

## AB017. A novel risk assessment model of venous thromboembolism after major thoracic surgery: a Chinese single-center study

Hui Li, Bo Tian, Chunfeng Song

Department of Thoracic Surgery, Beijing Chao-Yang Hospital, Capital Medical University, Beijing 100020, China

**Background:** Venous thromboembolism (VTE) is an insidious disease with significant morbidity and mortality. However, the possible risk factors for VTE in the Chinese thoracic surgical population are largely unknown. Moreover, there is still no reasonable VTE risk assessment model (RAM) or individual prophylaxis strategy for Chinese thoracic surgical patients. Therefore, in this study, we applied several models to determine the possible risk factors for VTE in the Chinese thoracic surgical population. Subsequently, we tried to define risk stratification scores and develop a VTE RAM applicable to Chinese thoracic surgical patients. Finally, we established an individual prophylaxis strategy and reasonable VTE prophylaxis protocol.

**Methods:** This prospective study was approved by the institutional research ethics committee of Beijing Chao-Yang Hospital, and all enrolled patients signed informed consent preoperatively. Patients who underwent Thoracic Surgery at Beijing Chao-Yang Hospital were identified between July 2016 and December 2017 (n=710). VTE diagnosis was confirmed by clinical imaging examinations before discharge. The VTE incidence was evaluated before discharge. Caprini, Rogers, Padua, and Khorana risk factors were recorded. Inclusion criteria: the medical records of patients who underwent thoracic surgery were reviewed. Exclusion criteria: patients with missing information, especially those who did not undergo VTE-related imaging examinations before or after surgery, were excluded. The discriminatory power of various different prediction models for the development of VTE was tested using the area under the receiver operating characteristic (ROC) curve. A novel RAM of VTE was developed according to the univariate and regression analysis and based on clinical experience. We

called the developed RAM the Chao-Yang VTE RAM.

**Results:** The overall incidence of VTE after thoracic surgery was 9.7% (69 of 710). Specifically, the incidence of VTE in patients who received lung surgery was 9.3% (54 of 581), while the incidence of VTE after esophagus surgery, mediastinal surgery, and other surgeries was 17.6% (9 of 51), 4.4% (2 of 45), and 12.1% (4 of 33), respectively. There was no difference in terms of sex between patients with and without VTE. However, the mean surgery age of patients who developed VTE was significantly greater than those without VTE (65.1 versus 54.6 years,  $P=0.000$ ). Furthermore, the BMI in VTE patients was higher than in those without VTE (24.6 versus 23.5  $\text{kg/m}^2$ ,  $P=0.038$ ). We also found that postoperative hospital stay, operative time, and intraoperative bleeding of VTE patients were higher than those of non-VTE patients (9.1 versus 7.5 days,  $P=0.000$ ; 201.9 versus 151.9 min,  $P=0.000$ ; 276.1 versus 165.4 mL,  $P=0.000$ ). Postoperative VTE incidence was correlated with an increased American Society of Anesthesiologists (ASA) score. The VTE incidence in the 1, 2, and 3–5 ASA scores were 2.4%, 10.2%, and 14.1%, respectively. The high-ASA patients had a significantly higher incidence of VTE than low-ASA patients ( $P=0.028$ ). The VTE incidence in patients with cancer diseases after surgery was 13.1% (56 of 429), which was higher than those with benign diseases (4.6%, 13 of 281,  $P=0.000$ ). Furthermore, VTE incidence in patients who received open surgery was higher than in those who received video-assisted thoracic surgery (VATS) (15.8% versus 7.6%,  $P=0.001$ ). The cost for post-surgery VTE patients was much more than that for non-VTE patients (53,702.2 versus 47,066.3 yuan,  $P=0.002$ ). However, there was no difference in terms of smoking between patients with and without VTE. A novel RAM of VTE was developed according to the univariate and regression analysis and based on clinical experience. We called this new RAM the Chao-Yang VTE RAM. The areas under the ROC curve of Caprini, Rogers, Padua, Khorana, and Chao-Yang models were 0.71, 0.55, 0.67, 0.64, and 0.77, respectively. In the Caprini model, when the Youden index was  $>5.5$ , the sensitivity and specificity were 0.7971 and 0.546, respectively ( $P<0.0001$ ). Similarly, in the Rogers model, when the Youden index was  $>14.5$ , the sensitivity and specificity were 0.5797 and 0.5257, respectively ( $P=0.1958$ ). For the Padua model, when the Youden index was  $>3.5$ , the sensitivity was 0.4058, and the specificity was 0.8565 ( $P<0.0001$ ). For the Khorana model, when the Youden index was  $>0.5$ , the sensitivity was 0.8261, and the specificity was 0.4415 ( $P<0.0001$ ). Finally, with the

Chao-Yang model, when the Youden index was  $>4.5$ , the sensitivity and specificity for the prediction of VTE were 0.7971 and 0.6147, respectively ( $P<0.0001$ ). The area under the ROC curve for the Chao-Yang prediction score was much more than that predicted with the Caprini model ( $P=0.01739$ ). The VTE incidence in the low-, moderate-, and high-risk groups predicted with Chao-Yang scores were 3.4% (14 of 408), 15.3% (38 of 249), and 32.1% (17 of 53); these were 1.9% (4 of 210), 12.1% (54 of 445), and 20.0% (11 of 55), respectively, when using Caprini criteria. The high-risk patients group had a significantly higher incidence than the low and moderate-risk groups ( $P=0.000$ ). Additionally, as the number of risk factors increased, the incidence of VTE increased from 1.3% to 62.5%.

**Conclusions:** The incidence of VTE in patients receiving thoracic surgery was high in our series. Based on a prospective single-center population study, we developed a Chao-Yang VTE RAM, and compared it with other widely accepted models in a Chinese thoracic surgery cohort. This

model had adequate power in identifying patients with different risks for VTE events, and was somewhat better than the Caprini model. Therefore, the Chao-Yang model may be applicable in predicting the occurrence of VTE in Chinese patients receiving thoracic surgery. However, this study was carried out in only one large center, which limits its usefulness and dissemination. Hopefully this model will be further validated in a large, multi-center, prospective validation study before providing benefits for Chinese patients.

**Keywords:** Venous thromboembolism (VTE); thoracic surgery; risk assessment model

doi: 10.21037/shc.2018.AB017

**Cite this abstract as:** Li H, Tian B, Song C. A novel risk assessment model of venous thromboembolism after major thoracic surgery: a Chinese single-center study. *Shanghai Chest* 2018;2:AB017.