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Research Article

The changes of choroidal thickness of patients with retinal detachment after scleral buckling using enhanced depth imaging (EDI)-OCT in Isfahan Feiz Hospital in 2015

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ABSTRACT

Background: There is a growing interest in the role of the choroid in various chorioretinal diseases. The aim of this study is to investigate the changes in different area of choroidal thickness (CT) following scleral buckling surgery using Enhanced-depth imaging optical coherence tomography (EDI-OCT).

Methods: This prospective clinical study compared 24 patients with Retinal detachment (RD) and 24 control eyes. The macular CT in the sub fovea and in four different regions, superior, inferior, temporal and nasal areas were measured using EDI-OCT at 1000 microns (S1000, I1000, T1000, and N1000).

Results: The average age was 52.33±12.72 years (range 30–80 years). There was significant difference between mean subfoveal CT of operated eye in three exams (P<0.05) .This value was significantly larger at before surgery, 1st week and 1st month exams when compared with control eye (P<0.05 for all comparison). All of these thickness significantly decreased at the 1st week and 1st month follow-up exams. Mean CT of operated eye at S1000,T1000, I1000,N1000 locations was 301.68±112.39, 289.89±114.7, 219±57, 276.05±120.76, and 263±111.74µm, respectively before surgery . These macular choroidal thickness in the study eye was larger when compared with the control eye. The differences were statistically significant for the nasal (p=0.009) and superior (p=0.012) locations.

Conclusions: Patients with RD had a significantly larger CT that All of these thickness significantly decreased at the 1st week and 1st month follow-up exams.

Keywords: Choroidal thickness, Scleral buckling, Retinal detachment, Enhanced-depth imaging optical coherence tomography

INTRODUCTION:

Rhegmatogenous retinal detachment (RRD) is characterized by a break in neurosensory retina with moving of fluid into the sub retinal space. Scleral buckling surgery has been considered as the “gold standard” for uncomplicated RRD, despite recent trend toward pars planvasectomy(1).Thehigh percentage of anatomical successes suggests that this method is relatively safe (2, 3).Choroidal thickness may be an important parameter in studying the pathogenesis of RRD.The choroid, a well-vascularized connective tissue, resides between the retina pigment epithelium (RPE) and the sclera and extends from the oraserrata anteriorly to the optic nerve posteriorly. The choroid receives most of the ocular blood flow and has one of the highest metabolic activities in the body. The physiological functions of the choroid include providing vascular supply to the anterior optic nerve head and retina, emmetropization, thermoregulation, and waste-product removal.(4,5) Thus, a structurally and functionally healthy choroid plays an essential role in the function of the macula and per papillary area.

Due to rapid developments in modern imaging methods,it is possible to understand changes in the retina better and their influence on functional results after a successful surgery.However, we still know very little about changes in the choroid after scleral buckling surgery. Laser Doppler flowery has shown a reduced choroidal blood flow in the fovea region after scleral buckling procedures.(6) Changes in choroidal circulation can affect the thickness of thechoroid (7).In the past, choroidal thickness could not be accurately measured.In recent years, detecting the choroid using spectral domain optical coherence tomography (SD-OCT) has often been difficult, because the RPE hinders the penetration process. This is because the wavelength of the light source is occasionally not long enough to penetrate into the choroid. Conventional OCT employs a wavelength of about 800 nm, while the wavelengths capable of clear choroidal imaging are reportedly in the 1,060 nm range (8-10).

Enhanced depth imaging (EDI) optical coherence tomography (OCT) is a recent modification of the standard technique. This novel modality shows the cross-sectional structure and thickness of the choroid using commercial SD-OCTs.EDI-OCT provides high-definition cross-sectional images of the choroid. Information on alterations in choroidal thickness after scleral buckling surgery is rare.Two researchers have found that in RRD eyes,the subfovealchoroidal thickness is significantly thicker than in normal eyes (11, 12). However, most of these studies did not provide any information about other area of choroid except fovea (11, 12).There is a growing interest in the role of the choroid in various chorioretinal diseases.The aim of this study is to investigate the changes in different area of choroidal thickness following scleral buckling surgery with use of an encircling band using EDI-OCT.

