Effect of Retina Detachment Surgery at Long Time on Macular Microvascular Structure: An Optical Coherencetomographyangiography Study

Mehmet Demir (drmehmetfe@hotmail.com)
Health Science University-Sisli Hamidiye Etfal Training and Research Hospital

Research Article

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Abstract

Purpose

To investigate the macular microvascular changes after surgery for rhegmatogenous retinal detachment(RRD) using optical coherence tomography angiography(OCTA).

Methods

Study analyzed the of 33 patients, who underwent pars plana vitrectomy(PPV) plus tamponade silicon oil(SO) or sulfurhexafluoride/perfloropropan(SF6/C3F8), or silicon band cerclage(SBC) in one eye. Operated eyes were included in group A(n=33) and fellow eyes served as control group B (n=33). The group A were created according to the type of surgery. Subgroup1: PPV+SBC+SO tamponade, subgroup 2: PPV+SF6/C3F8 tamponade, subgroup 3: PPV+SO tamponade and subgroup 4:SBC+SF6/C3F8 tamponade. Best corrected visual acuity (BCVA, log MAR), superficial and deep retinal vessel density(VD), choriocapillarisVD, foveal avascularzone(FAZ) area (mm2) and centra lmacular thickness(CMT) were evaluated using OCTA.

Results

Mean postoperative follow-up time was 23±16.6 months, BCVA was 0.53±0.5 in group A, 0.01 in group B(p<0.001), in subgroups 1-4: 0.64±0.35, 0.45±0.43, 0.41±0.54, 0.40±0.76, respectively(p<0.001).

Mean CMT(μm) was in groups A, B: 271±59, 261±37 (p=0.468); in subgroups 1-4: 239±46, 277±70, 273±60, 308±48, respectively(p=0.018). VD (%) in group A, B for superficial parafoveal (40.3±6.7 vs 46.9±6.2, p<0.001), superficial superiorhemifield (39.6±6.3vs 45.6±.2(p<0.001) and superficial inferiorhemifield (38.2±9.1vs 44.9±5.7(p<0.001).

Mean VD in subgroups 1-4: for superficial superiorhemifield 40.25±7.8, 36.4±3.7, 40.1±6.3, 40.7±6(p=0.003); for superficial inferiorhemifield 36.0±14.5, 37.0±3.9, 40.1±5.7, 39.6±6.5p=0.019); for deep fovea 27.0±8.9, 33.6±10.3, 33.2±7.4 ,42.37±8.2(p=0.016).

The mean FAZ area(mm^2) in group A and B: 0.286±0.14;0.264±0.11(p=0.59), in subgroups 1-4: 0.363±0.14, 0.268±0.11, 0.221±0.13,0.279±0.13(p=0.131).

Conclusion

Superficial and deepVD measurements of OCTA represented a decreasing trend following the surgery for RRD. The FAZ area was similar between theoperated and fellow eyes for a longer follow-up period.

Inroduction

Rhegmatogenous retinal detachment (RRD) is secondary to retinal break or breaks and subsequently the accumulation of subretinalfluid in the subretinala rea. This pathology, the separation of theneurosensory retina from the retinal pigment epithelium (RPE), causes severe visuala cuity (VA) and needs surgical intervention [1].

The surgical treatment for RRD had been the 360-degree scleral buckling until 1971. Since 1971 pars plana vitrectomy (PPV) has been used as another choice for the treatment of RRD. In some cases of RRD, combined encircling with buckling material and PPV has been performed [2–4].To re-attach the detached retina, prevent further detachment and visual loss PPV, silicon band cerclage (SBC), cryocoagulation, pneumatic retinopexy, silicon oil (SO) injection accompanied by laser photocoagulation (LFK) or combination of these method.

Post operative visual outcomes could be affected by many parameters, including preoperative visual acuity, the status of macula on or off, the involvement of optic nerve, lens and cornea, age of the patient, duration and extension of detachment, degree of proliferative vitreoretinopathy, and integrity of the macular structure.

