

Vitreotomy with removal of the internal limiting membrane in refractory diabetic macular edema with or without vitreomacular traction

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ABSTRACT

Purpose: To assess the effect of pars plana vitrectomy (PPV) including peeling of the internal limiting membrane (ILM) on the resolution of refractory or chronic diabetic macular edema (DME).

Methods: A prospective evaluation of 36 eyes of 36 patients with resistant DME, included 20 (55.5%) eyes with vitreo-macular traction, who underwent PPV. With ILM removal even in cases without vitreo macular traction 16 (44.4%) eyes. All patients had a history of macular edema of at least 6 months (Ms). In most of the eyes, grid laser and anti vascular endothelium growth factors (VEGF) in sections had been performed previously at least 6Ms preoperative. Funduscopic examinations and the assessment of best corrected visual acuity (BCVA) with fluorescen angiography (FFA) and optical coherent tomography (OCT) were performed pre and post operative. The mean duration of follow up was 6Ms.

Results: The clinical examinations, FFA and OCT revealed a decrease of leakage within the macula with decrease of macular thickness in 28 eyes (77.7%), BCVA significant improved to more than 20/60 in 13 years (81.2%) of 16 eyes without vitreomacular tractions (VMT), while BCVA improved in 15 eyes (75%) with VMT to more than 20/100, while 6 eyes (16.6%) without improved in thickness or vision. Two eyes with drop vision after recurrent macular hemorrhage (hge) improved to more 20/100 after resolving .

Conclusion: Pars plana vitrectomy with ILM peeling reduce chronic DME in most cases (77.7%), even with or without VMT, while visual acuity was less in improvement of cases with VMT, even with improvement of macular thickness because of macular functional loss (foveal cellular degenerations), secondary to macular shagreen.

Key words: Pars plana vitrectomy (PPV), the internal limiting membrane (ILM), diabetic macular edema (DME)

Introduction

Macular edema is a major cause of central vision loss in patients with diabetic retinopathy (DR). Diffuse diabetic macular edema (DME) is caused by extensive breakdown of the inner and outer blood retinal barrier. Vitrectomy has been performed as a treatment for resistant diabetic macular edema (Diabetic Retinopathy Clinical Research Network, 2007). The vitreous and vitreo retinal junction have been detected as modulator of DME (Klein *et al.*, 1992).

Encouraged by reports showing that diabetic patients with posterior vitreous detachment (PVD) (Pendergast *et al.*, 2000). Vitrectomy with removal of posterior hyaloid was considered to be therapeutic option in diffuse and cystoids edema, which often persists despite multiple laser treatment (Jahn *et al.*, 2004). Several authors postulate a positive effect of additional peeling of the internal limiting membrane (ILM) in patient with DME refractory to laser or intra vitreal injection bevacizumab (IVB) (Costa *et al.*, 2004).

Vitrectomy with ILM removal provides better visual and morphological results than the nature causes, uncertainly remains as to whether vitrectomy and PVD alone is sufficient or wheather additional ILM delimitation is beneficial and remarkable decrease of macular edema with improvement of best corrected visual acuity (BCVA).

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Methods

The study was conducted by me at 3 clinical cities of Egypt, (Memorial Institute of ophthalmology for Researches in Giza, El Nour eye hospital and my private clinic, Cairo). This paper reports data collected through the one year primary outcome phase of the protocol with additional safety data collected through the final follow up at one year.

Study population:

Eligible participants had to be at least 18 years and with Type – I or II diabetes mellitus (DM). Data were collected from 36 patient who had a vitrectomy as treatment for diffuse DME refractory to macular photocoagulation (MPC) or IVB, the current study includes a predefined subset of eyes that met the following criteria for the primary analysis:

- a) Vitreomacular traction as the indication for vitrectomy based on investigator assessment.
- b) BCVA, 20/60 to 20/400 “Snellen equivalent”.
- c) Retinal central subfield thickness (CSF) >300 microns on status OCT.

Major exclusion criteria included, cataract extraction not performed in conjunction with vitrectomy, history of MPC, IVB and intravitreal steroid within 6 Ms prior to enrollment also excluded cases with massive hard exudates within the macular area proliferative or non proliferative diabetic retinopathy (PDR), peripheral laser scatter photocoagulation, prior vitrectomy or other major ocular surgery with 6Ms, prior to enrollment. Preoperative evaluations included determination of snellen BCVA, biomicroscopic examination of the anterior and posterior segment, fluorescein angiography (F.A) and OCT for measuring CMT. Standard 23 gauge three port P.P. vitrectomy including the use of intraoperative dyes, “Trypan blue “Dorc” and drug 0.1 ml/4 mg of triamcilon was performed according to investigators usual routine. The ILM was incised and peeled at all direction. No intravitreal tamponade was used at the end of surgery except two causes complicated by intrasurgical bleeding through SF6-gas tamponade. Panretinal photocoagulation or IVB could be given at any time following surgery if judged medically necessary postoperative data collected have been reported one day, one and four weeks of the surgery and every one or two months thereafter. Standardized refraction was performed and BCVA was measured, FA and OCT images were obtained at each of these visits were reported every 3Ms. Through a dilated pupil using the Zeiss-stratus, OCT. postoperative complications were reported allover follow up