MATERIALS AND METHODS:

Between April 2015 and January 2016, all consecutive patients fulfilling the criteria of having aprimaryrhegmatogenous retinal detachment (RRD) were participated in this observational case series. This prospective, observational study was performed at the Department of Ophthalmology at Isfahan Feiz Education and Research Hospital. The study followed the tenets of the Declaration of Helsinki for human experimentation. All patients voluntarily participated in the study and signed an informed consent form prepared according to the ethical protocol.

1. Participants and enrollment criteria

The study was performed on 24patients with RRD who underwent scleral buckling surgery with or without an encircling band for unilateral RRD.A diagnosis of RRD was established based on the clinical ocular examination.Exclusion criteria included history of any retinal abnormalities other than high myopia such as diabetic retinopathy , retinal vascular abnormalities, history of idiopathic or autoimmune associated uveitis in either eye,macular hole,Cases of preoperative PVR grade C or higher ,history of any posterior segment operation in either eye,Redetachment cases and any previous ocular surgery other than uncomplicated cataract surgery or had glaucoma, endophthalmitis or other infectious process in the study eye and media opacities preventing OCT imagingof the retina or choroid. Also,patients with incomplete data regarding the status of the macula were also excluded from the final analysis.The inclusion criteria were asfollows: all patients who had clear ocular media anda clear image was obtained to enable precise measurement of the choroidal thickness.All patients were interviewed, and an ophthalmologic examination was performed before surgery. All subjects underwent a comprehensive ophthalmic examination, that included a thorough ocular examination using an indirect ophthalmoscope and slit-lamp bio microscope with a contact lens, spherical equivalent(SE)of refractive errorusing an autorefract meter (Topcon Corporation, Tokyo, Japan,uncorrected visual acuity best(UCVA),best corrected visual acuity (BCVA) measurement using standard snellen eye charts converted into LogMAR scale, intraocular pressure(IOP) using aGoldmanapplication tonometry, anterior segment, and fundus examination with Volk 78 and 90 lenses (Volk Optical Inc., USA).Spherical equivalent (SE) was calculated as the sum of the spherical power and half of the cylinder power (13).

Therefore, the status of the macula was determined by indirect ophthalmoscopy. The baseline characteristics that were collected includes: Age, sex, preoperative BCVA, final visual acuity, primary surgeon, primary anatomical success rate,extent of RD, attached or detached status of macula, presence of preoperative proliferative vitreoretinopathy (PVR) less than grade C, retinal breaks (types, location, number, and size), presence or absence of high myopia, and lens status(phakic or psudophakic), whether the external sub retinal fluid drainage was performed or not.All surgeries were performed by a single surgeon (D.AR.) under general anesthesia to reduce patient’s pain during the surgery.After the sclera was exposed with a perilimbalconjunctivalperitomy, extra ocular rectus muscles were isolated. Once the extraocular muscles were hookedat the insertion site, tractional sutures were placed with 4-0 black silk.During conventional scleral buckling using indirect ophthalmoscopy, fundus observation was performed through an indirect ophthalmoscope. Retinal breaks were identified in all patients and were treated with trans scleralcry therapy.A silicone tire (#276 FCI, Ophthalmic,Paris, France) with or without a silicone band (#240 FCI, Ophthalmic, Paris, France) was fixed to the sclera with mattress sutures using 5-0 Mersilene. Sub retinal fluid drainage is performed underneath the buckling in relation to the highest retina elevation, preferably near the upper or lower edge of the horizontal rectus muscles or beneath the vertical rectus muscles and far from the choroidal area of the vortex veins. The position and height of the buckle were confirmed by indirect ophthalmoscopy. Physiological saline irrigation was employed during surgery to prevent the corneal surface from drying.In terms of complications, we assessed the occurrence of bleeding, incarceration or retinal break at the drainage site as well as any choroidal detachment and sub retinalhemorrhage during the SRF drainage process. At the end of the drainage, under ophthalmoscopy during surgery the retina appeared to be reattached.Finally, after checking the fundus surgery was completed by closing the conjunctiva.Postoperatively, all patients were followed up at regular controls. Anatomical success was defined as a reattached retina at the last postoperative follow-up at one month.