Optical coherence tomography angiography (OCTA) is a novel non-invasive vascular imaging technique used to display retinal and choroidal vessels by detecting red blood cell movement OCTA can detect vascular density at superficial, deep, and choroidal plexus and measure the FAZ area [5]. Compared with fluorescein angiography, OCTA can detect changes in the microcirculation without dye leakage, segmental analysis, and provide information about superficial and deep retinal vascular status, macular microvasculature with regard to the vessel density(VD) and foveal avascular zone(FAZ) area.

The purpose of the present study was to evaluate the postoperative BCVA, macular microvascular changes in OCTA according to the type of surgery in eyes und erwent surgery and compare the findings with those control eyes.

Methods

This present retrospective study analyzed the results of 66 eyesof33 patients, who underwent surgery in one eye due to RRD. This study adhered to the tenets of the Declaration of Helsinki and was approved by the local Ethics Committee.

Patients

The patients with anatomically succesful surgical results were consecutively selected for the enrollment in the study. The eyes that underwent the operation for RRD were included in group A (n = 33) and fellow eyes that were not operated for RRD were enrolled in group B (n = 33). Inaddition, the eyes that underwent surgery were divided into subgroups1, 2, 3 4 according to the type of vitreoretinal surgery. Subgroup 1 included ten patients who underwent PPV + SBC + SO tamponade, subgroup 2 included six patient whounder went PPV + sulfurhexafluoride/perfloropropan(SF6/C3F8) tamponade, subgroup 3 included ten patients who underwent PPV + SO tamponade and subgroup 4 included seven patients who underwent SBC + SF6/C3F8 surgeries. Patients with high refractive error (sphericalequivalentmorethan ± 6 Dioptres), keratopathy, re-detached retina, axiallength ≥ 26 mm, glaucoma, uveitis, traumatic maculopathy or traumatic retinal detachment, diabetic retinopathy, retinal veinoc clusion, severe senile macular degeneration, preoperative vitreoretinopathy, macular hole, eyes filled with SO during last visit und poor OCTA scan quality were excluded.

SurgicalProcedures

Standard three-port 23 gauge PPVwas performed using theAlcon Constellation system (Alcon Laboratories, Inc., Fort Worth, TX, USA) under retrobulbar or general anesthesia. During PPV, the triamcinolone acetonide was used to visualize the remnants of vitreous. The SBC was performed under general anesthesia: Firstly 360 degrees conjunctival peritomy was performed then silicon band 2.5 mm was implanted at 13–14 mm from limbus and sutured with 5/0 nonabsorbable suture, and following subretinal fluid drainage silicon band was tightened. Incase of gas injection, laser application was performed at postoperative1-3 days.

OCTA Measurement

All patients underwent a complete ophthalmic examination, including best-corrected visuala cuity (BCVA, log MAR), intraocular pressure (IOP,mmHg), slit-lampbiomicroscopy, fundoscopy, and OCTA measurements (RTVue XR Avanti, Optovue, Fremont, CA, USA).OCTA centered in themacular area was performed in both eyes after pupillary dilatation in the last visit of the post operative period. A fovea-centered scan of 3 mm x 3 mm OCTAwas performed for each eye. OCTA scans included central macular thickness (CMT), superficial foveal, parafoveal, superior and inferiorhemifield VD, deep foveal, parafoveal, superior and inferiorhemifield VD, choriocapillaris VD, FAZ area and perimeter of FAZ (PERIM) measurements. VD measurements were analyzed with Optovue’sAngioanalytics software program. Each image was evaluated by two different authors. Correlations between surgery type and OCTA measurements were compared between the operated and control eyes.

Statistics

Statistical analysis was performed using SPSS V.27.0 software for Windows. Demographic and clinical characteristics were summarized by Standard descriptive statistics (e.g. Mean ± Standard deviation, SD). Independent student's t-test and one–way analysis of variance (ANOVA) tests were used in case of normal distribution, otherwise non-parametric Kruskal—Wallis test was used to compare variables between the groups and subgroups. The paired sample t-test or theWilcoxon test was applied for dependentvariables because of the eyes belonging to the sameindividuals. A p-value of < 0.05 was considered statistically significant.

