Diffuse unilateral subacute neuroretinitis

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Abstract

The clinical syndrome of diffuse unilateral subacute neuroretinopathy (DUSN) has been characterised in its early and late stages. Different types of migrating worms in the subretinal and intraretinal space have been described as the cause of the clinical syndrome. We observed a patient with a long history of visual loss, vitritis, and a fundus of abnormal appearance where the worm was noted to migrate to different areas over the course of hours.

Between 1963 and 1973 thirteen patients were described at Bascom Palmer with a clinical syndrome consisting of decreased vision, inflammatory cells in the vitreous, optic atrophy, vascular attenuation, diffuse and focal retinal pigment epithelial atrophy, and abnormalities of the electroretinographic responses. This was referred to as the 'unilateral wipe-out' syndrome. In 1975 the earlier stages of the clinical syndrome were recognised as including mild optic disc oedema, vitritis, extensive pigment epithelial changes, and yellow-white lesions affecting the deep retina. In 1978 Gass and Scelfo¹ described later stages of the disease characterised by optic

atrophy, vascular attenuation, arterial sheathing, and diffuse retinal pigment epithelial changes with focal and coarse mottling of the pigment epithelium and atrophy. With marked inflammatory disease of the retina and optic nerve, the syndrome was named 'diffuse unilateral subacute neuroretinitis.'

Gass *et al*² in 1978 reported 37 more cases. It was suggested from the newer observations that the syndrome may be related to toxic damage to the optic nerve and retina caused by a worm migrating in the subretinal space. Gass *et al* emphasised the early or subacute stage and the appearance of 'successive crops of evanescent lesions', either grey-white or yellow-white, involving the deep layers of the retina. These lesions would fade in several days, leaving colour changes in underlying pigment epithelium. In two of these patients a motile subretinal worm was noted close to active retinal lesions.² The changes in the pigment epithelium produced a dull-reflex which was similar to changes noted in a diffuse tapetoretinal degeneration.

The electroretinogram (ERG) was normal in two patients in the early stages of the disease.² In the late stages there was more B-wave reduction than A-wave reduction. The ERG was not extinguished in any of the patients.² Electro-oculograms were abnormal in 16 of 29 performed.² It has been suggested that this unocular syndrome may be caused by several nematodes, with *Baylisascaris procyonis*, the raccoon roundworm, being one possible cause.³⁻⁵

Case report

A 22-year-old Liberian woman presented to the Ophthalmology Office of the Medical College of Virginia on 13 August 1987 complaining chiefly of decreased vision in the left eye. Before leaving Liberia in 1979 she was seen by an ophthalmologist. At that time she complained of nyctalopia and decreased vision in the left eye. The condition was essentially stable until two months prior to her visit to the Medical College of Virginia, at which time she noted a further decrease in the visual acuity of the left eye and intermittent micropsia. Her past eye history was otherwise normal. Her seven siblings had no history of nyctalopia or known tapetoretinal degeneration.

On examination she was found to have a visual acuity of 20/20 in the right eye and 20/50 in the affected left eye. There was an afferent pupillary defect in the left eye. The intraocular pressures were normal. There was pallor of the left optic disc, with marked arteriolar attenuation and diffuse patchy retinal pigment epithelial changes without overt bony spicule changes; a decreased macular reflex was present.

The patient was examined by the Neuro-ophthalmology Service on 9 September 1987. Her visual acuity had decreased to 15/200 in the

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Accepted for publication
15 March 1991

Figure 1 Left optic disc with nematode in the deep retina (arrow) on 25 November 1987, one disc diameter from the disc, in a dumbbell configuration, along a branch of the inferonasal artery.

Figure 2 At 1130 the worm (small arrow) has moved nasally, located in the inner retina superonasal to the fovea (large arrow). Note the tail of the worm overlies the vessel.

left eye. Colour discrimination was absent in the left eye and normal in the right eye. The fundus was described 'as that of a unilateral retinitis pigmentosa'. The right eye yielded visual evoked potential (VEP) and ERG. An absent pattern

Figure 3 At 1400 the worm (small arrow) was located inferotemporal to the optic disc margin.

VEP response was present on the left; the flash VEP response was present. On the left the ERG was absent to photopic stimuli with reduced scotopic A and B waves. On 25 November 1987 while she was being examined, a motile worm was seen inferonasal to the optic disc (Fig 1). It was approximately 800 μm in length and approximately 33 μm in width. The patient returned on 1 December 1987 for follow-up, and the location of the worm was followed for several hours. At 1000 h the worm was seen coiled in the superotemporal macula. At 1130 it had moved nasally in the superior macula (Fig 2). At 1400 the worm was noted to be inferotemporal to the optic disc margin (Fig 3). At 1600 it had moved back into the superior macular area (Fig 4). Light stimulation was used at 1630 to move the worm further into the superior macula area, where photocoagulation was applied.

