ORIGINAL ARTICLE

Assessment of sub retinal fluid using optical coherence tomography after surgery of macula-off Rhegmatogenous retinal detachment

Sharjeel Sultan, Nisar A. Siyal, Nargis Nizam Ashraf, A. Rasheed Khokar

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Abstract:

Objective: To assess the presence and persistence of submacular fluid using optical coherence tomography (OCT) after clinically successful vitrectomy surgery of macula-off Rhegmatogenous retinal detachment.

Material and Method: This was the prospective observational study carried out at operation theatre, Eye unit II, Civil hospital Karachi – Pakistan from September 2017 to March 2018. All patients went through the detail pre- and post-operative clinical examination and optical coherence tomography (OCT) scan of the macula. Patients who observed with sub retinal fluid on OCT at 6 weeks after surgery underwent follow-up with repeat of the study investigation at 3rd and 6th months after surgery. If no abnormality was seen on OCT at the 6th week examination, no further investigation was undertaken. Demographic data and detachment characteristics were collected retrospectively from the patient medical record.

Results: Total of 50 patients were recruited with mean age of 42 ± 8 years. 08 of these had sub retinal fluid (SRF) on macula diagnosed on optical coherence tomography performed at 6th weeks after anatomically and clinically successful retinal detachment surgery. Out of these 8 patients, sub retinal fluid was present in 5 patients on follow up OCT after 3 months of surgery and this sub retinal fluid remained there in 2 patients on 6 months follow up optical coherence tomography.

Conclusion: Sub retinal fluid (SRF) after pars plana vitrectomy (PPV) is the uncommon troublesome and disturbing cause of persistent decrease visual acuity. OCT is a noninvasive real-time imaging system that can be used to investigate retinal structures as well as the shallow sub retinal fluid.

Keywords: retinal detachment, optical coherence tomography; pars plana vitrectomy; sub retinal fluid

Dow University of Health Sciences, Karachi
S Sultan
NA Siyal
NN Ashraf
AR Khokar

Correspondence:
Dr. Sharjeel Sultan, Assistant Professor, Department of Ophthalmology, Dow University of Health Sciences, Karachi.
Cell: 0321-2393133
Email: sharj35@yahoo.com

Introduction:

Pars plana vitrectomy (PPV) has become the established and mainstay treatment for complicated rhegmatogenous retinal detachment. PPV was established in 1970 by Machemer et al.[1] In 1975, the use of a 20-gauge 3 port system was described by O' Malley and Heintz.[2] This 20-gauge 3 port PPV has became the gold standard and remained so for at least 3 decades till 2002. In recent year, many considerable changes occur for the development of small incision transconjunctival, sutureless pars plana vitrectomy (PPV).[5,6] In 2002, modern 25-gauge PPV system was introduced by Fujii et al.[3] For phacic patients 25-gauge pars plana vitrectomy system was combined with phacoemulsification surgery having number of vitreoretinal diseases compared to vitrectomy alone. After post-operative PPV surgery, clinically successful reattachment of the macula occur which is most commonly associated with incomplete visual recovery.

For vision impairment, cystoid macular edema, epiretinal membrane, retinal folds, retinal pigment epithelium migration, and persistent SRF are the post-operative clinical findings. SRF was

Figure 1: Fundus photograph of both left and right eye

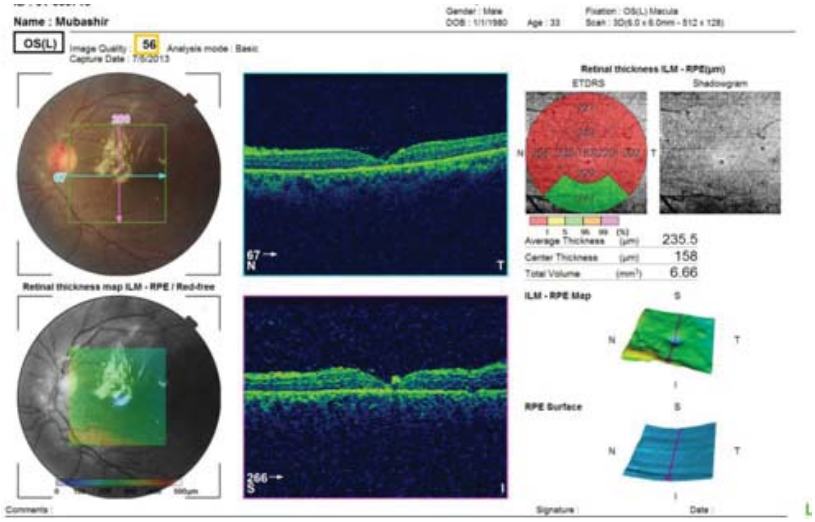

Figure 2a: Sub retinal fluid found on OCT after 2 weeks of retinal reattachment surgery

