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Chronic Diabetic Macular Oedema, Pars Plana Vitrectomy or Combination of PPV and Laser?

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A B S T R A C T

Diabetic cystoid macular oedema (DME) is a common cause of visual acuity (VA) decrease. Good anatomical results and VA of pars plana vitrectomy (PPV) in cases of macular hole internal limiting membrane (ILM) peeling leads to usage of this technique in DME. A favorable result even in a case without vitreoretinal traction leads to conclusion that pathogenesis of this disease is different. We analyzed retrospectively 20 eyes from 20 patients with DME that had undergone PPV and ILM peeling. Half of them were laser treated 6 months before surgery. All eyes had an attached posterior hyaloids membrane in the macular region, but without thickening and without traction. Median duration of DME at the time of PPV was 18 months (range 12–24 months). The median preoperative best-corrected VA of 0.4 (range 0.01–1.0), improved to a median postoperative VA of 0.55 (range 0.01–1.0). Ten eyes without preoperative laser coagulation had a median VA improvement of 77%, while 10 eyes with preoperative macular laser treatment had a median VA improvement of 14.8%. In all 20 eyes DME was no longer visible on microscopic examination after a median period of 3 months after PPV. PPV and ILM peeling resulted in the resolution of oedema, with an improvement in VA in the majority of cases. Eyes without preoperative macular photocoagulation had a significantly higher visual improvement than eyes with preoperative laser treatment. A randomized controlled prospective trial of PPV versus laser is needed to determine the role of PPV as a treatment modality for DME.

Key words: *pars plana vitrectomy, diabetic macular oedema, mental insanity, internal limiting membrane peeling*

Introduction

Macular oedema is present in various general and ophthalmologic disorders and is the most frequent cause of decreased vision acuity (VA). It is also encountered as a complication of diabetic retinopathy. Etiology is complex. Impairment of hematoretinal barrier and impaired blood supply to retina are included among the causes. Another possible cause is an early ageing of the vitreous body in diabetic patients, which is manifested by morphological and biochemical changes. Migration of glial and epithelial cells on the vitreoretinal border with a production of epiretinal membranes in the central area, which is morphologically manifested as a cystoid macular oedema (CME), was described but not always with vitreomacular traction, however. Ischemia of the central region of retina[1,2] results in production of humoral substances like vascular endothelial growth factor (VEGF) and interleukin (IL-6, IL-8). Observations of some authors[3] who report occurrence of macular oedema in diabetic patients without obvious traction as well as a possibility of spontaneous healing after detachment of the posterior vitreous body also support this version. It is not clear if pars plana vitrectomy (PPV) heals CME alone, or has an additional effect on laser treated eyes. The object of this study is comparison of clinical results in both groups.

Materials and Methods

For the purpose of this study, we dealt with patients with clinically significant diabetic macular oedema (DME) without other eye pathology. We divided the patients in two groups: 10 patients were treated with focal laser coagulation at least 6 months prior to surgery and 10 pa-

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tients with the same pathology without laser coagulation of the central region performed. All patients signed the informed consent prior to the procedure. The diagnosis of CME was confirmed by biomicroscopy and OCT or HRT II examination. No patient had a vitreoretinal macular traction. All patients suffered from type 2 diabetes mellitus. Patients were treated with PPV with peeling of the internal limiting membrane (ILM). The clinical condition of patients was further observed 12–36 months after the procedure.

TABLE 1
PATIENTS BY GENDER AND AGE

Characteristic	Laser + PPV* group	Only PPV* group
Male:female ratio	7:3	2:8
Age		
X ± SD	59.7 ± 11.3	66.4 ± 8.8
Range	36–76	53–76

* PPV – pars plana vitrectomy

Results

Age and gender distribution in both groups was similar (Table 1). Clinical data of treated patients are presented in Tables 2 and 3. Median of macular oedema in the time of PPV was 11 months (ranging 2–36). Throughout a 12-month period flattening of retina and disappearance of cystic changes in macula were observed in all patients. Ophthalmologic findings always stabilized; more significant improvement of ocular functions was observed in the group of patients without previous laser coagulation. This finding is statistically significant for PPV group but not for PPV and laser group (Table 4).

Discussion and Conclusion

Kishi and Shimizu described the morphology of pre--macular vitreous body for the first time[4]. Gandorfer et al. properly analyzed samples of vitreoretinal border in patients with diabetic retinopathy and chronic macular oedema and found that in diabetic patients, even in case

TABLE 2
DATA FOR PARS PLANA VITRECTOMY GROUP

No	Age/Sex/Eye	Visual acuity preoperative	Thickness OCT (μ)	Visual acuity final	Complication	Follow-up (months)
1	64/f/r	0.6	320	1	None	24
2	61/m/l	0.16	450	0.6	None	18
3	74/f/l	0.02	500	0.33	Hard exudates	22
4	75/f/l	0.16	420	0.16	Hard exudates	12
5	72/f/r	0.16	380	0.33	None	16
6	53/f/r	0.01	520	0.01	Hard exudates	21
7	76/f/r	0.01	510	0.3	Cataracta	18
8	55/f/l	0.16	511	0.16	Cataracta	24
9	60/m/r	0.01	480	0.16	Hard exudates	14
10	74/f/r	0.16	370	0.16	Hard exudates	16

TABLE 3
DATA FOR LASER + PARS PLANA VITRECTOMY GROUP

No	Age/Sex/Eye	Visual acuity preoperative	Thickness OCT (μ)	Visual acuity final	Complication	Follow-up (months)
1	60/m/r	0.6	280	1	Cataracta	18
2	50/m/r	1	220	1	None	12
3	57/m/l	0.3	360	0.25	Cataracta	20
4	60/m/r	0.6	420	0.5	None	16
5	68/f/l	0.5	390	0.6	None	18
6	76/f/l	0.5	350	0.6	None	15
7	72/f/r	1	240	1	None	23
8	36/m/l	0.6	400	1	None	15
9	57/m/l	0.6	420	1	Open angle glaucoma	24
10	61/m/r	1	240	1	None	24

