

Successful Closure of Iatrogenic Double Macular Hole Using inverted Internal Limiting Membrane Flap Technique-Case Report

Adam Klus^{*}, Mariusz Kosatka, Milena Kozera and Marek Rękas

Ophthalmology Department, Military Institute of Medicine, Warsaw, Poland

^{*}Corresponding author: Adam Klus, Department of Ophthalmology, Military Institute of Medicine, Warsaw, Poland, Tel: +48501727343; E-mail: adamklus@gmail.com

Received date: July 14, 2016; Accepted date: December 26, 2016; Published date: December 31, 2016

Copyright: © 2016 Klus A, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Purpose: To present a case study describing inverted internal limiting membrane flap technique used after failed treatment of double large full-thickness macular hole.

Case presentation: A 79-year-old woman presented large full-thickness macular hole after primary failed pars plana vitrectomy with internal limiting membrane (ILM) peeling and SF6 gas endotamponade. The corrected distance visual acuity (CDVA) was 0.1 (Snellen chart). Optical coherence tomography (OCT) revealed two full-thickness macular holes. The first one of central location 825 μm in based diameter, and the second of nasal location 575 μm in based diameter. For this reason the patient was performed 25G posterior vitrectomy with inverted internal limiting membrane flap technique. The follow-up examinations were performed on day 1,7,30,180 postoperatively. Finally visual acuity was 0.4 (Snellen chart). Postoperative OCT confirmed MHs closure with the preservation of foveal profile.

Conclusion: It seems, that in the case of full-thickness macular hole which was not closed after the first surgery and even there came to a complication and the formation of iatrogenic full-thickness macular hole, the use of inverted internal limiting membrane flap technique can be a good solution.

Keywords: Macular hole; Pars plana vitrectomy; Inverted ILM flap technique; Case series

Abbreviations ILM: Internal Limiting Membrane; OCT: Optical Coherence Tomography; FTMH: Full Thickness Macular Hole; PPV: Pars Plana Vitrectomy; BCVA: Best-Corrected Visual Acuity; IOP: Intraocular Pressure

Background

Macular holes are an important cause of significant reduction in visual acuity. Macular hole surgery is a well-established method for the treatment of macular holes [1]. Vitrectomy for the treatment of macular holes was first described in 1991. Since then, numerous modifications of surgical technique have been applied, trying to get the best results after surgery. The inverted internal limiting membrane (ILM) flap (inverted ILM flap) technique has been proposed by Michalewska et al. to improve surgical treatment [2]. This technique was successfully applied for macular hole. The aim of this paper is to present the inverted ILM flap technique in iatrogenic double- full thickness macular hole.

Case Report

A 79-year-old female was referred to the Ophthalmology Department due to reduced visual acuity after ineffective surgery of full thickness macular hole (FTMH). 25 gauge pars plana core vitrectomy (PPV) was performed with internal limiting membrane (ILM) peeling and SF6 gas endotamponade. The best corrected visual acuity (BCVA) was 0.1 (Snellen chart). Postoperative optical coherence

tomography (OCT) revealed two full-thickness macular holes. The first one of central location 825 μm in based diameter, and the second of nasal location 575 μm in based diameter (Figures 1A and 1B). For this reason the patient was qualified for another 25G posterior vitrectomy.

Surgical Technique

Posterior pole was stained during 25-gauge vitrectomy. A fragment of retinal internal limiting membrane was found on the nasal side (Figure 1B). After ILM separation from the retinal layers, it was inverted to cover both holes (Figure 1C).

Inverted internal limiting membrane flap technique was applied [1,3]. Then, fluid-air exchange was performed and 2 cm^3 of SF6 were injected via pars plana to perform endotamponade. The patient was positioned for 24 h [4].

Results

The follow-up examinations were performed on day 1,7,30,180 postoperatively. Final visual acuity was 0.4 (Snellen chart). Postoperative OCT confirmed MHs closure with the preservation of foveal profile (Figure 1D).

