



A Puzzling “Switch” in Blood Type Following Blood Transfusion

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Dear Editor,

Here, we describe an unusual case in which blood type was determined following an incompatible blood transfusion, resulting in further incompatible blood product transfusions.

A 16-yr-old Syrian male with abdominal and chest trauma, pelvic fractures, and compressed skull fracture, underwent an emergency laparotomy with splenectomy in Syria and received an unknown quantity and type of blood products. Upon arrival at Israeli Hospital #1, his blood group was determined as A+ with a double population (DP) noted in the anti-A column. He received two units of O+ packed red blood cells (RBCs) and was transferred to our hospital. The patient was hemodynamically-unstable with active bleeding upon arrival at our emergency room (ER); he received two additional units of O+ packed RBCs. His blood type was determined as A+ with a small negative population in the anti-A column, confirming the results of Hospital #1; the antibody screen with indirect antiglobulin test (IAT) was negative (Fig. 1A). Because of active bleeding during surgery, the patient was transfused with five units of type A+ packed RBCs, 10 units of type A fresh frozen plasma (FFP), five units of random platelets, and five units of cryoprecipitate. Post-surgery, the patient had low blood pressure and tachycardia, without active bleeding.

Additional blood samples, taken at 12 hr and day 4 post ad-

mission, were typed as A+DP (Fig. 1B). No additional blood products were required during the following six days.

A fresh blood sample was sent to the blood bank on day 7 because the patient's hemoglobin dropped to 6.6 g/dL. At this time, his blood type was determined as O+, with anti-A and anti-B antibodies in his sera (Fig. 1C). An in-depth risk management investigation ruled out clerical errors; all subsequent samples were O+.

Molecular analysis by PCR (*ABO* genotyping) was performed on the three patient samples: arrival at ER, 12 hr, and day 7. The arrival and 12 hr samples were type A, while the day 7 sample was type O, in concordance with the serological results. PCR analysis of patient tissue biopsy confirmed blood type O (Fig. 2). Genotyping of the three blood samples and patient tissue biopsy using 13 polymorphic short tandem repeat (STR) markers [1, 2] yielded identical size capillary electrophoresis peaks (3500; Applied Biosystems, Foster city, CA, USA) for all samples, confirming the samples were from the same patient (Data not shown).

No indication of hemolysis was noted including the hemolytic index of the chemistry samples (ARCHITECT plus ci16200 analyzer, Abbott Diagnostics, Wiesbaden, Germany). Patient haptoglobin was normal and direct antiglobulin test (DAT) was negative with polyspecific anti-human globulin; however, both were

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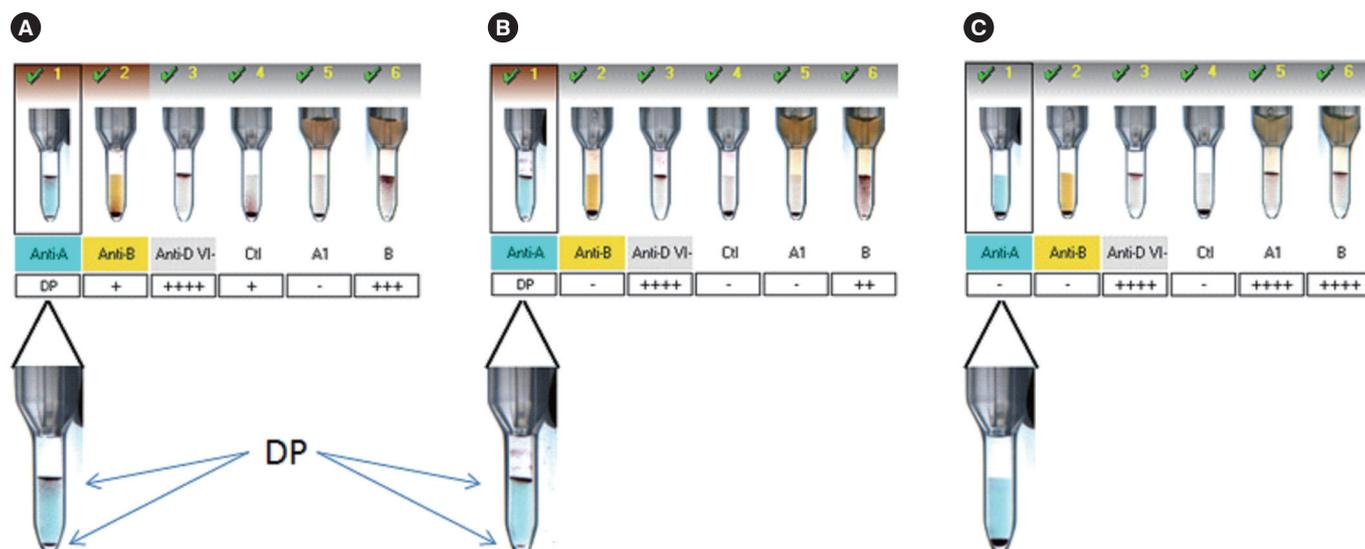


