Tractional Retinal Detachment Related to Hemoglobin C Trait Retinopathy: A Case Report

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Abstract

Hemoglobin C (HbC) disease is an uncommon disease that is generally considered benign, causing only occasionally painless hematuria, osteomyelitis, and dental abnormalities. Ocular manifestations have rarely been described in these patients. Here we report a novel ophthalmological manifestation of the disease. A 20-year-old woman presented with progressive visual loss in her right eye due to tractional retinal detachment. The left eye was apparently normal, but wide-field fluorescence angiography showed mild peripheral ischemia with multiple vascular abnormalities. Vitrectomy was performed and the systemic workup revealed the presence of hemoglobinopathy C in heterozygous form. HbC disease can be sight-threating due to retinal proliferation, similar to sickle cell retinopathy. Patients affected with this disease should undergo regular surveillance. Ultra-wide angiography is a helpful examination to detect peripheral ischemia in the earlier stages.

Keywords: Hemoglobin C trait, sickle cell retinopathy, retinal detachment, tractional retinal detachment, case report

Introduction

Sickle cell retinopathy is a retinal disease that consists of multiple vascular phenomena that have been well described, including peripheral vascular obliteration, sea-fan neovascularization, and hemorrhages. These findings are a consequence of vaso-occlusion in the peripheral retina and have been associated with a variety of hemoglobinopathies such as sickle cell anemia and sickle-C disease.

Similar findings have been described in other hemoglobinopathies, such as hemoglobin C (HbC) disease, which can be present either in a homozygous or heterozygous state. Homozygous HbC disease is uncommon and most patients are asymptomatic, although it may cause moderate hemolytic anemia, splenomegaly, and microspherocytes.[1] Heterozygous HbC disease is more common, being present in 2-3% of the African-American population and 17-28% of the black population in West Africa.[2] Although this entity has traditionally been considered benign, only occasionally causing painless hematuria, osteomyelitis, and dental abnormalities, some reports have described a proliferative retinopathy in these patients.[3,4] We now describe an extreme case of tractional retinal detachment in a 20-year-old patient affected by heterozygous HbC disease.

Case Report

A 20-year-old female patient who was a native of Ghana residing in Barcelona for the last 3 years consulted the emergency department complaining of progressive visual impairment in her right eye for the last 4 months. She reported no personal medical history or ocular disease. Her visual acuity was hand motions in the right eye and Snellen 20/20 in the left eye. The anterior segment showed mild anterior chamber reaction and abundant cells in the anterior vitreous in her right eye. The left eye was completely normal. Intraocular pressure was 10 mmHg and 18 mmHg, respectively.

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Fundoscopy of the right eye was difficult due to abundant vitreous haze but revealed a tractional retinal detachment in the posterior pole that extended beyond the vascular arcades, with an important area of fibrovascular proliferation in the superior temporal arch with sickle-shaped retinal folds towards the periphery and subretinal fibrotic tracts. In the lower region, two areas of proliferation with sickle-shaped folds were identified. In addition, a marked peripheral vascular attenuation was observed. Fluorescein angiography revealed vascular attenuation and peripheral vascular loops, showcasing severe peripheral ischemia. Increased contrast uptake without clear contrast leakage was observed in the area of fibrovascular proliferation (Figure 1). Fundoscopy of the left eye was apparently normal, but a detailed study of fluorescein angiography images showed mild peripheral ischemia with vascular abnormalities (Figure 2).

It was decided to perform vitreoretinal surgery in the right eye. A 23-gauge pars plana vitrectomy was performed with hyaloid dissection (induced posterior vitreous detachment). Traction zones were dissected with the vitreotome and the vitreoretinal proliferation was released with bimanual technique. Perfluorocarbon was injected, draining subretinal fluid and flattening the macula and lower retina. Traction persisted in the superior retina, so a superior retinotomy was performed from the 11 to 1 clock hours, after which the entire retina was flattened. Endolaser was applied around the superior retinotomy and silicone oil exchange was performed.

