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Favorable outcome after intra-arterial thrombolysis in a patient with branch retinal artery occlusion: a case report

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CASE REPORT

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Background: Branch retinal artery occlusion (BRAO) is characterized by a sudden, painless monocular visual loss. The condition usually has a favorable prognosis but can sometimes cause severe visual loss. Currently, no clinical guidelines are available for the treatment of BRAO.

Case Report: A 38-year-old man presented with vision loss. Initial visual acuity was 0.08/1.0 and a lower-altitudinal visual field defect was detected in the right eye. Occlusion of the superior temporal branch of the retinal artery was observed using fluorescein angiography. The patient was diagnosed with BRAO, and intra-arterial thrombolysis (IAT) was performed 11 hours after the first abnormality. The patient demonstrated rapid improvement after IAT. Visual acuity recovered to 0.8/1.0 and only the cecocentral scotoma remained at 5-month follow-up.

Conclusion: For patients with BRAO and severe vision loss, IAT may be an effective treatment. However, owing to potential complications, this procedure should be reserved for selected patients.

Keywords: Retinal artery occlusion; Thrombolytic therapy; Visual acuity; Case report

INTRODUCTION

Central retinal artery occlusion (CRAO) typically manifests as a sudden, painless monocular loss of visual acuity and peripheral vision. The degree of visual loss varies, but in more than 70% of patients, the initial visual acuity is "count fingers" or worse [1]. Branch retinal artery occlusion (BRAO) has similar clinical characteristics; however, the severity of vision loss and prognosis are generally better than those of CRAO [2]. Numerous trials have been undertaken to improve visual outcomes in patients with CRAO and BRAO, but none of them demonstrated effectiveness and safety in randomized placebo-controlled clinical trials [3]. Intra-arterial thrombolysis (IAT) is sometimes considered a treatment option for CRAO; however, the procedure is usually not performed in patients with BRAO. Here, we report a case of BRAO that was successfully treated with IAT 11 hours after the first abnormality.

CASE REPORT

A 38-year-old man visited our clinic complaining of vision loss in his right eye. The patient had no underlying diseases, except for

chronic hepatitis B infection. The patient did not experience any problems until he slept at 2 AM, only noticing a visual problem upon waking up at 9 AM. On examination, the visual acuity was 0.08/1.0 (20/240, 20/20), and a lower-altitudinal visual field defect of the right eye was identified. The patient reported no other symptoms, including ocular pain, and no abnormalities were observed during the neurological examination. The ophthalmological evaluation demonstrated no abnormalities in the cornea or lens, and fundoscopy did not reveal any evidence of intraocular hemorrhage, retinal detachment, or optic neuritis. Fluorescein angiography (FAG) and fundoscopy revealed delayed retinal perfusion and occlusion of the superior temporal branch of the retinal artery, accompanied by a pale retina of the occluded vascular branch (Fig. 1). Blood tests revealed that the erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) levels were within normal ranges, with no evidence of coagulopathy.

The patient was diagnosed with BRAO, and IAT was performed at 8 PM, 11 hours after his first abnormality. The ophthalmic artery was selected using a microcatheter and 10 mg of tissue plasminogen activator (tPA, alteplase) was injected into the ostium of the ophthalmic artery (Fig. 2). Thirty minutes after the injection, the patient reported improvements in visual acuity and

