망막전막 제거를 위한 유리체절제술 중 인도시아닌그린 주사 후 발생한 망막열공의 3년 경과

Three-Year Follow-Up of an Iatrogenic Retinal Break after Indocyanine Green Injection During Pars Plana Vitrectomy for Epiretinal Membrane Removal

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Purpose: To report a case of retinal break formed after intravitreal injection of indocyanine green during pars plana vitrectomy for epiretinal membrane removal.

Case summary: A 63-year-old female patient with a metamorphopsia and decreased visual acuity in her left eye was diagnosed as epiretinal membrane and underwent pars plana vitrectomy for epiretinal membrane removal. During intravitreal injection of indocyanine green for internal limiting membrane peeling, a retinal break was formed at 1-disc diameter above the fovea because of a bolus injection. The retinal break did not show any other complications anatomically during three years, but microperimetry showed decreased retinal sensitivity around the retinal break.

Conclusions: Retinal break developed after intravitreal injection of indocyanine green showed non-progression anatomically during three years, but functional disability remained.

Keywords: Indocyanine green; Internal limiting membrane peeling; Microperimetry; Retinal break; Spectral domain optical coherence tomography

Introduction

Indocyanine green (ICG) is used to improve internal limiting membrane (ILM) visualization during ILM peeling [1]. One complication of ICG staining is subretinal delivery of ICG, which had been reported during macular hole surgery [2,3]. Here, we report a case of a retinal break and sequential sub-retinal delivery of ICG that was made by forceful injection

of ICG dye during pars plana vitrectomy (PPV) for epiretinal membrane (ERM) removal and its three-year follow-up.

Case Report

A 63-year-old woman presented with decreased vision and metamorphopsia of the left eye, and the best corrected visual

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Figure 1. Fundus image and microperimetry. Preoperative fundus photograph revealed epiretinal membrane and tortuous retinal vessels at the posterior pole (A). The intraoperative fundus photograph showed an iatrogenic retinal break and subretinal migration of the indocyanine green (ICG) dye directly after ICG injection (B). Fundus examination and microperimetry performed three years postoperatively indicated that the iatrogenic retinal break (black arrow) was still present, in addition to decreased retinal sensitivity corresponding to the lesion affected by previous ICG migration (C, D).

acuity (BCVA) was 20/70. Fundus examination and an optical coherence tomography (OCT) scan showed ERM (Fig. 1A, 2A). Following ERM removal, 0.5% ICG was applied to stain the ILM. During the instillation of ICG with a 1 mL syringe connected to a 26-gauge cannula, a dye embolus was forcefully and suddenly introduced into the vitreous cavity. An iatrogenic retinal break with subretinal delivery of ICG developed approximately 1-disc diameter above the fovea (Fig. 1B). No additional procedure was performed for the retinal break. After ILM peeling, 18% SF6 gas tamponade was performed. At three years after PPV, the retinal break was still present with a final BCVA of 20/20 (Fig. 1C). On microperimetry (MAIA, CenterVue, Padova, Italy) examination, retinal sensitivity at the corresponding lesion decreased (Fig. 1D). Serial OCT examinations (Stratus OCT, Carl Zeiss Meditec Inc., Dublin, CA; 3D OCT-1000 Mark II, Topcon Corp., Tokyo, Japan) revealed that the retinal break showed a wedge-shaped retinal defect, and the defect remained without progression during the three years after vitrectomy (Fig. 2B-D).

Figure 2. Optical coherence tomography (OCT) images. Time domain-OCT (6 mm in length, 512 pixels) images showed an epiretinal membrane over the macula preoperatively (A) and a wedge-shaped defect of the outer layer ten weeks after vitrectomy (B). Spectral domain-OCT (6 mm, 1,024 pixels) images acquired postoperatively revealed that the previous wedge-shaped defect remained. The external limiting membrane (arrow) was observed eight months after surgery (C) and was followed by partial restoration of the underlying photoreceptor layer defect (arrowhead) three years after surgery (D).

On time domain-optical coherence tomography (TD-OCT) images, markedly decreased outer retinal thickness, especially in the outer nuclear layer around the retinal break, was presented. At 8 months, the hyper-reflective external limiting membrane (ELM) without underlying inner segment/outer segment (IS/OS) junction reflectivity was observed at eight months after PPV. After three years, the hyper-reflectivity from the IS/OS junction was partially detected around the retinal break.

Discussion

In this case, retinal break was suggested to be made from a jetstream by ICG dye without pre-existing retinal break, and ICG dye was infiltrated and located in the subretinal space. The retinal break did not show hole enlargement or progress to retinal detachment during three years.

The anatomical status of the outer retina was not clearly defined on TD-OCT images because of its low resolution. However, on SD-OCT images, disrupted or attenuated IS/OS

junction reflectivity was detected with the presence of ELM around the retinal break at 8 months. At three years after surgery, the IS/OS junction reflectivity was partially recovered and showed hyper-reflectivity continuous from the fovea. In addition to anatomical damages, functional disability with decreased retinal sensitivity around the retinal hole was detected on microperimetry exam and it was wider than that of the retinal hole. This might be because the IS/OS junction was not restored completely in spite of the presence of ELM around the retinal break.

It is uncertain whether the cause of anatomical and functional abnormalities was the trauma, subretinal ICG toxicity or a combination. Subretinal ICG may cause toxicity to the outer retina and induce histological and functional damages to the retina [4,5]. So, in addition to the trauma by jetstream, ICG toxicity might affect the outcome. In this study, however, the outer retinal thinning around the retinal break did not progress over three years [6,7]. In addition, persistent subretinal ICG might induce retinal pigment epithelium atrophy [8], but the reflectivity of retinal pigment epithelium did not change over three years. In conclusion, retinal hole caused by traumatic ICG dye injection and subretinal ICG remained stable during three years after PPV, but a functional defect remained at the lesion with subretinal ICG.

Conflicts of Interest

The authors have no proprietary or commercial interest in any material discussed in this article.

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