Macular Hole Closure After Vitrectomy: The Inverted Flap Technique

SOCT Copernicus HR improves visualization of the retina and increases the understanding of retina pathology.

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Spectral-domain (SD) optical coherence tomography (OCT) is an innovative technology that enables high-speed, high-resolution imaging of the retina. Spectral OCT (SOCT) Copernicus HR (Optopol, Zawiercie, Poland) is a device with axial resolution of 3 µm, the highest resolution among commercially available SD OCT devices. Furthermore, it produces C-scans and maps of particular retinal layers. Imaging of the optic nerve head and cornea are also possible.

Vitrectomy with internal limiting membrane (ILM) peeling has become the method of choice in macular hole treatment. Anatomic success of 90% to 98%[1,2] is described by most authors in stage 2 and 3 macular holes. However, large, long-lasting stage 4 macular holes are still a surgical challenge. In these cases, not often described, a closure rate of 56% to 76% was noted.[3] Additionally in 18.0% to 38.7% cases with flat/closed configuration of the macular hole, characterized by flat margins of the macular hole, bare retinal pigment epithelium (RPE) is noted.[4,5] Visual acuity does not improve much in cases. This article describes a new technique developed in our department for the treatment of large macular holes and the use of SOCT in postoperative evaluation.

MACULAR HOLE CASE

A 20-year-old patient with a history of ocular trauma was diagnosed with neovascularization in a posttraumatic scar in both eyes and had three antivascular endothelial growth factor injections in each eye in another center (Figure 1). After the third injection, a macular hole was noted in his left eye, and the patient was referred to our clinic (Figure 2). Imaging with SOCT was performed and a macular hole with minimum diameter of 1,268 µm of and base diameter of 1,958 µm was noted. Initial visual acuity was 0.05 logMAR. In the foveal area, multiple RPE changes were noted.

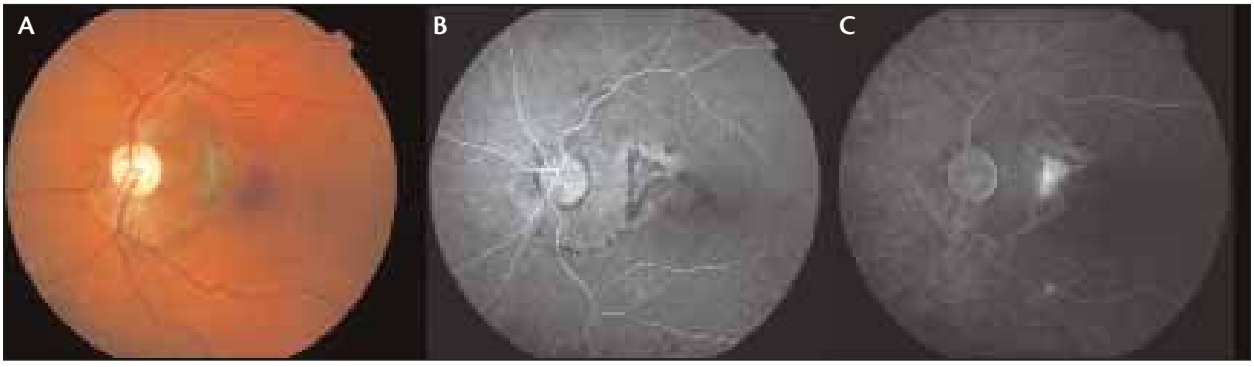

Figure 1. Color photograph before anti-vascular endothelial growth factor (anti-VEGF) injections (A). Early phase fluorescein angiogram before anti-VEGF injections (B). Late phase fluorescein angiogram before anti-VEGF injections. (C) Leakage spot can be seen near the fovea.

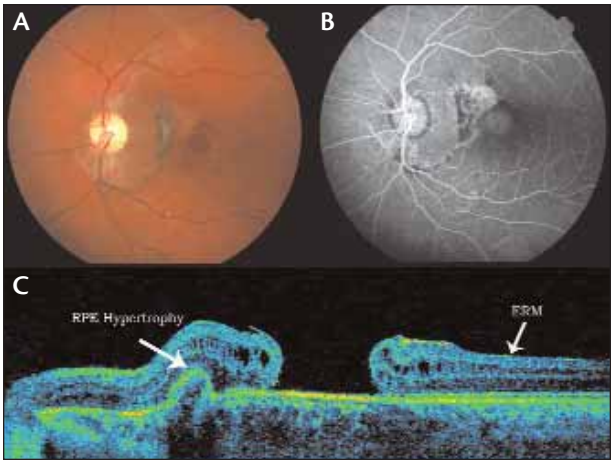

Figure 2. Macular hole in color fundus photograph after the third anti-VEGF injection (A). Macular hole in fluorescein angiography. On the nasal side of the fovea hyperfluorescence corresponding to changes of the retinal pigment epithelium without features of leakage (B). Stage 4 traumatic macular hole visualized with SOCT. Epiretinal membrane is visible on the surface of the retina. Additionally, RPE changes can be seen at the borders of the macular hole (C).

