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CASE REPORT

Diffuse Unilateral Subacute Neuroretinitis in Young Adolescents: A Case Series

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ABSTRAK

Kami membentangkan empat pesakit dengan neuroretinitis subakut unilateralis difus pada remaja muda dengan hasil penglihatan yang baik yang didiagnosis dari Mei 2020 hingga April 2021. Semua pesakit hadir pada peringkat awal penyakit dan aduan utama adalah pengurangan penglihatan sebelah mata dalam tempoh kurang daripada 2 minggu. Pemeriksaan dan penyiasatan sistemik tidak menunjukkan apa-apa kecacatan kecuali eosinofilia dalam kes 1. Ketajaman penglihatan semasa pembentangan adalah antara 6/6 hingga 2/60. Keradangan ruang anterior diperhatikan pada kes 1 dan 2. Pemeriksaan fundus pada semua pesakit menunjukkan cakera optik yang bengkak, saluran darah yang dialihkan dan berbelit, vaskulitis, edema makula, kehadiran lesi retina kuning-putih dalam kelompok dan pelbagai peringkat vitritis kecuali dalam kes 4 yang tidak mempunyai edema makula. Cacing ditemui 2 minggu kemudian dalam pesakit kes 1 dan sebulan kemudian dalam pesakit kes 4. Kombinasi albendazole oral 400 mg sekali sehari dan prednisolone oral (0.5 mg/kg sehari dengan pengurangan dos secara mingguan) diberikan kepada semua pesakit selama 4-6 minggu kecuali pesakit kes 4 yang tidak diberikan prednisolone oral. Semua pesakit memberikan tindak balas yang baik terhadap rawatan oral. Kedua-dua kes 1 dan 4 dengan cacing bergerak yang kelihatan dirawat dengan fotokoagulasi laser. Selepas rawatan, tiada lesi retina baru kelihatan dan semua pesakit mencapai ketajaman penglihatan akhir terbaik yang diperbetulkan sebanyak 6/9 atau lebih baik.

Kata kunci: *DUSN; neuroretinitis; neuroretinitis subakut*

ABSTRACT

We demonstrated four patients with diffuse unilateral subacute neuroretinitis in young adolescents with good visual outcome which diagnosed from May 2020 until April 2021. All patients presented at early stage of the disease and the main complaint was reduced unilateral vision within 2 weeks duration. Systemic examinations and investigations were unremarkable except eosinophilia in case 1. Visual acuities during presentation ranged from 6/6 to 2/60. Anterior chamber inflammation noted in case 1 and 2. Fundus examinations in all patients revealed swollen optic disc, dilated and tortuous vessels, vasculitis, macular edema, presence of cluster deep yellow-white retinal lesions and varying degrees of vitritis except in case 4 , absence of macular edema. The worms were identified 2 weeks later in case 1 and one month later in case 4. A combination of oral albendazole 400 mg once daily and oral prednisolone (0.5

mg/kg daily with a weekly taper) were prescribed to all patients for 4-6 weeks except in case 4 was not prescribed with oral prednisolone. All patients responded well to oral medications. Both case 1 and 4 with visible motile worm treated with laser photocoagulation. Following treatments, no new retinal lesion seen and all patients achieved best corrected final best corrected visual acuity of 6/9 or better.
Keywords: DUSN; neuroretinitis; subacute neuroretinitis

INTRODUCTION

Various nematodes species cause diffuse unilateral subacute neuroretinitis (DUSN), a progressive eye disease that causes degenerative and inflammatory changes in the outer retina, retinal pigmentary epithelium, retinal arteries, and optic nerve (Kang & Lee 2015). Although DUSN was first identified in regions such as the Caribbean, Brazil, Ghana and Germany, it is now recognised as endemic in the southeastern and upper Midwestern United States, with few reports from Southern India, China, South Africa, Spain, Korea (Ramachandran et al. 2020), and recently, two cases reported in Malaysia (Nurul-Farhana et al. 2024).

DUSN in its acute stage presents as unilateral vision loss with mild vitritis, papillitis and fleeting gray-white outer retinal lesions, which may be mistaken for other white dot syndromes or optic neuritis. In the chronic phase, it progresses to optic atrophy, diffuse retinal pigment changes, visual field narrowing and abnormal electroretinogram findings (Hegde et al. 2025). Visual loss is rarely reversible and usually less than 6/60 in approximately half of patients (Mazzeo et al. 2019). To the best of my knowledge there has no case series on DUSN been reported yet in East Malaysia.

