Original Research Paper

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Choroidal thickness in a patient with central retinal vein occlusion associated with iron deficiency anemia

Ophthalmology

KEYWORDS: Choroidal thickness, Central retinal vein occlusion, Macular edema, Optical coherence tomography, Iron deficiency anemia

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ABSTRACT

To investigate the central macular thickness and choroidal thickness in an 18-year-old woman with central retinal vein occlusion (CRVO) associated with iron deficiency anemia (IDA), via enhanced-depth imaging optical coherence tomography (OCT). At the initial visit, the best-corrected visual acuity (BCVA) in the left eye was 0.6. Fundus examination revealed tortuous retinal veins and macular edema with stellate figure. OCT showed that the macular thickness was increased to 539 µm. Systemic administration of elemental iron was initiated. The BCVA improved to 1.2, the macular edema dramatically resolved, and the macular thickness was reduced to 219 µm 1 month later. On the other hand, the choroidal thickness was reduced during recovery of macular edema in the left eye.

INTRODUCTION

In 2008, Spaide et al. [1] used spectral domain optical coherence tomography (OCT) and developed a method termed enhanced depth imaging (EDI) OCT, which enables in vivo cross-sectional imaging of the choroid and measurement of the thickness of the choroid. Although many studies have reported measurements of choroidal thickness in various diseases, [2-10] few reports have described in central retinal vein occlusion (CRVO). [11,12]

CRVO is most commonly seen in older patients. [11, 12] CRVO in young adults is occasionally associated with systemic diseases such as hypertension, diabetes, hyperlipidemia, and hematological abnormalities. [11, 12] However, few reports have described CRVO in patients with iron deficiency anemia (IDA). [13-15] Yumusak et al. [16] reported that the choroidal thickness was significantly reduced in the patient with IDA. We could find no other report on choroidal thickness in patients with IDA. Here, we investigate the central macular thickness and choroidal thickness in an 18-year-old woman with CRVO associated with IDA.

CASE PRESENTATION

An 18-year-old Japanese woman complaining of a 1-week history of visual disturbance in the left eye was referred to our hospital. On ophthalmic examination, the best-corrected visual acuity (BCVA) was 1.2 in the right eye and 0.6 in the left eye. Fundus examination revealed tortuous retinal veins and macular edema with stellate figure in the left eye (Figure 1B). In contrast, no abnormal findings were observed in the right eye (Figure 1A).

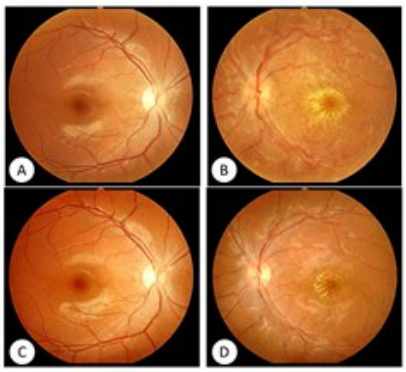


Fig 1.Fundus photographs of the right (A and C) and left (B and D) eyes (A, B: initial visit, C, D: one month after the initial visit)

Note retinal edema with stellate figure (B), and reduced retinal edema and hard exudates (D).

Fluorescein angiography demonstrated marked hyperfluorescence of the retinal veins and optic disc in the left eye. OCT revealed increased macular thickness (539 µm) in the left eye (Figure 2B arrows).

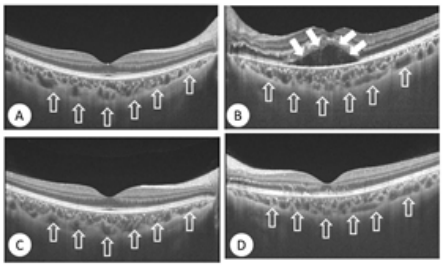


Fig 2. OCT images of the right (A and C) and left (B and D) eyes (A, B: initial visit, C, D: one month after the initial visit)

Note marked retinal edema (B, arrows), reduced retinal edema (D). Choroidal thickness was not changed in the right eye (A and C, framed arrows). In the left eye, choroidal thickness was reduced during recovery of macular edema (B and D, framed arrows).

