

Introduction

Coagulopathy is commonly observed after traumatic brain injury (TBI). However, it is not known whether using the standard independent predictors in conjunction with coagulation tests would improve their prognostic value. We determined the incidence of TBI-associated coagulopathy in patients with isolated TBI (iTBI), evaluated the prognostic value of coagulation tests for in-hospital mortality, and tested their predictive power for in-hospital mortality in patients with iTBI.

Methods

We conducted a retrospective, observational database study on 2319 consecutive patients with iTBI who attended the Huashan Hospital Department of the Neurosurgery Neurotrauma Center at Fudan University in China between December 2004 and June 2015. Two models based on the admission characteristics were developed: model A included predictors such as age, Glasgow Coma Scale (GCS) score, pupil reactivity, type of injury, and hemoglobin and glucose levels, while model B included the predictors from model A as well as coagulation test results. A total of 1643 patients enrolled between December 2004 and December 2011 were used to derive the prognostic models, and 676

Results

Overall, 18.6% (n = 432) of the patients developed coagulopathy after iTBI. The prevalence of acute traumatic coagulopathy is associated with the severity of brain injury. The percentage of platelet count $<100 \times 10^9/L$, international normalized ratio (INR) > 1.25 , the prothrombin time (PT) > 14 s, activated partial thromboplastin time (APTT) > 36 s, D-dimer >5 mg/L and fibrinogen (FIB) < 1.5 g/L was also closely related to the severity of brain injury, significance being found among three groups. Age, pupillary reactivity, GCS score, epidural hematoma (EDH), and glucose levels were independent prognostic factors for in-hospital mortality in model A, whereas age, pupillary reactivity, GCS score, EDH, glucose levels, INR >1.25 , and APTT >36 s exhibited strong prognostic effects in model B. Discrimination and calibration were good for the development group in both prediction models. However, the external validation test showed that calibration was better in model B than in model A for patients from the validation population (Hosmer-Lemeshow test, $p = 0.152$ vs. $p = 0.046$, respectively).

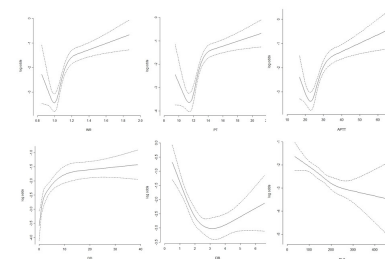
Conclusions

Coagulation tests can improve the predictive power of the standard model for in-hospital mortality after TBI.

Learning Objectives

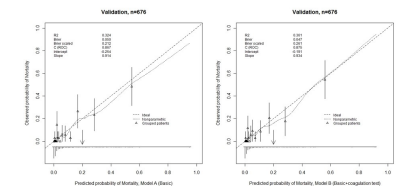
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Figure 1



The shape of the relationship between continuous variables (coagulation tests) and in-hospital mortality. The solid line indicates that the relationship was analyzed with cubic spline function. The dash line indicates 95%CI.

Figure 2



Validation of the prognostic models in validation patients (n = 676). The smooth solid curves reflect the relation between observed probability of in-hospital mortality and predicted probability of in-hospital mortality. The triangles indicate the observed frequencies by deciles of predicted probability.