CASE REPORT

Case 1

A 19-year-old male with no known medical illness came to us with chief complaint of sudden reduced generalised vision over right eye for 2 days. The patient did not have eye pain and eye redness. He also had no history of exposure to any live animals or cutaneous larva migrans.

Ocular examination revealed best corrected visual acuity (BCVA) of 6/60 and 6/6 in his right eye and left eye, respectively. On initial examination over right eye revealed normal anterior segment. Examination of right fundus showed vitritis and live motile subretinal worm very near to the fovea (<500 um) (Figure 1A). There were surrounding multifocal whitish-yellowish intraretinal lesions at superotemporal along the vessel, macular striations and also vasculitis. The left fundus was normal.

The blood investigations revealed normal white blood count of 9.5 x 10^9/L, haemoglobin of 14.7 g/L and platelet count 208 x 10^9/L. The erythrocyte sedimentation rates (ESR), Mantoux test, liver function test, serum urea and electrolytes as well as his chest X-ray were also normal. Optical coherence tomography (OCT) of macula over right eye showed subretinal and intraretinal fluid with macular edema (Figure 1B). Clinically he was diagnosed to have right

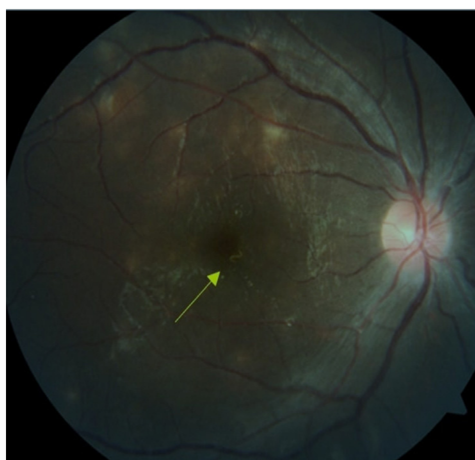

FIGURE 1A: Pre-treatment fundus (arrow showing worm)

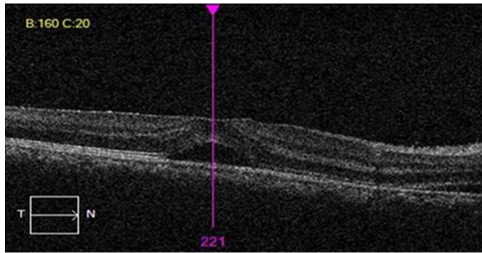

FIGURE 1B: Pre-treatment OCT macula of right eye. OCT: Optical coherence tomography

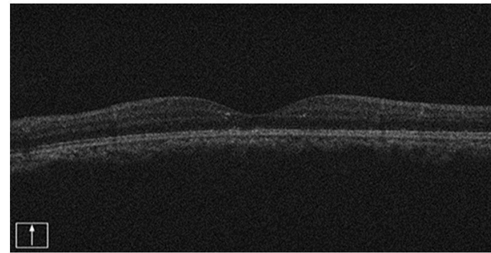

FIGURE 1D: Post-treatment OCT macula of right eye

eye posterior uveitis secondary to DUSN. Serial fundus photos were done revealed the nematodes moved to entire retinal layer. Direct photocoagulation was done above the edge of end of retinal lesion once the nematode moved away from the fovea. For prevention, he initially was started with oral albendazole 400 mg OD for 6 weeks and oral prednisolone 35 mg OD was added 1 week after that with tapering 5 mg dose weekly for 2 months. Two months after laser treatment, a juxtafoveal chorioretinal scar was seen at previous laser site and visual acuity improved to 6/6 (Figure 1C). OCT macula over right eye showed no more subretinal or intraretinal fluid (Figure 1D).

FIGURE 1C: Post-treatment fundus of right eye. OCT: Optical coherence tomography

Case 2

A 12-year-old girl with no known medical illness presented with left eye redness for 1 month associated with worsening blurring of vision for two weeks. Patient denied any eye pain.

Ocular examination revealed best corrected vision of left eye 2/60. On slit lamp examination of her left eye showed mild anterior chamber reaction with cells 4+ and streak of hypopyon. Meanwhile, fundus examination retina revealed moderate vitritis with multiple yellow ill-defined lesions almost in all four quadrants at temporal, inferotemporal, inferior and superior with macular exudates (Figure 2A and 2B).