2. Axial length

Axial length measurements were obtained from the patient's medical records. Measurements were performed using the IOL Master (Carl Zeiss, Oberkochen, Germany) bio meter. In cases of media opacities, interfering with the bio meter measurements, axial length was measured using an A-scan 10- MHz transducer with minimal corneal compression and with the use of topical anesthesia. The recorded value was the mean of six reliable measurements.

3. Enhanced depth imaging (EDI) optical coherence tomography (0CT):

All subjects were imaged with Heidelberg Spectral is (Heidelberg Engineering Inc. Heidelberg, Germany) using the EDI-OCT technique. It enables us to achieve high definition cross-sectional images of the choroid in vivo.Choroidal thickness (CT) was measured using EDI-OCT on the day of the diagnosis and on two follow-up exams (1st week, 1st month).Since previous studies have indicated that CT and choroidal blood flow regulation may be altered in acute and chronic smokers, no regular cigarette smokers were included in the study. (14, 15)Participants were asked to not consume alcoholic or caffeinated drinks for at least 12 hours before having their measurements taken, as well as instructed to refrain from ingesting any food or liquids in the 30 min before the experiment. Each EDI-OCT examination was done between 10 am and 12pm.We compared the measurement performed by 2 ophthalmologists, and the results did not differ more than 5 μm and were repeatable. We have taken an average of these two measurementsThe choroid thickness was measured as the distance between the hyper reflective line corresponding to the base of RPE - Bruch's membrane complex and the margin or hyper reflective line corresponding to chorioscleral interface. It was measured manually using the caliper tool.CTwas also measured in the fellow eyes (24 eyes) without any previous ocular surgery and any diseases (as a control group). We compared choroidal thickness between operated and fellow eyes. In each patient, Mean subfovealchoroidal thickness (SFCT)was measured in horizontal and vertical sections beneath the foveaand recorded average of two horizontal and vertical subfoveal measurements.

Choroidal thickness was measured a nine macular locations: SFCT and 1000 micronsnasal (N1000), temporal (T1000), inferior (I1000), and superior (S1000) to the foveal center. All of datawas recorded in special forms.

4. Statistical analysis

All data were expressed as means ± standard deviation (SD). Statistical analysis was performed using SPSS software (Version 21.0 for Windows, IBM-SPSS, Japan).The significance level was set to be $P \leq 0.05$.

RESULTS:

Patients and procedures

Twenty four participants were included in present study, thirteen (54.2%) women and eleven (45.8%) men. The average age was 52.33±12.72 years (range30–80 years). There were 19 left studyeyes and 5 right study eyes in operated eye group. In 14 (58.3%) eyes, the macula detached before surgery and in 10(41.7%) eyes macula was attached. Fifteen (62.5%) patients wasphakic and nine (37.5%) patients was psudophakic. Axial length of operated eye was 25.42±1.66 millimeters (range 23-28.47) and axial length of fellow eye was 24.73±1.72 (range 22-28.1).(P-value>0.05)

Sphere equivalent of operated eye was -3.14±4.17 diopters (range-13 to +0.75) and in fellow eye was-4.83±5.52 (range -15 to +3.50).All patients had undergone uneventful scleral buckling surgeries. Subretinal drainage performed in 22 (91.7%) patients. . Anatomic success (complete retinal attachment) was noted in all cases after one surgical intervention. During the last follow-up examination, the retina was still attached in all 24 eyes.

Table 1, 2 showed the place of buckle insertion and band fixation in operated eyes.

Table 1. Freuency and percentage of buckle place insertion in operated eyes.

