Successful outcome after timely management of severe fetal anemia with intrauterine transfusion in female with bad obstetric history

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ABSTRACT

Development of severe fetal anemia due to red cell destruction in intrauterine life, most commonly implicated with hemolytic disease of fetus or newborn. Untreated cases lead to hydrops and even death of newborn. We are reporting a case of severe fetal anemia successfully delivered after intrauterine transfusion. A 28-year-old female having bad obstetric history G10 P3600, came to our fetal unit at 23 + 4 weeks gestation. Middle cerebral artery peak systolic velocity (MCA PSV) value was 2.2 mom before 1st intrauterine procedure. Subsequent intrauterine session was planned at 1–2 week interval. After completion of 3rd intrauterine transfusion, MCA PSV value was 0.8 mom and baby was delivered at 32 + 1 week via lower segment cesarean section. Intervention at appropriate time, appropriate volume of selected unit and appropriate rate of transfusion definitely improves perinatal outcome.

Keywords: Bad obstetric history, intrauterine transfusion, severe fetal anemia

Background

In intrauterine life, Haemolytic Disease of the Foetus and Newborn (HDFN) is the most common disease responsible for red cell destruction, leading to severe foetal anaemia. HDFN involves the formation of the iso-immune response of the mother against foetal red cell antigens. Untreated cases lead to severe anaemia responsible for foetal hydrops and even the death of the newborn. If the foetus survives, ongoing destruction of the red cells may cause aggravation of bilirubin when its level reaches a particular threshold; it crosses the blood-brain barrier and causes irreversible damage to the brain. [1]

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Case

A 28-year-old female with Bad Obstetric History (BOH) G_{<10} P_{<600} at 23 + 4 weeks of gestation was referred to the Fetal Medicine Unit of our hospital [Table 1]. The mother’s blood group was B Rh D negative at the initial workup, while her husband’s blood group was O Rh D positive. The mother’s indirect coombs test was positive, and the antibody was identified as anti-C and anti-D specificity (after ruling out anti G). Anti-D had a titer of 32, whereas anti-C had a titer of 2 at the presentation time. After adjusting for gestational age, the patient’s color Doppler for MCA PSV was 66.4 (2.2 MoM). After obtaining informed consent, an intrauterine transfusion (IUT) was planned. Procedure was performed intravascularly at the placental end of the mother’s cord insertion at 24 + 3 weeks of pregnancy.

Specifically, the unit selected was less than five days old, negative for the O Rh D and C antigens, crossmatch compatible with the mother’s serum, and the blood volume calculated was 40 mL. Furthermore, the unit is modified through leucofiltration, Saline Adenine Glucose Mannitol (SAGM) depletion and reconstitution with AB plasma to achieve a final hematocrit of 80–83%. When the aliquot is issued, it was irradiated. We prepared a 40-millilitre aliquot and transfused it into an umbilical vein at a rate of fewer than 5 millilitres per minute. The entire procedure took approximately 8 min. The foetal heart rate was monitored by foetal medicine specialist throughout the course. Following the procedure, the foetal sample is tested for the direct coomb’s test, blood group, haemoglobin concentration and white blood cell (WBC) count. The second IUT procedure was performed at 26 + 2 weeks of pregnancy, with a baby weighing 900 gm. This time volume used was 50 mL, and the pre-Hematocrit (HCT) percentage was 8.4%, while the post-HCT percentage was 36.3%. It was decided to perform the third IUT at 27 + 4 weeks, baby had a birth weight of 1119 g, a pre-HCT of 24 and a post-HCT of 40, and a volume of 80 ml. The fourth procedure was performed at 28 + 5 weeks and birth weight 1391 gm; the HCT was 36.6 before the procedure and was not measured after the procedure due to insufficient sample [Table 2]. MCA PSV was 37.2 after the third procedure (mom 0.8). Betamethasone was administered to aid in the maturation of the lungs. The baby was born via elective LSCS under spinal anaesthesia at the age of 32 + 1 weeks. The newborn weighed 1780 grammes, and the cord haemoglobin level was 12 g/dl immediately after birth, while the cord bilirubin level was 5 mg/dl. APGAR scores were 5, 9 and 10 after 1, 5, 10 min and the combined APGAR scores (convolutional plus expanded) were 12, 11 and 13, respectively. Following the birth of the baby, one session of double volume exchange transfusion was performed. The baby is kept in the NICU for approximately 28 days. During his time in the NICU, the baby does not require any additional transfusions. When the baby was discharged from the hospital, he was in good health.

