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The burden of carotid-related strokes

Kosmas I. Paraskevas¹, Dimitri P. Mikhailidis², Hedyeh Baradaran³, Reinoud P. H. Bokkers⁴, Alun H. Davies⁵, Hans-Henning Eckstein⁶, Gianluca Faggioli⁷, Jose Fernandes E Fernandes⁸, Mauro Gargiulo⁷, Arkadiusz Jawien⁹, Mateja K. Jezovnik¹⁰, Stavros K. Kakkos¹¹, Michael Knoflach¹², M. Eline Kooi^{13,14}, Gaetano Lanza¹⁵, Christos D. Liapis¹⁶, Ian M. Loftus¹⁷, Armando Mansilha¹⁸, Laura Mechtouff¹⁹, Antoine Millon²⁰, Piotr Myrcha²¹, Andrew N. Nicolaides²², Rodolfo Pini⁷, Pavel Poredos²³, Jean-Baptiste Ricco²⁴, Tatjana Rundek²⁵, Luca Saba²⁶, Mauro Silvestrini²⁷, Francesco Spinelli²⁸, Francesco Stilo²⁸, Sherif Sultan²⁹, Jasjit S. Suri³⁰, Alexei V. Svetlikov³¹, Tissa Wijeratne³², Clark J. Zeebregts³³, Peter Gliviczki³⁴

¹Department of Vascular Surgery, Central Clinic of Athens, Athens, Greece; ²Department of Clinical Biochemistry, Royal Free Hospital Campus, University College London Medical School, University College London (UCL), London, UK; ³Department of Radiology and Imaging Sciences, Neuroradiology Division, University of Utah Health, Salt Lake City, UT, USA; ⁴Department of Radiology, Medical Imaging Center, University Medical Center Groningen, Groningen, The Netherlands; ⁵Section of Vascular Surgery, Imperial College & Imperial Healthcare NHS Trust, London, UK; ⁶Department for Vascular and Endovascular Surgery, Klinikum rechts der Isar, Technical University of Munich, Munich, Germany; ⁷Vascular Surgery, Department of Experimental, Diagnostic and Specialty Medicine, University of Bologna, IRCCS Policlinico di Sant'Orsola, Bologna, Italy; ⁸Department of Vascular Surgery, University of Lisbon, Lisbon Academic Medical Center, Lisbon, Portugal; ⁹Department for Vascular Surgery and Angiology, L. Rydygier Collegium Medicum in Bydgoszcz, Nicolaus Copernicus University in Torun, Poland; ¹⁰Department of Advanced Cardiopulmonary Therapies and Transplantation, The University of Texas Health Science Centre at Houston, Houston, TX, USA; ¹¹Department of Vascular Surgery, University of Patras Medical School, Patras, Greece; ¹²Department of Neurology, Medical University of Innsbruck, Innsbruck, Austria; ¹³CARIM School for Cardiovascular Diseases, Maastricht University, Maastricht, The Netherlands; ¹⁴Department of Radiology and Nuclear Medicine, Maastricht University Medical Center, Maastricht, The Netherlands; ¹⁵Vascular Surgery Department, IRCCS MultiMedica Hospital, Castellanza, Italy; ¹⁶Athens Vascular Research Center, Athens, Greece; ¹⁷St. George's Vascular Institute, St. George's University London, London, UK; ¹⁸Faculty of Medicine of the University of Porto, Porto, Portugal; ¹⁹Stroke Center, Hospices Civils de Lyon, Lyon, France; ²⁰Vascular Surgery Department, Hospices Civils de Lyon, Lyon, France; ²¹First Chair and Department of General and Vascular Surgery, Faculty of Medicine, Medical University of Warsaw, Warsaw, Poland; ²²Department of Surgery, University of Nicosia Medical School, Nicosia, Cyprus; ²³Department of Vascular Disease, University Medical Centre Ljubljana, Slovenia; ²⁴Department of Clinical Research, University of Poitiers, CHU de Poitiers, Poitiers, France; ²⁵Department of Neurology, Miller School of Medicine, University of Miami, Miami, FL, USA; ²⁶Department of Radiology, Azienda Ospedaliera Universitaria Di Cagliari, Cagliari, Italy; ²⁷Neurological Clinic, Department of Experimental and Clinical Medicine, Marche Polytechnic University, Ancona, Italy; ²⁸Vascular Surgery Division, Campus Bio-Medico University of Rome, Rome, Italy; ²⁹Western Vascular Institute, Department of Vascular and Endovascular Surgery, University Hospital Galway, National University of Ireland, Galway, Ireland; ³⁰Stroke Diagnosis and Monitoring Division, AtheroPoint™, Roseville, USA; ³¹Division of Vascular and Endovascular Surgery, North-Western Scientific Clinical Center of Federal Medical Biological Agency of Russia, St. Petersburg, Russia; ³²Department of Neurology, Sunshine Hospital and Melbourne Medical School, St. Albans, Victoria, Australia; ³³Division of Vascular Surgery, Department of Surgery, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands; ³⁴Division of Vascular and Endovascular Surgery, Mayo Clinic, Rochester, MN, USA

