Choroidal Thickness in Dry Age-Related Macular Degeneration

Kuru Tip Yaşa Bağlı Maküla Dejenerasyonunda Koroidal Kalınlık

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ABSTRACT

Purpose: Evaluating choroidal thickness measurements in patients with dry age-related macular degeneration (AMD).

Material and Methods: The choroidal thickness measurements were performed in 54 eyes of 30 cases with dry AMD using Enhanced depth imaging (EDI) mode of spectral domain optic coherence tomography (SD-OCT), (Heidelberg Engineering, Heidelberg, Germany) in retina division of our ophthalmology department. Choroidal thickness was measured from the posterior edge of the retinal pigment epithelium to the choroid-sclera junction. The measurement values obtained from the dry AMD cases were compared with 40 eyes of 20 age-matched healthy controls.

Results: The mean ages were 70.4±4.1 years in dry AMD patients and 68.2±5.5 years in the control group. The mean visual acuity values were 0.26±0.29 logMar in dry AMD group and 0.03±0.05 logMar in the control group and the values in dry AMD group were found to be statistically lower than the control group ($p<0.05$). The mean choroidal thickness measurements were 214.28±86.88 microns in AMD group and 326.23±45.98 microns in the control group. The choroid was significantly thinner in the AMD group than the control group ($p<0.05$). A positive correlation was observed between the visual acuity values and the choroidal thickness in AMD group.

Conlusion: In dry AMD group, the choroid was thinner than healthy control group. This finding may be the result of the progression of the disease.

Key Words: Choroidal thickness, dry type age-related macular degeneration, optic chorence tomography.

ÖZ

Amaç: Kuru tip yaşa bağlı maküla dejenerasyonlu (YMBD) hastalarda koroidal kalınlığı değerlendirmek.

Gereç ve Yöntem: Göz hastalıkları Kliniğimizin Retina biriminde kuru-tip YBMD tanısı olan 30 hastanın 54 gözünde koroid kalınlığı Spektral Domain Optik Kohorens Tomografi cihazının EDI (Enhanced depth imagining) modu kullanılarak (Heidelberg Mühendislik, Heidelberg,Almanya) ölçüldü. Koroidal kalınlık retina pigment epitelinin arka sınırından koroid-sklera kesişimine kadar olan mesafe olarak belirlendi. Kuru tip YMBD'li hastalar ile yaş eşlenmiş 20 sağlıklı bireyin 40 gözü arasındaki ölçümler karşılaştırıldı.

Bulgular: Ortalama yaş kuru tip YBMD grubunda 70.4±4.1 ve kontrol grubunda 68.2±5.5 idi. Ortalama görme keskinliği değerleri ETDRS eşeline göre kuru tip YBMD grubunda 0.26±0.29 logMar ve kontrol grubunda 0.03±0.05 logMar idi ve görme keskinliği YBMD grubunda kontrol grubu ile karşılaştırıldığında istatistiksel olarak anlamlı derecede daha düşüktü ($p<0.05$). Ortalama koroid kalınlığı kuru tip YBMD grubunda 214.28±86.88 mikron ve kontrol grubunda 326.23±45.98 mikron olarak bulundu. Koroid kalınlığı, kuru tip YBMD grubunda kontrol grubuna gore kayda değer şekilde daha inceydi ($p<0.05$). AMD grubunda görme keskinliği ve koroid kalınlığı arasında pozitif bir korelasyon bulundu.

Sonuç: Kuru tip YBMD hastalarında sağlıklı kontrollere göre koroid daha inceydi. Bu bulgu hastalığın progresyonunun sonucu olabilir.

Anahtar Kelimeler: Koroid kalınlığı, kuru tip yaşa bağlı maküla dejenerasyonu, optik koherens tomografi.

