

Venous thromboembolism events after thoracic surgery: global steps toward prevention

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In 1856, Rudolf Virchow summarized the risk factors for venous thromboembolism (VTE) with a triad: hypercoagulability, endothelial injury, and venous stasis (1). Since that time there have been numerous advancements in the assessment and prevention of VTE. Currently, there are several guidelines for the prevention of VTE including American College of Chest Physicians (ACCP) and European Society of Medical Oncology; however, none of these guidelines specifically discuss patients undergoing lung cancer resection.

VTE is a significant clinical problem in thoracic surgery. A recent review of the National Surgical Quality Improvement Program (NSQIP) database for patients undergoing anatomic lung resection found a 1.6% VTE rate, 44% of which occurred after hospital discharge (2). In lung cancer resection patients without prophylaxis the incidence can reach 16.4% (3). Furthermore, postoperative VTE results in an eight-fold increase in mortality rates after lung cancer resection (4).

In this month's *Journal of Thoracic Disease*, Dr. Li and colleagues present guidelines for the assessment and prevention of VTE after lung cancer resection (5). The authors established a working group amongst the Society for Translational Medicine and the China National Research Collaborative Group on Venous Thromboembolism. They are to be congratulated for establishing an international collaborative group and providing the first VTE guidelines specifically for lung cancer patients.

The authors recommend that lung cancer patients

are risk stratified using the Caprini scale (6). For those at low risk (score 0–4) they recommend early ambulation or mechanical thromboprophylaxis with intermittent pneumatic compression devices (IPC). For those at moderate risk (score 5–8) they recommend low-dose unfractionated heparin/low molecular weight heparin or mechanical thromboprophylaxis with IPC. For those high risks (score ≥9) they recommend low-dose unfractionated heparin/low molecular weight heparin plus mechanical thromboprophylaxis IPC.

These guidelines represent an important first step for thoracic surgeons, however there are limitations to consider. The majority of the recommendations are based on literature from general surgery and other subspecialties rather than thoracic surgery. Additionally, the guidelines do not provide evidence grading to justify their recommendations. Most likely, this is because there are few studies which evaluate the safety and efficacy of VTE prevention after lung cancer resection. This paucity of data was highlighted by a recent Cochrane review of six studies in thoracic surgery patients (n=2,890, with 15 symptomatic VTE 0.5% VTE rate). They concluded that the efficacy and safety of thromboprophylaxis in thoracic surgery is limited, and given these uncertainties, a case-by-case risk evaluation of VTE and bleeding is necessary (7).

Individualized risk assessment using Caprini Score is one element of the guidelines that has been validated after lung cancer resection (3). Hachey *et al.* retrospectively assigned Caprini score to 232 lung resection patients and found the VTE rate increased with higher risk score: low risk (score

0–4, 0% VTE), moderate risk (score 5–8, 1.7% VTE), and high risk (score ≥ 9 , 10.3% VTE) (8). However, the Caprini score does not include lung cancer specific variables such as the extent of resection, histology and the history of neoadjuvant radiation therapy, all of which are considered potential VTE risk factors (2).

These guidelines were written by the China National Research Collaborative Group on Venous Thromboembolism and the majority of authors are from China. These guidelines will create an increased awareness of the clinical importance of VTE prevention for thoracic surgeons in China and potentially globally. As the authors described, 35% of thoracic surgeons in China do not routinely administer any chemical thromboprophylaxis (9). Additionally, the VTE rate after lung cancer resection in patients with no perioperative VTE prophylaxis was 16% in a recent Chinese study (3). This provides an opportunity, in China, for future research to prospectively evaluate the safety and efficacy of chemical thromboprophylaxis in lung cancer surgery in terms of VTE rates and bleeding complications.

There are several other important areas of future study. Risk assessment models could be improved by incorporating variables specific to lung cancer resection, such as pathologic features, extent of resection, and associated oncologic treatment, are needed to help thoracic surgeons make informed decisions about VTE prophylaxis. Thromboelastography provides an overview of coagulation status and can identify trauma patients' high risk for VTE, but has not been evaluated in thoracic surgery patients (10,11). Recent studies have suggested that extended duration chemoprophylaxis with fractionated heparin after thoracic surgery is safe and may decrease VTE rates (12), however larger validation studies are needed. The time has come for a thoracic-specific risk stratification system to allow actionable prevention of VTE in this high-risk group of surgical patients.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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