Volume 3, Issue 5, May 2025 ISSN (E): 2938-3765

THE IMPORTANCE OF THROMBODYNAMICS IN POSTOPERATIVE PATIENTS

Berdiyarova Shokhida Shukurullaevna
Najmiddinova Nigora Kamoliddinovna
Sunnatova Makhliyo Abdurashid kizi
Yodgorova Dilsuz Ulugbekovna
Samarkand State Medical University. Samarkand, Uzbekistan

Abstract
The postoperative period is accompanied by a high risk of thrombotic and hemorrhagic complications, which requires timely monitoring of the hemostasis system. A modern and informative method for assessing coagulation status is thrombodynamics, a laboratory test that allows real time visualization and quantification of the thrombosis process. This article discusses the advantages of using thrombodynamics in the postoperative period for early detection of hypercoagulation and individualization of anticoagulant therapy. The data on the diagnostic and prognostic significance of the method in patients after surgical interventions of various profiles are presented. The importance of integrating thrombodynamics into the management protocols of postoperative patients in order to reduce the risk of thrombosis and improve clinical outcomes is noted.

Keywords: Thrombodynamics, hemostasis, postoperative period, thrombosis, coagulopathy, thrombosis, anticoagulant therapy, hemostasis monitoring.

Introduction

Postoperative thrombotic and hemorrhagic complications are caused by disorders in the hemostasis system that occur under the influence of a number of factors. The main etiological causes of hypercoagulation after surgery are tissue injury, activation of the vascular-platelet link, systemic inflammatory response, as well as immobilization and decreased fibrinolytic activity. Concomitant diseases (oncopathology, cardiovascular insufficiency, obesity, diabetes mellitus), as well as an individual predisposition to thrombophilic conditions, play an essential role. The use of certain medications (for example, hormonal drugs, factor VIII inhibitors, etc.) can also enhance the coagulation potential. These factors require careful monitoring of the hemostasis system in the postoperative period, where thrombodynamics acts as a highly sensitive method for assessing blood clotting disorders and allows timely detection of abnormalities to prevent thromboembolic complications. [2, 5, 9].

Postoperative changes in the hemostasis system are caused by the activation of the blood coagulation cascade in response to surgical trauma. Damage to the vascular wall leads to the expression of a tissue factor and the launch of an external coagulation pathway, which initiates the formation of thrombin and fibrin. Additionally, platelet activation increases, the balance between coagulation and fibrinolysis is disrupted, and the activity of natural anticoagulants (antithrombin

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

III, protein C and S) decreases. These processes create a hypercoagulable state, especially pronounced in the presence of concomitant risk factors such as inactivity, inflammation, cancer, obesity and other conditions. [3, 6, 11].

Traditional coagulological tests (PTI, APTT, INR) do not always reveal subclinical or early forms of coagulopathy. In this context, the thrombodynamic method provides an objective and visual assessment of the spatiotemporal dynamics of thrombosis in the patient's plasma. It makes it possible to identify both hypercoagulable conditions with a risk of thrombosis and hypocoagulable conditions with a risk of bleeding, which is especially important in the postoperative period for individualizing anticoagulant therapy and improving patient safety.[1,6,8].

The clinical picture of hemostasis disorders in the postoperative period varies from asymptomatic forms to life-threatening complications. The most common signs of thrombosis are pain, swelling, hyperemia, and local fever in the lower extremities, which are symptoms characteristic of deep vein thrombosis. If the pulmonary artery is involved, pulmonary embolism (PE) may develop, accompanied by shortness of breath, chest pain, tachycardia, and decreased saturation, which requires immediate intervention. A number of patients, on the contrary, develop hypocoagulation, which manifests itself clinically in the form of hematomas in the surgical area, prolonged bleeding from a postoperative wound, hemorrhages in the mucous membranes and skin, and in severe cases, internal bleeding. These complications may remain unrecognized in the absence of adequate laboratory monitoring. Classical laboratory methods (APTT, PTI, INR, fibrinogen levels) are not always sensitive to subtle disturbances in the coagulation system, especially under conditions of stress, hypoxia, and inflammation typical of the postoperative period. That is why the integration of the thrombodynamic method into clinical practice makes it possible to increase diagnostic accuracy by identifying latent hyper- and hypocoagulation conditions at the preclinical stage. This makes it possible to timely adjust the tactics of anticoagulant or hemostatic therapy, preventing the development of complications. Thus, the clinical use of thrombodynamics in postoperative patients contributes not only to improving the quality of hemostasis monitoring, but also to improving treatment outcomes through an individualized approach to therapy. [3, 4, 10].