Place of buckle insertion	Frequency(percent)
Supratemporal	7(29.2%)
Temporal	4(16.7%)
Supranasal	5(20.8%)
Inferior	4(16.7%)
Superior	4(16.7%)
Total	24(100%)

Mean LogMAR (Logarithm of the Minimum Angle of Resolution) visual acuity:

Mean LogMAR visual acuity of control eyes was 0.16±0.17. Mean LogMAR visual acuity of operated eyes before surgery and in final follow-up visit were 1.18±0.78 and 0.58±0.37, respectively (p<0.001).

Subfovealchoroidal thickness (SFCT) in vertical and horizontal meridian:

Foveal choroidal thickness measurements are shown in Table2**.**Foveal choroidal thickness±SD at in vertical meridian (fovea.V) and horizontal meridian (fovea.H) of operated eye before surgery was 302.63±129.32 and 308.89±121.69µm, respectively. (Table2)There was significant difference between fovea.H,fovea.V and MF(mean foveal thickness) of operated eye in three exams ($P<0.05$) but there was no significant difference between these measurement of control eye in three exams ($P>0.05$). Choroidal thickness of fovea.H, fovea.V and MF in the study eye was significantly larger at before surgery, 1st week and 1st month exams when compared with control eye ($P<0.05$ for all comparison). All of these thickness significantly decreased at the 1st week and 1st month follow-up exams (compared with preoperative thickness in the study eye).(Figure 1)

Table2 . The mean ± standard deviation values of choroidal thickness measurements of the study (operated) and control groups in different examination times. Fovea.H: choroidal thickness at fovea in horizontal meridian; Fovea.V :choroidal thickness at fovea in vertical meridian; MF:meanfoveal thickness.

Variable	Eye	Examination time			P-Value	
		Before surgery	1st week after surgery	1st month after surgery	Comparison of 3 exams	Compared with Control eye before surgery
Fovea.H	control	231±82.24	233.26±82.47	232.16±79.06	0.143	0.027
	study	308.89±121.69[b]	298.47±110.92[c]	266.68±94.18	0.011	
Fovea.V	control	222.74±69.52[a]	225.74±68.54[c]	217.11±66.23	0.017	0.046
	study	302.63±129.32[a]	288±121.63[c]	254±110.63	<0.001	
MF	control	226±72.48	245.26±86.79	224.47±68.8	0.185	0.034
	study	305.68±123.18[a,b]	277.74±99.32	258.47±99.07	0.007	

a: Differences between before and 1st week after surgery is significant ($P<0.05$).

b: Differences between before and 1st month after surgery is significant ($P<0.05$).

c: Differences between 1st week and 1st month after surgery is significant ($P<0.05$).

*: Differences between operated and control eye is significant ($P<0.05$).

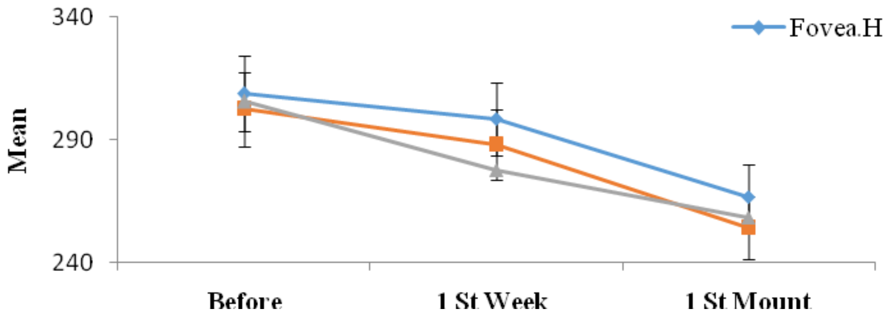

Figure 1. Subfovealchoroidal thickness in horizontal meridian (Fovea.H), vertical meridian (Fovea.V) and mean foveal thickness(MF) based on the time of measurement in study(operated) eye.

Mean macular choroidalthicknesses of operated eye at 1000µm superior,1000µm temporal, 1000µm inferior, and 1000µm nasal locations was 301.68±112.39, 289.89±114.7, 219±57, 276.05±120.76, and 263±111.74µm, respectively before surgery . These were larger than control eye measurements (Table2).

