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SHORT COMMUNICATION

Macular edema and visual loss after macular pucker surgery with ICG-assisted internal limiting membrane peeling

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PURPOSE. *To describe the occurrence of massive macular edema and visual loss after indocyanine green-assisted (ICG) macular pucker surgery.*
METHODS/RESULTS. *A 74 years old female presented with a macular pucker and a hypertrophy of the retinal pigment epithelium (RPE) in her left eye. The preoperative visual acuity (VA) was 20/100. Surgery consisted of cataract extraction, lens implantation and standard pars plana vitrectomy with peeling of epiretinal tissue followed by the removal of the internal limiting membrane (ILM) remnants stained using a 0.05% ICG solution. One day after surgery, VA was counting fingers. There was an extensive macular edema and retinal thickening with hyperfluorescence during fluorescein angiography and pronounced autofluorescence using ICG filters. During follow up, the macular edema resolved completely, but VA decreased to 20/800 at six months postoperatively. There was a central scotoma and unstable fixation seen during microperimetry.*
DISCUSSION. *This case report indicates that ICG might come into contact with bare retina if injected following removal of epiretinal membranes. Whether the observed RPE hypertrophy might have contributed to the pathogenesis of the adverse effect described remains hypothetical. (Eur J Ophthalmol 2005; 15: 289-91)*

KEY WORDS. *Indocyanine green, Macular pucker surgery, Toxicity*

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INTRODUCTION

Indocyanine green (ICG) was introduced to intraoperatively stain and facilitate the removal of the internal limiting membrane (ILM) during surgery for macular holes or macular pucker. Since then reports on functional outcome of ICG-assisted vitrectomy were contradictory, with some authors describing beneficial and others unfavorable results (1, 2). Several pathomechanisms such as photosensitizing effects (3) have been hypothesized to explain unfavorable results after ICG-assisted vitrectomy. We describe the occurrence of macular whitening following ICG-assisted macular pucker surgery.

Case report

A 74-year-old woman presented with a macular pucker and a retinal pigmented epithelium (RPE) hypertrophy in her left eye (Fig. 1A). Fluorescein angiography disclosed distorted vessels and late leakage (Fig. 1B). Best-corrected visual acuity (VA) was 20/25 in the right and 20/100 in the left eye. Because of significant lens opacification, a combined procedure of cataract extraction, lens implantation, and pars plana vitrectomy was performed. After core vitrectomy (Millennium Bausch & Lomb vitrectomy 19 G system), a detachment of the posterior hyaloid was induced. The epiretinal membrane was first incised (20 G

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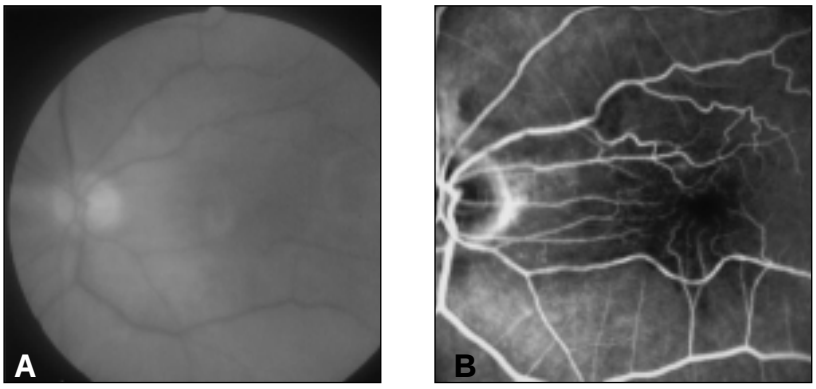

Fig. 1 - *Fundus photograph* **(A)** *and fluorescein angiography* **(B)** *before surgery. Note the opaque appearance of the macula and the presence of a retinal pigmented epithelium (RPE) hypertrophy* **(A)**. *The distortion of retinal vessels and leakage becomes apparent during angiography* **(B)**.

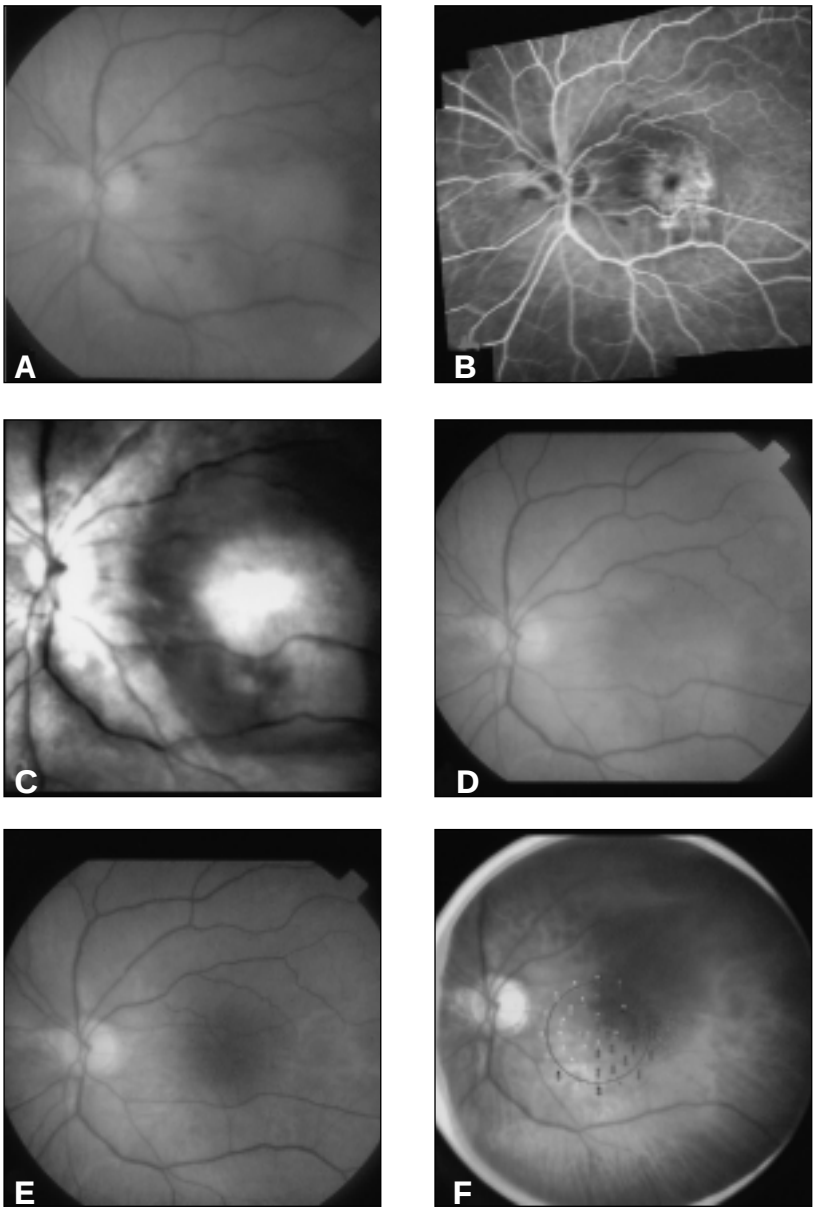

Fig. 2 - *Postoperative findings after indocyanine green (ICG)–assisted macular pucker surgery: One day postoperatively, an extensive, diffuse whitening and thickening of the macular region occurred* **(A)**. *Fluorescein angiography disclosed a hyperfluorescent lesion with late leakage* **(B)** *and autofluorescence using ICG filters revealed a marked hyperfluorescent macular lesion* **(C)**. *One week later* **(D)** *a regression of the macular edema was noted and appeared more confined to the area of macular retinal pigmented epithelium (RPE) hypertrophy. One month later, a complete resolution was noted* **(E)**. *Six months postoperatively, microperimetry (Nidek MP1) revealed unstable fixation and a large relative central scotoma* **(F)**.

bent needle) and then peeled with a vitreous forceps. Then, ICG was used to stain remnants of the ILM. A 0.05% ICG solution was prepared by diluting 25 mg of dry ICG powder with 10 mL of glucose 5%. Four milliliters of glucose 5% were then added to 1 mL of this solution after placing a 0.22 µm Millipore filter unit (Millex GS Carrighwohill Co., Cork, Ireland) at the end of the syringe. The dye was injected over the posterior pole into the BSS-filled globe and removed by irrigation through an aspiration cannula a few seconds later. The stained ILM remnants were peeled using an end-gripping forceps. No intraoperative complications occurred surgery lasted 40 minutes. At the first postoperative day VA was counting fingers. We observed an extensive, diffuse whitening and thickening of the macular region (Fig. 2A). Fluorescein angiography showed a hyperfluorescent lesion with late leakage due to a breakdown of the outer blood–retinal barrier (Fig. 2B). Autofluorescence using ICG filters showed a marked hyperfluorescent macular lesion (Fig. 2C). One week later, a regression of the whitening and thickening in the macular area was seen and the lesion was confined to the area of macular RPE hypertrophy (Fig. 2D). One month later a complete resolution was noted with the RPE hypertrophy being clearly visible (Fig. 2E). Six months postoperatively, VA was only 20/800 in the operated eye. Microperimetry revealed unstable fixation and a large central scotoma (Fig. 2).

DISCUSSION

A possible explanation for the observed massive macular edema after ICG-assisted macular pucker surgery might be the fact that ICG was used after initial removal of epiretinal tissue. We know from histopathologic evaluations that the ILM is often removed in part along with epiretinal membranes. We therefore hypothesize that, as in our case, ICG might have come into contact with bare retina or even the nerve fiber layer itself and penetrated into deeper retinal layers. It remains speculative whether or how the visible hypertrophy of the RPE contributed to the adverse effect presented or whether RPE hypertrophy might accelerate potential photosensitizing effects. The choice of glucose 5% as a solvent medium for ICG was based on previous reports describing no adverse effects on functional outcome (4) and in vitro studies suggesting that toxicity of ICG on RPE cells was probably related to the hypo-osmolarity of the solvent and may be avoided by using glucose 5% as a solvent medium (5). As a consequence, we considered the ICG solution applied in our patient to be safe enough for intraoperative application. However, this case report indicates a potential source of retinal damage and underlines that ICG should be used with care, especially when considering its use in situations where bare retina is potentially exposed. This might be the case in ICG assisted macular pucker surgery (6) or double staining techniques using trypan blue for removal of epiretinal tissue and ICG for subsequent ILM peeling as previously published (7).

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