Results

Atotal of 66 eyes of 33 patients (23 Men, 10 Female, Meanage: 56 ± 11years) who underwent vitreoretinal surgery in one eye due to RRD were evaluated in two main (A and B) and four subgroups (Table A). The mean age values of subgroups 1, 2,3 and 4 were 49.4 ± 17.8, 56.8 ± 9.5,56.9 ± 12.6, and 57.7 ± 5.0 ($p = 0.374$) years, respectively, (Table 1)

Table 1
Characters of Group A and B

Parameter	Gr A(n = 33, operated eyes)	S.D	Gr B(n = 33(control eyes)	SD	P*
Values	Mean		Mean		
Mean age(years)	56	11			
Follow-up(months)	22,9	16,6			
BCVA(logMAR)	0,44	0,31	0,84	0,21	0,000
CMT(µm)	271,42	59,0	261,7	37,42	0,468
SPF VD	40,3061	6,744	46,9182	6,171	0,000
Ssup Hemi VD	39,60	6,30	45,56	5,25	0,000
s inf Hemi VD	38,19	9,05	44,92	5,68	0,000
FAZ	0,29	0,14	0,26	0,11	0,594
PERIM	2,21	0,70	2,08	0,44	0,236

S.D:standart deviation, BCVA: best corrected visual acuity, CMT:central macular thickness, log MAR:logarithm of the minimum Angle of Resolution, ; SPF VD:superficial parafoveal vessel density, sSup hemi field VD: superficial superior hemifield vessel density, Sinf Hemi VD: superficial inferior hemi field vessel density, FAZ: foveal avascular zone, PERIM: FAZ perimeter, *:Wilcoxon Signed Ranks Test

Mean postoperative follow-up time was 23 ± 16.6 months in group A, and 23.9 ± 14; 29 ± 24.4;21 ± 16 and 19 ± 15 months ($p = 0.788$) in subgroups 1, 2,3 and 4, respectively.

In the last visit, BCVA was 0.53 ± 0.5 in group A and 0.01 log MAR in group B ($p < 0.001$). In subgroups 1, 2, 3 and 4, the mean BCVA values were 0.64 ± 0.35, 0.45 ± 0.43, 0.41 ± 0.54 and 0.40 ± 0.76 logMAR ($p < 0.001$), respectivel. BCVA was worser in subgroups 1 and 2 than the control eyes ($p < 0.001$andp = 0.002, respectively, Table 1).The mean postoperative IOP values were16.7 ± 6 and 15.9 ± 7 mmHg in group A and B ($p = 0.791$)and17.4 ± 6.1, 15.8 ± 2.1, 17.7 ± 5.2 and 14.1 ± 4.2 mmHg in subgroups 1–4, respectively ($p = 0.742$).

The mean CMT was 271 ± 59 µm in group A, and 261 ± 37 µm in group B in the last visit ($p = 0.468$). In subgroups 1, 2, 3 and 4 the mean CMT values were as follows: 239 ± 46,277 ± 70,273 ± 60,308 ± 48 µm ($p = 0.018$). Measurements of OCTA at macular area 3X3 mm were represented in Table 2.