TABLE 4
STATISTICS OF VISUAL ACUITY IN BOTH GROUPS

	Visus	Mean	Mean SD**	Number of patients	Differences	SD**	t***	sv	p-value
Group laser + PPV*	Before	0.625	0.22	10	0.031	0.11	0.88	9	0.40
	After	0.594	0.25						
Group PPV*	Before	0.181	0.19	10	–0.155	0.17	–2.82	9	0.02
	After	0.336	0.28						

* PPV – pars plana vitrectomy, ** SD – standard deviation, *** T-test (Student test) for dependent samples was used, statistical significance at $p<0.05$

of vitreous body detachment, there is collagen fibers bound to ILM in the pre-macular region[5]. They expressed a theory that ablation of the posterior vitreous body does not occur in the level of ILM. Our results support this theory. It seems that for a successful result of the surgery, it is necessary to remove ILM, also. This conclusion is supported by the regression of macular oedema also in patients where it was impossible to remove ILM completely during the surgery. The same opinion share many vitreoretinal surgeons. Focal laser coagulation in CME is a proven standard according to a multi-centric study EDTRS.

Considering that own collagen of the vitreous body has no contractile abilities, attention is paid mainly on cells, in which contractile fibers were proven. Participation of cell membrane together with pathological collagen fibers is necessary for the occurrence of tangential traction of the macular retina. In our material, we did not find continuous cell membranes and corresponding OCT finding. This would support the above mentioned humoral and ischemic theory. The same conclusion was expressed by Gandorfer et al.[5]. The effect of other factors besides mechanical traction of epiretinal tissue may be assumed in the etiology of DME. Funatsu et al.[6–8] and Aiello et al.[9] independently expressed a hypothesis that, in the vitreous body of diabetic patients, there are humoral substances like VEGF and IL-6 produced in the cells of epiretinal membranes, which impair hematoocular barrier and contribute to the development of macular oedema. Regression of macular oedema after PPV may be explained also by a decrease or removal of the above factors with vitrectomy[10]. This hypothesis is also supported by the gradual post-operative regression of CME. The efficiency of epimacular tissue removal and pathogenesis of macular oedema is till a subject to discussions[11]. Theoretically, it can be assumed that PPV results in loosening of traction forces and removal of factors increasing permeability. The benefit may also be an improved supply of macula with oxygen and nutritive substances. ILM peeling furthermore facilitates removal of epimacular pathological tissue and core of the vitreous body.

PPV and posterior limiting membrane peeling in diabetic retinopathy without obvious traction may result in regression of clinically significant CME and improvement of VA. Patients who were not treated with laser had a better improvement of post-operative VA. Follow-up randomized studies of the efficiency of simple PPV with membrane peeling compared to the therapy with focal laser coagulation will be necessary[12]. Good functional results despite adverse vitreoretinal traction may be caused also by a different pathogenesis of the disorder compared with the surgery of the true macular hole.

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KRONIČNI DIJABETIČKI MAKULARNI EDEM, ODSTRANJIVANJE GLATKOG DIJELA STAKLASTOG TIJELA (ENGL.PARS PLANA VITRECTOMY) ILI KOMBINACIJA PPV-A I LASERA?

S A Ž E T A K

Dijabetički cistični makularni edem (DME) uobičajen je razlog smanjenja oštrine vida (engl. visual acuity (VA)). Dobri rezultati u anatomiji i oštrini vida kod odstranjivanja glatkog dijela staklastog tijela (PPV) u slučajevima odvajanja makule od stražnjeg segmenta (engl. ILM peeling) dovode do upotrebe ove tehnike kod dijagnoze DME-a. Dobri rezultati čak i u slučajevima bez povlačenja retine od staklastog tijela dovode do zaključka kako je patogeneza ove bolesti različita. U ovom smo istraživanju proučavali 20 očiju od 20 pacijenata s dijagnosticiranim DME-om koji su bili podvrgnuti PPV- u i ILM odvajanju. Polovica ispitanika bila je tretirana laserski 6 mjeseci prije operacije. Sve su oči imale stražnju hijaloidnu membranu u makularnoj regiji, ali bez zadebljanja ili povlačenja. Prosječno trajanje DME-a u trenutku PPV-a bilo je 18 mjeseci (u rasponu od 12–24 mjeseci). Prosječno preoperativno najbolje ispravljen VA od 0,4 (u rasponu od 0,01–1,0), poboljšao se do prosječnog postoperativnog VA od 0.55 (u rasponu od 0.01–1.0). Deset očiju bez laserske preoperativne koagulacije imale su VA poboljšanje od 77%, dok je 10 očiju s preoperativnim makularnim laserskim tretmanom imalo prosječno VA poboljšanje od 14,8%. Kod svih 20 očiju 3 mjeseca nakon PPV, DME mikroskopskim pregledom više nije bio uočljiv. PPV i ILM odvajanje rezultirali su nestajanjem edema i poboljšanjem oštrine vida u većini slučajeva. Oči bez preoperativne makularne fotokoagulacije imale su značajno veće vidno poboljšanje u odnosu na oči s laserskim preoperativnim zahvatom. Potrebne su nasumične kontrolirane studije PPV-a u odnosu na laserske tretmane kako bi se utvrdila uloga PPV-a kao zamjenske terapije u tretiranju DME-a.