American Journal of Ophthalmology Case Reports 32 (2023) 101894

Contents lists available at ScienceDirect

American Journal of Ophthalmology Case Reports

journal homepage: www.ajocasereports.com/

Optical coherence tomography angiography imaging in peripheral commotio retinae: A case report

Masaki Suzue [a], Nobuhiko Shiraki [a,*], Susumu Sakimoto [a], Kazuichi Maruyama [a,b,c], Kohji Nishida [a,c]

[a] Department of Ophthalmology, Osaka University Graduate School of Medicine, Suita, Japan
[b] Department of Vision Informatics, Graduate School of Medicine, Osaka University, Suita, Japan
[c] Integrated Frontier Research for Medical Science Division, Institute for Open and Transdisciplinary Research Initiatives, Osaka University, Suita, Japan

ARTICLE INFO

Keywords:
Optical coherence tomography angiography
Commotio retinae
Retinal tear

ABSTRACT

Purpose: We present a case of traumatic commotio retinae (CR), in which blood flow was evaluated using optical coherence tomography angiography (OCTA).

Observations: An 18-year-old Japanese man presented with traumatic retinal detachment and CR in his left eye, which had been hit by a handball. Fundus examination revealed peripheral retinal tear extending from the 1 to 3 o'clock position with retinal detachment, and CR near the area of tear. Fluorescein angiography (FA) confirmed an ischemic area near the retinal tear area at the CR. The patient underwent successful scleral buckling and cryopexy. Sequential OCTA imaging was performed and we were able to determine perfusion in the CR area, with maintained blood flow.

Conclusions and importance: In blunt eye trauma, peripheral commotio retinae can be assessed non-invasively over time using OCTA. OCTA is a useful method for evaluating peripheral retinal whitened areas.

1. Introduction

Commotio retinae (CR), a common ocular fundus feature following blunt eye trauma, involves retinal whitening with hemorrhage. CR is found in approximately 9.4% of all ocular trauma cases.[1] Based on a histopathologic study, the whitened area is thought to be caused by photoreceptor outer segment disruption.[2] The CR area also shows increased reflectivity in the photoreceptor outer segment on optical coherence tomography (OCT).[3] Further, optic coherence tomography angiography (OCTA) of macular and peripapillary lesions associated with blunt eye trauma have shown impairment of the retinal microvasculature.[4]

It is important to determine whether blood circulation is maintained in the whitened peripheral retinal area in cases of blunt eye trauma, as necrotic areas have increased risk of retinal rupture.[5] Although fluorescein angiography (FA) is a useful method for identifying retinal perfusion, it is somewhat invasive and difficult to repeat; in contrast, OCTA can evaluate blood flow non-invasively. However, there are few reports demonstrating blood flow in CR, and no report has evaluated peripheral CR and whether the CR area becomes necrotic.[6]

Here, we describe a case of blunt eye trauma associated with CR and traumatic rhegmatogenous retinal detachment. A whitened lesion in the periphery of the rhegmatogenous retinal detachment was evaluated using sequential OCTA, and the lesion was successfully diagnosed as CR.

2. Case report

A healthy 18-year-old Japanese man with no prior ocular history was hit by a handball in his left eye (OS). His Snellen best-corrected visual acuity (BCVA) was 20/20 OS and in his right eye (OD). The intraocular pressure was 15 mmHg OD and OS. Fundus examination with a wide-field fundus camera (Optos Silverstone®, Nikon, Tokyo, Japan) showed peripheral retinal tear extending from the 1 to 3 o'clock position, with retinal detachment and a whitened area in the superotemporal region OS (Fig. 1). There was no significant change OD. FA revealed capillary stasis and perivascular leakage in the whitened area, and in the more peripheral area there was nonperfusion (Fig. 2). The hyperperfusion area corresponded to the retinal tear area. We captured OCTA(PLEX® Elite 9000, Zeiss, Oberkochen, Germany) images with a field of view of 12 × 12mm and examined them using the automated

* Corresponding author. Department of Ophthalmology, Osaka University Graduate School of Medicine, 2-2 Yamadaoka, E-7, Suita, Osaka 565-0871, Japan.
E-mail address: nobuhiko.shiraki@ophthal.med.osaka-u.ac.jp (N. Shiraki).

https://doi.org/10.1016/j.ajoc.2023.101894
Received 24 January 2023; Received in revised form 31 May 2023; Accepted 9 July 2023
Available online 17 July 2023

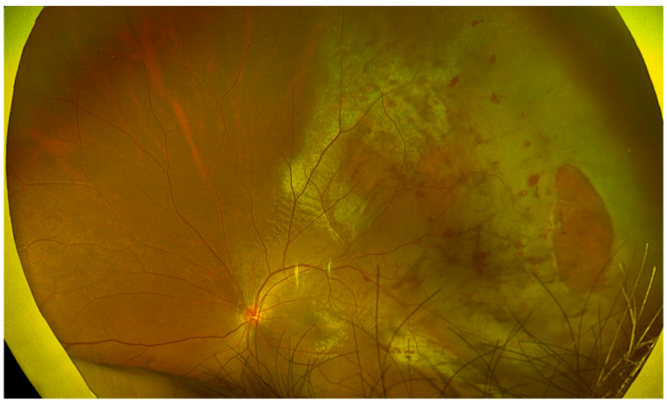

Fig. 1. A wide-field fundus camera; Macular-on rhegmatogenous retinal detachment and commotio retinae are observed in the supero-temporal retina. In this area, retinal tear, extending from the 1 to 3 o'clock position, is observed.

