Vitrectomy in vitreomacular traction syndrome evaluated by ocular coherence tomography (OCT) retinal mapping.

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Vitrectomy in vitreomacular traction syndrome evaluated by ocular coherence tomography (OCT) retinal mapping

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ABSTRACT.

Purpose: **To evaluate vitreomacular traction syndrome with ocular coherence tomography (OCT) retinal mapping before and after vitrectomy.**

Methods: **A prospective study of 11 eyes with vitreomacular traction syndrome was carried out. Ocular coherence tomography retinal mapping was performed before vitrectomy and 6 months postoperatively. Visual acuity (VA) was measured with the ETDRS chart.**

Results: **All patients showed a reduction in the thickness of the macular area postoperatively. The mean thickness in the central macular area was 609 μm preoperatively and 243 μm 6 months postoperatively ($p < 0.001$). Ten patients had an increase in VA of at least two lines on the ETDRS chart and in one patient VA was unchanged. The mean improvement in VA was 3.1 lines.**

Conclusion: **Retinal mapping with OCT is a good method of evaluating the thickness of the macula before and after surgery in vitreomacular traction syndrome and vitrectomy improves VA in most cases**

Key words: ocular coherence tomography (OCT) – retinal mapping – vitreomacular traction syndrome – vitrectomy

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Introduction

Vitreomacular traction syndrome (VMT) is caused by an incomplete posterior vitreous detachment, where the vitreous remains attached to the macular area, leading to traction and development of increased thickness in the macula, cystoid changes and impaired visual acuity (VA) (Smiddy et al. 1988, 1990; McDonald et al. 1994). Optical coherence tomography (OCT) studies have shown that the vitreous in most cases is detached around the macula, but remains attached to the macular area (Fig. 1) and to the optic disc, causing anterior–posterior traction to the macula (Gallemore et al. 2000; Sulkes et al. 2000; Kusaka et al. 2001; Uchino et al. 2001). Diagnosis can be difficult when only biomicroscopic examination is used, but the condition is easily diagnosed with an OCT examination.

In some cases there is a spontaneous resolution of the traction if the vitreous detaches from the macula (Cheng et al. 2003; Hee et al. 1998; Sulkes et al. 2000; Kusaka et al. 2001), but in most cases a vitrectomy is probably necessary in order to surgically detach the vitreous from the macular area and the optic disc with the aim of relieving the macula of the vitreous traction (Massin et al. 1997; Smiddy et al. 1988; McDonald et al. 1994; Melberg et al. 1995; Munuera et al. 1998; Pournaras et al. 1999; Uchino et al. 2001).

The OCT retinal mapping program has proved to be an excellent tool to evaluate retinal thickness in the macula (Hee et al. 1998), and has a high degree of reproducibility (Massin et al. 2001). We wanted to investigate the usefulness of OCT retinal mapping in VMT as well as the outcome after vitrectomy.

Methods

Eleven consecutive patients (11 eyes) with VMT as diagnosed by OCT 2 (Zeiss-Humphrey Inc., San Leandro, California, USA) were recruited from the Eye Department at Lund University Hospital between August 2002 and September 2003 and studied prospectively. They included eight women and three men. Their mean age was 70 years (range 62–72 years). The mean duration of visual deterioration was 5 months (2–12 months). Two patients were pseudophakic and nine were phakic at the time of the vitrectomy.

