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Case Report: Indocyanine Green Dye Leakage from Retinal Artery in Branch Retinal Vein Occlusion

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Background: Little is known about retinal vascular lesions underlying hemorrhage in the acute phase of branch retinal vein occlusion (BRVO).

Case: A 64-year-old woman presented with a decrease in visual acuity of ten-day duration in her left eye.

Observations: At the initial examination, her left fundus showed the typical appearance of BRVO, including retinal bleeding and soft exudates in the lower half of the fundus, after the arteriovenous crossing. Fluorescein angiography showed no detail in the retinal vessels, which were occluded by retinal bleeding. However, in the early phase of indocyanine green (ICG) angiography, ICG dye leaked from the retinal artery at a point proximal to the first bifurcation. In the late phase of ICG angiography, the dye pooled along the retinal artery in a fusiform fashion. One year after laser photocoagulation was performed in the area of the BRVO, ICG dye leakage from the retinal artery had completely disappeared.

Conclusions: These findings suggest that the changes in the retina detected by ICG angiography may have been associated with the onset of BRVO. In patients with acute BRVO, ICG angiography may be used to evaluate retinal arterial lesions covered by hemorrhage and provide useful information. **Jpn J Ophthalmol 2000;44:277–282**

Key Words: Branch retinal vein occlusion, fluorescein angiography, indocyanine green angiography.

Introduction

Branch retinal vein occlusion (BRVO) affects middle-aged or older patients who have a history of systemic hypertension. Distinctive microvascular changes, such as nonperfused capillaries, microaneurysms, or dilated collateral vessels, have been reported to occur secondary to BRVO.[1–3] Most of these findings are observed in the later phase of BRVO. Just after the onset of BRVO, flame-shaped hemorrhages in the retinal territory drained by the occluded vein often obscure the details of the underlying retina. Fluorescein angiography is of little clinical use because the retinal hemorrhages preclude observation.

Indocyanine green (ICG) angiography is a technique used to observe the choroidal vasculature.[4,5] It has also been useful to examine retinal vascular lesions under hemorrhage, such as retinal arterial macroaneurysms.[4,5] Indocyanine green dye maximally absorbs and fluoresces in near-infrared wavelengths.[6] These wavelengths can easily penetrate hemorrhages, enabling observation of underlying retinal vascular lesions. In this case report, ICG angiography was very helpful in treating a patient with an acute phase BRVO.

Case Report

A 64-year-old woman visited us in March 1996 complaining of a sudden decrease of visual acuity in the left eye that had lasted for 10 days. She had had hypertension for 4 years and was taking antihypertensive drugs. At the initial examination, her best corrected visual acuities were 20/20 in the right eye

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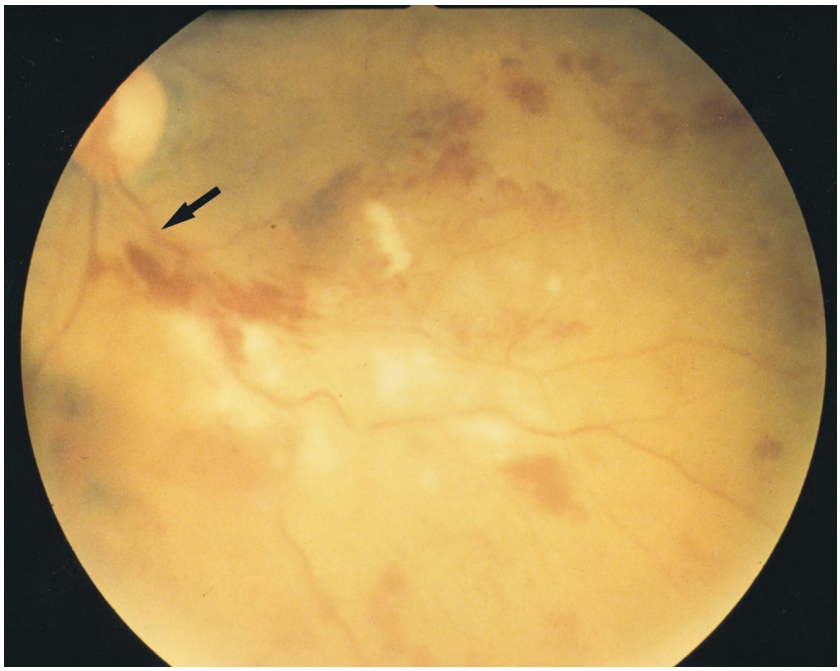

