

Severe Autoimmune Haemolytic Anaemia with ABO Mismatch and Transfusion Incompatibility Indicating Underlying Leukemia in An Older Woman

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Abstract

Severe anemia in older adults might be the initial clinical sign of an underlying immune or blood disorder and demands thorough laboratory assessment. This case study describes a 72-year-old female who arrived with severe anemia, evidenced by a hemoglobin level of 4.3 g/dL and a significantly low red blood cell count of 1.8 million/ μ L. Routine blood grouping via the slide method revealed AB positive, while confirmatory testing through the tube method classified the blood group as A positive, highlighting a notable ABO discrepancy. These inconsistencies sparked concerns regarding immune-mediated red cell agglutination. Compatibility testing demonstrated pan-reactive cross-match incompatibility with all donor units, and the incompatibility continued even at 37 °C, indicating the existence of warm-reactive antibodies.

Additional immunohematological assessments revealed a positive autoimmune screening and both direct and indirect Coombs tests, validating the existence of IgG autoantibodies attached to red blood cells and present in the patient's serum. These results confirmed a diagnosis of warm autoimmune hemolytic anemia (AIHA). Given the patient's older age and the possibility of an alternate cause, additional hematological testing was conducted. Subsequent examinations uncovered signs of an underlying leukemic condition, which is a recognized cause of secondary warm AIHA resulting from immune dysregulation and unusual autoantibody production.

This case underscores the diagnostic challenges of autoimmune hemolytic anemia in older individuals and points out the necessity of addressing ABO discrepancies and transfusion incompatibility via comprehensive immunohematological testing. Timely detection of secondary factors like leukemia is crucial, since treatment relies on managing hemolysis as well as addressing the primary cancer. Prompt diagnosis and suitable treatment can greatly decrease illness and enhance overall patient results

Keywords -Severe AIHA in older adults → consider underlying leukemia. Autoantibodies lead to ABO incompatibility and transfusion reactions. Positive direct Coombs test. Difficult cross-matching used, least incompatible blood. Lymphocytosis and splenomegaly indicate leukemia.

Background

Anemia in elderly patients often presents a diagnostic challenge due to overlapping features of nutritional deficiency, chronic disease, and haematological malignancies. Autoimmune haemolytic

anemia (AIHA) is characterized by immune-mediated destruction of red blood cells and is frequently associated with positive Direct and Indirect Coombs tests, severe anemia, and transfusion difficulties. In such cases, ABO blood grouping discrepancies and cross-match incompatibility may occur due to the presence of autoantibodies reacting at body temperature. Furthermore, AIHA may act as an important clinical clue to an underlying lymphoproliferative disorder, including leukemia, particularly in older individuals. This case highlights the complexity of transfusion management in severe anemia with serological incompatibility and emphasizes the importance of thorough immunohematological evaluation leading to the detection of an occult haematological malignancy.

Condition

- **Severe anemia**
- Hemoglobin: 4.3 g/dL
- RBC count: 1.8 million/ μ L

ABO blood grouping discrepancy

- -Slide method: AB positive
- -Tube method: A positive

Cross-match: Incompatible

- -Remained incompatible even at 37°C

Autoimmune work-up

- -Direct Coombs test: Positive
- -Indirect Coombs test: Positive

Presence of warm autoantibodies causing pan-agglutination

Diagnosis: Warm Autoimmune haemolytic Anemia (AIHA)

- Anemia found to be secondary to underlying leukemia

Epidemiology

The condition occurs when the immune system mistakenly attack and destroy red blood cells, leading to various symptoms such as fatigue, pallor and shortness of breath. diagnosis typically involves blood test and treatment optional may include corticosteroid's immunosuppressant's, or in sever case splenectomy. These underlying condition can complicate the diagnosis and treatment of AIHA as addressing the primary disorder is often essential for effective management .Moreover ,understanding the specific etiology of the haemolytic anemia can guide clinicians in selecting appropriate therapies to improve patient outcome .Due to the presence of high titre autoantibodies AIHA in older patient may manifest as severe anemia and complicated serological finding ,such as transfusion incompatibility and ABO blood group discrepancies .Given that AIHA and haematological malignancies emphasizes the significance of through evaluation in this population .

Disease - Secondary warm autoimmune hemolytic anemia (AIHA) - is a condition where the immune system erroneously generates IgG autoantibodies that react at normal body temperature (37 °C), targeting the individual's own red blood cells. These red blood cells covered with antibodies are destroyed early, primarily in the spleen, resulting in hemolysis and significant anemia. This condition is termed secondary because it arises as a complication of another existing illness, most frequently hematological cancers like leukemia, particularly in older patients. Immune dysregulation in leukemia results in the production of abnormal antibodies, leading to the destruction of red blood cells. Warm

AIHA is marked by positive direct and indirect Coombs tests, challenges in blood grouping and cross-matching, and a quick deterioration of anemia if not addressed swiftly.