All patients were examined with OCT and diagnosed with VMT if any

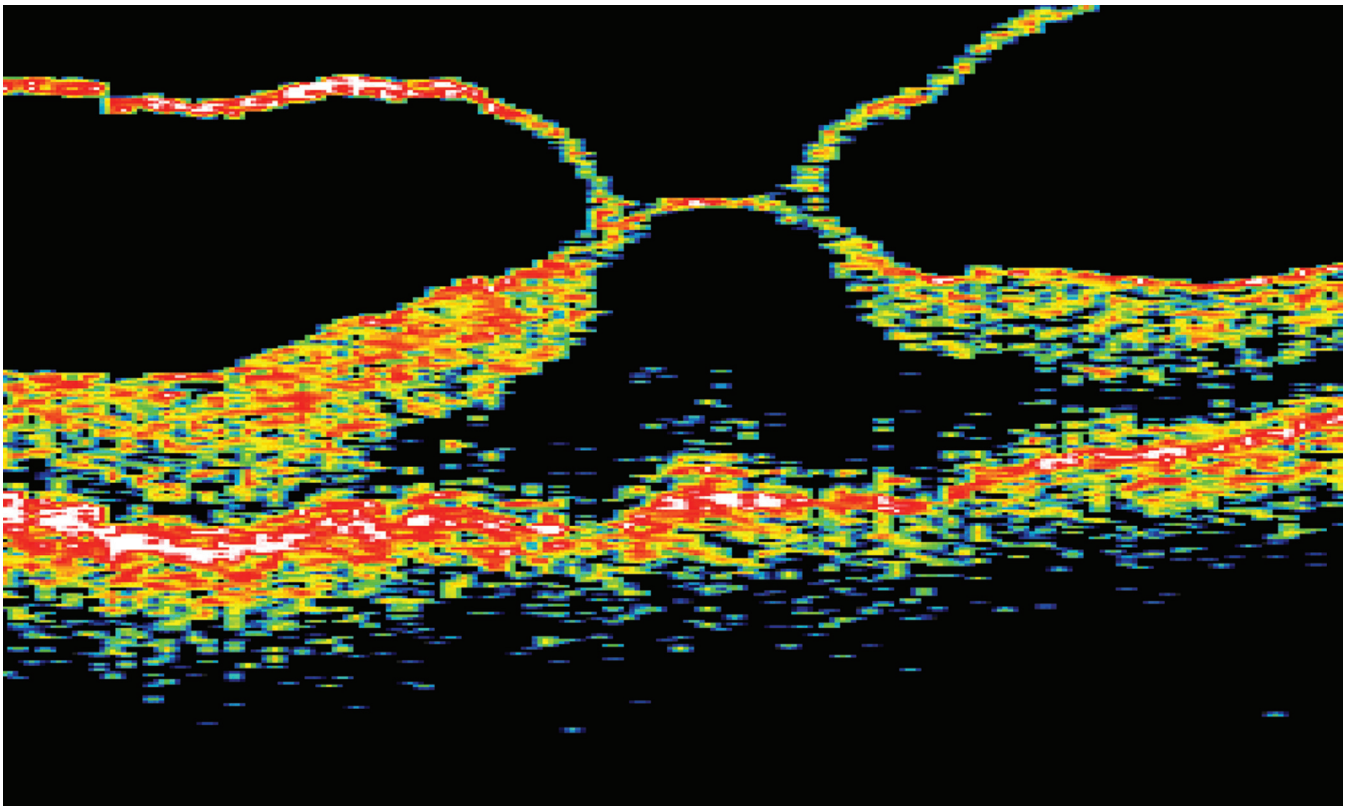

Fig. 1. This OCT scan shows a typical VMT case with an incomplete vitreous detachment leading to traction and the development of increased thickness in the macular area.

apparent traction from the vitreous causing increased thickness of the macula was present. The OCT examination was primarily performed as a single line procedure. If the patient had VMT, retinal mapping was performed. The retinal mapping was carried out using the OCT 2 standard program for retinal mapping, as has been described previously (Hee et al. 1998; Massin et al. 2001). An examination using six radial lines, each with a length of 3.45 mm, centred at the fovea and with 30 degrees displacement from one another, was performed. Internal fixation was used and the scanning and video images were displayed simultaneously to verify fixation The OCT software for retinal mapping calculated the mean retinal thickness in nine areas. Only the most central area of 1 mm in diameter with the fovea in the centre was used for calculations.

When the patients had been diagnosed with VMT, they were informed of their diagnosis and told that there was a slight possibility that their condition would resolve spontaneously. They were then informed of the study to be conducted and invited to participate. Patients were deemed to be enrolled in the study when they had given their informed consent. They were offered a vitrectomy within a few weeks or the option of being seen again in the clinic after 6 and 12 weeks. All patients chose to be seen again before making a decision to undergo vitrectomy. After 12 weeks follow-up, vitrectomy was performed in all patients.

A standard three-port pars plana vitrectomy was performed and the central vitreous was removed first. Then the vitreous membrane was engaged with gentle suction from the vitreous cutter above the optic disc and detached from the optic disc and macular area. The vitreous membrane was unusually difficult to detach in all patients compared to patients with macular holes. No tamponade was used.

Optical coherence tomography retinal mapping and ETDRS VA testing were performed the day before surgery and after 6 months.

For the statistical analysis the Student's paired *t*-test and Pearson's correlation were used as appropriate.

