU during the following ophthalmological examinations performed in June 2003, in May 2006 and in June 2009. SLO microperimetry confirmed the presence of good retinal sensitivity and best corrected visual acuity remained 20/20 in OU. Stratus-OCT (OCT-3) (Figure 4) and Spectralis-OCT were carried out in 2006 and in 2009 respectively, showing the complete restoration of the normal foveal anatomy and the absence of tissue loss, thanks to their higher resolution power compared to the OCT-1.

**Discussion**

Spontaneous closures of macular holes have already been well documented, mostly by means of OCT images\cite{5, 18, 20}. However, also SLO microperimetry has been reported to be important in the long term follow-up of this severe macular disease\cite{19}.

![Figure 3. October 2000: unmodified retinal features as shown by SLO microperimetry (up) and OCT examination (down).](image)

![Figure 4. May 2006: unmodified retinal features as shown by colour retinography (up) and OCT examination (down).](image)

Two main different types of macular hole resolution are usually mentioned in the literature. The first one highlights that a complete vitreofoveal separation, following a posterior vitreous detachment\cite{4, 5} or a pars plana vitrectomy\cite{22}, could play an important, mechanical role. This is probably the main pathogenetic mechanism involved in the spontaneous closure of traumatic\cite{23} as well as full thickness stage 2, 3 and 4 macular holes\cite{24}, although spontaneous closure in the outer retina may develop in some cases of stage 1B macular holes without vitreofoveal separation\cite{24}.

The second type of macular hole resolution suggests a histological mechanism, due to both fibroastrocyte proliferation and collagen neosynthesis, inducing a glial scar instead of the pre-existing macular holes\cite{18}. Ho et al. noted that 5-12\% of stage 2 macular holes, according to Gass original classification\cite{3}, may develop spontaneous flattening\cite{4}.

Our observations support the theory that the release of vitreous traction permits the flattening of macular break edges. We hypothesize that, in addition to the mechanical release of vitreofoveal traction due to the posterior vitreous detachment, fibroblasts and glial cells might play an important histological role in the closure of macular holes. Therefore, a follow-up period of clinical observation, aided by the introduction of novel anatomical and functional diagnostic tools such as OCT and SLO microperimetry\cite{21}, should be carried out in eyes with lamellar or even full-thickness macular hole before any surgical approach is considered, in order to let be possible a spontaneous resolution of the disease, which is more frequent in the earliest Gass stages.
In conclusion, in this paper we highlighted the presence of a spontaneous bilateral resolution of the full-thickness macular holes as a consequence of complete posterior vitreous detachment. This result was confirmed by OCT images and associated with the complete resolution of the central macular scotoma assessed by SLO microperimetry. These morphological and functional results remained unchanged during the whole period of follow-up.

To our knowledge, this is the first report of a spontaneous closure of bilateral full-thickness macular holes without surgery described in the literature, also characterized by a very long period (eleven years) of follow-up. In fact, Win and Young reported a similar case some years ago but only one eye of their patient showed a spontaneous closure of the full thickness macular hole since the other eye underwent macular surgery.25

References