Table2-The mean values and choroidal thickness measurements of the study and control group. N1000, choroidal thickness at 1000µm nasal to the fovea; T1000,choroidal thickness at 1000µm temporal to the fovea; S1000, choroidal thickness at 1000µm superior to the fovea; I1000, choroidal thickness at 1000µm inferior to the fovea.

Variable	Eye	Examination time			P-value	
		Before surgery	1st week after surgery	1st Month after surgery	Comparison of 3exam	Compare with control before surgery
T1000	control	227.95±75.27[a]	222.26±76.68	224.11±69.52	<0.001	0.057
	study	289.89±114.7[b]	269.26±99.03	248.84±83.98	0.095	
N1000	control	209.26±81.24	209.26±80.31	209.58±78.93	0.987	0.009
	study	263±111.74	252.42±108.42	248.05±101.56	0.489	
S1000	control	222.53±66.68	222.32±66.94	224.26±61.4	0.797	0.012

	study	301.68±112.39[a,b]	283.63±114.01[c]	256.84±94.65	<0.001	
I1000	control	210.68±76.29	209.79±74.12	206.63±78.41	0.418	0.054
	study	276.05±120.76[b]	266±118.97	250.53±101.7	0.003	

a: Differences between before and 1st week after surgery is significant (P<0.05).

b: Differences between before and 1st month after surgery is significant (P<0.05).

c: Differences between 1st week and 1st month after surgery is significant (P<0.05).

*: Differences between operated and control eye is significant (P<0.05).

Macular choroidal thickness measurements are shown in Table2. Superior, inferior, temporal and nasal macular choroidal thickness in the study eye was larger before surgery when compared with the control eye. The differences were statistically significant for the nasal (p=0.009) and superior (p=0.012) locations.(Figure2-6) Thickness decreased at the1st week and 1st month follow-up exams compared with preoperative thickness in the study eye. The differences were statistically significant for superior (p<0.001) andinferior (p=0.003) location.

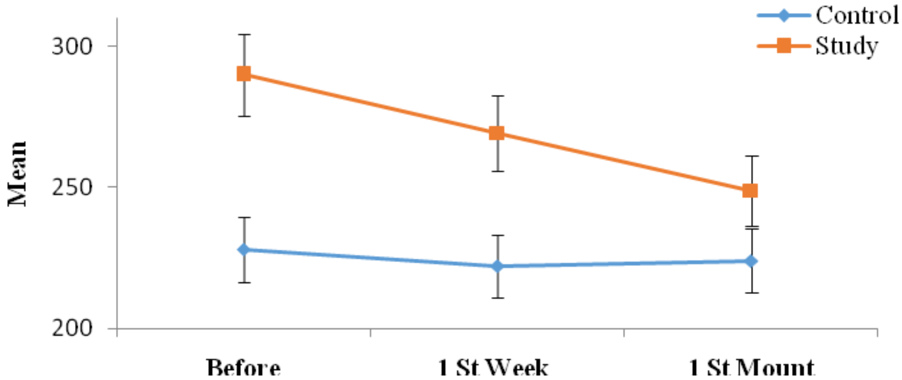

Figure 2. The mean choroidal thickness at 1000μm temporal to the fovea based on the time of Measurement.

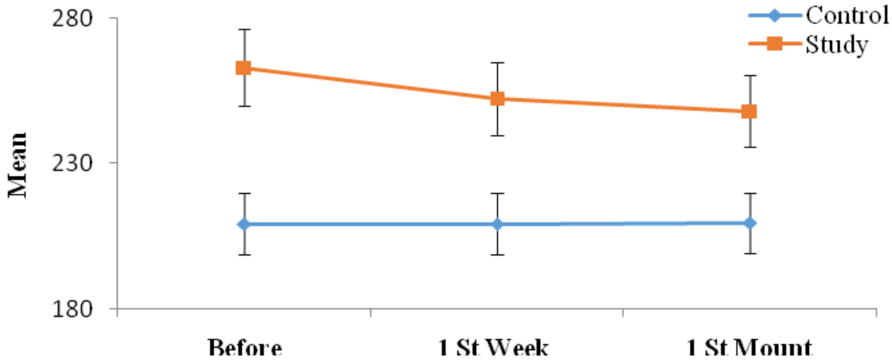

Figure 3. The mean choroidal thickness measurements of the study and control group at 1000μm nasal to the fovea.