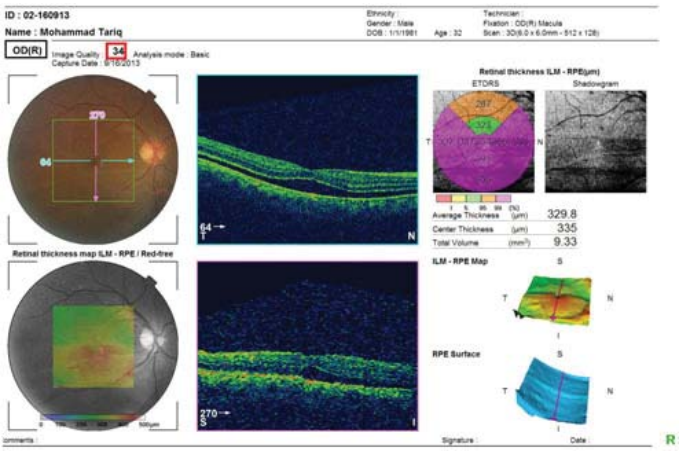

Figure 2b: Sub retinal fluid found on OCT after 2 weeks of retinal reattachment surgery

not commonly found and was characterized by long term persistence of shallow SRF often involving the macula, usually not extending peripheral to macula, not associated with open retinal breaks, and often accompanied by subretinal precipitates. When involving the macula these SRF cause prolonged and disturbing post-operative visual symptoms, such as decreased visual acuity and metamorphopsia. Since absorption of the fluid can take many months, this problem should be recognized early and not be mistaken for failure of detachment surgery due to open, missed, or new retinal breaks and may need immediate attention for proper management.

Optical coherence tomography (OCT) is a non-invasive real-time imaging system that can be used to investigate retinal structures as well as anterior segment of the eye.[4,5,7] OCT has allowed objective and quantitative measurements of the retina near histological resolution. Dmitry S et al[6] study suggest that OCT is based on low-coherence interferometry using infrared light, while the use of long wave length light penetrate into the scattering medium. The key benefits of OCT include live sub-surface images at near-ultra-microscopic resolution, gives instant direct imaging of tissue morphology and also do not expose the patient to ionizing radiation.

So, the main objective of this study was to assess the presence and persistence of submacular fluid using optical coherence tomography (OCT) after clinically successful vitrectomy surgery of macula-off Rhegmatogenous retinal detachment.

Material and methods:

This was the prospective study carried out at Eye unit II, Civil hospital Karachi–Pakistan from September 2017 to March 2018. Patients who had undergone PPV and silicone oil temponade as a primary procedure for recent non-complicated superior or sub-total Rhegmatogenous retinal detachment with macula-off were included in this study. Patients who were phakic and didn't had any history of previous intraocular surgery were also included in this study. Patients with complicated retinal detachment (RD), RD with macular hole, and RD in patients with diabetic retinopathy or maculopathy and age-related maculopathy (ARMD) were excluded from this study.

All patients went through the detail pre- and post-operative clinical examination and opti-

cal coherence tomography (OCT) scan of the macula using three-dimensional OCT-2000 FA (Topcon). The OCT measurements were made after pupil dilation (0.5% tropicamide), with the patient in the sitting position and the head placed on a chin rest. Those patients in whom submacular fluid was seen on OCT at 6 weeks after surgery underwent follow-up with repeat of the study investigation at 3 and 6 months after surgery. If no abnormality was seen on OCT at the 6-week examination, no further investigation was undertaken. Details of demographic data (including gender and age) and detachment characteristics were collected from the patient medical record.

Result:

Total of 50 patients were recruited in this study, who had operated on within a 1-month period for a spontaneous non-complicated superior or sub-total Rhegmatogenous retinal detachment with macula-off. All patients were undergone pars plana vitrectomy with silicone oil and endolaser sealing of associated tear. The mean age of patients was 42±6 years. There were 28 females and 22 males, patients. All Patients had gone through successful retinal reattachment surgery.

