

# Diffuse retinal pigment epitheliopathy: Treatment with laser photocoagulation

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**PURPOSE.** *To evaluate the effectiveness of laser treatment in eyes with diffuse retinal pigment epitheliopathy (DRPE).*

**METHODS.** *The authors retrospectively reviewed the medical records of 56 consecutive patients (78 eyes) with DRPE. All eyes were treated with digital fluorescein angiography guided argon green laser photocoagulation, direct on the focal retinal pigment epithelium (RPE) leaks and in a grid pattern to the RPE decompensation areas. A processed digital red-free fundus image including all the important traces on it was used as a guide to the laser treatment. The follow-up period ranged from 6 months to 7 years.*

**RESULTS.** *At the end of the follow-up time, 70 (89.7%) eyes showed anatomic improvement with complete or partial resolution of the macular exudative lesions. Visual acuity of less than 20/40 was noted in 60 eyes (76.9%) preoperatively compared with 46 eyes (59.0%) finally ( $p=0.0252$ ). The visual acuity was improved in 19 eyes (24.4%), stabilized in 51 (65.4%), and reduced in only 8 eyes (10.2%).*

**CONCLUSIONS.** *In this series of patients with DRPE, the results of laser treatment were uniformly satisfactory producing a gradual resolution of the macular exudative lesions and an improvement or stabilization of the visual acuity. (Eur J Ophthalmol 2004; 14: 315-20)*

**KEY WORDS.** *Chronic CSC, DRPE, Decompensation RPE, Laser*

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## INTRODUCTION

Central serous chorioretinopathy (CSC) is a disorder with good visual prognosis, which usually affects one eye of young people (1, 2). Clinically it is demonstrated by serous neurosensory detachment (NSD) of the macula with one or more "smokestack" or "inkblot" fluorescein leaks.

A rare variant of CSC with usually bilateral widespread progressive decompensation of the retinal pigment epithelium (RPE), persistent exudative manifestations, and chronic course has been described as diffuse reti-

nal pigment epitheliopathy (DRPE) (3-8). Fluorescein angiography (FA) reveals oozing or diffuse leakage through the RPE with a generalized hyperfluorescent pattern, as well as more than one, usually atypical, focal RPE leaks. Eyes with DRPE may develop serious permanent reduction of visual acuity due to cystic degeneration of the RPE at the fovea centralis.

The typical clinical presentation of CSC for retinal specialists poses little challenge. However, in some atypical cases of CSC, such as in most cases of DRPE, the indocyanine green (ICG) angiogram is of great value in recording the presence of multifocal areas of

choroidal hyperpermeability that have no clinical or fluorescein angiographic counterpart and are known to be indicative of CSC, establishing a more definitive diagnosis (9-12).

Laser photocoagulation treatment is recommended in CSC when there is persistent or recurrent NSD with associated visual reduction (13-15). However, there has been limited experience in laser treatment of DRPE (8, 16-18). This is a retrospective study evaluating the effectiveness of the argon green laser treatment in a large number of eyes with DRPE photocoagulation.