Table 1: Details of Obstetric history

| No. of pregnancy | Duration | Gender | Gestational age | Outcome | Other |
|------------------|----------|--------|-----------------|---------|-------|
| 1                | 13.5 year| Female | Term            | Died after seven days | Anti-D not received |
| 2                | 11 year  | Male   | Term            | Died after one day    | Anti-D not received |
| 3                | 10 year  | Female | 7 month         | IUD      | Hydrops present |
| 4                | 9 year   | Female | 7 month         | IUD      | Data not available |
| 5                | 8 year   | Male   | 7 month         | IUD      | Data not available |
| 6                | 7 year   | Male   | 7 month         | IUD      | Data not available |
| 7                | 6 year   | Male   | 7 month         | IUD      | Congenital anomaly present |
| 8                | 4.5 year | Female | Term            | Died after four days | Received blood transfusion |
| 9                | 3 year   | Female | 6 months        | IUD      | Scalp oedema present, spontaneous expulsion at home |

Table 2: Procedure Details

| Session | Gestational age | Volume | Hct of bag | Weight | Pre-Hct | Post-Hct | Time | MCA PSV |
|---------|-----------------|--------|------------|--------|---------|----------|------|---------|
| 1       | 24+3            | 40     | 82.5%      | 575    | 10.30   | 36       | 8 min| 66.4 (2.2 MOM) |
| 2       | 26+2            | 50     | 83.5%      | 900    | 8.40    | 36.30    | 7 min| -       |
| 3       | 27+4            | 80     | 82%        | 1119   | 24.10   | 40       | 13 min| -       |
| 4       | 28+5            | 82     | 82%        | 1391   | 36.60   | ...      | 15 min| 37.2 (0.8 MOM) |

Discussion

Mothers may become sensitized to RBC antigens as a result of previous blood transfusions or fetomaternal haemorrhage. Even 0.5 mL of allogeneic blood can cause maternal sensitization.[8] All donor units are routinely screened for ABO and D antibodies, and sensitization to minor red cells occurs frequently. Depending on the type of antibody, exposure during the upcoming pregnancy will result in an immune response. Antibodies of the IgG type can cross the placenta, destroying foetal red cells.[8] Following that, a foetus at high risk of anaemia is monitored using MCA–PSV. In response to foetal anaemia, cerebral blood flow increases. The severity of foetal anaemia is classified as mild 0.83–0.65, moderate 0.64–0.55 and severe 0.55 based on haemoglobin concentration expressed as a multiple of the median gestational age.[9] The cutoff point for foetal anaemia is a haematocrit of less than 30%.[10] The unit is chosen based on the maternal antibody profile. Typically, group O Rh D–packed red cells that are crossmatched to the mother’s serum are chosen. Donor units are
screened for TTI, gamma-irradiated, leukoreduced, and SAGM depleted and then reconstituted with AB plasma to achieve a target Hct of 75% to 85%. However, intrauterine transfusion is associated with foetal mortality (4.8%).

Perinatal death, emergency LSCS, premature membrane rupture, foetal bradycardia or bleeding from the puncture site are all associated with the procedure. Managing the appropriate volume and rate of transfusion, on the other hand, significantly reduces the incidence of these complications with favourable outcomes. After IUT, HCT decreases by approximately 1% per day due to ageing RBCs and foetal growth. Fall is rapid at 2% per day in a hydropic foetus with FMH, maternal alloantibody. Apart from this, the transfusion rate should not exceed 5–10 ml/min. The final hematocrit of a severely anaemic foetus should not exceed four times the initial hct. If hydrops or severe anaemia occurs before 20 weeks of gestation, the survivability is poor.

In Lotus study they found that the neurodevelopment impairments were more prevalent in high-risk, very-low-birth weight infants when compared to the IUT group (10% vs. 18%), while they were less prevalent in healthy control groups (10% vs. 6%). Yet no data were available regarding the outcome of fetal anemia and long-term neurological development.

**Implication for clinical practice**

Intrauterine transfusion is a potentially life-saving modality for foetal survival in pregnancies complicated by Rh isoimmunization. The selection of an appropriate unit, in an appropriate volume, at an appropriate rate, and at an appropriate time significantly improves the perinatal outcome, particularly before the development of hydrops. The poor prognosis is attributed to the delayed diagnosis, a severely harmed foetus, volume overload, and a delay in IUT.

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**Conflicts of interest**

There are no conflicts of interest.

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