

# Low-fluence photodynamic therapy in longstanding chronic central serous chorioretinopathy with foveal and gravitational atrophy

M. REIBALDI<sup>1</sup>, F. BOSCIA<sup>2</sup>, T. AVITABILE<sup>1</sup>, A. RUSSO<sup>1</sup>, V. CANNEMI<sup>1</sup>, M.G. UVA<sup>1</sup>, A. REIBALDI<sup>1</sup>

<sup>1</sup>Department of Ophthalmology, University of Catania, Catania

<sup>2</sup>Department of Ophthalmology, University of Bari, Bari - Italy

**PURPOSE.** To describe anatomic and functional outcomes in two patients with long-standing severe chronic central serous chorioretinopathy (CSC) with foveal and gravitational atrophy treated with low-fluence photodynamic therapy (PDT).

**METHODS.** Two patients with a history of over 10 years of chronic CSC and development of gravitational tracts, with best-corrected visual acuity  $\leq 20/200$ , were treated with PDT guided by indocyanine green angiography (ICGA) with a fluence of 25 J/cm<sup>2</sup> at an irradiance of 300 mW. Follow-up examinations 1 and 9 months after therapy included measurement of near and far best-corrected visual acuity, fundus biomicroscopy, fluorescein angiography and ICGA, optical coherence tomography, and microperimetry.

**RESULTS.** At 1 and 9 months after low-fluence PDT, complete resolution of subretinal, intraretinal, and under retinal pigment epithelium fluid was observed in both patients. Far and near visual acuity improved in both eyes. Improvement of sensitivity and fixation stability were demonstrated by microperimetry. No treatment-related side effects were seen.

**CONCLUSIONS.** ICGA-guided low-fluence PDT seems effective and safe for treating long-standing chronic CSC. (*Eur J Ophthalmol* 2009; 19: 154-8)

**KEY WORDS.** Chronic central serous chorioretinopathy, Fluence, Photodynamic therapy

Accepted: July 23, 2008

## INTRODUCTION

Chronic central serous chorioretinopathy (CSC) is characterized by multifocal, irregularly distributed, and often widespread retinal pigment epithelium (RPE) changes associated with persistent subretinal exudation and consequent visual decline (1). In the more advanced disease state, atrophic changes, cystoid macular degeneration, pigment hyperplasia, lipid deposits, and gravitational tracts of subretinal fluid may occur (1). Cystoid macular degeneration and foveal atrophy are considered the main factors accounting for the poor visual outcome in patients with a long history of chronic CSC. These conditions of-

ten indicate irreversible structural change and potentially limited visual recovery (2).

We report two cases of severe long-standing chronic CSC with a favorable response after photodynamic therapy (PDT) with a low fluence rate.

### Case 1

A 60-year-old man presented with a 15-year history of bilateral visual problems from chronic CSC that led to persistent worsened vision more than 5 years earlier, especially in the right eye. His past medical history was negative for other disease and corticosteroid use. He had

received no previous systemic or local treatment.

Far and near best-corrected visual acuity (BCVA) were 20/200 and 20/240 in the right eye and 20/38 and 20/50 in the left eye, respectively. In the left eye, fluorescein angiography (FA) (HRA2, Heidelberg Engineering, Heidelberg, Germany; FF 450 plus, Carl Zeiss Meditech, Dublin, CA) and optical coherence tomography (OCT) (OCT3, Zeiss-Humphrey, San Leandro, CA) showed alterations due to chronic CSC without serous detachment at the posterior pole. In the right eye, fundus examination and diagnostic procedures (FA, indocyanine green angiography [ICGA], and OCT) disclosed diffuse macular pigmentary changes with foveal thinning and gravitational atrophy, a pigment epithelium detachment (PED), and neurosensory detachment in the macular area (Fig. 1, A–D). Very low sensitivity (1.8 dB) and reduced fixation stability (39%) were demonstrated by microperimetry (Fig. 1E).

