Role of PASCAL and optical coherence tomography angiograpgy in the treatment of diffuse unilateral subacute neuroretinitis caused by large live motile worm

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A 46-year-old male presented with best corrected visual acuity (BCVA) of 20/125 in his right eye. Fundus showed disc edema, multiple yellow outer retinal crops, macular edema and a live motile worm in the subretinal space. Diagnosis of diffuse unilateral subacute neuroretinitis (DUSN) was made and pattern scanning laser photocoagulation (PSLP) was performed along with administration of oral albendazole, diethylcarbamazine and corticosteroids. Complete disappearance of the worm was observed at 2 weeks. At last follow up, final BCVA improved to 20/30. Herein, we report role of PSLP in the management of DUSN.

Key words: Diffuse unilateral subacute neuroretinitis, live worm, OCTA, pattern scanning laser photocoagulation, PASCAL

Gass described diffuse unilateral subacute neuroretinitis (DUSN) as a progressive ocular infectious disease caused by various species of nematodes, leading to inflammation and degeneration of the outer retina and the retinal pigment epithelium (RPE).[1] It is usually unilateral mainly affecting children and young adults with no gender predilection[2] and commonly seen in those who walk bare foot in the fields.

The causative agent can be divided into a small and large worm. Several species of nematodes, including Toxocara canis,[3] Baylisascaris procyonis[4] and Ancylostoma caninum have been suggested as the potential causative agent. The treatment mainly consists of destruction of the visible worm or the yellow crops of lesion using laser photocoagulation in combination with oral anthelmintic therapy.[5,6] Herein, we report a case of DUSN caused by live motile worm and the use of pattern scanning laser photocoagulation (PSLP) in the treatment.

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Case Report

A 46-year-old Indian male, farmer by occupation, presented with sudden painless diminution of vision in the right eye for 6 days. The best corrected visual acuity (BCVA) in the right eye was 20/125 and left eye was 20/20. Bilateral anterior segment examination was unremarkable. Fundus examination in the right eye showed mild vitritis, disc edema with peripapillary superficial hemorrhages, multiple yellow white crops at the level of outer retina at the posterior pole and the periphery, macular edema with ILM folds and a live motile worm superotemporal to the fovea with rapid wriggling movements [Fig. 1]. The left eye fundus was unremarkable. There were no lesions noted on the hands or feet of the patient.

A diagnosis of right eye diffuse unilateral subacute neuroretinitis (DUSN) was made. Fundus photograph (FP), and a video capture of the worm movement [Video 1] along with optical coherence tomography (OCT; *Triton*, Topcon, Tokyo, Japan) and OCT angiography (OCTA; *Triton*, Topcon, Tokyo, Japan) was performed. The video was captured with a mobile phone camera focused on the live screen of the fundus camera. The OCT through the macula showed vitreous cells, loss of foveal contour, presence of neurosensory detachment with subretinal hyperreflective dots and RPE undulation. Motility of the wriggling worm was captured on OCTA as hyperreflectivity in the outer retinal slab [Fig. 1].

PSLP was performed to the live worm using PASCAL (Optimedica Corp., Santa Clara, CA, USA) in three steps. Step1: treating the ends of the worm; Step 2: barrage the perimeter of the worm; Step 3: photocoagulation within the barrage area. A 4 × 4 grid with spot size 100 μ; pattern spacing 0.25 burn apart; power 150 mW; duration 20 ms, Volk QuadrAspheric lens was used for the photocoagulation. The worm became immobile as soon as the PSLP was applied to one of its end and the subsequent steps of PSLP were completed. FP, OCT, and OCTA were repeated after the PSLP. The OCTA following PSLP could not pick up the motility of the worm [Fig. 2]. Oral anthelmintics comprising tablet albendazole 400 mg once daily, diethylcarbamazine 100 mg thrice daily along with oral corticosteroids 1 mg/kg were started.

At 1 week follow-up, BCVA improved to 20/60 and fundus showed an immobile worm with laser marks, resolving disc and macular edema and reduction of outer retinal crops. The patient was asked to continue the medical treatment. In the next follow-up 1 week later, BCVA was 20/50, the worm had disappeared, and the inflammation had reduced. At this point, the patient was asked to discontinue the medical treatment. At the final follow-up 6 weeks later, the BCVA

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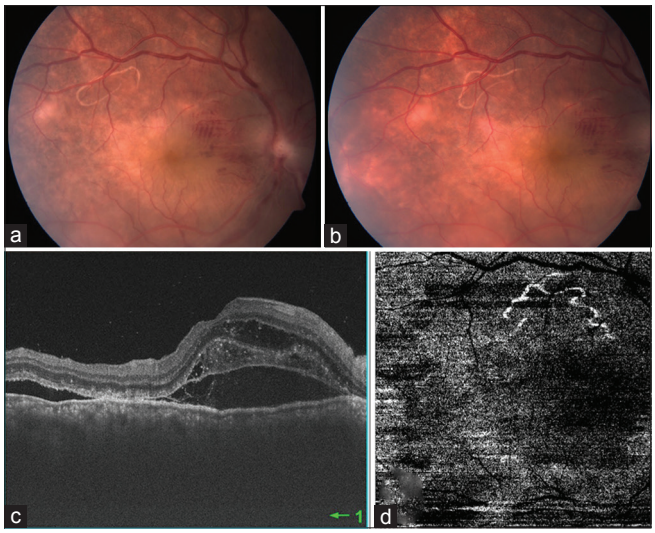

