

Use of autologous plasmin during vitrectomy for diabetic maculopathy

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PURPOSE. *To evaluate the efficacy of autologous plasmin enzyme as an adjunct to vitrectomy in diabetic macular edema.*

METHODS. *Plasmin derived from autologous blood was injected intravitreally into seven eyes 15 min before vitreous surgery. The development and progression of a posterior vitreous detachment (PVD) was followed, and the time required for vitreous removal was measured. Both pre- and postoperative visual acuities and optical coherence tomography (OCT)-determined macular thickness were measured.*

RESULTS. *In the seven eyes in which plasmin was used, a PVD developed approximately 5 min after the injection and was confirmed to extend to the far periphery. In all cases, the removal of the vitreous was completed in a shorter time and no complications were observed. A restoration of the shape of the macula was observed in all cases. The visual acuity improved by two or more lines in four eyes, and remained unchanged in the remaining three eyes.*

CONCLUSIONS. *Autologous plasmin alone will create a full PVD, and eliminates the need for a mechanical creation of a PVD. Thus, plasmin is a safe and effective adjunct to vitreous surgery for the treatment of diabetic maculopathy. (Eur J Ophthalmol 2006; 16: 138-40)*

KEY WORDS. *Autologous plasmin, Diabetic maculopathy, Posterior vitreous detachment, Vitreous surgery*

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INTRODUCTION

Diabetic macular edema develops in many cases of diabetic retinopathy and has a significant deleterious effect on vision (1). Grid pattern photocoagulation of the macula has achieved some success in these eyes, but it is ineffective for cases of diffuse macular edema (2, 3). Although the mechanism causing the edema is not fully understood, vitreous traction is believed to be involved.

Traction on the macular region can be released by surgically removing the vitreous. However, several complications have been reported following vitreous surgery (4), and some of these develop during the creation of the posterior vitreous detachment (PVD). To try to create a PVD less traumatically, it has been reported that intravitreal plasmin derived from autologous blood can act at the vitreoretinal

interface to allow PVD to develop safely and reliably (5-7). However, in these earlier studies, plasmin was combined with cutting of the posterior vitreal membrane.

The purpose of this study was to investigate the efficacy of creating a PVD using only autologous plasmin during vitrectomy for cases of diabetic maculopathy.

METHODS

Seven eyes from seven patients (five men, two women; mean age 63.8 years) with diabetic macular edema were studied. No patient had signs of a PVD. But all had evidence that the macular edema was due to traction by the vitreous membrane. One eye was pseudophakic and six were phakic. Patients with the following conditions were

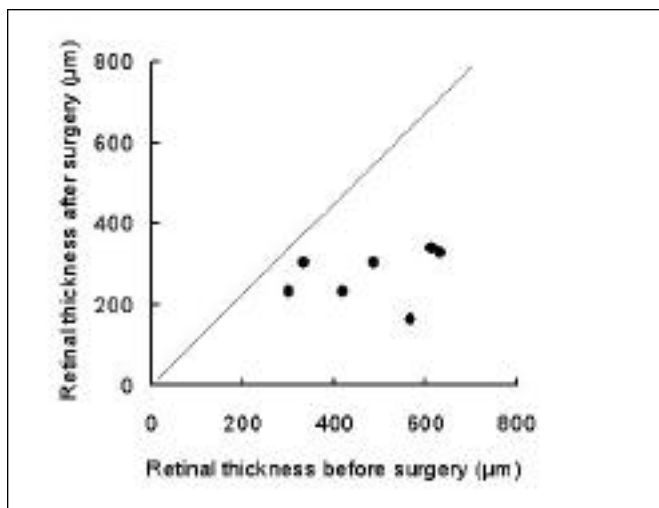


Fig. 1 - Pre- and postoperative macular thickness measured by optical coherence tomography. In all cases, the macular edema decreased after surgery.

excluded: lens opacities affecting the visual acuity, opacities in the vitreous body, macular heterotopia due to fibrous membranes, macular ischemia, and epiretinal membranes. Panretinal photocoagulation had been carried out in three of the eyes, but none of the subjects had been treated with grid pattern photocoagulation of the macula. Pre- and postoperative evaluations of the presence or absence of a PVD were performed by B-mode scan ultrasonography and biomicroscopy with the precorneal lens (+90 D lens). The following examinations and measurements were carried out before and after vitrectomy: visual acuity, funduscopy by three mirror contact lens, thickness of central retina by optical coherence tomography (OCT), and fluorescein angiography. The follow-up period ranged from 13 to 18 months and the latest data were used in the analysis of the postoperative results. The study protocol was approved by the Juntendo University's Institutional Review Board. Informed consent was obtained from all participants after