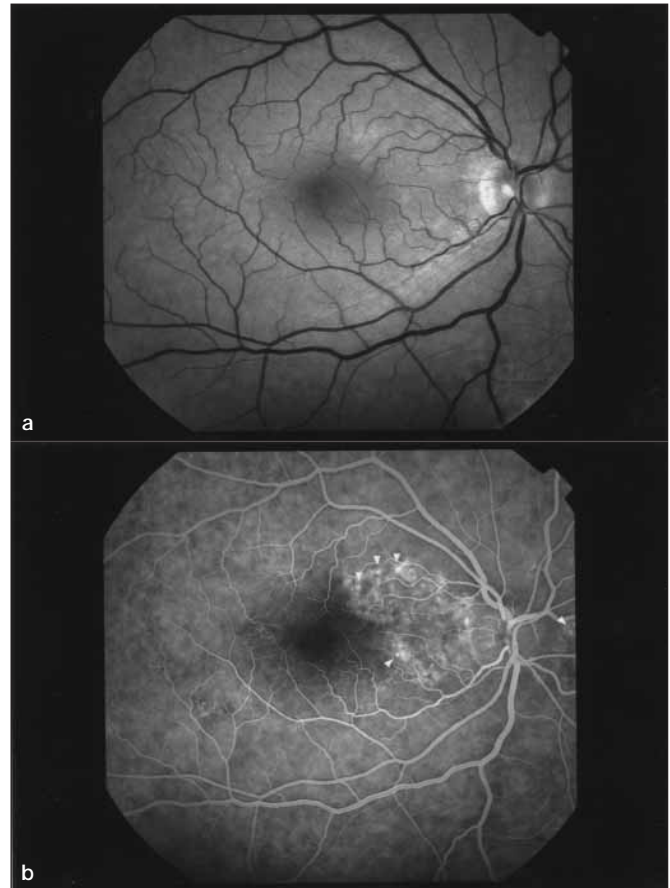
## METHODS

We retrospectively reviewed the records of 73 consecutive patients with DRPE who were examined by us from January 1996 to March 2003. Included in this study were 56 (78 eyes) who were treated by us with laser photocoagulation during this period and completed at least a posttreatment follow-up of at least more than 6 months. Seventeen more eyes of the 56 patients were excluded from the study because they had severe visual loss (best corrected visual acuity of less than 20/200) due to serious irreversible RPE atrophic changes or macular choroidal neovascularization (CNV) on the first examination (15 eyes), or they did not complete a follow-up period of at least 6 months after laser treatment (2 eyes).

At initial diagnosis, the mean age of the patients was  $51 \pm 7.4$  years with a range of 36 to 65 years. The male:female ratio was 7:1. All patients were white, either emmetropes or low hyperopes.

Twenty patients of the study had a known past history of CSC. By biomicroscopic examination all eyes had NSD with atrophic changes of the RPE in the macula. Furthermore, 28 eyes had associated lipid exudations. The dysfunction of the RPE was documented by digital FA as a widespread decompensation of the RPE with one or more, typical or atypical, RPE leaks (Figs. 1b, 2a, 3b). In some atypical cases ICG angiography was performed to establish a more definitive diagnosis. Informed consent was obtained from all the patients.