Figure 1. Fundus photograph of left eye. At first examination there was superficial retinal bleeding and soft exudates in lower half of fundus distal to first retinal arteriovenous crossing (arrow).

and 20/300 in the left. Slit-lamp biomicroscopy of the anterior segments revealed normal findings, with mild cataract in each eye. The intraocular pressure was 15 mm Hg in the right eye and 13 mm Hg in the left. The fundus examination of her right eye showed slight arteriosclerotic changes in the retinal arteries, such as narrowing of the retinal artery and increased reflex of the retinal arterial wall. The left fundus showed a segmental pattern of flame-shaped retinal hemorrhages accompanied by several soft exudates in the lower half of the fundus, distal to the first retinal arteriovenous crossing (Figure 1). From this fundus appearance, we diagnosed the patient as having BRVO. Fluorescein angiography and ICG angiography were performed consecutively in the first visit. In the early phase of the fluorescein angiogram (Figure 2A), filling of the choroid, optic disc, and retinal artery was normal, but the retinal venous filling was delayed in the area of the BRVO. The retinal artery was dilated in the area peripheral to the first bifurcation in the inferotemporal quadrant. Widespread nonperfused areas were seen peripheral to the site of the arteriovenous crossing. In the late phase of the fluorescein angiogram, both the major retinal artery and venous walls were stained with fluorescein dye, and the leaked dye diffused into the adjacent retina (Figure 2B). However, the overlying hemorrhage precluded a detailed view of the retinal vasculature around the site of the first bifurcation of the retinal artery. Using ICG angiography (Figure 3), the entire course of the retinal artery underneath the retinal hemorrhages was clearly visible. About 45 seconds after ICG dye injection, dye began to leak from the retinal artery just proximal to the first bifurcation (Figure 3A). The leakage gradually increased with time. In the late phase of the ICG angiogram, dye pooled along the retinal artery in a fusiform fashion (Figure 3B). In contrast, ICG angiography showed no dye leakage from the occluded retinal vein.

Retinal laser photocoagulation was performed soon after the first examination of the nonperfused retina. One year after the initial examination, retinal hemorrhages and soft exudates had decreased. Bright plaque was formed within the retinal artery just proximal to the first bifurcation, where ICG dye leakage was first seen (Figure 4). Fluorescein angiography disclosed irregular narrowing of the lumen of the retinal artery at the site of previous ICG dye leakage (Figure 5). The corrected visual acuity in the left eye has remained 20/300 for 2 years after the patient's initial visit.

Discussion

In this case report, we described ICG dye leakage from the major retinal artery proximal to the first bifurcation in a patient with acute BRVO. Indocyanine green angiography was a very useful technique

