



RESEARCH ARTICLE

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## CLINICAL EVALUATION OF NEOVASCULAR AND NON-NEOVASCULAR CHRONIC CENTRAL SEROUS CHORIORETINOPATHY (CSC) DIAGNOSED BY SWEEP SOURCE OPTICAL COHERENCE TOMOGRAPHY ANGIOGRAPHY (SS OCTA)

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### ABSTRACT

The authors are commenting on the study entitled “Clinical evaluation of neovascular and non-neovascular chronic central serous chorioretinopathy (CSC) diagnosed by swept source optical coherence tomography angiography (SS OCTA)” published in Graefes Archive for Clinical and Experimental Ophthalmology 2019; 257(8):1581-1590. This study concluded that clinical evaluation of neovascular and non-neovascular chronic serous chorioretinopathy revealed a significant difference between the age of chronic central serous chorioretinopathy patients (69 and 47 years, respectively) and a significant differentiation according to distance and reading visual acuity outcomes with better initial and final values for non-neovascular chronic central serous chorioretinopathy eyes. Conceivably, the number of these clinical findings would have been higher if all the missing data mentioned by us had been included in statistical analyses in addition to the baseline characteristics already assessed in this study, serving to identify the key drivers correlated with final visual acuity and resolution of subretinal fluid after treatment.

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### INTRODUCTION

The study by Sulzbacher *et al.* (2019) evaluated the clinical characteristics of eyes with chronic central serous chorioretinopathy (CSC) based on swept source optical coherence tomography angiography (SS OCTA). Twenty nine eyes presenting with CSC were classified as neovascular or non-neovascular CSC depending on whether a vascular pattern was detected in the outer retina on OCT angiogram. The two groups were compared based on the following clinical findings: best-corrected visual acuity, rate of subretinal fluid (SRF), intraretinal fluid (IRF), and retinal pigment epithelial detachment (PED). The authors concluded that neovascular CSC is associated with a worse outcome in terms of visual and reading acuity compared to non-neovascular CSC. We would like to address several challenges that have arisen from this study, which can be specifically summarized below.

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Ten of the 29 eyes with CSC included in this study (34.48%) were classified as neovascular CSCs because the outer retinal OCT angiogram revealed a distinct choroidal neovascularization (CNV) suggesting the presence of secondary CNV. Nineteen of the 29 remaining eyes (65.51%) were considered to be non-neovascular CSCs because SS OCTA revealed no abnormal vessel configuration in the outer retina. Importantly, the assessment of the spectral domain optical coherence tomography morphology during the initial visit highlighted a flat irregular undulating PED with internal hyperreflectivity in 2 of 19 eyes (10.52%) certifying the presence of secondary CNV (type 1 CNV). And yet, these eyes were considered to be non-neovascular CSCs. It is noteworthy that the neovascular network assessed by SS OCTA in the outer retina, ascertained existence of the neovascular CSC but was unable to specify the type of CNV, namely, type 1 CNV, located under the retinal pigment epithelium (RPE), or type 2 CNV, located in the subretinal space, above RPE (Călugăru *et al.* 2019).

The characteristic abnormalities of the pachychoroid disease phenotype, which are primarily involved in the CSC and have a pivotal contribution in its pathogenesis, have not been fully documented with the multimodal imaging in both study groups. Specifically, there were no data on the assessment of the following alterations: the increased permeability of choroidal vasculature with extravascular leakage, one of the hallmarks of CSC imaging; the distribution of the pachyvessels in the Haller's layer (in a diffuse or patchy manner) localized within the areas of increased choroidal vascular permeability; the focal or diffuse attenuation of the inner choroid (thinning/absence of the choriocapillaris and intermediate caliber vessels within Sattler's layer in areas overlying abnormally dilated Haller's layer vessels); and the focal choroidal excavations (Călugăru *et al.* 2018). Of note, the perfusion indices (density of blood vessels and flow index) were not calculated for the choriocapillaris zone on the SS OCTA.

There were no data referring to the multimodal imaging of the overlying photoreceptor cell layer, which may suffer progressive and irreversible damages in cases of CSC because of the persistence of the SRF caused by the pronounced dysfunctional RPE outer blood-retinal barrier with severe widespread RPE decompensation. Specifically, these alterations include: the thinning of the outer nuclear layer; the discontinuity of the ellipsoid zone; the elongation of the photoreceptor outer segment; the external limiting membrane band defects allowing fluid to enter the retina and causing in some cases intraretinal fluid, sometimes referred to as "cystoid macular degeneration"; the interdigitation zone loss; and the hyper reflective deposits frequently accumulated in the subretinal space below the detached neurosensory retina (Călugăru *et al.* 2019). Furthermore, the perfusion indices for the outer retinal zone (photoreceptor) were not calculated on the SS OCTA. Of note, although the outer retina does not have vessels, the perfusion indices can be still determined.

There were no comparative data in the 2 phenotype groups referring to the baseline serum potassium levels, the renal function, the level of endogenous and exogenous corticosteroids, the type personality of the patients, and the testing of patients with regard to the *Helicobacter pylori* infection.

The final results of this study were unsatisfactory. Although the non-neovascular CSCs were associated with significantly better outcomes in terms of visual and reading acuity compared to neovascular CSCs, the structural outcomes were poor for the both groups, namely, persistence of SRF and serous PED in 47.36% and 10.5%, respectively, of eyes for non-neovascular CSC eyes and persistence of SRF and serous PED in 40% and 30%, respectively, of eyes as well as occurrence of IRF in 40% of eyes for neovascular CSC eyes.

Altogether, clinical evaluation of neovascular and non-neovascular CSCs revealed in this study a significant difference between the age of CSC patients (69 and 47 years, respectively) and a significant differentiation according to distance and reading visual acuity outcomes with better initial and final values for non-neovascular CSC eyes.

Conceivably, the number of these clinical findings would have been higher if all the missing data mentioned by us had been included in statistical analyses in addition to the baseline characteristics already assessed in this study, serving to identify the key drivers correlated with final visual acuity and resolution of SRF after treatment.

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### Conflict of interest

All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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All authors have completed and submitted the ICMJE form for disclosure of potential conflicts of interest. No financial disclosures. Both authors (D.C and M.C) were involved in the design and conduct of the study; collection, management, analysis and interpretation of the data; and preparation, review or approval of the manuscript. The authors have full control over the primary data and they agree to allow the International Journal of Development Research to review their data if requested.

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