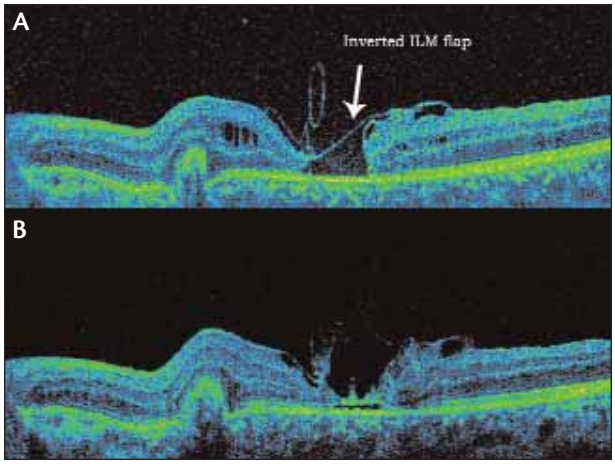

Figure 3. Macular hole 1 week after surgery. A hyperreflective line between flat borders of the macular hole can be seen with SOCT (A). Macular hole closed 1 month after surgery (B).

Because of the large size of the macular hole and suspected poor visual and anatomical outcome, a modification of standard vitrectomy—the inverted flap technique—was used. Core vitrectomy and trypan blue staining (0.5% solution of trypan blue irrigated after 1 minute) was performed, and the epiretinal membrane was removed. The ILM was grasped with vitreous forceps and peeled off in a circular fashion on an area of about two-disc diameters around the macular hole. After circumferential peeling, the peeled-off ILM was not removed completely from the retina, but left still attached to the edges of the macular hole. In this way, a rolled fragment of the peeled-off ILM was "hanging" into the vitreous cavity. A piece of the ILM slightly bigger than the size of the macular hole was cut at the edge of the macular hole with a vitreous cutter and left on the surface of the macular hole. Then the ILM was gently massaged over the macular hole from all sides. The ILM became inverted, so that the surface normally directed toward the vitreous body was turned toward the RPE. The macular hole remained closed with the inverted ILM flap.

At the end of surgery, the vitreous cavity was filled with air. The patient was advised to spend 3 to 4 days in a position in which he could see the air bubble in the center of the visual field at all times. One week after surgery, on SOCT flat margins of the macular hole were noted with an overhanging flap of hyperreflective tissue, probably ILM (Figure 3). Visual acuity was 0.15 logMAR. Three months after surgery the hyperreflective line connecting the borders of the macular hole became thicker, probably due to glial cells proliferation on top of the ILM. Visual acuity improved to 0.2 logMAR.

DISCUSSION

The inverted flap modification of standard vitrectomy for macular hole was performed in about 40 cases in the last 2 years (article in review). This innovative technique which allows the surgeon to achieve good anatomical and functional results in large stage 4 macular holes, was presented for the first time by our group in 2008. Spectral OCT enables not only improved visualization of the vitreoretinal interface but also explains the pathology and healing processes of retinal diseases. ■

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1. Beutel J, Dahmen G, Ziegler A, Hoerauf H. Internal limiting membrane peeling with indocyanine green or trypan blue in macular hole surgery: a randomized trial. *Arch Ophthalmol*. 2007;125:326–332.
2. Brooks HI Jr. Macular hole surgery with and without internal limiting membrane peeling. *Ophthalmology*. 2000;107:1939–1949.
3. Ip MS, Baker BJ, Duker JS, et al. Anatomical outcomes of surgery for idiopathic macular hole as determined by optical coherence tomography. *Arch Ophthalmol.* 2002;120(1):29–35.
4. Kang SW, Ahn K, Ham DI. Types of macular hole closure and their clinical implications. *Br J Ophthalmol.* 2003;87:1015–1019.
5. Michalewska Z, Michalewski J, Cisiecki S, Nawrocki J. High speed, high resolution spectral optical coherence tomography after macular hole surgery. *Graefes Arch of Clin and Exp Ophthalmol*. 2008;246:823–830.