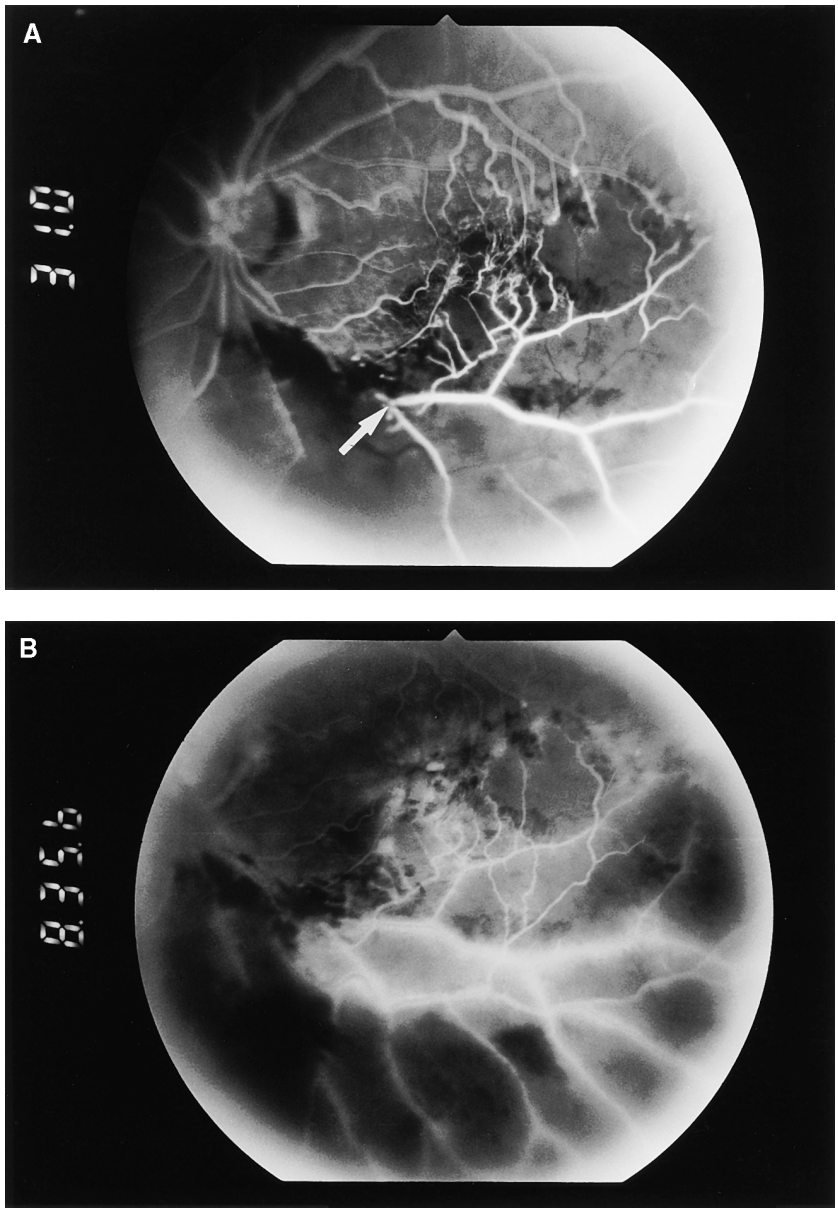

Figure 2. Fluorescein angiogram at first examination. (**A**) In early phase, filling of retinal vein was delayed in area of branch retinal vein occlusion. Retinal artery dilated after first bifurcation (arrow). Widespread nonperfused areas were seen peripheral to arteriovenous crossing. (**B**) In late phase, both major retinal artery and vein were stained profusely with fluorescein dye, which leaked into adjacent retina.

to examine the retinal artery under retinal hemorrhages. Unlike fluorescein angiography, ICG angiography clearly demonstrated the lesions covered by the hemorrhages and enabled us to observe the entire course of the retinal vessels, because of the dye's near infrared absorption and emission characteristics.[5–7]

In this patient, fluorescein angiography and ICG angiography showed different clinical features. In the fluorescein angiograms, both the retinal artery and vein stained with fluorescein and demonstrated diffuse dye leakage into the adjacent retina distal to the arteriovenous crossing in the late phase. In contrast, ICG dye leakage was focal and could be observed only from the major artery. Indocyanine green dye leakage from the retinal artery began proximal to the first bifurcation. Later the dye pooled around the artery in a fusiform fashion.

