Objective: To describe clinical and angiographic features of patients with central serous chorioretinopathy (CSC) who had yellowish subretinal deposits forming a reticulated leopard-spot pattern during fluorescein angiography.

Methods: We conducted case studies using the clinical and photographic records of 5 patients.

Results: All 5 patients were older men between the ages of 68 and 81 years who had been treated with corticosteroids and had bilateral CSC. Nine eyes of the 5 patients developed yellowish deposits in a reticulated pattern in the macular region under the chronic detached neurosensory retina. The pattern of leopard-spot deposits was well demonstrated on the fluorescein angiogram, with hypo-fluorescence in most of the deposits and hyper-fluorescence from atrophy of the retinal pigment epithelium. Later phases of the fluorescein angiographic study showed leaks from the retinal pigment epithelium. During the indocya-nine green angiography evaluation of 4 patients, all had bilateral multifocal patches of hyperfluorescence in the mid-phase, findings typical of CSC.

Conclusions: Yellowish deposits forming a reticulated leopard-spot pattern may occur under the neurosensory retina and are associated with chronic neurosensory detachment caused by CSC. All patients were older men being treated with corticosteroids. This report described a newly recognized finding: the subretinal deposition of a yellowish material in a leopard-spot pattern in eyes with CSC.

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PATIENTS AND METHODS

Patients were considered to have CSC if they had (1) ophthalmoscopic findings of subretinal fluid in the posterior pole; (2) fluorescein angiographic evidence of leakage from the level of the RPE; and (3) no history or signs of clinically evident intraocular inflammation, choroidal neovascularization, or other conditions related to the exudation of subretinal fluid.

After giving their consent, the patients underwent complete ophthalmic examinations, color fundus photography, contact B-scan ultrasonography, and fluorescein angiography. Four of them had indocyanine green (ICG) videoangiography (Topcon TRC-501A fundus camera; Topcon ImageNet H 1024 Digital Imaging System; Topcon USA, Paramus, NJ).

PATIENT 1

A 68-year-old white man had decreased vision in his left eye. He had a medical history of asthma and polymyalgia rheumatica and had been treated with systemic corticosteroids for several years. His best-corrected visual acuity was 20/20 OD and 20/60 OS. The right eye had some pigmentary disturbances in the macula and several focal leaks during fluorescein angiography consistent with CSC. There was no evidence of choroidal vascular filling defects. The left eye had an ovoid neurosensory retinal detachment in the macula with an underlying pigmentary disturbance and an accumulation of yellowish subretinal deposits (Figure 1). Fluorescein angiography of the left eye showed several leaks from the RPE consistent with CSC. Two and a half years later, the patient developed a central deposit with reticular flecks of material in an area bounded by the neurosensory detachment in the left eye (Figure 2A). These yellowish deposits seemed to be situated under the neurosensory retina. The right eye had a shallow neurosensory detachment with pigmentary disturbances and yellowish subretinal deposits in the macula (Figure 2B). The patient’s best-corrected visual acuity was 20/30 OD and 20/400 OS. In the fluorescein angiographic evaluation of the left eye, most of the deposits blocked the underlying choroidal fluorescence, whereas the areas between the deposits were hyperfluorescent because of RPE atrophy, producing a negative pattern of the ophthalmoscopic picture and a leopard-spot pattern (Figure 2C). The fluorescein angiography also revealed diffuse retinal pigment epitheliopathy with several subtle leaks from the RPE in both eyes (Figure 2D and 2E). Besides a slight blockage of the fluorescence in the left eye caused by the yellow material and the neurosensory detachment, ICG videoangiography revealed only the typical findings of CSC; namely, patchy areas of hyperfluorescence in the midphase (Figure 2F and 2G) and dispersion of the dye in the late phase in both eyes. No late staining consistent with choroidal neovascularization was seen.

Nine months later, the patient was found to have a neurosensory detachment in both eyes. In the right eye, a reticulated leopard-spot pattern of flecks was beginning to form under the neurosensory retina. Four years after his initial symptoms, the central yellowish deposit and reticular flecks in the left eye had decreased in thickness and had become more fibrotic in appearance (Figure 3A). The right eye developed a leopard-spot pattern of yellowish deposits under the detached neurosensory retina on ophthalmoscopy (Figure 3B). The visual acuity was 20/40 OD and 20/400 OS. The patient was followed up for a total of 8½ years.

