



Research Article

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Surgery of an Idiopathic Macular Hole in the Eyes Accompanied by Dry, Age Related Macular Degeneration Own Results

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Abstract

The paper presents own results of surgical treatment of a full thickness macular hole in eyes, where age-related macular degenerative changes of the "dry" type were also found. The use of conventional surgical technique has resulted in a favourable anatomical and functional effect. An idiopathic, full thickness macular hole accompanied by dry changes of age-related macular degeneration should be treated in the same way as a typical macular hole without macular degeneration.

Keywords

Macular hole; Age related macular degeneration; Macular drusen; Posterior vitrectomy.

Introduction

An idiopathic, full thickness macular hole is a rare disease observed in 3.3 /1,000 people. It is more common in women after 65 years of age. In 1988, a 4-step Gass classification of holes was introduced, based on the macular image visible in the biomicroscopic examination [1]. In 2013, a new classification was proposed based on the retinal image in the Optical Coherent Tomography (OCT). Macular holes were divided into primary and secondary, taking into account the reason for their formation. The main division criteria using the OCT were the hole size and the presence of vitreous macular traction. The hole size is determined by the smallest distance between the inner edges of the hole. The holes are divided into small, less than 250 μm in diameter, medium, between 250 μm and 400 μm , and large, larger than 400 μm [2]. Since the last division, further classification modifications have been proposed, which include additional 6 parameters, i.e. vitreous macular adhesion width, presence of vitreous retinal border pathology, pigment epithelial pathologies, elevation of the lowest vitreous adhesion point, and presence of intraretinal changes, which are divided into internal and external, corresponding to vitreous macular traction within vitreomacular adhesion and traction [3]. If there is a suspicion of a full thickness defect in the macula, without access to the OCT, it is recommended to perform the Watzke-Allen test. The test made with the use of a slit lamp consists

in moving the vertical slit beam of light through the macular area. The result is positive when the light beam divides into two parts [4]. Cases when the macular hole is accompanied by age-related retinal degenerative changes (AMD) are extremely rare (Figure 1). Rao et al. determined their incidence at 0.7% (199 eyes) in the group of 15,196 eyes tested. In 160 eyes, representing 1.1% of the study group, there were changes characteristic of dry AMD. In the remaining 39 eyes (0.3%) the changes were exudative. The anatomical effectiveness of the procedure, i.e. closure of the macular hole, was achieved in 91.5% of eyes with dry AMD and in 81% of eyes with AMD exudative changes. However, only in the group with dry AMD changes significantly improved postoperative visual acuity was observed [5].

Due to the small number of cases of comorbidity of both diseases, the number of available publications on the subject of treatment is also minimal. This condition may create a therapeutic dilemma for some clinicians, including surgeons, who are afraid of failing to obtain a beneficial effect, both anatomical and functional, after surgery, and do not qualify patients for surgical treatment.

The treatment of choice of an idiopathic, full thickness macular hole is posterior vitrectomy with removal of the internal limiting membrane from the macular area and endotamponade with air or a mixture of expansile here gas. The anatomical effectiveness of the above procedure in the form of closing the hole is estimated at 85% -100% of cases [6]. Preoperative visual acuity is the most important prognostic factor. The better the vision in the preoperative period, the better the postoperative effects, and hence the range of vision improvement [7,8]. A forced position after surgery, i.e. prone, face-down position, is the most frequently recommended postoperative procedure. Some authors consider it superfluous to obtain the effect of closing the hole [9].

