Optical coherence tomography characterisation of idiopathic central serous chorioretinopathy

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Aim: To describe retinal findings in patients with idiopathic central serous chorioretinopathy (ICSC) as assessed by optical coherence tomography (OCT), and to compare them to fluorescein angiography (FA) findings.

Methods: Case series of 39 eyes from 36 patients with ICSC. Complete ophthalmological examination, last generation OCT (StratusOCT, Software version 3.1) and FA were performed. Six radial scans using OCT were performed and repeated. Singular findings were recorded, OCT images were measured and the results compared with those of FA. The main outcome measures were FA and OCT findings.

Results: Two patterns of distinct OCT findings are described. In the first one, an optically empty vaulted area of different heights was observed under the neurosensory retina in 36 eyes, being related to fluorescein filled areas; in 35 of them, highly characteristic small bulges could be observed protruding from the retinal pigment epithelium (RPE), angiographically related to leaking spots. In the second pattern, three eyes showed an almost semicircular space under the RPE, with thinner overlying retina.

Conclusions: OCT may offer a new approach to the staging and knowledge of ICSC, and may help the understanding of the mechanisms of the disease.

Idiopathic central serous chorioretinopathy (ICSC) typically affects young and middle aged males in their third to fifth decades. Patients may develop one or more small areas of serous detachment of retinal pigment epithelium (RPE) in the macula or in the paramacular area, which may be followed by serous detachment of the overlying and surrounding retina. Demonstration of ICSC is based on angiographic pooling of subretinal fluid, appearance of defects in the RPE, and typical dye leakage from the choroid into the subretinal space.1,3

New diagnostic and therapeutic tools have increased our ability to study this condition, allowing us to have new theories on its in-depth mechanisms or the presence of choroidal neovascularisation (CNV).4-6 Optical coherence tomography (OCT) is an imaging procedure that uses reflection of light off the retinal layers to create a false colour tomographic image of retinal and RPE structures with a resolution of 10 μm axially and 20 μm in transverse dimension.5

METHODS
We performed OCT (StratusOCT Software 3.1, Carl Zeiss Meditec Inc, San Leandro, CA, USA) and fluorescein angiography (FA) (Imagenet 2000, Topcon TRC50IX, Topcon Corp, Japan) on 39 eyes from 36 consecutive patients with ICSC. OCT and FA were performed on the same day.

Eleven patients (10 males, one female, 13 eyes) had had symptomatic ICSC with angiographic changes for more than 12 months without clinical normalisation (chronic forms). Fifteen patients (11 males and four females, 15 eyes) have had the first episode for less than 4 months (acute forms). Ten patients (six males and four females, 11 eyes) have had two or more episodes.

OCT was performed by acquiring six radial scans, 6 mm long, centred in the fovea using the fast macular scan function (transverse sampling, 128 A-scans). When fixation was poor, scans were centred in the fovea under video surveillance. OCT scans were repeated three times to ensure reproducibility. When particular details were observed, the scan was centred in that location to check that they were not caused by saccadic movements or other artefacts, at a higher scan rate (transverse sampling, 512 A-scans).

Scans were examined and compared to FA to determine the mutual relation and nature of the findings. OCT video imaging was used to centre scans on angiographic photographs to locate and identify the findings on FA. Retinal thickness was measured at the fovea using the macular thickness calliper.

RESULTS
The mean age of the patients was 43 (SD 8) years, (range 29-68), with 27 males (75%) and nine females (25%). All were white. Mean visual acuity at baseline was 20/25 (range 20/20 to 20/60). Fundus examination showed serous detachment in all of them with patches of RPE atrophy. No haemorrhages or choroidal neovascularisation (CNV) were observed.

OCT showed foveal distortion and cystic and atrophic macular changes in all eyes. Thirty six eyes (92%) showed neuroretinal detachments corresponding to the affected area, with empty spaces underneath. Three eyes (8%) showed RPE detachment and overlying retinal thinning.

Two different patterns could be observed. The first pattern was an empty vaulted area of variable height (41–539 μm, mean 198 μm, SD 107) under the neurosensory retina, angiographically related to fluorescein filled areas. It was present on 36 eyes (15 from acute forms 100%, 11 from multiepisodic forms 100%, and 10 from chronic forms 77%). Empty spaces were underlined by a hyper-reflective line, probably corresponding to scarred RPE. In 35 eyes a small bulge was observed protruding from RPE (fig 1A–D). Foveal thickness was 135–268 μm (mean 207 μm, SD 34). In four cases the cystic space was very...
shallow (fig 1D), showing the previously described bulge. Only one case showed one small cystic structure with an empty core, which might be assimilated to a small cystic RPE detachment.

Three eyes (all from chronic forms, 23%) showed a vaulted space of variable height (fig 1E, F) under RPE, what probably identifies them as RPE detachments. Overlying retina measured 83–145 μm (mean 106 μm, SD 36). Angiographic correspondence of these structures was actually RPE detachments (fig 2D and E).

FA showed fluorescein pooling under detached retina in all cases. Thirty six eyes (92%) showed active forms of ICSC. Leaking points and smokestacks could be demonstrated in 28 eyes (72%) (fig 2A–D); meanwhile eight eyes (20%) showed diffuse patterns with severe, diffuse RPE atrophy (fig 2E and F). One eye (3%) showed only RPE defects. All eyes showed parafoveal, patchy RPE atrophy without CNV.

Comparing OCT scans with FA it could be demonstrated that protrusions were located exactly where fluorescein leakage appeared. A similar topographic relation could be established for RPE detachments.

**DISCUSSION**

The role of OCT as a non-invasive way of studying the retina is well known. Several papers have recently appeared describing OCT findings in eyes with ICSC. We describe two different OCT patterns in patients with ICSC, and one finding highly characteristic of this condition. Acute and multiepisodic forms of ICSC showed in all cases empty subretinal spaces. In most of them bulges protruded from the RPE under a detached retina; this also appears in some chronic cases, which probably meant activity of the disease. Their location was that of the angiographic leakage.

The appearance of high, vaulted subretinal spaces in OCT was associated with the biomicroscopical presence of local neuroretinal detachment and fluorescein filled areas. Bulges could not be located biomicroscopically.

Twenty three per cent of chronic forms appeared to be associated with high RPE detachments and retinal thinning without retinal detachment. FA showed progressive filling. Biomicroscopically they showed well defined neuroretinal detachment.

Kamppeter and Jonas and Drexler et al have previously described similar findings lacking hyper-reflective RPE, considering them to be RPE detachments. Drexler et al were uncertain whether these findings might actually be...
OCT may offer a new approach to the diagnosis and evaluation of retinal damage in ICSC, and help us to understand its staging and mechanisms.

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