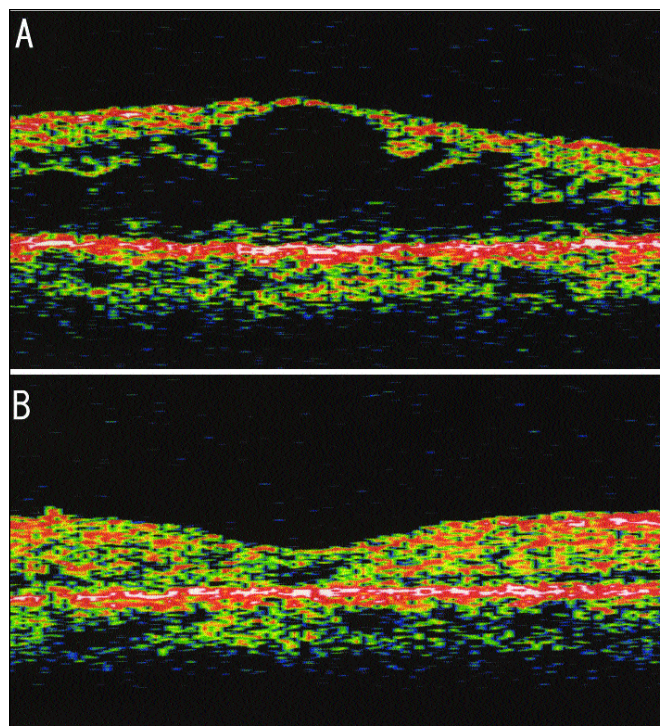


Fig. 2 - Changes in the pre- and postoperative optical coherence tomography findings in Case 3. Thickness of the central retina improved after vitreous surgery with autologous plasmin.

the nature of the procedure had been fully explained. Plasminogen was extracted from the patient's blood and activated to plasmin by urokinase 5 min before use as described (8). Phacoemulsification and aspiration, intraocular lens implantation (PEA-IOL), and vitreous surgery were performed successively in all eyes, with the exception of one patient who was aphakic. Immediately after PEA-IOL, plasminogen was activated by urokinase, and after 5 min, 0.1 mL (0.2 IU) of the activated plasmin was injected into the center of the vitreous cavity using a 30-gauge needle. About 15 min after the injection, vitreous surgery was

TABLE I - SUMMARY OF PATIENTS

Case	Age, yr	Sex	Visual acuity		Follow-up period, mo
			Preoperative	Postoperative	
1	63	Female	20/100	20/20	18
2	55	Male	20/100	20/100	18
3	48	Male	20/100	20/30	18
4	61	Male	20/200	20/200	13
5	80	Female	20/60	20/40	13
6	77	Male	20/100	20/100	13
7	63	Male	20/50	20/30	13

begun. At that time, PVD was observed by surgical microscope in all cases. The degree of vitreous detachment and liquefaction was evaluated.

RESULTS

Approximately 10 min after the plasmin injection, the vitreous appeared to have moved forward and Weiss ring appeared to be floating. During the vitreous removal, viscous vitreous was observed in the center of the cavity and only liquefied vitreous remained in the posterior part of the vitreous cavity in contact with the retina. An adherence of the vitreous to the retina was not found in the posterior pole to the far periphery, and thus a mechanical PVD was not necessary. The removal of the vitreous was completed within 5 min in all patients. The vitreous was detached from the retina even in areas where photocoagulation had been applied. The pre- and postoperative visual acuities for the seven eyes are shown in Table I and Figure 1. Postoperative OCT images showed that the thickness of the retina had decreased (Fig. 2). The visual acuity improved by two or more lines in four eyes, and remained unchanged in the other three eyes.

DISCUSSION

Macular edema tends to be more serious in cases where a PVD is not present (9, 10), and vitrectomy is often carried

out to treat this condition (11, 12). However, some adverse effects develop during the mechanical separation of the vitreous from the retina. In 2001, Williams et al (7) reported that intravitreal autologous plasmin was beneficial for the surgical management of diabetic retinopathy. However, they combined plasmin with membrane peeling. In our cases, a PVD was created by 0.1 mL (0.2 IU) of plasmin, half the dose of plasmin reported by Williams et al (7), alone in all cases, and membrane peeling was not necessary. Although only seven cases were studied, no complications were found. We therefore find that plasmin alone is efficacious as an intraoperative adjuvant.

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