

Case Report

OCT Angiography Use in Pregnancy: Branch Retinal Artery Occlusion Associated with Patent Foramen Ovale – A Case Report and Multimodal Analysis

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Keywords

Branch retinal artery occlusion · Patent foramen ovale · Pregnancy · OCT angiography

Abstract

This case report is a multimodal analysis of a pregnant patient with branch retinal artery occlusion (BRAO) associated to patent foramen ovale (PFO). A 28-year-old woman presented at the clinic 20 h after an acute, painless black spot appearance in the inferior temporal visual field of the right eye (OD). At that time, she was 18 weeks pregnant and had no report of complications in her previous pregnancy. Best-corrected visual acuity was 1.0 in both eyes. Color fundus photo, perimetry, and OCT angiography were required. The results clearly showed an embolus in the superior nasal retinal arteriole, associated with a pallor in the distal retina. Patient was referred to a cardiologist and a transcranial Doppler with contrast indicated a right-to-left intracardiac shunt, confirmed by the presence of a PFO at the transesophageal echocardiography. Thrombophilic conditions were excluded. Enoxaparin 1 mg/kg was started and kept until the delivery. Now, a PFO surgical closure is on schedule. This case highlights the noteworthiness of considering PFO as a source of embolism for BRAO in young patients, the capability of OCTA as a dye-free method for use in pregnancy and emphasizes the importance of systemic evaluation in patients with BRAO.

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Introduction

Retinal artery occlusion (RAO) is an ophthalmic emergency, requiring prompt medical assessment and rapidly becoming irreversible. The blockage can either occur in the central retinal artery occlusion (CRAO) or one of its branches (branch retinal artery occlusion [BRAO]). Among risk factors for BRAO are systemic conditions such as hypertension, hypercholesterolemia, obesity, thrombophilia, and diabetes mellitus. In terms of epidemiology, the main referred cause of BRAO is embolic obstruction being cardiac valvular diseases, atrial fibrillation and the carotid artery the most common sources of endogenous emboli.

The diagnosis of BRAO is usually made with a simple funduscopic examination, showing a pallor following the course of the occluded branch and a view of the emboli in almost two-thirds of the cases. For diagnostic procedures, fluorescein angiography (FA), a contrast-based invasive method, remains the gold standard and can be used to observe the perfusion of the retinal arteries and visualize the embolus. The use of FA in pregnancy remains controversial. Optical coherence tomography (OCT) can be used as an alternative method, exhibiting an increased inner retinal reflectivity and thickness corresponding respectively, to an atrophy of the neurosensory tissue and a retinal edema due to reperfusion can be detected. Nowadays, OCT angiography (OCTA) has emerged as a noninvasive contrast-free alternative method to evaluate the vasculature, though its use in pregnancy has been poorly reported. In this report, a 28-year-old healthy pregnant patient with OCTA documented BRAO associated with a patent foramen ovale (PFO) and emphasized the importance of systemic evaluation in patients with BRAO.

Case Presentation

A 28-year-old woman, 18 weeks pregnant at that time, came to the clinic 20 h after the appearance of an acute, painless dark spot in the inferior temporal visual field of the right eye. She was pregnant for the second time and had no report of complications in her previous pregnancy. Best-corrected visual acuity was 1.0 in both eyes. Anterior segment examination was normal. Color fundus photo, perimetry, and OCTA were required.

Color fundus photo (Fig. 1a) and red-free photo (Fig. 1b) in the right eye clearly showed an embolus in the superior nasal retinal arteriole associated with a pallor in the distal retina. *En face* OCT (Fig. 1c) also showed an artery embolus, and OCTA (done 3 weeks later) (Fig. 1d–i) has demonstrated the decorrelation signal in the superior nasal artery, indicating reperfusion. Perimetry (Fig. 1j) confirmed total scotomas in the inferior temporal visual field. Patient was then referred to a cardiologist for further investigation of possible sources of emboli.

A transcranial Doppler with contrast (Fig. 2) evidenced a severe number of microbubbles into the brain circulation even at rest and an increased quantity during the Valsalva maneuver, indicating the presence of an intracardiac right-to-left shunt and a higher risk of paradoxical embolism. A transesophageal echocardiography confirmed the presence of a PFO with atrial septal aneurysm. Thrombophilia studies were normal.

