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Macular shunt in radiation retinopathy

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1. Case report

A female in her twenties was referred for unilateral vision loss. The best-corrected visual acuity was counting fingers. Medical history was relevant for radiotherapy for a left lacrimal gland tumor three years prior. Before radiotherapy fundoscopy and optical coherence tomography (OCT) were unremarkable. The present fundus examination showed a hemorrhage covering the full extent of the macula, lipid exudates, and a tuft of peripheral pre-retinal neovascularization, compatible with proliferative radiation retinopathy.[1] Intravitreal injection (IVI) with anti-VEGF was advised. Four weeks later, as the hemorrhage partially resolved swept-source OCT-Angiography disclosed a direct communication between a superficial arteriole and a deep capillary plexus draining venule (macular shunt) at the nasal perifovea (Fig. 1A).[2] Displacement and enlargement of capillaries forming a vortex shape were observed between the lower boundary of the outer plexiform layer and the retinal pigment epithelium layer (Fig. 1B and C). The patient received a further intravitreal injection of anti-VEGF. At the follow-up examination one month after treatment, visual acuity, and the macular shunt remained unchanged (Fig. 2). No further treatments were recommended.

2. Discussion

We report here on a macular shunt acquired after radiotherapy. Radiation retinopathy is a slowly progressive microangiopathy that occurs months to years after exposure of the eye to ionizing radiation and is associated with the development of macular edema, hemorrhage, capillary leakage, and eventually neovascularization.[1] Shields et al. found an enlargement of the foveal avascular zone and decreased parafoveal capillary density by OCTA in eyes that underwent radiation therapy.[3] To our knowledge, there have been no reports of macular shunts with OCTA in patients with radiation retinopathy. Macular shunts represent a direct connection between an artery and a vein without an intervening capillary bed. Ischemic retinopathies, as vein occlusion, may be accompanied by microvascular arteriovenous shunts.[4] Arteriovenous shunts are thought to begin as new vessels that grow and become true shunts. We hypothesize that in this case the abnormal vascular remodeling is related to radiation-induced vascular changes. Our report shows that the macular shunts do not regress with anti-VEGF, even if this is anecdotal.[5]

3. Conclusion

We describe the novel observation of a macular shunt in a patient with radiation retinopathy. It is hypothesized that a direct shunt between a retinal arteriole and a draining vein occurs due to abnormal vascular remodeling and does not regress with anti-VEGF injections.

Patient consent

Consent to publish this case report has been obtained from the patient in writing.

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Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

CRediT authorship contribution statement

Pedro Carreira: Formal analysis, Investigation, Writing – original draft. **Mara Ferreira:** Resources, Validation, Writing – review & editing. **Margarida Brízido:** Formal analysis, Supervision, Validation, Writing –

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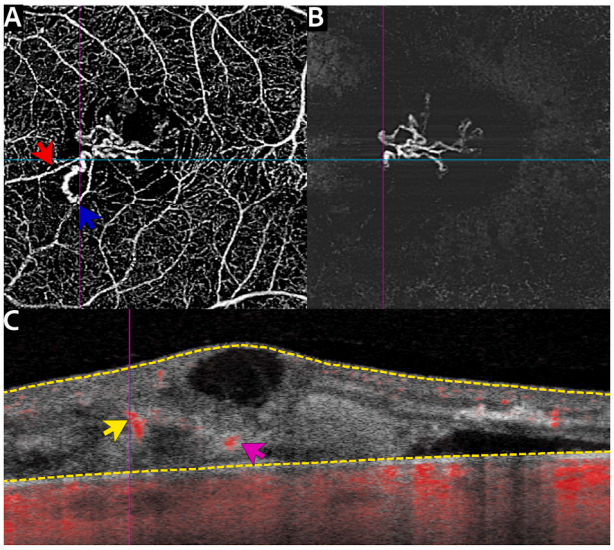

Fig. 1. Swept-source Optical Coherence Tomography Angiography (OCT-A) exam centered in the left-eye fovea (3 × 3mm). **A.** En-face OCT-A spanning the full-retina thickness shows a vortex-shaped vascular complex at the central macula arising after the communication of a superficial arteriole (red arrow) with a venule (blue arrow). The coordinates of the communication are indicated by the intersection between the magenta and cyan lines. **B.** En-face OCT-A slab of the retinal avascular zone shows a vascular complex of vortex-shaped enlarged capillaries converging towards a central draining venule. **C.** OCT B-scan with flow overlay shows segmentation lines (dashed yellow lines) used for the en face projection (A) and shows the direct communication between the arteriole and a venule (yellow arrow) and enlarged retinal capillaries (magenta arrow). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

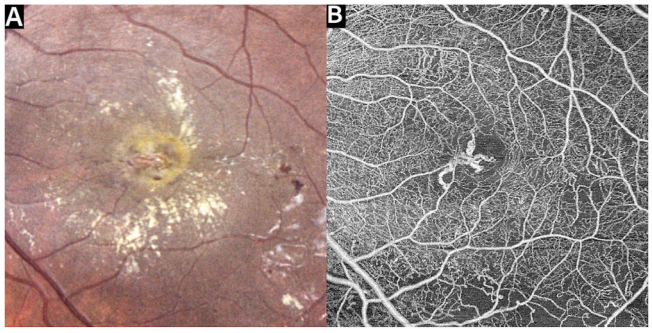

Fig. 2. Color fundus photography (CFP) and swept-source Optical Coherence Tomography Angiography (OCT-A) exam centered in the left-eye macula region (6 × 6mm) four weeks after the second intra-vitreal injection of anti-VEGF. (A) CFP shows lipid exudates in a circinate pattern peripheral to yellowish lesion with dilated vessels and punctate hemorrhages in the center. (B) OCT-A spanning the full-retina thickness shows telangiectatic vessels and areas of capillary dropout. The arteriovenous shunt aspect remained unchanged. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

review & editing. **Diogo Cabral:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Validation, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

The authors have no conflict of interest.

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Nothing to disclose.

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