Aneurysmal subarachnoid hemorrhage outcome prediction models

- Serum peroxiredoxin 2 emerges as a predictive biomarker of poor neurological outcome and delayed cerebral ischemia after aneurysmal subarachnoid hemorrhage: a prospective cohort study
- The relationship between the triglyceride-glucose index and functional outcomes in patients with aneurysmal subarachnoid hemorrhage: a retrospective cohort study
- Evaluating extreme temperature values and patient outcomes in aneurysmal subarachnoid hemorrhage: Post-hoc insights from the Earlydrain trial
- Evaluation of cerebral blood flow after subarachnoid hemorrhage using near-field coupling and machine learning
- Development and validation of a nomogram-based risk prediction model for unfavorable outcomes in pediatric traumatic brain injury: a retrospective study
- Intrathecal nicardipine for cerebral vasospasm after non-traumatic subarachnoid hemorrhage: a meta-analysis
- Quantitative electroencephalography predicts delayed cerebral ischemia after aneurysmal subarachnoid hemorrhage: a retrospective study
- Visualizing the burden of brain tissue hypoxia and metabolic dysfunction assessed by multimodal neuromonitoring in subarachnoid hemorrhage patients: the TITAN study

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There is increasing evidence suggesting that biomarkers can give insight into the aneurysmal subarachnoid hemorrhage pathogenesis and can serve as an outcome predictor [1)]

Systematic reviews for clinical prognostic factors and clinical prediction tools in aneurysmal subarachnoid hemorrhage (aSAH) face a number of methodological challenges. These include within and between study patient heterogeneity, regional variations in treatment protocols, patient referral biases, and differences in treatment, and prognosis viewpoints across different cultures [2)].

Clinical prediction models were developed with individual patient data from 10 936 patients and validated with data from 3355 patients after development of the model. In the validation cohort, a core model including patient age, premorbid hypertension, and neurological grade on admission to predict risk of functional outcome had good discrimination, with an area under the receiver operator characteristics curve (AUC) of 0.80 (95% confidence interval 0.78 to 0.82). When the core model was extended to a “neuroimaging model,” with inclusion of clot volume, aneurysm size, and location, the AUC improved to 0.81 (0.79 to 0.84). A full model that extended the neuroimaging model by including treatment modality had AUC of 0.81 (0.79 to 0.83). Discrimination was lower for a similar set of models to predict risk of mortality (AUC for full model 0.76, 0.69 to 0.82). All models showed satisfactory calibration in the validation cohort.

The prediction models reliably estimate the outcome of patients who were managed in various

settings for ruptured intracranial aneurysms that caused subarachnoid haemorrhage. The predictor items are readily derived at hospital admission. The web based SAHIT prognostic calculator (http://sahitscore.com) and the related app could be adjunctive tools to support management of patients [3].

Ventricular hemorrhage

Quantitative imaging indicators of ventricular hemorrhage (standard deviation of third ventricular hemorrhage density, minimum density of fourth ventricular hemorrhage, and left ventricular sphericity) are helpful to predict the poor prognosis of patients with aSAH with ventricular hemorrhage. The dimensional fusion model has greater value in predicting the poor prognosis of patients [4].

Sex and Race

In a nationally representative study, women were less likely to have excellent outcomes following aneurysmal subarachnoid hemorrhage, and White patients had disproportionately higher likelihood of worse clinical outcomes. Lower rates of mortality were seen among Black and Hispanic patients [5]

Nomogram

A retrospective analysis that included 2 separate cohorts of patients undergoing endovascular coiling for aSAH. The training cohort consisted of 687 patients in the First Affiliated Hospital of Shantou University Medical College; the validation cohort consisted of 299 patients from Sun Yat-sen University's Affiliated Jieyang People's Hospital. The training cohort was used to develop 2 models to predict unfavorable prognosis (modified Rankin scale of 3-6 at 3 months): one was based on traditional factors (e.g., age, modified Fisher grade, NIHSS score, and blood glucose), and another model that included traditional factors as well as MNM on admission.

In the training cohort, MNM upon admission was independently associated with unfavorable prognosis (odds ratio after adjustment, 1.06; 95% confidence interval [CI], 1.03-1.10). In the validation cohort, the basic model that included only traditional factors had 70.99% sensitivity, 84.36% specificity, and 0.859 (95% CI, 0.817-0.901) area under the receiver operating characteristic curve (AUC). Adding MNM increased model sensitivity (from 70.99% to 76.48%), specificity (from 84.36% to 88.63%), and overall performance (AUC 0.859 [95% CI, 0.817-0.901] to 0.879 [95% CI, 0.841-0.917]).

MNM upon admission is associated with unfavorable prognosis in patients undergoing endovascular embolization for aSAH. The nomogram including MNM is a user-friendly tool to help clinicians quickly predict the outcome of patients with aSAH [6]

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VASOGRADE

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Machine learning

Machine learning for Aneurysmal subarachnoid hemorrhage outcome prediction

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