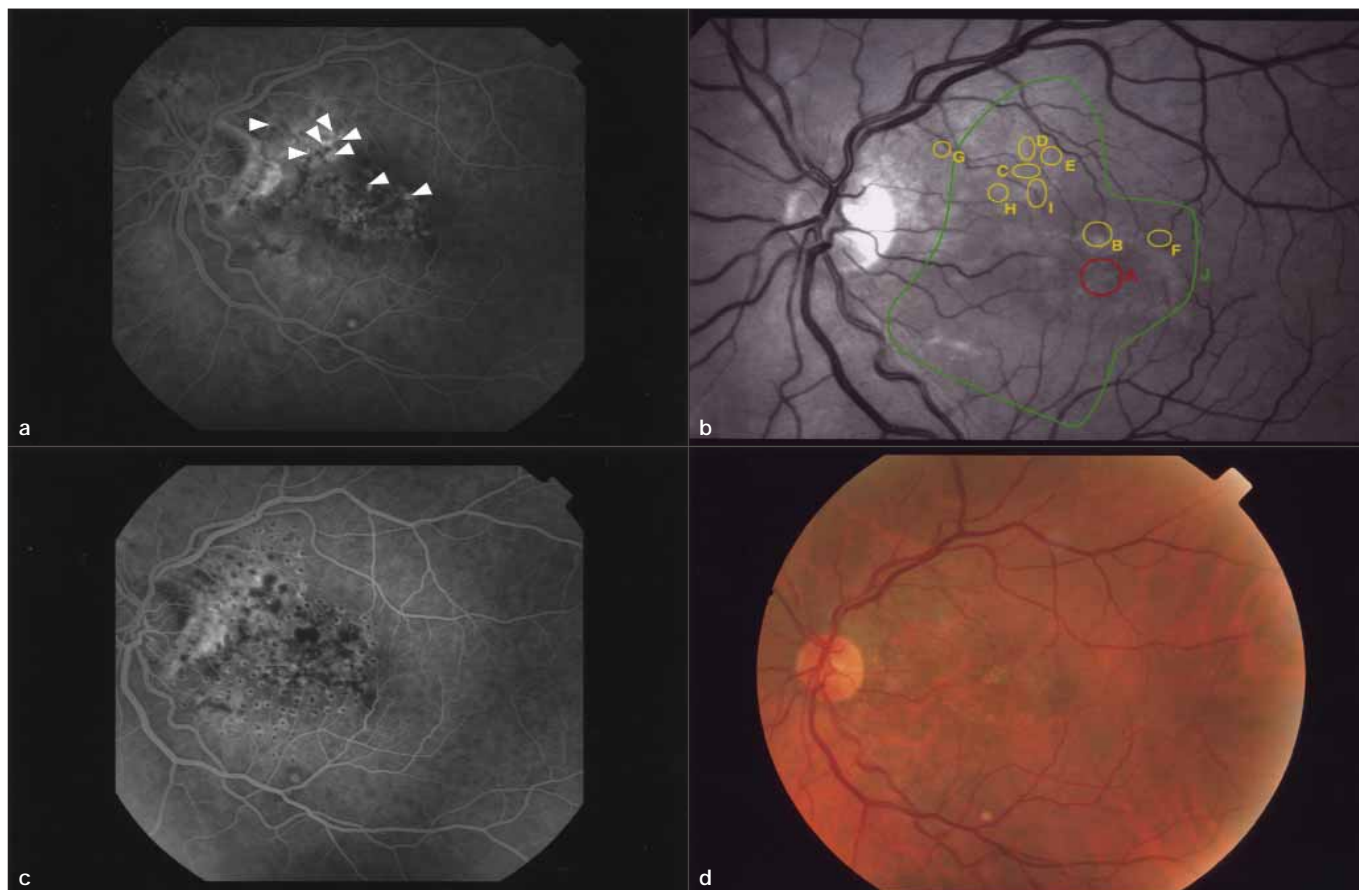
All eyes were treated with digital FA guided argon green laser photocoagulation, direct on the focal RPE leaks, as well as in a grid pattern to the areas of RPE decompensation. The goal of the treatment was to



**Fig. 1 - a)** Red-free fundus photograph of the right eye of a 43-year-old man seems almost normal with a slit neurosensory detachment at the papillomacular bundle. Visual acuity 20/20. **b)** Fluorescein angiography image reveals five sites of focal retinal pigment epithelium (RPE) leaks (arrowheads) and an extensive area of RPE decompensation at the papillomacular bundle.

achieve a light laser reaction in the grid pattern and a light to moderate reaction in the direct treatment.

According to a similar technique that we have described previously in treating patients with diabetic macular edema (19), the sites of laser application, as well as the borders of the foveal avascular zone (FAZ), had been mapped on the FA image and transferred to the red-free fundus photograph using the Topcon Imagenet 2000 Digital Imaging System with Imagenet 2000 (version 2.14) software (Figs. 2b, 3c). We performed the laser treatment looking back and forth between the color image of the patient's fundus through the biomicroscope of the laser and the processed red-free fundus image displayed on the computer monitor adjacent to the laser using it as a guide to the



**Fig. 2 - a)** Pretreatment fluorescein angiography image of the left eye of a 54-year-old man reveals eight sites of focal retinal pigment epithelium (RPE) leaks (arrowheads) and an area of RPE decompensation at the papillomacular bundle and the fovea. Visual acuity 20/200. **b)** Analysis of the traces outlined on the processed red-free fundus image used to guide laser treatment. Red trace: traces of FAZ; yellow traces: focal RPE leaks (laser spots must be applied in a direct fashion); green trace: RPE decompensation area (laser spots must be applied in a grid fashion). **c)** Fluorescein angiography image 6 months post laser treatment. Visual acuity improved to 20/50. **d)** Color fundus photograph 24 months after laser treatment. The visual acuity remains stable at 20/50.

laser photocoagulation.