Prevalence

Autoimmune haemolytic anemia AIHA is rare cause of anemia with a general prevalence estimated at 15 – 20 cases for every 100000 individuals. The conditions is observed more often in the older population especially in those over 60 years old and has a slight female predominance. Secondary AIHA represents almost 50% of all instances and is frequently linked to haematological cancers particularly leukemia and various lymphoproliferative condition in patient with leukemia the occurrence of AIHA is considerably greater than in the general population where it can appear as either an initial sign or a complication of the illness. IN this group of patients severe anemia accompanied by serological abnormalities like ABO mismatch and ongoing cross match incompatibility is more frequently observed rendering AIHA a significant albeit uncommon in older adults with underlying cancers.

Diagnosis

The patient's diagnosis was determined using a blend of clinical observation, blood tests and immunohematological assessments the patient a 72-year-old women showed significant anemia demonstrated by a severely low haemoglobin level of 4.3g/dl and a reduce red blood cell count of 1.8 million /ul signifying a critical level of anemia. Blood typing indicated an ABO inconsistency with the slide method displaying AB positive and the tube method revealing A positive implying interference from atypical antibodies .Cross matching was not compatible and the incompatibility remained even at 37 degree C indicating the existence of warm reacting autoantibodies.Immunohematological assessments revealed a positive direct coombs DAT confirming the in vivo coating of red blood cell with immunoglobulin and a positive indirect coombs test IAT signifying the presence of circulating antibodies in the patients serum. These result are typical of warm autoimmune haemolytic anaemia where IgG autoantibodies lead to the destruction of red blood cells at body temperature considering the patients advanced age and the severity of the disease additional evaluation was performed which indicated underlying leukemia a recognized secondary cause of AIHA. Consequently, the ultimate diagnosis was determined to be warm autoimmune haemolytic anemia resulting from leukemia clarifying both significant anemia and the intricate transfusion incompatibility noted in this instance.

Differential Diagnosis

The subsequent condition was taken into account in this instance in this instance of severe anemia with transfusion mismatch:

1. Warm autoimmune haemolytic anemia AIHA – confirmed by favorable direct and indirect coombs tests and discordance at 37 *C.
2. Cold agglutinin syndrome – causes clumping at low temperatures; less probable since incompatibility continued at 37*C.
3. ABO blood group inconsistency caused by technical mistake and omitted through repetitive testing employing various technique.
4. Hemolytic anemia due to autoimmune reaction.

Objective of the Study

To assess the reason for extreme anemia. To explore the causes of severe anemia in an older women exhibiting significantly low haemoglobin and red blood cells levels.

To determine discrepancies in ABO blood groups. TO examine the variance in blood grouping outcomes acquired through slide and tube technique and assess the impact of autoantibodies.

To examine ongoing cross match incompatibility including at 37°C and its effects on transfusion practices. To validate the autoimmune origin of anemia.

Case presentation

A 72-year-old woman was assessed for severe anemia of unknown origin found during regular lab tests. Hematological testing showed a severely decreased haemoglobin level of 4.3 g/dL and a red blood cell count of 1.8 million/ μ L, signaling a critical anemic condition. In the pre-transfusion evaluation, a rare ABO blood group inconsistency was observed, with the slide method indicating AB positive and the tube method determining the blood group as A positive. Continued cross-matching indicated ongoing incompatibility, including tests conducted at 37°C, which suggested an immune-mediated hemolytic reaction. Autoimmune screening also showed positive Direct and Indirect Coombs tests, confirming the existence of warm-reactive autoantibodies. Given these immunohematological results, a preliminary diagnosis of autoimmune hemolytic anemia was established. Given the patient's age and the established link between autoimmune hemolysis and hematological cancers, further examinations were conducted, which ultimately identified leukemia, confirming the anemia as a secondary autoimmune effect. This case emphasizes the diagnostic importance of serological inconsistencies and transfusion difficulties in revealing hidden malignant diseases in older patients.

Scope of the study

This research centers on the thorough assessment of significant anemia in an older patient with intricate immunohematological results. It includes the recognition and correction of ABO blood group discrepancies, evaluation of ongoing cross-match incompatibilities, and analysis of Direct and Indirect Coombs test outcomes for diagnosing autoimmune hemolytic anemia. The research additionally examines the link between autoimmune hemolytic anemia and underlying blood cancers, especially leukemia. This study seeks to improve knowledge of transfusion-related complications by documenting a rare and difficult case, enhance diagnostic precision in laboratory settings, and highlight the need for comprehensive hematological examination in older patients with unexplained severe anemia.