The effectiveness of the procedure decreases as the disease duration increases and the hole size increases. So far, many modifications have been introduced to improve post-operative effectiveness. One of them is the "inverted flap" technique described by Michalewska et al. which, according to the authors, significantly improved the anatomical

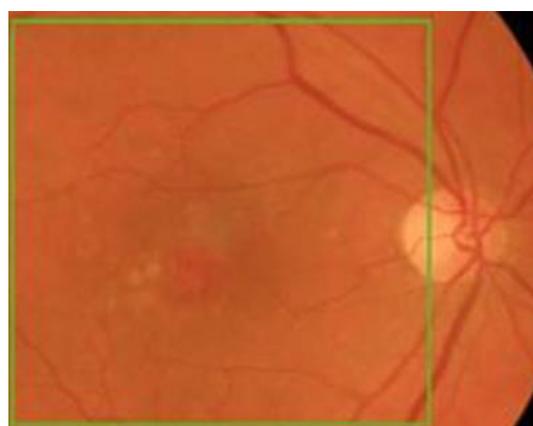


Figure 1: Observed degenerative changes of the retina are primarily macular drusen and punctate pigment epithelial and photoreceptor defects, detected in the examination of the color fundus photography.

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effectiveness of treating large macular holes - larger than 400 μm . The authors achieved the effect of closing the hole in 98% compared to 88% using the conventional technique [10].

Objective

Assessment of the effectiveness of posterior central vitrectomy followed by complete disconnection of the vitreous, removal of the internal limiting membrane from the macular area and endotamponade with a mixture of expandable gas conducted in the eyes with a full thickness, idiopathic macular hole accompanied by changes characteristic of dry age-related retinal degeneration.

Materials and Methods

In the period between 2009-2019, posterior vitrectomy was performed in seven eyes in four patients, including three women. The average age of patients is 73 years, ranging from 63 to 78. The reason for the procedure was the presence of a full thickness, idiopathic macular hole accompanied by degenerative changes characteristic of dry AMD. The first procedures were performed in the period between 2009-2012 using the sutureless 20G technique. The last two procedures were performed in 2019 using the 23G technique. Observed degenerative changes of the retina are primarily macular drusen and punctate pigment epithelial and photoreceptor defects, detected in the examination of the color fundus photography (Figure 2). Geographic atrophy outside the foveal region was found in one patient (1 eye). The results of the treatment of the first three patients (five eyes) were presented in the form of a poster at the Euretina congress, which took place in Milan in 2012. The subject of the presented work was: "Posterior vitrectomy in a treatment of macular hole accompanying to dry AMD. Does this surgery make sense?". In three eyes, posterior vitrectomy was combined with cataract removal and subsequent implantation of an artificial lens into the capsule. In each case, posterior vitrectomy included removal of the central vitreous with subsequent posterior vitreous detachment. In the next stage, the internal limiting membrane (ILM) was removed from the macular Region. During four treatments, dye was used to make it visible. The procedure was completed by replacing the intraocular fluid with an expansile gas mixture, sulfur hexafluoride (SF6), at a concentration of 18-30%. The face-down position was recommended for a period of 5 days for small and medium-sized holes and 7 postoperative days if the hole was large. Postoperative follow-ups were performed on the first and seventh day, and one month and six months after surgery. The visual acuity of distance and near vision as well as intraocular pressure were examined. Macular OCT was performed before surgery, one month after and six months after surgery.

Results

Four holes with an average size of 318 μm (in the range from 290 to 360 μm) and 3 large holes with a size of 603 μm (in the range from 590 to 630 μm) were subjected to surgery.

In four eyes only posterior vitrectomy was performed, in the next three eyes vitrectomy was combined with cataract removal and artificial lens implantation. In the last 2 cases, a bifocal lens with addition of + 1.5 Dsph to the near distances (Mplus Comfort by Oculentis) was implanted. The postoperative follow-up period was 6 to 36 months.

Anatomical effect.

In six out of seven cases, the effect of closing the hole was obtained after the first treatment (Figure 3A and 3B). In one eye, the

hole closed after the second procedure, when the endotamponade procedure was performed again with 12% perfluoropropane (C3F8) and maintaining a face-down position for a period of 7 postoperative days was recommended. In this eye, an increase in geographic atrophy was observed in further follow-up.

Visual acuity.

