



## Case report

## Usefulness of B-scan ocular ultrasound images for diagnosis of optic perineuritis

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## ABSTRACT

**Purpose:** This study was performed to examine the usefulness of B-scan ocular ultrasound images for the diagnosis of optic perineuritis.

**Observations:** A 72-year-old woman developed nonpainful blurred vision in her left eye. At the first ophthalmological consultation, she had optic disc swelling and choroidal folds in both eyes and subretinal fluid in the left eye. She was referred to our clinic 1 month after symptom onset. At the first visit to our clinic, she still complained of blurred vision. She was found to have mild vitreous cells in the left eye and optic disc swelling in both eyes. However, the choroidal folds had already resolved in both eyes. B-scan ultrasound images displayed the optic nerve sheath as a highly reflective circle with shadowing around the optic disc in both eyes and scleral thickening in the left eye with fluid in sub-Tenon's space. Bilateral optic perineuritis with posterior scleritis seemed highly plausible. Magnetic resonance imaging with intravenous contrast revealed increased signal intensity around the optic nerve (i.e., the "tram track sign") in both eyes, which was consistent with optic perineuritis.

**Conclusion and importance:** Optic perineuritis is a rare inflammatory disorder involving the optic nerve sheath. Although magnetic resonance imaging is reportedly useful for diagnosis of this disease, no previous reports have described B-scan ultrasound imaging for this purpose. We herein provide the first report of a patient suspected to have optic perineuritis based on B-scan images. B-scan ultrasound may be useful for diagnosis of optic perineuritis, especially with inflammation surrounding the optic nerve.

## 1. Introduction

Optic perineuritis (OPN) is a rare orbital inflammatory disease in which the specific target tissue is the optic nerve sheath. Patients typically experience acute or subacute visual loss, eye pain, and a paracentral scotoma or an arcuate defect. If the inflammation spreads to the extraocular muscles and sclera, patients develop pain with eye movement, diplopia, and conjunctival injection. Diagnosis of OPN is usually dependent on magnetic resonance imaging (MRI) features.<sup>1–3</sup> Enhancement surrounding the intraorbital optic nerve in fat-suppressed, contrast-enhanced MRI is definitive for a diagnosis.<sup>4</sup> In contrast, no reports have described the characteristics of OPN by other imaging techniques, including computed tomography or ultrasound. We herein report a case in which OPN was suspected by B-scan ultrasound images and confirmed by MRI.

## 2. Case report

A 72-year-old woman developed nonpainful blurred vision in her left eye. The patient had a history of angina pectoris and well-controlled diabetes mellitus. She also had a history of liver enzyme elevation secondary to systemic corticosteroids; the patient did not remember the reason for which she was taking the corticosteroids and had not been on systemic steroids since then. She had no history of ophthalmologic disease. At the first ophthalmological consultation, she had optic disc swelling and choroidal folds in both eyes and subretinal fluid in the left eye (Fig. 1). Her best-corrected visual acuity (BCVA) was 20/16 in the right eye and 20/29 in the left eye. The critical flicker-fusion frequency (CFF), which is impaired in patients with optic nerve damage or retinal damage, was low at 24 Hz in the right eye and 22 Hz in the left eye (reference range, 52.5 ± 4.4 Hz).<sup>5</sup> She was followed up by the same doctor for 1 month with steroid eye drops, but she was not treated with systemic therapy. Her symptom did not improve, and she was referred to Hiroshima University Hospital 1 month after symptom onset.