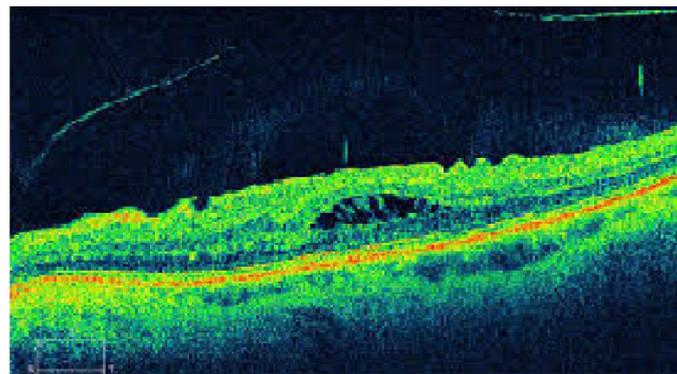
Results

The study includes 36 eyes of 36 patients that had vitrectomy by one surgeon as treatment for DME; between 2012- 2014, average age of the participants was 64 years (ys) (19-72 ys.). 40% were women, 12 (33.3%) patients with type-I and 24 (66.6%) type II, Diabetes mellitus (D.M). duration of persistent DME were more than 3Ms (3-6 Ms). While interval time between PPV and the onset of diagnosis, was from 2-4Ms. Two eyes (5.5%) were complicated with intra operative bleeding included one eye with iatrogenic break managed by intraoperative gas tamponade (SF6). Postoperative complication included 2 (5.5%) eyes with postoperative. Macular hge. Resolved spontaneously, 3 (8.3%) eye with premacular proliferation within more than 4Ms postoperative follow up: managed by recurrent vitrectomy but association with low vision gain (less than 20/200). Four eyes (11.1%) without improved of vision postoperative then before (Stationary cases) secondary to macular degeneration (vision not improved than 20/400 as preoperative).

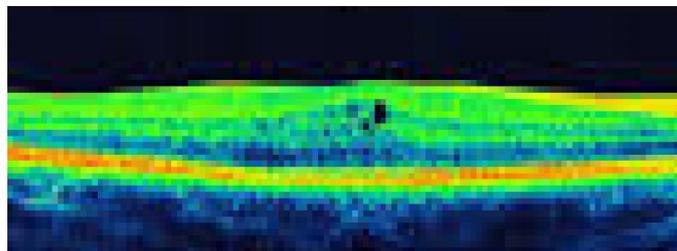
Median visual acuity prior to surgery was a letter score of 15 (41.6%) eyes “20/100 snellen equivalent with an interquartile range of 20/500” to 20/400. Median central subfield thickness (CSFT) was 420mm (interquartile range 315 to 570).

Over half of patient 20 (55.5%) eyes had evidence a proliferative diabetic retinopathy (PDR) “defined as neovascularization (NV) and fibrous proliferative postoperative recurrent intravitreal bevacizumab (IVB) and photocoagulation were recorded in 11 (30. 5%) eyes for recurrent or resistant DME.

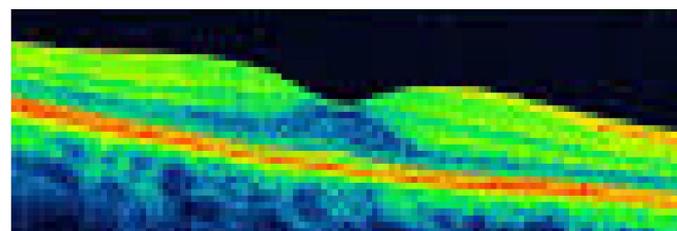
Factors association with visual acuity outcome; mean BCVA at final follow up was recorded as follow 18 (50%) eyes improved to (20/30 – 20/60) mean 20/40, 9(25%) eyes from 20/100 – 20/200, included two (5.5%) eyes complicated postoperative by Vit. hge managed by recurrent vitrectomy but postoperative vision gain within 20/200. 4(11.1%) eyes with stationary without improvement of vision than preoperative even with improvement in macular thickness (less than 20/400) secondary to macular degeneration. 5 (13.8) eyes with more worse of vision gain (C.F/ 1 meter to H.M. secondary to 3 (8.3%) eyes macular scar and two (5.5%) eyes with macular shagreen intraretinal macular proliferations. Finally, at end of follow up mean BCVA improved to more than 20/100 at 27 (75%) eyes, 4 (11.1%) eyes with stationary non improvement in vision less than 20/200 and 5 (13.8%) with more worse or loss of visions. Mean central macular thickness (CMT) at final follow up was 315 mm \pm 95 mm which was significantly less than it's preoperative value of 467 mm \pm 107 mm. CMT had decreased by more than 60% in 29 (80.5) eyes. (Figures 1, 2, 3)



