

## Brief Communication

# Optical Coherence Tomography Angiography following Scleral Buckling Surgery

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### Abstract

**Purpose:** The retinal changes following scleral buckling surgery (SBS) for rhegmatogenous retinal detachment (RRD) have been rarely evaluated with optical coherence tomography angiography (OCTA).

**Methods:** A 40 years old male presented with subtotal RD involving the macula and had best corrected visual acuity of logmar 2.3 in the affected right eye. Five months after applying 120 degree scleral buckle, swept source optical coherence tomography (SSOCT) and swept source optical coherence tomography angiography (SS-OCTA) were done.

**Result:** At five months post-surgery, despite a settled retina in the operated eye, the patient had vision of logmar 1 and thin retinal nerve fibre layer (115 micrometer). The SSOCT showed inner segment-outer segment (IS-OS) junction disruption, thinned retinal pigment epithelium, central macular thickness of 275 micrometer and subfoveal choroidal thickness of 222 micrometer. A 3x3 mm macular OCTA scan showed a normal foveal avascular zone along with higher values for vascular density in superficial capillary plexus in all quadrants except temporal quadrant in operated eye as compared to fellow eye.

**Conclusion:** The SBS with 120 degree buckle did not lead to a reduced vascular density in superficial capillary plexus in the operated eye with respect to fellow eye.

**Key words:** optical coherence tomography angiography; retinal blood flow; scleral buckling surgery; superficial retinal vascular density; myopia

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**Conflict of Interest:** Nil

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## Introduction

The encircling scleral buckles stretch the optic nerve, change the ocular blood flow and interrupt choroidal venous drainage causing venous engorgement leading to ocular ischemia. There are very few reports discussing postoperative Optical Coherence Tomography Angiography (OCTA) findings in the eyes with macula-off rhegmatogenous retinal detachment (RRD), according to a search of the PubMed system (Yui et al, 2018). Still fewer are studies on OCTA findings post SBS; for example, only 6/27 eyes studied by Yui et al (2018) and 5/28 eyes examined by Chui-Lien Tsen et al (2019) underwent SBS.

We examined swept source optical coherence tomography (SSOCT) and swept source optical coherence tomography angiography (SSOCTA) scans in our subject who underwent SBS.

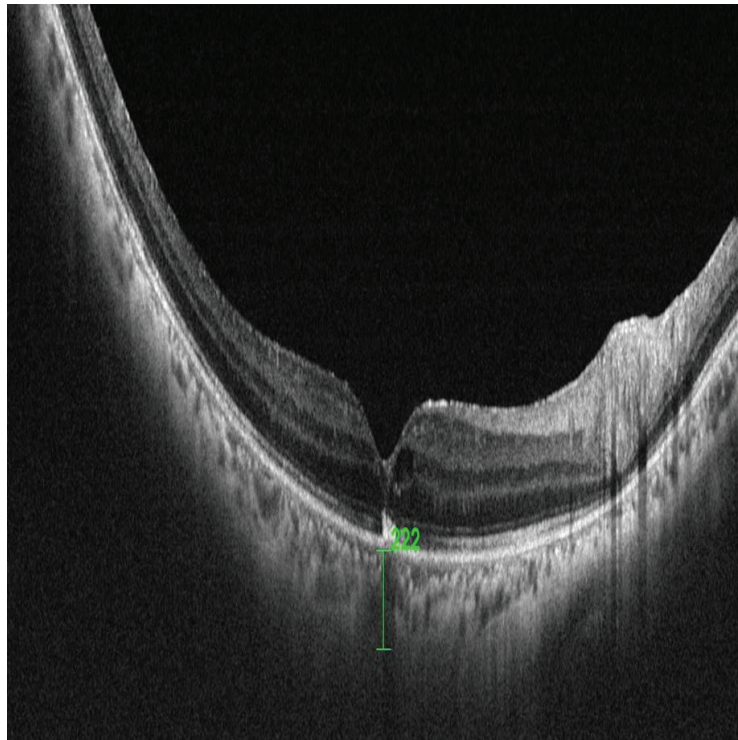
## Case

A 40 years old male presented with sudden diminution of vision in right eye (RE) for 15 days. The subject had best corrected visual acuity (BCVA) of logmar 2.3 in RE and logmar 0.2 in LE. The fundus examination showed a subtotal retinal detachment (RD) involving macula and supero-temporal horseshoe tear with proliferative vitreo-retinopathy A. The axial length was 24.59 mm in RE and 24.9 mm in LE. The intraocular pressure was 14 mmHg in both eyes. The retinal nerve fibre

