Low Levels of Low-Density Lipoprotein Cholesterol Increase Hemorrhagic Transformation but Not Parenchimal Hematoma in Large Artery Atherothrombosis

To the Editor:

We read with interest the article by Kim and colleagues reporting on the effect of low level of total cholesterol and low-density lipoprotein cholesterol (LDLC) on hemorrhagic transformation (HT) after acute ischemic stroke. The authors found that low levels of LDLC are independently associated with the risk of HT after acute ischemic stroke attributable to large artery atherothrombosis (LAA) but not to cardioembolism (CE). The authors commented on the results saying that they should be interpreted with caution in consideration of several points: the study was conducted in a retrospective manner, some of the patients had total cholesterol levels without LDLC levels, they did not distinguish between symptomatic and asymptomatic HT, the cholesterol level may change in the acute stages of stroke, and finally, the long-term outcome of HT was not evaluated in the study. We showed that only parenchimal hematoma (PH) but not hemorrhagic infarction is associated with an adverse outcome at 3 months. In our study, of 1125 stroke patients included, 191 had stroke attributable to LAA and 300 to CE. HT was more prevalent in CE subgroup (51/300, 17%; 30 hemorrhagic infarction and 21 PH) than in LAA subgroup (21/191, 11%; 15 hemorrhagic infarction and 6 PH). In patients with CE the mean value of LDLC was 111.2±34.0 mg/dL; 108.0±28.3 mg/dL in patients with HT (P = not significant [n.s.]) and 107.1±26.9 mg/dL in patients with PH (P = n.s.). In patients with LAA, the mean value of LDLC was 114.1±33.9 mg/dL; 100.5±29.5 mg/dL in patients with HT (P = 0.05) and 97.1±16.1 mg/dL in patients with PH (P = n.s.). Lower LDLC levels were related to an increased risk of HT after ischemic stroke due to LAA, with the risk of HT increasing by 2% for each 1 mg/dL decrease in the LDL level (treated LDLC as a continuous variable), after adjusting for other risk factors (odds ratio 0.98, 95% CI 0.96 to 1.00, P = 0.05). This was not the case for the association between PH and the LDL level after adjusting for other risk factors (odds ratio 0.98, 95% CI 0.95 to 1.02, P = n.s.). A low level of LDLC was not associated with HT or PH in patients with stroke due to CE (odds ratio 0.99, 95% CI 0.98 to 1.00, P = n.s.; odds ratio 0.99, 95% CI 0.98 to 1.01, P = n.s. respectively). Also our data should be interpreted cautiously because they ultimately rest on just 6 PH occurrences in LAA cases.

In conclusion, the association among HT, PH, low levels of LDLC and outcome in stroke attributable to LAA should be considered in clinical stroke research in the future.

Disclosures
None.

Maurizio Paciaroni, MD
Giancarlo Agnelli, MD
Stroke Unit, Division of Cardiovascular Medicine
University of Perugia
Perugia, Italy

Francesco Corea, MD, PhD
Stroke Unit, Department of Neurology
Institute of Experimental Neurology
Scientific Institute
San Raffaele, Milano, Italy

Walter Ageno, MD
Department of Clinical Medicine
University of Insubria
Varese, Italy

Valeria Caso, MD, PhD
Stroke Unit, Division of Cardiovascular Medicine
University of Perugia
Perugia, Italy

Giorgio Silvestrelli, MD, PhD
Stroke Unit, Division of Neurology
Carlo Poma Hospital
Mantova, Italy


Low Levels of Low-Density Lipoprotein Cholesterol Increase Hemorrhagic Transformation but Not Parenchimal Hematoma in Large Artery Atherothrombosis
Maurizio Paciaroni, Giancarlo Agnelli, Francesco Corea, Walter Ageno, Valeria Caso and Giorgio Silvestrelli

Stroke. 2009;40:e544; originally published online July 23, 2009;
doi: 10.1161/STROKEAHA.109.556399

Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2009 American Heart Association, Inc. All rights reserved.
Print ISSN: 0039-2499. Online ISSN: 1524-4628

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://stroke.ahajournals.org/content/40/9/e544

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Stroke can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Stroke is online at:
http://stroke.ahajournals.org//subscriptions/