Correspondence to: Kosmas I. Paraskevas, MD. Department of Vascular Surgery, Central Clinic of Athens, 24, Alex. Papagou street, N. Iraklio 14122, Athens, Greece. Email: paraskevask@hotmail.com.

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We would like to thank Dr. Beach for his interest in our work published in two previous issues of this Journal on prevention and treatment of stroke due to carotid artery stenosis (1,2). We agree with him that identifying high-risk patients with asymptomatic carotid stenosis (AsxCS) and establishing measures to prevent the catastrophic sequelae of carotid-related strokes should become our research priority.

Stroke risk in patients with AsxCS varies considerably. The Asymptomatic Carotid Stenosis and Risk of Stroke (ACRSRS) study assessed the risk of stroke in patients with mild (50–69%; n=198), moderate (70–89%; n=598) and severe AsxCS (90–99%; n=325) followed for a mean period of 48 months (range, 6–96) (3). The cumulative 5-year risks of ipsilateral cerebral or retinal ischemic (CORI) events were 9%, 15% and 20%, respectively (log-rank $P=0.009$) (3). The stroke risk varied by different criteria applied, e.g., using carotid plaque area, the presence of juxtaluminal black area without a visible echogenic cup, the presence of silent embolic infarcts on brain computed tomography (CT) scans, etc. For example, for patients with 70–89% AsxCS, the incidence of stroke was 5.7% in individuals with plaque types 1–3 and 0.8% in those with types 4 and 5 (3). Furthermore, for individuals with 90–99% AsxCS, the incidence of stroke was 7.7% in patients with plaque types 1–3 *vs.* 0% in those with types 4 and 5 (3). Based on a stroke risk calculation model, the predicted annual average stroke rate varied from <1.0% to >6.0% (3).

Dr Beach supports the implementation of selective screening programs in primary care to identify patients with AsxCS. Support for such screening programs targeting high-risk patient subgroups has also been provided from earlier independent reports (4,5). The 2017 European Society for Vascular Surgery (ESVS) guidelines for the management of patients with carotid and vertebral artery stenosis also addressed the issue of screening for AsxCS (6). About 10–15% of all first-ever strokes occur following thromboembolism from a previously untreated significant AsxCS. Successful stroke prevention strategies could therefore have considerable clinical, social and financial benefits (6). Although both the 2017 ESVS (6) and the 2021 Society for Vascular Surgery (SVS) Guidelines (7) recommended against routine population screening for AsxCS, they recommended that selective screening for AsxCS may be considered in patients with multiple vascular risk factors (e.g., smoking, hypertension, hypercholesterolemia) (Class IIb, Level of Evidence: C). The rationale supporting screening in such high-risk patients is not necessarily to offer a prophylactic

carotid intervention, but rather to identify those individuals with AsxCS in order to optimize risk factor control and to provide best medical therapy (BMT). These measures should reduce cardiovascular morbidity/mortality and prevent both strokes and myocardial infarctions/cardiovascular events (6,7).

A crucial issue in the management of AsxCS patients—which is sometimes under-recognized—is patient preference and individual patient needs (8). Patients may have a different perception of their disease and different expectations than their treating physicians (8). Individual patient needs/patient preferences, compliance with BMT, patient age, gender and individual comorbidities are important parameters that should be taken into account when advising patients with AsxCS about the possible treatment options (8). Such patient characteristics support the view that the management of AsxCS should be individualized and tailored to each patient's needs/expectations (8).

Despite the release of >30 national and international guidelines, the optimal management of patients with AsxCS still remains the subject of extensive debate (9). Several plaque and brain imaging biomarkers have been suggested for stroke risk stratification in patients with AsxCS, including change in AsxCS degree of stenosis, plaque volume, plaque echolucency, plaque area, intraplaque hemorrhage, a lipid-rich necrotic core, a thin fibrous plaque, microembolic signals in transcranial Doppler, neovascularization, cerebrovascular reserve, silent brain infarcts, and others (6,10,11). The use of these imaging/clinical criteria is essential for stroke risk stratification and for targeting prophylactic carotid revascularization procedures (carotid endarterectomy/carotid artery stenting) to those AsxCS patients that will most likely benefit from them.

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