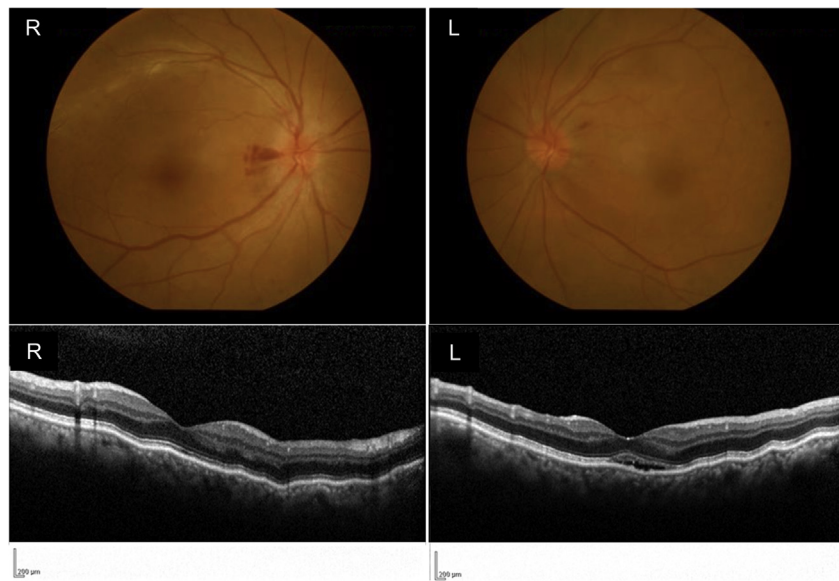
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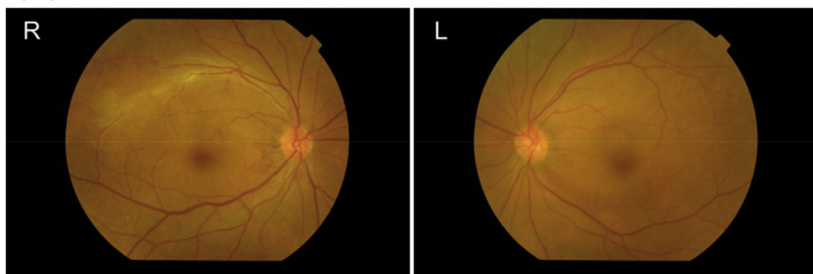
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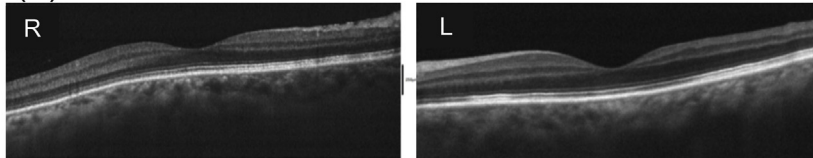


**Fig. 1.** Fundus photographs and OCT images at the time of disease onset. Fundus photography of both eyes shows optic disc swelling with disc hemorrhage and choroidal folds. OCT images show choroidal folds in both eyes and serous retinal detachment in the left eye.

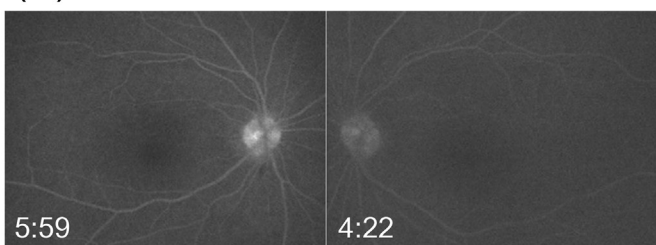
(A)



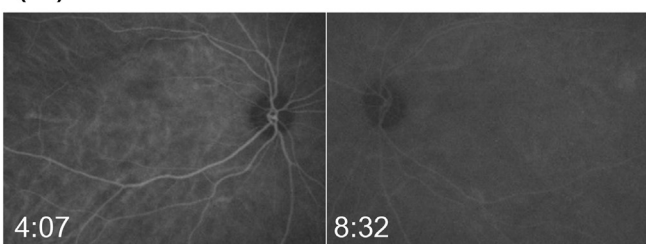
(B)



(C)



(D)



**Fig. 2.** Fundus photographs and OCT images, FA, and indocyanine green (ICG) angiography at the time of presentation to our hospital. (A) Fundus photography of both eyes shows optic disc swelling with disc hemorrhage, which had improved compared with the findings of the previous doctor. (B) The OCT image shows disappearance of the choroidal folds in both eyes and serous retinal detachment in the left eye. (C) FA shows slight hyperfluorescence of both optic nerves but no leakage or pooling. (D) ICG angiography shows no leakage or dark spots characteristic for VKH. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

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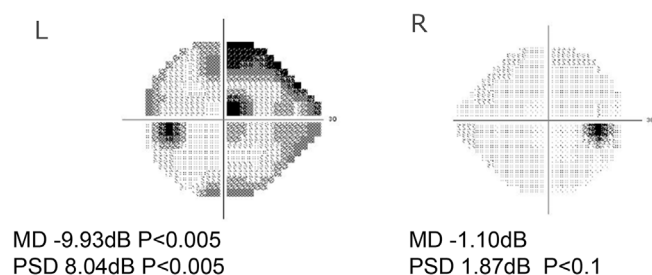


Fig. 3. Humphrey visual field test before treatment. Decreased sensitivity in the left eye is evident.