Results

During the 12-week period before vitrectomy was performed, no patients showed any improvement in VA or any decrease in retinal thickness. Two of the patients deteriorated slightly, and the other nine patients showed an unchanged status.

There were no surgical complications. Four of the nine patients who were phakic developed significant cataract and underwent cataract extraction before the 6-month follow-up.

The mean retinal thickness in the macula (the 1 mm central circle) preoperatively was 608 μm ± 260 μm (range 311 μm–1200 μm; 95% confidence interval 434–784 μm) and 243 μm ± 66 μm (range 145 μm–353 μm; 95% CI 189–287 μm) postoperatively (Fig. 2). This difference is statistically significant ($p < 0.001$). The normal macular anatomy with a foveal dip was re-established in seven patients. Four patients had a remaining diffuse thickening of the macula, although no patients had any signs of persistent vitreomacular traction at follow-up.

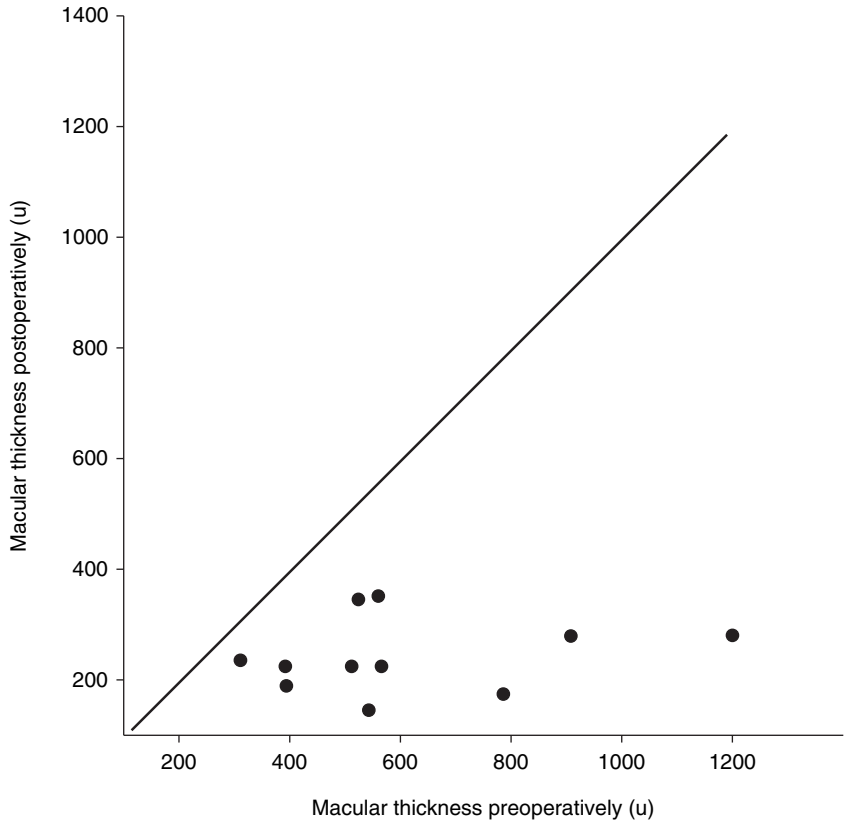

Fig. 2. Macular thickness preoperatively compared to 6 months postoperatively. All patients had a decrease in macular thickness ($p < 0.001$).

Ten patients had an increase of at least two lines in VA on the ETDRS chart, and in one patient VA was unchanged. The mean improvement in VA was 3.1 lines (Fig. 3). Preoperative ETDRS VA was 0.20 ± 0.11 (range 0.04–0.40; 95% CI 0.12–0.27) and it improved postoperatively to 0.41 ± 0.23 (range 0.10–0.77; 95% CI 0.26–0.57) ($p < 0.001$).

