Araştırma Makalesi / *Reserch Paper*

doi: 10.5505/sakaryamj.2015.29981

# Anizometrik Ambliyopi Hastalarının Makula Ve Retina Sinir Lifi Tabaka Kalınlıkları

## *Thicknesses Of The Macula And Retinal Nerve Fiber Layer İn Patients With Anisometropic Amblyopia*

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**Başvuru Tarihi:** 14.01.2014 **Kabul Tarihi:** 25.09.2014

**Özet**

Amaç: Anizometropik ambliyopi hastalarının makula kalınlıklarının ve retina sinir lifi tabaka kalınlıklarının optik koherens tomografi ile ölçülen değerlerinin sağlam gözleri ile ambliyop gözleri arasında değerlendirilmesi

Gereç ve Yöntemler: Çalışmaya 18 anizometropik ambliyopi hastası dahil edildi ve hastalar 9 hiperopik ve 9 miyopik olmak üzere iki gruba ayrıldı. Hastaların tamamında en iyi düzeltilmiş görme keskinliği, refraktometrik değerleri,retina sinir lifi tabaka kalınlığı ve makula kalınlığı optik koherens tomografi cihazı ile ölçüldü. Çalışma türü prospektif olup istatistiksel analiz için SPSS 11.0 software programı kullanıldı.

Bulgular: Ortalama makula kalınlığı ambliyop gözlerde 195 (±20.8) µm ve sağlam gözlerde 171(±45.8) µm ölçülmüş olup ortalama retina sinir lifi tabaka kalınlığı ambliyop gözlerde 101.50 (±15.23) ve sağlam gözlerde 101.50 (±15.23) ölçüldü. Sağlam gözler ve ambliyop gözlerin makula kalınlığı ve retina sinir lifi tabaka kalınlığı arasında istatistiksel olarak anlamlı bir fark bulunmadı. Ayrıca hiperopik grup ile miyopik grup arasında da istatsitiksel olarak anlamlı bir fark tespit edilmedi.

Sonuç: Ambliyopi göz küresinde herhangi bir organik patoloji olmadan görme keskinliğinin yeteri kadar gelişmemesi durumudur.Biz çalışmamızda 18 anizometropik ambliyop hastasının makula kalınlıkları ve retina sinir lifi tabaka kalınlıklarını ambliyop ve sağlam gözlerde karşılaştırdık. Hastaların sağlam gözleri ile ambliyop gözleri arasında istatistiksel olarak anlamlı bir fark bulamadık ama bu konuda daha fazla bilimsel çalışmaların yapılması gerektiğini düşünüyoruz.

**Anahtar Kelimeler:** Anizometropik ambliyopi, makula kalınlığı, retina sinir lifi tabaka kalınlığı

***Abstract***

*Objective: To compare macular and retinal nerve fiber layer thicknesses of the normal fellow eye to that of the amblyopic eye using optical coherence tomography in patients with anisometropic amblyopia.*

*Methods and Material: 18 patients with anisometropic amblyopia were included. Patients were divided into two groups: nine hyperopic and nine myopic. Best corrected visual acuity, refraction, retinal nerve fiber layer and macular thicknesses were measured.*

*Results: The mean macular thickness of all anisometropic patients was 195 (±20.8) µm and (171±45.8) µm, and the mean retinal nerve fiber layer thickness was 101.50 (±15.23) and 102.61 (±11.48), in the amblyopic eye and the normal eye, respectively. There was no significant difference between eyes in either macular or retinal nerve fiber layer thickness. Also there was no significant difference in two parameters in myopic and hyperopic group.*

*Conclusions: No difference between the macular and retinal nerve fiber layer thicknesses was established in anisometropic amblyopia. Further evaluation is needed.*

***Aplication:*** *14.01.2014* ***Accepted:*** *25.09.2014*

***Keywords:*** *anisometropic amblyopia, macular thickness, retinal nerve fiber layer thickness*

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Amblyopia is unilateral or bilateral underdevelopment of visual acuity without any organic abnormality of the globe. Anisometropia was evaluated as the most frequent cause of amblyopia in numerous studies.[1,2,3]

Several studies reported that visual deprivation has an effect on the growth of cells in the lateral geniculate body and the visual cortex. It has been reported that in humans, the ipsilateral lateral geniculate body that developed for the amblyopic eye showed severe atrophy, however, alteration of the anatomical structure of the retina was not detected [4,5].