On blood laboratory findings, a complete blood count showed IDA, with hemoglobin of 6.2 g/dL, serum iron of 10mg/dL, iron binding capacity of 460 mg/dL, and ferritin of 3.0 ng/ml. We diagnosed the condition as a CRVO due to IDA. The patient was started on elemental iron (100mg daily) as oral tablet. The BCVA improved to 0.8, the retinal edema dramatically reduced, and the macular thickness was reduced to 279 µm two weeks later. The BCVA recovered to 1.2, the stellate figure showed gradual improvement one month later (Figure 1D), and the macular thickness was reduced to 219 µm (Figure 2D). On the other hand, the choroidal thickness was reduced during recovery of macular edema in the left eye (Figure 2B and D framed arrows). In contrast, the choroidal thickness was not changed in the right eye (Figure 2A and C framed arrows).

DISCUSSION

In 2008, Spaide et al. [1] examined choroidal thickness and its associated factors in normal eyes and eyes with various retinal and retinochoroidal disorders. Their studies revealed that the mean subfoveal choroidal thickness in normal eyes is approximately 250 µm at age 65 years; that choroidal thickness showed a marked interindividual variability with values as low as 8 µm and values as great as 854 µm; that choroidal thickness decreased by about 4 µm per year of age and by 15 µm per diopter of myopia; and that choroidal thickness is additionally associated with male gender, a deeper anterior chamber, and thicker lens. Ikuno et al. [17] found a mean choroidal thickness of 354 µm (range, 80 to 641 µm) in healthy Japanese subjects, with a significant negative correlation with axial length and age. They estimated a decrease of 14 µm for each decade of life.

Subsequently, the choroidal thickness of patients with various diseases, such as central serous chorioretinopathy (CSC) [2,3], macular

hole [4], age-related macular degeneration [5,6], high myopia [7], and Vogt-Koyanagi-Harada disease [8], was reported. However, few reports have described choroidal thickness in CRVO. [9,10] In the largest series of population-based study, Du et al. [9] evaluated the choroidal thickness in 85 eyes with retinal vein occlusion (RVO) among 3,468 participants. According to their report, on univariate analysis, choroidal thickness was significantly thinner in the RVO study group than in the remaining study population of subjects without RVO. After adjustment for age, gender, axial length, anterior chamber depth, and lens thickness, choroidal thickness was no longer associated with the presence of an RVO. They found that that there was no association of choroidal thickness with either longstanding branch RVO or CRVO after adjustment for age, axial length, gender, anterior chamber depth, and lens thickness. In contrast, Tsuiki et al, [10] examined the choroidal thickness among 36 patients with unilateral CRVO as hospital-based study. They found that choroidal thickness was significantly thicker in eyes affected by CRVO than in the fellow unaffected eyes. The discrepancy of above two studies [9,10] may be explained by the difference in the study design; Tsuiki et al. [10] examined patients with a recently developed CRVO, whereas population-based study reported Du et al. [9], included subjects with longstanding RVO without recent onset and without marked macular edema. In this present patient who had recently developed CRVO, the choroidal thickness was relatively thick at the initial visit, and reduced during recovery of macular edema.

Maruko et al. [3] found that the choroidal thickness in the fellow eyes of patients with CSC was increased in the eyes with choroidal vascular hyperpermeability. They suggested that hyperpermeability causes choroidal thickening through accumulation of fluid and that dilation of choroidal vessels plays a partial role in the choroidal thickening. On the other hand, the pathogenesis of anemic retinopathy has been attributed to factors such as anoxia, venous stasis, angiospasm, and increased capillary permeability. [13-15] Choroidal blood flow is the highest of any tissue in the body to satisfy the normal metabolic demands of the outer retina. [10] Patients with CRVO also may be experiencing retinal hypoxia. [10] Because of tissue hypoxia, vascular endothelial growth factor (VEGF) expression increases in retinal pigment epithelium, pericytes, and microvascular endothelial cells. VEGF induces vessel dilation and increased ocular blood flow through a mechanism involving increased nitric oxide production, and it increases vascular permeability in the eye. Therefore, they speculated that vessel dilation and increased permeability caused by VEGF were related to increased choroidal thickness.

We could find only one report on choroidal thickness in patients with IDA. Yumusak et al. [16] evaluated the potential significance of the central macular thickness and choroidal thickness in the eyes of patients with IDA. According to their report, the choroidal thickness was significantly reduced in the patient group relative to the controls. In this present patient who had IDA, the choroidal thickness was not changed during recovery of IDA.

CONCLUSIONS

Although our findings were based on a single case of CRVO with IDA, additional cases are necessary to further characterize correlation between choroidal thickness and CRVO associated with IDA.

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