Ocular Coherence Tomography: An Adjuvant Tool for Monitoring Repeated Photodynamic Therapy in Age-Related Macular Degeneration

YAŞA BAĞIMLI MAKÜLER DEJENERASYON: OKÜLER KOHORENS TOMOGRAFİ VE SÜREGELEN FOTODİNAMİK TEDAVİNİN MONİTORİZASYONU

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Abstract

The aim of this report is to demonstrate the value of ocular coherence tomography (OCT) for the monitoring of age-related macular degeneration (AMD) and the effects of repeated photodynamic therapy (PDT). Sequential stereo color films, angiograms and OCT scans of a patient with AMD were compared over 15 months, during which PDT was applied 4 times.

The stereo photos and the angiograms remained relatively unchanged over 15 months. OCT, however, demonstrated significant changes in retinal structure and provided evidence of the positive effect of PDT in the treatment of AMD. OCT can provide relevant information for the application of PDT as well as serve as an adjuvant tool for demonstrating its effects in the treatment of AMD.

Key Words: Age-related maculopathy
choroidal neovascularization,
photodynamic therapy

Özet

Bu olgu sunumunun amacı yaşa bağımlı gözlenen maküler dejenerasyonun (AMD) monitorizasyonu için oküler kohorens tomografi ve fotodinamik tedavinin (PDT) etkilerini gözlemlemektir. AMD'li bir hastanın 15 ay boyunca PDT tedavisi (4 kere) sırasında alınan stereo filmleri, anjiyogramlar ve tomografileri karşılaştırıldı.

Stereo fotogramlar ve anjiyogramlarda 15 ay boyunca anlamlı değişimler gözlenmedi. Bununla birlikte tomografilerde retinanın yapısında değişiklik ve PDT'nin pozitif etkileri gözlendi. Sonuç olarak oküler kohorens tomografi ile AMD'li hastalarda PDT'nin etkileri izlenebilir.

Anahtar Kelimeler: Yaşa bağımlı makülopati,
koroidal neovaskülarizasyon,
fotodinamik tedavi

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At a symposium at the Association for Research in Vision and Ophthalmology (ARVO) meeting in 2001, the panelists, reiterated that the "gold standard" for applying photodynamic therapy (PDT) for age-related macular degeneration (AMD) is a fluorescein angiogram, that demonstrates a leak from a predominantly classic choroidal neovascular (cnv) membrane. The "gold standard" for re-treatment is a persistence or a recurrence of the leak on a subsequent angiogram.

In the mean while, ocular coherence tomography (OCT) has become an important adjunct in the diagnosis of macular diseases. In contrast to angiography it represents a non-invasive modality that provides a cross section of the retina.[1] An OCT can reveal retinal pigment, intraretinal fluid, cysts, and subretinal proliferation.[2-5] Therefore, the information from an OCT provides an additional parameter for administering PDT for AMD.[6-8] OCT may complement the angiogram, augment or contradict

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it.[6-8] In the following a report on a patient with AMD and a classic cnv which was treated 4 times with PDT. OCT proved to be a valuable tool in monitoring the subsequent follow-up and in indicating a re-treatment with PDT.

Material and Methods

A 90-year-old female presented with dimished vision in her right eye of one week duration. The visual acuity on the EDTRS chart was 20/125. The left eye had lost central vision the year before with a parafoveal cnv that was treated with thermal laser and had suffered recurrence. The visual acuity in this left eye was finger counting. Biomicroscopy of the right eye revealed multiple drusen and a small sensory elevation at the inferior edge of the fovea (Figure 1A).