Discussion

To the best of our knowledge this is first report of the successful treatment double large iatrogenic full thickness macular hole. Since its first description by Kelly and Wendel vitrectomy has been the gold standard of macular hole surgery [5]. Although an initial success rate of 68% was reported most surgeons currently achieve a success rate of

90% to 98% [5-7]. Conventional vitrectomy with ILM peeling was internal limiting membrane peeling remains a method of choice for the repair of FTMH [8,9]. Large macular holes are less likely to be closed after pars plana vitrectomy. Michalewska et al. first presented the inverted ILM flap technique in 2009 [10]. They hypothesize that the inverted ILM flap technique stimulates proliferation of glial cells that fill macular holes, thereby enhancing closure, improving macular hole closure rate, and improving postoperative visual acuity [2]. All of the above approaches and the inverted ILM flap technique have one thing in common: They may induce glial cell proliferation, resulting in the macular hole filling with proliferating cells that enhance closure [2]. In idiopathic MH, ILM peeling relieves foveal traction from the retinal surface by complete removal of any epiretinal tissues and by stimulation of gliosis [11-13]. There are some complications after macular peeling including focal retinal haemorrhages and edema, which generally resolves spontaneously without the need of treatment [14-17].

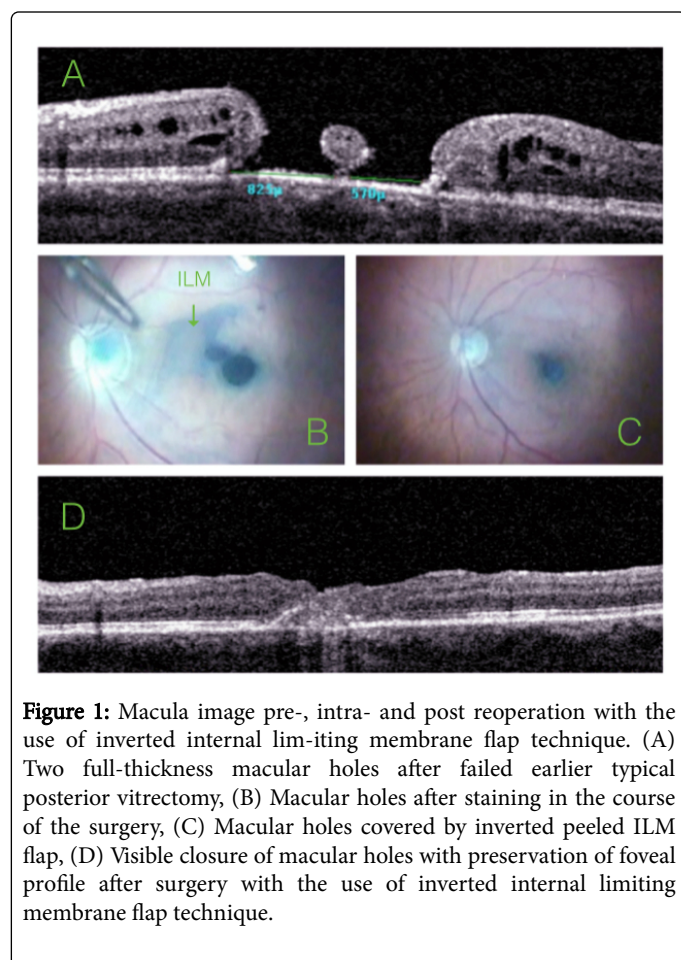


Figure 1: Macula image pre-, intra- and post reoperation with the use of inverted internal limiting membrane flap technique. (A) Two full-thickness macular holes after failed earlier typical posterior vitrectomy, (B) Macular holes after staining in the course of the surgery, (C) Macular holes covered by inverted peeled ILM flap, (D) Visible closure of macular holes with preservation of foveal profile after surgery with the use of inverted internal limiting membrane flap technique.

