SCIENTIFIC REPORT

“Worm in the eye”: the rationale for treatment of DUSN in south India

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Aim: To discuss the rationale for different techniques of treatment for DUSN (diffuse unilateral subacute neuroretinitis) and their effectiveness in two patients from south India.

Methods: Two rare cases of live worms in DUSN from India are reported, where filarial *Brugia malayi* is endemic. Both cases presented with progressive unilateral loss of vision with no history of animal contact. They were 40 year old, apparently healthy men. In case 1, the worm (1500–2000 µm) was easy to identify with wriggling movements among crisscrossing diffuse subretinal tracks. The worm was destroyed by a single shot of laser to its advancing end, which was followed by oral steroid to control the inflammation caused by the dead worm. In case 2, the worm was small and difficult to identify. Initially diffuse neuroretinitis was diagnosed and treated with intravenous methylprednisolone and oral corticosteroid. A week later, a small live worm (400–600 µm) was found and subsequently destroyed by laser photocoagulation followed by a combination of anthelmintics.

Results: The patients' vision had improved to 6/60–6/36 from counting fingers after a few weeks.

Conclusion: The role of a combination of laser treatment, systemic steroid, and anthelmintics is discussed.

There have been many reports of diffuse unilateral subacute neuroretinitis (DUSN), but rarely with a documented subretinal worm from India.¹ We report two cases of DUSN with different sizes of live worms (400–600 µm and 1500–2000 µm) from Kerala, south India, which were killed by combined laser photocoagulation and systemic therapy with subsequent visual improvement.

METHODS

Case 1

A 40 year old man presented with right visual loss of 4 days' duration. There was no history of contact with live animals or cutaneous larva migrans. Right eye visual acuity (VA) was 2/60 with relative afferent pupillary defect (RAPD) and the left eye was 6/6, with otherwise unremarkable anterior segment findings. The right fundus revealed mild vitritis with a glistening white worm (1500–2000 µm) found in the temporal periphery among the diffuse subretinal tracts (fig 1A). Full blood count, peripheral blood smear for microfilaria, and stool examination were normal.

When the patient was scheduled for 532 nm argon laser treatment the same day, the worm had already migrated to the macula. Immediately, after a single shot of laser (spot size 200 µm, duration 150 ms, and power 160 mW) applied to the advancing end of the worm,² it began to migrate to the subfovea and further laser treatment was abandoned (fig 1B). A combination of anthelmintics,^{3–5} albendazole 400 mg

immediately, and diethylcarbamazepine (100 mg three times daily for 21 days) was started. On the next day, the worm was immobile with surrounding neuroretinitis (fig 1C). The patient was put on oral corticosteroid 40 mg tapering over 21 days.

Case 2

A 45 year old, otherwise healthy man presented with progressive unilateral loss of vision in the left eye for 1 month. His VA was counting fingers with RAPD. His fundus showed mild disc hyperaemia and macular exudates. His eosinophilic count, peripheral blood smear and stool examination for ova were normal. Diffuse neuroretinitis was diagnosed (fig 2A), he was started on intravenous methylprednisolone 1 g for 3 days and oral corticosteroid 40 mg in tapering doses. After a week, a small live worm, size 1/3 disc diameter (400–600 µm) was found in the superonasal region (fig 2B) with new foci of retinal oedema and optic disc pallor. Subsequently the worm was destroyed by laser photocoagulation (fig 2C) and followed by a combination of anthelmintics.

RESULTS

In case 1, the right VA improved to 6/60 after 3 weeks. There were diffuse pigmentary changes in the superior temporal fundus where the worm was first identified, but there was no trace of the worm or inflammation (fig 1D).

In case 2, the VA improved to 6/36 with good laser uptake and resolution of inflammation, 1 week after the laser and anthelmintics (fig 2D).

Demographic habitat

Filariasis is common in India, where 300 million people are living in an endemic zone. It is estimated that there are at least six million acute cases every year and over 15 million people have chronic filarial diseases. These slender thread-like nematodes are transmitted by blood sucking mosquitoes (*Culex fatigans*). They exist as adult worms (elephantiasis) and embryos (microfilaria) in infected human hosts. The endemic areas of lymphatic filariasis—*Wuchereria bancrofti* (Malabar leg) and *Brugia malayi*—are mainly along the sea coast and the banks of large rivers. Kerala state has a network of backwater serving as a breeding ground for mosquitoes. The geographic distribution of *B. malayi* is much more restricted than that of *W. bancrofti*. They may present together in the same endemic area, as in Kerala. In such places, *B. malayi* tends to be predominantly in rural and *W. bancrofti* appears in urban areas. Our patients were from the same coastal region of Kerala where filarial *B. malayi* is endemic, and where most people choose not to wear shoes.

Abbreviations: DUSN, diffuse unilateral subacute neuroretinitis; RAPD, relative afferent pupillary defect; VA, visual acuity

Figure 1 (A) Fundus picture of the right eye showing motile worm (arrow) among crisscrossing subretinal tracts in the temporal mid-periphery at presentation. (B) The same eye showing the migrated worm (1 500–2 000 μm) in the macular region with the arrow indicating the area where the laser was given. (C) The same eye showing the non-motile dead worm (arrow) with surrounding serous detachment and new crops of multiple evanescent white inflammatory lesions. (D) The same eye showing the resolved inflammatory lesions, 3 weeks post laser.

