Stroke Imaging Marker for detection of hyperacute ischemic changes in NCCT - advances

Ryszard Stefan Gomółka1, Chrzan RM2, Urbanik A1, Nowinski WL4 and Grzanka AD1
1Warsaw University of Technology, Poland
2Jagiellonian University, Poland
3University of Washington, USA
4Wyszyński University, Poland

NCCT states a first-line diagnostic procedure for the emergency assessment of acute stroke. Although the NCCT is highly specific in differentiation of intracerebral hemorrhage from ischemia, it has a poor sensitivity in evaluation of acute ischemic stroke. Hence, computer-aided diagnosis is able to improve the performance.

In 2013 we introduced a computational method for detection and localization of visible infarcts in NCCT. Herein, we aimed to evaluate and extend our method to localize a non-visible hyperacute ischemia by means of Stroke Imaging Marker (SIM).

Based on the SIM and its components: ratio of percentile differences in subranges of HU distribution (P-ratio), ratio of voxels count in ranges of brain CT intensity (N-ratio), median HU attenuation value (MAV); the infarct localization was performed in 140 early and follow-up scans of 70 patients. The infarct was not visible to a radiologist or to an experienced stroke neuroradiologist in any of the early scans. The infarcted hemisphere detection rate and sensitivity of infarct localization were measured by comparing the detected region in the initial scan, with the gold standard set in respective follow-up examination.

The best performance of the algorithm was found for the P-ratio including 7 percentile subranges within the range of 35th-75th percentile. The modified SIM provided 76% ischemic hemisphere detection rate and 54% sensitivity in spatial localization of hyperacute ischemia (68% among properly detected sides).

The improved SIM is a dedicated and potentially useful tool for hyperacute non-visible brain infarcts detection in NCCT and may contribute to decision to triage.

Biography

Ryszard Gomolka has commenced his Master’s Degree in Electronics and IT in Medicine from Warsaw University of Technology (WUT). Earlier, he received a Bachelor’s Degree in the field of medical Electrodiagnosis, from Medical University of Warsaw (WUM). Currently, he is a PhD Candidate and Assistant at the WUT. He specializes in signal and image processing, and modeling of physiological control systems. Since 2006 he participates in research on computer aided diagnosis in hemorrhagic and ischemic stroke in NCCT, as well in research on modeling of central regulation of blood pressure in basic conditions, hypertension, obesity and acute stress.

rgomolkartg@gmail.com

Notes: