

---

**SHORT COMMUNICATION**

---

**Case report**

# A simple way to prevent indocyanine green from entering the subretinal space during vitrectomy for retinal detachment due to myopic macular hole

M. FACINO<sup>1</sup>, B. MOCHI<sup>1</sup>, S. LAI<sup>2</sup>, R. TERRILE<sup>1</sup>

<sup>1</sup>Department of Ophthalmology, Padre Antero Micone Hospital, Genova Sestri Ponente

<sup>2</sup>University Eye Clinic, Genova - Italy

---

**PURPOSE.** *To present a safe and simple method of preventing indocyanine green (ICG) from entering the subretinal space in patients undergoing vitrectomy for retinal detachment caused by myopic macular hole.*

**PATIENTS AND METHODS.** *Four consecutive highly myopic eyes (three phakic, one pseudophakic) with retinal detachment due to myopic macular hole were operated on by pars plana vitrectomy. The ICG-assisted peeling of the internal limiting membrane was performed after temporarily closing the macular hole by means of a small bubble of perfluorocarbon liquid (PFCL) in order to prevent ICG from entering the subretinal space.*

**RESULTS.** *Retinal reattachment was successful in all patients, and anatomic closure of the macular hole occurred during the follow-up period (range 3 to 10 months).*

**CONCLUSIONS.** *A small bubble of PFCL prevents ICG dye from entering the subretinal space during vitrectomy for retinal detachment due to macular hole in highly myopic eyes. (Eur J Ophthalmol 2004; 14: 269-71)*

**KEY WORDS.** *Indocyanine green, Internal limiting membrane, Myopic macular hole, Perfluorocarbon liquids, Retinal detachment*

---

*Accepted: January 18, 2004*

## INTRODUCTION

Macular hole in highly myopic eyes is a well known condition that can present with or without retinal detachment (1). Vitrectomy, including the removal of the membranes that lie on the macular surface (posterior hyaloid, epiretinal membranes, internal limiting membrane [ILM]), can effectively repair these eyes (1-3). In particular, ILM peeling has proven to be both anatomically and visually effective. Nevertheless, recognition and removal of such a structure can be difficult and

may damage the retina. In order to make the ILM more easily visible, indocyanine green (ICG) has been used to completely and effectively remove interfacial membranes without damaging the retina (2). However, recent reports have raised questions regarding the safety as well as the potential toxicity of ICG to both the retina and the retinal pigment epithelium (RPE) (4-6).

The purpose of this study is to present a safe, simple method to prevent ICG from entering the subretinal space in patients undergoing vitrectomy for retinal detachment caused by myopic macular hole.

## Surgical Technique

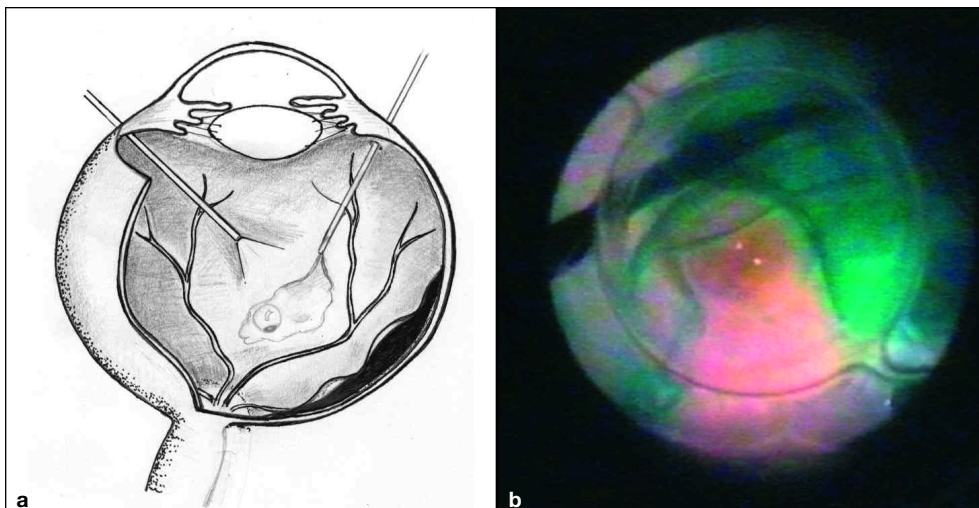
Four consecutive highly myopic eyes (three phakic, one pseudophakic) with retinal detachment due to myopic macular hole were operated on by pars plana vitrectomy. After complete core vitrectomy and shaving of the vitreous base, fluid-air exchange with drainage of the subretinal fluid through the macular hole was performed. The goal of this step was not to completely flatten the retina but to drain the subretinal fluid just enough to have a concave shape of the detached retina. Thereafter, perfluorocarbon liquid (PFCL) was injected over the posterior pole followed by air-fluid exchange. Then, to stain the ILM at the posterior pole, ICG was prepared: 25 mg of ICG powder was diluted in 10 ml of 5% glucose solution. To prevent ICG from entering the subretinal space via the macular hole, the volume of the PFCL bubble was reduced to place it just above the hole in order to temporarily close it. After lowering the infusion pressure to 5 mmHg, 0.2 ml of ICG solution was instilled directly over the macular area and left in the posterior vitreous cavity for 1 minute (Fig. 1). Following ICG and PFCL aspiration by flute cannula, ILM peeling was performed by creating a flap tear that was then grasped with end-gripping vitreoretinal forceps in order to obtain a circular maculorhexis. At the end of this procedure, complete fluid-air exchange with complete subretinal fluid drainage was performed, followed by air-gas