Figure 1: At presentation - (a and b) Fundus photograph of right eye shows mild vitritis, disc edema with peripapillary superficial hemorrhages, multiple yellow white crops at the level of outer retina, macular edema with ILM folds and a live motile worm superotemporal to the fovea. (c) OCT through the macula shows vitreous cells, loss of foveal contour, presence of neurosensory detachment with subretinal hyperreflective dots and RPE undulation. (d) Motility of the live wriggling worm captured by OCTA as hyperreflectivity in the outer retinal slab

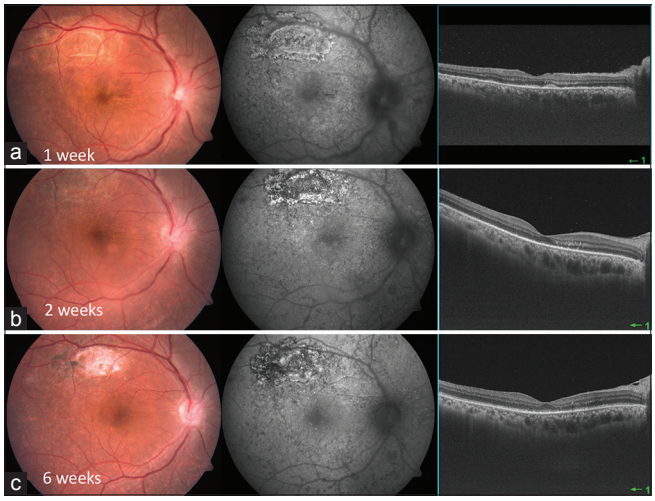

Figure 3: Comparison of FP, autofluorescence and OCT outcomes at (a) 1 week, (b) 2 weeks and (c) 6 weeks. Note the disappearance of the worm at 2 weeks

had improved to 20/30 and the inflammation had completely resolved [Fig. 3].

Discussion

Laser photocoagulation is the treatment of choice in cases of DUSN where the worm is seen clinically or to the outer retinal crops as the worm might be in the vicinity of these lesions.[7] The worm is identifiable in only 30% of the cases. This case may be an early stage of the disease since no optic atrophy or vascular attenuation was present. We used a PSLP for the treatment of the worm instead of a conventional laser as multiple spots of laser in a grid pattern can be administered within a faster time frame. The speed of performing the laser is important as to

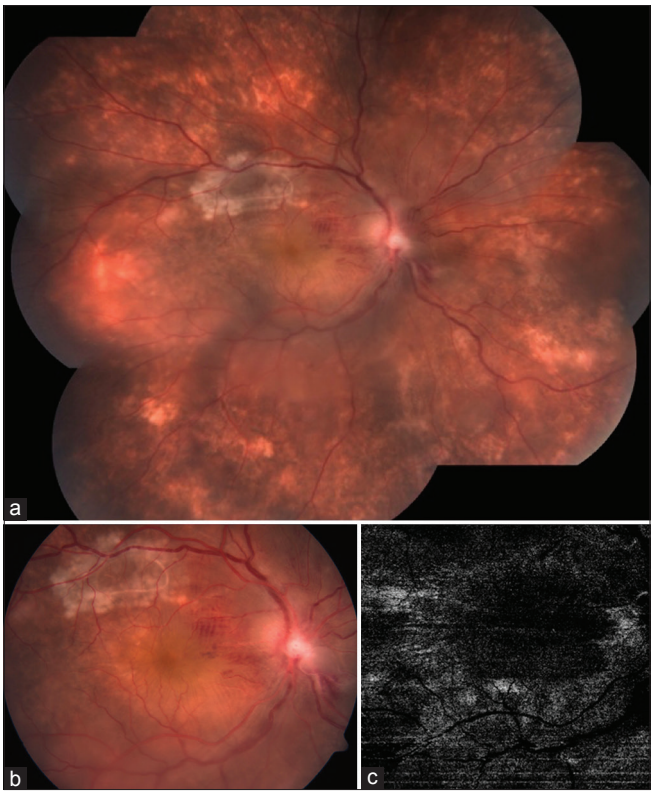

Figure 2: Immediately post PSLP - (a) Montage colour fundus photograph showed presence of active outer retinal crops in the periphery along with laser marks at posterior pole; (b) Closer look at posterior pole showed fresh laser marks with worm coiled in a circle; and (c) OCTA showed disappearance of the worm once it got immobilised post PASCAL

avoid the migration of the worm to the fovea. In case of a large worm, the first step could be targeting the ends of the worm since laser to the head end would immobilize the worm and prevent its migration.

The worm disappeared two weeks post PSLP and medical treatment. A similar observation was made by Kang *et al*.[8] The live worm was captured on OCTA in the outer retinal slab as it was mobile. However, once the worm was immobilized post PSLP, the OCTA did not pick up the worm. Kalevar *et al*.[9] had described a mobile worm on the OCTA and proposed that an inactive worm could not be detected as the nematode has no vascular system. We confirm this finding as the live motile worm seen prior on OCTA could not be picked up once it became immobile.

As reported earlier,[7,9] laser photocoagulation required to disrupt the blood retinal barrier allowing better intraocular anthelmintic drug penetration was performed in our patient.

PSLP can be the treatment of choice in cases of DUSN caused by a live motile worm and OCTA could be of help to assess the motility of the worm following photocoagulation.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients

understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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