Deepa CM, Chhina AS. Severe Neonatal Anaemia Caused by Fetomaternal Haemorrhage with a Positive Neonatal Outcome. J Pediatrics & Pediatr Med. 2025; 5(3): 1-3

Journal of Pediatrics and Pediatric Medicine

Journal of Pediatrics and Pediatric Medicine

Case Report Open Access

Severe Neonatal Anaemia Caused by Fetomaternal Haemorrhage with a Positive Neonatal Outcome

Deepa C M, Amitoj Singh Chhina

Department of Neonatology, Cloudnine Hospital, Old Airport Road, Bengaluru, India.

Article Info

Article Notes
Received: December 27, 2024
Accepted: January 20, 2025

***Correspondence:**
*Dr. Amitoj Singh Chhina, Department of Neonatology, Cloudnine Hospital, Old airport road Bengaluru, India. Email; amitoj13a@gmail.com.

© 2025 Chhina AS. This article is distributed under the terms of the Creative Commons Attribution 4.0 International License.

Keywords
Fetomaternal Hemorrhage (FMH)
Severe Neonatal Anemia
Neonatal Transfusion
Kleihauer-Betke Test
Rh Sensitization
Placental Barrier Disruption

Abstract

Spontaneous massive fetomaternal hemorrhage (FMH) is a rare but significant cause of severe neonatal anemia, often presenting without identifiable risk factors and posing diagnostic challenges. This report describes the case of a 35-year-old G2A1 mother with an uneventful pregnancy who delivered a neonate exhibiting profound anemia and respiratory distress shortly after birth. FMH was confirmed by a Kleihauer-Betke test, revealing a significant fetal blood loss of 198 mL into the maternal circulation. Prompt intervention with packed red blood cell transfusion led to stabilization and a favorable neonatal outcome.

FMH frequently presents with nonspecific symptoms such as decreased fetal movements or neonatal anemia, emphasizing the importance of clinician vigilance. Diagnostic methods, including the Kleihauer-Betke test and flow cytometry, play a critical role in confirming FMH and guiding treatment. This case highlights the necessity of early recognition and intervention, as well as routine FMH screening in Rh-negative pregnancies and unexplained neonatal anemia, to improve maternal and neonatal outcomes. Enhanced awareness and advancements in diagnostic technologies are crucial for better management of this underrecognized condition.

Introduction

Fetomaternal haemorrhage (FMH) refers to the transfer of fetal blood into the maternal circulation, which can occur at any stage of pregnancy, often due to a disruption in the placental barrier. This disruption allows fetal erythrocytes to enter the maternal circulation, typically through events such as placental trauma, rupture, or spontaneous occurrences without an identifiable cause[1,2]. While small-volume FMH is considered a physiological event with minimal clinical impact, large-volume FMH is associated with significant perinatal morbidity and mortality[2]. Severe anaemia at birth is one of the hallmark presentations of massive FMH, necessitating prompt recognition and management to mitigate adverse outcomes[3].

Case report

A 35-year-old G2A1 mother was admitted at 37 weeks and 4 days of gestation with labor pains. She underwent an emergency lower-segment cesarean section (LSCS) due to a non-reassuring non-stress test (NST). The pregnancy was uneventful, with the mother regularly attending antenatal checkups at our hospital. Her blood group was O negative, and all antenatal ultrasounds, including growth scans and fetal Dopplers, were normal. She had no history of pregnancy-associated comorbidities, vaginal bleeding, abdominal trauma, placental abruption, or decreased fetal movements. Mother

had received Anti-D injection 300mcg at 28 weeks of gestation and the same dose was provided a year and half ago after the abortion.

A male neonate was delivered who required tactile stimulation to initiate crying. However, the baby developed respiratory distress immediately after birth and was started on continuous positive airway pressure (CPAP) in the delivery room. Apgar scores were 5 at 1 minute and 8 at 5 minutes. The baby had palpable peripheral pulses and normal anthropometric measurements. The baby appeared pale, prompting further evaluation.. Due to significant pallor and respiratory distress requiring oxygen support, the neonate was transferred to the neonatal intensive care unit (NICU) on CPAP.