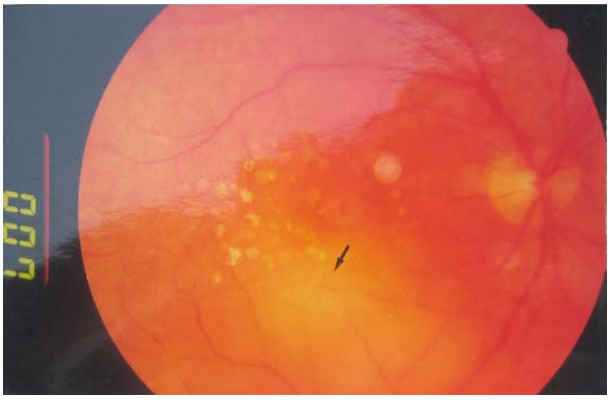
Fluorescein angiography demonstrated a small cnv membrane at the inferior edge of the fovea that leaked fluorescein in the late phase (Figures 1B, 1C). The ICG of the right eye demonstrated a hot spot in the late phase that corresponded to the fluorescein leak. Based on the angiograms, it was elected to treat the lesion with PDT; an infusion of verteporfin, followed by a laser application at 689 nm for 83 s. The laser application had a spot size of 2,500 µm, centered at the inferior edge of the fovea. Two weeks after the treatment the retina looked flat and visual acuity had improved to 20/80.

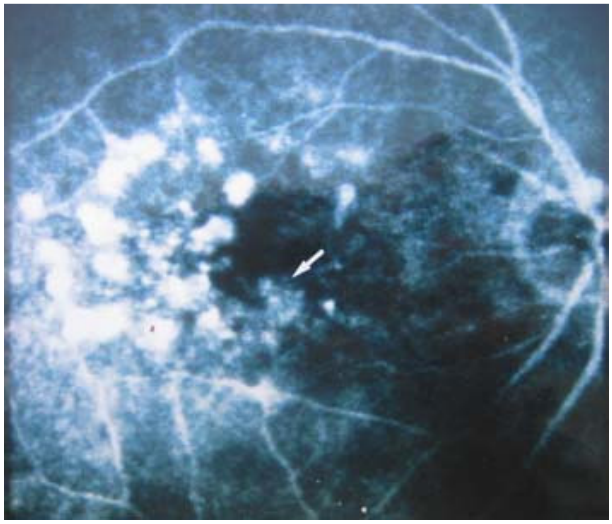
Results

Over the next 3 months visual acuity diminished to 20/165. An angiogram revealed the membrane at the inferior edge of the fovea to be leaking again. The leak was less extensive than before PDT (Figure 2A).

An OCT, however, revealed significant intraretinal fluid at the inferior edge of the fovea that extended into the fovea (Figure 2B). A second PDT was performed. Two weeks later the OCT showed some resolution of the intraretinal fluid (Figure 3). The visual acuity improved to 20/100.

Four months later the visual acuity diminished again, this time to 20/200. The late angiogram





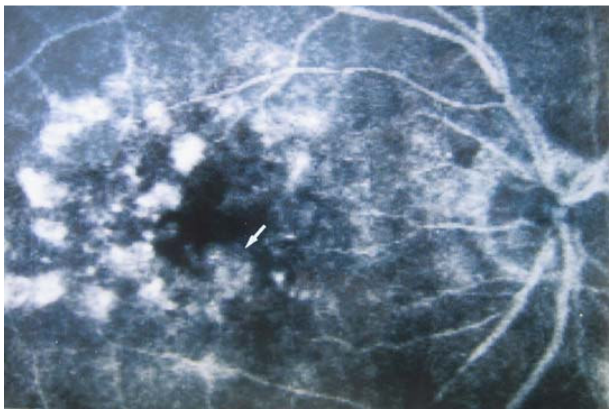


Figure 1A. Macula of the right eye of a 90-year-old female with diminished vision (20/125) of 1 week duration. There are multiple drusen and a small sensory elevation at the inferior edge of the fovea (arrow).
1B. Fluorescein angiogram of Figure 1A demonstrating the drusen and membrane at the inferior edge of the fovea at 6 o'clock in the early phase (arrow).
1C. In the late phase (arrow).

