Hemorrhagic transformation

- Advances and Integrations of Computer-Assisted Planning, Artificial Intelligence, and Predictive Modeling Tools for Laser Interstitial Thermal Therapy in Neurosurgical Oncology
- MicroRNA-29a-5p attenuates hemorrhagic transformation and improves outcomes after mechanical reperfusion for acute ischemic stroke
- A low apparent diffusion coefficient value is associated with hemorrhagic transformation following endovascular treatment for a large ischemic core
- Spinal Extradural Angiolipoma: A Report of Two Cases and Review of Literature
- Gut microbiota-derived phenylacetylglutamine mitigates neuroinflammation induced by intracerebral hemorrhage in mice
- Preparation of a Brucella multiepitope fusion protein based on bioinformatics and its application in serological diagnosis of human brucellosis
- Current Trends and Future Directions in Lumbar Spine Surgery: A Review of Emerging Techniques and Evolving Management Paradigms
- Progress to Date on Cranial Electromagnetic Field Stimulation to Modulate Brain Activity

Large areas of hemorrhagic transformation within an ischemic infarct may be more indicative of cardiogenic brain embolism (CBE) due to thrombolysis of the clot and reperfusion of infarcted brain with the subsequent hemorrhagic conversion. Hemorrhagic transformation most often occurs within 48 hrs of a CBE stroke, and is more common with larger strokes.

Intraarterial thrombolysis within 6 hours of stroke onset may increase recanalization rates to 37–100% and clinical improvement to 53–94% without a significant increase in the hemorrhagic transformation when compared with intravenous thrombolytic therapy alone.

Risk factors

see also Spontaneous Intracerebral Hemorrhage Risk Factors.

Identifying risk factors and making an early prediction of HT in acute cerebral infarction contributes not only to the selections of therapeutic regimen but also, more importantly, to the improvement of prognosis of acute cerebral infarction.

Decompressive craniectomy for a malignant stroke, after reperfusion, corresponding to an endovascular thrombectomy failure, increases the risk of severe hemorrhagic transformations in a ischemic stroke model in mice. This result support the need of clinical studies to evaluate the added value of DC at the era of endovascular thrombectomy [1)].

Prediction

The purpose of a study of Wang et al. was to develop and validate a model to predict a patient's risk of Hemorrhagic transformation within 30 days of initial ischemic stroke.

They utilized a retrospective multicenter observational cohort study design to develop a Lasso Logistic Regression prediction model with a large, US Electronic Health Record dataset which structured to the Observational Medical Outcomes Partnership (OMOP) Common Data Model (CDM). To examine clinical transportability, the model was externally validated across 10 additional real-world healthcare datasets include EHR records for patients from America, Europe and Asia.

In the database the model was developed, the target population cohort contained 621,178 patients with ischemic stroke, of which 5,624 patients had HT within 30 days following initial ischemic stroke. 612 risk predictors, including the distance a patient travels in an ambulance to get to care for a HT, were identified. An area under the receiver operating characteristic curve (AUC) of 0.75 was achieved in the internal validation of the risk model. External validation was performed across 10 databases totaling 5,515,508 patients with ischemic stroke, of which 86,401 patients had HT within 30 days following initial ischemic stroke. The mean external AUC was 0.71 and ranged between 0.60-0.78.

A HT prognostic predict model was developed with Lasso Logistic Regression based on routinely collected EMR data. This model can identify patients who have a higher risk of HT than the population average with an AUC of 0.78. It shows the OMOP CDM is an appropriate data standard for EMR secondary use in clinical multicenter research for prognostic prediction model development and validation. In the future, combining this model with clinical information systems will assist clinicians to make the right therapy decision for patients with acute ischemic stroke [2)].

Outcome

Hemorrhagic transformation (HT) after cerebral infarction is a complex and multifactorial phenomenon in the acute stage of ischemic stroke, and often results in a poor prognosis.

1)
Borha A, Lebrun F, Touzé E, Emery E, Vivien D, Gaberel T. Impact of Decompressive Craniectomy on Hemorrhagic Transformation in Malignant Ischemic Stroke in Mice. Stroke. 2022 Dec 7. doi: 10.1161/STROKEAHA.122.041365. Epub ahead of print. PMID: 36475467.

2)
Wang Q, Reps JM, Kostka KF, Ryan PB, Zou Y, Voss EA, Rijnbeek PR, Chen R, Rao GA, Morgan Stewart H, Williams AE, Williams RD, Van Zandt M, Falconer T, Fernandez-Chas M, Vashisht R, Pfohl SR, Shah NH, Kasthurirathne SN, You SC, Jiang Q, Reich C, Zhou Y. Development and validation of a prognostic model predicting symptomatic hemorrhagic transformation in acute ischemic stroke at scale in the OHDSI network. PLoS One. 2020 Jan 7;15(1):e0226718. doi: 10.1371/journal.pone.0226718. eCollection 2020. PubMed PMID: 31910437.