Table 2
Characters of Subgroups and Hypothesis Test Summary

Paramater	Subgroup 1(n = 10)	Subgroup 2(n = 6)	Subgroup 2(n = 10)	Subgroup 4(n = 7)	control eyes (n = 33)	p
Mean age(years)	49,4 ± 17,8	56,8 ± 9,5	56,9 ± 12,6	57,7 ± 5.0		0,374
Follow up(months)	23,9 ± 14	29 ± 24,4	21 ± 16	19 ± 15		0,788
BCVA(log MAR)	0,64 ± 0,35	0,45 ± 0,43	0,41 ± 0,54	0,40 ± 0,76	0,09 ± 0,15	0,000
sPF VD	41,0 ± 8,50	37,23 ± 3,53	41,27 ± 7,51	40,60 ± 5,32	46,91 ± 6,17	0,004
s sup Hemi VD	40,25 ± 7,75	36,40 ± 3,73	40,06 ± 6,27	40,74 ± 6,10	45,56 ± 5,24	0,003
s inf Hemi VD	36,01 ± 14,52	36,96 ± 3,85	40,12 ± 5,66	39,58 ± 6,51	44,91 ± 5,68	0,019
PERIM	2,40 ± 0,84	2,16 ± 0,40	2,00 ± 0,66	2,28 ± 0,75	2,08 ± 0,43	0,786
CMT	239 ± 46,1	277 ± 70	273 ± 60	30 ± 48	261 ± 37	
FAZ	0,363 ± 0,15	0,270 ± 0,11	0,221 ± 0,132	0,280 ± 0,130	0,264 ± 0,108	0,131
Choriocapillaris	2,0 ± 0,00	2,00+-0,00	1,80 ± 0,42	1,83 ± 0,44	1,96 ± 0,250	0,246

BCVA: best corrected visual acuity,, log MAR:logarithm of the minimum Angle of Resolution, ; SPF VD:superficial parafoveal vessel density, sSup Hemi VD: superficial superior hemifield vessel density, sinf hemifield VD: superficial inferior hemifield VD, CMT:central macular thickness, PERIM: FAZ perimeter,, FAZ: foveal avascular zone, *p-value of < 0.05 was considered statistically significant.

In group A (operated eyes), mean VD (%) values were significantly lower than in group B (control eyes) regarding superficial parafoveal (40.3 ± 6.7 vs 46.9 ± 6.2, p < 0.001), superficial superiorhemifield (39.6 ± 6.3 vs 45.6 ± .2, p < 0.001), superficial inferiorhemifield (38.2 ± 9.1 vs 44.9 ± 5.7,p < 0.001).

The mean superficial foveal VD values in group A and B were 18.7 ± 8.1 and 19.6 ± 7.6 % and in subgroups 1- 4were 16.2 ± 10.2, 16.1 ± 6.7, 19.5 ± 7 and 23.2 ± 6.7 % (p = 0.181), respectively.

The mean superficial parafoveal VD values were 40.3 ± 6.7 % and 46.9 ± 7.2 % in grup A and B (p < 0.001), and40.1 ± 8.5;37.2 ± 3.5;41.3 ± 7.5 and 40.6 ± 5.3in subgroups 1–4, respectively(P = 0.004).

The mean superficial superiorhemifield VD measurements were 40.25 ± 7.8, 36.4 ± 3.7, 40.1 ± 6.3and40.7 ± 6.1 % in subgroups 1–4, respectively(p = 0.003). The meansuperficial inferiorhemifield VD measjurements were 36.0 ± 14.5, 37.0 ± 3.9, 40.1 ± 5.7 and 39.6 ± 6.5 % in subgroups 1–4, respectively (p = 0.019). The mean deep fovea VD measurements were 33.3 ± 9.8 and 35.0 ± 8.3 % in group A, and B (p = 0.124) and27.0 ± 8.9, 33.6 ± 10.3, 33.2 ± 7.4 and 42.37 ± 8.2 % in subgraups 1–4, respectively(p = 0.016).

The mean deep parafovel VD measurements were 48.8 ± 7.2 and 50.0 ± 5.0 % in Group A and B(p = 0.381), and 48.3 ± 8.2, 50.0 ± 5.2, 47.6 ± 7.3and50.3 ± 8.2 % in subgroups 1–4, respectively(p = 0.929). The mean deep superiorhemifield VD measurements were in group A, B and subgroups 1–4: 46,-±7,0; 48,00-±5,1; 47.0 ± 6.5, 46.7 ± 8.1, 45.8 ± 7.9and47.9 ± 6.1 in subgroups 1–4, respectively (p = 0.926). The mean FAZ area (mm^2) measurements were 0.286 ± 0.14 and0.264 ± 0.11 in group A and B(p = 0.59), and were 0.363 ± 0.14, 0.268 ± 0.11, 0.221 ± 0.13 and 0.279 ± 0.13 in subgroups 1–4, respectively(p = 0.131).