At the first visit to our clinic, she still complained of blurred vision. Her BCVA was 20/20 in the right eye and 20/40 in the left eye. The intraocular pressure was 17 mmHg in both eyes, and the CFF had improved to 33 Hz in both eyes. The pupillary direct light reflex was normal in both eyes, and no relative afferent pupillary defect was seen in either eye. No conjunctival injection and no cells in the anterior segment were observed in either eye. However, 1 + vitreous cells were seen in the left eye.<sup>6</sup> She was found to have optic disc swelling in both eyes, but it was improved compared with the findings of the previous doctor (Fig. 2). The bilateral choroidal folds and the subretinal fluid in the left eye had resolved without any treatment (Fig. 2). Fluorescence angiography (FA) showed slight hyperfluorescence in both optic nerves but no leakage or pooling. Indocyanine green (ICG) angiography showed no leakage or dark spots characteristic for Vogt-Koyanagi-Harada disease (VKH) (Fig. 2). Laboratory tests for syphilis, tuberculosis, anti-aquaporin 4 antibody, and angiotensin-converting enzyme were normal or negative. Bilateral hilar lymphadenopathy, which is seen in sarcoidosis, was not detected on a chest radiograph. A visual field test showed decreased sensitivity in the left eye (Fig. 3). A B-scan ultrasound image showed slight fluid in sub-Tenon's space and scleral thickening characterized by posterior scleritis in the left eye; additionally, the optic nerve sheath was displayed as a highly reflective circle with shadowing around the optic disc in both eyes (Fig. 4). According to these examination findings, bilateral OPN with posterior scleritis in the left eye seemed highly plausible. MRI with interpretation by a radiologist was then planned. MRI with intravenous contrast revealed increased signal intensity around the optic nerve (i.e., the “tram track sign”) in both eyes, which was consistent with OPN<sup>2</sup> (Fig. 5). Based on the MRI and B-scan ultrasound images, she was finally diagnosed with bilateral OPN with posterior scleritis. Because of her history

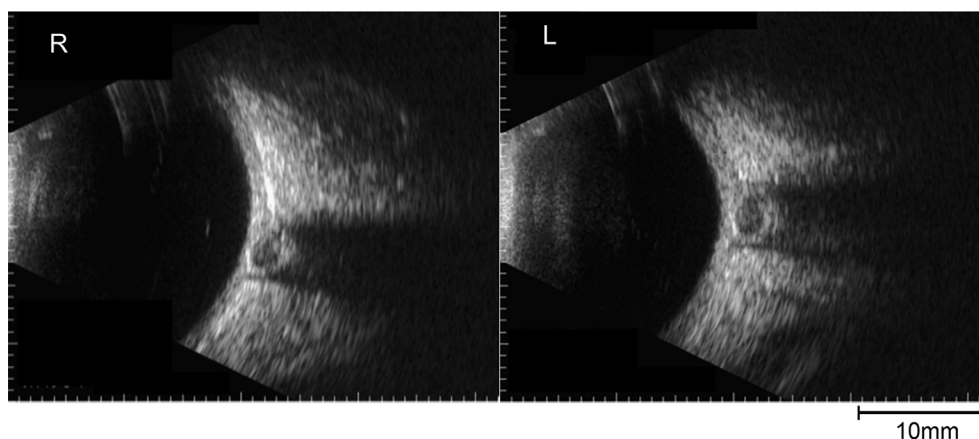


Fig. 4. Transverse B-scan ultrasound image (15 MHz) of both eyes showing a conspicuous image of the optic nerve sheath as a highly reflective circle surrounding the optic disc with acoustic shadowing. Scleral thickening (> 2.0 mm) and fluid in sub-Tenon's space are also seen in the left eye.

