Does Allergic Rhinitis have any Effect on Choroidal Thickness?

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Authors’ contributions

This work was carried out in collaboration between both authors. Authors RK and HS designed the study, wrote the protocol and wrote the first draft of the manuscript. Author RK managed the literature search. Both authors read and approved the final manuscript.

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ABSTRACT

Aim: The aim of this study is to compare the choroidal thickness between patients with allergic rhinitis (AR) and healthy controls.

Study Design: Prospective case-control study.

Methodology: This cross sectional case control study consisted of 52 patients with AR and 52 healthy subjects. The choroidal thicknesses were measured horizontally with the digital calipers provided by the Heidelberg Spectralis software. The points of measurements were at the subfovea, 1500 µm nasal and 1500 µm temporal to the center of the fovea. The right eye was assessed in all participants.

Results: There was no statistically significant difference between the groups for age and gender distribution, intraocular pressure and spherical equivalent. Mean subfoveal choroidal thickness, nasal choroidal thickness and temporal choroidal thickness were 382.1±121.7, 328.6±111.8 and 368.1±98.2 in AR patients and 378.5±87, 309±77 and 354.2±94.2 in healthy subjects respectively. These differences were not found statistically significant (P>0.05).

Conclusion: Choroidal thickness in AR patients was found to be thicker, but not statistically significant.

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Keywords: Allergic rhinitis; choroidal thickness; inflammation; optical coherence tomography.

1. INTRODUCTION

Allergic rhinitis (AR) affects approximately 10-20% of the population worldwide and its prevalence has been increasing day after day [1]. It is a chronic inflammatory disease that affects nasal mucosa. It is characterized by nasal symptoms such as sneezing, itching, rhinorrhea and nasal blockage. The pathophysiology of AR is associated with IgE-mediated immune response against the allergens. A part of AR patients also have asthma [1,2].

Choroid has a common vascular meshwork and one of the highest blood flow in the body [3]. It has a pivotal role for the blood supply of the retina pigment epithelium and outer retinal layers. Photoreceptor cells in the foveal avascular zone that have high oxygen and metabolic exchange need are supplied by the only source of choroid [3]. It was shown while many ocular disorders such as age-related macular degeneration, polypoidal choroidal vasculopathy and central serous chorioretinopathy originate from the choroid, a number of systemic diseases especially some inflammatory disorders such as Behçet’s disease, sarcoidosis and Vogt-Koyanagi-Harada, affect the choroidal structures and hemodynamics [4-8]. These study results suggest that choroid may be affected by inflammation. The changes in the choroidal blood flow may affect the macula and visual acuity. Therefore, it has a vital role in maintaining the central vision.

Allergic rhinitis is an inflammatory disorder which causes an increase in circulating cytokines and growth factors [9,10]. We thought that choroidal structures may be influenced by high level of cytokines and growth factors in AR patients. We therefore aimed to compare the choroidal thickness between patients with allergic rhinitis and healthy controls.

2. MATERIALS AND METHODS

This cross sectional case control study consisted of 52 patients with allergic rhinitis and 52 healthy subjects. The study was carried out according to the Helsinki Declaration principles. We assessed only the right eye of all participants. The right eye was chosen randomly.

We included AR patients and age-gender matched healthy subjects. The allergic rhinitis was diagnosed according to medical history, clinical findings and prick test at Otorhinolaryngology Department. The patients did not have any medication before the diagnosis. Exclusion criteria include any ocular surgery or trauma, ocular disorder such as uveitis, glaucoma and macular degeneration, systemic disease such as Behçet’s disease, sarcoidosis, hypertension and diabetes mellitus, visual acuity less than 0.8, a spherical equivalent more than ±3 diopters, pregnancy and any ocular or systemic drug use.

A comprehensive ophthalmic examination was carried out for all participants including best corrected visual acuity measurement with the Snellen chart, anterior and posterior segment examination using a slit lamp biomicroscopy, measurement of intraocular pressure with the air puff tonometer and measurement of choroidal thickness with enhance depth imaging optical coherence tomography (EDI-OCT).

2.1 Choroidal Thickness Measurement

A method which previously described for EDI-OCT was used for measuring choroidal thickness [9]. Spectral domain OCT device (Software version 6.3.3.0, Heidelberg Engineering Inc., Heidelberg, Germany) was used in the study. The ophthalmologist performed the choroidal thickness measurements manually in all participants (Fig. 1). The borders of choroidal thickness were defined as the outer reflective retinal pigment epithelium layer and the inner sclera border. The choroidal thicknesses were measured horizontally with the digital calipers provided by the Heidelberg Spectralis software. The points of measurements were at the subfovea, 1500 µm nasal and 1500 µm temporal to the center of the fovea.

2.2 Statistical Analysis

The data analysis was carried out with the SPSS software, version 22.0 (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp., USA). Normality assumption for quantitative variables was tested with Kolmogorov-Smirnov and Shapiro-Wilk tests (P>0.05). The explanatory statistics for the variables are given as mean±standard deviation and frequencies n (%). The analysis of the categorical variables in the study was done by Chi-Square test. Independent t test was used for the analysis of quantitative variables providing normality assumption. The alpha value was fixed in 0.05 to show significance of the analysis.
3. RESULTS

The mean age was 31.8±11.2 in AR patients and 32.4±8.5 in healthy subjects. The gender distribution was as follows: 32 females and 20 males in AR patients, 34 females and 18 males in control individuals. There was no statistically significant difference between the groups for age and gender distribution (P>0.05). It was also not found statistically significant difference for spherical equivalent and intraocular pressure (P>0.05). When the subfoveal choroidal thickness, nasal choroidal thickness and temporal choroidal thickness were compared between the groups, no significant difference was found (P>0.05). The results are seen in Table 1.