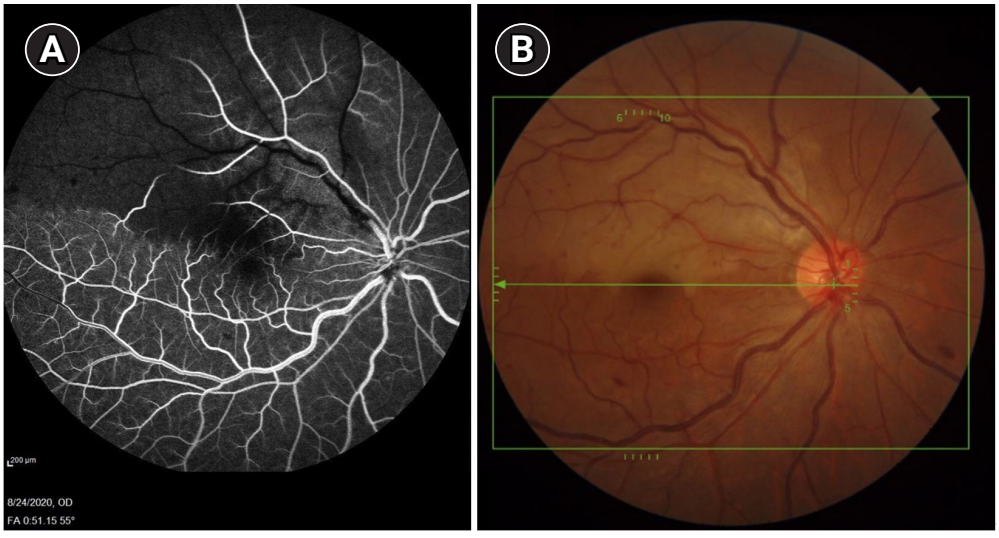

Fig. 1. Fluorescein angiography and fundus photograph of the right eye obtained before intra-arterial thrombolysis. (A) Occlusion of the superior temporal branch of the retinal artery on fluorescein angiography. (B) The pale retina of the occluded vascular branch on fundoscopy.

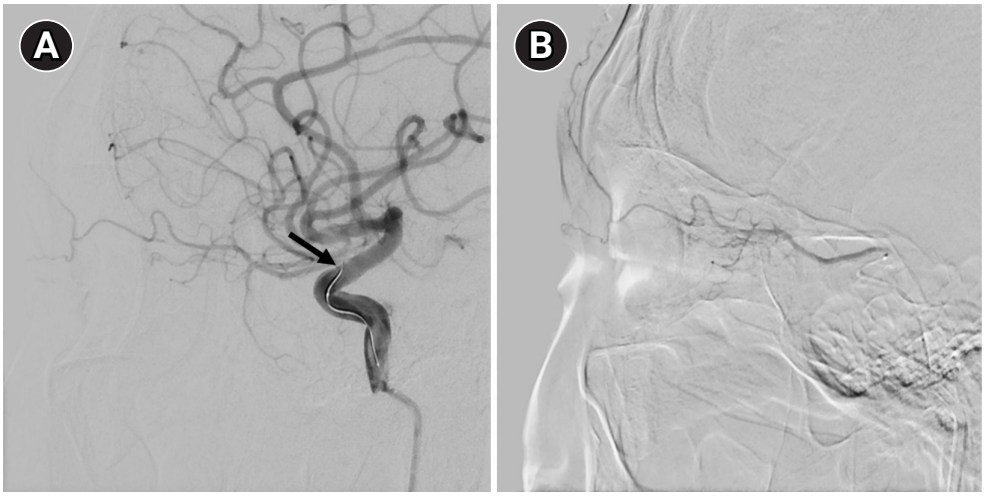

Fig. 2. Digital subtraction angiography. (A) The ophthalmic artery is selected using a microcatheter (arrow). (B) Tissue plasminogen activator is injected into the ophthalmic artery.

field defects.

Magnetic resonance imaging (MRI) after the IAT revealed a small infarction in the right posterior parietal cortex. Brain MRI 1 day after IAT demonstrated multiple new infarctions in the right parieto-occipital cortex and right external capsule, however no evidence of intracranial hemorrhage was observed. Transcranial Doppler sonography, carotid duplex, 24-hour holter monitoring, transthoracic echocardiography, and transesophageal echocardiography revealed no abnormal findings. The patient was prescribed 100 mg of aspirin and 75 mg of clopidogrel daily.

Three days after IAT, blood flow improved, and the superior temporal branch of the retinal artery was recanalized as observed on FAG (Fig. 3). Visual acuity recovered to 0.8/1.0 (20/25, 20/20), while the lower-altitudinal defect of the right eye remained. Five months later, a visual field test demonstrated no field defects except for a cecocentral scotoma (Fig. 4).

DISCUSSION

CRAO and BRAO typically present with a sudden and painless loss of visual acuity and peripheral vision. Fundoscopic examination is necessary to exclude alternative causes such as retinal detachment, intraocular hemorrhage, and acute optic neuropathy. Although not performed in this patient, the identification of thickened and irregular inner retinal layers on macular optical coherence tomography can help diagnose retinal edema secondary to acute retinal ischemia. Furthermore, the possibility of arteritis should be considered, and tests such as ESR and CRP level can serve as valuable diagnostic indicators in such cases [3].