To our knowledge, this is the first report describing ICG dye leakage from the major retinal artery in retinal disorders, with or without accompanying BRVO. The retinal artery has been considered more resistant to ICG dye leakage than the retinal vein, because of the structural differences of the vascular walls. Although the mechanism of ICG dye leakage

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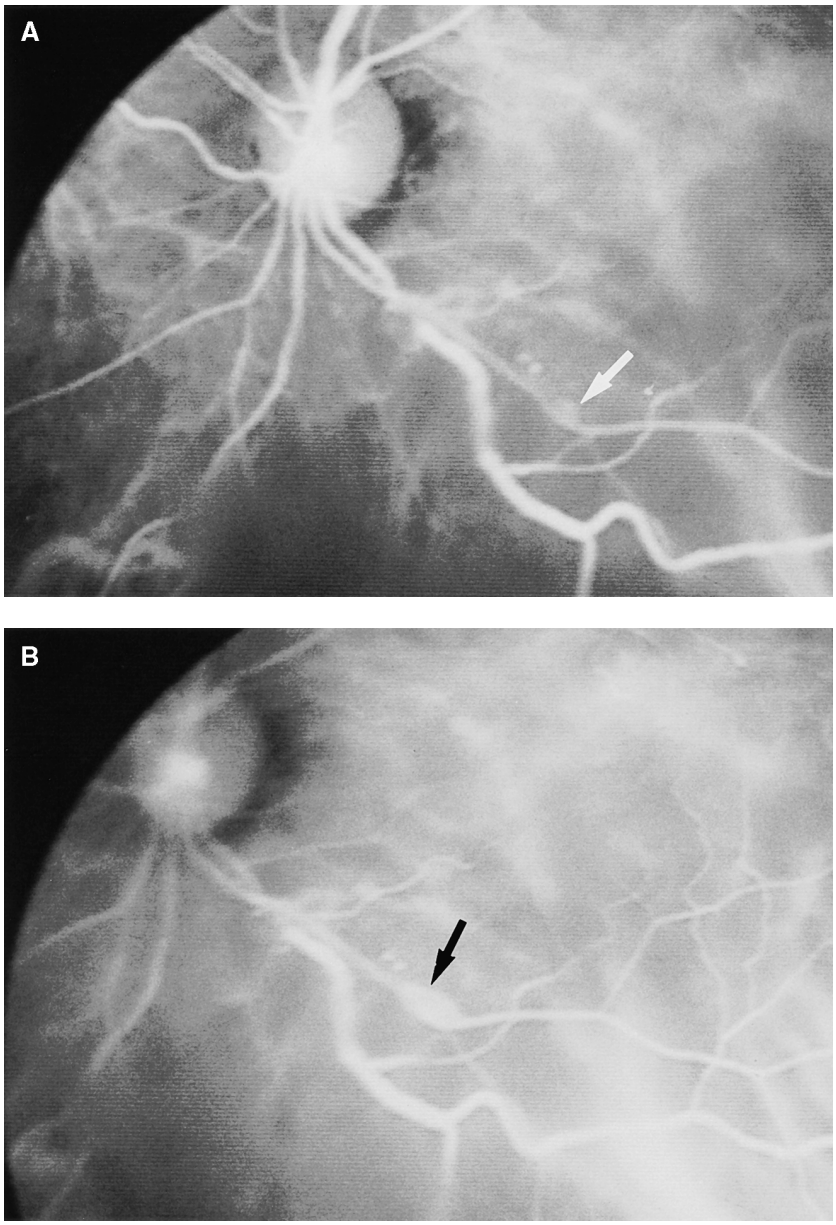

Figure 3. Indocyanine green (ICG) angiogram at first examination. (**A**) At 45 seconds after fluorescein injection, ICG dye began to leak from retinal artery just before first bifurcation (arrow). (**B**) At 2 minutes after injection, ICG dye leakage from retinal artery gradually increased (arrow) and pooled along retinal artery in fusiform fashion.

from the retinal artery requires further investigation, we suspect that this leakage indicates extensive retinal artery wall damage. First, ICG dye leaked focally just proximal to the first bifurcation. This site receives constant high blood pressure on the artery wall. Second, bright plaque and irregular narrowing of the retinal arterial lumen were formed at the site of previous ICG dye leakage after the hemorrhages resolved. These findings showed the previous damage to the retinal artery wall that was not evenly healed.

From these findings, we believe that other patients with acute phase BRVO might also show retinal arterial lesions with ICG dye leakage. These retinal arterial lesions may often be missed when conventional fluorescein angiography is used because of overlying hemorrhage. Although the hemodynamics of ICG dye leakage are unknown, we believe that this report showed for the first time the presence of prominent endothelial damage of the retinal arteries detected by ICG angiography in the acute phase of BRVO.