PATIENT 2

An 81-year-old man developed a serous retinal detachment of the macula from CSC in both eyes. He had a medical history of prostate carcinoma treated with radiation therapy but had experienced no recurrence. He had developed radiation neuropathy and pain and had been treated with oral corticosteroids for several years. His best-corrected visual acuity was 20/50 OD and 20/40 OS. Fluorescein angiography revealed multiple leaks from the RPE in the superior macula of the right eye and in both the peripapillary and macular regions of the left eye. Indocyanine green angiography showed patchy areas of hyperfluorescence in the midphase and dispersion of the dye in the late phase in both eyes.

Nine months later, the right eye had persistent subretinal fluid in the macula and mild exudates in the inferior macula. The left eye showed peripapillary subretinal angiogram and was easier to discern using this technique than with ophthalmoscopy. During the ICG angiographic evaluation of 4 patients, all demonstrated bilateral multifocal patches of hyperfluorescence in the midphase and dispersion of the dye with silhouetting of the larger choroidal vessels in the late phase, findings typical of CSC.12 No occlusion of the choriocapillaris was apparent, and no late staining consistent with choroidal neovascularization was seen.

COMMENT

We describe 5 men ranging in age from 68 to 81 years with chronic CSC and yellowish deposits under a detached neurosensory retina in the macular region (seen during ophthalmoscopy) that caused a leopard-spot pattern on fluorescein angiography. The fluorescein angiographic findings were characterized by hypofluorescence...
fluid. Both eyes also developed a reticulated pattern of yellowish deposits under the neurosensory retina. On fluorescein angiography, diffuse retinal pigment epitheliopathy with multiple subtle leaks in both eyes remained. The leopard-spot pattern of subretinal deposits was well demonstrated on the fluorescein angiogram. Eighteen months after the patient’s initial examination, the areas of the leopard-spot pattern increased in size in the right macula and in the whole posterior pole in the left eye; this was associated with fluorescein leakage (Figure 4A, 4B, 4C, and 4D). The best-corrected visual acuity was 20/70 OD and 5/400 OS. The patient was followed up for a total of 18 months.

PATIENT 3

A 73-year-old man had blurred vision in his right eye. He had a history of chronic lymphatic leukemia that was in remission. He noted back pain because of herniated intervertebral disks and had received 3 epideral corticosteroid injections. He also used nasal corticosteroids for allergic sinusitis. He developed a decline in visual acuity in the right eye. He had a large serous detachment associated with subretinal lipid and a reticulated leopard-spot pattern of yellowish subretinal deposits in the right inferior portion of the macula in an area of neurosensory retinal detachment (Figure 5A).

Fluorescein angiography revealed diffuse RPE leaks and a leopard-spot pattern in the right eye (Figure 5B). His left eye had a localized serous detachment associated with multiple leakage from the RPE during fluorescein angiography. Indocyanine green angiography showed patchy areas of hyperfluorescence in the midphase in both eyes with no late staining, a finding consistent with CSC. The best-corrected visual acuity was 20/40 OD and 20/30 OS. After the patient’s visual acuity declined to 20/60 OD, he was treated with laser photoacogulation. Although his acuity initially improved in the right eye, he continued to have diffuse leakage and a large serous detachment; subsequently his visual acuity declined to 20/200. He had laser therapy in the left eye with resolution of the serous detachment, and his acuity remained stable at 20/30 with no evidence of leakage. The patient was followed up for a total of 4 years.

PATIENT 4

A 68-year-old man had decreased vision in his right eye for several months and decreased vision in his left eye for 2 weeks. He had undergone renal transplantation 1 year previously and was treated with oral cyclosporine and oral corticosteroids. His best-corrected visual acuity was 20/400 OD and 20/40 OS. A fundus examination in the right eye showed serous elevation along the superotemporal and inferotemporal arcades, with the fluid just reaching the fovea. There was some serous fluid at the inferotemporal periphery. Yellowish deposits in a reticulated pattern were present at the posterior pole and inferotemporal periphery. In the left eye were serous fluid, pigmentary mottling, and yellowish subretinal deposits inferior to the optic disc. Subretinal lipid was seen at the macula. Fluorescein angiography showed extensive pigment disruption of the RPE with leaks along the inferotemporal vessels in the right eye. In the left eye there was minimal leakage. On fluorescein angiography, the leopard-spot pattern was demonstrated in the areas of yellowish deposits in both eyes. Although the amount of fluid fluctuated in both eyes during the 7 years of follow-up, the area of leopard-spot changes gradually increased. The patient was followed up for a total of 7 years.