The blood investigations revealed normal white blood count of 7.5 x 10^9/L, haemoglobin of 14.7 g/L and platelet count 220 x 10^9/L. The ESR, Mantoux test, liver function test, serum urea and electrolytes as well as his chest x-ray were also normal. OCT of left eye showed subretinal fluid which subsequently resolved with treatment. (Figure 2C)

Clinically she was diagnosed to have DUSN and thus she was started on oral albendazole 400 mg OD for 6 weeks and oral prednisolone 30 mg OD (0.5 mg/kg) with tapering dose for 2 months. After completed oral albendazole, he showed improvement with BCVA over left eye 6/6. Fundus examination showed no more macular exudates and active lesion on the retina. Whereas multiple chorioretinal scar and fibrosis seen at inferotemporal of retina (Figure 2D). OCT macula of left eye showed no more intraretinal fluid (Figure 2E).

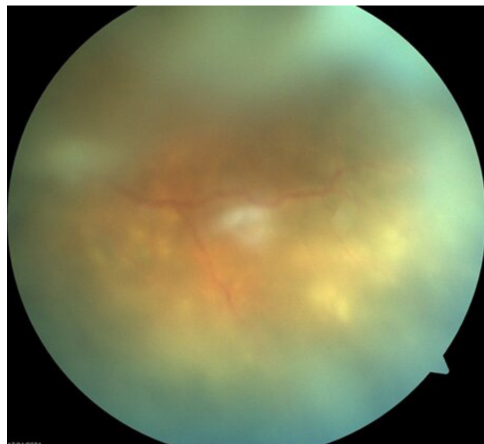

FIGURE 2A: Pre-treatment fundus of left eye

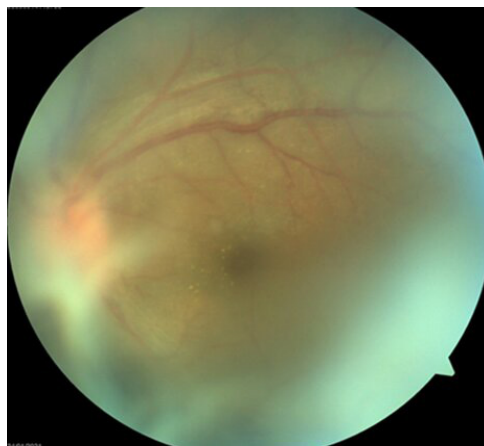

FIGURE 2B: Pre-treatment fundus of left eye

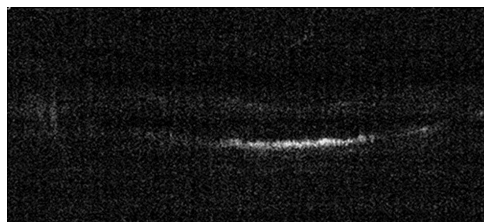

FIGURE 2C: Pre-treatment OCT macula of left eye. OCT: Optical coherence tomography

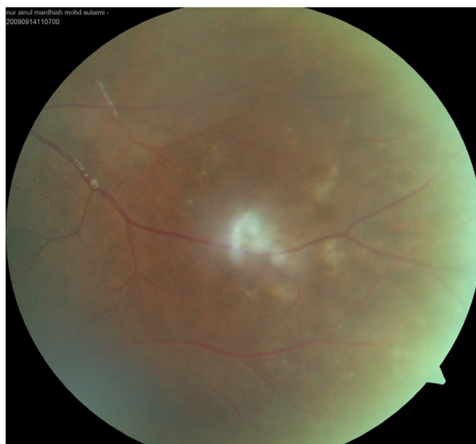

FIGURE 2D: Post-treatment fundus of left eye

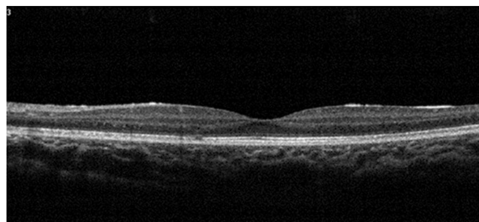

FIGURE 2E: Post-treatment OCT macula of left eye. OCT: Optical coherence tomography

Case 3

A 9-year-old boy with no known medical illness came with left eye pain and redness for 4 days associated with blurring of vision. Ocular examination showed best corrected vision of left eye 6/18 with mild anterior chamber reaction. Fundus examination revealed vitritis grade 2 with multiple yellow ill-defined lesions at temporal, inferotemporal, inferior and superior (Figure 3A and 3B).

