·Clinical Research·

Vitrectomy results in proliferative diabetic retinopathy

Jie Luan[1], Fumitaka Ando[2], Hirosi Hirose[3], Osumu Yasui[3]

Foundation items: Takeda Science Foundation of Japan and Asia Ophthalmologist Training Foundation of Japan

[1] Department of Ophthalmology, Zhongda Hospital of the Southeast University, Nanjing 210009, Jiangsu Province, China

[2] Eye Care Nagoya, Nagoya 450-0002, Japan

[3] Department of Ophthalmology, National Nagoya Hospital, Nagoya 460-0001, Japan

Correspondence to: Jie Luan. Department of Ophthalmology, Zhongda Hospital of the Southeast University, Nanjing 210009, Jiangsu Province, China. luanqiu10@hotmail.com

Received: 2008-03-08 Accepted: 2008-08-16

Abstract

• AIM: To evaluate the effectiveness of vitrectomy on eyes with proliferative diabetic retinopathy (PDR).

• METHODS: A total of 139 eyes of 93 cases with PDR underwent vitrectomy and were followed up for 3-24 months (16.72±8.53 months; mean±SD). The visual acuity and the factors causing recurrence of operation were analyzed.

• RESULTS: The visual acuity was improved in 98 eyes (70.50%) after vitrectomy. The mean postoperative visual acuity was significantly better than the mean preoperative visual acuity. The main reasons for the failure of operation were retinal detachment and maculopathy.

• CONCLUSION: These results demonstrate that vitrectomy is generally an effective procedure in treating PDR.

• KEYWORDS: proliferative diabetic retinopathy; vitrectomy; retrospective study

Luan J, Ando F, Hirose H, Yasui O. Vitrectomy results in proliferative diabetic retinopathy. *Int J Ophthalmol* 2008;1(4):356–358

INTRODUCTION

Proliferative diabetic retinopathy (PDR) is the serious complication of diabetes mellitus. PDR is the main cause for blindness in western countries. In this study, we retrospectively reviewed the patient charts of 139 eyes that underwent vitrectomy in National Nagoya Hospital. The surgical results, surgical complications, and visual acuity were tabulated and summarized.

MATERIALS AND METHODS

This was a retrospective study of the effect of vitrectomy on 139 eyes of 93 cases with PDR. Pars plana vitrectomy was performed at National Nagoya Hospital between January 2000 and February 2001. The clinical characteristics of the 93 patients were listed in Table 1. The patients included 57 men and 36 women whose age ranged from 23 to 84 years (58.37±11.56 years; mean±SD). Sixteen eyes of 10 patients were type I diabetes mellitus and 83 patients (123 eyes) were type II diabetes mellitus. The duration of diabetes was for 2 to 35 years (14.34±8.15 years; mean±SD). All eyes had received 1 or 2 times retina photocoagulation before the development of PDR. The preoperative visual acuity was from light perception to 0.5. Cataract extraction with implantation of an intraocular lens had performed previously in 27 eyes. One eye was aphakic eye. Preoperative fundus fluorescein angiography (FFA) was performed in 125 eyes of 82 patients. Macular edema was diagnosed by FFA and optical coherence tomography (OCT).

Among 139 eyes of 93 cases, vitreous hemorrhage (VH) without retinal detachment (RD) were 24 eyes of 19 cases, VH with RD were 14 eyes of 11 cases, preoperative membrane in vitreous without RD were 18 eyes of 13 cases, epiretinal membrane were 21 eyes of 17 cases, tractional retinal detachment (TRD) were 38 eyes of 29 cases, macular edema were 48 eyes of 31 cases, macular hole were 5 eyes of 4 cases, branch retinal vein occlusion (BRVO) were 2 eyes of 2 cases, neovascularization of optic disc (NVO) were 6 eyes of 5 cases.

For follow-up, all patients were seen at regularly intervals after operation. The duration of follow-up was for 3-24 months (16.72±8.53 months; mean±SD).

The surgical procedure was a standard three-port pars plana vitrectomy. Posterior vitreous was detached from the optic disc by using high suction power with the vitrectomy instrument at optic disc until detachment was created. The other procedures during operation included proliferative membrane removal, epiretinal membrane peeling, ICG assisted ILM peeling, retina holes or tears treatments by using photocoagulation or cryocoagulation, air-fluid exchange. At the end of the operations, 120-140mL/L C_3F_8 or 150-200mL/L SF_6 or silicone oil were injected.

Along with the vitrectomy, 6 eyes of 6 cases were performed phacoemulsification and IOL implantation, 3 eyes of 2 cases were performed nuclear phacofragmentation. IOL were removed from 2 eyes of 1 case. Gas tamponade were 126 eyes of 80 cases, silicone oil tamponade were 8 eyes of 8 cases.

Statistical Analysis Snellen visual acuities were converted to a logarithmic scale (LogMAR), as described earlier [1]. This conversion is very good, however, usually Japan use decimal visual acuity chart, not the Snellen chart. Comparisons between preoperative and postoperative visual acuities were performed using Wilcoxon signed rank test. The visual acuity was the best corrected visual acuity.

RESULTS

Among 139 eyes of 93 cases, 108 eyes of 66 cases received one time vitrectomy, and 31 eyes of 27 cases received multiply operations from 2-6 times. The mean time of operations was 1.37 times.