PATIENT 5

A 73-year-old man had bilateral decreased vision that had reportedly started 2 months previously. He had a history of prostate carcinoma treated with radiation but no recurrence. He also had a medical history of chronic obstructive pulmonary disease and asthma and had been treated with oral corticosteroids. His best-corrected visual acuity was 20/80 OD and 20/70 OS. He developed a serous retinal detachment, subretinal lipid, and yellowish deposits of the macula with multiple subleu fluorescein leaks from the RPE in both eyes. The pattern of leopard-spot subretinal deposits was well demonstrated on the fluorescein angiogram. Indocyanine green angiography showed patchy areas of hyperfluorescence in the midphase and dispersion of the dye in the late phase in both eyes. The patient was followed up for a total of 3 years.

of most of the deposits and mottled hyperfluorescence from the atrophy of the RPE. Later this evaluation revealed several leaks consistent with diffuse retinal pigment epitheliopathy. The pattern of subretinal leopard-spot deposits was well demonstrated on fluorescein angiography. Indocyanine green angiography revealed multifocal choroidal vascular hyperpermeability in a pattern characteristic of CSC but did not show findings typical of choroidal neovascularization or infarction of the choriocapillaris. Although the literature contains reports of CSC in patients with subretinal deposits, to the best of our knowledge, the yellowish deposits located at the level of the RPE that form a leopard-spot pattern, as found in our study, have not been described in CSC.

Mottled or leopard-spot hyperpigmentation and secondary retinal detachment may develop in patients with chronic serous detachment of the choroid and ciliary body in idiopathic uveal effusion syndrome. None of our 5 patients had either ophthalmoscopic or ultrasonographic evidence of ciliochoroidal detachment or choroidal thickening. All 5 of our patients had multiple fluorescein leaks from the RPE, which are not usually seen in uveal effusion syndrome. Although leopard spots are seen in uveal effusion syndrome, they are caused by mottling of the RPE. Our patients had deposits of a yellowish material at the level of the RPE. Furthermore, there was no shifting of the subretinal fluid. Gass et al described 4 patients with serous retinal detachment associated with RPE derangement in the posterior pole after organ transplantation. These patients appeared to have a deposition of subretinal yellow-orange flecks as well as multiple pinpoint areas of fluorescein leaks. Gass and colleagues speculated that localized intravascular coagulation induced by subclinical graft rejection affected the choroid, causing the findings ob-
served in their patients. Our patients had similar fundus findings, but only patient 4 underwent organ transplantation. None had systemic conditions associated with intravascular coagulation. Neither the fluorescein angiographic evaluation nor the ICG videoangiographic examination suggested any filling defect in the choriocapillaris. In addition, the ophthalmoscopic appearance and natural course of our patients were different from those of patients with intravascular coagulopathies caused by neoplasm or sepsis.\textsuperscript{17,18} The patients described by Gass et al\textsuperscript{16} had organ transplantation; these patients are treated with drugs such as corticosteroids to produce chronic immunosuppression. Corticosteroids have been associated with the production, exacerbation, and prolongation of CSC, especially diffuse retinal pigment epitheliopathy.\textsuperscript{10-24} All patients in our series were being treated with corticosteroids and had diffuse retinal pigment epitheliopathy. Corticosteroid use is undoubtedly important in the appearance of these fundus findings.

The leopard-spot pigmentation was also similar in appearance to that occurring in some patients with

![Figure 1. Patient 1: a 68-year-old man. At the initial visit, the left eye had a neurosensory detachment (arrows) and flecks of yellow material (arrowheads) in the superior macula.](image)

