Perioperative Intrascleral Fluid Observed on Optical Coherence Tomography in Epiretinal Membrane

Introduction

It was reported that macular edema (ME) following PPV was common in many papers. Especially for ERM, the incidence of ME after PPV was reported as wide range of 1-64%. Occurrence of intrascleral fluid (IRF) or intraretinal cystic changes in optical coherence tomography (OCT) so called ME were associated with delay of postoperative visual improvement. Many authors concentrated on the correlation between the postoperative new IRF and postoperative visual acuity, but there were no previously reported about preoperative IRF and its influence on visual acuity.

Purpose

To investigate incidence and clinical implications of the intrascleral fluid (IRF) observed on optical coherence tomography in epiretinal membrane (ERM).

Method

Subjects: The medical records of patients who were operated for idiopathic ERM between January 2014 and January 2017 were retrospectively reviewed. Patients with secondary ERM, prior intraocular surgery within 3 months before ERM surgery, postoperative follow up period less than 6 months and surgery performed by junior surgeons less than 2 years of experience were excluded.

Study design: Best-corrected visual acuity was measured before operation and at postoperative 1, 3, and 6 months. Demographic data such as age, sex, lens status and surgical factors (staining method, with or without ILM peeling, combined or PPV only, duration of surgery) were evaluated. OCT images were obtained by capturing the 3D volume scan of the posterior pole over a 12 x 9 mm area of 256 horizontal B-scans before surgery and postoperative 1, 3, and 6 months. If any small IRF were detected at 3D volume scan, it was classified into IRF positive group. The IRF showed the hype-reflective space with well-defined boundaries seen in the retinal layers and the incidence of IRF and central significant macular thickness (CSMT) were calculated. OCT findings were analyzed independently by two trained readers. The rate of IRF was analyzed before operation and at postoperative 1, 3 and 6 months and factors were also evaluated to find a correlation to IRF. The effect of IRF on visual acuity was analyzed.

Result

Of 155 eyes of 155 patients included in the study, 36 eyes (23.2%) had preoperative IRF, and new IRF developed in 49 eyes (31.6%). Seventy eyes (45.2%) did not show any IRF during the study period. The development of new IRF was peaked at postoperative 1 month and then decreased over time. Overall, preoperative IRF persisted in 55.6% (20/36), and new IRF group had persisting IRF in 51.0% (25/49) at postoperative 6 months. All patients were divided into three groups; preoperative IRF, new IRF and IRF (-) groups. At baseline, IRF (-) group had better visual acuity than other two groups. Visual acuity improved significantly after surgery in all three groups. At postoperative 6 months, there was no difference in visual acuity between IRF (-) and new IRF groups, and preoperative IRF group had significantly lower visual acuity than other two groups. The mean CSMT significantly decreased after surgery in all groups. At postoperative 1 month, there was significant difference in CSMT among three groups (p=0.027), but there was no difference at postoperative 3 and 6 months.

Discussion

Our study revealed that about one third of the patients had preoperative IRF and these patients had significantly worse pre- and postoperative visual acuity than the other patients. These findings suggested that ERM with preoperative IRF indicates a more advanced disease. The mechanical traction by the fibrous membrane and deformation of the retinal vessels would cause vascular stasis resulting in BRB breakdown and development IRF. Structural dehiscence of the Muller cells would be another cause of preoperative IRF.

Regarding the mechanism of macular edema after PPV, postoperative inflammation is one of well-known causes. In our study, new IRF occurred most frequently at postoperative 1 month and postoperative inflammation was assumed to be one of the mechanisms. Up-regulation of inflammatory mediators in the perioperative period can break down the BRB and lead to increased vascular permeability, like pseudophakic cystoid ME. The surgical trauma was also suggested as a mechanism of postoperative macular edema.

Therefore, intraoperative damage and postoperative inflammation would put weights on the arm of IRF accumulation, the balance scale will be tilt to development of new IRF. So, newly developed IRF would represent a stage more advanced than IRF (-) group, but a reversible status allowing a prominent improvement of vision after surgery. Whereas preoperative IRF represented irreversibly degenerated changes even before the operation, and was a predictor of relatively poorer functional outcomes than the other groups.

Conclusion

The IRF associated with ERM was frequently observed before and after surgery, but did not prevent postoperative improvement of vision. Preoperative IRF was related to lower postoperative visual vision.

References