Journal of Molecular Pathophysiology, 2024
VOL 13, NO. 2, PAGE 01-02

COMMENTARY

Open Access

Mechanisms and Clinical Implications of Splenic Sequestration in Hemoglobinopathies

Herman Wolkers*
Department of Hematology, University of Amsterdam, Amsterdam, The Netherlands

ARTICLE HISTORY
Received: 16-Feb-2024, Manuscript No. JMOLPAT-24-130696;
Editor assigned: 19-Feb-2024, PreQC No. JMOLPAT-24-130696 (PQ);
Reviewed: 05-Mar-2024, QC No. JMOLPAT-24-130696;
Revised: 12-Mar-2024, Manuscript No. JMOLPAT-24-130696 (R);
Published: 19-Mar-2024

About the Study

Hemoglobinopathies represent a group of inherited blood disorders characterized by abnormalities in the structure or production of hemoglobin, the protein responsible for transporting oxygen throughout the body. These disorders encompass a wide range of conditions, including Sickle Cell Disease (SCD), thalassemias, and other variants. Hemoglobin is a complex protein found in Red Blood Cells (RBCs), comprising four globin protein subunits, two Alpha (α) and two Beta (β) chains and four heme groups. The primary function of hemoglobin is to bind and transport oxygen from the lungs to tissues throughout the body, facilitating cellular respiration. Hemoglobinopathies arise from genetic mutations affecting the synthesis or structure of hemoglobin molecules. These mutations can lead to abnormal hemoglobin variants with altered biochemical properties, stability, or oxygen-binding capacity.

Sickle cell disease is one of the most well-known hemoglobinopathies, characterized by the presence of abnormal Hemoglobin Sickle (HbS) due to a point mutation in the beta-globin gene. In individuals with SCD, a single amino acid substitution (glutamic acid to valine) in the beta-globin chain leads to the formation of HbS. Under conditions of low oxygen tension, HbS molecules polymerize, causing RBCs to assume a characteristic sickle shape. This process results in impaired RBC deformability, increased adhesion to endothelial cells, and vaso-occlusive events, leading to tissue ischemia, pain crises, and organ damage.

Thalassemias are a group of inherited disorders characterized by reduced or absent synthesis of one or more globin chains, typically alpha or beta globin. The pathophysiology of thalassemias varies depending on the type and severity of the globin chain imbalance. In alpha thalassemia, mutations affecting the alpha-globin genes result in decreased production of alpha chains, leading to an excess of beta chains and the formation of unstable hemoglobin tetramers. This imbalance can cause ineffective erythropoiesis, hemolysis, and anemia. Beta thalassemia results from mutations in the beta-globin gene, leading to reduced or absent synthesis of beta chains. The imbalance between alpha and beta chains disrupts normal hemoglobin synthesis, resulting in ineffective erythropoiesis, hemolysis, and anemia.

Apart from SCD and thalassemias, numerous other hemoglobin variants have been identified, each with its unique pathophysiology. These variants may involve alterations in globin chain structure, stability or oxygen affinity. For example, hemoglobin C disease arises from a mutation in the beta-globin gene, leading to the substitution of glutamic acid with lysine. This mutation results in the formation of abnormal Hemoglobin C (HbC), which can polymerize under certain conditions, although less readily than HbS. Similarly, hemoglobin E disease results from a mutation affecting the beta-globin gene and is prevalent in regions where thalassemias are endemic.

Hemoglobinopathies have a variety of clinical symptoms and consequences that are related to their pathogenesis. Vaso-occlusive crises in Sickle Cell Disease (SCD) can cause severe pain, tissue ischemia, and organ damage. Chronic hemolysis and anemia are common features of both SCD and thalassemias, leading to fatigue, pallor and impaired oxygen delivery to tissues. Additionally, complications such as stroke, acute chest syndrome, pulmonary hypertension and splenic sequestration may occur in individuals with SCD. Thalassemia complications include bone deformities, growth retardation, iron overload, and hepatosplenomegaly. Hemoglobinopathies encompass a diverse group of genetic disorders

Contact: Herman Wolkers, Email: wolkersh77@yahoo.com

characterized by abnormalities in hemoglobin structure or production. The pathophysiology of these conditions involves disruptions in RBC function, oxygen transport and erythropoiesis, leading to a range of clinical manifestations and complications.