![Figure 2. Patient 1: 2 1/2 years later. A, The left fundus shows a central deposit of yellow subretinal material, with eddies of deposit forming a leopard-spot pattern arranged under the neurosensory detachment. B, The right eye has a shallow neurosensory retinal detachment with pigmentary disturbances and yellowish subretinal deposits (arrowheads) in the macula. Subretinal lipid is also seen. C, Fluorescein angiogram of the left eye reveals blockage of the underlying fluorescence by most of these yellow deposits, whereas the areas in between are hyperfluorescent owing to decompensation of the retinal pigment epithelium (RPE), producing a leopard-spot pattern. D, The late-phase fluorescein angiogram shows several small leaks from the RPE and some staining in the left eye. E, In the right eye, fluorescein angiography shows focal leaks from the RPE. F (left eye) and G (right eye), The midphase of the indocyanine green angiography shows bilateral patchy hyperfluorescence due to choroidal vascular hyperpermeability typical of central serous chorioretinopathy.](image)
Figure 3. Patient 1: 4 years after his initial visit. A, The central yellow deposit has flattened, and there is an area of metaplasia of the retinal pigment epithelium in the left eye. There are several new flecks nasal and superior to the optic disc. B, The right eye, which previously showed only mild affectation with central serous chorioretinopathy, demonstrates a leopard-spot pattern of yellowish subretinal deposits. A focus of subretinal lipid can be seen.

Figure 4. Patient 2: an 81-year-old man who developed chronic central serous chorioretinopathy in both eyes after using high-dose corticosteroids. A (right eye) and B (left eye), The fundus photograph shows a deposition of yellow material in a leopard-spot pattern under both maculas. C (right eye) and D (left eye), Fluorescein angiogram of both eyes reveals leaks at the level of the retinal pigment epithelium and a blockage of the underlying fluorescence by most of the yellow deposits. The pattern of leopard-spot deposits is well-demonstrated on the fluorescein angiogram.

Figure 5. Patient 3. A, A 73-year-old man developed a serous retinal detachment of the macula associated with subretinal lipid and a reticulated pattern of yellowish deposits in the right eye. B, Fluorescein angiography shows diffuse retinal pigment epithelial leaks and a leopard-spot pattern of subretinal deposits.
systemic large cell lymphoma, leukemia, or bilateral diffuse uveal melanocytic proliferation. Vitreous cellular infiltration and choroidal thickening, frequent features of ocular involvement by lymphomatous and leukemic cells, were not present in our patients. The leopardspot changes seen in lymphomas are caused by pigmen-
tary clumping, in contrast to the yellowish material seen in our patients. Patient 3 had a history of chronic lymph-
phatic leukemia, but it was in remission at the onset of ocular symptoms. The other patients had no systemic conditions associated with neoplasms.

The 5 men we described had yellow deposits forming a leopard-spot pattern under the neurosensory retina associated with chronic neurosensory detachment caused by CSC. All patients were older men being treated with corticosteroids. Subretinal fibrin may occur in acute or chronic CSC, and subretinal lipid may also be seen, especially in more chronic cases such as those in this study. These subretinal deposits may reflect the subretinal milieu in these patients; there were probably a large amount of macromolecules present. The yellowish material in our patients appeared to lie deeper, at the level of the RPE. Certainly macrophages and RPE cells containing melanin granules may occur, but the flecks seen in our patients were yellow. It is possible that the flecks were composed of aggregates of RPE cells or macrophages laden with material, perhaps including macromolecules such as protein or lipid that led to the yellow color.

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REFERENCES

10. Iida T, Hagimura N, Sato T, Kishii S. Evaluation of central serous chorioretinopat-
12. Guyer DR, Yannuzzi LA, Slakter JS, Sorenson JA, Ho A, Orlock D. Digital indo-
ucyanine green videangiography of central serous chorioretinopathy. Arch Oph-
thalmol. 1994;112:1057-1062.
14. Yannuzzi LA, Slakter JS, Sorenson JA, Guyer DR, Orlock DA. Digital indocya-
16. Gass JD, Slamovits TL, Fuller DG, Gieger RG, Lean JS. Posterior chorioretinopa-
18. Metlon RC, Spaide RF. Visual problems as a presenting sign for thrombotic throm-
19. Jain IS, Singh K. Maculopathy: a corticosteroid side-effect. J All-India Ophthal-
mol Soc. 1966;14:250-252.
20. Williamson J, Nuki G. Macular lesions during systemic therapy with depot tet-
21. Wakasaka M, Ishikawa S. Central serous chorioretinopathy complicating sys-
22. Gass JD, Little H. Bilateral bullous exudative retinal detachment complicating id-
23. Polak BCP, Baarsma GS, Snyers B. Diffuse retinal pigment epitheliopathy com-
26. Clayman HM, Flynn JT, Koch K, Israel C. Retinal pigment epithelial abnormali-
29. Crafoord S, Dalgard Kopf E, Seregard S, Algvere P. Cellular migration into neu-