HEREDITARY COAGULOPATHIES: PATHOGENESIS AND LABORATORY DIAGNOSTICS

Makhamova Mokhidil
cadet of the Department of Clinical Laboratory Diagnostics with the course of Clinical Laboratory Diagnostics of PGD
Umarova Tamila Abdufattoevna
assistant of the Department of Clinical Laboratory Diagnostics with the course of Clinical Laboratory Diagnostics of PGD Samarkand State Medical University
Samarkand, Uzbekistan

Introduction. Hereditary coagulopathies are a group of genetically determined disorders of the hemostatic system characterized by impaired blood coagulation and an increased tendency to bleeding. These conditions are associated with a deficiency or functional insufficiency of coagulation factors, proteins of the coagulation cascade, or components responsible for their activation. The most well-known forms of hereditary coagulopathies include hemophilia A and B, von Willebrand disease, and rare coagulation factor deficiencies. Early diagnosis of these disorders is of crucial importance for the prevention of severe hemorrhagic complications and for improving patients' quality of life.

Keywords: *pathogenesis, hereditary coagulopathies, fibrinolysis, blood coagulation, mutation, genes, coagulopathy.*

Pathogenesis of Hereditary Coagulopathies. The hemostatic system includes the vascular–platelet component, plasma coagulation, and fibrinolysis. Hereditary coagulopathies predominantly affect the plasma component of hemostasis [10,11,12].

Genetic Basis. Most hereditary coagulopathies are caused by mutations in genes encoding blood coagulation factors. Thus, hemophilia A is associated with mutations in the *F8* gene, which encodes factor VIII, while hemophilia B is linked to mutations in the *F9* gene, responsible for the synthesis of fa ctor IX. Both disorders are inherited in an X-linked recessive manner.

Willebrand disease is most commonly inherited in an autosomal dominant manner and is associated with mutations in the *WF* gene, leading to quantitative or qualitative defects of Willebrand factor [1,2,3].

Disorders of the Coagulation Cascade. Deficiency of coagulation factors leads to impaired cascade activation of coagulation, reduced thrombin and fibrin formation, making the formation of a stable clot impossible. As a result, even minor vascular injuries are accompanied by prolonged or spontaneous bleeding [17,18,19,20].

Clinical Manifestations. Pathogenetic mechanisms determine the clinical presentation of these disorders. Hemophilia is characterized by deep bleeding episodes (hemarthroses and hematomas), whereas von Willebrand disease predominantly presents with mucocutaneous bleeding (epistaxis, gingival bleeding, and menorrhagia) [21,22,23,24].

Laboratory Diagnosis of Hereditary Coagulopathies. Laboratory evaluation is the main tool for confirming the diagnosis and includes both screening and specialized methods [4,5,6].

Screening Tests. Basic investigations include:

- **Activated partial thromboplastin time (APTT)** — prolonged in deficiencies of factors VIII, IX, XI, and XII
- **Prothrombin time (PT)** — usually normal in hemophilia
- **Thrombin time (TT)** — allows exclusion of fibrinogen abnormalities
- **Platelet count** — generally within normal limits

Correction Tests. Performance of the mixing test (mixing the patient's plasma with normal plasma) allows differentiation between coagulation factor deficiencies and the presence of inhibitors. Normalization of APTT after mixing indicates a factor deficiency [7,8,9].

Determination of Coagulation Factor Activity. To specify the type of coagulopathy, the activity of specific factors (VIII, IX, XI, etc.) is measured. Activity levels correlate with disease severity:

- **Severe form** — <1%
- **Moderate form** — 1–5%
- **Mild form** — >5%

Diagnosis of Willebrand Disease. Includes:

- determination of Willebrand factor antigen
- assessment of ristocetin cofactor activity
- measurement of factor VIII activity

Genetic Diagnosis. Molecular genetic methods allow identification of specific mutations, confirmation of the diagnosis, genetic counseling, and prenatal diagnosis [13,14,15,16].

Conclusion. Hereditary coagulopathies represent a significant medical and social problem requiring a comprehensive diagnostic approach. Understanding the pathogenesis of these disorders enables targeted use of laboratory diagnostic methods and timely initiation of replacement therapy. Modern advances in molecular diagnostics open new opportunities for early detection and personalized treatment of patients with hereditary hemostatic disorders.

References:

1. Abduhakimov B. A. et al. Bolalar va o'smirlarda birlamchi tuberkulyozning o'ziga xos kechish xususiyatlari va klinik-laboratoriya usullari //Ta'lim innovatsiyasi va integratsiyasi. – 2024. – Т. 32. – №. 3. – С. 139-143.

2. Бердиярова Ш. Ш. и др. Клинико-лабораторная диагностика фолиевой кислотодефицитной анемии //TADQIQOTLAR. UZ. – 2024. – Т. 49. – №. 3. – С. 46-53.

3. Umarova T. A., Kudratova Z. E., Axmadova P. Role of conditionally pathogenic microflora in human life activities //Web of Medicine: Journal of Medicine, Practice and Nursing. – 2024. – Т. 2. – №. 11. – С. 29-32.