A complete workup study was initiated to identify the etiology of the case. Various entities were considered in the differential diagnosis, including sickle cell retinopathy, familial exudative vitreoretinopathy, peripheral vasculitis, and retinopathy of prematurity. Given the characteristics of the patient and the high probability of sickle cell retinopathy, a study of hemoglobinopathies was performed and revealed the presence of heterozygous HbC (38.5%), but no hemoglobin S (HbSC). The hematology department adopted a watch-and-see approach due to the benign nature of hemoglobinopathy C in heterozygous form.

After two years of follow-up, the retina remained attached under silicone oil and vision improved from hand motions to counting fingers at 50 cm in the patient's right eye. Furthermore, follow-up optical coherence tomography scans showed an important destructuring of the inner and outer layers of the retina, given the chronicity of the retinal detachment at presentation (Figure 3).

Discussion

HbC is a variant of normal hemoglobin A caused by the substitution of a single glutamic amino acid at position 6 on the β chain to a lysine. It is similar to HbSC, in which there is a substitution of glutamic acid in the same position by valine. Unlike in sickle cell disease, HbC does not polymerize under conditions of low oxygen tension, so it does not cause the same elongation of the erythrocyte's cell membrane producing the characteristic sickle shape. However, HbC can form precipitates in the form of crystals inside the erythrocytes, increasing their rigidity. This can lead to hyperviscosity and decreased red blood cell life span. Nevertheless, the vaso-occlusive crises seen in sickle cell disease do not happen in HbC disease, unless it is combined with HbSC.

Retinal ischemic phenomena related to the HbC trait have been described very rarely. Most reports have described peripheral vascular abnormalities including obliteration and vascular loops. There are also cases of sea-fan neovascularization similar to the retinopathy caused by sickle cell anaemia.[3,4] Welch and Goldberg[5] examined the ocular fundus of nine patients with HbC and found that three of them had retinal vascular changes such as venous tortuosity and obliteration of peripheral capillaries, suggesting that these findings might not be that rare. No ocular findings in homozygous HbC disease have been reported to date.

This case is the first to report a tractional retinal detachment related to the HbC trait. It is of particular interest that we could observe two different stages of the same disease in this patient: a more advanced stage with severe peripheral ischemia and tractional retinal detachment in the right eye versus an earlier phase with mild peripheral ischemia and secondary vascular anomalies in the left eye.

We believe the role of wide-field fluorescence angiography in this case should be highlighted. It is a relatively new

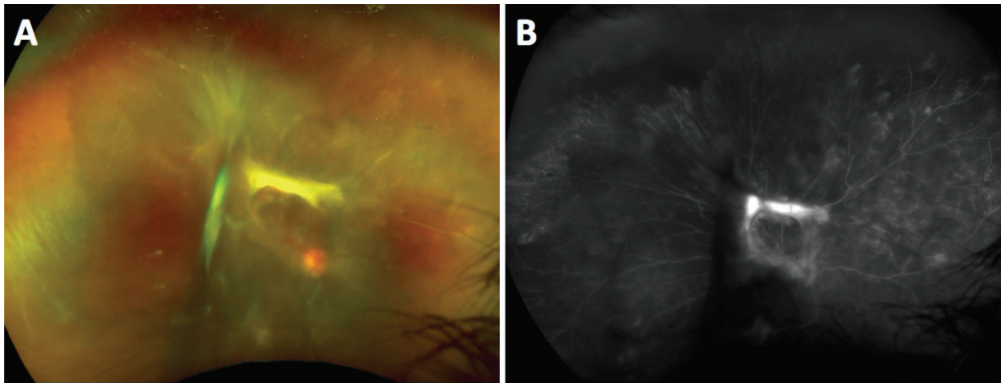

Figure 1. Wide-field retinography (A) of the right eye shows the presentation of the tractional retinal detachment, with prominent fibrovascular proliferations along the vascular arcades. Wide-field angiography (B) of the right eye shows marked ischemia and peripheral vascular attenuation