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INTRODUCTION

The choroid is a highly vascular tissue forming posterior uvea between the retina and the sclera layers. It's an anatomical structure that plays a critical role in blood supply of the eye especially for outer retina layers. It has several functions: thermoregulation, regulating intraocular pressure by uveascleral aqeous drainage, adjustment of the position of the retina by changes in choroidal thickness, and secretion of growth factors.[1]

It has been reported that choroidal thickness can be affected in many ocular diseases. Age-related macular degeneration, glaucoma, choroidal neovascular membrane, uveal effusion syndrome, central serous chorioretinopathy, Vogt-Koyonagi-Harada disease, angioid streaks, polypoidal choroidal vasculopathy are clinical pathologies that can affect the choroidal thickness.[2-7]

Age-related macular degeneration (AMD) is one of the most important causes of blindness in both developed and developing countries over the age of 60.[8-10] Thus understanding the pathophysiological mechanism underlying the AMD is critical. One of the suggested mechanisms is the changes in choroidal structure.[11] The choroidal thickness changes have been reported for both dry type and wet type AMD.[12]

There are studies reporting decreased and altered choroidal blood flow in patients with dry type AMD and it is getting worse with increased severity of the disease.[13-15]

This study aims to evaluate choroidal thickness changes in patients with dry AMD comparing to normal control group.

MATERIAL AND METHOD

The choroidal thickness measurements were performed for 54 eyes of 30 cases (17 male and 13 female) with dry type age-related macular degeneration (AMD) in our retina division. Definitions were based on the Age-Related Eye Disease Study (AREDS) AMD classification systems.[16] Inclusion criteria were as follows:

1) Patients with intermediate AMD (AREDS category 3: who has more than 20 intermediate drusen or at least one large drusen or noncentral geographic atrophy).

2) Patients with advanced AMD (AREDS category 4: who has central geographic atrophy). Exclusion criteria were as follows:

a) Patients with neovascular AMD.

b) Patients with systemic vascular disease that may affect choroidal thickness (like hypertension, diabetes, Behcet's disease and etc.).

3) Patients with any other ocular disease except dry AMD, which may affect choroidal thickness (glaucoma, uveitis, central serous chorioretinopathy and etc.).

The control group including 40 eyes of 20 subjects (12 male and 8 female) who were examined in our clinic and the participants exhibited no features associated with AMD and any other ocular disease except mild age related cataract and presbiopia. The control subjects also had no systemic disease that may affect the choroidal thickness.

The choroid was imaged in the enhanced depth imaging (EDI) mode with the spectral domain optic coherence tomography (SD-OCT) system. In this mode, the signal from the retinochoroidal portion of the scanned region is enhanced relative to that in the vitreoretinal portion. Each image encompassing the fovea was obtained from 9 averaged scans.

In most cases, good-quality images were obtainable, allowing choroidal thickness measurements to be performed. All images included in this study were taken as close to the fovea as possible in order to demonstrate clear visualization of the choroid-sclera interface. The choroidal thickness was defined as the distance from the outer border of the retinal pigment epithelium line to the hyperreflective line behind the large vessel layers of the choroid, which is presumed to be the choroid-sclera interface.

Choroidal thickness measurements were obtained manually using the linear measurement tool perpendicular from the base of the hyperreflective retinal pigment epithelium to the choroid-sclera junction (Figure).

The choroidal thickness measurements of a patient were acquired for each eye by averaging at least two measurements on the same day that were evaluated by the same and the only experienced author. At each scan, the distribution of thickness measurements was checked for normality, and an independent t test was conducted between the control and early AMD groups. $p<0.05$ was evaluated as statistically significant.

