

Pulmonary embolism and deep venous thrombosis in China

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ABSTRACT The *Annual Report on Cardiovascular Health and Diseases in China* (2022) intricate landscape of cardiovascular health in China. In connection with the previous section, this eighth section of the report offers a comprehensive analysis of pulmonary embolism and deep venous thrombosis. In recent years, research in the field of pulmonary vessel in China has made great progress. A number of nationwide multi-center registry research results have filled the gaps in the epidemiology, diagnosis and treatment of pulmonary hypertension and venous thromboembolism. Different types of pulmonary hypertension still need attention to the identification of risk factors and/or risk stratification, and venous thromboembolism needs attention in the prevention and the overall management inside and outside hospital. In the future, we look forward to the publication of more high-quality research in China, which could be able to improve relevant guidelines for pulmonary vascular diseases both domestically and internationally.

EPIDEMIOLOGY

A registry study in Hong Kong included 2214 newly diagnosed venous thromboembolism (VTE) inpatients from January 2004 to December 2016, including 1444 deep venous thrombosis (DVT) patients (65.2%) and 770 pulmonary embolism (PE) patients (34.8%).^[1] In the 13-year period, the incidence of VTE increased significantly from 28.1/100,000 person/years in 2004 to 48.3/100,000 person/years in 2016. Active malignant tumor was the main cause of VTE, the proportion increased from 34.8% in 2005 to 60.9% in 2014.

The trends in hospitalization rate and mortality between January 2007 and December 2016 were analyzed among 105,723 patients with VTE from 90 hospitals across China. Of these participants, 43,589 patients (41.2%) had PE (with or without DVT) and 62,134 patients (58.8%) had DVT alone. For patients with VTE, the age- and sex-adjusted hospitalization rate increased from 3.2 to 17.5 per 100,000 population and in-hospital mortality decreased from 4.7% to 2.1%. The mean length of stay (LOS) declined from 14 days to 11 days.^[2] This study showed that in the past 10 years the hospitalization rate of VTE in China increased, but the in-hospital mortality decreased and the LOS was shortened. This indicates that the incidence of VTE in China has increased, while the level of diagno-

sis and treatment has been improved significantly (Figure 1).

China Pulmonary Thromboembolism Registry Study explored the epidemiological characteristics,^[3] etiology and natural course of acute PE in China. From 2009 to 2015, a total of 7438 adult hospitalized patients with acute symptomatic PE were included from medical institutions in 31 provincial administrative units across China. The results showed that patients of high risk (unstable haemodynamics), of intermediate risk [simplified Pulmonary Embolism Severity Index (sPESI) score ≥ 1] and of low risk (sPESI = 0) accounted for 4.2%, 67.1% and 28.7%, respectively. Computed tomographic pulmonary angiography was the most commonly used diagnostic method (87.6%), and anticoagulation therapy was the most commonly used initial treatment (83.7%). During 2009–2015, the use of initial systemic thrombolysis for treatment of acute symptomatic PE declined significantly from 14.8% to 5.0%, and the all-cause mortality decreased from 3.1% to 1.3%.

A retrospective study included 3875 hospitalized patients with VTE from January 2008 to December 2017 to observe the incidence of VTE in different seasons.^[4] The results showed that there was a significant seasonal variation in VTE incidence, with the highest in spring (1232/3875) and the lowest in summer (645/3875) (Figure 2).

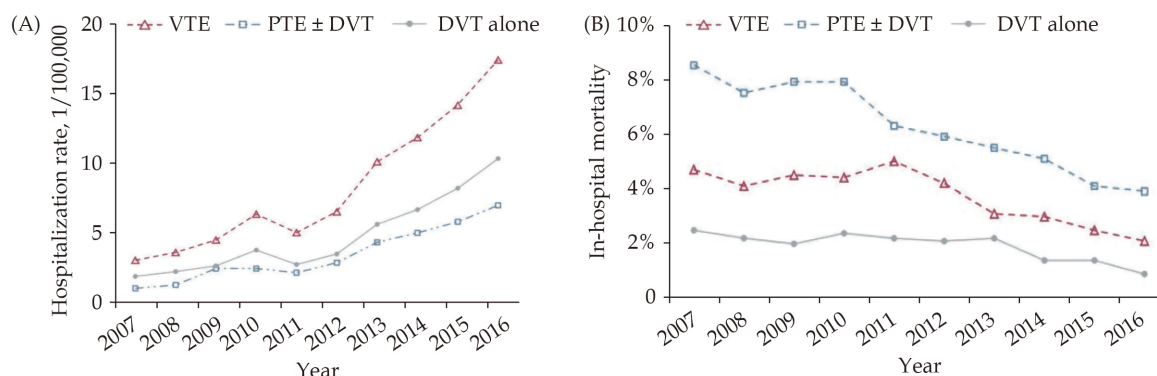


Figure 1 Hospitalization rate (A) and in-hospital mortality (B) of VTE in China from January 2007 to December 2016. DVT: deep venous thrombosis; PTE: pulmonary thromboembolism; VTE: venous thromboembolism.

