P1652 MACHINE-LEARNING-BASED MORTALITY PREDICTION OF ICH IN ADULTS WITH ITP: A NATIONWIDE REPRESENTATIVE MULTICENTRE STUDY

Topic: 32. Platelet disorders

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Background: ITP is more likely to be persistent or chronic in adults, whereas it is a self-limiting disease in children. Although mortality in patient with ITP is only slightly higher than in the general population, severe bleeding events such as intracranial haemorrhage (ICH) are often considered to be associated with a poor prognosis. Bleeding is considered to be one of the important clinical outcomes in patients with ITP. According to previous studies, ICH occurs in approximately 1% of ITP patients, with a mortality rate of 24.0%-31.2%, and is considered a fatal complication of ITP. (Blood, 2009; Platelets, 2021) However, large-scale clinical studies on mortality and associated risk factors are still lacking.

Aims: To identify 30-day mortality and associated risk factors for ICH in ITP adults. To develop and validate a machine learning model to predict 30-day mortality. To establish an application for mortality prediction.

Methods:

A national real-world study of ICH in adult ITP patients was conducted using data from 27 centres. The clinical characteristics and mortality of these patients were summarized. In addition, we identified risk factors for 30-day mortality by least absolute shrinkage and selection operator (Lasso) regression in a training cohort of 16 centres. We developed 10 machine learning models with algorithms including support vector machine (SVM), k-nearest neighbour (kNN), logistic regression, linear discriminant analysis (LDA), decision tree, random forest, gradient decision tree (GBDT), adaptive boosting (AdaBoost), extreme gradient boosting (XGBoost), and light gradient boosting machine (LGBM). We then evaluated the performance of the models with metrics including the receiver operating characteristic (ROC) area under the curve (AUC), accuracy, sensitivity/recall, specificity, positive predictive value (PPV)/precision, negative predictive value (NPV), and F1 score by 10-fold cross-validation in the training cohort and independent external test cohort with data from 11 other geographically separate centres. We selected the best-performing model and further established an application to predict 30-day mortality for ICH in adults with ITP.

Results:

The mortality rate of ICH was 33.8% in 142 adults with ITP. Ninety (65.7%) patients had a platelet count of /L or less at the time of ICH. The parenchyma was the most commonly affected region (N=75, 58.14%). Intraparenchymal haemorrhage, the platelet count at the time of ICH, the coexistence of severe infection, prior severe bleeding events, and an absence of head trauma were considered potential risk factors for death, adjusted for a parameter (λ) of 1 standard error of the minimum criterion: 0.076 by lasso regression. In internal validation, the SVM model exhibited an optimal AUC of 0.879 ± 0.145 and an optimal F1 score of 0.748 ± 0.183. In independent external validation, the SVM model also exhibited an optimal sensitivity of 0.600 and an F1 score of 0.667. Therefore, a corresponding application (47.94.162.105:8080/ich/) was established for users to predict 30-day mortality in adult ITP patients at the time of ICH. The specific study process is depicted in Figure 1.
Summary/Conclusion: ICH is a rare and life-threatening bleeding event in adult ITP patients. We developed a machine learning model using an SVM algorithm and validated its prediction of 30-day mortality.