The blood investigations revealed normal white blood count of 13.8 x 10^9/L, haemoglobin of 10.7 g/L and platelet count 310 x 10^9/L. The ESR, Mantoux test, liver function test, serum urea and electrolytes as well as his chest X-ray were also normal. OCT of left eye showed minimal intraretinal fluid, hard exudates, and edema at maculopapular bundle (Figure 3C).

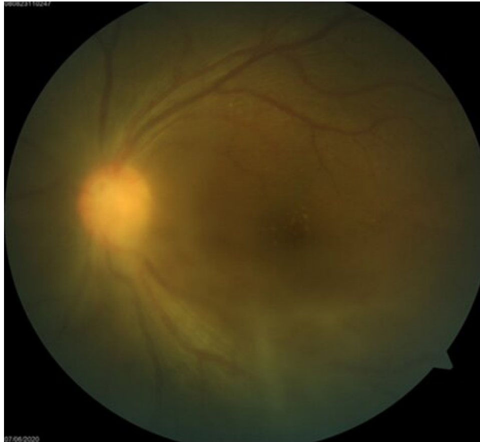
FIGURE 3A: Pre-treatment fundus of left eye

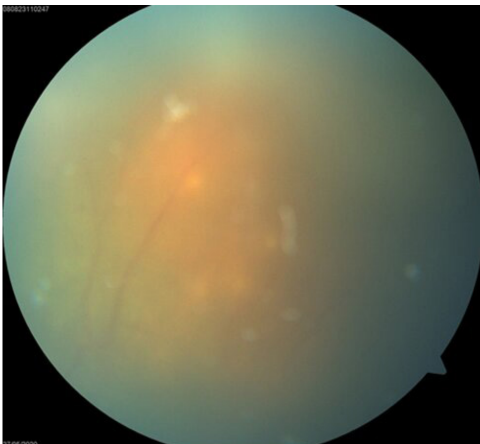
FIGURE 3B: Pre-treatment fundus of left eye

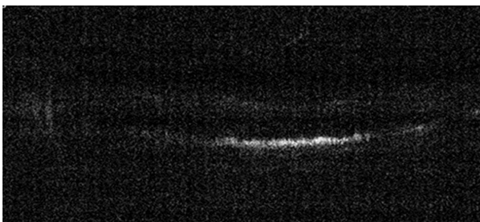
FIGURE 3C: Pre-treatment OCT macula of left eye. OCT: Optical coherence tomography

DUSN was suspected then he was started with oral albendazole 400 mg OD for 6 weeks and oral steroid with tapering dose. After completed oral albendazole 400 mg OD for 6 weeks and oral prednisolone 0.5 mg/kg with tapering dose for 2 months, he showed improvement with BCVA over left eye 6/6. Fundus examination showed resolved retinal lesion (Figure 3D). OCT macula of left eye showed no intra or subretinal fluid (Figure 3E).

Case 4

A 18-years-old man with no known medical illness came with sudden onset of left eye floaters with 3 weeks duration. He had history of consuming rare steak almost every day for 2 months. Ocular examination showed best corrected vision of left eye 6/6 with no significant anterior chamber reaction. Fundus examination

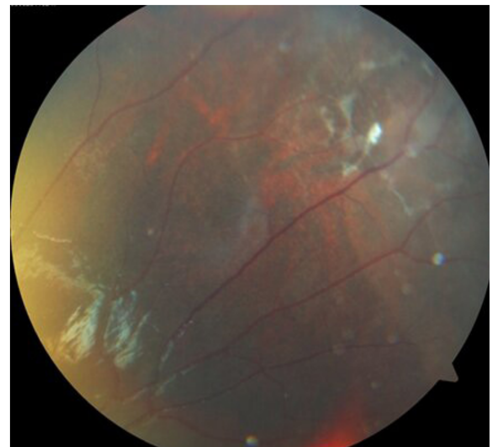
FIGURE 3D: Post-treatment fundus of left eye

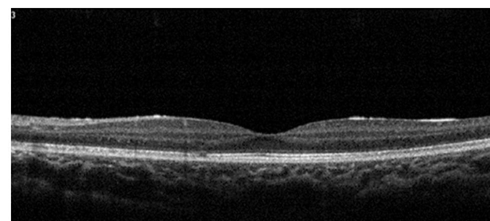
FIGURE 3E: Post-treatment OCT macula of left eye. OCT: Optical coherence tomography

revealed vitritis grade 1 with multiple yellow ill-defined lesions at nasal and temporal. Optic disc showed swollen and hyperaemic (Figure 4A and 4B).

