

## Sequential optical coherence tomography images of early acute retinal necrosis

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**Key words:** Acute retinal necrosis, hyperreflectivity, spectral-domain optical coherence tomography (SDOCT)

A 33-year-old healthy man presented with defective vision in the left eye for 10 days. Visual acuity in the right (OD) and left eye (OS) was 6/6 and counting finger, respectively. Fundus examination OD was normal whereas OS showed a yellowish-white lesion at the macula and multiple discrete lesions in the periphery and mid-periphery. SDOCT (Heidelberg Engineering, Heidelberg, Germany) OS showed hyperreflectivity of inner retinal layers with extensive loss of retinal tissue suggestive of necrotizing retinitis [Fig. 1]. Considering the differentials of tuberculosis, toxoplasma, syphilis, and viral infection, which can cause necrotizing retinitis, a thorough workup was done. While awaiting the test results, the patient was started on oral antiviral with a strong suspicion of viral necrotizing retinitis. The laboratory results were negative for human immunodeficiency virus, syphilis, and toxoplasma. The result of the Mantoux test was negative. Within 3 days of presentation, the right eye was involved and showed a retinitis patch just inferior to fovea [Fig. 2]. Seeing the rapidity of progression, the patient was started on intravenous acyclovir followed by oral steroids 48 hours later. Polymerase chain reaction (PCR) analysis of aqueous humor was performed for *Mycobacterium tuberculosis*, *Toxoplasma gondii*, herpes simplex virus (HSV), cytomegalovirus (CMV), and varicella-zoster virus (VZV). PCR turned out to be positive for VZV, confirming the diagnosis of acute retinal necrosis (ARN). As an adjuvant to systemic therapy, each eye received one dose of intravitreal ganciclovir (2 mg/0.05 mL). SDOCT through the edge of lesion OD on the day of involvement showed hyperreflectivity and thickening of an inner plexiform layer

only. Subsequently, the hyperreflectivity progressed to all retinal layers with retinal edema and hyporeflective spaces in the inner retinal layers [Fig. 3]. Intravenous acyclovir was administered for 5 days. Thereafter, the patient developed neurological signs and on evaluation was diagnosed to have encephalitis. The patient was lost to follow-up and so the response to treatment could not be assessed. With this case, we report the early SDOCT findings of ARN [Figs. 3 and 4].

### Discussion

In this case of ARN, there was early involvement of the macula with few lesions in the periphery in one eye and only macular lesion in the other eye. Although early involvement of macula is uncommon in ARN, it has been reported previously.<sup>[1,2]</sup> Hyperreflectivity and thickening of the inner plexiform layer was the earliest change noted on SDOCT, followed by involvement of all retinal layers corresponding to the yellowish-white lesion. The hyperreflectivity on SDOCT corresponds to the histopathologic findings of edema of the inner retinal layers caused due to occlusive vasculopathy of the arteries. It is similar to the pathophysiology of central retinal artery occlusion wherein ischemia of the inner retinal layers results in edema, seen as hyperreflectivity on OCT.<sup>[3]</sup> As the retinitis progressed, SDOCT showed disorganization of all retinal layers and the appearance of hyporeflective spaces suggestive of retinal tissue loss due to necrosis. In addition to our findings, Suzuki *et al.*<sup>[3]</sup> reported the presence of subretinal fluid in one of their cases. In our case, we could not document the SDOCT findings in the resolution phase, previously reported as a marked reduction in the retinal thickness. Though the fundus appearance in the resolution phase normalizes, OCT still shows thinning of the retinal layers. Thus, OCT can help in determining the extent of involvement of retina even after resolution of retinitis lesion and normalization of the retina.<sup>[3]</sup> In our case, the inner plexiform layer was foremost affected followed by the involvement of all other retinal layers as the lesion progressed. Murata *et al.*<sup>[4]</sup> reported that the inner retinal necrosis precedes the outer retina necrosis in ARN in contrast to progressive outer retinal necrosis (PORN), which affects the outer retinal layers initially, seen as thickening of the outer retinal layers on OCT.<sup>[5,6]</sup> But the layer which is foremost affected has not been documented previously. Here we report that the inner plexiform layer is the earliest layer to be affected in ARN. This SDOCT finding may be beneficial in the early diagnosis of ARN. In addition, it will aid in differentiating it from PORN and central retinal artery occlusion.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have

