

Early and global estimation of microvascular target organ damage in hypertension by use of innovative software

Areti Triantafyllou¹,
Xenophon Zabulis²,
Panagiota Anyfanti³,
Eleni Gavriilaki³,
Eugenia Gkaliagkousi³,
Athina Pyrpasopoulou³,
Vasileios Gkolias¹,
Georgios Triantafyllou¹,
Barbara Nikolaidou³,
Chrysanthos Zamboulis¹,
Spyros Aslanidis³,
Stella Douma¹

1. 3rd Department of Medicine, Papageorgiou Hospital, Aristotle University of Thessaloniki,
2. Institute of Computer Science, Foundation for Research and Technology - Hellas,
3. 2nd Propedeutic Department of Internal Medicine, Hippokration General Hospital, Aristotle University of Thessaloniki, Greece

Correspondence address:

Areti Triantafyllou
Kamvounion 8, P.C. 54621, Thessaloniki, Greece
E-mail: artriant@hotmail.com

Abstract

In the cardiovascular disease arena, the central role of microcirculation has been verified, and research towards global cardiovascular risk assessment and early identification of hypertensive target organ damage is continuously expanding. In this concept, quantitative microcirculation measures have been developed, applied to the easily accessible arterioles and venules of the retina, the skin and the kidney. Indeed, subtle retinal vascular alterations, capillary rarefaction and microalbuminuria have been each associated with increased risk of cardiovascular mortality. However, data regarding the concomitant presence of microvascular lesions in the above target organs in the early stages of hypertension, association of the number of affected organs with cardiovascular risk, and the effect of aldosterone on multiple target organ damage are lacking. We therefore studied consecutive naïve, never-treated patients attending the Hypertension Unit of our Department with recent duration of hypertension (<1year), confirmed with 24h ambulatory blood pressure monitoring, and healthy volunteers. Innovative, semi-automated software was specifically developed by our Hypertension Unit and the Institute of Computer Science, Foundation for Research and Technology-Hellas (FORTH) to estimate retinal vascular diameters obtained by retinal photography and capillary density obtained by nailfold capillaroscopy photography. The Framingham Risk Score was used to determine future cardiovascular risk. Biochemical parameters including serum aldosterone were also derived. A total of 118 subjects, 77 hypertensives and 41 normotensives, were included. Hypertensive patients exhibited a significantly greater number of affected target organs compared to normotensives ($P=0.018$), with retinopathy representing the most common target organ among hypertensives. The number of microcirculation target organ damage was linearly correlated with increased Framingham score ($r=0.276$, $P=0.015$). Aldosterone levels linearly correlated ($r=0.398$, $P<0.001$) and significantly predicted ($P=0.03$) the number of microcirculation target organ damage even after adjustment for other variables. Physicians dealing with the hypertensive patient should be aware of the possibility of diffuse microvascular impairment and seek for multiple target organ damage even in the early stages of hypertension, in order to apply appropriate treatment and decelerate its progression towards cardiovascular disease.

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