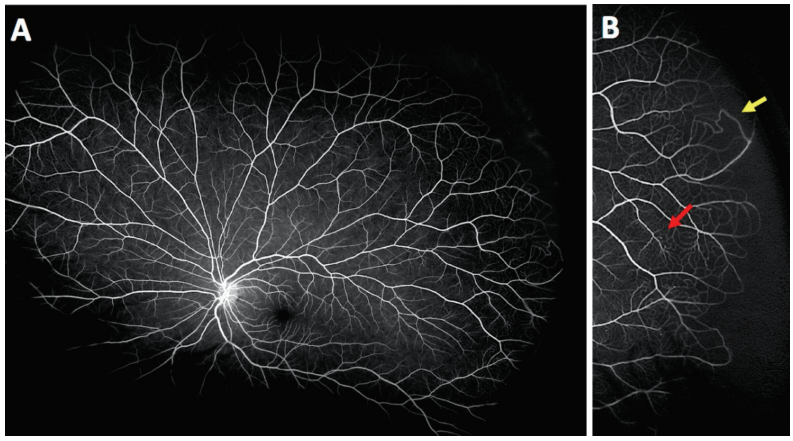

Figure 2. Wide-field angiography of the left eye (A) and a detailed view of the periphery (B) showing peripheral ischemia and vascular abnormalities, including vascular loops and telangiectasias (yellow arrow) and microaneurysms (red arrow)

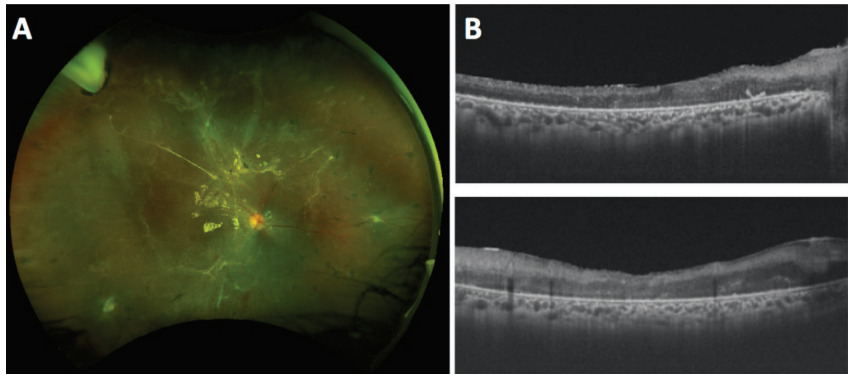

Figure 3. Wide-field retinography (A) and optical coherence tomography (OCT) (B) after surgery. The retina remains flattened with silicone oil as a tamponade, but marked atrophy can be seen on OCT, which indicates poor visual function and prognosis

technology that permits the study of vascular changes in the extreme periphery, such as in retinopathy of prematurity, sickle cell retinopathy, or peripheral vasculitis.[6,7,8] These changes may be missed during routine fundoscopy, whereas ultra-wide field fluorescein angiography permits a better study of this area.

In conclusion, proliferative retinopathy may be present not only in association with sickle cell disease, but also in other hemoglobinopathies in which there is no sickling. These hemoglobinopathies, such as the HbC trait, can be sight-threatening despite being generally considered a benign disease. The use of ultra-wide field fluorescein angiography may reveal a higher prevalence of this retinopathy than previously reported.

Ethics

Informed Consent: Obtained.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: X.G-S., C.G-A., S.B.G., J.G-A., Concept: X.G-S., C.G-A., S.B.G., J.G-A., Design: X.G-S., C.G-A., Data Collection or Processing: X.G-S., Y.B., Analysis or Interpretation: X.G-S., Y.B., Literature Search: X.G-S., Y.B., Writing: X.G-S., C.G-A., Y.B., S.B.G., P.B., J.G-A.

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