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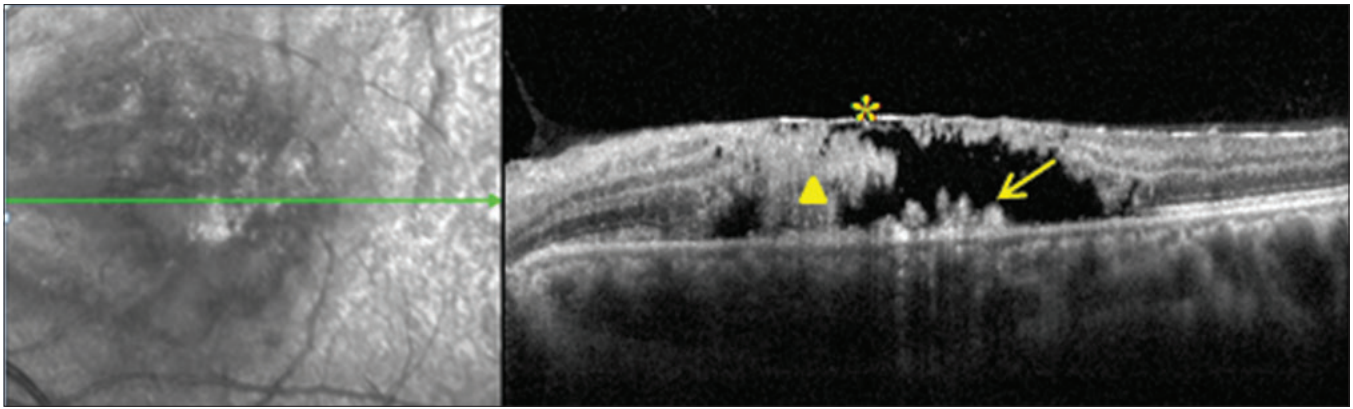
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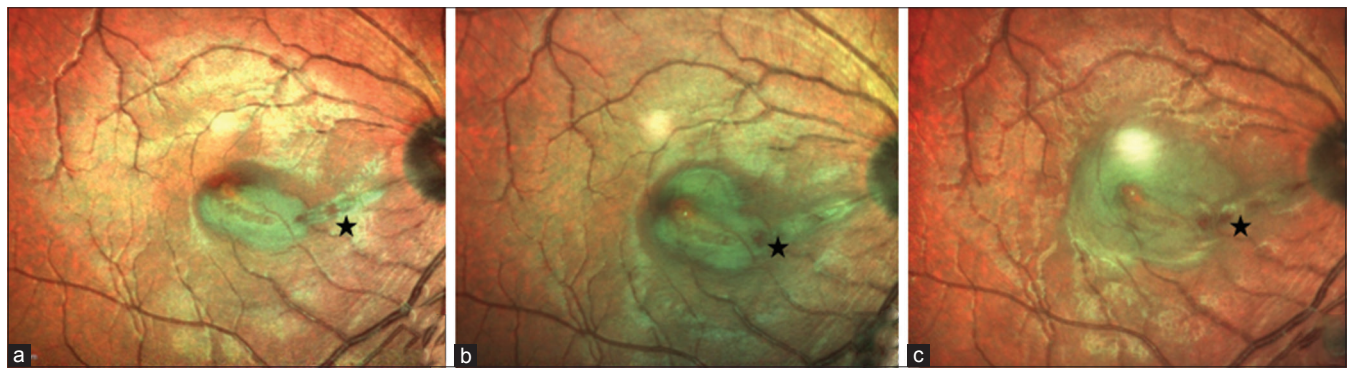
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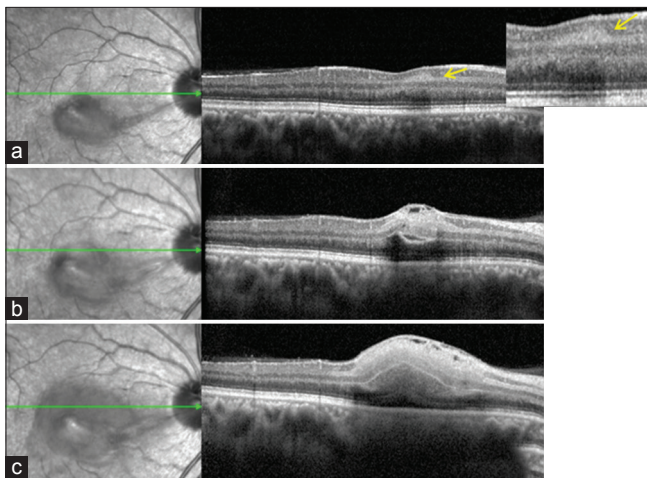
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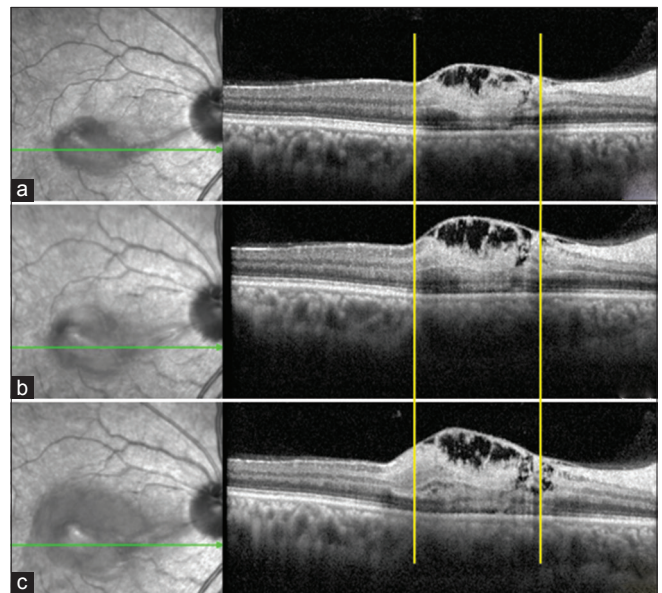
**Figure 1:** Optical coherence tomography image of the left eye showing irregular hyporeflective space indicative of retinal tissue loss, irregular hyperreflectivity (arrowhead) suggestive of retinal necrosis, membrane-like internal limiting membrane (asterisk), and fractions of the hyperreflective outer retina over the retinal pigment epithelium (arrow)



**Figure 2:** (a-c) Are multicolor images on day 1, day 2 and day 4, respectively. (a) shows a well-defined retinitis patch (green) just involving the fovea with intraretinal hemorrhage (star). No sparing of perivascular area. (b and c) show overnight increase in size of retinitis patch at day 2 and day 4



**Figure 3:** (a-c) optical coherence tomography images through the edge of retinitis lesion on day 1, day 2 and day 4, respectively. (a) shows hyperreflectivity and thickening of the inner plexiform layer (arrow) with minimal backshadowing. (b and c) through same section on day 2 and day 4 show increase in intensity and extent of hyperreflectivity involving all the retinal layers with increase in backshadowing, retinal edema and hyporeflective spaces in inner retinal layers



**Figure 4:** (a-c) optical coherence tomography images through the fovea on day 1, day 2 and day 4, respectively. (a) shows hyperreflectivity of retinal layers with retinal edema, loss of retinal architecture, and hyporeflective spaces in the inner layers indicative of retinal necrosis. (b and c) through the same section on day 2 and day 4, respectively show rapid progression of the lesion and necrosis

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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