Paracentral scotomas and visual field defects, usually asymptomatic, have also been reported but not directly correlated with the removal of the ILM and could result from adjuvant stain or mechanical trauma to the nerve fiber layer (RNFL) [14,17-19]. ILM peeling can cause morphologic changes to the macula, such as a dissociated optic nerve fiber (DONF) layer. Nevertheless, no functional consequences have been attributed to this anatomic change ILM peeling does require more surgical time and greater expense (for dyes and forceps), and it incurs the potential risk of iatrogenic trauma. Iatrogenic eccentric full-thickness retinal breaks have been documented after ERM and ILM

removal in idiopathic FTMH and DME [20-22]. Sandali et al. had found six cases (average incidence of 0.6%) of the retrospective series of 909 patients operated on for either a macular hole (MH, n=400 patients) or an epiretinal membrane (ERM, n=509 patients) with a mean follow-up of two years [24]. It is believed that the location of the holes represents the initial or the end site of ILM elevation, or the result of a weakening in the glial structure of the retina [23,24]. MH after vitrectomy and complete ILM peeling has been reported to occur in approximately 20% of cases with myopic foveoschisis (MF) [25]. ILM peeling removes the Müller cone cells, which form the base of the fovea and serve as a plug that binds the photoreceptor cells in the foveola and supports the foveola structurally. The stretched retina in a highly myopic eye can easily induce a MH without this structure. To prevent postoperative MH, fovea-sparing ILM peeling was introduced [26,27]. Some authors propose a modification of the peeling avoiding the foveolar ILM in order to prevent damage to the Müller cone cells during surgery. In the past, the ILM was peeled completely for MHRD, but the MH closure rate was less than 50% after surgery. Recently, the inverted ILM flap procedure has been applied not only for large and chronic MHs but also for retinal detachment due to MH (MHRD) [2,28]. In this case idiopathic full thickness macular hole was not closed after first PPV with ILM peeling. Additionally developed iatrogenic macular hole near IMH. The use of inverted internal limiting membrane flap technique caused closure both macular hole.

Conclusion

It seems that in the case of full-thickness macular hole which was not closed after the first surgery and even there came to a complication and the formation of another full-thickness macular hole, the use of inverted internal limiting membrane flap technique can be a good solution.

Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Acknowledgements

The language assistance was provided by Proper Medical Writing Ltd.

Competing Interest

The authors declare that they have no competing interests.

Synopsis

In certain cases of full-thickness macular hole which was not closed after the first surgery and even there came to a complication and the formation of iatrogenic full-thickness macular hole, the use of inverted internal limiting membrane flap technique can be a good solution.

References

1. Mahalingam P, Sambhav K (2013) Surgical outcomes of inverted internal limiting membrane flap technique for large macular hole. *Indian J Ophthalmol* 61: 601-603.