Optical coherence tomography (OCT) is a noncontact and noninvasive technique that can measure the thickness of both peripapillary retinal nerve fiber layer (RNFL) and macula retinal layer.

The purpose of this study was to compare the macula and peripapillary RNFL thicknesses of the amblyopic eye and the normal eye using OCT in patients with anisometropic amblyopia.

**Material and Methods:**

Approval was obtained from the local ethics committee for the study. The study conformed to the tenets of the Declaration of Helsinki.

This prospective study enrolled 18 patients with hyperopic and myopic anisometropic amblyopia. All subjects underwent a comprehensive eye examination including best corrected visual acuity using Snellen chart, cycloplegic refraction, intraocular pressure (IOP) measurement, slit-lamb biomicroscopy and fundus examination. We examined outpatients who met the following inclusion criteria of hyperopic and myopic anisometropic amblyopia; no history or evidence of neurologic or retinal disease, intraocular surgery, glaucoma, nistagmus and strabismus. The visual acuity (VA) difference between the amblyopic and normal eyes was at least two lines of Snellen acuity. Anisometropia was defined as a cycloplegic spherical equivalent difference greater than 2.00 diopter (D) between fellow eyes.

The macular and RNFL thickness of the amblyopic and the sound eye were measured by OCT (Spectral OCT SLO; Opko/OTI, Miami, FL). Signal strength was rated on a ten-point scale; signal strength values of ≥ six were considered acceptable. Multiple images were taken from each eye by an experienced operator and the scan with the best signal was chosen for the study.

The scans were subjected to analysis with standard software (SPSS 11.0 ) provided with the apparatus. Student's two-tail t test was used for data analysis, and a p value of less than 0.05 was considered statistically significant.

**Results:**

The study included 18 unilateral anisometropic amblyopia patients aged from nine to 63. The basic clinical data of 18 patients with anisometropic amblyopia is shown in Table 1. Of the 18 patients nine was hyperopic and nine was myopic. The mean best-corrected VA was 0.35 LogMAR (range, 0.2 to 1.0) in the amblyopic eye and 0.0 LogMAR (range, 0.0 to 0.1) in the sound eye.

There was no statistically significant difference between RNFL of the amblyopic and sound eyes (p=0.63). The macular thickness ranged from 151 to 234 µm (195±20.8 µm) in the amblyopic eyes and 81 to 255 µm (171±45.8 µm) in the sound eyes. There was no statistically significant difference between the two (p=0.08). (Table 2)

The macular and RNFL thicknesses also compared in myopic and hyperopic anisometropic amblyopia separately. In two groups, there were no statistically significant difference between macular and RNFL thicknesses of the amblyopic and sound eye, but mean macular thickness was slightly greater in amblyopic eyes.

**Discussion:**

Although amblyopia has been defined as reduction of best-corrected visual acuity that no structural abnormalities can be detected, it has been established that the anatomy and function of the visual cortex and lateral geniculate nucleus are changed by visual deprivation.[6] The optic pathway originates in the photoreceptor layer and ends in the visual cortex. If the amblyopic process may have an effect on various levels of the visual pathway, we could hypothesize that some anatomic