The mean perimeter values were 2.21 ± 0.69, 2.08 ± 0.43) in group A and B(p = 0.240) and 2.4 ± 0.84, 2.16 ± 0.40, 2.00 ± 0.66 and 2.28 ± 0.75 subgroups 1–4, respectively(p = 0.786). The mean VD measurements of choriocapillaris in group A, B and subgroups 1-4were 1.90 ± 0,31;1,96 ± 0,25; 2.0 ± 0.0, 2.00 ± 0.00, 1.80 ± 0.42, 1.83 ± 0.43, respectively (p = 0.246). Reduction of VD in superficial parafoveal, superficial superiorhemifield, superficial inferiorhemifield were significantin subgroup 2 (p = 0.14, p = 0.10, p = 0.10) whencompared to control eyes. Thevalues of VD insubgroup 1 forsuperficial parafoveal, superficial superiorhemifield, superficial inferiorhemifield, and deep foveal were significantly lower than control eyes(p = 0.031, p = 0.019, p = 0.026, p = 0.041). In additionthe VD values reduced for superficial parafoveal, superficial superiorhemifield and superficial inferiorhemifield in subgroup 2 than control eyes (p = 0.01, p = 0.001and p = 0.001, respectively).The mean deep foveal VD was significantly lower in subgroup 1and 3 thansubgroup 4(27.0 ± 8.9, 33.2 ± 7.1vs42.4 ± 8.2%; p = 0.015,p = 0.042, p = 0.006, respectively). In subgroup 3 superficial parafoveal, superficial superiorhemifield and superficial inferiorhemifield VD measurements were lower than control eyes(p = 0.044, p = 0.020andp = 0.02, respectively). In addition, value of subgroup 3 in deep parafoveal VD was lower than subgroup 4 (p = 0.042).

Discussion

In this study, was valuated the changes in the macularmicrovascular structure, CMT, and FAZ area according to differen tsurgical approaches or combinations in patients with RRD repair. The several studies based on examining the macula with OCTA after surgery of RRD in the literature. Although many of these studies had been designed according to the macular on-off status with relatively short follow-up time, maximum of 12 months. Whereas in our study, main and subgroups were created without considering the status of the macula as on/off with mean 23 months follow-up time. All operated eyes were evaluated both within the main groups and subgroups for data analyses. The subgroups included eyes according to surgery type including PPV + SBC + SO, PPV + gas tamponade, PPV + SBC + gas tamponade, and SBC + gas tamponade. The fellow eyes served as the control group. To the best of our knowledge, these differences in subgroups and longer follow-up time than the previous studies make ourwork unique in the literature. We observed that the macular microvascularstructure was negatively affected by PPV even a long time later.Themean BCVA was worser in the operated eyes than the control eyes. In the comparison of subgroups, BCVA was significantly different. In the PPV + SBC + SO subgroup, BCVA was worser than the control group. In paired-comparisons of subgroups, BCVA in PPV + SBC + SO and PPV + SO subgroups were lower than the control eyes. Mean BCVA was better in the SBC + gas subgroup than the PPV + SBC + SO, PPV + gas tamponade, and PPV + SO subgroups. In SBC + gas and PPV + gas tamponade subgroups, mean BCVA values were similar to the control eyes. The mean CMT of all operated eyes was similar to the control eyes, but the PPV + SBC + SO subgroup had lower mean CMT than the SBC + gas subgroup.