Visual acuity for distance and near vision was tested using Snellen charts. Preoperative values and those obtained 6 months after surgery were analyzed. The effect of closing macular holes was accompanied by improved visual acuity for distance and near vision. Visual acuity for distance vision reached an average postoperative value = 0.48 (from 0.1 to 1.0) compared to 0.16 (from 0.04 to 0.3) obtained before surgery. Near vision after the surgery reached the mean value

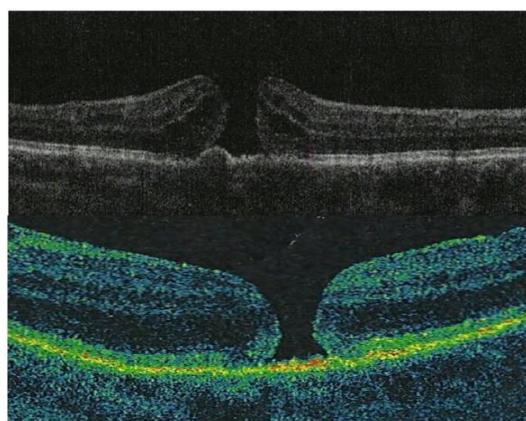


Figure 2: Optical coherent tomography.

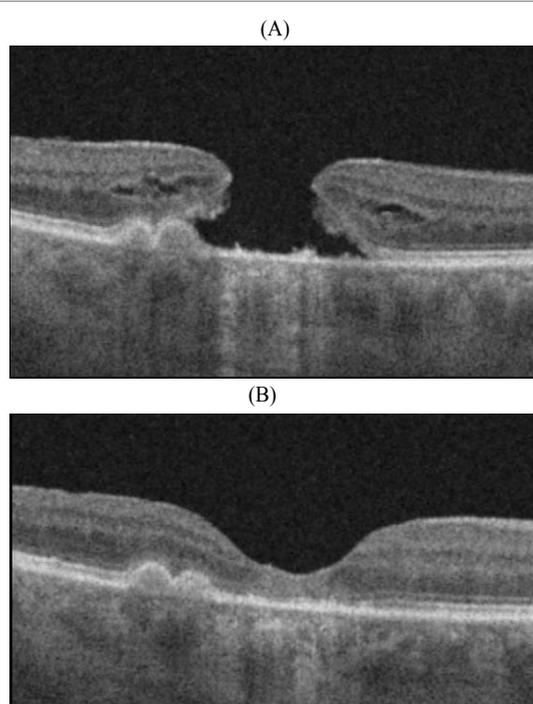


Figure 3: A) and B) The effect of closing the hole was obtained after the first surgery.

= D-1.0 (from 2.0 to 0.5), compared to the D-1.5 (from 3.0 to 1.0) obtained before the procedure. The smallest value of distance vision improvement, i.e. 0.1, was obtained in the eye with preoperative value = 0.08. Near vision in this eye has hardly changed and the preoperative size of the hole reached 630 μm . The best improvement of visual acuity for distance vision, i.e. by 7 lines, was obtained in the eye with preoperative value = 0.3 (after surgery 1,0), with a hole size = 315 μm . Visual acuity for near vision improved from D-0.75 to D-0.5. In this patient, vitrectomy was combined with cataract extraction. In the next eye, visual acuity for distance vision improved from 0.2 to 0.7, and near vision from 1,0 to D-0,5f, with the best correction. In this case, the effect of closing the hole was obtained after another procedure was performed, and slight increase in the size of geographic atrophy was observed in the parafoveal area. It is difficult to determine whether the surgical trauma was the cause of the enlargement of atrophy.