The primary cause of CRAO and BRAO is embolism, which commonly originates from the ipsilateral carotid artery plaque, although emboli from the heart, aortic arch, or great vessels can also be implicated [1,4]. Cardiovascular risk factors, such as obesity, hypertension, tobacco use, and cardiac arrhythmia are related risk factors [3]. Despite the similarities in clinical presentation between CRAO and BRAO, their initial visual acuity and final visual outcomes differed significantly. Yuzurihara et al. conducted a retrospective study comparing visual outcomes in patients with CRAO and BRAO. In the study, the initial visual acuity for patients with CRAO was generally worse than 0.1, with only 22% achieving a final visual acuity of 0.5 or better. In contrast, the majority of patients with BRAO demonstrated initial visual acuity better than 0.1, with 80% attaining a final visual acuity of 0.5 or better [2]. Other studies have also demonstrated relatively favorable visual outcomes in patients with BRAO [5,6].

Nevertheless, poor initial visual acuity in cases with BRAO is

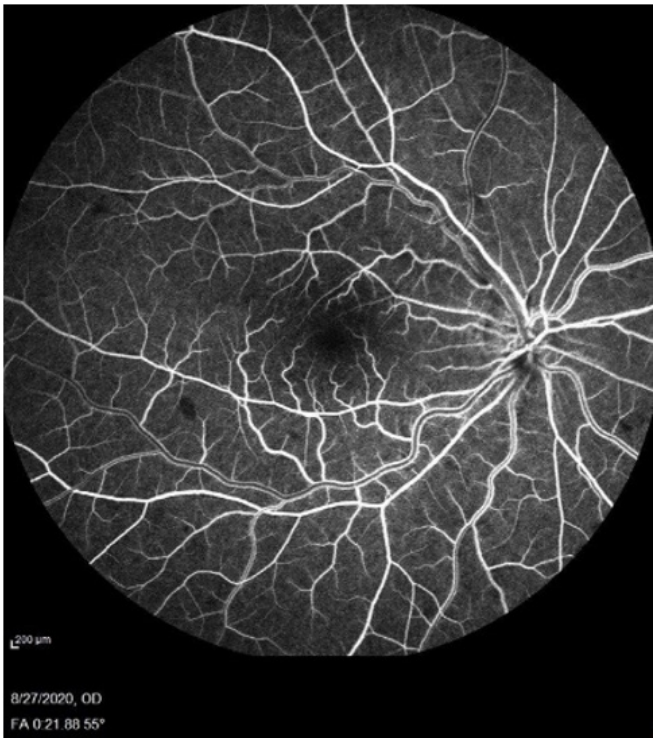

Fig. 3. Fluorescein angiography 3 days after the intra-arterial thrombolysis. Improved blood flow and recanalized superior temporal branch of the retinal artery are observed.

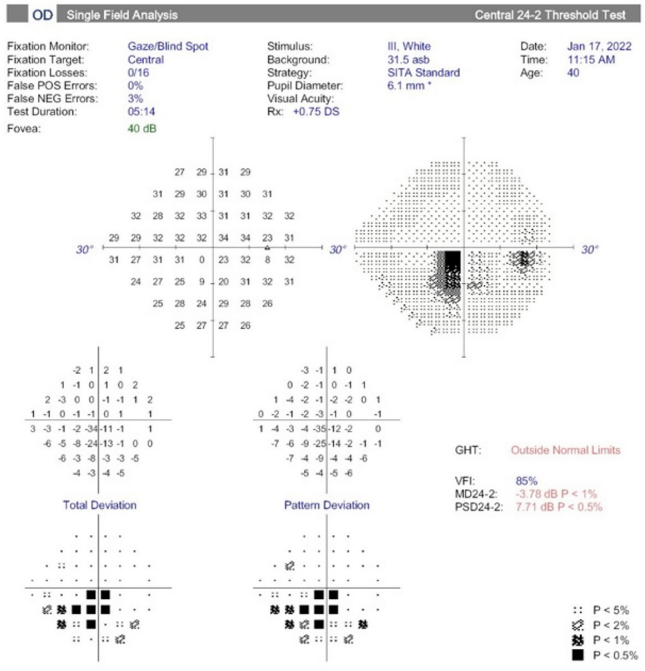

Fig. 4. Visual field test of the right eye 5 months after the treatment. No visual field defect is observed except mild cecocentral scotoma.

