

Study program: Doctoral Academic Studies in Biomedical Sciences

Name of the subject: ARTERIAL AND VENOUS THROMBOSES

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Status of the subject: elective

Number of ECTS points: 20

Condition:

Goal of the subject: Education on the biochemical mechanisms and regulation of the hemostatic system, risk factors for venous or arterial thrombosis occurrence and various imaging techniques used for early diagnosis. Importance of early thromboprophylaxis implementation and personalized treatment aimed to obtain optimal balance between the risk of recurrence and risk of bleeding, Training in laboratory monitoring of anticoagulant therapy, new diagnostic tools and new anticoagulant drugs. Education on the use of anticoagulant drugs in the context of pregnancy, liver and kidney diseases, as well as the management of the treatment complications.

Outcome of the subject: to provide knowledge and skills that enable PhD students to timely identify risk factors for thrombosis occurrence, to diagnose thrombotic event and to choose optimal therapeutic approach, to provide knowledge for personal tailoring of anticoagulant or antiplatelet regimen, based on patients characteristics and preferences; to manage the most common complications in patients taking antithrombotic drugs, to manage antithrombotic drugs in patients undergoing surgery or invasive procedures based on current guidelines and recommendations.

Content of the subject

Theoretical lectures

Pathophysiology of arterial and venous thrombosis. Thrombophilia and hypercoagulable state. Molecular markers of hemostatic system activation. Inherited and acquired thrombophilia and their role in arterial and venous thrombosis occurrence. Antiphospholipid syndrome. Inflammation and thrombosis. Clinical manifestations, diagnosis and treatment of arterial thromboses. Clinical manifestations, diagnosis and treatment of deep venous thromboses. Treatment of superficial vein thrombosis. Diagnostic and treatment of pulmonary embolism. Anticoagulant drugs: heparin, vitamin K antagonists, direct thrombin and factor Xa inhibitors. Antiplatelet drugs, platelet membrane receptor inhibitors. Primary and secondary thromboprophylaxis. Resistance to anticoagulant therapy. Thrombolysis, indications and contraindications. Complications of anticoagulant treatment and management of bleeding. Interventional radiology in the treatment of arterial and venous thrombosis. Management of patients taking oral anticoagulants in elective and emergency surgery settings. Recurrent thromboses and their management. Thrombosis in children. Treatment and prophylaxis of pregnancy related thromboembolism. Management of VTE in chronic liver and chronic kidney diseases.

Practical lectures

Physiology of hemostasis. Laboratory diagnostics of hemostatic system alterations. Laboratory diagnostic of platelet function. Laboratory diagnostics of antiphospholipid syndrome. Laboratory diagnostics of inherited thrombophilia. Individual thrombosis risk assessment. Diagnosis and treatment of ACS, ischemic stroke, peripheral artery disease. Diagnosis and treatment of DVT, SVT, PE. Laboratory evaluation of the activation of coagulation system, role of D-dimer in diagnostic algorithm and during follow up after cessation of treatment. Sensitivity and specificity of imaging methods for diagnosis of venous and arterial thrombosis. Anticoagulant treatment – initial treatment and secondary prophylaxis, laboratory monitoring and complications. Laboratory monitoring of heparin and oral anticoagulants. Heparin induced thrombocytopenia – diagnosis and treatment. Management of drug related bleeding. Venous thromboprophylaxis in surgical settings, in malignant diseases and in medically ill patients. Operative and invasive endovascular treatment of thrombosis. Resistance to anticoagulant therapy, laboratory diagnosis. Perioperative and periprocedural management of antithrombotic drugs. Scoring system for recurrence risk assessment. Diagnosis and treatment of thrombosis in specific settings: in children, during pregnancy and postpartum, in CKD and liver diseases. Case report analysis.

Recommended literature:

1. Kearon C, Akl EA, Ornella J, et al. Antithrombotic Therapy for VTE Disease: CHEST Guideline and Expert Panel Report [published correction appears in Chest. 2016 Oct;150(4):988]. *Chest*. 2016;149(2):315-352.
2. Ibanez B, James S, Agewall S, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *Eur Heart J*. 2018;39(2):119-177.
3. Steffel J, Verhamme P, Potpara TS, et al. The 2018 European Heart Rhythm Association Practical Guide on the use of non-vitamin K antagonist oral anticoagulants in patients with atrial fibrillation. *Eur Heart J*. 2018;39(16):1330-1393.

4. Levine GN, Bates ER, Bittl JA, et al. 2016 ACC/AHA Guideline Focused Update on Duration of Dual Antiplatelet Therapy in Patients With Coronary Artery Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines: An Update of the 2011 ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention, 2011 ACCF/AHA Guideline for Coronary Artery Bypass Graft Surgery, 2012 ACC/AHA/ACP/AATS/PCNA/SCAI/STS Guideline for the Diagnosis and Management of Patients With Stable Ischemic Heart Disease, 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction, 2014 AHA/ACC Guideline for the Management of Patients With Non-ST-Elevation Acute Coronary Syndromes, and 2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery [published correction appears in *Circulation*. 2016 Sep 6;134(10):e192-4]. *Circulation*. 2016;134(10):e123-e155.
5. Aboyans V, Ricco JB, Bartelink MEL, et al. Editor's Choice - 2017 ESC Guidelines on the Diagnosis and Treatment of Peripheral Arterial Diseases, in collaboration with the European Society for Vascular Surgery (ESVS). *Eur J Vasc Endovasc Surg*. 2018;55(3):305-368.
6. Powers WJ, Rabinstein AA, Ackerson T, et al. Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association [published correction appears in *Stroke*. 2019 Dec;50(12):e440-e441]. *Stroke*. 2019;50(12):e344-e418.
7. Bates SM, Rajasekhar A, Middeldorp S, et al. American Society of Hematology 2018 guidelines for management of venous thromboembolism: venous thromboembolism in the context of pregnancy. *Blood Adv*. 2018;2(22):3317-3359. doi:10.1182/bloodadvances.2018024802
8. Sacks D, AbuAwad MK, Ahn SH, et al. Society of Interventional Radiology Training Guidelines for Endovascular Stroke Treatment. *J Vasc Interv Radiol*. 2019;30(10):1523-1531.

Number of active classes	Theory: 60	Practice: 45
Methods of delivering lectures		
Formal lecture, small group work, individual tutorial, case studies, laboratory results and imaging scans analysis and discussion.		
Evaluation of knowledge (maximum number of points 100)		
seminars: 20		
project presentation: 20		
interactive discussion: 10		
written tests: 20		
oral exam: 30		