CORRESPONDENCE

Atypical indocyanine green angiography findings after indocyanine green-assisted internal limiting membrane peeling

Indocyanine green (ICG) is a cyanine dye with a peak spectral absorption at approximately 800 nm. Because infrared light penetrates the retinal layers, ICG angiography (ICGA) is better at imaging the circulation of deeper layers (i.e., choroidal circulation) than fluorescein angiography (FA). Additionally, ICG has a high affinity for basement membranes and is commonly used to visualize the lens capsule and internal limiting membrane (ILM) during ophthalmic surgery.[1,2]

Here, we report atypical ICGA findings that were apparent on both still and video images throughout the postoperative period after vitrectomy with ICG-assisted ILM peeling. The study adhered to the tenets of the Declaration of Helsinki and was approved by the Institutional Review Board of Osaka University Graduate School of Medicine (Approval No. 10039). Informed consent was obtained from the patient after detailed explanation of the nature of the procedures.

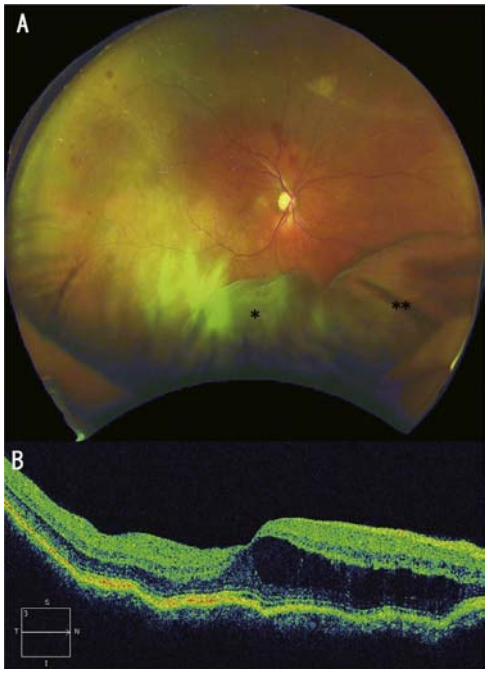


Fig. 1—Ultra-wide field (UWF) fundus photograph (A) and optical coherence tomography (OCT) image (B) before surgical repair of a retinal detachment. An inferonasal bullous retinal detachment (*) and a choroidal detachment (**) are apparent in the UWF photograph (A). The OCT image shows macular edema accompanied by a choroidal fold (B).

A 62-year-old male with a superotemporal visual field defect in his right eye was referred to our hospital with a diagnosis of inferonasal retinal detachment (RD). The patient had a 15-year history of insulin-independent diabetes mellitus, and his hemoglobin A1c level was 7.2%. At presentation to our clinic, his best-corrected visual acuity (BCVA) was 20/25 OD and 20/16 OS. Ophthalmic examinations confirmed the presence of an inferonasal bullous RD with a choroidal detachment, macular edema (ME), and a choroidal fold in the right eye (Fig. 1).

A 25-gauge vitrectomy combined with cataract surgery was performed using the Constellation Vision System (Alcon Japan Ltd, Tokyo, Japan) under local anaesthesia. Posterior vitreous detachment was created after core vitrectomy. Peripheral vitrectomy and vitreous base shaving were performed with scleral indentation using a noncontact wide-viewing system. No obvious retinal breaks were detected. A 0.1–0.2 mL intravitreal injection of 0.25% ICG was administered to help visualize the ILM. Immediately after injection, the ICG solution was washed from the eye. The ILM over the macula was then peeled to reduce ME. Subretinal fluid was trans-sclerally drained, and the vitreous cavity was filled with 1000 centistokes silicone oil (Silikon; Alcon Japan Ltd) to prevent postoperative macular involvement and to make ophthalmic examinations easier to perform.

Swept-source optical coherence tomography (SS-OCT) performed 2 days after surgery showed choroidal thickening in the right eye, which made choroidal luminal structures difficult to visualize. Both FA and ICGA were performed 2 days after vitrectomy (Fig. 2). In the right eye, FA showed mild leakage and hyperfluorescence caused by retinal pigment epithelium atrophy, and ICGA revealed an absence of retinal arcade blood perfusion (Video 1). No FA or ICGA abnormalities were detected in the left eye. The patient did not report ocular hyperemia or pain, but SS-OCT findings led to a diagnosis of RD secondary to posterior scleritis.

A previous study on ICGA features in posterior scleritis did not find any abnormalities of retinal arcade blood perfusion.[3] Comparison of the intraoperative video and the postoperative ICGA video revealed a hyporeflective area in the macula that corresponded to the area of ILM peeling (Fig. 3). Therefore, we theorized that retinal arcade perfusion was not detected on postoperative ICGA in the right eye because of a hyperfluorescence caused by residual ICG (originally administered during surgery) in the retina.