4. Muhamadiyeva L. A., Kudratova Z. E., Sirojeddinova S. Pastki nafas yo'llari patologiyasining rivojlanishida atipik mikrofloraning roli va zamonaviy diagnostikasi //Tadqiqotlar. Uz. – 2024. – Т. 37. – №. 3. – С. 135-139.

5. Umarova T. A., Kudratova Z. E., Norboyeva F. Modern aspects of etiology and epidemiology of giardias //Web of Medicine: Journal of Medicine, Practice and Nursing. – 2024. – Т. 2. – №. 11. – С. 25-28.

6. Isomadinova L. K., Daminov F. A. Glomerulonefrit kasalligida sitokinlar ahamiyati //Journal of new century innovations. – 2024. – Т. 49. – №. 2. – С. 117-120.

7. Umarova T. A., Kudratova Z. E., Maxmudova H. Mechanisms of infection by echinococococosis //Web of Medicine: Journal of Medicine, Practice and Nursing. – 2024. – Т. 2. – №. 11. – С. 18-21.

8. Даминов Ф. А., Исомадинова Л. К., Рашидов А. Этиопатогенгетические и клинико-лабораторные особенности сальмонелиоза //TADQIQOTLAR. UZ. – 2024. – Т. 49. – №. 3. – С. 61-67.

9. Umarova T. A., Kudratova Z. E., Baxromova M. Autoimmune diseases: new solutions in modern laboratory diagnostics //International Conference on Modern Science and Scientific Studies. – 2024. – С. 78-81.

10. Бердиярова Ш. Ш. и др. Узловой зоб и его клинико-лабораторная диагностика //TADQIQOTLAR. UZ. – 2024. – Т. 49. – №. 3. – С. 38-45.

11. Umarova T. A., Kudratova Z. E., Muhsinovna R. M. The main purpose of laboratory diagnosis in rheumatic diseases //International Conference on Modern Science and Scientific Studies. – 2024. – С. 82-85.

12. Umarova T. A., Kudratova Z. E., Ruxshona X. Contemporary concepts of chronic pancryatitis //International Conference on Modern Science and Scientific Studies. – 2024. – С. 11-15.

13. Хамидов З. З., Амонова Г. У., Исаев Х. Ж. Некоторые аспекты патоморфологии неспецифических язвенных колитов //Молодежь и медицинская наука в XXI веке. – 2019. – С. 76-76.

14. Umarova T. A., Kudratova Z. E., Muminova G. Instrumental diagnostic studies in chronic pancreatitis //International Conference on Modern Science and Scientific Studies. – 2024. – С. 16-20.

15. Атамурадовна М.Л., Рустамовна Р.Г., Эркиновна К.З. Роль современных биомаркеров в изучении различных поражений головного мозга //Достижения науки и образования. – 2020. – №. 10 (64). – С. 88-90.

16. Рустамова Г. Р., Мухамадиева Л. А. Современные аспекты клинико-лабораторных методов исследования острой ревматической лихорадки //International scientific review. – 2020. – №. LXVI. – С. 106-110.

17. Кудратова З.Е. и др. Роль цитокиновой регуляции при обструктивном синдроме атипичного генеза у детей // Анналы Румынского общества клеточной биологии. – 2021. – Т. 25. – №. 1. – С. 6279-6291.

18. Erkinovna K. Z. et al. Bronchial obstruction syndrome in young children with respiratory infections of different etiology: features of clinical manifestations and immune response //Проблемы науки. – 2021. – №. 1 (60). – С. 60-62.

19. Кудратова З.Е. и др. Хламидийные инфекции (внутриклеточная инфекция) в развитии бронхита // TJE-Tematics journal of Education ISSN. – 2021. – С. 2249-9822.

20. Kudratova Z. E. et al. Principles of therapy of chlamydial and mycoplasma infections at the present stage //Вопросы науки и образования. – 2021. – №. 28 (153). – С. 23-26.

21. Rustamova G. R., Kudratova Z. E. CHRONIC ENDOMETRITIS OLD ISSUES NEW POSSIBILITIES //Western European Journal of Medicine and Medical Science. – 2024. – Т. 2. – №. 5. – С. 12-14.

22. Erkinovna K. Z., Rustamovna R. G., Suratovna H. F. LABORATORY MARKERS OF PERINATAL HYPOXIC DAMAGE TO THE CENTRAL NERVOUS SYSTEM IN NEWBORNS //Наука, техника и образование. – 2020. – №. 10 (74). – С. 102-104.

23. Mukhamadieva L. A., Rustamova G. R., Kudratova Z. E. IMMEDIATE RESULTS OF COMPLEX TREATMENT OF CHILDREN WITH CHRONIC TONSILLITIS AND CHRONIC ADENOIDITIS ASSOCIATED WITH CMV AND EBV //Western European Journal of Medicine and Medical Science. – 2024. – Т. 2. – №. 5. – С. 20-24.

24. Umarova T. A., Kudratova Z. E., Norxujayeva A. Etiopathogenesis and modern laboratory diagnosis of prostatitis //International Conference on Modern Science and Scientific Studies. – 2024. – С. 6-10.