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Introductory Chapter: Blood Groups - From Past to the Future

Anil Tombak

1. Introduction

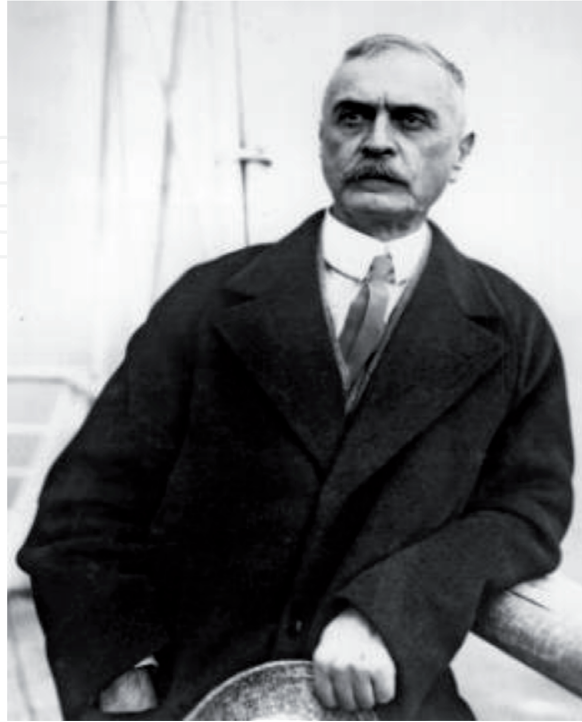
Because we know there are different blood groups today, doctors can save lives by transferring the right blood to patients. But previously, the blood transfusion was just a dream. This idea was first discussed by the doctors at the time of Renaissance. In later periods, a French doctor transfused calf blood to a patient in the 1600s and the patient died. Of course, blood transfusions which were made unaware of the presence of antigenic differences ended with death. Because of such unsuccessful trials, the blood transfusion gained a bad reputation. In 1817, Dr. James Blundell, an English obstetrician, said that living species had different blood structures, so blood could not be transfused between different species, but only human blood could be given to a human. In the following years, a total of 10 blood transfusions were performed, of which only 4 survived. Dr. Blundell did not know that human blood had different antigens, and people should be transfused with the same blood group antigens. And probably, this was the cause of death in some patients.



Dr. James Blundell

Karl Landsteiner identified ABO blood group antigens in 1900. And this was one of the most important steps in safe transfusion. He wondered what would happen

when the bloods of healthy people mixed up and sometimes saw clots in healthy blood. When he separated the plasma with the red cells in the blood and mixed the plasma of the different bloods, he realized that clotting was involved in certain mixtures. He gave random names to these plasmas like A, B, and C. Later, C's name was changed to O; after a while, the AB group was found.



Dr. Karl Landsteiner

In the mid-twentieth century, American researcher Philip Levine discovered Rhesus (Rh) factor and classified the blood as Rh (+) and Rh (-).



Dr. Philip Levine

In this still ongoing historical journey, today, blood groups are defined as hereditary characters on the surface of erythrocytes detected by a specific allo-antibody. International Society of Blood Transfusion (ISBT) reported that there are 33 blood group systems and more than 300 blood group antigens for these systems in humans. The structure of blood group antigens may be protein, glycoprotein, and glycolipid. The distribution of these antigens varies between people and societies, and between the human tissues, as well. Some of them are found just at the erythrocytes, at the other blood cells, and at the tissues. Blood groups are of great importance in transplantation, pregnancy, and transfusion. Some functions of blood group antigen are as follows: transport of some biological molecules toward the erythrocyte membrane, cell adhesion, autologous complement regulators, enzymes, receptors for external stimuli, anchors connecting the erythrocyte membrane to the cell skeleton, extracellular carbohydrates that protect the cell from the mechanical and microbial attacks, etc. Blood group antibodies may develop due to various reasons. These may be “natural antibodies” which develop in the first months of life as in ABO system or may be “immune antibodies” which develop due to transfusion, transplantation, or pregnancy. Antibodies against lots of erythrocyte antigens may cause severe transfusion reactions. For this reason, beside the tests where ABO and RhD antigen are evaluated, additional tests are needed to ensure transfusion safety. The goal is to maintain the vitality and the function of erythrocytes in the longest period and prevention of hemolysis after transfusion. For this purpose, to detect and type antibodies that may pose risk, we perform cross-match, antibody screening/identification, direct antiglobulin test and investigate minor blood group antigens.

2. Conclusion

Although the recent developments, the biological structure of most blood group antigens and their functions are still unknown, and we still have more ways to walk in this area. This book aims to reveal the latest developments related to “blood groups.”

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