| Table1: Basic clinical data of 18 patients with anisometropic amblyopia | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Refractive Error (D) | | MT (µm) | | Avarage RNFLT (µm) | |
| case | gender | age | A | N | A | N | A | N |
| 1 | F | 17 | + 10.50 | + 7.00 | 185 | 163 | 90 | 104 |
| 2 | M | 22 | + 3.00 | 0 | 204 | 149 | 108 | 123 |
| 3 | F | 9 | - 2.00 | 0 | 188 | 171 | 89 | 92 |
| 4 | M | 23 | - 2.25 | 0 | 171 | 82 | 88 | 97 |
| 5 | F | 9 | + 6.75 | + 0.75 | 218 | 81 | 134 | 102 |
| 6 | M | 17 | - 3.50 | - 1.50 | 183 | 145 | 97 | 107 |
| 7 | F | 49 | + 4.00 | + 1.00 | 200 | 172 | 125 | 108 |
| 8 | F | 59 | - 5.50 | - 1.50 | 218 | 193 | 86 | 89 |
| 9 | M | 15 | - 3.25 | 0 | 151 | 173 | 86 | 88 |
| 10 | F | 36 | - 2.00 | 0 | 191 | 191 | 93 | 89 |
| 11 | M | 49 | + 2.00 | 0 | 197 | 195 | 90 | 97 |
| 12 | F | 21 | - 3.00 | - 1.00 | 204 | 223 | 112 | 116 |
| 13 | M | 55 | + 5.50 | + 1.00 | 220 | 255 | 105 | 103 |
| 14 | F | 63 | - 2.00 | 0 | 170 | 193 | 102 | 112 |
| 15 | M | 15 | - 8.50 | - 0.50 | 211 | 115 | 83 | 86 |
| 16 | F | 54 | + 2.00 | 0 | 234 | 226 | 100 | 106 |
| 17 | F | 41 | + 2.50 | + 0.25 | 181 | 197 | 119 | 124 |
| 18 | M | 22 | + 2.50 | 0 | 184 | 169 | 120 | 104 |
| D: diopter, MT: macular thickness, RNFLT: retinal nerve fiber layer thickness, A: amblyopic eye, N: normal eye, F: female, M: male | | | | | | | | |

changes should occur in the retina as well. [7,8]

| Table 2. Measurement of foveal retinal thickness and nerve fiber layer thickness | | | | |
|---|---|---|---|---|
| Group | No. of Patient | Amblyopic eye | Normal eye | p-value |
| Macular retinal thickness (µm) mean±SD | 18 | 195±20.88 | 171.83±45.88 | 0.08 |
| RNFL thickness (µm) mean±SD | 18 | 101.50±15.23 | 102.61±11.48 | 0.63 |

In our study, macular thicknesses were statistically the same in amblyopic and sound eyes. There were no statistically significant difference between avarage RNFL and macular thicknesses. In a study, Colen et al measured RNFL thickness in strabismic amblyopia and found no statistically significant difference between the strabismic amblyopic eyes and normal eyes.[9] Altintas et al, also found no significant difference in RNFL thickness, macular thickness or foveal volume between amblyopic and normal eyes in 14 patients with unilateral strabismic amblyopia.[10] Bozkurt et al, found no significant differences in the retardation measurements of the nerve fiber layer between amblyopic and normal eyes by scanning laser polarimeter(GDx).[11] Yen et al, on the other hand, reported thicker RNFL in refractive amblyopia and a significantly different RNFL thickness between the amblyopic and normal eyes in refractive amblyopia patients.[12] The authors suggested that refractive amblyopia affects the process of postnatal reduction of ganglion cells and RNFL thickness may be thicker than normal eye. Yoon et al also showed that there was no statistically significant difference in macular thicknesses between hyperopic amblyopic eyes and the normal eyes, although the peripapillary RNFL was significantly thicker in the amblyopic eyes. [13] Repka et al, found a significant difference in RNFL thickness between the amblyopic and sound eyes in 18 patients with unilateral strabismic (six patients), anisometropic (four patients), or combined (eight patients) amblyopia.[14] Dickmann et al found significantly greater foveal volume and

macular thickness in amblyopic than the normal eyes in strabismic amblyopia, whereas no statistically significant differences were detected in refractive amblyopia.[15] The researchers reported amblyopia of different etiologies was associated with the loss of different neural cells. They found statistically insignificant difference in RNFL thickness between the amblyopic and sound eyes.

In conclusion, there was no significant difference between peripapillary RNFL and macular thicknesses between amblyopic and normal eyes of anisometropic amblyopia. It remained unclear that if anatomical alterations are expected in retina why there was no significant difference in macular and RNFL thicknesses of amblyopic and normal eyes. There are several limitations to our study, wide age range (nine-63 years) the small number of patients and lack of a control group of normal population, although we used the sound eye in each patient as a control.

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