4. DISCUSSION

The choroid is a vital tissue for the blood supply of the outer retinal layers [3]. It is very important to know factors affecting choroidal blood flow. In the present study, we therefore aimed to evaluate the choroidal thickness in AR patients. The choroidal thickness measurements of subfoveal, nasal and temporal areas were compared between AR patients and healthy subjects. We found no statistically significant difference between the patient and control groups in all areas (p>0.05).

Optical coherence tomography is a non-invasive technique that provides in vivo sectional images from both anterior and posterior segments [11]. It has made it possible to obtain additional information about the physiological state and pathological changes of the choroid. Many sight-threatening ocular disorders such as age related macular degeneration, degenerative myopia and polypoidal choroidal vasculopathy are affected by choroidal changes [4,12]. While the choroid is very thin in degenerative myopia, it is thick in pachychoroid diseases [12,13]. On the other hand, systemic disorders such as hypertension and diabetes mellitus also affect choroidal thickness [14,15]. The choroidal changes have been measured in many conditions [16,17].

Table 1. Comparison of demographic features, choroidal thickness, spherical equivalent and intraocular pressure between the allergic rhinitis patients and healthy controls

<table>
<thead>
<tr>
<th></th>
<th>Allergic rhinitis (n=52)</th>
<th>Healthy controls (n=52)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>31.8±11.2</td>
<td>32.4±8.5</td>
<td>0.775</td>
</tr>
<tr>
<td>Gender (Female/Male)</td>
<td>32/20</td>
<td>34/18</td>
<td>0.684</td>
</tr>
<tr>
<td>Spherical equivalent</td>
<td>-0.52±0.72</td>
<td>-0.57±1</td>
<td>0.796</td>
</tr>
<tr>
<td>Intraocular pressure</td>
<td>15.1±3.4</td>
<td>14.7±2.6</td>
<td>0.520</td>
</tr>
<tr>
<td>Subfoveal choroidal thickness</td>
<td>382.1±121.7</td>
<td>378.5±87</td>
<td>0.861</td>
</tr>
<tr>
<td>Nasal choroidal thickness</td>
<td>328.6±111.8</td>
<td>309±77</td>
<td>0.301</td>
</tr>
<tr>
<td>Temporal choroidal thickness</td>
<td>368.1±98.2</td>
<td>354.2±94.2</td>
<td>0.462</td>
</tr>
</tbody>
</table>
It is known that Behçet’s disease and Vogt-Koyanagi-Harada's disease are autoimmune disorders that generally influence the choroidal structure [6,8]. Hirooka et al. [8] reported increased choroidal thickness in acute phase of Vogt-Koyanagi-Harada's disease and observed a decrease in the thickness after treatment. Ishikawa et al. [6] reported similar pattern in choroidal thickness as Vogt-Koyanagi-Harada's disease in the duration of Behçet’s disease. When the choroidal thickness was evaluated in patients with ankylosing spondylitis, it was found to be significantly thicker than the control subjects. The researchers concluded that inflammation could be the reason [18]. However, Onal et al. [19] reported no significant difference of the choroidal thickness between the patients with inflammatory bowel disorder and control individuals. It has been shown that the inflammatory process related to disease duration in psoriasis also affects the choroidal thickness [20,21]. Consequently, there are many disorders that have effects on choroidal structure and they may indirectly contribute the pathogenesis of chorioretinal diseases [14-23]. The AMD prevalence is lower in rheumatoid arthritis patients who receive anti-inflammatory treatment [24].

Allergic rhinitis is an inflammatory disorder caused by IgE mediated reactions [9]. Environmental allergen exposure is a reason for the disease in genetically predisposed subjects. Inflammatory cells such as mast cells, basophils, eosinophils, macrophages and lymphocytes accumulate in the nasal mucosa after the IgE-allergen introduction. Many inflammatory cytokines such as TNFα, interleukin (IL) -4, IL-6, IL-13, and IL-18 have also a role in the pathogenesis of the disorder [2,9]. The studies investigating the AR pathogenesis have revealed that serum levels of many inflammatory cytokines and growth factors are increased [9,10]. This results suggest that AR causes not only a local inflammation but also a systemic inflammation.

The autoregulation of choroid is not fully understood and it can be affected by many systemic inflammatory disorders. The relationship between choroidal thickness and systemic inflammation is explained above aforementioned studies. AR causes systemic inflammation and therefore choroidal thickness was investigated in AR patients in this study. We found thicker choroidal thickness in AR cases but the difference was not statistically significant. However, in a study similar to ours, Yenigun et al. [25] investigated choroidal thickness in AR patients and they reported significantly increased choroidal thickness. This difference may be associated with low grade systemic inflammation in AR or low sample size.

5. CONCLUSION

In conclusion, this result suggests that choroidal thickness in AR is controversial. Studies have larger sample size are needed to confirm the results.

CONSENT

We obtained written informed consent from all subjects.

ETHICAL APPROVAL

This study was approved by Ahi Evran University Medical Faculty Ethics Committee (2018-14/120).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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