In ourstudy, a significant reduction of VD in superficial parafoveal, superficial superiorhemifield, and superficial inferiorhemifield were observed in the operated eyes than the control eyes, but not in VD measurements of superficialfoveal, deepfoveal, deepparafoveal, deepsuperiorhemifield, deepinferiorhemifield. The FAZ area and PERIM measurements were higher in the operated than control eyes but were not significant. The mean values of VD between subgroups in the foveal superficial and deep plexus were higher in the SBC + gas subgroup. Superficial parafoveal and superficial superiorhemifield VD were lower in the subgroups of PPV + gas, PPV + SO, and PPV + SBC + SO than the control eyes. Only the SBC + gas subgroup did not have lower value than the control group. In subgroups PPV + SO or gase tamponade, superficial parafoveal and superior hemifield was significantly lower than the controls. In almost all subgroups foveal and parafoveal values of VD were better in the SBC + gas subgroup. The measured values of VD in the macula of the SBC + gas subgroup were similar to the control eyes. Wu et al. found significantly lower blood flow in both superficial capillaryplexus (SCP) and deep capillaryplexus (DCP) of the eyes with vitrectomy and scleralbuckling than the fellow eyes [6]. The follow-up time of this study(3.6 ± 2.4 months) was shorter than our study.

Lee et al. reported lower VD values in both SCP and DCP of the patients who underwent PPV + SO tamponade compared to thecontrol eyes [7]. The same study found that FAZ was larger than the control eyes. In ours tudy, in the main group which included whole eyes underwent surgery for RRD repair and in the PPV + SBC + SO and PPV + SO subgroups, superficial parafoveal and deepfoveal VD values were lower than the controls. And the FAZ was larger than the control eyes. Follow-up time with 23 months was longer in our study than the mentioned study.

Lu et al. reported a reduction in peripapillary VD after RRD surgery in patients who underwent PPV + SO or air/gastamponade, but no significant difference in SCP and DCP in the foveal, parafoveal flowdensity and FAZ area when compared to the control eyes at postoperative 3 months [8]. Xiang et al showed SO had no significant effect on macular VD and FAZ area in patients who underwent PPV + SO tamponade with 6 months followup time [9]. The current study showed microvascular changes in groups of operated eyes. These changes had a decreasing trendin mean superficial parafoveal, superiorhemifield, inferior hemifield and deepparafoveal VD in themacula. In the subgroupsthat underwent PPV ± SBC + t SO or gas tamponade, VD was lower than the control eyes. Despite the reductionin the microvasculardensity, FAZ was not different from the control eyes. Lee et al. found tha ttheaverage VD in the deep capillaryplexus of nasalparafovealarea, and both superficial and deep capillary VD in the operated eyes with PPV + SO for maculaoff-RRD were lower than the control eyes and FAZ area measurements in the DCP and SCP were larger in operated eyes. In both maculaoff and on patients with RRD, there was no differentin VD with 6 months follow-up time [10]. The seresults of VD changes were consistent with our results, but FAZ was not larger in ourcases. Evita et al. reported lower macular VD and larger FAZ in RRD patients with the macula off and on afterPPV + gas tamponade at postoperative 3 months when compared to thecontrol eyes[11]. In ourstudy, VD in SCP was lower than the control eyes, but FAZ was not larger both in main group and subgroups than the control eyes. In addition, only the PPV + gas tamponade subgroup had lower superficial parafoveal and superficial superiorhemifield VD than the fellow eyes. Our results both in the main group which included all operated eyes and PPV + gas tamponade subgroup were consistent witht heresults of the above studies [10, 11].Wang et al. reporteda significant increase in SCP flow density over time with anatomical successful in macula off patients who underwent PPV + gas tamponade at 3 months [12].