Follow-up examinations were performed at 3-month intervals until complete resolution of the NSD was noted. Subsequent examinations were done at 6-month intervals. The follow-up period ranged from 6 months to 7 years (mean  $21.2 \pm 13.7$  months).

At every examination all patients underwent a general ophthalmologic and retinal assessment including indirect ophthalmoscopy and slit-lamp biomicroscopy with an area centralis contact lens. Best-corrected visual acuity was recorded on standard Snellen charts. Improvement or decline of visual acuity was defined as a change of at least two lines of Snellen acuity. Color or red-free photography and digital FA were performed on all patients at every examination.

Numerical data in the text and the tables are presented as mean ( $\pm$ SD). The two-tailed paired t-test and the two-sided Fisher exact test were used for the statistical analysis of the data. A p value less than 0.05 was considered statistically significant.

## RESULTS

At the end of the follow-up time 70 of the 78 study eyes (89.7%) showed anatomic improvement with gradual resolution of the exudative lesions in the macula. Particularly, 49 (62.8%) eyes demonstrated complete and 21 (26.9%) eyes partial resolution of the NSD and lipid exudation, while the remaining 8 (10.3%) eyes

showed persistent or recurrent NSD (Tab. I).

The mean best-corrected visual acuity of the study patients was  $0.34 \pm 0.2$  initially (preoperatively) compared with  $0.39 \pm 0.2$  at the end of the follow-up time (finally). According to paired t-test, the mean of the difference between them is highly significant ( $p=0.0049$ ). Sixty of the 78 eyes (76.9%) presented an initial (preoperative) best-corrected visual acuity of less than 20/40 compared with only 46 (59%) eyes that presented the same levels of visual acuity at the end of the study ( $p=0.0252$ ) (Tab. II). A best-corrected visual acuity equal to or less than 20/100 was noted in 32 (41.0%) eyes preoperatively and in 25 (32.1%) eyes finally. At the last examination, 19 (24.4%) eyes had a visual acuity improvement, while no change was noted in an additional 51 (65.4%) eyes (Tab. III). In 8 (10.2%) eyes the visual acuity declined as compared with initial presentation.

Twelve eyes received additional laser treatment because there was not improvement of the macular exudative lesions at least 6 months after the initial laser photocoagulation or there were recurrent macular elevations due to new sites of RPE dysfunction during the follow-up time. Argon green laser photocoagulation was performed directly to the new focal RPE leaks on all the above 12 eyes. Moreover, in two of these eyes laser photocoagulation was applied additionally in a grid pattern to a new RPE decompensation area. None of the 12 eyes was treated again on the previously photocoagulated areas.

Five eyes developed extrafoveal CNV 1 to 2 months after the laser treatment. All these eyes were successfully treated by argon green laser using confluent photocoagulation direct on it producing intense laser reaction. None of them developed recurrent CNV during the follow-up time.

## DISCUSSION

DRPE is a rare variant of CSC with chronic course (3-8, 18). As opposed to the classic CSC, DRPE most commonly affects adults older than 45 years of age, is more likely to have bilateral involvement, and usually carries a bad prognosis. Photocoagulation of the leaking RPE sites in classic CSC has been demonstrated to produce accelerated resolution of the neurosensory detachment (13-15).

