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Does choroidal thickness change in advanced hemorrhoids patients?

BACKGROUND: This study was conducted to examine the choroidal thickness of patients with grade 4 hemorrhoids to see if vascular abnormalities in hemorrhoid patients may affect other parts of the body.

METHODS: 51 patients diagnosed with grade 4 hemorrhoids in the last two years and 49 healthy volunteers were included. Choroidal evaluation was done by measurements from various points of the choroid using a spectral domain Cirrus HD-OCT (Carl Zeiss Meditec Inc.) in enhanced-depth imaging mode. Choroidal thicknesses were compared between the two groups.

RESULTS: Nasal choroidal thickness, temporal choroidal thickness and mean choroidal thickness measurements were significantly higher in the hemorrhoid group ($p < 0.05$), while subfoveal choroidal thickness did not differ significantly between the groups. Macular thickness was also significantly higher in the hemorrhoid group compared to the control group ($p < 0.05$).

CONCLUSION: There was an increase in choroidal thickness in patients with grade 4 hemorrhoids.

KEY WORDS: Choroidal thickness, Hemorrhoids, Macular thickness, Optical coherence tomography, Vascular pathologies

Introduction

Hemorrhoidal disease is a common disease that occurs due to the expansion of the vascular structures in the anal region ¹⁻⁶. The etiology of hemorrhoidal disease consists of reasons such as constipation, pregnancy with increased intraabdominal pressure and obesity, systemic diseases such as hypertension, diabetes and chronic lung diseases and smoking, alcohol and eating habits ³. While these causes have an effect in the development of hemorrhoids disease, the actual etiopathogenesis is suggested to be the changes in vascular structures. Myofibrotic mal-

formation is common in hemorrhoidal vascular structures, along with weakness in vascular structures ⁵⁻⁸.

The choroid is one of the most vascular tissues in the body. The main task of the choroid is to provide blood of the outer parts of the retina ^{9,10}. Choroidal thickness is affected by hypertension, diabetes, preeclampsia, dehydration, smoking, pregnancy and vascular diseases ¹⁰⁻¹⁶. Our hypothesis is that, since changes in the vascular structures in the anal region are effective in the pathogenesis of hemorrhoidal disease, patients with hemorrhoids will show changes in other dense vascular regions of the body, such as the choroid ¹⁷. The aim of this study is to investigate the choroid in patients with hemorrhoids.

Materials and Methods

Fifty-one stage-4 hemorrhoid patients who were admitted to the emergency outpatient clinic of Niğde Ömer Halisdemir University Training and Research Hospital between 2018-2020 with complaints related to hemorrhoids and met the inclusion criteria were included in the study group. These patients were evaluated and treat-

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ed as an emergency intervention by a general surgeon (HB). Control group is formed from patients who admitted to general surgery department and examined by the same surgeon (HB) and who did not have hemorrhoids or history of surgery for hemorrhoids. The study was conducted in accordance with the Declaration of Helsinki, after obtaining the approval of the ethics committee and informing the patients with an informed consent form.

Inclusion criteria were being aged 18-50 years and having grade 4 hemorrhoids disease for the hemorrhoids groups. Exclusion criteria were having grade 1-3 hemorrhoids, pregnancy, hypertension, diabetes, chronic lung disease, smoking, glaucoma, macular degeneration and other retinal diseases or history of intraocular surgery and history of surgical treatment for hemorrhoids for both groups. Participants with spherical refractive errors higher than ± 3 diopters and cylindrical refractive errors higher than ± 2 diopters and patients with history or findings of uveitis were also excluded.

Patients were examined by the same general surgeon (HB) and diagnosed for hemorrhoids disease. The patients were first seated and then strained and taken to the prone position to be examined. Hemorrhoids disease was graded according to the degree of prolapse of the hemorrhoid clots. Hemorrhoid grading was done according to Goligher's classification, and the presence of fibrovascular prolapsed hemorrhoid clots that do not spontaneously go inside or cannot be pushed inside by hand were accepted as grade 4 hemorrhoids disease¹⁸. These patients were either hospitalized and operated a few days later after their hemorrhoids were manually reduced, or they were operated urgently on the same day.

Both hemorrhoids patients and healthy volunteers had visual acuity and intraocular pressure measurements and biomicroscopic and fundus examinations in the ophthalmology outpatient clinic. Then, Optical Coherence Tomography (OCT) was performed for all participants to examine their choroidal thickness after pupil dilation with 5% tropicamide. Optical coherence tomography (OCT) is a non-invasive optical device that obtains high-resolution cross-sectional images of the ocular structures and frequently used in the evaluation of the retina and choroid. It uses low-coherent light acquire images of ocular structures. The images obtained using OCT is similar to ultrasonic scans except it uses light instead of sound and the images are in micrometer-resolution. We used a previously described method for measurements of choroidal thickness¹². All OCT scans were performed by the same person using a Spectral Domain Cirrus OCT Model 400 (Carl Zeiss Meditech, Jena, Germany) in our hospital in enhanced-depth imaging (EDI) mode. To overcome diurnal variations in the choroid, the scans were performed in the afternoon between 2:00 and 3:00 pm for all participants. This mode enables the visualization and measurement of the choroidal layer in OCT