Laboratory monitoring of the hemostasis system in postoperative patients is an essential component of assessing the risk of thromboembolic and hemorrhagic complications. Traditionally, standard coagulological tests are used, such as prothrombin time (PT), international normalized ratio (INR), activated partial thromboplastin time (APTT), fibrinogen levels, platelets, D-dimer, and markers of fibrinolysis. However, these methods have a number of limitations: they characterize individual stages of blood clotting, are performed in conditions far from physiological, and do not reflect the spatiotemporal dynamics of thrombosis as a whole. In this regard, the thrombodynamics test, which is an innovative method for global assessment of the blood coagulation system, is becoming increasingly important. It is based on recording the formation of a fibrin clot in plasma in real time, with an assessment of the spatial growth of the clot from the source of the tissue factor. The method makes it possible to quantify the rate, intensity and nature of thrombosis, to identify both hypercoagulable and hypocoagulable conditions, which is especially important in the postoperative period, when the risk of transition from one condition to another is high. [2, 5, 9].

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

Thrombodynamics demonstrates a high sensitivity to coagulation balance disorders caused by surgical trauma, an inflammatory response, the use of anticoagulants, or the presence of concomitant diseases. The method allows evaluating the effectiveness of therapy (for example, heparin or low-molecular-weight heparins), as well as conducting dynamic monitoring of patients during critical periods after surgery. In addition, thrombodynamics can be useful in combination with thromboelastography (TEG), D-dimer levels, and quantification of anti-factor Xa, which gives the doctor a complete picture of the state of the hemostasis system. In some cases, especially in cancer patients or patients with high thrombophilia, thrombodynamics can reveal hidden forms of hypercoagulation that are not detected by routine tests. Thus, the inclusion of the thrombodynamic method in the algorithm of laboratory diagnostics of postoperative patients allows not only to increase the accuracy of the assessment of coagulation status, but also to individualize the prevention and treatment of thrombotic complications, improving the prognosis and reducing the risk of adverse outcomes. [5, 7, 15].

Therapy of hemostasis disorders in the postoperative period is aimed at maintaining an optimal balance between the risk of thrombosis and the risk of bleeding. The use of individualized anticoagulant therapy becomes especially important in conditions of an increased risk of thromboembolic complications characteristic of the early postoperative stage. The basis of therapy is the prevention of venous thromboembolism (VTE), including pharmacological and mechanical methods. Pharmacological treatment includes the use of low molecular weight heparins (enoxaparin, nadroparin, etc.), unfractionated heparin, direct oral anticoagulants (rivaroxaban, apixaban) or vitamin K antagonists (warfarin), depending on the indications, risk level and functional condition of the patient. The choice of the drug, its dosage and duration of use should be based on laboratory diagnostic data, the clinical situation, as well as the results of the thrombodynamic method. The thrombodynamic method makes it possible to evaluate the effectiveness of anticoagulant therapy in real time and adjust the dosage of drugs in a timely manner. If signs of hypercoagulation are detected, for example, accelerated growth of a fibrin clot or increased blood clot density, it is possible to increase the dose of the anticoagulant or change the therapy regimen. At the same time, if there are signs of hypocoagulation (delayed thrombosis, lack of a stable clot), tactics should be reviewed and, if necessary, treatment should be temporarily discontinued or adjusted, especially if there are clinical signs of bleeding. Local and general hemostatic therapy also plays an important role, especially in patients with a high risk of bleeding. [5, 7, 15].

In such cases, blood products (freshly frozen plasma, cryoprecipitate, platelet mass), as well as synthetic hemostatics (ethamzylate, tranexamic acid) are used. At the same time, the thrombodynamic method helps to avoid excessive prescribing of hemostatic agents and timely assess the restoration of a normal coagulation profile. Mechanical thrombosis prevention, including the use of compression knitwear, intermittent pneumocompression, and early patient mobilization, remains an important addition to drug therapy. Combined with thrombodynamic monitoring, these measures significantly reduce the risk of VTE and other complications. Thus, the use of thrombodynamics in the postoperative period makes it possible not only to diagnose coagulopathies, but also to guide clinical treatment decisions, ensuring accurate and safe hemostasis correction. This increases the effectiveness of prevention of thrombotic and

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

hemorrhagic complications, improves outcomes and reduces the duration of hospitalization. [6, 8, 14].