**TABLE I - CLINICAL EVALUATION AT THE FINAL EXAMINATION**

Clinical outcome	Number of eyes (%)
Complete resolution	49 (62.8)
Partial resolution	21 (26.9)
Persistent or recurrent NSD	8 (10.3)

NSD = Neurosensory detachment

**TABLE II - INITIAL VERSUS FINAL VISUAL ACUITY**

Visual acuity	Initial (preoperative)	Final (postoperative)
$\geq 20/40$	18 (23.1)	32 (41.0)
$< 20/40$	60 (76.9)	46 (59.0)

Values are n (%). The two-sided p value of Fisher exact test is 0.0252

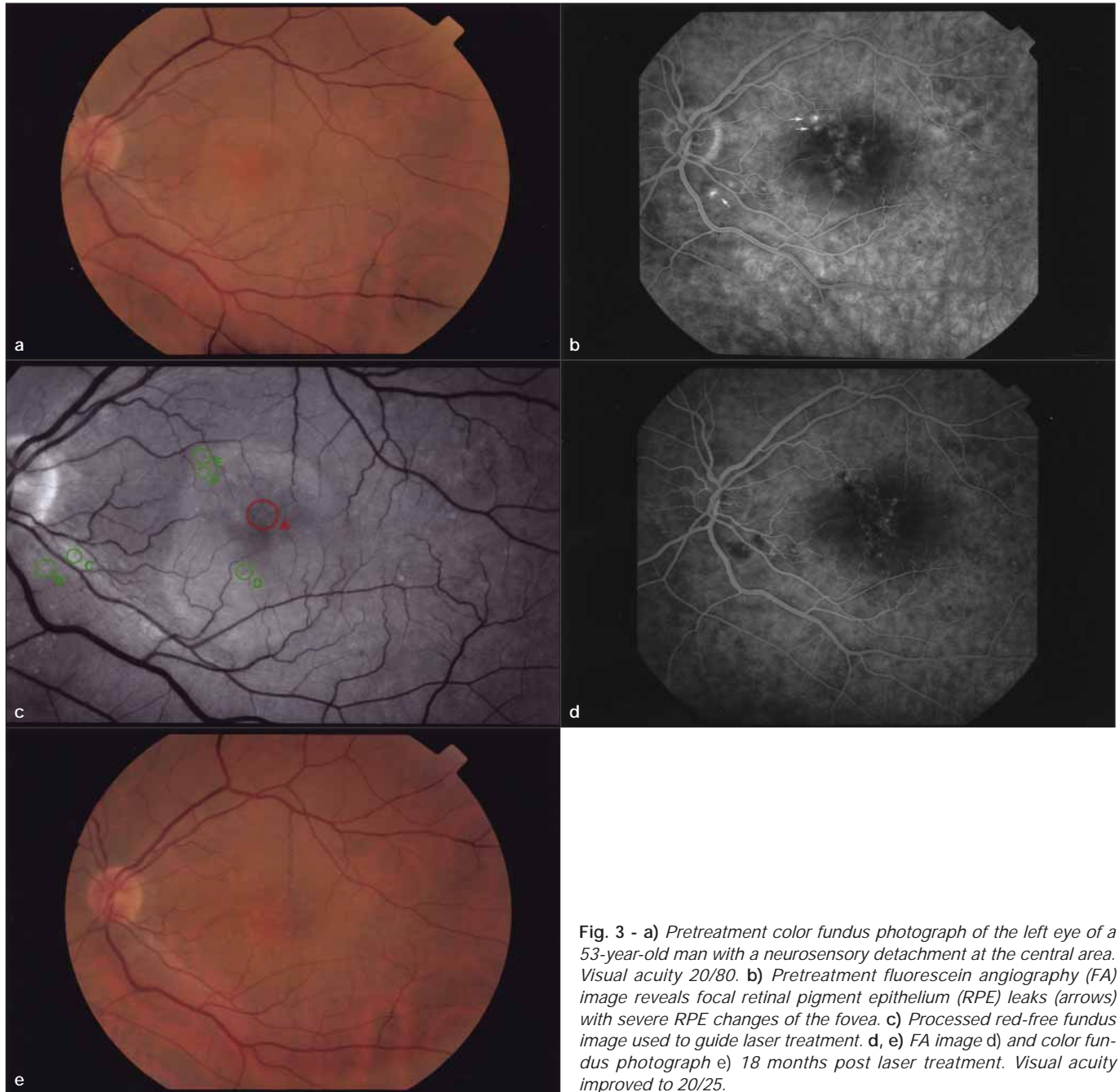
**TABLE III - FINAL VISUAL ACUITY**

Visual acuity	Number of eyes (%)
Improvement	19 (24.4)
Stabilized	51 (65.4)
Decline	8 (10.2)

Improvement or decline defined as a change of at least two lines of Snellen acuity

There are encouraging reports of laser photocoagulation treatment in patients with DRPE (16-18). Jalk et al (16) achieved favorable results utilizing grid argon green laser to manage 41 eyes presenting macular RPE decompensation. Some years later, Roseman and Olk (17) achieved similar satisfactory results with the same technique treating a patient who could be categorized as having DRPE. Finally, in 1992, Yannuzzi et al (18) used krypton red laser photocoagulation in a grid technique treating 18 eyes with DRPE with resultant resolution of chronic neurosensory detachment and visual improvement.

The results of the argon green laser treatment in our large series of patients are quite satisfactory (Figs. 1-3). In accordance to our technique the intensity of the laser burns was different when they were applied in a grid pattern on the RPE decompensation areas



**Fig. 3 - a)** Pretreatment color fundus photograph of the left eye of a 53-year-old man with a neurosensory detachment at the central area. Visual acuity 20/80. **b)** Pretreatment fluorescein angiography (FA) image reveals focal retinal pigment epithelium (RPE) leaks (arrows) with severe RPE changes of the fovea. **c)** Processed red-free fundus image used to guide laser treatment. **d, e)** FA image **d)** and color fundus photograph **e)** 18 months post laser treatment. Visual acuity improved to 20/25.

