White Centered Retinal Hemorrhages in Vitamin B₁₂ Deficiency Anemia

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Key Words

White centered retinal hemorrhages · Roth's spots · Vitamin B₁₂ deficiency anemia

Abstract

Background: To report a case of severe vitamin B₁₂ deficiency anemia presenting with white centered retinal hemorrhages.

Methods: Interventional case report.

Results: A 40-year-old man, general practitioner himself, presented with a 1-day history of diminished left visual acuity and a drop-shaped central scotoma. The corrected visual acuities were 20/20, OD and 20/100, OS. Ophthalmic examination revealed bilaterally pale tarsal conjunctiva, discretely icteric bulbar conjunctiva and disseminated white centered intraretinal hemorrhages with foveal involvement. OCT imaging through these lesions revealed a retinal thickening caused by a sub-ILM accumulation of hyperreflective and inhomogeneous deposits within the nerve fiber layer. Immediate laboratory work-up showed severe megaloblastic anemia caused by vitamin B₁₂ deficiency requiring erythrocyte transfusions.

Discussion: Most reports of white centered retinal hemorrhages have been described in patients with leukemic retinopathy and bacterial endocarditis. It is interesting that this case of vitamin B₁₂ deficiency anemia retinopathy has a clinically indistinguishable fundus appearance. This is probably due to the common pathology of capillary disruption and subsequent hemostatic fibrin plug formation. In megaloblastic anemia, direct anoxia results in endothelial dysfunction. The loss of impermeability allows extrusion of whole blood and subsequent diffusion from the disrupted site throughout and above the nerve fiber layer. Therefore the biomicroscopic pattern of white centered hemorrhages observed in anemic retinopathy is most likely due to the clot formation as the reparative sequence after capillary rupture.

Introduction

Ocular symptoms can represent first signs of potentially life-threatening systemic disorders like severe anemia in this case. Accurate ophthalmologic assessment therefore facilitates timely diagnosis and subsequent therapy.

We report a case of severe vitamin B₁₂ deficiency anemia presenting with white centered retinal hemorrhages.

Case Report

A 40-year-old man, general practitioner himself, presented with a 1-day history of diminished left visual acuity and a drop-shaped central scotoma. He reported dyspnea seemingly caused by a respiratory tract infection, but an antibiotic therapy with amoxicillin/clavulanic acid 875/125 mg b.i.d., which he had prescribed himself 14 days before, had not induced any recovery so far.

The corrected visual acuities were 20/20, OD and 20/100, OS. Ophthalmic examination revealed bilaterally pale tarsal conjunctiva, discretely icteric bulbar conjunctiva and disseminated white centered intraretinal hemorrhages with foveal involvement ([fig. 1](#)). OCT imaging through these lesions revealed a retinal thickening caused by a sub-ILM accumulation of hyperreflective and inhomogeneous deposits within the nerve fiber layer (NFL) ([fig. 2](#)).

Immediate laboratory work-up showed: megaloblastic anemia caused by vitamin B₁₂ deficiency, with erythrocytes $0.95 \times 10^6/\mu\text{l} \downarrow$, Hb 4 g/dl $\downarrow\downarrow$, Hct 12.3% $\downarrow\downarrow$, MCH 42.1 pg $\uparrow$, MCV 129 fl $\uparrow$, thrombocytes $33 \times 10^9/\text{l} \downarrow$, vitamin B₁₂ 40 pmol $\downarrow\downarrow$, folate 4.9 $\mu\text{g/l}$, bilirubin 2.5 mg/dl $\uparrow$, γ -GT 340 U/l $\uparrow$, D-dimer 2,715 $\mu\text{g/l} \uparrow$, CRP and ESR normal. Because of vital threat, the patient was admitted to the department of internal medicine and consecutively administered four erythrocyte and two thrombocyte concentrates. The subsequent causal therapy with intravenous vitamin B₁₂ supplements resulted in resolution of the retinal changes ([fig. 3](#)) and the megaloblastic anemia with subsequent rise in VA.

Discussion

Most reports of white centered retinal hemorrhages have been described in patients with leukemic retinopathy and bacterial endocarditis. The retinal findings in the latter disease were first described by Moritz Roth (Swiss pathologist, 1839–1914). Roth's spots were considered as pathognomonic for subacute bacterial endocarditis but a wide spectrum of pathologies like leukemia, anemia, diabetes, sickle cell disease, scurvy and connective tissue disorders with increased capillary fragility can act as causative factors [1].

In leukemia the retina is involved more often than any other ocular tissue and the proposed histological correlate is capillary rupture accompanied by hemorrhage and an extravasal concentration of leukocytes. The pathophysiologic explanation for these capillary occlusions in leukemia is poorly understood. They may be related to endothelial ischemia secondary to anemia, direct occlusion by leukemic cells, occlusion by platelet fibrin aggregates, or sludging resulting from hyperviscosity. These lesions are found at all levels of the retina, but especially in the inner layers with focal destruction [2, 3].

It is interesting that this case of vitamin B₁₂ deficiency anemia retinopathy has a clinically indistinguishable fundus appearance. This is probably due to the common pathology of capillary disruption and subsequent hemostatic fibrin plug formation. In megaloblastic anemia, direct anoxia may result in endothelial dysfunction.

In maintaining vascular integrity furthermore, platelet function plays a decisive role by the maintenance of hemostasis. Hence it was shown that retinal lesions can be observed more frequently in anemic patients with concomitant thrombocytopenia [4] and the same coincidence was also observed in leukemic patients [3]. In this case, the patient presented with low platelet counts ($33 \times 10^9/l$) too. This association may substantiate the pathophysiologic hypothesis of disruption of vascular stability in anemia by disturbance of the balance between damaging endothelial factors and its reparative sequences.

The loss of impermeability allows extrusion of whole blood and subsequent diffusion from the disrupted site throughout and above the NFL. This is confirmed by histologic serial sections of white centered retinal hemorrhages showing a symmetric distribution of fibrin, platelets and infiltrating red blood cells arising from the point of damage to the capillary wall [1].

Accordingly, OCT cross sections through a white centered lesion depict hyperreflective deposits below the internal limiting membrane and thickening of the NFL most likely representing the fibrin-platelet hemostatic complex (fig. 4). Therefore the biomicroscopic pattern of white centered hemorrhages observed in anemic retinopathy seems to be due to the clot formation as the reparative sequence after capillary rupture [1].

Our case illustrates that vitamin B₁₂ deficiency anemia must be considered as a cause for white centered retinal hemorrhages. In our patient megaloblastic anemia was caused by vitamin B₁₂ deficiency, resulting from inadequate diet and alcohol abuse. Prompt assessment of blood samples is obligatory because of possible vital threat and the need for consecutive therapy.

Disclosure Statement

The authors indicate no financial relationship of any kind and state to have full control of all primary data and agree to allow *Case Reports in Ophthalmology* to review their data if requested.

Fig. 1. Multiple white centered retinal hemorrhages at the posterior pole.

Fig. 2. Peripapillary white centered retinal hemorrhages.

Fig. 3. Follow-up image with resolution of retinal hemorrhages 4 weeks after initial therapy.

Fig. 4. OCT section of white centered lesion with thickening of the NFL and hyperreflective deposits below the internal limiting membrane.

References

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