After informed consent had been given, PDT with a fluence of 25 J/cm<sup>2</sup> and a light dosage rate of 300 mW/cm<sup>2</sup> was administered in the right eye, with a time of photosensitization of 83 s, being standard the other parameters (6 mg/m<sup>2</sup> infusion of verteporfin over 10 minutes followed by delivery of diode laser at 689 nm 15 minutes after commencement of infusion). The reduced light dose was selected on the basis of the results of previous clinical trials (3, 4). The eye was treated with a 3.4 mm spot over the area of hyperpermeability of the choriocapillaris in the macula detected on ICGA.

One month after treatment, the subretinal fluid and PED had completely resolved. The BCVA of the treated eye improved to 20/96 and 20/100 in far and near, respectively. At 9 months follow-up, a further improvement in BCVA was observed (20/40 and 20/50, far and near, respectively). FA and OCT showed no subretinal fluid or PED (Fig. 1, F and I). ICGA showed narrowing of the choroidal vessels and no late leakage (Fig. 1, G and H). The anatomic results were associated with a great improvement in sensitivity and fixation stability (9.8 dB and 97%, respectively) (Fig. 1J). No complications related to the treatment were observed.

### Case 2

A 51-year-old man presented with a history of intermittent visual blurring over 10 years and a diagnosis of chronic CSC. During the last 12 months he complained of a marked visual acuity reduction in his left eye. Past medical history was negative for other systemic diseases and

for use of corticosteroids. No previous therapy was given for CSC. Far and near BCVA were 20/317 and 20/348, respectively, in the left eye, and 20/25 and 20/29 in the right eye. No evidence of active CSC was present in the right eye. In the left eye, fundus examination and diagnostic procedures (FA, ICGA, and OCT) showed evidence of diffuse macular pigmentary changes, foveal RPE atrophy with gravitational tract, and subretinal fluid and intraretinal cysts in the macular area (Fig. 2, A–D).

Microperimetry showed no determinable sensitivity (0 dB) and very unstable fixation (15%) (Fig. 2E).