Preoperative

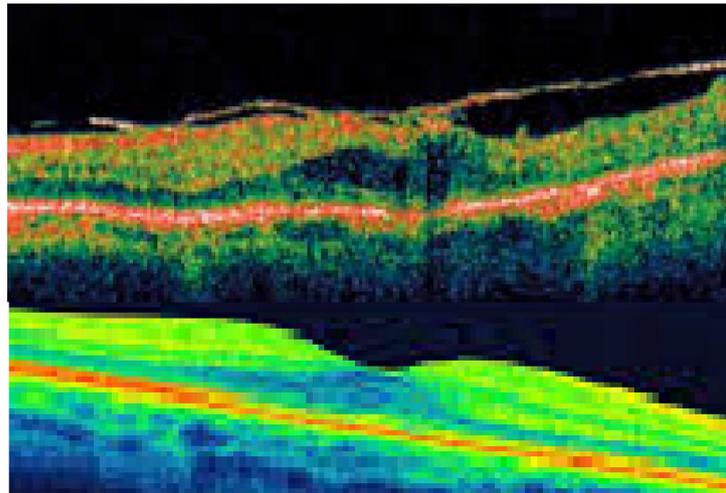


1 week postoperative



6 months postoperative

Fig. 1: Macular odema from tractional epimacular membrane



6 months postoperative

Fig. 2: Macular odema from recurrent tractional epimacular membrane (Retinal Shagreen)

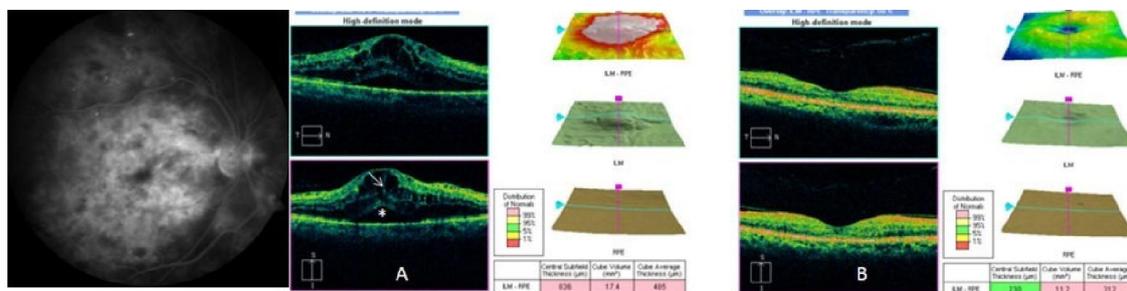


Fig. 3: Macular odema from tractional epimacular membrane 6 months postoperative

Discussion

DME remains a significant cause of visual impairment in developed countries. The cornerstone for treatment of DME is MPC, which has been shown to reduce the incidence of moderate visual loss in eyes with clinically significant macular edema by 50% (Jahn *et al.*, 2004).

In eyes with diffuse DME, however, the visual response to MPC is less encouraging (Nasralla *et al.*, 1988). The biological plausibility of vitrectomy for DME has been suggested by clinical observation that PVD is associated with a lower incidence of DME. In a retrospective study by Patel *et al.* (2016) only 20% of eyes with DME had PVD, where as 55% of eyes without DME had PVD. Vitrectomy has been shown to be efficacious in eyes with identifiable hyaloid thickening or contraction. In this prospective case series of patients with refractory diffuse DME treated by PPV combined with ILM peeling, a significant improvement in foveal thickness was observed more than 86.1% (31 eyes) however visual acuity improvement was not significant ever after excluding 2 eyes complicated by vitreous. hge. Visual acuity improvement by more than 20/100.

In retrospective study, found that visual outcomes correlated with improvement in foveal thickness, while in 4 eyes (11.1%) without improvement in vision even with improvement in foveal thickness, Shah *et al.* (2006) showed no significant correlation was found between change in central macular thickness and change in vision. There are reports that PPV with ILM peeling reduce retinal thickness without improvement in vision, due to different factors (a) duration of macular edema prior to surgery (b) prior MPC and or IVB (c). Severity and type of D.M correlates with severity of DM (d) severity of macular ischemia. (Costa *et al.*, 2004; Shah *et al.*, 2006; Anonymous, 1987).

In our study visual acuity also, non improvement in correlation to foveal thickness improvement usually related to photoreceptors degeneration secondary to longstanding macular edema. So that the visual gain after PPV. Was diminished in cases with delayed surgical interference.

The role of ILM removal in DME is unclear, Comparative study of PPV. with and without ILM peeling for diffuse clinically significant macular edema, structural improvement was seen but with limited visual improvement after ILM peeling (Yanyali *et al.*, 2005).

Surgery for refractory DME without a taut hyaloid is associated with a significant improvement in visual acuity and diminution of retinal thickness as measured by OCT.

The discrepancy between anatomical and functional results of ILM removal in chronic DME is likely to be caused by structural changes of the macula due to long – studying edema. The role of vitrectomy compared with other approaches in the management of DME remains uncertain as the potential benefits.

In conclusion, vitrectomy with ILM peeling for refractory diffuse DME may reduce macula thickness, but does not seem to significantly improve visual acuity during intermediate – term follow up for about one year.

The patient with type – IDM with high incidence in visual acuity again but with high incidence of complications of macular and vitreal he. In our study all cases of retinal he. were type – I -DM.

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