DISCUSSION

DUSN is a clinical syndrome, caused by a motile, white, glistening non-segmented nematode wandering in the subretinal space. It is characterised by vitritis, papillitis, and recurrent crops of white evanescent lesions, followed by

severe visual loss, optic atrophy, narrowing of the major retinal vessels, and diffuse retinal pigment epithelium degeneration.⁶ The syndrome is primarily unilateral, rarely affecting the other eye, though the reason for this is not clear. The worm has been recorded in at least two different sizes,

Figure 2 (A) Fundus picture of the left eye showing diffuse neuroretinitis and macular exudates. (B) The same eye showing the small worm (400–600 μm) at the superonasal region with new intense foci of retinitis, a week after immunosuppression. (C) The same eye showing the small worm (arrow), immediately after the laser. (D) The same eye showing the confluent laser burns and resolving inflammation, 1 week post laser and anthelmintics.

400–1000 µm or 1500–2000 µm. Presumably there are two different species or two sizes of a single species reflecting different ages of the larvae.^{7,8} Many organisms have been implicated including *Ancylostoma caninum*, *Toxocara*, *Baylisascaris procyonis*, and filarial worms,⁹ but the precise identity of worm and portal of entry are still a mystery.

The pathogenesis of DUSN seems to involve a local toxic effect on the retina caused by the worm byproducts. Rapid loss of vision and progressive optic atrophy secondary to death of ganglion cells may be a remote reaction to an immune toxin.⁶

Early signs of DUSN are often mistaken for multifocal choroiditis, acute posterior multifocal placoid pigment epitheliopathy, multiple evanescent white dot syndrome, and non-specific optic neuritis. Even though DUSN is suspected, documentation of the live worm is uncommon.

The visibility of a motile worm is the gold standard in making the diagnosis of DUSN. However, identifying the small worm may be difficult, time consuming, and involve many visits. A series of fundus photography is useful for its localisation.

The death of the worm in case 1 could not be attributed to oral anthelmintics, because the worm was found to be dead the day after the laser treatment. The worm was large, it was easy to identify its moving advanced end, and we managed to kill it with a single laser shot. The use of oral corticosteroid also helped to control the inflammation caused by the dead worm and improved the final vision.

In most cases, it may not be easy to distinguish the head from the tail, especially for small worms as in case 2. One approach is to lure the worm away from the macula with the aiming beam followed by gradual burns over worm with the laser. A useful sign during the treatment is slower uptake of the laser heat energy, seen as a fleeting translucency within the opaque laser spot.¹⁰ Pretreatment immunosuppression with corticosteroid has reduced retinal inflammation, uncovered the small worm, and made it easy to identify.

The aim of laser therapy is to achieve death of the worm without inflicting collateral damage to the macula. Previous studies have demonstrated the photosensitivity of different species of ocular infecting parasites¹¹ and this may be utilised in luring the target organism away from the macula. The leading end of the nematode in forward movement will be the head, and this can be identified by using a low level of illumination to shepherd the nematode away from the macula, with a posterior vertical slit beam, before laser application to the head. This strategy minimises the risk of nematode migration to the macula, reduces the energy needed to achieve immobilisation, and is a more effective approach for safe treatment in DUSN.

Endobacterial release from the filarial gut may excite an enhanced inflammatory reaction. However antimicrobial dosing may not be appropriate in view of the prolonged course and extended life cycle of the parasite infection. Oral anthelmintics and antimicrobials¹¹ are likely to be ineffective, because of the relative impermeability of the blood-retinal barriers (BRB), though it is recommended for those patients who have severe vitritis when the worm can not be

easily identified. Some authors have even suggested the use of scatter laser photocoagulation in the vicinity of multifocal active lesions, when the worm is not visible.⁷ The BRB function may be altered by severe vitritis and laser photocoagulation might modulate drug entry to the neuroretina. Serological studies for detecting the worm, analysis of stool for ova, and haematological evaluation for eosinophilia are of limited value in establishing the diagnosis of DUSN.⁸

These patients may not manifest evidence of systemic disease and stool shedding. Eosinophilia is infrequently detected.⁸ By the time the worm reaches the subretinal space, systemic markers may not be informative as there is likely to be a time lapse between systemic infestation and intraocular involvement. Intraocular protection from the worm is interesting and little is known about susceptibility factors to retinal infestation after systemic infection. The Th1/Th2 immune response may be impaired during infestation¹² and return to normal levels between the recurrent bouts of infection. This may explain why markers of systemic disease and stool shedding are absent, despite persistent survival in the relatively immune privileged subretinal space.

In summary, DUSN is associated with severe visual loss. Early identification and prompt destruction of the infecting worm by laser can preserve good visual acuity. When the live worm can be identified, laser photocoagulation is the treatment of choice.^{6,7,9}

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