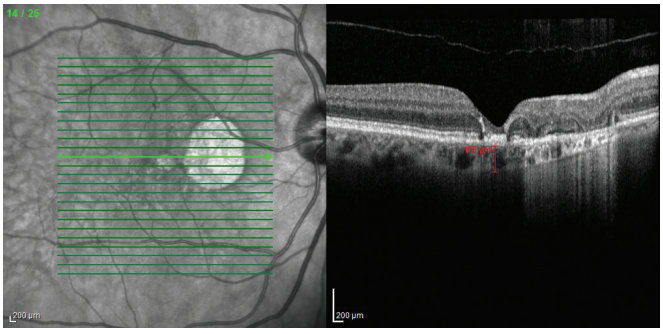

Figure: *Choroidal thickness measurements were obtained manually using the linear measurement tool perpendicular from the base of the hyperreflective retinal pigment epithelium to the choroid-sclera junction.*

RESULTS

The mean ages were 70.4±4.1 years in dry AMD patients and 68.2±5.5 years in the control group. The visual acuity values were 0.26±0.29 logMar in AMD group and 0.03±0.05 logMar in the control group. In dry AMD group, the visual acuity values were found to be statistically lower than the control group ($p<0.05$). The mean choroidal thickness measurements were 214.28 ±86.88 µm in AMD group and 326.23±45.98 µm in the control group.

In AMD group, the choroid was significantly thinner than the control group ($p<0.05$). A positive correlation was observed between the visual acuity values and the choroidal thickness in AMD group.

DISCUSSION

There are many studies reporting choroidal thickness changes in ocular diseases especially the ones in posterior pole. One of these diseases is AMD.[2-3] In this study we focused our interest on choroidal thickess changes in dry-type AMD.

Choroidal thickness has been measured with various techniques and OCT imaging seems to measure it more accurately.[17-20] OCT also allows creating choroidal thickness maps.[21]

Manjunath et. al.,[22] reported that eyes with wet AMD demonstrated a mean subfoveal choroidal thickness of 194.6 µm compared with 213.4 µm in the dry AMD group and presented that the choroidal thickness in eyes with dry AMD was correlated inversely with age.

However, analysis of the number of intravitreal antivascular endothelial growth factor injections, number of years of disease, and visual acuity failed to demonstrate any significant correlations with choroidal thickness.

Spaide et.al.,[23] described an entity, termed age-related choroidal atrophy, which has some overlap with dry AMD. In their study they described 28 eyes of 17 patients with a mean age of 80.6±7.3 years, with mean choroidal thickness less than 125 µm.

The mean subfoveal choroidal thickness was 69.8 µm, and 35.7% of the eyes presented with late-stage AMD and they concluded that choroidal thickness decreases with increasing age and the choroidal circulation might play a role in the pathophysiology of AMD.

McCourt et. al.,[24] studied subfoveal choroidal thickness in 194 eyes and they demonstrated that patients with diabetic retinopathy, wet or dry age-related macular degeneration, and glaucoma all had subfoveal choroidal thickness measurements that were significantly less than those of normal patients.

Wood et. al.,[25] studied retinal and choroidal thickness in early AMD patients and they reported that although a modest reduction in retinal thickness in early AMD was shown, no significant change in choroidal thickness was found during this study. They concluded that these findings suggest that measurement of choroidal thickness using OCT is not diagnostic for early age-related macular disease.

Switzer et. al.,[26] evaluated choroidal thickness in early AMD patients and found that eyes with reduced subfoveal choroidal thickness were more likely to have subretinal drusenoid deposits. They also concluded that reduced choroidal thickness appears to be associated with particular phenotypes in the aging eye.

In our study we observed that in dry type AMD patients, the choroid was thinner than normal age-matched controls which is consistent with previous studies. And we found a positive correlation between the visual acuity values and the choroidal thickness in AMD group.

The choroidal thickness has been reported to vary significantly between individuals and with location, axial length, refractive error, and age so this must be kept in mind when evaluating it. Further studies are needed which are eliminating all these factors and comparing choroidal thickness between normal population and dry type AMD.

In conclusion there is a relation between dry type AMD and choroidal thickness. This may point that the choroidal thickness may vary due to the stage of the disease. Better understanding of this relation may help to clarify the pathogenesis and the progression of the disease and also discovering further interventions for management of dry type AMD.

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