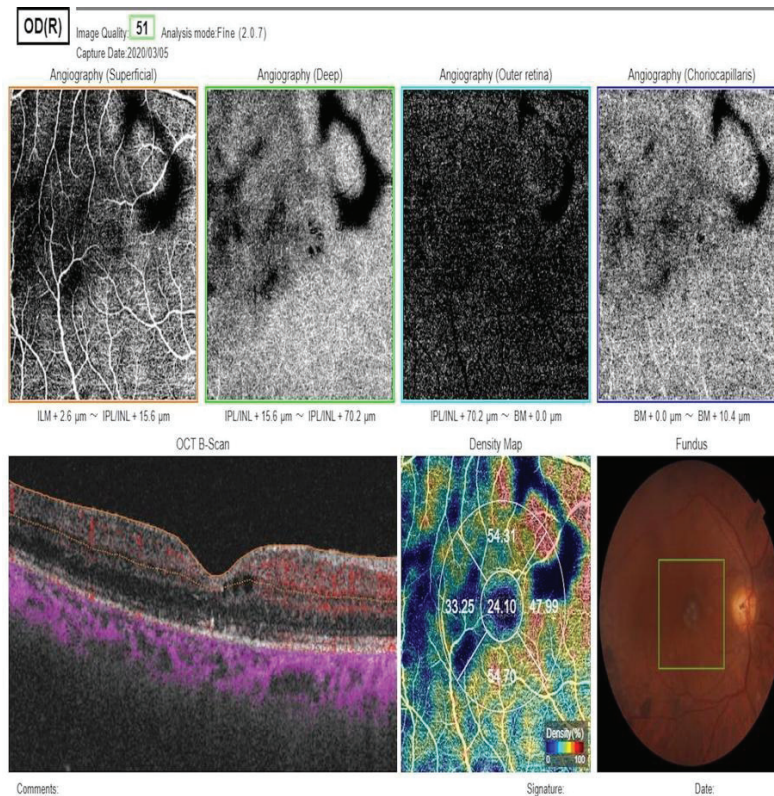
layer (RNFL) thickness was 143 micrometer in RE and 103 micrometer in LE. The retina got settled following SBS with temporal 120 degree buckle (Style; 277, 7 mm, Mira Inc., Uxbridge, MA01569, USA) at 8 mm from limbus along with encirclage band (Style 240, 2.5 mm, Mira Inc., Uxbridge, MA01569, USA).

Five months after surgery, BCVA in RE was logmar 1. The refractive error was -7 Dsph in both eyes. The retinal nerve fibre layer thickness in the operated eye reduced to 115 micrometer. The SSOCT showed central macular thickness (CMT) of 275 micrometer and 260 micrometer and subfoveal choroidal thickness (SFCT) of 222 micrometer and 256 micrometer in RE and LE respectively. There was subfoveal cystoid space with scar, inner segment-outer segment (IS-OS) junction disruption and thinned retinal pigment epithelium (RPE) (Figure 1 a & 2a).

The 3x3 mm macular OCTA scan with ETDRS chart overlay showed normal foveal avascular zone measuring 0.30 mm<sup>2</sup> in RE and 0.24 mm<sup>2</sup> in LE and higher values for vascular density in superficial capillary plexus in superior (54.31>48.84), inferior (54.70>41.44), nasal (47.99>37.82) quadrant and central macula (24.10>13.73) but lower values for vascular density in temporal quadrant (33.25<40.65) of operated eye as compared to fellow eye. In RE, the OCTA scan showed shadow of floater and some voids, most probably due to subfoveal cystic spaces (Figure 1b & 2b).