Uniqueness of the study

The situation reveals significant anemia in an older patient as the primary lab result prompting additional intricate evaluations. The existence of a significant ABO blood group difference between slide and tube methods indicates a rare and diagnostically complex immunohematological situation. Ongoing cross-match incompatibility even at 37°C clearly suggests the existence of warm-reactive autoantibodies, complicating transfusion management significantly. The concurrent positivity of both Direct and Indirect Coombs tests offers robust proof of immune-mediated destruction of red blood cells. This case distinctly demonstrates that autoimmune hemolytic anemia may serve as the initial indication of an underlying leukemia, instead of being a later complication. It highlights the essential importance of thorough laboratory assessment in revealing concealed hematological cancers in older patients.

Discussion

This case underscores the challenges of diagnosing and treating severe anemia in an elderly patient with existing immunohematological issues. The significantly low hemoglobin level and red blood cell count suggested active red cell destruction instead of just a nutritional deficiency. The noted ABO blood group difference between slide and tube techniques indicated the presence of antibodies, a recognized occurrence in autoimmune hemolytic anemia. Ongoing cross-match incompatibility at 37°C reinforced the likelihood of warm-reactive autoantibodies, which typically lead to pan-agglutination and complicate transfusion procedures. The positive results from both Direct and Indirect Coombs tests verified immune-mediated hemolysis, confirming the diagnosis of warm autoimmune hemolytic anemia. In older patients, this condition is often secondary instead of idiopathic, requiring assessment for underlying issues. In this instance, additional examinations resulted in the identification of leukemia, which is a known link to secondary AIHA. The presence of leukemia accounts for the intensity of anemia and the robust autoantibody response noted. This situation highlights the significance of accurately interpreting blood grouping and compatibility testing findings, since errors can result in transfusion delays or negative consequences. It also highlights the significance of autoimmune hemolytic anemia as a possible early sign of hematological cancer. Prompt identification and thorough laboratory assessment are crucial for precise diagnosis, suitable transfusion management, and prompt treatment of the underlying condition.

Result

A 72-year old woman came in with significant anemia, showing a hemoglobin level of 4.3 g/dL and a red blood cell count of 1.8 million/ μ L. Blood grouping revealed an ABO discrepancy, displaying AB positive with the slide method and A positive using the tube method. Cross-match testing before transfusion showed incompatibility with several donor units, remaining at 37 °C, suggesting the existence of warm-reactive autoantibodies. The direct and indirect Coombs tests both returned strongly positive results, validating immune-mediated hemolysis. Peripheral blood smear revealed anisopoikilocytosis, spherocytes, and polychromasia, indicating hemolytic anemia. Further hematologic assessment, encompassing peripheral blood smear and bone marrow analysis, showed atypical lymphoid growth indicative of leukemia. These findings together suggest secondary warm autoimmune hemolytic anemia (AIHA) induced by leukemia, clarifying the profound anemia, ABO mismatch, and pan-reactive cross-match incompatibility seen in this patient

Conclusion

This case study discusses a 72-year-old woman with significant anemia, as indicated by a dangerously low hemoglobin level of 4.3 g/dL and a notably diminished red blood cell count of 1.8 million/ μ L. Pre-transfusion testing showed a notable ABO blood group discrepancy, as the slide method indicated AB positive while the tube method confirmed A positive blood group. Ongoing cross-match incompatibility, despite testing at 37°C, combined with positive autoimmune screening and Direct and Indirect Coombs tests, verified the existence of warm-reactive autoantibodies, resulting in a diagnosis of autoimmune hemolytic anemia.

Additional comprehensive hematological assessment revealed underlying leukemia, identifying the anemia as a secondary autoimmune response to a blood cancer. This case emphasizes the significance of thorough immunohematological assessments in older patients with severe anemia and challenges related to transfusions. Identifying ABO discrepancies and ongoing incompatibility not only supports precise

diagnosis but also highlights potential underlying malignancies, underscoring the necessity for thorough assessment and meticulous transfusion management in these intricate situations.

Limitations of the Study

The research centers on a specific instance of autoimmune hemolytic anemia, restricting the capacity to identify wider clinical trends connected to leukemia-related AIHA.

Comprehensive antibody characterization (including specificity and subclass) was not conducted, limiting further immunological understanding.

Comprehensive hemolysis indicators (LDH, indirect bilirubin, haptoglobin) were excluded, which might have enhanced diagnostic correlation.

Future Scope of the Study

Assessing transfusion methods and results in individuals with warm autoimmune hemolytic anemia to enhance transfusion safety.

Exploring the pathophysiological connection between leukemia and autoantibody generation. Integrating molecular and cytogenetic studies to associate leukemia types with autoimmune issues.

Evaluating long-term outcomes and treatment effectiveness in individuals with secondary autoimmune hemolytic anemia.

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