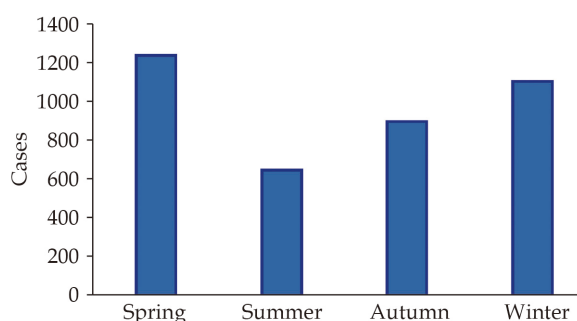


Figure 2 Seasonal distribution of VTE onset. VTE: venous thromboembolism.

RISK FACTORS OF VTE

There are many risk factors for VTE, mainly including hereditary and acquired risk factors. The latter includes renal dialysis [PE incidence rate is 0.92/1000 person-years, about 3 times that of those without renal dialysis (0.33/1000 person-years), hemodialysis patients' risk of PE was significantly higher than that of peritoneal dialysis patients],^[5] acute exacerbation of chronic obstructive pulmonary disease (prevalence of VTE was 6.8%,^[6] and prevalence of PE was 10.3%^[7]), non-traumatic osteonecrosis of femoral head (DVT risk was 2.3 times higher than that of control group),^[8] hormonal contraceptives and infertility medications (VTE risk increased in females, hazard ratios were 1.14 and 1.996, respectively),^[9] post appendectomy (the incidence of symptomatic VTE was significantly higher than that of those without appendectomy, 5.90/10,000 person-years vs. 3.29/10,000 person-years),^[10] post lung cancer surgery (the incidence rate of 30-day PE was 0.53% in all patients, and 0.57% in those who did not receive anticoagulant therapy),^[11] postoperative cancer patients (incidence of PE was 1.5%, incidence of DVT was 2.4%, and incidence of symptomatic VTE was 3.1%),^[12] and isolated lower extremity fractures (preoperative ultrasonic

detection rate of DVT was 30%, and the incidence of symptomatic PE was 1.6%).^[13]

PROPORTION OF VET PATIENTS RECEIVING PROPHYLAXIS

A total of 13,609 patients (including 6623 medical patients and 6986 surgical patients) were admitted to 60 tertiary Chinese hospitals due to acute medical condition or surgery during March to September 2016. The LOS was ≥ 72 h. All the patients were assessed for VTE risk in the Identification of Chinese Hospitalized Patients' Risk Profile for Venous Thromboembolism-2 study.^[14] According to the 9th edition of American College of Chest Physicians guidelines, VTE risk was categorized as low in 63.4% and high in 36.6% medical patients. For surgical patients, 13.9% was categorized as low, 32.7% as moderate, and 53.4% as high risk. Major risk factor for VTE was open surgery in surgical patients (52.6%) and acute infection in medical patients (42.2%). The overall rate of any prophylaxis was 14.3% (19.0% in surgical patients vs. 9.3% in medical patients), and that of appropriate prophylactic measures based on the American College of Chest Physicians guidelines was 10.3% (11.8% vs. 6.0%) (Figure 3). It shows that the risk management of VTE for inpatients in China is still very insufficient, and there is a lot of room for improvement.

INTERVENTION MEASURES AND THEIR SIGNIFICANCE

From January 2002 to January 2013, 1200 DVT patients were enrolled in a multi-center prospective study of permanent vena cava filters. 62 patients had filters placed in the superior vena cava and 1138 patients in the inferior