Enoxaparin 1 mg/kg was started as treatment and was kept until delivery. Postpartum, a surgical close of the defect is scheduled.

Discussion

RAOs including BRAO and CRAO are infrequent in childhood and young adults, occurring even more occasionally in the setting of pregnancy [1]. The RECO study group [2] and the American Academy of Ophthalmology (AAO) emphasized [3] the importance of a systematic

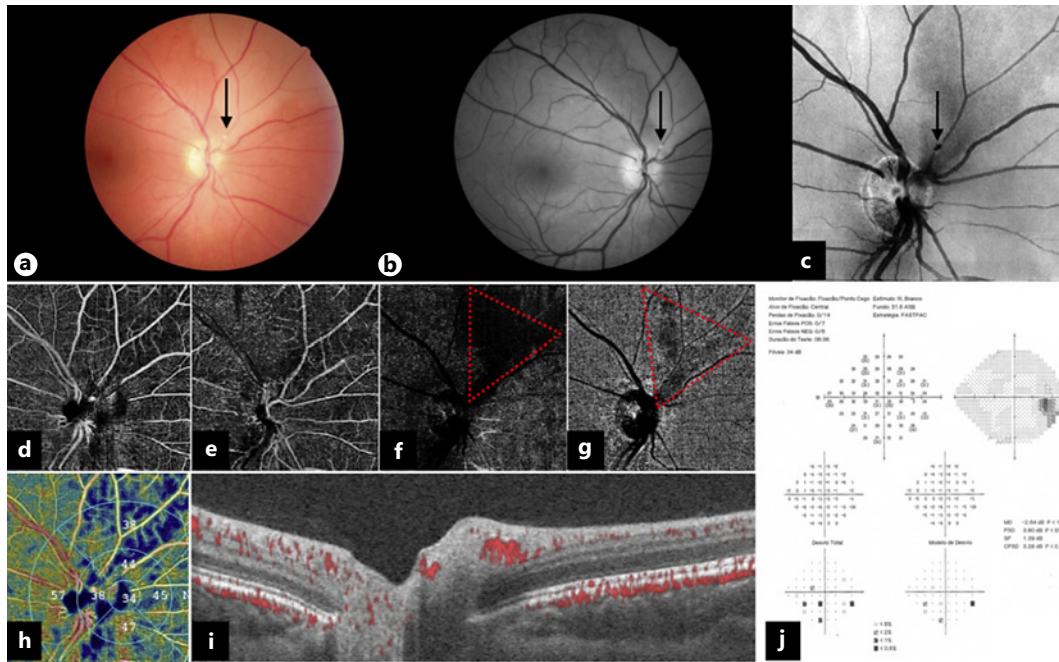


Fig. 1. Color fundus photo (a) shows an embolus (black arrow) in the superior nasal artery associated to a pallor area distal to the embolus. Red free (b) easily exposes the embolus (black arrow) and the pallor area distal to the embolus. En face OCT (c) also shows the embolus (black arrow). OCTA (d–i), 3 weeks after the onset, shows that the vessel has decorrelation signal distal to the embolus, despite a dark area (red dotted triangle) in the outer retina (f) and choriocapillaris slabs (g). Perimetry (j) identifies total scotomas in the inferior temporal quadrant.

evaluation of young patients with RAO, presenting results of almost 1 out of every 2 patients with acute RAO had an echocardiography with cardiac abnormality and were deemed to be at high risk for cardioembolic diseases. During pregnancy, it is well established the presence of a hypercoagulable state induced by the Virchow triad. Pregnancy has even been suggested as an isolated risk factor for BRAO [1].

PFO is a persistent foramen ovale, a flaplike opening between the atrial septum primum and secundum at the location of the fossa ovalis. It was first described in 1,564, and there is increasing evidence of PFO as the guilty party in paradoxical embolic such as cryptogenic stroke and peripheral artery occlusion [4]. There are no more than a handful of reports of PFO as a source of emboli for RAO [5–7] and only three of them occurring in pregnancy [8].