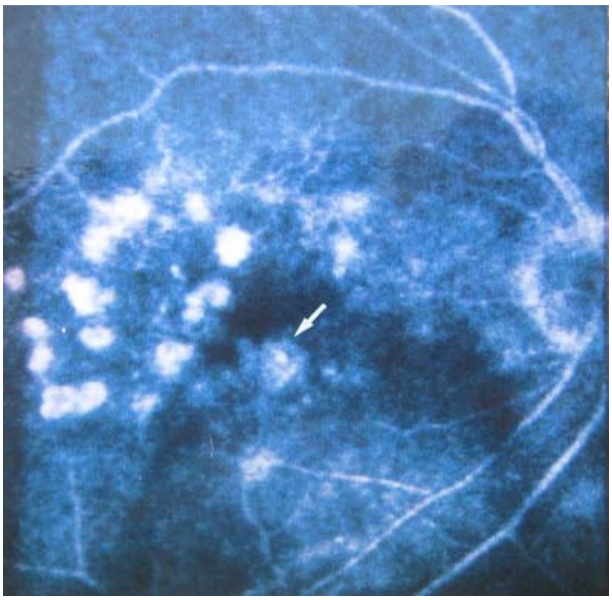


Figure 2A. Fluorescein angiogram 3 months after the 1st PDT. The membrane at the inferior edge of the fovea appears unchanged (arrow). **2B.** The OCT (it is oriented vertically for easier correlation with the accompanying angiogram) revealed intraretinal fluid at the inferior edge of the fovea that extended into the fovea. Visual acuity, after a brief increase to 20/80 at 2 weeks, had decreased to 20/165.

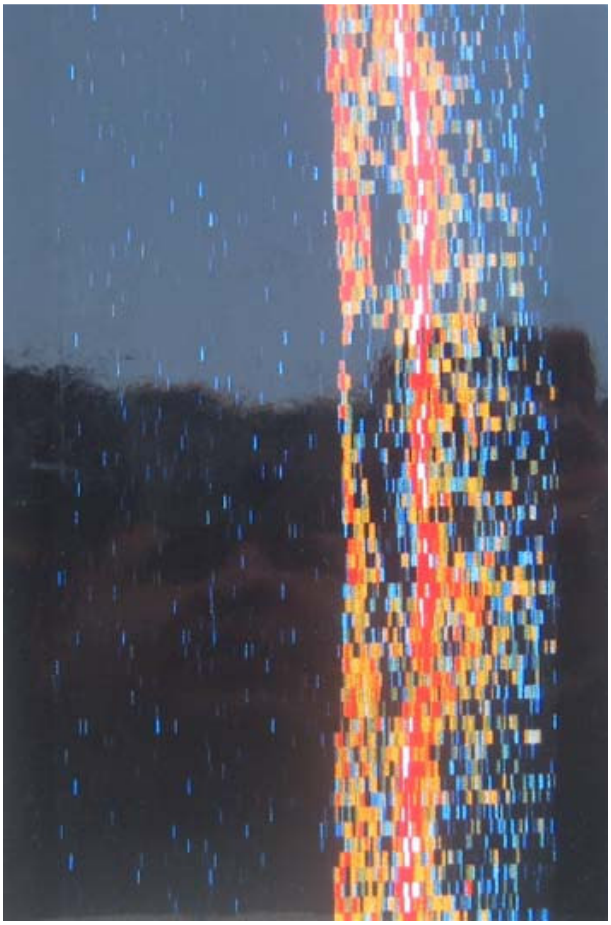
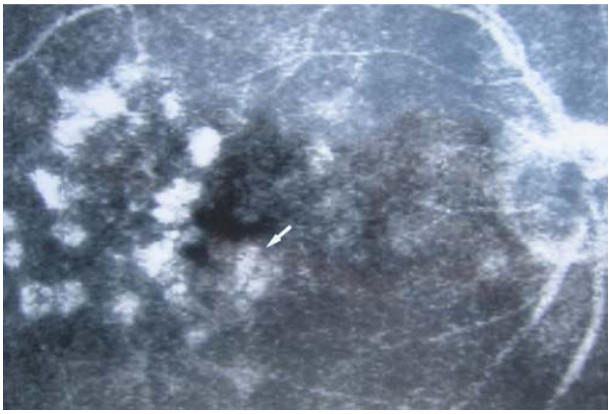