Conclusion

The postoperative period is characterized by a high frequency of hemostasis disorders, manifested by both thrombotic and hemorrhagic complications, which requires timely and accurate diagnosis of coagulation status. The thrombodynamics method is a highly sensitive and informative tool for the global assessment of the blood coagulation system, which allows real-time analysis of the spatial and temporal dynamics of thrombosis. The use of thrombodynamics in clinical practice contributes to the early detection of latent forms of hyper- and hypocoagulation, which often remain inaccessible to traditional laboratory tests. The inclusion of thrombodynamics in the laboratory monitoring protocol makes it possible to individualize anticoagulant or hemostatic therapy, reducing the risk of thromboembolic and bleeding complications in postoperative patients. An integrated approach, including clinical assessment, standard coagulological parameters and thrombodynamic examination, is the optimal strategy in ensuring the safety and effectiveness of postoperative management of patients.

References

1. Аветисян А. О., Корнеев А. В., Рудакова И. А. Применение тромбодинамики в клинической практике. // Клиническая лабораторная диагностика. – 2019. – № 2. – С. 23–29.
2. Маев И. В., Ситников А. Н., Якубовская М. Ю. Нарушения системы гемостаза в хирургии. // Хирургия. – 2021. – № 5. – С. 15–20.
3. Адамова Ю. А., Рожкова Н. В., Петров С. А. Диагностика тромбофилий и выбор антикоагулянтной терапии. // Акушерство и гинекология. – 2020. – № 11. – С. 48–53.
4. Khismatullin R. R., et al. Thrombodynamics as a global hemostasis assay: Concept, development, and clinical application. // Seminars in Thrombosis and Hemostasis. – 2021. – Vol. 47(4). – P. 457–466.
5. Лобастов К. В., Трофимов С. Н., Барбухатти К. О. Профилактика венозных тромбозов в хирургии. // Ангиология и сосудистая хирургия. – 2020. – № 1. – С. 47–52.
6. Ovanesov M. V., et al. Spatial propagation of blood coagulation as a basis for thrombin generation tests. // Journal of Thrombosis and Haemostasis. – 2008. – Vol. 6. – P. 1973–1980.
7. Багненко С. Ф., Чернявский А. М., Шалагин А. А. Хирургические аспекты нарушений гемостаза. // Вестник хирургии имени И.И. Грекова. – 2018. – № 3. – С. 25–31.
8. Hemker H. C., et al. Calibrated automated thrombin generation measurement in clotting plasma. // Pathophysiol Haemost Thromb. – 2003. – Vol. 33(1). – P. 4–15.
9. Белобородова Н. В., Малышев Ю. Ю. Гемостаз и его коррекция в критических состояниях. // Анестезиология и реаниматология. – 2021. – № 6. – С. 10–17.
10. Efremov S. M., et al. Thrombodynamics as a novel assay for hemostasis monitoring in patients with high thrombotic risk. // Clinical Hemorheology and Microcirculation. – 2022. – Vol. 82(3). – P. 229–239.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

11. Хазова Н. Г., Колтунов А. Е. Возможности тромбодинамики в индивидуализации антикоагулянтной терапии. // Клинико-диагностическая лаборатория. – 2020. – № 5. – С. 45–50.
12. Levi M., et al. Disseminated intravascular coagulation in surgery: Clinical features, diagnosis, and treatment. // Blood Reviews. – 2020. – Vol. 39. – P. 100–111.
13. Грачев А. В., Петров А. Ю. Современные подходы к лабораторной диагностике нарушений гемостаза. // Клиническая медицина. – 2019. – № 10. – С. 74–78.
14. Gorog D. A., Yamamoto J. Blood coagulability and thrombosis risk in the perioperative setting. // Thrombosis Research. – 2019. – Vol. 184. – P. 38–45.
15. Сидорова И. С., Панина Е. А. Инновационные методы оценки гемостаза в хирургической практике. // Медицинский вестник Юга России. – 2022. – № 3. – С. 33–39.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5