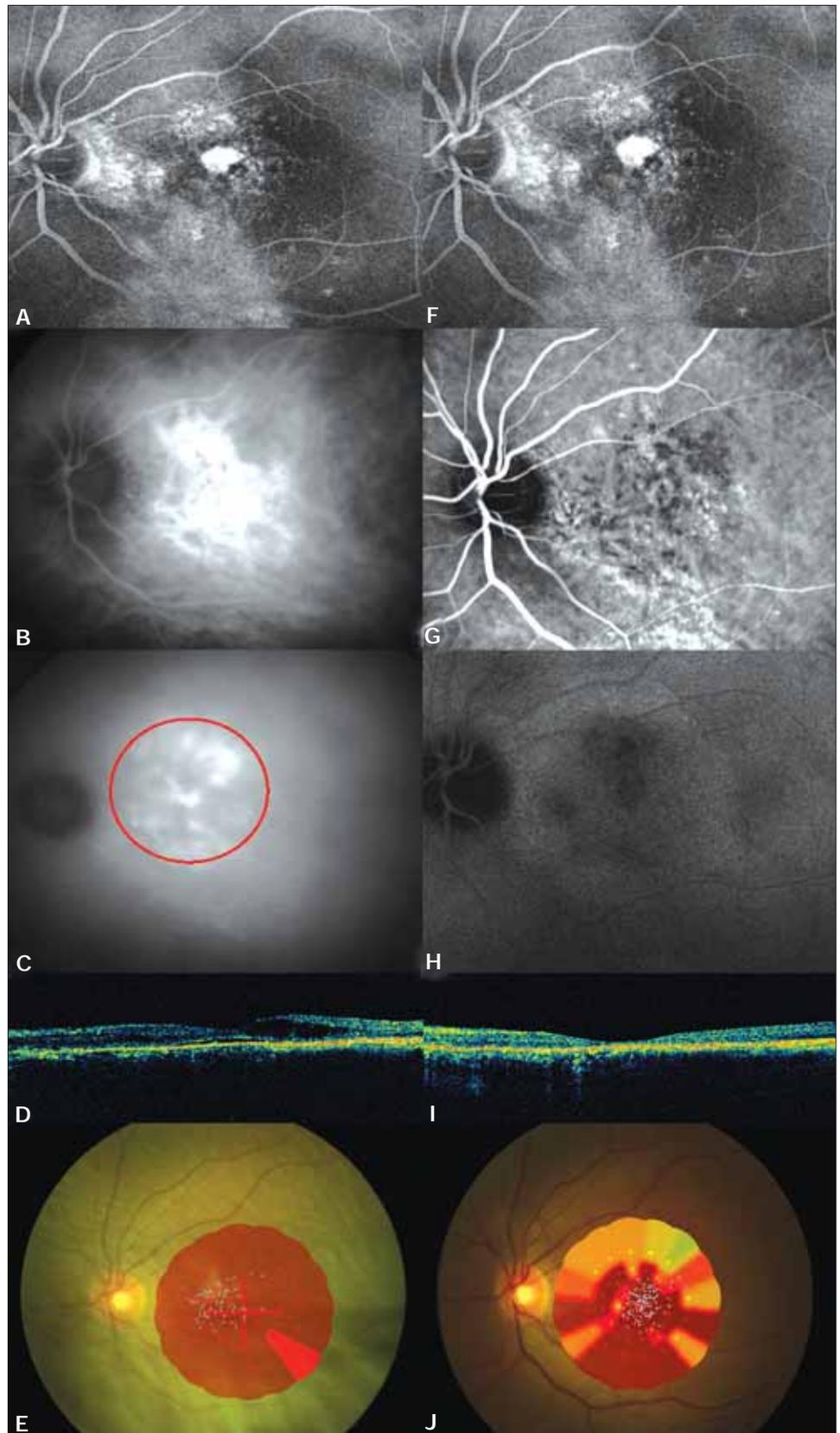
The left eye was treated with low-fluence PDT, with a 3.8 mm spot over the area of the leakage shown on ICGA. One month after PDT, there was a moderate improvement in far visual acuity, to 20/230, and a complete resolution of the subretinal and intraretinal fluid. Nine months after therapy, no new changes in fluorescence transmission in the treated zone were observed on FA (Fig. 2F). No late leakage was seen on ICGA (Fig. 2H). OCT showed foveal thinning without subretinal fluid and intraretinal cysts (Fig. 2I). Consistent with these features, far and near visual acuity further improved to 20/126 and 20/159, respectively. Microperimetry showed an increase in sensitivity (1.7 dB) and fixation stability (28%) (Fig. 2J). No significant adverse events were observed.

## DISCUSSION

No standardized treatment is available for chronic CSC. Recently, it has been suggested that conventional PDT effectively resolves subretinal fluid with beneficial visual outcomes in most patients. It is not without complications, such as RPE atrophy, choriocapillaris ischemia, and secondary choroidal neovascularization (5, 6). The rationale of using a reduced fluence rate is to improve the safety of PDT. Previous studies showed an improved selectivity of PDT using a reduced fluence (25 J/cm<sup>2</sup>) in neovascular age-related macular degeneration, by allowing a reduced occlusive effect on the choriocapillary layer (3, 4). This effect might be especially favorable in eyes with chronic CSC presenting foveal and gravitational atrophy. In our two cases of long-standing severe chronic CSC, complete and persistent resolution of subretinal, intraretinal, and sub-RPE fluid was associated with functional recovery after PDT with a low fluence rate. The mechanism of action of PDT in chronic CSC is thought to be secondary to choriocapillaris narrowing, with ensuing