images. Scans with signal strength equal to or greater than 6 were included in the study. Choroidal thickness of the right and left eyes were measured on OCT in micron length units. Choroidal thickness was measured manually in micron length on the Cirrus HD-OCT device using a digital ruler. Choroidal thickness was taken as the vertical distance between the outer edge of the pigmented layer of retina on the posterior uvea and the inner surface of the sclera. The subfoveal thickness was measured first, and then the temporal and nasal choroidal thicknesses were measured at 1500 microns from the subfoveal vertical line to the sides. The study group and the control group were compared in terms of choroidal thickness. The OCT image of retinal and choroidal layers and measurements of the choroidal layer were demonstrated in figure 1 in a patient with hemorrhoidal disease.

Statistical analysis was performed using SPSS version 20.0 (IBM Corporation, Armonk, NY). Quantitative data are expressed as the means $\pm$ standard deviations, and qualitative data are expressed as percentage (%). The Chi-Squared test and the t-test were used to compare the groups for age, choroidal thickness and macular thickness. A p value <0.05 was accepted as statistically significant.

Results

There was no significant difference between the groups in terms of gender or age ($p>0.05$). Twenty-seven (53%) out of 51 participants were older than the age of 40 in the hemorrhoids group while 29 (59%) out of 49 participants in the control group were older than the age of 40. The groups were also not significantly different based on distribution over the age of 40 and below ($p=0.53$). Nasal choroidal thickness and temporal choroidal thickness measurements were significantly higher in the hemorrhoids group compared to the control group ($p=0.003$ and $p<0.001$, respectively) (Table I). Subfoveal choroidal thickness did not differ significantly between the groups ($p=0.999$). Macular thickness was

Table I

Findings	Hemorrhoids group (n. 51; 102 eyes)	Control group (n. 49; 98 eyes)	p
Nasal			
choroidal thickness (μ)	300.1 $\pm$ 34.5	275.8 $\pm$ 46.5	0.003
Subfoveal			
choroidal thickness (μ)	305.7 $\pm$ 31.4	305.7 $\pm$ 39.6	0.999
Temporal			
choroidal thickness (μ)	305.8 $\pm$ 29.5	277 $\pm$ 43.4	<0.001
Mean			
choroidal thickness (μ)	304.1 $\pm$ 29.5	286.4 $\pm$ 39.7	0.013
Central			
macular thickness (μ)	258.9 $\pm$ 19.1	248 $\pm$ 22.9	0.026

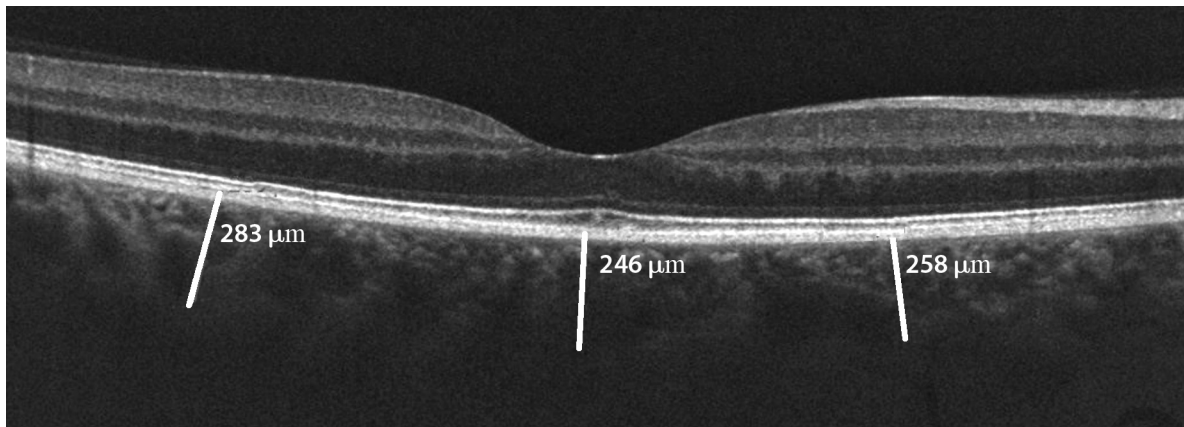


Fig. 1: The OCT image of the right eye of a patient with hemorrhoidal disease showing retinal, choroidal layers and the location of three choroidal thickness measurements.

also significantly higher in the hemorrhoids group ($p=0.026$). Mean choroidal thickness was significantly different between the groups ($p=0.013$) (Table I). When we compared the choroidal thicknesses in female and male subgroups, female patients and controls showed no significant difference ($306.5 \pm 23.2 \mu$ and $296.0 \pm 32.0 \mu$, respectively, $p=0.354$). However, male patients had significantly higher mean choroidal thickness compared to male controls ($303 \pm 31.2 \mu$ and $280.8 \pm 43.0 \mu$, respectively, $p=0.012$).

