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Early blood-brain barrier dysfunction predicts neurological outcome following aneurysmal subarachnoid hemorrhage

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Disease progression and delayed neurological complications are common after aneurysmal subarachnoid hemorrhage (aSAH). We aimed at targeting the potential of quantitative blood-brain barrier (BBB) imaging to predict disease progression and neurological outcome. We retrospectively, blindly and semi-automatically, analyzed magnetic resonance images from 124 aSAH patients scanned at four time points (24-48 h, 6-8 days, 12-15 days and 6-12 months) after the initial hemorrhage. Volume of brain with apparent pathology and BBB-dysfunction, subarachnoid space and lateral ventricles were measured. Neurological status on admission was scored using the Rosen-Macdonald scores (RMS). Clinical outcome at >six months was assessed using the extended Glasgow outcome scale. Based on repeated volumetric measures of pathological brain tissue and CSF, patients were grouped into progressive and non-progressive disease course. No differences were found between the groups in aneurysm locations, neurological status on admission or initial brain pathology. Females were older and more likely to have a non-progressive course compared to males. Progressive course was associated with worse outcome at >six months. A significant brain volume with BBB-dysfunction was found already 24-48 hours after admission, and persisted at all-time points. Brain volume with BBB-dysfunction was significantly larger in patients with progressive compared with non-progressive course. BBB-dysfunction increased the likelihood of a normal brain tissue to turn into a pathological one. A multi-linear regression model revealed a significant power for BBB-dysfunction in combination with RMS at 24-48 hours to predict patient outcome. We suggest that early identification of BBB-dysfunction may serve as a key predictive biomarker for neurological outcome in aSAH.

Biography

Svetlana Lublinsky is completing her PhD studies under supervision of Professor Alon Friedman and Professor Ilan Shelef (Ben Gurion University, Israel). She has a Bachelor's degree in Electromechanical Engineering, and a Master's degree in Biomedical Engineering (Technion, Israel). Her research focuses on development of image processing methods, identification of imaging biomarkers, building prognostic and diagnostic tools. She has published and co-authored at 16 papers in reputed journals.

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