Fig. 2. Fluorescein angiography (FA); Perivascular leakage is observed in the commotio retinae area (arrow), with more peripheral nonperfusion.

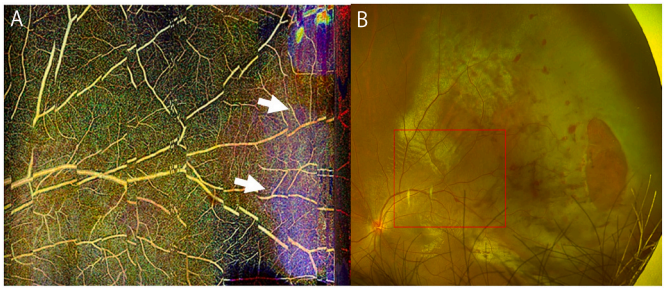

Fig. 3. (A)Optical coherence tomography angiography (OCTA); Pre-operative optical coherence tomography angiography shows that the commotio retinae area (arrow) has maintained blood flow (Pseudo-colors are used to indicate superficial vessels (red), deep vessels (green), and avascular (blue)). (B) A wide-field fundus camera shows the postoperative retinal attachment. The area displayed by OCTA is indicated by a red line. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

superficial retinal slab. OCTA showed that the whitened area was filled with blood flow (Fig. 3A and B).

The patient was treated using scleral buckling. We performed cryotherapy on the perimeter of the tear; we did not perform prophylactic laser photocoagulation or cryotherapy on the whitened area. During the postoperative period, OCTA revealed maintained blood flow in the whitened area (Fig. 4A–E), and there was no evidence of retinal breaks or retinal necrosis in this area. Two months postoperatively, FA showed hyperfluorescein at the cryopexy area, and the whitened area was filled with blood flow (Fig. 5). Therefore, a definitive diagnosis of CR was made in the whitened area, and no laser or other treatments for CR were performed. At four months postoperatively, the retina remained attached and his BCVA was 20/20 OS.

3. Discussion

Almost half of eye trauma cases are sustained by children younger than 17 years of age, and eye trauma is the most common cause of unilateral blindness in children.[7] Thus, the prevention of subsequent complications is crucial in the management of eye trauma. CR is a common finding in blunt trauma to the eye. CR was first reported by Berlin in 1873.[8] In CR, the retina has a whitish appearance due to extracellular edema.

In the present case, it was necessary to determine whether the whitened area became necrotic, as this area was complicated by traumatic retinal detachment. The differential diagnosis between CR and traumatic retinal necrosis is important because subsequent retinal breaks may occur in necrotic lesions. We hypothesized that evaluating the perfusion status of the peripheral lesion would help with the diagnosis, as necrotic lesions have no blood circulation. Blunt trauma may secondarily cause peripheral tears following vitreous base traction.[9] Therefore, it is crucial to determine whether there is a problem that must be treated. However, in the present case, the whitened area extended toward the vascular arcade, and it was difficult to perform prophylactic laser photocoagulation or cryotherapy because of atrophic creep. As FA

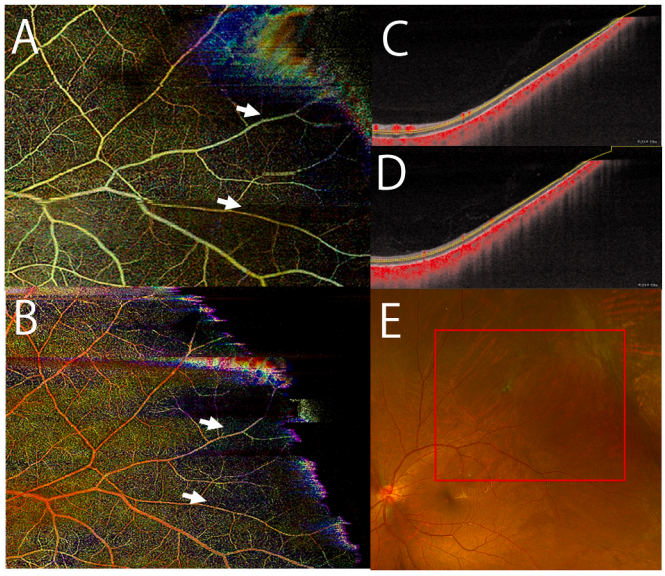

Fig. 4. (A,B) Optical coherence tomography angiography (OCTA); OCTA shows maintained blood flow in the commotio retinae area (arrow) at 1 week (A) and 2 months (B) postoperatively (Pseudo-colors are used to indicate superficial vessels (red), deep vessels (green), and avascular (blue)). (C,D) OCT B-scan corresponding to the same area of OCTA show an OCT signal flow in the area at 1 week (C) and 2 months (D) postoperatively. (E) A wide-field fundus camera shows the postoperative retinal attachment. The area displayed by OCTA is indicated by a red line. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

