A case report on uncommon A2 subtype of blood group A

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ABSTRACT

Blood group A has various subtypes with A1 being the most common. A2 and other weaker subtypes are less commonly encountered. The differentiation between A1and A2 is based on the reactivity of A1 cells but not A2 cells with anti-A1 lectin. A2 cells show increased reactivity with anti-H lectin. The incidence of A2 subtype is not known in this region. Here, we report an incidental case of A2 blood group in a 25-year male. Subgroups of blood group A can result in ABO blood group discrepancy and rarely may lead to hemolytic transfusion reactions. The case report highlights the need to be aware of such uncommon and rare blood groups and using anti-A1 lectin as a standardized protocol to prevent blood group incompatibility.

Key words: *A1 Lectin, A2 subtype, Blood group, Subgroup*

The ABO blood group system was first discovered by Landsteiner around 1900s. However, the occurrence of weaker subtypes due to the heterogeneity of A and B alleles still pose a problem for immunohematologist. The ABH antigens are expressed by addition of terminal monosaccharide immunodominant sugar to a precursor oligosaccharide H chain. A1 is the most common subtype of blood group A. A2 and other weaker subtypes are less commonly encountered. The prevalences of A1 and A2 in South India were reported to be 98.4% and 1.85%, respectively [1]. A hospital-based study performed in Northeastern India also showed similar findings with an incidence of A1 being 98.3% [2]. The subtypes of blood group A may result in a discrepancy in ABO blood grouping and rarely may lead to hemolytic transfusion reactions [3]. We report an incidental case of A2 blood group in a 25-year male.

CASE REPORT

A 25-year-old male came to blood bank, affiliated to the department of transfusion medicine in a tertiary care teaching hospital of Central India, as a replacement donor. He had no systemic illness and no significant history.

His hemoglobin was >12.5 g, percentage and weight were around 45 kg. His blood pressure was 110/80 mm Hg and pulse rate was regular at 80/min. Local phlebotomy site was free from any skin disease and showed no scars. Based on these findings, the patient was found fit for donation and 350 ml of whole blood was collected.

Routine blood grouping by tube method was performed by forward and reverse grouping. In the forward grouping tube method, sample red cells were tested with commercially available known anti-sera with the presence of agglutination in the respective tube suggests positive reaction. A 3–5% saline suspension of washed red blood cells (RBCs) was prepared from the sample. Two test tubes were labeled with sample number and anti-A and anti-B and two drops of each anti-A anti-sera B anti-sera were taken in respective test tubes, and one drop of RBC suspension was added in the test tubes.

Reverse grouping tube method was done as follows: Sample serum was tested against known red cells with the presence of agglutination in the respective tube suggests positive reaction. Two test tubes were labeled with sample number and A-cells, B-cells, O-cells, and auto control. Two drops of the serum sample were taken in each of the test tubes. One drop of 3–5% saline suspension of A-cells, B-cells, O-cells, and sample red cells was added to respective test tubes. The contents of all the test tubes were mixed by gentle shaking and centrifuged at 1000 rpm for 1 min. A cell button was formed and dislodged by gently shaking the test tubes, and the agglutination was read against the well-lit background.

Forward grouping and reverse grouping tube methods showed the result to be A-positive. As per the departmental protocol, it was further tested with anti-A1 lectin which showed no agglutination. On further testing with anti-H lectin, it showed 4+ reaction. Based on these results, it was typed as A2 subgroup of blood group A.

DISCUSSION

International Society of Blood Transfusion has described nearly 700 erythrocyte antigens which are organized into 30 major blood grouping systems, of which ABO and Rhesus (Rh) are the most common ones. This system was discovered by Landsteiner in

1900 on the basis of the presence of agglutinins in the blood and the agglutinogen on the red cell membrane [1]. The Rh system is the second most significant blood group system in blood transfusion services and was identified by Landsteiner and Wiener in 1940 [2]. Based on the presence or absence of Rh factor, the blood groups may be positive or negative, respectively.

Blood group A has various subtypes with A1 being the most common subtype. Anti-A1 lectin differentiates A1 and A2 cells as A2 cells show no reaction with it. The blood group A2 and A2B are extremely rare and can cause a discrepancy in ABO blood grouping [3]. Occasionally, this ABO discrepancy can lead to hemolytic transfusion reaction; hence, it is necessary to include anti-A1 lectin in blood group testing protocol. The occurrence of A2 subtype is rare in the Asian population, and hence, A2 and A2B blood groups are the rare types among Asians [4]. A study by Giriyan *et al*. showed the incidence of A2 and A2B subtypes to be 0.8% and 2.5%, respectively [5]. The study by Mathur and Lamichaney from India showed the prevalence of various blood groups as O (34.73%), B (28.24%), A (22.91%), and AB (14.12%) [2].

The A1 and A2 subgroups differ from each other both qualitatively and quantitatively, with A1 red cells having 8.1–11.7×10^5 antigenic sites as compared to 2.4–2.9×10^5 antigenic sites on A2 red cells. In routine testing, both A1 and A2 are strongly agglutinated by anti-A antiserum. However, A1 and A2 cells can be distinguished from each other by anti-A1 lectin of *Dolichos biflorus*, which agglutinates A1 red cells but not A2 red cells. As the A2 phenotype reflects the inefficient conversion of H to A antigen, A2 red cells have increased reactivity with the anti-H lectin of *Ulex europaeus* [6].

In general, A2 subtype is not identified until they have developed an antibody to A1 cells, which occurs either from exposure by transfusion or pregnancy. Once the A2 subtype has developed an anti-A1, they can only be transfused with A2 or with O blood group that is compatible. In the organ transplantation setting, the ABO compatibility is important. However, organs from A2 individuals have been transplanted into group O or B patients, without the need for debilitating immune suppression [7].

Most of the individuals with a rare blood group are incidentally identified when a routine pre-transfusion testing or pregnancy follow-up is performed. Our case was also identified incidentally while performing routine blood grouping. However, as we mandatorily use anti-A1 lectin and anti-H lectin, we were able to detect this rare group. A molecular characterization would have been useful in this regard, but could not be performed. Nevertheless, this case report highlights the need to be aware of such uncommon blood groups and using anti-A1 lectin and anti-H lectin as a standardized protocol to prevent blood group incompatibility.

The genomics revolution and its potential to transform the way blood are selected for transfusion can bring a great change in transfusion medicine. Various blood bank techniques ranging from antibody-based technology to now single-nucleotide polymorphism genotyping for blood, has led to an extended matching of RBC units [8]. Such advances in cross-matching of blood can help save many lives.

CONCLUSION

Our case report points to the need to perform molecular tests in certain cases. We also recommend that testing of all blood groups should be mandatorily done using anti-A1 and anti-H lectin. The establishment of a state and national registry of rare blood groups donors would aid in creating awareness of their existence and would help to save lives at the time of need.

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