Fig. 1. Forward and reverse ABO/D typing of the patient using a gel technique with the DiaMed IH-1000 Automated Blood Screening System (Bio-Rad). Blood group was determined as: (A) A+ upon arrival, (B) A+ at 12 hr from admission, and (C) O+ at day 7 (post admission). The anti-A column is magnified in all gel cards to emphasize the change from double population (DP) to lack of agglutination.

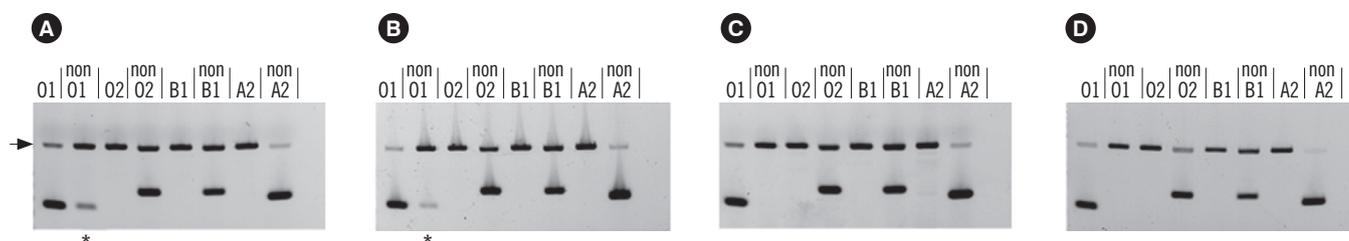


Fig. 2. ABO genotyping based on sequence-specific primer (SSP) PCR using RBC Ready Gene ABO kit (Inno-Train Diagnostik GmbH, Kronberg, Germany). Internal control PCR products are indicated by arrows. (A) Blood from patient upon admission; genotyping consistent with blood type A. (B) Blood from patient 12 hr after arrival; genotyping consistent with blood type A. (C) Blood from patient 7 days post admission; genotyping consistent with blood type O. (D) Patient skin biopsy; genotyping consistent with blood type O. Note: blood type A is distinguished from blood type O based solely on the “non O1” position (*) band.

only measured on day 11 post admission. Lactate dehydrogenase (LDH) levels were high from the start, although following severe trauma, high LDH cannot be assigned solely to hemolysis. Patient renal function was stable with normal creatinine and urine analysis was positive for blood/hemoglobin; however, this finding is not specific for hemolysis because of the pelvic trauma. Hemolysis was suspected because of the gradual drop in hemoglobin during the first week, from 10.5 to 6.6 g/dL, with no signs of active bleeding. Clinically, the only events suggesting a hemolytic transfusion reaction were the hypotension and tachycardia following the blood transfusion during surgery. Although we do not have any information regarding the patient’s transfusion history in Syria, we assume that he received a massive incompatible blood transfusion (type A+) resulting in a blood exchange

effect with transient disappearance of anti-A antibodies, which led us to erroneously conclude that his blood type was A+ and to transfuse an additional five units of A+ packed RBCs. We hypothesize that the splenectomy further delayed the production of new antibodies, contributing to the gradual decrease in hemoglobin levels without obvious intravascular hemolysis.

PCR analysis of genomic DNA extracted from leukocytes is a highly sensitive method that can detect 0.01% of type A DNA (validated in our laboratory).

PCR analysis confirmed type A blood upon arrival; supporting Utter *et al*, who demonstrated that persistence of allogeneic donor white blood cells following massive transfusion occurs relatively frequently in trauma patients [3, 4].

Moreover, genetic analysis of polymorphic STR markers con-

firmed that all samples had an identical "finger print", indicating they originated from the same person.

The DP reported in the first blood type analysis was misinterpreted as A+ after receiving O+ blood. However, the opposite was true; the patient was O+ and had apparently received A+ blood. The patient was released in good clinical condition 31 days post admission.

This case demonstrates that survival is possible following massive ABO incompatible blood transfusion during massive bleeding. All record-less patients presenting with double blood type populations should be considered O+, until otherwise proven.

Authors' Disclosures of Potential Conflicts of Interest

No potential conflicts of interests relevant to this article were reported.

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