The blood investigations revealed normal white blood count of 10.9 x 10^9/L, haemoglobin of 16.4 g/L and platelet count 280 x 10^9/L. The ESR, Mantoux test, liver function test, serum urea and electrolytes as well as his chest X-ray were also normal. OCT of left eye showed no intraretinal fluid.

DUSN was suspected then he was started with oral albendazole 400 mg OD for 1 month.

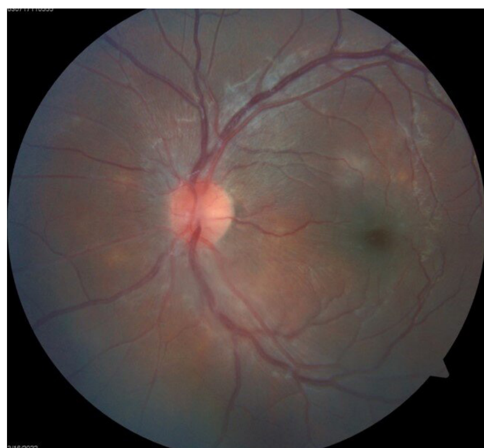

FIGURE 4A: Pre-treatment fundus of left eye

On the next appointment 1 week later, it was noted the retinal lesion was migrating to the temporal part of macula. OCT macular over the lesion revealed retinal lesion at retinal pigment epithelium (RPE) layer. Fundus fluorescein angiography (FFA) was done. There was hot disc, noted leakage from arterioles at superotemporal and temporal quadrant and there was leakage at retinal lesion temporal to fovea.

After 1 week on oral albendazole, there was suspicious lesion at superotemporal arcade possible the nematode. Focal laser photocoagulation was done at the lesion. After completed oral albendazole, he showed improvement with BCVA over left eye 6/6. Fundus examination showed resolved retinal lesion and laser marks over the focal laser photocoagulation area (Figure 4C and 4D).

DISCUSSION

Males are more likely than females to develop DUSN, a progressive eye disease caused by nematodes (Barbazetto et al. 2009). It most frequently occurs in healthy children and young adults (Siti Khadijah et al. 2021). According to Cortez and colleagues (2005), 83.3% of patients with DUSN were under the age of 20, and the mean age of these patients was 16.7 years. In contrast, over 75% of the patients in our research