2. Michalewska Z, Michalewski J, Adelman RA, Nawrocki J (2010) Inverted internal limiting membrane flap technique for large macular holes. *Ophthalmology* 117: 2018-2025.
3. Michalewska Z, Michalewski J, Dulczewska-Cichecka K, Nawrocki J (2014) Inverted internal limiting membrane flap technique for surgical repair of myopic macular holes. *Retina* 34: 664-669.
4. Shah SP, Manjunath V, Rogers AH, Baumal CR, Reichel E, et al. (2013) Optical coherence tomography-guided facedown positioning for macular hole surgery. *Retina* 33: 356-362.
5. Kelly NE, Wendel RT (1991) Vitreous surgery for idiopathic macular holes. Results of a pilot study. *Arch Ophthalmol* 109: 654-659.
6. Ando F, Sasano K, Ohba N, Hirose H, Yasui O (2004) Anatomic and visual outcomes after indocyanine green-assisted peeling of the retinal internal limiting membrane in idiopathic macular hole surgery. *Am J Ophthalmol* 137: 609-614.
7. Beutel J, Dahmen G, Ziegler A, Hoerauf H (2007) Internal limiting membrane peeling with indocyanine green or trypan blue in macular hole surgery: a randomized trial. *Arch Ophthalmol* 125: 326-332.
8. Brooks HL Jr (2000) Macular hole surgery with and without internal limiting membrane peeling. *Ophthalmology* 107: 1939-1948.
9. Eckardt C, Eckardt U, Groos S, Luciano L, Reale E (1997) Removal of the internal limiting membrane in macular holes. Clinical and morphological findings. *Ophthalmology* 94: 545-551.
10. Michalewska Z, Michalewski J, Nawrocki J (2009) Macular hole closure after vitrectomy: the inverted flap technique. *Retina Today* 3: 73-74
11. Madreperla SA, Geiger GL, Funata M, de la Cruz Z, Green WR (1994) Clinicopathologic correlation of a macular hole treated by cortical vitreous peeling and gas tamponade. *Ophthalmology* 101: 682-686.
12. Gass JD (1995) Reappraisal of biomicroscopic classification of stages of development of a macular hole. *Am J Ophthalmol* 119: 752-759.
13. Nakamura T, Murata T, Hisatomi T, Enaida H, Sassa Y, et al. (2003) Ultrastructure of the vitreoretinal interface following the removal of the internal limiting membrane using indocyanine green. *Curr Eye Res* 27: 395-399.
14. Haritoglou C, Gass CA, Schaumberger M, Ehrt O, Gandorfer A, et al. (2001) Macular changes after peeling of the internal limiting membrane in macular hole surgery. *Am J Ophthalmol* 132: 363-368.
15. Kuhn F, Morris R, Mester V, Witherspoon CD (2001) Internal limiting membrane removal for traumatic macular holes. *Ophthalmic Surg Lasers* 32: 308-315.
16. Park DW, Sipperley JO, Sneed SR, Dugel PU, Jacobsen J (1999) Macular hole surgery with internal-limiting membrane peeling and intravitreal air. *Ophthalmology* 106: 1392-1397.
17. Nagai N, Ishida S, Shinoda K, Imamura Y, Noda K, et al. (2007) Surgical effects and complications of indocyanine green-assisted internal limiting membrane peeling for idiopathic macular hole. *Acta Ophthalmologica Scandinavica* 85: 883-889.
18. Yamashita T, Uemura A, Kita H, Sakamoto T (2006) Analysis of the retinal nerve fiber layer after indocyanine green-assisted vitrectomy for idiopathic macular holes. *Ophthalmology* 113: 280-284.
19. Pichi F, Lembo A, Morara M, Veronese C, Alkabes M, et al. (2014) Early and late inner retinal changes after inner limiting membrane peeling. *Int Ophthalmol* 34: 437-446.
20. Tadayoni R, Paques M, Massin P, Mouki-Benani S, Mikol J, et al. (2001) Dissociated optic nerve fiber layer appearance of the fundus after idiopathic epiretinal membrane removal. *Ophthalmology* 108: 2279-2283.
21. Imai H, Ohta K (2010) Microperimetric determination of retinal sensitivity in areas of dissociated optic nerve fiber layer following internal limiting membrane peeling. *Jpn J Ophthalmol* 54: 435-440.
22. Steel DH, Dinah C, Habib M, White K (2015) ILM peeling technique influences the degree of a dissociated optic nerve fibre layer appearance after macular hole surgery. *Graefes Arch Clin Exp Ophthalmol* 253: 691-698.
23. Sandali O, El Sanharawi M, Basli E, Lecuen N, Bonnel S, et al. (2012) Paracentral retinal holes occurring after macular surgery: incidence, clinical features, and evolution. *Graefes Arch Clin Exp Ophthalmol* 250: 1137-1142.
24. Rubinstein A, Bates R, Benjamin L, Shaikh A (2005) Iatrogenic eccentric full thickness macular holes following vitrectomy with ILM peeling for idiopathic macular holes. *Eye* 2005; 19: 1333-1335.
25. Gao X, Ikuno Y, Fujimoto S, Nishida K (2013) Risk factors for development of full-thickness macular holes after pars plana vitrectomy for myopic foveoschisis. *Am J Ophthalmol* 155: 1021-1027.
26. Ho TC, Chen MS, Huang JS, Shih FY, Henry BS, et al. (2012) Foveola nonpeeling technique in internal limiting membrane peeling of myopic foveoschisis surgery. *Retina* 32: 631-634.
27. Shimada N, Sugamoto Y, Ogawa M, Takase H, Ohno-Matsui K (2012) Fovea-sparing internal limiting membrane peeling for myopic traction maculopathy. *Am J Ophthalmol* 154: 693-701.
28. Kuriyama S, Hayashi H, Jingami Y, Kuramoto N, Akita J, et al. (2013) Efficacy of inverted internal limiting membrane flap technique for the treatment of macular hole in high myopia. *Am J Ophthalmol* 156: 125-131.