Bonfiglio et al. reported no difference in CMT and FAZ area of macula for RRD patients who underwent PPV + gas tamponade, but lower deep parafoveal, superficial parafoveal, deep foveal and parafoveal VD measurements were found than the control eyes at 12 months follow-up time [13]. In a previous study (13) values of VD in SCP, DCP and choriocapillaris plexus showed an increase at postoperative 3 months, but we found lower values in superficial parafoveal, superficial superior and inferior hemifieldplexusVD measurements of the main group and in SCP and deep foveal VD measurements of the PPV + gas tamponade subgroup even at postoperative 23 months follow-up time. Results of the current study showed that mean macular VD in the superficial and deep plexus were lower than the control eyes, which was similar to previous studies [12, 13]. Nevertheless FAZ and CMT measurements were not different from the control eyes. In the PPV + SBC + gas and PPV + gas tamponade subgroups similar results were observed.

Hong et al. reported that, in the macula off group, CMT and the choriocapillaris plexus VD measurements were decreased compared to the control eyes at postoperative 6 months [14]. Maqsood et al. reported that FAZ areas were not different between the operated and control eyes [15]. In ourstudy, macular VD was similar to the first study (15). However, CMT was not decreased in the current study, but FAZ area results were similar in both studies (14,15). Barca et al. measured lower VD values in the macula in a macula off RRD patient operated with PPV or surgical scleral buckling at postoperative 6 months(16). In our study patients were not divided according to thestatus of the macula. After a long follow-up period, lower values of VD were measured than the control eyes in the macula. Zhou et al. showed that SO had a more negative effect on vasculature and structure of the superficial, deep and choriocapillaris plexus when compared to gas [17].

VD was lowerin both subgroups of PPV + SO and PPV + gas tamponade.There was no difference between silicon oil and gastamponade for macular microvascularchanges. In ourstudy, both subgroups of PPV + gas and SO had lower values in VD, but FAZ was similar in both subgroups. Many studies reported a significant reduction in VD of the operated eyes with PPV. Previous comments were consistent with our study. This showed that RRD surgery resulted in some changes in the macular VD. We found changes in the macular VD of almost all eyes underwent RRD surgery. We observed a decreasing trend in VD in alleyes, but a statistical decrease was observed in some localizations of the main group and subgroups. Our findings describe that the SBC technique seems to be associated with minimum changes in the macular vessel density. We might speculate that this minimum effect can be secondary to the retention of vitreous. Moreover, traumatic movement on the retinal surface is minimized in this surgical technique, as air or perfusion liquid.

One of the most notable observations from our study was that mean CMT did not show statistically significant differences between the operated and control eyes. And despite anatomical success, BCVA was lower in the operated eyes. In these eyes, OCTA scans are necessary to understand the cause of functional failure but not alwayse nough.

Our study thus suggests that OCTA approach may be extremely useful for an easy and non-invasiveevaluation of the eyes of the patients whounderwent retinalsurgery for RRD. The fluorescein angiographyreported a reduced and slow retinal bloodf low in patients affected by retinal detachment due to an increase of peripheral vascular resistance [18]. Retinal blood flow was found to be impaired both in scanning laser Doppler flowmetry and color-Doppler ultrasound examinationin RRD [19–20].These previous studies can not show plexus, which is negatively affected, whereas OCTA can represent which plexus is defective, which is an advantage of the OCTA tool.

In our study, SCP is the most affected plexus than deep andchoriocapillaris, which may be due to being the first vascular layer of the retina. Other important factors involved in VD reduction could be the endothelin-1 release. A study showed that significantlevels of Endotheli-1 level in the subretinal fluid may cause vasoconstriction on retinal microvasculature [21].This study has somelimitations. First, the sample size was relatively small in the subgroups and the stud was designed retrospectively. Second, we did not divide the eyes according to macula status(off or on). Third, we did not evaluate RRD duration before the surgery. The possible reasons for several discrepancies between our results and other studies (as the FAZ area) may be the differences in the number of patients and follow-up period.

Conclusion

Retinal detachment may cause not only structural damage but also decreased retinal perfusion even after successful anatomical repair. OCTA can provide muchmore information about the macular structure after RRD surgery. This information help to expla in the reason for impaired BCVA. It would be beter if OCTA device also includes a microoperimeter tool.

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