The patient was administered a systemic glucocorticoid after surgery, and the retina flattened. Silicone oil was removed from the eye 15 weeks after primary vitrectomy, and the RD did not recur (Fig. 4). At this

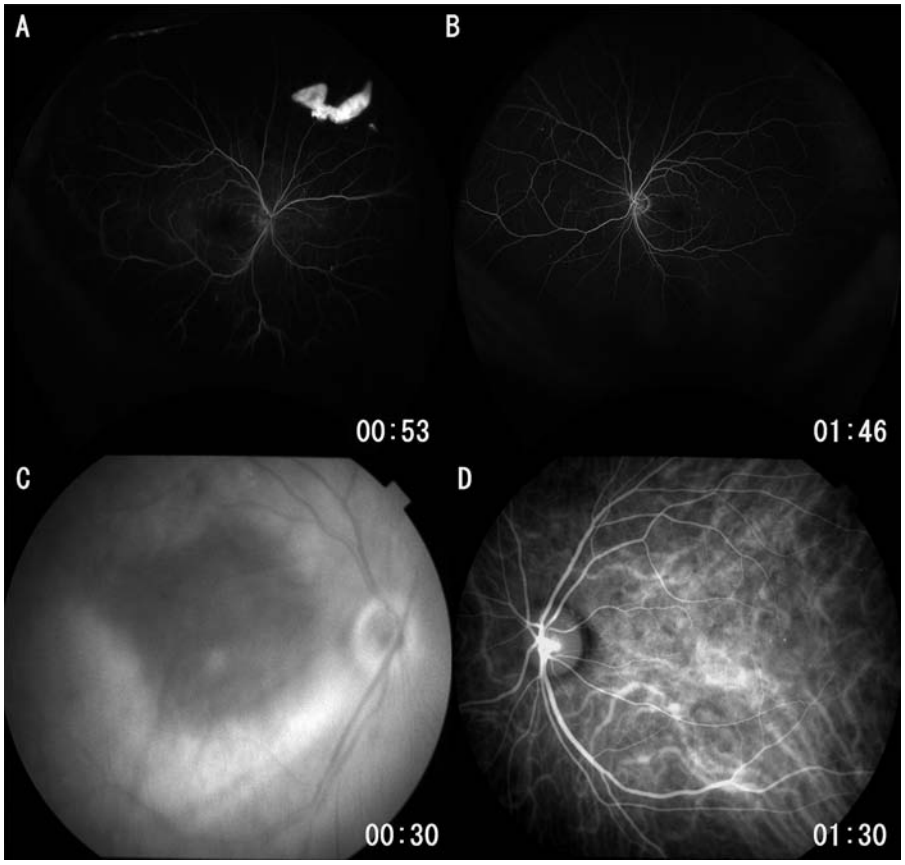
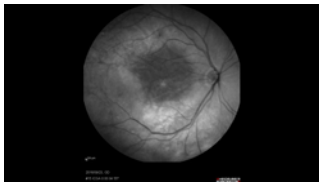


Fig. 2—Ultra-wide field fluorescein angiography (UWFA) images in the right (A) and left (B) eyes. Indocyanine green angiography (ICGA) images taken with Heidelberg Retina Angiograph 2 (HRA2; Heidelberg Engineering, Inc, Heidelberg, Germany) in the right (C) and left (D) eyes. Both UWFA and ICGA were performed 2 days after vitrectomy performed to repair a retinal detachment. After vitrectomy, the vitreous cavity of the operative eye (right eye) was filled with silicone oil. The time between intravenous dye injection in the arm and image capture is shown in the lower right corner.

time, BCVA was 20/25 OD. The day after this second surgery, ICGA was repeated to evaluate posterior scleritis activity. At this time, the signal intensity of the residual ICG was weak enough that the underlying fluorescence of the intravenously injected ICG was detectable (Video 2). Additionally, ICG could be seen migrating toward the optic disc along the vascular arcade after ICG fluorescence image sensitivity and illumination were adjusted (Fig. 5).

There have been several reports[4–8] of persistent ICG fluorescence after vitrectomy with ICG-assisted ILM peeling since the first report[9] about residual ICG after macular hole surgery by Weinberger et al. Here, we show atypical ICGA findings on both still and video images after vitrectomy with ICG-assisted ILM peeling in the eye, with RD secondary to posterior scleritis.



Video 1.

The retina had residual ICG after ICG-assisted ILM peeling that persisted for over 15 weeks after surgery. Serial ICG fluorescence images taken throughout the postoperative period showed that residual ICG appeared to diminish over time, migrating toward the optic disc along the vascular arcade. These findings are in agreement with those of Cekic et al.,[10] who reported ICG migration into the optic nerve via nonaxoplasmic extension after intravitreal ICG injection in rabbits. The potential toxicity of ICG on retinal pigment epithelium, retinal ganglion cells, and photoreceptors has been reported.[11] Therefore, understanding how long ICG remains in retinal tissues after ILM staining is important.

Video ICGA obtained 2 days after primary vitrectomy showed that hyperfluorescence from residual ICG in the