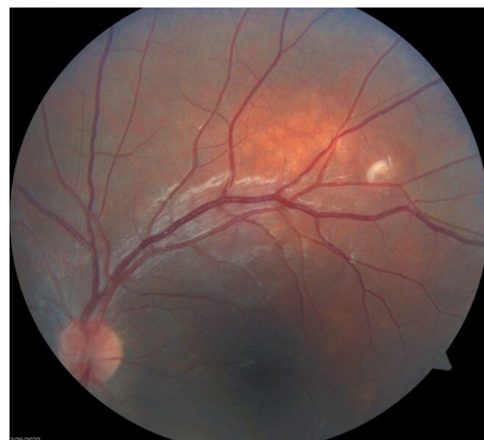

FIGURE 4B: Pre-treatment fundus of left eye

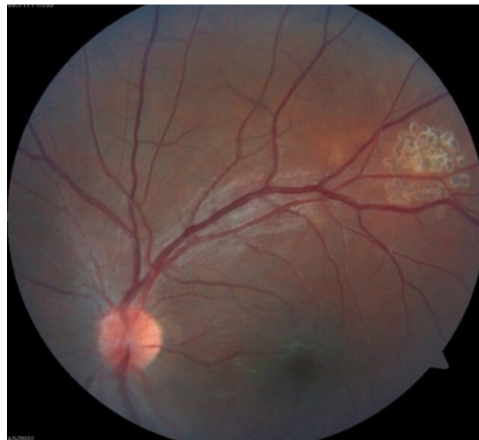

FIGURE 4C: Post-treatment fundus of left eye

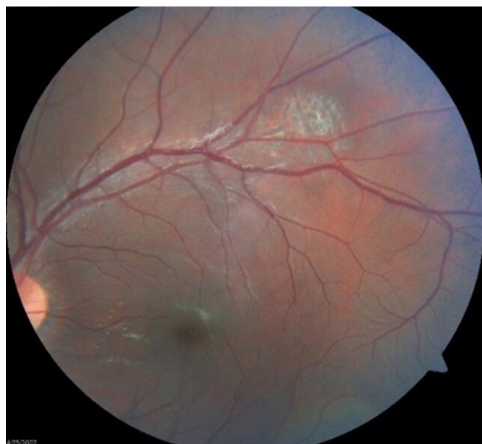

FIGURE 4D: Post-treatment fundus of left eye

were under 20. This suggests that children and young adults had a significant prevalence of DUSN and this correlates with our case series (Table 1).

Toxocara canis, Baylisascaris procyonis, Ancylostoma caninum, and other parasites and nematode species are thought to be the aetiologic agents causing DUSN. Additionally, *B. procyonis* and *A. caninum* are thought to be the most frequent causal agents. It is uncertain, yet, which particular microbe is responsible for this illness. The absence of stool examination and serology testing limits the ability to diagnose these nematodes (Sodhi et al. 2021).

Worms enter the eye when nematode eggs enter the eye hematogenously after being consumed. They can then spend months or even years wandering around in the subretinal space.

Currently, the pathophysiology remains unclear. It is thought that the host's immune system and the toxic compounds produced by the larvae can harm both the inner and outer retina, which will have an impact on the RPE, optic nerve, and retinal nerve fibre layer (RNFL) both physically and functionally.

Additionally, DUSN will result in progressive ganglion cell loss and vascular narrowing, both of which will cause optic atrophy (Relhan et al. 2015). DUSN is the term used to indicate inflammation and degeneration of the posterior retina associated with nematode subretinal

TABLE 1: Summary of diffuse unilateral subacute neuroretinitis cases

Case	Age/ Gender	Eye/ DUSN stage	Pre-treatment		Treatment	Post-treatment
			Visual Acuity	Fundus	Oral albendazole + Prednisolone	Visual Acuity
1	19/M	RE/early stage	6/60	RE optic disc swollen Vitritis Macular edema Multiple deep retinal lesions	√ + Laser	6/6
2	12/F	LE/early stage	6/36 ph 6/18	LE optic disc swollen Vitritis Macular edema Multiple deep retinal lesions	√	6/6
3	12/M	LE/early stage	2/60	LE optic disc swollen Vitritis Macular edema Multiple deep retinal lesions	√	6/6
4	18/M	LE/early stage	6/6	LE optic disc swollen Vitritis Multiple deep retinal lesions	Oral albendazole + Laser	6/6

'√': given oral albendazole and prednisolone
DUSN: Diffuse unilateral subacute neuroretinitis; LE: Left eye; Ph: Pinhole; RE: Right eye

migration (Gass & Braunstein 1983).

Clinical presentation of DUSN is divided into two stages; early and late. At the outer retina and choroid level, it is characterised in its early stages by repeated crops of evanescent, multifocal, yellow-white lesions, mild to moderate vitritis and mild optic disc edema.

According to Gass et al. (1978), patients would experience significant visual loss in the later stages, which are marked by optic nerve atrophy, retinal vascular narrowing, and focal or diffuse RPE degeneration. Retinitis is the most characteristic but can masquerade as 'white dot syndrome' (Moraes et al. 2002).

We compared our study with other countries (Table 2), as there was no similar study reported in our country. Our sample size is very small compared to other studies. In all of our studies, all patients presented with unilateral eye involvement. All four patients presented in early stage of the disease even though in other studies, almost half of patients presented in late stage of the disease (Souze et al. 2009).

According to several cases, the pathognomonic factor for DUSN is parasites in the subretinal region (de Souza & Nakashima 1995), and in 33.3% to 40.2% of cases, the worm is visible (Cortez et al. 2005). In our study, two out of four patients, the worm visible in the subretinal space, which accounted 50% of cases which is comparable to the case reported in Brazil in 2005 (Souza et al. 2005).