The patient returned on 2 January 1988. Her visual acuity remained 20/400. No other parasites were noted. The area of laser photocoagulation involving the worm showed evidence of chorioretinal scarring.

Discussion

Further observations⁶⁻¹⁴ have supported those of Gass *et al*² that the clinical syndrome of diffuse unilateral subacute neuroretinitis (DUSN) is caused by a nematode. It was initially suggested that this syndrome was caused by *Toxocara canis*.² However, evidence has been presented which supports that there are nematodes of two different sizes or nematodes at two different stages of development. Gass and Braunstein³ on examining 18 patients noted that in 12 the nematode measured 400 to 1000 μm in length; in the other six patients they measured 1500 to 2000 μm . The majority of patients with the smaller nematodes were residing in the south-eastern United States, whereas most of those with the larger nematodes resided in the northern mid-western United States.

Our patient was born in Liberia and moved to the south-eastern United States in 1979. It is noteworthy that her diagnosis of DUSN is suggested prior to her moving from Liberia when, in 1979, at about the age of 14, she was given the diagnosis by an ophthalmologist of a 'circulation problem' of unknown aetiology. There are no other known reports from Africa characterising the size and possible types of nematodes that may cause this syndrome. The worm's size in our patient, approximately 800 μm in length, is within the size category (400–1000 μm) of the nematode found mainly in the south-eastern United States. Like several of the reported patients of Gass *et al*² who had reductions in the A or B wave of the electroretinogram, or both, our patient's scotopic electroretinogram had reduced A and B waves and an extinguished photopic ERG.

Kazacos *et al*⁵ have made further experimental observations in animals giving support to the possible cause of diffuse unilateral subacute neuroretinitis. Infection by *Baylisascaris procyonis*, the raccoon roundworm, parallels the human infection by *Toxocara canis* in that it is acquired by ingestion of soil containing raccoon ova. The larvae of this parasite are larger than

Figure 4 At 1600 the worm (small arrow) has moved back superotemporal to the fovea (large arrow) beneath the superotemporal artery.

those of *Toxocara canis*, which average about 400 µm.^{7,8} Although infection by nematodes of at least two different sizes has been suggested by Gass *et al*,² Kazacos *et al*⁵ suggest that DUSN is probably caused by a variety of nematode species including *Toxocara* species,^{2,3,6} *Baylisascaris procyonis*, and other larvae not yet identified. With the report of exposure to a pet raccoon prior to the onset of visual symptoms in the patient reported by Raymond *et al*⁹ and with the more recent reports^{10,11} of its zoonotic potential, *B. procyonis* has been suggested as one of the possible causes of the ocular larva migrans syndrome and DUSN.^{4,12} Kazacos *et al*⁵ have suggested that indeed the two sizes of worms reported by Gass and Braunstein³ are not inconsistent with the growth range of baylisascaris in infected animals and humans,^{10,11,15,16} which may cause many cases of DUSN.

John *et al*¹³ have studied the choroidal and retinal response to ascarid-infected eyes in guinea pigs. A closer antigenic relationship exists between baylisascaris and ascaris than between either parasite and toxocara.¹³ With intravitreal injection of *Ascarid suum* into guinea pig eyes the resulting response was a diffuse eosinophilic choroiditis, neuroretinal degeneration, and retinal pigment epithelial changes.¹³ Intraocular IgE antibody production and mass cell degeneration may lead to the release of a number of eosinophil chemotaxins (eosinophil chemotactic factor of anaphylaxis, histamine). After antigen-

antibody complement activation, the focal release of other diffusible eosinophilotactic factors may lead to alterations in the choriocapillaris which contribute to a more generalised and progressive retinal degeneration distant from sites of DUSN. This is probably caused by a number of intraocular nematodes producing a clinical syndrome of decreased visual acuity, anterior uveitis, vitritis, optic disc oedema, and later optic disc atrophy. Diffuse retinal pigment epithelial changes and probable outer and inner retinal damage are suggested by changes in the electro-oculogram and the A and B waves of the electroretinogram.

The worm may cause destructive changes and, as in our patient, lie dormant for years, only to cause further decrease in visual acuity later. Like toxocara, an enzyme-linked immunosorbent assay may soon be available for the diagnosis of *Baylisascaris procyonis* larva migrans or DUSN.¹⁴ Regardless of the type of nematode causing the syndrome, this diagnosis must be considered by the ophthalmologist when patients present with unilateral visual loss of unknown aetiology, particularly when they are young, healthy adults in whom the diagnosis of a 'unilateral retinitis pigmentosa' is considered.

This work was supported in part by a grant from Research to Prevent Blindness, Inc.

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