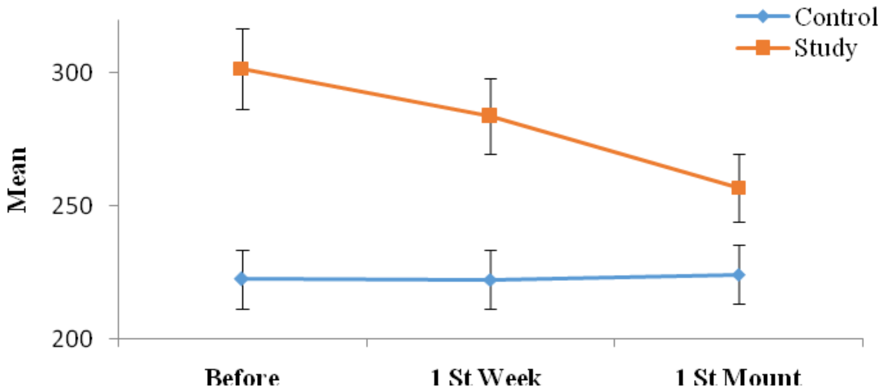

Figure 4. The mean choroidal thickness measurements of the study and control group at 1000μm superior the fovea

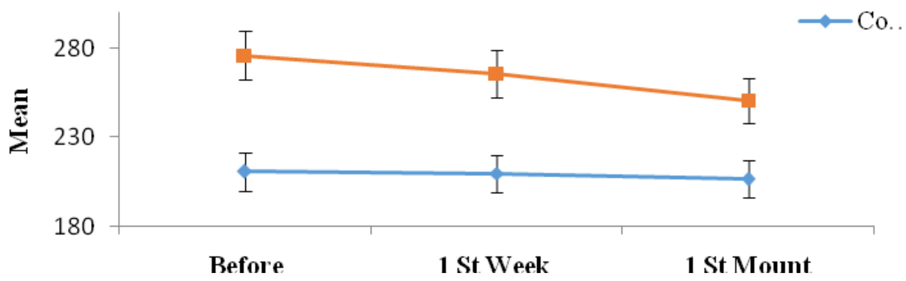

Figure 5. The mean choroidal thickness measurements of the study and control group at 1000µm inferior the fovea.

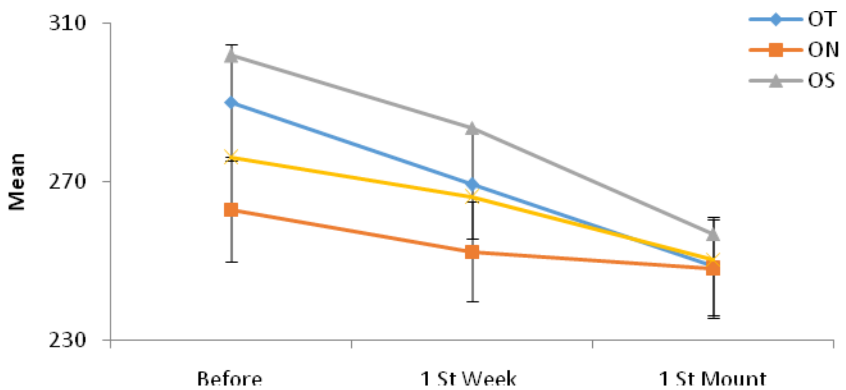

Figure 6. Choroidal thickness measurements of the study and control group. ON, choroidal thickness at 1000µm nasal to the fovea; OT,choroidal thickness at 1000µm temporal to the fovea; OS, choroidal thickness at 1000µm superior to the fovea; OI, choroidal thickness at 1000µm inferior to the fovea.