Discussion

We found a significant increase in the choroidal thickness of patients with grade 4 hemorrhoids. This increase was evident in both mean choroidal thickness and in nasal and temporal thicknesses. We also found a significant increase in macular thickness in grade 4 hemorrhoids patients.

Choroidal thickness also changes in cardiovascular diseases. There is an increase in thickness, particularly in subfoveal thickness, in acute hypertension and acute hypertension due to HELLP syndrome, while there is a decrease in choroidal thickness in all regions in chronic hypertension¹⁹⁻²¹. Regarding its pathogenesis, chronic hypertension has been reported to decrease choroidal thickness secondary to malnutrition of the choroid^{22,23}. Similarly, many studies have reported decreases in choroid thickness in carotid artery obstruction, heart failure and coronary artery disease²⁴⁻²⁷. These studies demonstrate obstructive vascular diseases and conditions associated with hypoperfusion to be associated with decreased choroidal thickness. Our findings were on the contrary, where we observed that the increased thickness in vascular structures may be associated with the vascular structures in all parts of the body, and therefore can reflect as an increase in choroidal thickness in individuals with hemorrhoids. In other words, changes in vascular structures in different parts of the body can cause

similar effects in the choroid. Kim et al. showed that diabetic retinopathy and atherosclerosis secondary to diabetes resulted in decreased vascularity index in the choroid and decreased choroidal thickness²⁸. Moreover, patients with histological renal inflammation in chronic kidney disease and accompanying vascular stiffening have been shown to have decreased choroidal thickness²⁹.

Varicoceles, pelvic and peripheral varicose veins and hemorrhoids are aneurysms of venous vascular regions and are defined as dilating venous diseases. This suggests that they should be considered as systemic vascular wall disorders rather than the dilatation of veins in any body region or local disease of any vessel³⁰. We observed an increase in choroidal thickness in patients with advanced hemorrhoids. In other words, venous dilation in the perianal region has been found to be associated with increased thickness in the venous structures of the eye. On the other hand, Wang et al. compared the materials taken from the rectal clots of grade 3 hemorrhoids patients and non-hemorrhoids patients in terms of their elastic structure using Hematoxylin-Eosin and found that hemorrhoids patients had significant structural disorders and retrograde changes in subepithelial veins, particularly in the cavernous veins of hemorrhoidal tissues, and rupture and discontinuity in the internal elastic lamina⁷. This shows that the vascular structures of patients with hemorrhoids have lost their properties, which may be seen in the vascular structures in other body parts.

The main limitation of our study was that we only included grade 4 hemorrhoids patients and therefore could not carry out a subgroup analysis in terms of hemorrhoids. The main strengths of our study were having a sufficient number of cases, being a prospective study and being the first study on this subject in the literature.

In addition, the finding of increased macular thickness raised the suspicion that neurovascular injuries may occur in the pathogenesis of hemorrhoids disease, as its etiopathogenesis is still unknown. There is a need for larger and more comprehensive research on the topic.

Conclusion

In conclusion, patients with advanced hemorrhoids have increased choroidal thickness. These findings suggest that the vascular disorders in hemorrhoids patients may be systemic rather than localized. In patients with advanced hemorrhoids disease, ocular fundus examinations can be effective on the early diagnosis of choroidal changes and therefore the early diagnosis and treatment of possible choroidal diseases. There is a need for further research on the topic, involving all grades of hemorrhoids patients and measurements of choroidal vascular flow. Approval was obtained from Niğde Ömer Halisdemir University Ethics Committee

Riassunto

Questo studio è stato condotto per esaminare lo spessore della coroide dei pazienti con emorroidi di 4° grado per verificare se le anomalie vascolari a livello emorroidale possono influenzare altre parti del corpo.

Lo studio è stato condotto negli ultimi due anni su 51 pazienti affetti da emorroidi di 4° grado e su 49 volontari sani. La valutazione della coroide è stata fatta con misurazioni su vari punti con spettrometro domain Cirrus HD-OCT (Carl Zeiss Meditec Inc.) in modo imaging ad aumentata profondità. È stato paragonato lo spessore della coroide nei due gruppi.

RISULTATI: lo spessore della coroide nel versante nasale, di quello temporale e quello medio è risultato significativamente maggiore nel gruppo con le emorroidi ($p < 0.05$), mentre lo spessore della coroide subfoveale non differisce significativamente nei due gruppi. Anche lo spessore della macula è significativamente maggiore nel gruppo con le emorroidi rispetto al gruppo di controllo ($p < 0.05$).

CONCLUSIONE: È stato verificato un incremento dello spessore coroidale nei pazienti con emorroidi di 4° grado.

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