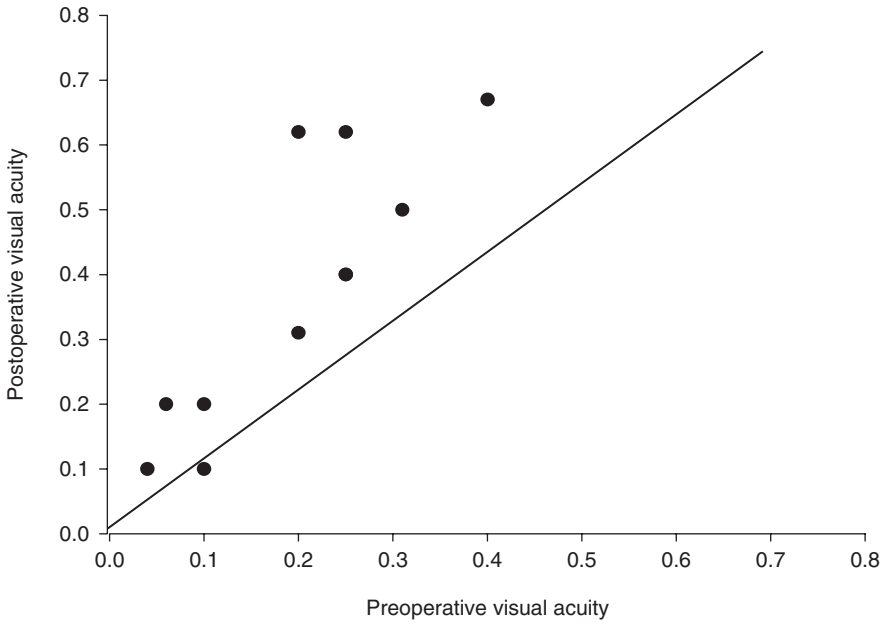

Fig. 3. Visual acuity preoperatively compared to 6 months postoperatively. Ten of the 11 patients had an increase in VA ($p < 0.001$).

There was no correlation between VA at follow-up and retinal thickness at baseline ($r = -0.0022$, $p = 0.99$), nor between duration of symptoms and VA at follow-up ($r = 0.30$, $p = 0.37$). However, there was a strong correlation between duration of symptoms and retinal thickness at baseline ($r = 0.85$, $p = 0.001$), and between preoperative VA and postoperative VA ($r = 0.83$, $p = 0.001$), although there was no difference between the number of lines gained on the ETDRS chart and preoperative VA ($r = -0.19$, $p = 0.58$).

Discussion

Retinal mapping with OCT in order to measure retinal thickness has advantages compared to using a single line scan. A single line scan to measure retinal thickness provides incomplete information because it is only possible to obtain the thickness in one single A-scan. In retinal mapping with OCT, several A-scans are put together to calculate the mean thickness of the macula. The method has been used in previous studies for measuring changes in retinal thickness in macular oedema due to diabetic retinopathy, retinal vein occlusions and uveitis before and after treatment (Sekiryu et al. 2000; Antcliff et al. 2001; Saika et al. 2001; Martidis et al. 2002; Massin et al. 2004), and has proved to have very good reproducibility (Massin et al. 2001). A potential problem with the method can arise if the patient's fixation during the examination is not adequately controlled, leading to incorrect measurements. In this study the scanning and video images were displayed simultaneously to verify fixation in order to avoid this problem.

A few case reports describe VMT cases with spontaneous detachment of the vitreous from the macula with resolution of macular oedema and improvement in VA (Sulkes et al. 2000; Kusaka et al. 2001; Cheng et al. 2003). However, Hikichi et al. (1995) reported that, during a follow-up period of 60 months, only six (11%) of 53 patients with VMT developed a complete spontaneous posterior vitreous detachment. In our study, surgery was deferred for 3 months and no spontaneous improvement was noted during this time period. Once the surgery had been performed, all patients but one had a significant

improvement in VA, and all patients had a reduction of the retinal thickness, with seven patients showing a normal macular structure with a foveal dip and four patients showing a remaining diffuse macular oedema. No patients had any remaining VMT at follow-up.

No correlation between initial retinal thickness and final VA could be demonstrated ($r = -0.0022$, $p = 0.99$), nor between duration of symptoms and VA at follow-up ($r = 0.30$, $p = 0.37$). However, there was a strong correlation between duration of symptoms and retinal thickness at baseline ($r = 0.85$, $p = 0.001$). These findings indicate that VMT is probably a continuous process and the longer the traction is present, the more severe the retinal thickness will be. From a prognostic point of view, preoperative VA correlated well with postoperative VA ($r = 0.83$, $p = 0.001$), but there was no correlation between the number of lines gained on the ETDRS chart and preoperative VA ($r = -0.19$, $p = 0.58$).

In conclusion, this study showed that vitrectomy effectively resolves traction in VMT, reduces retinal thickness as measured by OCT, and improves VA irrespective of duration, retinal thickness and VA at baseline. It seems reasonable to suggest that patients should be offered surgery once the condition has been diagnosed.