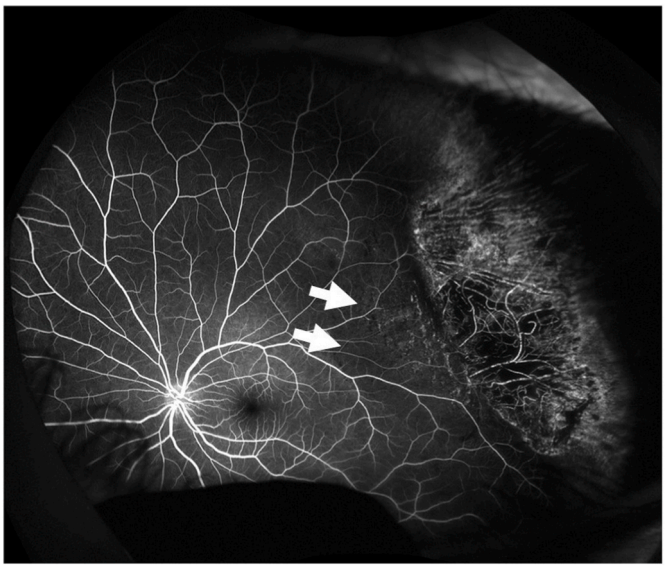

Fig. 5. Fluorescein angiography; Hyper-fluorescein (window defect) (red dots line) is observed at the cryopexy area during surgery. The commotio retinae area (white arrow) can be observed as filled with blood flow.

can cause various side effects, such as nausea, vomiting, extravasation, and local tissue necrosis, it would have been difficult to perform repeated FAs during the observation period.[10,11] Thus, we decided to use OCTA with swept-source OCT, which can capture a relatively large area, allowing us to non-invasively perform repeated evaluations over time.

4. Conclusions

In the present case, the whitened area did not become necrotic and there was no further formation of retinal breaks. The patient was successfully treated prophylactic photocoagulation, or cryotherapy. This case demonstrates that whitened lesions associated with severe traumatic retinal detachment can be non-invasively and frequently evaluated without numerous FAs to determine whether the CR area becomes necrotic, increasing the risk of retinal tears. Therefore, we considered OCTA to be a very important and useful method for the non-invasive assessment of retinal blood flow in CR.

Patient consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Financial support

None.

Funding sources

None.

Authorship

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

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.

Acknowledgements

None.

References

1. Atmaca LS, Yilmaz M. Changes in the fundus caused by blunt ocular trauma. *Ann Ophthalmol.* 1993;25(12):447–452.
2. Mansour AM, Green WR, Hogge C. Histopathology of commotio retinae. *Retina.* 1992;12(1):24–28.
3. Sony P, Venkatesh P, Gadaginamath S, Garg SP. Optical coherence tomography findings in commotio retina. *Clin Exp Ophthalmol.* 2006;34(6):621–623.
4. Montorio D, D'Andrea L, Cennamo G. Retinal vascular features in ocular blunt trauma by optical coherence tomography angiography. *J Clin Med.* 2020;9(10):3329.
5. Johnston PB. Traumatic retinal detachment. *Br J Ophthalmol.* 1991;75(1):18–21.
6. Montorio D, D'Andrea L, Cennamo G. Retinal vascular features in ocular blunt trauma by optical coherence tomography angiography. *J Clin Med.* 2020;9(10):3329.
7. Rapoport I, Romem M, Kinek M, et al. Eye injuries in children in Israel. A nationwide collaborative study. *Arch Ophthalmol.* 1990;108(3):376–379.
8. Berlin R. Zur sogenannten commotio retinae. *Klin Monatsbl Augenheilkd.* 1873;11:42–78.
9. Youssri AI, Young LH. Closed-globe contusion injuries of the posterior segment. *Int Ophthalmol Clin.* 2002;42(3):79–86.
10. Yannuzzi LA, Rohrer KT, Tindel LJ, et al. Fluorescein angiography complication survey. *Ophthalmology.* 1986;93(5):611–617.
11. Moosbrugger KA, Sheidow TG. Evaluation of the side effects and image quality during fluorescein angiography comparing 2 mL and 5 mL sodium fluorescein. *Can J Ophthalmol.* 2008;43(5):571–575.