Out of 50 patients, 38 patients had myopia of more than -4.00 D and 12 patients had either low myopia or Hypermetropia. Post-operative 6 weeks by 3D OCT (Topcon) examination showed SRF on macula in 8 patients. The SRF was diffused in nature in 6 patients and was well circumscribed in 2 of the total 8 patients. The SRF was resolved in 5 patients on 3 months after repeated OCT examination and persistent subretinal fluid found in 2 patients till 6 months follow up on OCT examination.

Fundus photograph of left eye was shown in figure 1 after 1-month surgery of macula-off Rhegmatogenous retinal detachment with retina clinically reattached, but OCT findings of left eye shows subretinal fluid under the macula.

Discussion:

Our study highlights the least understood lesion of the macula following the retinal detachment surgery by pars plana vitrectomy (PPV). We have used non-invasive cross-sectional imaging technique, the OCT for the identification of the submacular fluid after the PPV. The findings of our study are related to the Miltiadis K et.al[8] study that using biomicroscopy and SD-OCT for post-operative evaluation of the macula can help in diagnosis of alterations with incomplete visual recovery. The advent of OCT in Jen-Hao Cheng et.al[12] study permitted detailed visualization of the retinal anatomy and anatomic responses to medical or surgical interventions. The axial resolution of OCT is of a few micrometers studied by B Baumann et.al[9,10,13] and can detect reflected signals as small as ~10–10 of the incident optical power. Previous study shows that using OCT, successful scleral buckle surgery could be explained with presence of submacular fluid in patients with macula-off retinal detachment who had undergone prolonged recovery of visual acuity.[14,15] It was also indicated that in a 12-month-period, final visual outcome was favourable due to the gradual resorption of submacular fluid.

In some cases, no clinically detected macular changes were observed and reduced postoperative VA remains unexplained. Recently, a possible cause of unexplained post-operative visual loss was identified. Using OCT, a foveal detachment with residual subretinal fluid, not visible clinically or on fluorescein angiography, was found in up to two-thirds of patients after buckle surgery. This trend implies that persistent subfoveal fluid accumulation is correlated with a worse visual outcome. In Wolfensberger T et al[16] study results also indicate that eight eyes (50%) showed persistent subfoveal fluid accumulation at 6 months after surgery and one eye continued to do so at 12 months.[17] In our study, there were 16% of patients who showed submacular fluid on OCT at 1 month after PPV surgery not detected on clinical examination. There is another study who also described this phenomenon of clinically silent subfoveal fluid accumulation on OCT in seven of 15 cases at 1 month after sur-

gery.[17,18]

The residual foveal detachment resolved within 12 months in most cases but was correlated with delayed visual recovery.[13,19] The presence of this foveal detachment after RD surgery was later confirmed by others. Another study done by Bensen SE et al[20] in 2006 showed presence of submacular fluid on OCT in clinically unremarkable macula which is responsible for decrease post-operative best corrected visual acuity (BCVA).[14] In this study, 15% of patients operated for PPV showed submacular fluid on OCT that was remained there with the median age of 5.5 months.[20] This was again consistent with our study in which submacular fluid was present in 16% of the patient and was totally resolved on 6 months follow up OCT. Our study results were also consistent with Meng ZJ and et al[20] who also showed submacular fluid in 13.9% of the total patient. However, visual recovery after reattachment surgery also depends upon several pre-and post-operative factors including duration and height of the macular detachment, residual vitreomacular traction, post-operative cystoid macular edema, epiretinal membrane, retinal folds, subretinal retinal pigment epithelium (RPE) migration and clinically undetected subfoveal fluid.

It was concluded in our study that sub retinal fluid after PPV is the uncommon troublesome and disturbing cause of persistent decrease visual acuity. Early and confirmed identification of this SRF is the key for the proper management of the disease. OCT is a noninvasive real-time imaging system that can be used to investigate retinal structures as well as the shallow SRF.

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Role and contribution of authors:

Dr Sharjeel Sultan, concept and design, undertook the data analyses, wrote, edited and revised the manuscript.

Dr Nisar A. Siyal, interpretation of data, wrote and reviewed the manuscript

Dr Nargis Nizam Ashraf, wrote, edited and reviewed the manuscript

Dr A Rashedd Khokar, reviewed and approved the manuscript

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