References

Antcliff RJ, Spalton DJ, Stanford MR, Graham EM, Ffytche TJ & Marshall J (2001): Intravitreal triamcinolone for uveitic cystoid macular oedema: an optical coherence tomography study. Ophthalmology **108**: 765–772.

Cheng CL, Hoh ST, Chuan JC, Wong EY & Koh AH (2003): Acute vitreomacular traction with early spontaneous resolution. Clin Experiment Ophthalmol **31**: 161–163.

Gallemore RP, Jumper JM, McCuen BW, Jaffe GJ, Postel EA & Toth CA (2000): Diagnosis of vitreoretinal adhesions in macular disease with optical coherence tomography. Retina **20**: 115–120.

Hee MR, Puliafito CA, Duker JS et al. (1998): Topography of diabetic macular oedema with optical coherence tomography. Ophthalmology **105**: 360–370.

Hikichi T, Yoshida A & Trempe CL (1995): Course of vitreomacular traction syndrome. Am J Ophthalmol **119**: 55–61.

Kusaka S, Saito Y, Okada AA, Sasamoto M, Hayashi A, Ohji M & Tano Y (2001): Optical coherence tomography in spontaneously resolving vitreomacular traction syndrome. Ophthalmologica **215**: 139–141.

Martidis A, Duker JS, Greenberg PB, Rogers AH, Puliafito CA, Reichel E & Baumal C (2002): Intravitreal triamcinolone for refractory diabetic macular oedema. Ophthalmology **109**: 920–927.

Massin P, Audren F, Haouchine B, Erginay A, Bergmann JF, Benosman R, Caulin C & Gaudric A (2004): Intravitreal triamcinolone acetonide for diabetic diffuse macular oedema: preliminary results of a prospective controlled trial. Ophthalmology **111**: 218–224.

Massin P, Erginay A, Haouchine B, Paques M, Santiago PY, Than-Trong T, Lafont M & Gaudric A (1997): [Results of surgery of vitreomacular traction syndromes.] J Fr Ophtalmol **20**: 539–547.

Massin P, Vicaut E, Haouchine B, Erginay A, Paques M & Gaudric A (2001): Reproducibility of retinal mapping using optical coherence tomography. Arch Ophthalmol **119**: 1135–1142.

McDonald HR, Johnson RN & Schatz H (1994): Surgical results in the vitreomacular traction syndrome. Ophthalmology **101**: 1397–1402.

Melberg NS, Williams DF, Balles MW, Jaffe GJ, Meredith TA, Sneed SR & Westrich DJ (1995): Vitrectomy for vitreomacular traction syndrome with macular detachment. Retina **15**: 192–197.

Munuera JM, Garcia-Layana A, Maldonado MJ, Aliseda D & Moreno-Montanes J (1998): Optical coherence tomography in successful surgery of vitreomacular traction syndrome. Arch Ophthalmol **116**: 1388–1389.

Pournaras CJ, Kapetanios AD & Donati G (1999): Vitrectomy for traction macular oedema. Doc Ophthalmol **97**: 439–447.

Saika S, Tanaka T, Miyamoto T & Ohnishi Y (2001): Surgical posterior vitreous detachment combined with gas/air tamponade for treating macular oedema associated with branch retinal vein occlusion: retinal tomography and visual outcome. Graefes Arch Clin Exp Ophthalmol **239**: 729–732.

Sekiryu T, Yamauchi T, Enaida H, Hara Y & Furuta M (2000): Retina tomography after vitrectomy for macular oedema of central retinal vein occlusion. Ophthalmic Surg Lasers **31**: 198–202.

Smiddy WE, Michels RG, Glaser BM & deBustros S (1988): Vitrectomy for macular traction caused by incomplete vitreous separation. Arch Ophthalmol **106**: 624–628.

Smiddy WE, Michels RG & Green WR (1990): Morphology, pathology and surgery of idiopathic vitreoretinal macular disorders. A review. Retina **10**: 288–296.

Sulkes DJ, Ip MS, Baumal CR, Wu HK & Puliafito CA (2000): Spontaneous resolution of vitreomacular traction documented by optical coherence tomography. Arch Ophthalmol **118**: 286–287.

Uchino E, Uemura A, Doi N & Ohba N (2001): Postsurgical evaluation of idiopathic vitreomacular traction syndrome by optical coherence tomography. Am J Ophthalmol **132**: 122–123.

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