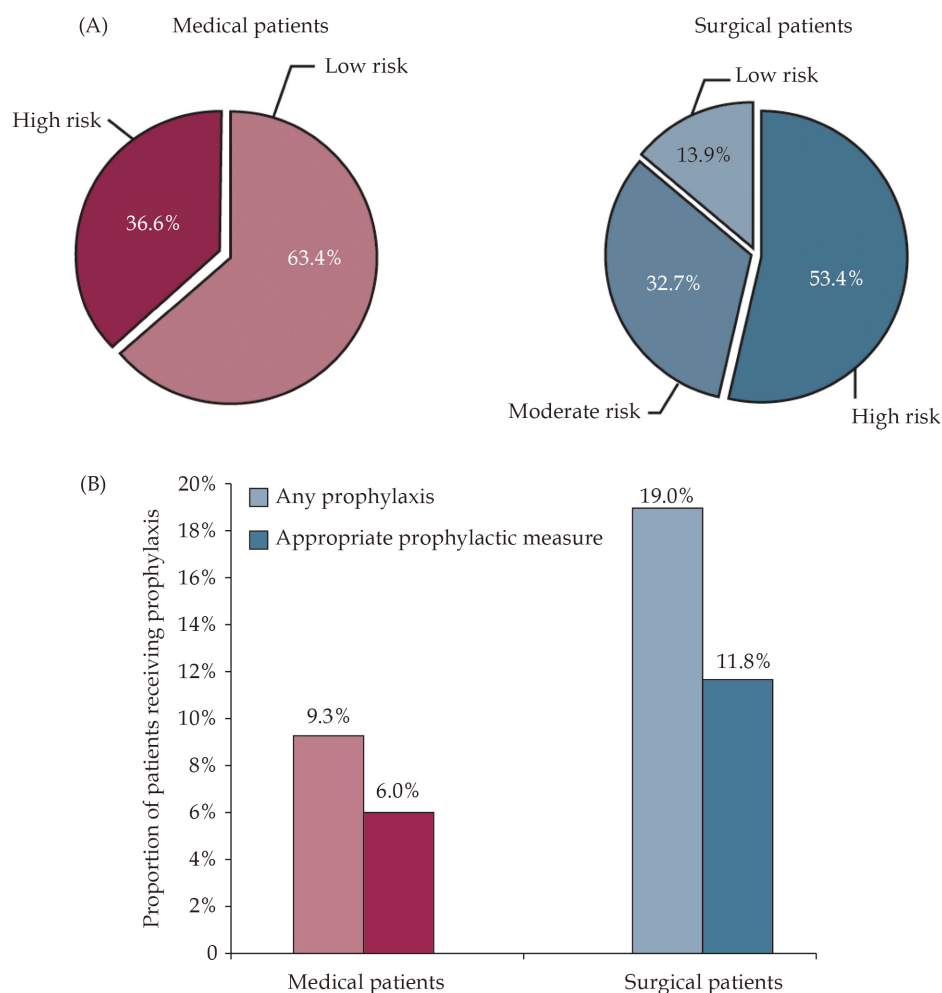


Figure 3 Risk stratification of VTE and prophylactic measures received by medical/surgical patients. (A): Risk stratification of VTE in medical/surgical patients; and (B): the proportion of medical/surgical patients receiving any or appropriate prophylactic measures. VTE: venous thromboembolism.

or vena cava. The mean follow-up time was 6 years (3 months to 10 years). The 5-year patency rate was 90%. The mortality within 30 days after filter placement was 0.5%, and the mortality beyond 30 days was 2.4%. No PE and other adverse events occurred.^[15]

GUIDELINES

In recent years, different disciplines have published or updated many guidelines for PE and DVT. In 2016, based on the 2009 guidelines, referring to foreign guidelines, the Chinese Orthopaedic Association updated the “Chinese guidelines for the prevention of VTE in major orthopaedic surgery”, supplemented evidence-based medical evidence such as new anticoagulants, and provided clinical guidance for the prevention and treatment of venous embolism in major orthopaedic surgeries in China.^[16]

In 2018, the PE and pulmonary vascular disease group of the Chinese Thoracic Society published *Guidelines for the diagnosis, treatment and prevention of pulmonary thromboembolism and Recommendations for the prevention, treatment and management of VTE in hospital*.^[17,18] In 2020, the expert committee of the thrombus and vessels special fund under the China Health Promotion Foundation published *Expert consensus on mechanical prevention of VTE in China*.^[19]

The guidelines commission of the Chinese Society of Clinical Oncology updated the *Chinese Society of Clinical Oncology (CSCO) guidelines for the prevention and treatment of venous thrombosis in cancer patients 2020*.^[20]

In 2021, the professional committee of peripheral vascular diseases of the Chinese Society of Microcirculation initiated and formulated the *Expert consensus on the diagnosis and treatment of distal deep vein thrombo-*

sis,^[21] which fully elucidates the diagnosis, anticoagulation scheme and management strategy in the case of combined special diseases, providing important guidance for clinical practice.

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