FA is a method often withdrawn from the possible alternatives in expectancy due to contrast use, being rated category C by the Federal Drugs and Administration (FDA). We are deeply convinced that OCTA plays an important diagnostic role in such cases. To our knowledge, this is the second case report in the literature of BRAO in pregnancy documented with OCTA [8], reinforcing the capability of this dye-free method to evaluate the unexplored vasculature in this population. OCTA works detecting and quantifying the retinal microcirculation by capturing the motion difference of the static neurosensory retina and the red blood cells flow in retinal vessels, allowing three-dimensional vascular information and, therefore, showing changes secondary to ischemia in BRAO such as loss of the smaller capillarity network and density. In our case, OCTA was performed 3 weeks after the symptoms had started and that might be the reason a decorrelation signal could be identified, indicating a possible reperfusion on the superficial plexus. However, both outer retina (red dotted triangle – Fig. 1f) and choriocapillaris slabs (red dotted triangle – Fig. 1g) showed a hyporeflective area due to signal loss artifact

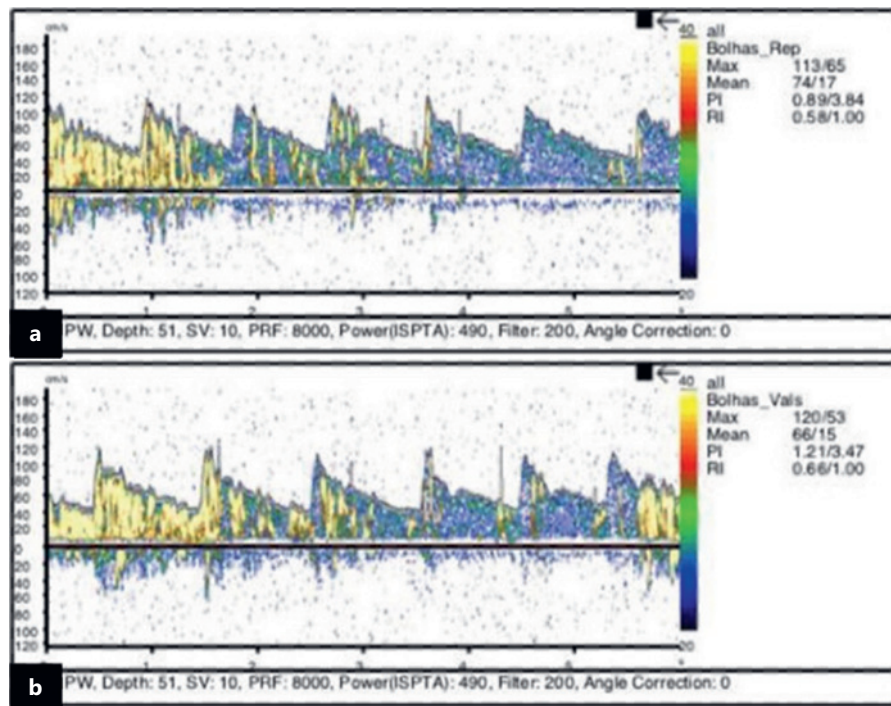


Fig. 2. Transcranial Doppler with gaseous contrast medium shows the curtain pattern (high-grade shunt) even at rest (**a**) and after Valsalva maneuver (**b**). Presence of a cardiac right-to-left shunt is due to PFO with high paradoxical embolism risk.

caused by a residual localized tissue edema. This finding was also reported by Banda et al. [8]. Nonetheless, Banda et al. [8] also reported vascular reperfusion on their report. The CARE Checklist has been completed by the authors for this case report, attached as online supplementary material (for all online suppl. material, see www.karger.com/doi/10.1159/000528142).

This case highlights the noteworthiness of considering PFO as a source of embolism for RAO in young patients, the possibility of vasculature evaluation in pregnancy with OCTA, and the importance of early referral to a cardiologist for PFO diagnosis and treatment preventing further paradoxical embolic events.

Statement of Ethics

Written informed consent for publication was obtained from the patient for publication of the details of her medical case and any accompanying images. Ethical approval is not required for this study in accordance with local guidelines.

Conflict of Interest Statement

The authors declare that they have no competing interests.

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Author Contributions

Carlos Moreira-Neto, Guilherme Barreto, Raphael Pereira, Paulo Ishida, and Romulo Torres made substantial contributions to the acquisition of the data. Gabriel Rammert Pipolo, Carlos Moreira-Neto, and Guilherme Barreto contributed by writing up the manuscript. Carlos Moreira Jr and Guilherme Barreto analyzed and interpreted the patient images and revised the manuscript.

Data Availability Statement

All data generated or analyzed during this study are included in this article and its online supplementary material. Further inquiries can be directed to the corresponding author.

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