Evaluation of retrobulbar blood flow with color Doppler imaging in central serous chorioretinopathy

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Aims and objectives

Central serous chorioretinopathy (CSC) is a benign and self-limiting disease generally observed in young and middle aged males and characterised by a serous detachment of the sensorial retina associated with retinal pigment epithelial (RPE) detachment at the macula. Although its etiology is yet to be cleared, various factors have been blamed for the condition.

Choriocapillary circulatory disorders are among the factors that have been held responsible in the last years. The vasospasm that occurs in the choroidal bloodstream leads to choroidal circulatory problems. As a result of the disruption in the choroidal circulatory function and the lesions in the retinal pigment epithelium, serous detachment develops in the retina.

Choriocapillary circulation disorder may affect retrobulber vessels and CDI can demonstrate altered retrobulbar blood flow velocities in CSC patients.

In this study based on the choriocapillary circulation disorder hypothesis, our aim is to compare the retrobulbar blood flow parameters in patients with CSC and the healthy control group using CDI.
Methods and materials

Between December 2011 and June 2012, we evaluated 30 patients with first episode of acute CSC (seventeen men and 13 women; age range, 23-54 years; mean age, 37 years ±7.4) and 30 healthy control group (eighteen men and 12 women; age range, 30-44 years; mean age, 35 years ±4.2) with CDI in the study. All patients and healthy control group underwent routine ophthalmic examination including assessment of visual acuity, direct ophthalmoscopy. Diagnosis of CSC was confirmed by fundus fluorescein angiography (FFA) and optical coherence tomography (OCT).

Patients included in our study consisted of the first episode of acute CSC. The control group consisted healthy individuals without any systemic or ocular disease other than refractive errors (from -1 to +1 diopters).

All patients and control group signed informed consent forms before the enrollment in the study. The approval of our institutional review board was obtained before the study. All patients underwent retrobulbar Doppler imaging assessments. The doppler imaging was performed by the same experienced radiologist (CH) using the Toshiba Aplio XG (Tokyo, Japan) device and a 7.5 MHz linear probe as the patient was in the supine position with closed eyes. The ophthalmic, posterior ciliary and central retinal arteries were evaluated and the peak systolic velocity (PSV), end diastolic velocity (EDV), resistive index (RI) and pulsatility index (PI) values of these arteries were recorded. Subsequently, these values were compared with the control group.

The independent samples t-test was used for the statistical analysis carried out through the Statistical Package for Social Sciences software (SPSS 18.0 for Windows). A p value below 0.05 was considered as statistically significant.
Results

The EDV values of posterior ciliary and central retinal artery were significantly lower in the patient group compared to the control group, while the RI and PI values were significantly higher ($p < 0.05$) (Table 1,2). There was no significant difference between the PSV values of posterior ciliary and central retinal arteries of CSC and control group ($p > 0.05$). The PSV and EDV values of the ophthalmic artery were significantly lower in the patient group than the control group ($p < 0.05$). There was no significant difference in terms of the ophthalmic artery RI and PI values between the two groups ($p > 0.05$) (Table 3).
Conclusion

Using CDI, our study has demonstrated that blood flow alterations occur in CSC patients. These results also support the theory blaming choriocapillary circulatory disorder as the etiology of the condition.

Through CDI, primarily the ophthalmic artery, posterior ciliary artery, central retinal artery and the central retinal vein are evaluated. The ophthalmic artery is a branch of the internal carotid artery and it is the main artery perfusing the orbita (Figs. 1, 2). The central retinal artery and the ciliary arteries are branches of the ophthalmic artery (Figs. 3-6). The central retinal artery perfuses the retina, while the ciliary arteries feed the sclera, choroid, iris and the ciliary bodies.

Our study has certain limitations. The number of the patients in the control group is low. Also, the retrobulbar doppler findings were not re-checked after the medical treatment and during the follow-up period, which may be carried out in the future studies. Other limitation of our study was absence of evaluation of short and long ciliary arteries separately with high frequency imaging using either wide-band Doppler or B-Flow imaging.

In conclusion, CDI can easily detect the changes in the retrobulbar blood flow. Although CDI findings have limited value in the diagnosis of CSC, increased vascular resistance in central retinal and posterior ciliary arteries detected by CDI in our study may contribute to understanding pathogenesis of CSC.
Images for this section:

**Fig. 1**

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