(very light or just visible retinal reaction) or direct on the RPE leaks (light to moderate retinal reaction). Further, our laser treatment was guided by a processed red-free fundus image including all the important traces on it (the sites of focal RPE leaks, the borders of the RPE decompensation areas, as well as the borders of the FAZ) (Figs. 2B, 3C). This processed image was

helping us to perform the laser treatment with great accuracy and safety.

In our series, a significant number of eyes (32.1% of the studied eyes) presented a very low final visual acuity (equal or less than 20/100). Although our study is a retrospective one without controls, these large numbers of eyes with very low final visual acu-

ity demonstrates that DRPE carries a poor prognosis as it frequently produces unilateral, or even bilateral, progressive irreversible visual deterioration secondary to degeneration of the RPE in the macula.

The mechanism of progressive vision loss in DRPE appears to follow a sequence of events beginning with macular NSD with one or more underlying focal leaks at the level of the RPE. Chronic accumulation of sub-neurosensory retinal fluid and lipid exudation in turn seems to lead to more widespread decompensation of the RPE with breakdown of the outer blood-retinal barrier. In many eyes all the above RPE changes spared the fovea. Consequently, some patients remain asymptomatic for a long period of time, in spite of the severe RPE dysfunction.

In our study laser photocoagulation treatment on

eyes with DRPE was successful in producing a gradual resolution of the macular exudative manifestations with a subsequent improvement in or stabilization of the visual acuity in a large number of study eyes. Until the results of prospective, randomized studies with control group are available, it is reasonable to consider laser photocoagulation for eyes with DRPE when there is chronic NSD of the macula on slit-lamp biomicroscopy and evidence of progressive RPE decompensation on FA.

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