Retinal arterial evaluation is considered to be important in predicting the visual outcome of BRVO.[8] Indocyanine green angiography is a useful technique to detect many arterial lesions in the acute phase of

Figure 4. Left fundus photograph at 1 year after first examination. Retinal hemorrhages and soft exudates had decreased. Bright plaque formed within retinal artery where indocyanine green dye leakage had been found at first examination (arrow).

BRVO. Further case studies are necessary to consider the mechanism and prognostic value of ICG dye leakage in BRVO.

In summary, we described BRVO in a patient who showed prominent ICG dye leakage from the retinal artery. Our findings indicated that some arterial lesions may be involved in the onset of BRVO. Examining the retinal artery by ICG angiography might add some useful information for predicting the outcome of this disease.

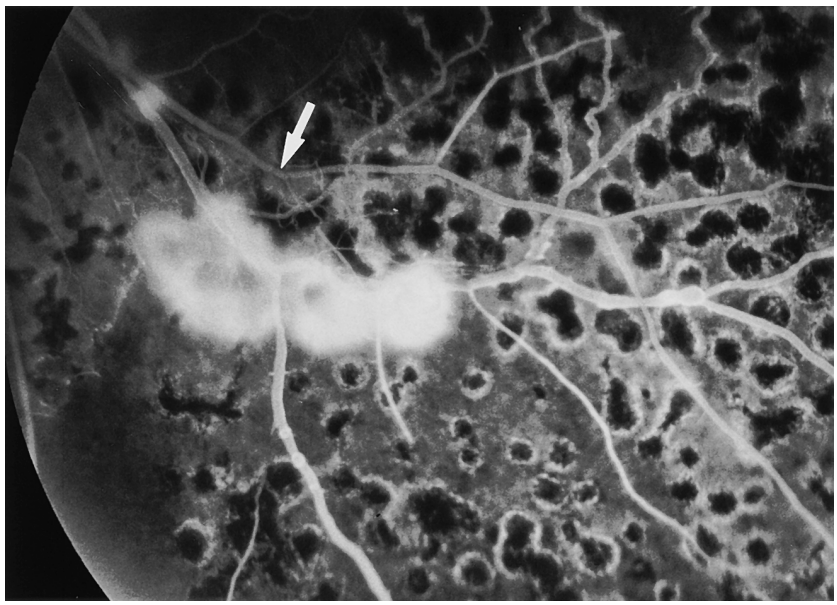

Figure 5. Fluorescein angiogram at 1 year after first examination. Irregular narrowing of lumen of retinal artery was observed at site of previous indocyanine green dye leakage (arrow).

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References

1. Yamamoto H. Ultrastructure of vessels in hemorrhagic area of human retina. Jpn J Ophthalmol 1976;20:232–42.
2. Rubinstein K, Jones EM. Retinal vein occlusion: long-term prospects. Br J Ophthalmol 1976;60:148–50.
3. Shilling JS. Vascular changes after branch retinal vein occlusion. Trans Ophthalmol Soc UK 1976;96:193–9.
4. Biscoff PM, Flower RW. Ten years experience with choroidal angiography using indocyanine green dye. A new routine examination or an epilogue. Doc Ophthalmol 1985;60:235–91.
5. Hayash K, DeLaey JJ. Indocyanine green angiography of choroidal neovascular membranes. Ophthalmologica 1980;58:528–38.
6. Hayashi K. Guidance in indocyanine green angiography. Rinsho Ganka (Jpn J Clin Ophthalmol) 1991;45:1764–70.
7. Flower RW, Hochheimer BF. A clinical technique and apparatus for simultaneous angiography of the separate retinal and choroidal circulations. Invest Ophthalmol Vis Sci 1973;12: 248–61.
8. Archer DB, Ernest JT, Newell FW. Classification of branch retinal vein obstruction. Trans Am Acad Ophthalmol Otolaryngol 1974;78:148–65.