The diagnosis of DUSN cannot be made only by haematologic assessment for eosinophilia. However, in our case, one patient exhibited eosinophilia.

The first choice of treatment for this disease is laser photocoagulation and highly effective halting worm motility when the worm is visualised, which sometimes is not possible. Antihelminthic is another option for patient with DUSN. It has been reported that antihelminthic

TABLE 2: Reported case series of diffuse unilateral subacute neuroretinitis

	Brazil (Souza et al. 2005)	**India (Relhan et al. 2015)**	**Brazil (Garcia et al. 2004)**	**Current study* (2021)**
Sample size (duration of study)	12 (2 years)	13 (3 years)	4 (2 years)	4 (1 year)
Mean age (year)	15.4 years (83.3% <20 year)	22.2 years (76.9% <20 year)	14.2 years (75% <20 years)	14.5 years (100% <20 years)
Laterality	100% (unilateral)	100% (unilateral)	100% (unilateral)	100% (unilateral)
Stage at presentation	Early (58.3%) Late (41.7%)	Early (53.9%) Late (46.2%)	Early (100%)	Early (100%)
Visibility of worm	33.3%	0%	100%	50% (2/4)
Eosinophilia	-	-	-	25% (1/4)
Treatment	Oral albendazole x 30/7 (100%)	Oral albendazole x 30/7 + laser (100%)	Laser (100%)	Oral albendazole x 30/7 (100%) + oral prednisolone (75%) + laser (50%)
Initial BCVA	66.6% (6/60)	69.2% (6/60)	25% (6/60)	50% (6/60)
Final BCVA	91.6% (>6/60)	VA improved = 53.9% VA unchanged = 46.1%	VA improved = 75% VA unchanged = 25%	100% (6/6)

BCVA: Best corrected visual acuity; VA: Visual acuity

can be effective and ineffective for them in whom the worm is not identified and in whom photocoagulation cannot be performed (Nurul-Farhana et al. 2024).

Patients who experience a recurrence of the condition require antihelminthic medication for a longer period of time (Cortez et al. 2005). According to Nurul-Farhana et al. (2024), when the worm cannot be located and DUSN is linked to moderate degress of vitreous inflammation and breakdown of blood-retinal barrier, thiabendazole may be beneficial for the patient. Twelve Brazilian patients who received a high dose of oral albendazole (400 mg/day) for 30 days showed improvements in their visual acuity, visual field and active ocular inflammatory signs (Souza et al. 2005).

In our case, all four studies given antihelminthic oral albendazole for 30 days and two of the patients also given laser photocoagulation. High dose of oral albendazole have been reported to be safe and beneficial in the treatment of DUSN especially in patient whom the worm is not visible. Meanwhile, laser photocoagulation is the treatment of choice for destroying the causative worm.

Initial best corrected vision in three studies including our study demonstrated that more than 50% of patients were 6/60 or worse. And final BCVA showed that more than half of the patients improved from initial BCVA. And in our case, all patients had improved vision to 6/6.

One of the major limitations of the reported cases was the absence of confirmatory diagnostic testing for DUSN, as no serological, microbiological, or hematological investigations were performed, including tests to rule out other infectious causes such as melioidosis and syphilis. The diagnosis relied solely on clinical presentation, which presents a significant challenge, particularly in differentiating confirmed DUSN from presumed cases. In such situations, confirmatory features such as visualisation of a motile subretinal nematode, characteristic unilateral visual loss, retinal pigment epithelial changes, and focal areas of active inflammation may support our clinical diagnosis.

CONCLUSION

DUSN was most prevalence in young adolescent in this study. Early stage of DUSN commonly presented with unilateral multifocal lesions involving the outer retinal layers, papillitis, retinal vasculitis and vitritis. Systemic antihelminthic therapy was effective in patients with moderate to severe inflammation. However, laser photocoagulation remained the mainstay of treatment when the worm visible. Systemic corticosteroid had been shown to suppress inflammation and prevent deterioration of vision. High clinical index of suspicion and prompt treatment resulted in good visual outcome.

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Conflict of interest: The authors declare no conflicts of interest.

Ethics statement: This study followed the tenets of the Declaration of Helsinki and approved by the ethics committee of the Health Campus Universiti Sains Malaysia. Informed written consent was obtained from all participants.

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