Figure 3. OCT 2 weeks after the 2nd PDT. There was resolution of the intraretinal fluid and visual acuity had improved to 20/100.

revealed the same degree of fluorescein leakage as before (Figure 4A). The OCT, however, showed cystic changes, and a thickening at the level of the pigment epithelium at the inferior edge of the fovea (Figure 4B).

A third PDT, centered at the inferior edge of the fovea, caused a resolution of the cystic fluid after 2 weeks and a return of the foveal depression (Figure 5). The subretinal proliferative mass at the inferior edge of the fovea appeared slightly larger. The visual acuity had improved to 20/165 + 1.

Four months later visual acuity deteriorated again to 20/200. The angiogram showed the same late staining as before (Figure 6A). The OCT revealed some reaccumulation of intraretinal fluid



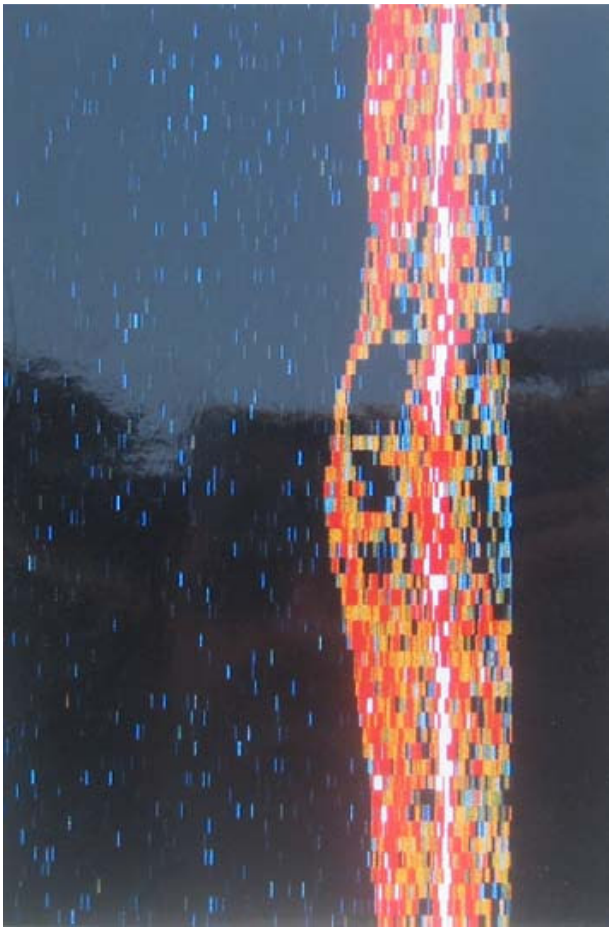


Figure 4A. Late phase of fluorescein angiogram 4 months after 2nd PDT appears practically unchanged (arrow).
4B. The OCT showed cystic changes and a thickening at the level of the pigment epithelium at the inferior edge of the fovea. Visual acuity had decreased to 20/200.

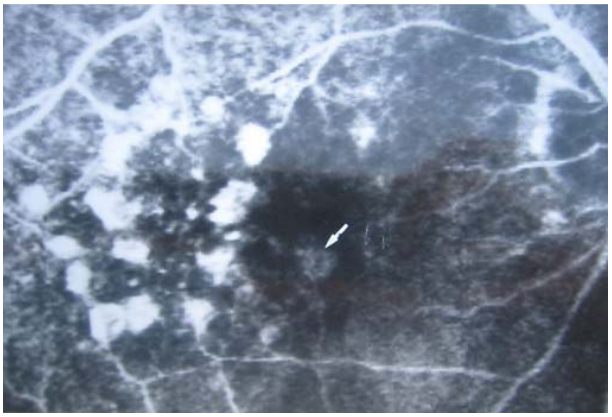
and a significant growth of the subretinal mass (Figure 6B).