DISCUSSION:

Scleral bucklingsurgery (SBS) is a very effective procedure in selected cases of RRD such as in uncomplicated phakic patients. Unfortunately, this technique is performed less frequently due to the introduction of PPV in early 1970s. However, SB has multiple advantages over PPV, including reducing the risk of cataract formation and endophthalmitis. It has faster visual rehabilitation compared to PPV, which requires intravitreal silicone oil.(16) Furthermore, in certain cases like retinal dialysis, SB is the treatment of choice, with a better prognosis and success rate. (17)

The choroid covers the outer retina and is among the most vascularized tissues in the body. The choroid's vasculature is the major supplier of oxygen and nutrients to the outer retina.With respect to the retina, the choroid assumes the important roles of growth factor secretion and removal of retinal residues (18). Both the structure and functionof the choroidal tissue are essential factors ensuring a normal and functional retina.Most ocular blood flow is accounted for by the choriocapillaris.Choroidal blood flow, which has one of the highest rates of blood flow in the body, may also cool and warm the retina.The choroid features both sympathetic and parasympathetic innervation to regulate the choroidal blood flow, which is controlled by an auto regulatory mechanism .Abnormal choroidal blood volume or impairment of oxygen flow from the choroid to the retina, or both, may result in photoreceptor dysfunction and death.(19,20). In this study we found that the choroidal thickness (CT) of eyes before and after scleral buckling surgery using an encircling band, in long-term observation, was significantly thicker (*P*<0.05) than in fellow eyes.To date, few reports have shown changes in subfovealCT after retinal detachment surgery using the segmental scleral buckling method but these studies did not evaluate CT of other location of macula.(21,22)This authors have analyzed CT after scleral buckling surgery, and their observations were carried out only after segmental scleral buckling without use of an encircling band (21, 22).Their results have shown that subfovealCT increased temporarily after segmental scleral buckling surgery and then returned to postoperative CT one to three months after the operation .Although it has been found that the scleral buckling surgery causes changes in the choroid and retinal microcirculation, the mechanism of these changes is still unclear (21-23).

We found that the superior, inferior, temporal and nasal macular CT in the study eye was larger before surgery when compared with the control eye. The differences were statistically significant for the nasal and superior locations. These CT decreased at the 1st week and 1st month follow-up exams compared with preoperative thickness in the study eye. The differences were statistically significant for superior and inferior location.

Kimura and associates did not observe any significant differences in subfovealCT between treated eyes and fellow eyes before or three months after operation. (21) Miura and associates also showed similar observations before surgery, but CT returned to normal one month after surgery. (22) In their studies the thickness of the subfoveal choroid or subfoveal choroidal blood flow is unchanged with unclear mechanism (22, 23).However in our study, subfovealCT was significantly thicker than in fellow eyes. Our EDI-OCT observation was performed also 1st week and 1st month after surgery. These results may suggest that the mechanism of changes in the choroid circulation is different after scleral buckling surgery.

We showed mean subfovealCTof the study eye was significantly larger at before surgery, 1st week and 1st month exams when compared with control eye. All of these thickness significantly decreased at the 1st week and 1st month follow-up exams (compared with preoperative thickness in the study eye).Takahashi and Kishi showed in the indocyanine angiography venovenous anastomoses formation the remodeling of thechoroidal venous drainage aftersurgery for retinal detachment (24).The encircling band causes changes in the circulationsof both the retina and the choroid. When increasing thethickness of the subfoveal choroid in the long-term observationsafter surgery, we found indications of persistent changesin choroid circulation. Although previous studies state thatscleral buckling surgery reduces choroidal blood flow, theresults are not consistent. Ito and associates found that the changes in choroid circulationwithout returning to the baseline after scleral bucklingsurgery (25). In their studies, Kimura and associates alsoobserved the fact that the encircling band causes a reductionof choroidal blood flow (26).Scleral buckling reduces blood flow and increaseshemostasis in choroidal circulation. This may cause an elevationin choroidal blood pressure and may increase the subfovealCT. Because of the fact that the encirclingband causes compression of a 360 degree circular area,choroid blood flow has been changed to a much larger areaof the eye than in the case of segmental scleral buckling.The size of the scleral buckling may therefore have an impact onchoroidal circulation over a longer period of time and mayreduce the possibility of CT returning to thebaseline. It seems that the width of the material may also affect the change in the choroid circulation .In our study we usedan encircling band with a width of 7 mm. Kimura and associatesandMiura and associates used a silicone spongewith awidth of 5mmand a silicone tire with a width of 7mm (21, 22) that were similar to my study. Probably using an implant with smaller width and using the sameforce, the formation of stitches obtainedmore pressure on theeye, as compared with an implant of greater width.