exchange with long lasting gas (sulfurhexafluoride). The patients were instructed to maintain a face down position for 2 weeks. Retinal reattachment was successful in all patients, and anatomic closure of the macular hole occurred during the follow-up period (range 3 to 10 months).

## DISCUSSION

Peeling the ILM surrounding the macular hole is technically difficult, mainly due to its diaphanous structure. In order to visualize the ILM more easily, ICG has been widely used as a surgical adjunct in vitreous surgery for macular hole repair. Moreover, ICG staining of the ILM has been used to treat highly myopic eyes with retinal detachment caused by a macular hole (2).

We have found that flattening the retina before releasing the tangential tractions around the macular hole is never complete, mainly related to poor retinal mobility and posterior staphyloma. If complete subretinal fluid drainage is carried out after membrane peeling, retinal reattachment can be performed more easily since the tangential tractions will already have been removed. As a consequence we suggest the use of a small bubble of PFCL before ILM staining, which effectively closes the macular hole temporarily and prevents ICG dye from entering the subretinal space.



**Fig. 1 - a)** Illustration of the surgical technique showing the injection of indocyanine green (ICG) (dotted area) over the retinal surface with the retinal hole temporarily closed by a small bubble of perfluorocarbon liquid (PFCL). **b)** The presence of a small bubble of PFCL placed over the macular hole to temporarily close it prevents ICG dye from entering the subretinal space.

Some recent reports (4-6) have hypothesized possible ICG-related damage to the retina and to the RPE. The adverse effects of intraoperative use of ICG would consist of RPE changes and/or atrophy, macular edema, and a selective delay in recovery of the focal macular electroretinogram b-wave.

In conclusion, despite the usefulness of ICG dye in the identification of ILM and epiretinal membranes, vitreoretinal surgeons must take into consideration the possible ICG-related adverse effects to the retina and RPE. We suggest a simple technique to pre-

vent dye from entering the subretinal space that can be used as a routine step during vitreous surgery for retinal detachment due to macular hole in highly myopic eyes.

Reprint requests to:  
Mario Facino, MD  
Via G. Amendola 10/3  
16145 Genova, Italy  
mafacino@tin.it

---

## REFERENCES

1. Stirpe M, Michels RG. Retinal detachment in highly myopic eyes due to macular holes and epiretinal traction. *Retina* 1990; 10: 113-4.
2. Kadonosono K, Futoshi Y, Norihiko I, et al. Treatment of retinal detachment resulting from myopic macular hole with internal limiting membrane removal. *Am J Ophthalmol* 2001; 131: 203-7.
3. Oshima Y, Ikuno Y, Motokura M, Nakae K, Tano Y. Complete epiretinal membrane separation in highly myopic eyes with retinal detachment resulting from a macular hole. *Am J Ophthalmol* 1998; 126: 669-76.
4. Engelbrecht NE, Freeman J, Sternberg P Jr, et al. Retinal pigment epithelial changes after macular hole surgery with indocyanine green assisted internal limiting membrane peeling. *Am J Ophthalmol* 2002; 133: 89-94.
5. Gandorfer A, Haritoglou C, Gass CA, Ulbig MW, Kampik A. Indocyanine green-assisted peeling of the internal limiting membrane may cause retinal damage. *Am J Ophthalmol* 2001; 132: 431-3.
6. Haritoglu C, Gass CA, Schaumberger M, et al. Macular changes after peeling of the internal limiting membrane in macular hole surgery. *Am J Ophthalmol* 2001; 132: 363-8.
7. Gandorfer A, Haritoglou C, Gandorfer A, Kampik A. Retinal damage from indocyanine green in experimental macular surgery. *Invest Ophthalmol Vis Sci* 2003; 44: 316-23.