

Commentary: Retinal branch vein occlusion and arteriosclerosis: Can cardio-ankle vascular index be a useful biomarker?

Retinal vein occlusion is one of the common causes of loss of vision, second only to diabetic retinopathy. Its pathogenesis is still not completely understood. The condition may be due to a combination of three systemic changes known as Virchow's triad which consists of hemodynamic changes (venous stasis), degenerative changes of the vessel wall, and blood hypercoagulability. Arteriosclerosis plays a major role in branch retinal vein occlusion.^[1] The sclerotic retinal arteriole compresses the accompanying vein because of a common thickened, adventitial and glial sheath. It is well known that the retinal arteries reflect the changes seen in the central arteries. Moreover, Bertelsen *et al.*^[2] have shown the association of retinal vein occlusion with peripheral arterial disease as well. Thus, studying the condition of retinal vessels can give useful information about the blood vessels in the other parts of the body and vice versa.

Cardio-ankle vascular index (CAVI), a noninvasive index, can be used to assess arterial stiffness from aorta to ankles.^[3] CAVI is theoretically independent of blood pressure. It is linked with intima-media thickness and the presence of carotid plaque. This index is used in conditions like atherosclerosis, coronary heart disease, cerebrovascular event and in patients who are at the risk of developing cardiovascular complications, viz., hypertensive, diabetic, elderly, and obese persons. In many studies, high CAVI implies a progression of carotid and coronary arteriosclerosis and the presence of multivessel disease.^[4] Being independent of blood pressure has made this index more appropriate than other indices like pulse wave velocity (PWV) which have been used previously in many studies as an index of arterial stiffness.^[3,4]

CAVI has shown its association mainly with large artery disease. However, a few studies have shown its correlation with ophthalmic vasculature. A study done in the Japanese population has shown the association of CAVI with retinal artery changes indicating small artery disease, and its association with recently diagnosed hypertension.^[5]

However, the application of CAVI in ophthalmology is yet very limited and not well studied till date. In this issue,

in the study done by Kocayigit, *et al.* the authors have shown that patients with branch retinal vein occlusion (BRVO) have higher CAVI than the normal controls.^[6] The authors feel that this index can be a useful biomarker for predicting the risk of developing BRVO. However, this is not enough to establish a causal relationship. It is quite apparent that despite the very high incidence of arterio-venous crossing changes in patients with arteriosclerosis and hypertension, the incidence of BRVO is very low. This clearly indicates the multifactorial etiology of BRVO. Evidently, factors other than simple anatomical arrangement and compression must play important roles in the development of BRVO.

However, CAVI can be a novel parameter which can be used by ophthalmologists for evaluating RVO patients for any cardiovascular risk. It is well known that RVO is associated with significant co-morbidities. In a study, before the diagnosis of BRVO, people who would eventually develop this condition had higher overall comorbidity.^[2] Hypertension, diabetes, and peripheral artery disease were more prevalent than in the general population. After being diagnosed with BRVO, the patients without the previous history of these disorders were more likely than the general population to develop arterial hypertension, diabetes, congestive heart failure, and cerebrovascular disease, etc. Their comorbidities and their overall burden of disease were increased.

There are conflicting reports about RVO and associated higher risk of myocardial infarction or cerebrovascular event. Although co morbidities have been strongly associated with RVO, there is a difference of opinion regarding associated perceived higher risk of cardiovascular infarction or cerebrovascular event. One study, based on healthcare claims databases from the United States reported an increased incidence rate (incidence rate ratio 1.72, 95% confidence interval 1.27 to 2.34) of cardiovascular disease (CVD) and higher co-morbidities index in RVO,^[7] whereas a study from Taiwan did not find increased risk of myocardial infarction in RVO.^[8] Therefore, an index which can help estimate the risk of future cardiovascular disease can be useful to guide decisions about preventative treatment for CVD in RVO patients.^[9]

Advancing age is the most significant risk factor for all types of RVO. However, a large number of younger population also gets diagnosed with this condition. Approximately, 30% of retinal vascular disorders including CRVO, BRVO, and hemicentral retinal vein occlusion are seen in patients younger than 45 years of age.^[10] The risk of developing cardiovascular

or cerebrovascular events in such persons is unknown. These patients who are in their prime would be greatly interested in knowing the risk. Indices such as CAVI might be of some benefit in predicting the risk in such patients. In conclusion, this novel index needs to be further studied in large populations to establish the causal relationship between increased CAVI and RVO.

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