

Short Report

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Thromboembolic events as a terrible complication in cancer patients**Azin Alizadehasl¹; Haniye Hajiali Fini^{2*}; Kamran Roudini³; Negar Dokhani⁴; Parisa Firoozbakhsh⁵; Amir Abdi⁶**¹Cardio-Oncology Research Center, Rajaie Cardiovascular Medical and Research Center, Iran University of Medical Sciences, Tehran, Iran.²Department of Adult Echocardiography, Rajaie Cardiovascular Medical and Research Center, Iran University of Medical Sciences, Tehran, Iran.³Department of Internal Medicine, Hematology and Medical Oncology Ward, Cancer Research Center, Cancer Institute, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran.⁴Cardio-Oncology Research Center, Rajaie Cardiovascular Medical and Research Center, Iran University of Medical Sciences, Tehran, Iran.⁵Cardio-Oncology Research Center, Rajaie Cardiovascular Medical and Research Center, Iran University of Medical Sciences, Tehran, Iran.⁶Medical Student, Tehran Azad University of Medical Science, Tehran, Iran.***Corresponding Author: Haniye Hajiali Fini**

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Introduction

Cancer is characterized as the highest clinical burden throughout the world. It is the second cause of death behind ischemic heart disease and will be expected to be the first in 2060 [1]. The statistical review showed about 18 million new cancer patients and 9.5 million cancer deaths in 2018 [1]. Thrombus can involve veins or arteries and is related to morbidity and mortality, and it is also demonstrated as the third most common cardiovascular disease [2]. Thrombus can break away into veins or arteries and transfer to the lung or cerebral and peripheral vessels. So, diagnosis and prevention of thrombus for-

mation in high-risk patients and immediate adequate treatment are fundamental subjects [2]. Cancer patients are at high risk for thromboembolic events, this complication is a significant cause of morbidity in patients with malignancy, and is the second cause of death after cancer. About 18% of all cases of Venous Thromboembolism (VTE) are also associated with malignancies [3,4]. Thrombotic events have increased in cancer patients over recent years due to improved patient survival, new thrombotic cancer treatment, and central catheter using [4].

Risk factors of thrombus in cancer patients include: 1. patient-related risk factors such as old age, black patients, poor

functional status, inherited coagulation disorders, prior history of thromboembolism, medical comorbidities (obesity, infection, renal disease) 2. cancer-related risk factors (malignancy site, stage, histopathology, and time after diagnosis) 3. treatment-related factors consist hospital admission for medical illness or surgery, anticancer therapies, and supportive care like erythropoiesis-stimulating agents, red blood cells or platelet transfusion, and Central venous catheters using [4]. Virchow's triad, including stasis, thrombophilia, endothelial damage, and hemostasis disturbance, along with hypercoagulable state, and inflammation have an important role in thromboembolic events in cancer patients. An imbalance of pro-coagulative factors and the fibrinolytic system eventually results in cancer-associated thrombosis [5].

Thromboembolism in cancer patients is related to poor outcomes due to the possibility of fatal pulmonary embolism. It can also reflect the advanced stages of cancer as an important factor in prognosis. Thrombotic events sometimes cause interruption and delay substantial cancer treatment. Anticoagulant agents therapy for thrombotic events can lead to significant complications, including bleeding. Venous Thrombo Embolism (VTE) recurrences also occur in patients with malignancies. Thus, primary prevention can be a more effective method to decrease morbidity and mortality related to thrombotic events in these patients and is recommended for hospitalized and ambulatory cancer patients [4,6].

The risk of thrombotic events in cancer patients undergoing cancer surgery is estimated at 50%, which is reduced about 50-80% by thrombo-prophylaxis agents [6]. In recent decades, guidelines recommend the use of venous thrombo-embolism prophylactic drugs (Low Molecular Heparin Weight (LMHW), Unfractionated Heparin (UFH), and fondaparinux) in hospitalized active cancer patients except for patients who are admitted for minor procedures such as chemotherapy infusion or stem cell/bone marrow transplantation [7,8]. Non-pharmacological prophylaxis should be recommended for cancer patients with contraindications for using pharmacological prophylaxis [7].

Ambulatory cancer patients on chemotherapy also have an increased risk for thromboembolism. Although, the absolute event rate is low in these patients. So, thromboprophylaxis is recommended by the guideline for some ambulatory cancer patients routinely [8]. Risk stratification can help to select ambulatory cancer patients at increased risk of venous thromboembolism. Khorana Score (KRS) is a simple and validated risk stratification tool used in recent decades to evaluate patients

at increased risk of Venous Thromboembolism (VTE) based on clinical and laboratory items. It uses platelet counts ($>350 \times 10^9$ /liter), leukocyte counts ($>11 \times 10^9$ /liter), hemoglobin level (<100 gram/liter), body mass index (≥ 35 kilogram/meter²), and site of cancer (Very high risk for the brain, stomach, pancreatic cancers and High risk for lung, lymphoma, gynecological, genitourinary cancer) as the predictors for thromboembolic events [7,8]. Thrombosis prophylaxis is recommended for ambulatory cancer patients with a high-risk Khorana score of 2 points or higher before starting a chemotherapy regimen [8].

Conclusion

Primary prevention of thrombotic events is essential in patients with malignancy, according to the increase of cancer incidence, improved patients' survival, and on the other hand, the high recurrence rate of thrombosis and related complications. It also has an influential role in patient prognosis and should be considered by physicians.

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