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associated with an unfavorable prognosis. Mason et al. [5] demonstrated that only 14% of patients with BRAO with an initial visual acuity of 0.2 or worse exhibited improvement to 0.5 or better. In our case, the initial visual acuity of the affected eye of 0.08 was notably worse than that of patients with typical BRAOs, aligning with the expectation of a poor prognosis.

Efforts have been made to improve the visual outcomes in patients with CRAO and BRAO. However, as of now, no widely accepted therapy exists. Various approaches, including anterior chamber paracentesis, ocular massage, and the use of topical intraocular pressure-lowering agents, have been attempted; however, none have been established as effective [3]. Intravenous tPA is effective in some cases with CRAO within a 4.5-hour window [7,8]. However, adequate randomized clinical trials have been conducted due to difficulties with patient enrollment. Although endovascular thrombectomy has demonstrated effectiveness in certain cases, it is not commonly performed as a standard procedure [9].

The IAT has been attempted in several patients with CRAO or BRAO. The procedure is performed by introducing tPA directly into ophthalmic circulation via selective microcatheterization of the ostium of the ophthalmic artery. IAT is theoretically advantageous in delivering thrombolytic therapy directly to the thrombus while minimizing systemic effects by reducing the dose of tPA reaching the systemic circulation [3,10].

Although some studies suggest that IAT may improve visual outcomes in CRAO, the only prospective randomized controlled study has failed to demonstrate its efficacy [3,11,12]. Moreover, major complications such as intracerebral hemorrhage were also reported. However, in this study, the mean time between symptom onset and treatment was 13 hours, with only four of the 41 patients receiving treatment within 6 hours. The early administration of IAT may lead to different outcomes [12].

Furthermore, differentiating between the types of CRAO in this study could have led to diverse outcomes. Stages of CRAO include incomplete, subtotal, and total types based on visual acuity, fundoscopy, and angiographic findings [13,14]. In Schmidt et al.'s study [14], the majority of patients were classified as having the subtotal type, characterized by significantly reduced visual acuity, distinct central retina edema, and delayed arterial blood flow on FAG. Despite the treatment time of approximately 9 hours, this study demonstrated the effectiveness of IAT. Similarly, Ahn et al. [13] observed early reperfusion in the IAT group, with the incomplete CRAO subgroup demonstrating significant visual improvement. These studies suggest that the IAT may be effective in certain CRAO subgroups.

Notably, no studies have exclusively focused on IAT in patients with BRAO, likely due to their generally favorable outcomes and a limited number of cases. However, given the shared pathophysiology of CRAO and BRAO, IAT may have a positive effect in certain patient groups with BRAO. This case suggests that when a patient presents with poor initial visual acuity and future vision is crucial for their quality of life, IAT should be considered. Nevertheless, as IAT carries the risk of intracranial and systemic hemorrhage, arterial dissection, catheter-induced spasm, and dislodgement of atheromatous plaques in the ophthalmic circulation, it should be performed only in highly selected patients [3,10].

However, this study had some limitations. Determining whether the improvement in visual acuity and peripheral vision was due to intensive treatment or the natural course of the disease is challenging. However, considering the immediate improvement observed after tPA injection, the IAT likely played a crucial role in the patient's positive visual outcome. In conclusion, this is the case of a patient with BRAO who exhibited a good response to IAT, even after a significant amount of time had passed. We suggest that IAT is a useful treatment option for highly selected patients with BRAO, but further studies are needed.

ARTICLE INFORMATION

Ethics statement

This study was approved by the Institutional Review Board of Keimyung University Dongsan Hospital (No. 2024-05-030). Owing to the retrospective design, the requirement for informed consent was waived.

Conflict of interest

Jeong-Ho Hong is an editorial board member of the journal but was not involved in the peer reviewer selection, evaluation, or decision process of this article. No other potential conflicts of interest relevant to this article were reported.

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