

## **Cancer and Thrombosis**

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Cancer is a major risk factor for the development of venous thromboembolism (VTE). VTE may occur in as many as 1/200 individuals with active malignancies. Epidemiologic studies have indicated that cancer patients have a sevenfold overall increased risk of VTE compared to non-cancer cohorts in the context of medical illness, and are over twice as likely to develop postoperative VTE complications. Recurrent VTE is also more common in cancer patients (Hazard ratio, 1.72) and may reflect the activity of the underlying malignancy.

The presentation of VTE in cancer patients is somewhat different from the non-cancer in that there is larger clot burden; a higher likelihood exist for VTE to occur in the upper extremities even in the absence of a central venous access device; and cancer patients have a higher incidence of recurrence of thrombosis or hemorrhage while being treated for VTE with anticoagulants.

VTE is the second most common cause of death among cancer patients, after complications of the underlying malignancy itself. Idiopathic recurrent VTE can be the harbinger of an otherwise occult malignancy; there is an almost 10-fold increased incidence of cancer in patients who experience recurrent idiopathic deep vein thrombosis (DVT). Although the underlying malignancy conveys an intrinsically increased risk of VTE, the addition of chemotherapy agents and/or adjuvant treatments such as tamoxifen, recombinant erythropoietin, or bevacisumab, increase the risk of VTE development by another two fold.

Pivotal clinical studies have shown that LMWH is more effective than long term use of warfarin to prevent recurrent VTE, and does not cause increased bleeding in the process. There are also provocative signals that LMWH may prolong the median survival of cancer patients. Despite these seemingly convincing data, over 70% of cancer patients received inadequate or no VTE prophylaxis after discharge from the hospital. The recommendations from the 8<sup>th</sup> edition of the ACCP guidelines, and the guidelines developed by ASCO and NCCN, are apparently not being followed.

The relationship between the development of VTE and the hypercoagulability induced by cancer appears to be due to the generation of tissue factor and other inciting cytokines when the cancer cells interact with macrophages, monocytes, etc. The generation of microparticles is also thought to increase the hypercoagulability potential of cancer. In the future, anticoagulation strategies may be based on parameters such as the degree of circulating microparticles. Furthermore, there will be more treatment options for antithrombotic care, including oral specific anti-Xa and IIa medications, e.g. rivaroxaban, dabigatran, etc.