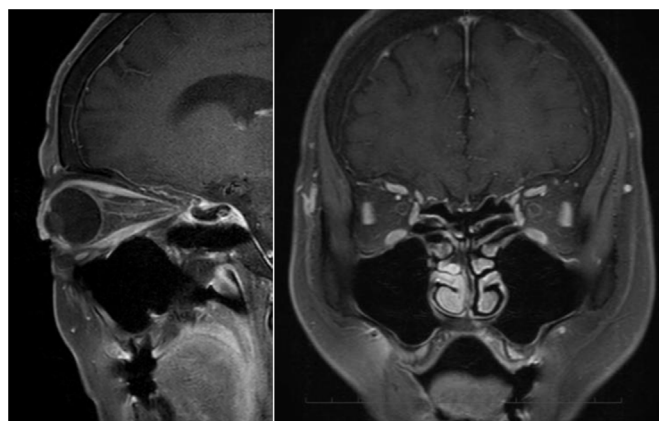


Fig. 5. Sagittal and coronal fat-suppressed gadolinium-enhanced T1-weighted images. The sagittal image shows enhancement around both optic nerves with the tram track sign. The coronal image shows circumferential enhancement around both optic nerves.

of liver enzyme elevation secondary to oral corticosteroids, she underwent a posterior sub-Tenon injection of triamcinolone in both eyes. After the treatments, her BCVA improved to 20/16 in both eyes and her CFF improved to 37 Hz in the right eye and 35 in the left eye.

### 3. Discussion

OPN is a rare inflammatory disorder involving the optic nerve sheath.<sup>2</sup> Although MRI is reportedly useful for diagnosis of this disease,<sup>3</sup> no previous reports have described the use of B-scan ultrasound images for this purpose. We have herein presented the first report in which OPN was suspected by B-scan imaging.

According to the fundus examination and optical coherence tomography (OCT) images, we considered several diagnoses including VKH, sarcoidosis, optic neuritis, posterior scleritis, and ocular tuberculosis. Although choroidal folds and subretinal fluid were present, FA did not show leakage and ICG angiography did not show dark spots in the late phase, both of which are characteristic of VKH.<sup>7</sup> According to Rajendram et al.,<sup>8</sup> some patients with VKH present with optic neuritis. However, FA in these patients shows the characteristic pattern of VKH (pinpoint hyperfluorescence). Moreover, in the present case, one injection of triamcinolone into the posterior sub-Tenon's space of both eyes improved her symptom, and no recurrence or sequelae occurred. According to the FA and ICG angiography findings and the patient's disease course, VKH was unlikely. The patient was also suspected to have optic neuritis at the first visit because she had disc swelling and

decreased visual field sensitivity.<sup>9</sup> However, MRI did not show hyperintensity of the optic nerve, allowing us to rule out optic neuritis. The posterior scleritis seemed to be associated with OPN according to the bilateral choroidal folds and subretinal fluid in the left eye on OCT images and fluid in sub-Tenon's space on B scan images of the left eye. Posterior scleritis with OPN was previously reported, although the previous report was unremarkable by ultrasonography.<sup>10</sup>

Because B-scan images cannot show the full optic nerve sheath, this technique may only be useful when OPN-associated inflammation surrounds the optic disc. Moreover, if a patient with OPN has pronounced sub-Tenon's fluid due to severe inflammation, B-scan ultrasound cannot clearly show the highly reflective circle surrounding the optic nerve sheath caused by accumulated fluid in sub-Tenon's space. Thus, compared with MRI, B-scan ultrasound is limited in the diagnosis of OPN and cannot substitute for MRI to obtain a diagnosis of OPN. Because patients with optic neuritis have a greater risk of developing multiple sclerosis, MRI is mandatory to confirm OPN and to differentiate OPN from optic neuritis. However, no previous reports have described B-scan ultrasound imaging in patients with OPN. Moreover, ultrasound imaging has no contraindications and is more convenient than MRI. We believe that this report may be helpful for some patients with OPN who have contraindications for MRI, such as claustrophobia.

#### 4. Conclusion

In the present report, OPN was suspected by B-scan images and confirmed by MRI. Ultrasound imaging has no contraindications and is a more convenient examination technique than MRI. B-scan imaging may be useful for diagnosis of OPN in some patients, especially with inflammation surrounding the optic nerve.

#### Patient consent

The patient provided verbal consent for publication of this case.

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#### Conflicts of interest

All authors have no financial disclosures.

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#### Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.ajoc.2018.08.007>.

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