Discussion

A favorable anatomical effect, i.e. closing the hole, was obtained in 100% of cases. Following the anatomical effect, an improvement in distance and near vision was achieved, which was also accompanied by a subjective improvement in vision. The weakest values of the improvement in visual acuity were observed in the eyes with the worst pre-operative visual acuity for distance and near vision, accompanying the macular holes with the largest diameters. This would confirm the observations contained in the studies conducted by Jaycock et al. and Gupta et al. in which the relationship between visual improvement and preoperative visual acuity was highlighted [7,8]. The average improvement in visual acuity for distance vision in the small study group reached the value of about 0.2 on the Snellen chart. Analyzing a group of 57 patients, Hirmeis et al. obtained an improvement of vision by about 0.4 using the logMar chart (from 0.68 to 0.23). There were no AMD changes in this group. Another publication, based on the analysis of over 2,400 patients operated on, showed an improvement in visual acuity for distance vision by 23 letters on average, examined using logMAR charts, over a 2-year follow-up period, which also gives an average improvement in vision by more than 0.4 [11]. Returning to the study group, there is no doubt that despite the presence of degenerative changes within the macula, improved vision was obtained in each case.

Conclusion

Central posterior vitrectomy, with total posterior vitreous detachment removal of the internal limiting membrane from the macular area, endotamponade with the expansile gas mixture and the recommended 5-7 face-down position, carried out due to the presence of an idiopathic full thickness macular hole, in the eyes in which additionally changes characteristic of dry AMD were observed, gives measurable benefits in the form of closing the hole and subsequent improvement of visual acuity for distance and near vision. The

presence of degenerative changes characteristic of “dry” AMD, i.e. macular drusen and individual defects within the pigment epithelium and photoreceptors should not constitute a contraindication to the above procedure. Due to the insufficient study group, it is difficult to say whether the obtained, smaller range of vision improvement is associated with the presence of degenerative changes in the macula

Data Availability

The data, which were used to support all details of the study include patient's age, gender, visual acuity, colour photography of the fundus, and OCT results, according to RODO rules cannot be personally shared, to protect patient's privacy. The anonymized data are available from the corresponding author (adamcyw@gmail.com) upon request.

Conflicts of Interest

Author declares that he has no conflicts of interest

References

1. Gass JDM (1988) Idiopathic senile macular hole. Its early stages and pathogenesis. *Arch Ophthalmol* 10:629–639.
2. Duker JS, Kaiser PK, Binder S (2013) The international vitreomacular traction study group classification of vitreomacular adhesion, traction, and macular hole. *Ophthalmology* 120: 2611–2619.
3. Steel DHW, Downey L, Greiner K (2016) The design and validation of an optical coherence tomography-based classification system for focal vitreomacular traction. *Eye* 30:314–325.
4. McDonnell PJ, Fine SL, Hillis AI (1982) Clinical features of idiopathic macular cysts and holes. *Am J Ophthalmol* 93:777–786.
5. Prethy Rao, Yoshihiro Yonekawa, Ashkan M. Abbey, Aparna A. Shah, Jeremy (2015) Prevalence and Surgical Outcomes of Macular Hole in Eyes with Age-Related Macular Degeneration. *Ophthalmology Retina* 1:158–164.
6. Wakely L, Rahman R, Stephenson J (2012) A comparison of several methods of macular hole measurement using optical coherence tomography, and their value in predicting anatomical and visual outcomes. *British Journal of Ophthalmology* 96: 1003–1007.
7. Jaycock PD, Bunce C, Xing W (2005) Outcomes of macular hole surgery: implications for surgical management and clinical governance. *Eye* 19: 879–884.
8. Gupta B, Laidlaw DA, Williamson TH, Shah S P, Wong R (2011) Predicting visual success in macular hole surgery. *British Journal of Ophthalmology* 93 :1488–1491.
9. Iezzi R, Kapoor KG (2013) No face-down positioning and broad internal limiting membrane peeling in the surgical repair of idiopathic macular holes. *Ophthalmology* 120:1998–2003.
10. Michalewska Z, Michalewski J, Adelman RA, Nawrocki J (2010) Inverted internal limiting membrane flap technique for large macular holes. *Ophthalmology* 117:2018–2025.
11. Essex RW, Hunyor AP, Moreno-Betancur M, Yek JTO, Kingston ZS et al (2018) The Visual Outcomes of Macular Hole Surgery: A Registry-Based Study by the Australian and New Zealand
12. Society of Retinal Specialist. *Ophthalmol Retina* 2: 1143-1151.

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