A fourth PDT was performed which provided a subjective improvement in visual acuity: There was a gain of 3 letters. An OCT three months later showed a minimum of intraretinal fluid and some evidence of the foveal depression. There was growth of the subretinal membrane (Figure 7). The patient's vision remained stable at 20/200 during the entire 1-year follow-up after the fourth PDT.

Figure 5. OCT 2 weeks after the 3rd PDT. There is resolution of the cystic fluid, which was present in Figure 4B. The subretinal proliferative mass at the inferior edge of the fovea appeared slightly larger (arrow). The visual acuity had improved to 20/165 + 1.

Discussion

The patient had a loss of visual acuity, because of a small parafoveal cnv in her second eye. The membrane responded positively to PDT 4 times, although the patient lost 15 letters on the EDTRS chart over 24 months. The angiograms demonstrated an unchanged or slighthly diminished fluorescein leak throughout the course. In contrast, the OCTs revealed the presence of



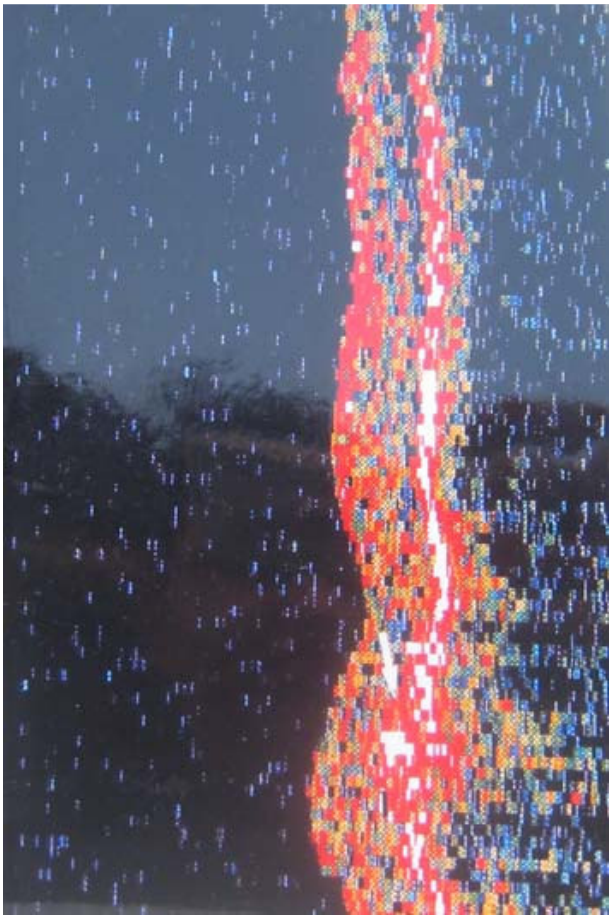


Figure 6A. Fluorescein angiogram 4 months after 3rd PDT revealed less leakage in the late phase (arrow).
6B. OCT revealed growth of the subretinal mass (arrow). The visual acuity had decreased to 20/200.

intraretinal fluid, cysts and the subsequent development of subretinal proliferation. Only the OCT revealed the significant changes that were occurring and the positive response to PDT.

Figure 7. OCT 3 months after the 4th PDT. There was additional growth of the subretinal membrane (arrow). Visual acuity had stabilized at 20/200.

Concerning the enlarging subretinal mass, demonstrated by the OCT, we suggest that it might be the cnv becoming infiltrated and encapsulated by pigment epithelium. In this respect OCT could provide relevant information during follow-up of the 4 PDT treatments and valuable insights into the resulting structural changes in the macula.

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