INTRODUCTION

Chronic renal failure (CRF), is a kind of metabolic disorder in which retention of various uraemic substances causes toxic effects in different organs and systems. One of the most common manifestations of CRF is anemia. Recombinant human erythropoietin (EPO) has been generally used for the management of anemia in patients with CRF.[1]

Ocular involvement in CRF is also frequently encountered and includes wide range of findings such as refractive changes, dry eye, conjunctival calcium deposits, band keratopathy, lenticular opacities, changes in intraocular pressure (IOP) and retinal nerve fiber layer (RNFL) thickness.[2,3] Additionally, retinopathy and optic neuropathy secondary to diabetes mellitus, hypertension, anemia, and uremia are also frequently observed in CRF patients.

Decreased RNFL thickness is a characteristic feature of ganglion cell loss and early glaucomatous damage. Recent studies indicate that EPO has neuroprotective effects on the central nervous system and retinal ganglion cells following nerve injury. Neuroprotection by EPO has been shown to be associated with anti-apoptosis, neuroregeneration and anti-inflammation.[4,5]

Therefore, in this study we aimed to investigate the effect of EPO treatment on RNFL parameters in patients with CRF undergoing peritoneal dialysis (PD).

MATERIALS AND METHODS

CRF patients undergoing PD in the Dialysis Unit of Gazi University Hospital were included. Inclusion criteria were the presence of best corrected visual acuity of 20/20 with unremarkable anterior segment and fundus examinations. Exclusion criteria were the presence of corneal pathology or cataract affecting optical clarity, glaucoma, prior ocular surgery, optic neuropathy, and any retinopathy including diabetic and hypertensive retinopathy. Anemia parameters were also measured. Patients with serum ferritin ≥100 mg/ml and transferrin saturation ≥20% were included. Informed consent was obtained from all of the patients, and all tenets of the Declaration of Helsinki were followed.

Patients were divided in two sub-groups: those who received EPO treatment (Group 1) and those who did not receive EPO treatment (Group 2). Control group was composed of age-matched healthy subjects. Detailed ophthalmologic examination including visual acuity, IOP measurement, anterior segment and fundus examinations together with RNFL measurement was performed for each patient after the PD session.

IOP was measured by Goldmann application tonometer. RNFL parameters were evaluated using Stratus OCT (Carl Zeiss Meditec, Stratus OCT, Germany) and measurements were performed by the same physician. The mean of three good-quality images was used for the assessment of RNFL thickness in each eye. RNFL parameters were Imax/Smax, Smax/Imax, Smastabg, Imax/Tavg, Smastabg/Navyg, Max-Min, Smax, Imax, Savg, Imax, Avg, Thick. Only left eyes of patients were recruited for the statistical analysis. Mann-Whitney U test was used to compare the RNFL measurements between groups. SPSS version 11.0 system for personal computer was used for all statistical analyses and P value of less than 0.05 was considered to be statistically significant.

RESULTS

Twenty-nine eyes of 29 patients (18 males, 11 females), aged 20–76 years, mean 45.93 ± 16.3 years were included in the study. The control group consisted of 29 healthy individuals (18 male and 11 female), with a mean age of 48.56±14.3 (range 24–72) years. There was no significant difference regarding ages between study and control groups and Group 1-2 (p: 0.20, p:42, respectively). Mean values of RNFL parameters and hematologic parameters for each group are presented in Table 1 - 3.

TABLE 1: RNFL parameters of the patients

<table>
<thead>
<tr>
<th>Group</th>
<th>Imax</th>
<th>Smax</th>
<th>Tavg</th>
<th>Smax</th>
<th>Tavg</th>
<th>Smax</th>
<th>Tavg</th>
<th>Avg</th>
<th>Thick</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Group</td>
<td>150</td>
<td>146</td>
<td>142</td>
<td>132</td>
<td>130</td>
<td>120</td>
<td>105</td>
<td>95</td>
<td>85</td>
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<tr>
<td>Control Group</td>
<td>150</td>
<td>146</td>
<td>142</td>
<td>132</td>
<td>130</td>
<td>120</td>
<td>105</td>
<td>95</td>
<td>85</td>
</tr>
</tbody>
</table>

TABLE 2: RNFL thicknesses of the quadrants

<table>
<thead>
<tr>
<th>Quadrant</th>
<th>Superior</th>
<th>Inferior</th>
<th>Temporal</th>
<th>Nasal</th>
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</thead>
<tbody>
<tr>
<td>Study Group</td>
<td>115.00</td>
<td>98.57</td>
<td>82.18</td>
<td>72.17</td>
</tr>
<tr>
<td>Control Group</td>
<td>115.53</td>
<td>113.31</td>
<td>72.40</td>
<td>75.20</td>
</tr>
</tbody>
</table>

DISCUSSION

Although it’s well-known for its hematopoietic properties, EPO has also been shown to be neuroprotective in experimental trauma, cerebral and retinal ischemia, chronic neuroregenerative disease such as glaucoma and retinits pigmentosa. It is also known to protect retinal ganglion cells, photoreceptors and retinal pigment epithelial cells. CRF, is a systemic disease decreasing RNFL thickness.[3] Thus, neuroprotective agents might be of importance in these patients. CRF patients generally treated with EPO for the treatment of anemia. We hypothesized that EPO might have had some neuroprotective properties against the negative effects of CRF on RNFL, clinically. On the other hand, anemic patients were excluded since anemia could affect RNFL parameters itself.

In conclusion, RNFL thicknesses were found to be higher in patients receiving EPO, but this was statistically significant only in temporal quadrant. This might be resulted from the limited number of patients included in the study. To the best of our knowledge, this is the first pilot study investigating the neuroprotective effects of EPO in CRF clinically. EPO seems to protect RNFL in CRF patients undergoing PD. Future prospective and randomized studies with a higher number of patients are needed to support these data.

REFERENCES