**Fig. 2** - Patient 2, before photodynamic therapy (PDT): **(A)** middle-phase fluorescein angiography (FA) shows pigment epithelial mottling with an atrophic tract going downwards and foveal patches of intense hyperfluorescence due to retinal pigment epithelium decompensation; **(B)** middle-phase indocyanine green angiography (ICGA) shows areas of diffuse choroidal hyperpermeability; **(C)** late ICGA shows extravascular leakage in the macular area; treatment site is shown by red circle; **(D)** intraretinal cysts and subretinal fluid are found on optical coherence tomography (OCT); **(E)** microperimetry reveals no measurable sensitivity and very unstable fixation. Nine months after PDT: **(F)** middle-phase FA shows no new alterations in transmission of fluorescence in the treated zone; **(G)** ICGA shows reduction of diffuse hyperpermeability in the middle phase, and **(H)** absence of late leakage in the late phase; **(I)** resolution of subretinal fluid, and intraretinal cysts with foveal thinning are observed on OCT; **(J)** microperimetry data show improvement in sensitivity and fixation stability.



choroidal hypoperfusion (6). However, previous experience with PDT using standard fluence showed persistent nonperfusion at the site of the PDT application that was still clearly visible after 3 to 12 months (7). This could be explained by a strong reaction to standard PDT, impaired recovery of the endothelial cells, and recanalization by a congested, hyperpermeable choriocapillaris, as in CSC. On the contrary, in our study, the lower light dosage resulted in less hypoperfusion of the choriocapillaris, as was seen by ICGA after 1 and 9 months of follow-up. This, in turn, might prevent or reduce ischemia-related complications such as neuroretinal atrophy, RPE disturbance, and development of choroidal neovascularization. Our results suggest that vision might recover also in patients with long-standing chronic CSC, although it depends on the extent of structural alterations such as RPE

damage, cystoid macular degeneration, and outer photoreceptor layer atrophy (8). This report is not definitive proof, but provides reason to perform additional studies for treatment of less severe forms of chronic CSC.

*The authors have no financial relationship to declare.*

Reprint requests to:  
Michele Reibaldi, MD, PhD  
Department of Ophthalmology  
University of Catania  
Via S. Sofia, 78  
95123, Catania, Italy  
mreibaldi@libero.it

---

## REFERENCES

1. Wang M, Munch IC, Hasler PW, Prunte C, Larsen M. Central serous chorioretinopathy. *Acta Ophthalmol* 2008; 86: 126-45.
2. Iida T, Yannuzzi LA, Spaide RF, Borodoker N, Carvalho CA, Negrao S. Cystoid macular degeneration in chronic central serous chorioretinopathy. *Retina* 2003; 23: 1-7.
3. Visudyne in Minimally Classic Choroidal Neovascularization Study Group. Verteporfin therapy of subfoveal minimally classic choroidal neovascularization in age-related macular degeneration: 2-year results of a randomized clinical trial. *Arch Ophthalmol* 2005; 123: 448-57.
4. Michels S, Hansmann F, Geitzenauer W, Schmidt-Erfurth U. Influence of treatment parameters on selectivity of verteporfin therapy. *Invest Ophthalmol Vis Sci* 2006; 47: 371-6.
5. Cardillo Piccolino F, Eandi CM, Ventre L, Rigault de la Longrais RC, Grignolo FM. Photodynamic therapy for chronic central serous chorioretinopathy. *Retina* 2003; 23: 752-63.
6. Chan WM, Lam DS, Lai TY, Tam BS, Liu DT, Chan CK. Choroidal vascular remodelling in central serous chorioretinopathy after indocyanine green guided photodynamic therapy with verteporfin: a novel treatment at the primary disease level. *Br J Ophthalmol* 2003; 87: 1453-8.
7. Yannuzzi LA, Slakter JS, Gross NE. Indocyanine green angiography guided photodynamic therapy for treatment of chronic central serous chorioretinopathy: a pilot study. *Retina* 2003; 23: 288-98.
8. Piccolino FC, de la Longrais RR, Ravera G, et al. The foveal photoreceptor layer and visual acuity loss in central serous chorioretinopathy. *Am J Ophthalmol* 2005; 139: 87-99.

Copyright of European Journal of Ophthalmology is the property of Wichtig Editore and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.