A case of hemolytic disease of the newborn due to anti-Kp\textsuperscript{a}

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A patient with hemolytic disease of the newborn (HDN) due to maternal anti-Kp\textsuperscript{a} alloimmunization is described. Although there are few reports in the literature, it appears that HDN due to anti-Kp\textsuperscript{a} is often mild and transfusion therapy is rarely required. However, in this case, the baby’s hemoglobin progressively decreased and on day 18 a blood transfusion was administered, but jaundice was not severe enough for exchange transfusion. Immunohematology 1997;13:61–62.

Kell system antigens are present at an early stage in fetal development.\textsuperscript{1} Their expression begins about the 10th week of fetal life, and flow cytometric analysis of bone marrow cell samples indicates that Kell system antigens are present at an early erythroblast stage in red cell maturation. Twenty-three antigens have been identified as belonging to the Kell complex, which is a system of low- and high-incidence antigens.\textsuperscript{2} The first antigen identified, called Kell (K) after the original proposita, has proven to be of great clinical importance in transfusion practice. It is third only to antigens of the ABO system and the D antigen in immunizing potential. Many examples of hemolytic transfusion reactions and severe hemolytic disease of the newborn (HDN) due to anti-K are known.\textsuperscript{3,4}

Other antibodies in the Kell system (i.e., anti-Kp\textsuperscript{b}) may also cause destruction of antigen-positive red blood cells (RBCs) in either a fetus or an adult recipient of a blood transfusion, but they are less common.\textsuperscript{5} The Kp\textsuperscript{a} antigen was identified as belonging to the Kell system in 1957.\textsuperscript{6} It has a low incidence in the random white population of the United States, Europe, and Canada (about 2%).\textsuperscript{6,7} Of interest, western North Carolina Cherokee Indians have an incidence of 6.25%.\textsuperscript{7}

Until now, reports have attributed HDN to anti-K, -k, -Kp\textsuperscript{a}, -Kp\textsuperscript{b}, -Ku, -Js\textsuperscript{a}, -Js\textsuperscript{b}, -U\textsubscript{p}, -K1\textsubscript{4}, -K22, and -K23. Anti-K and anti-k usually cause severe HDN, while the other antibodies such as anti-Kp\textsuperscript{a} cause only mild or moderate HDN and transfusion therapy is rarely required.\textsuperscript{8}

Materials and Methods

Routine blood typing and antibody screening were performed using the gel-test method (DIA-MED ID, Cressier sur Morat, Switzerland) according to the manufacturer’s instructions.

Direct antiglobulin tests (DATs) were performed using DC Screening I (IgG-IgA-IgM-C3c-C3d-ctl [DIA-MED]). Eluates were prepared with an acid eluate kit (R-E-S-, Red Cell Elution System, DOMINION BIOLOGICALS LIMITED, Dartmouth, Canada).

Serum and eluate samples were tested against a reagent panel of RBCs (ID-Dia Cell, ID-Dia Panel [DIA-MED]) and a commercially prepared papain-treated panel of RBCs (ID-Dia Cell P, ID-Dia Panel P [DIA-MED]). The gel test consists of two test methods. The first method, the indirect antiglobulin test (IAT), uses the ID-Card “LISS/Coombs” with microtubes containing polyspecific anti-human globulin serum (rabbit anti-IgG and monoclonal anti-C3d) suspended in gel and untreated RBCs. The second test, an enzyme technique, uses the ID-Card “NaCl/Enzyme test” with microtubes containing neutral gel and papain-treated RBCs. Titration was carried out by testing serial twofold dilutions of the serum against single-dose, antigen-positive untreated and papain-treated indicator RBCs from the ID-Dia Panels.

Case Report and Results

A 28-year-old group A, D+ woman who had never been transfused had her first child, born at 35 weeks, by cesarean section. The child had neither anemia nor jaundice. Three years later she delivered a 2,200 g group A, D– male at 38 weeks. The mother had not been tested for unexpected serum antibodies during the two pregnancies.

A DAT on the infant’s RBCs performed at delivery was strongly positive with anti-IgG and the infant’s RBC eluate and maternal serum, tested against a three-cell screening panel, were negative. However, both the mother’s serum and the infant’s eluate reacted strongly against paternal group O, D– RBCs. By testing RBCs positive for low-incidence antigens and typing the father’s
RBCs, anti-Kpa was identified. The titer was 512 versus untreated Kp(a+) RBCs at IAT and 2 versus papain-treated Kp(a+) RBCs at 37°C.

The baby’s total bilirubin was 1.87 mg/dL at delivery, peaked at 12.1 mg/dL on day 8, and progressively lowered to 4.4 mg/dL on day 18. Beginning on the second day, phototherapy was administered for 5 days. The hemoglobin was 22 g/dL at delivery and lowered to 8.1 g/dL on day 18. On that day the newborn received 40 mL of crossmatch-compatible Kp(a−) RBCs. The post-transfusion hemoglobin was 11 g/dL and the infant was discharged 10 days later. One month after discharge the hemoglobin was 12 g/dL.

Discussion

Only rarely has anti-Kpa been reported as a cause of HDN. The first case was described in 1962 by Gert Jensen, but the patient did not require transfusion therapy. A survey by Hardy and Napier of 380,790 pregnant women over a 30-year period (1948-1978) found only one example of anti-Kpa. The report did not describe the clinical features. Kornstad, performing a similar survey in Norway during 1975-1980, did not observe any Kpa antibodies.

In our case, the infant progressively developed anemia and red cell production seemed to be inadequate to replace destroyed RBCs. However, the bilirubin did not increase after the peak on the 8th day. It is possible that erythroid suppression, in addition to hemolysis, was involved in pathogenesis of the anemia. This was recently reported in fetal anemia due to maternal Kell (K) alloimmunization. Alternatively, it might be that hemolysis of an early RBC progenitor simulates erythroid suppression.

The presence of anti-Kpa in our case could not be established immediately because commercially available RBCs rarely carry low-incidence antigens. Although antibodies against low-incidence antigens rarely occur, their detection by routine screening cells carrying a few of these antigens would allow an earlier diagnosis of some cases of HDN and safer transfusion therapy.

References