Another factor that can change the subfoveal CT is periocular inflammation.Cryotherapy used during surgerycan cause scleral and choroidal inflammation, whichmay increase the thickness of the choroid (21). However, thisapplies only in the early postoperative period (21,22).In Akkoyun I et al study there were no differences in subfoveal CT 1 month after SBS between the eye with macula-off RRD and the fellow eye. They suggested that thicker CT 1 week postoperatively after SBS may most likely be induced by scleral buckle reduced blood flow and increased hemostasis in the choroidal circulation and by scleral and choroidal inflammation after cryopexy. (28)

Although, CT is not a direct measure of choroidal blood flow, which, is mainly evaluated by laser dopplerflowmetry,(29) we demonstrated the regulation of blood flow in choroidal and retinal circulation in vivo, as measured by thickness measurements that used EDI-OCT. Kim et al., revealed that CT may be indirectly indicative of choroidal perfusion status may effect CT.(30) Measurements of CT with EDI-OCT technology provide only an indirect index of the consequence of blood flow regulation in a vascular bed, yet cannot measure blood flow, volume, or velocity there. We, therefore, suggest that EDI-OCT can be used to evaluate the issue of blood flow regulation.

No eyes were excluded from our study due to poor-quality EDI-OCT images. Occasionally, it was necessary to change the image contrast, but this allowed us to detect the chorioscleral border in all eyes. Yamashita et al. reported that CT measurements were unsuccessful even in some healthy eyes examined (4 out of 43 eyes) because the subjects had CTexceeding 500 µm, making it impossible to clearly see the outer boundary of the choroid (31).

In present study we obtained good EDI-OCT images before surgery that it was strength point of our study. The limitation of previous studies is lack of data before surgery. This data could give us information on whether RD itself does cause changes in CT in the foveal area. However, it is difficult to perform good quality EDI-OCT in eyes where the macula was detached before the surgery. So, performing of OCT on patients preoperatively to rule out a subclinical extension of subretinal fluid under the fovea is beneficial.

This study has limitations such as other studies, including manual measurementof CT on EDI-OCTand the small sample size. Current OCT equipment does not provide software for the automated measurement of CT; therefore all identifications of the RPE and inner scleral border were conducted manually.However, even though EDI-OCT can enhance the sensitivity of the choroid, light scattering by the RPE and choroid remains a problem. In this event, the chorioscleral border cannot be detected, especially when a subject happens to have a particularly thick choroid.

For phakic eyes that experienced loss of vision in spite of successful surgery, it is possible that the low vision could have been caused by the progression of cataracts (32). However, there were 14 pseudophakic eyes in the group that experienced visual loss that could not be attributed to progression of lens opacity.

Some factors such as intraoperative complications like rise IOP and microscope light toxicity during the surgery, as well as the use of gas as tamponade, could have produced retinal damage, causing a reduction in the inner retinal thickness due to neuronal cell loss in the macular area (33). However, no postoperative rise in IOP was detected in our study.

In our case series, two patients had residual SRF and two patients had PED, which was absorbed in the subsequent follow-up of 2 months. One patient developed epiretinal membranes and one patient had cystoid macular edema, which are also causes of visual loss after RD surgery, was identified in the follow-up. So, further investigations should elucidate if causes of visual loss are related to a gross anatomic factor or could be a photoreceptor damage caused by diffusible factors released by ischemic detached retina (34).

CONCLUSION:

EDI-OCT provides high-definition cross-sectional images of the choroid. Information on alterations in choroidal thickness after scleral buckling surgery is important in understanding of choroidal changes after surgery.

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