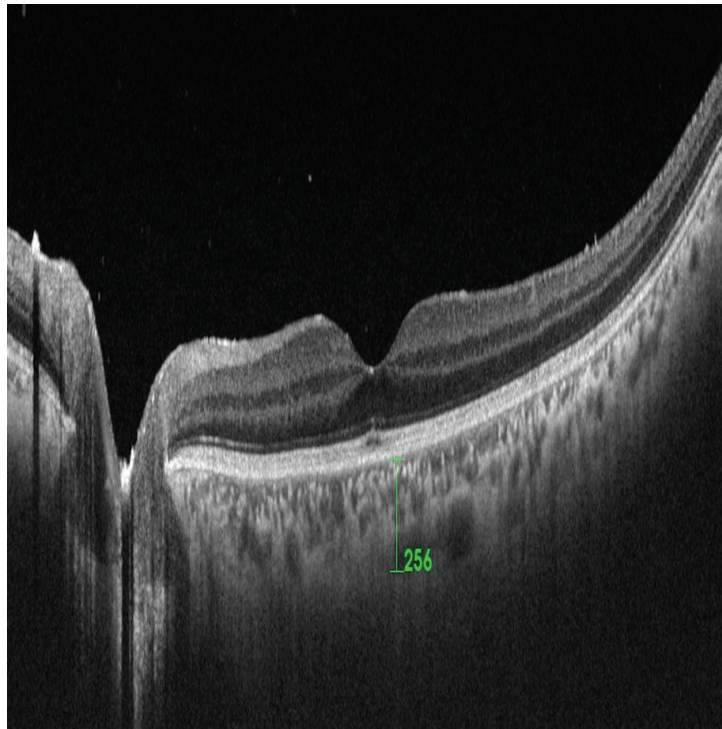


**Figure 1a:** SSOCT showing subfoveal cystoid space & scar in operated RE

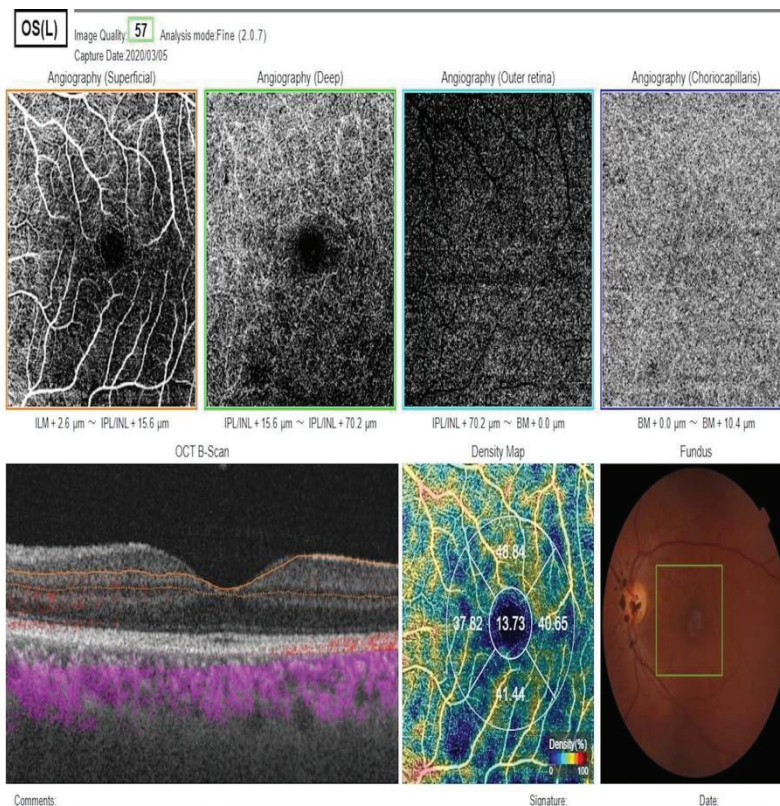


**Figure 1b:** OCTA showing superficial retinal VD in operated RE





**Figure 2a:** SSOCT showing normal foveal contour in LE



**Figure 2b:** OCTA showing superficial retinal VD in LE

## Discussion

Farooq et al (2018) used OCT having wavelength of 870 nm and found that 42.1% of their cases with subnormal BCVA following RD surgery did not show any change, so they recommended that SSOCT and SSOCTA are better imaging modalities. In 5/24 eyes of cryo buckle, Gil-Martinez et al (2018) did swept source OCT and found that changes in ellipsoid zone and outer retinal folds caused blurred vision and metamorphopsia.

The central retinal artery forms the superficial capillary plexus (SCP); central retinal artery and choriocapillaris supplying outer plexiform layer form deep capillary plexus (DCP); while the choriocapillaris supply the retinal pigment epithelium, photoreceptor layer, external limiting membrane and outer nuclear layer. The choroidal circulation supplies foveal avascular zone (FAZ) (Hong et al, 2020).

Following vitreo-retinal (VR) surgery in RRD, using SSOCTA, Hong et al (2020) found that the vascular densities in superficial and deep capillary plexus in the detached eyes did not differ significantly from those in the fellow eyes. Their eyes had a short onset duration (of 6-8 days) for RRD before undergoing surgery.

Tsen et al (2019) used OCTA having wavelength of 840 nm about 3 months following scleral buckling, vitreo-retinal and combined scleral buckle-vitreoretinal RD surgery and found no significant differences between operated and healthy eyes with respect to foveal avascular zone and vascular density in superficial capillary plexus, deep capillary plexus and chorio-capillary region.

Following VR or SB surgery, Yui et al (2019) did not find any correlation between parameters of foveal avascular zone and postoperative BCVA. They did not compare OCTA findings of operated eye with those of fellow eye.

We did SSOCT and SSOCTA using a wavelength of 1050 nm. The higher vascular density in the

SCP of the operated eye might be due to two factors. First, retinal microcirculation was less adversely affected due to an early RD surgery. Second, OCTA scan was done at five months post-surgery when microcirculation of the retina might have gradually recovered with time. It may also be due to optimum tension of passing buckle and encirclage sutures and that buckle having an extent of 120 degree and located at 8 mm from limbus might not have adversely influenced blood flow in the central retinal artery. Our patient did not have an increased sub-foveal choroidal thickness. Kimura et al (2012) demonstrated that a mean scleral indentation extension of  $107 \pm 38.8$  degree was not enough to produce choroidal thickness alterations. The foveal avascular zone is supplied by choroidal circulation and normal FAZ in our subject showed that surgery did not affect the choroidal circulation.

On using laser speckle method, having wavelength of 811 nm, Nagahara et al (2000) indicated that SBS reduced tissue blood velocity in the region of choroid and retina lying in vicinity of SB but caused no significant effect on optic nerve head (ONH) and fovea. The encircling element fastened more tightly and/or the buckle occupying more than three quadrants may significantly affect blood flow.

Tsen et al (2019) stated that a reduced vascular density may cause delayed visual recovery after successful repair of RRD, thus it could be an indicator of the visual outcome. We recommend that post scleral buckling surgery, association of OCTA findings may be studied in relation to best corrected visual acuity, duration of RD, central macular thickness, and buckle parameters including extent, type and location.

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