The factors which caused reoperation were retinal detachment (22 eyes of 21 cases), macular edema (6 eyes of 5 cases), vitreous hemorrhage (1 eye of 1 case), secondary glaucoma (6 eyes of 5 cases).

Ninety-eight eyes (70.50%) had an increase in visual acuity after vitrectomy. Fourteen eyes (10.07%) visual acuity were equal to preoperative acuity. Twenty-seven eyes (19.43%) postoperative visual acuity were decreased. The preoperative and postoperative mean visual acuity were 0.1521±0.1674 (light perception to 0.5) and 0.3903±0.3364(light perception to 1.2) respectively. The postoperative mean visual acuity was significantly better than the preoperative mean visual acuity, Table 2 (Wilcoxon signed-ranked test, t=6.9710, P<0.001) and Table 3.

DISCUSSION

Proliferative diabetic retinopathy is one of the serious complications of diabetic mellitus which could cause blindness. This retrospective study of the outcome of vitrectomy in 139 eyes of proliferative diabetic retinopathy showed positive results; the visual acuity was improved in 70.50% eyes after surgery and was significantly better than preoperation. Our vitrectomy results on proliferative diabetic retinopathy confirmed the earlier studies by Luan [2]. Vitrectomy could remove vitreous hemorrhage, peel epiretinal membranes as well as proliferative fibroneovascular membranes, remove growth factors which may be related to diabetic retinopathy, and re-attach the detached retina. Vitrectomy is an effective method to treat proliferative diabetic retinopathy.

Table 1 Baseline clinical characteristic of 139 eyes of 93 patients

Variable	Median (range)/(%)
Age[a]	58.37 ± 11.56(23-84)yr
Follow-up[a]	16.72 ± 8.53(3-24)mo
Duration of Diabetes[a]	14.34 ± 8.15(2-35)yr
Visual acuity[a]	0.1521 ± 0.1674 (LP-0.5)
Sex[b]	
Male	57 (61.29)
Female	36 (38.71)
Type of Diabetes Mellitus[b]	
Insulin-dependent	10 (10.75)
Non-insulin-dependent	83 (89.25)
Status of PDR[b]	
VH	24 (17.27)
VH+RD	14 (10.07)
Proliferative membrane without RD	18 (12.95)
Epiretina membrane	21 (15.11)
TRD	38 (27.34)
Macular edema	48 (34.53)
BRVO	2 (1.44)
NVO	6 (4.32)
Lens status[b]	
Pseudphakic	27 (19.42)
Aphakic	1 (0.72)
Clear lens	102 (73.38)
Cataract	9 (6.47)

[a]median(range),[b](%)

Table 2 Visual acuity change after vitrectomy

Change		Number of eyes(%)
Improvement	≤6 lines	41(29.50)
	≤3 lines, <6 lines	33(23.74)
	≤1 line, <3 lines	24(17.27)
No change		14(10.07)
Deterioration	≤1line	10(7.19)
	>1 line, ≤3lines	8(5.76)
	>3lines	9(6.47)

Table 3 Preoperative and Postoperative Visual Acuity (VA)

Preoperative VA	Postoperative VA	P^a
0.1521 ± 0.1674	0.3903 ± 0.3364	<0.001

[a]Wilcoxon signed-ranked test,t=6.9710,P<0.001

Though vitrectomy could reduce the traction exerted on retina by vitreous membranes and remove some related growth factors, and increase the preretinal oxygen tension to cause retinal vasoconstriction and reduce vascular leakage and diabetic macular edema [3]. In this study, 11 eyes had no visual acuity improvement or worse visual acuity with maculopathy. This result suggests that the process of

diabetic macular edema is complicated and the pathogenesis of diabetic macular edema may be caused by multifactors. A shorter interval from initial diagnosis of macular edema to vitrectomy may be associated with a better visual acuity outcome [4]. Another reason which caused poor visual acuity and the failure of surgery was retinal detachment. These cases had thickened retina or shortened retina in serious proliferative diabetic retinopathy, retinotomy combined with endophotocoagulation and intravitreous tamponade are often needed to reattach the retina. But there were still some failure cases because of retinal re-detachment. We suggest that we should treat complications early if happened after surgery. In this study, there was a typical case who received 6 operations of vitrectomy,lenscotomy,retinotomy, intravitreous gas-tamponade, intravitreous silicone oil tamponade and, at last, whose visual acuity was improved from 0.01 to 0.2.

From this retrospective study, we conclude that vitrectomy is an effective procedure to treat proliferative diabetic retinopathy and earlier vitrectomy may obtain good visual acuity result and avoid serious complications such as macular edema and retinal detachment.

REFERENCES

1 Ferris FL III, Kassoff A, Bresnick GH, Bailey I. New visual acuity charts for clinical research. *Am J Ophthalmol*1982;94(1):91–96

2 Luan J, Li CS, Sun JN, Ni Y. Vitrectomy combined with endolaser to treat proliferative diabetic retinopathy. *Rec Adv Ophthalmol*2002;22(3):202–203

3 Stefansson E, Novack RL, Hatchel DL. Vitrectomy prevents retinal hypoxia in branch retinal vein occlusion. *Invest Ophthalmol Vis Sci* 1990;31(2):284–289

4 Harbour JW, Smiddy WE, Flynn HW, Rubsamen PE. Vitrectomy for diabetic macular edema associated with a thickened and taut posterior hyaloid membrane. *Am J Ophthalmol*1996;121(4):405–413