Cord blood gas analysis revealed severe metabolic acidosis (pH < 6.99, pCO2: 47, pO2: 23, HCO3: 11.3, base excess (BE): -15), with a hemoglobin (Hb) level of 5 g/dL and hematocrit (Hct) of 16%. On admission to the NICU, blood tests confirmed profound anemia with an Hb of 4.4 g/dL, Hct of 13.1%, normal platelet and white blood cell counts, and normocytic normochromic anemia on peripheral smear. The reticulocyte count was elevated at 14%, indicating a regenerative response. The baby's blood group was O positive, and the direct Coombs test (DCT) was negative. Liver and renal function tests, coagulation profile, and cranial ultrasound findings were all normal.

Given the critical anemia, the baby received a transfusion of leukoreduced, irradiated packed red blood cells (PRBC) at a dose of 20 mL/kg. Post-transfusion, serial blood gases showed progressive improvement, eventually normalizing within hours. The neonate's tone, activity, and reflexes returned to normal by 4 hours of life.

As all other tests were inconclusive for etiology of severe anemia in the newborn period, possibility of FMH was considered and a Kleihauer-Betke test was performed on maternal blood six hours post-delivery. The test revealed 198 mL of fetal blood in the maternal circulation, confirming a significant FMH as the etiology.

At 24 hours post-transfusion, the neonate's hemoglobin level had risen to 11.1 g/dL. Serial monitoring revealed stable hemoglobin levels without further decline. Respiratory support was gradually weaned, and the neonate maintained oxygen saturation levels above 94% on room air by 63 hours of life.

The baby was discharged on day 9 of life with a hemoglobin level of 11.7 g/dL and was thriving well during follow-up visits. At 6 months of age, the infant was healthy with normal growth and development.

Discussion

Spontaneous massive FMH, though rare, can result in severe neonatal anemia, leading to both short-term and long-term morbidity and mortality. Most cases of spontaneous massive FMH occur without identifiable risk factors, making it challenging to diagnose[2]. A review of the literature indicates that decreased fetal movements within 1–3 days before delivery is the most commonly reported symptom, accounting for approximately 32% of cases, although this is not specific to FMH[3,4,5,6]. The estimated incidence of clinically significant FMH is about 0.3 to 1 per 1,000 births, contributing to 3.4% of all intrauterine deaths and 0.04% of all neonatal deaths[2]. This case highlights the challenges of diagnosing spontaneous massive FMH. DCT was negative, ruling out immune hemolytic anemia. Normal liver and renal function tests excluded intrinsic causes of neonatal anemia related to liver or renal failure. A normal cranial ultrasound ruled out intracranial hemorrhage. The peripheral smear revealed normocytic normochromic anemia with reticulocytosis, suggesting the possibility of acute blood loss with a regenerative marrow response. FMH was suspected and confirmed through the Kleihauer-Betke test. The FMH appeared to develop gradually over one to two days, as evidenced by the active bone marrow response, which likely contributed to the favorable neonatal outcome.

Laboratory findings in FMH typically indicate elevated production of erythrocyte precursors in fetal blood and an increased reticulocyte count, suggesting that the hemorrhage may have occurred one to two days prior to birth. Detection of fetal cells in maternal blood is essential for confirming FMH[7]. The Kleihauer-Betke test remains the most commonly used diagnostic method, while alternative techniques such as flow cytometry and liquid chromatography are gaining traction due to their increased accuracy and reliability[7,8,9]. A review of cases exceeding 50 mL of FMH identified decreased or absent fetal movements as the most frequent antenatal symptom[10,11]. Other associated findings include neonatal anemia, stillbirth, hydrops fetalis, intrauterine growth restriction, non-reassuring fetal heart rate tracings, and fetal tachyarrhythmias. Notably, sinusoidal fetal heart rate patterns were observed in only 10% of cases, indicating the variable nature of FMH presentations[3,8,9].

Acute FMH, characterized by rapid fetal blood loss in utero, is often associated with non-reassuring fetal heart rate patterns, intrauterine growth restriction, and severe fetal anemia. Postnatally, it may present as perinatal hypoxia or acidemia, neonatal hemodynamic instability, or even stillbirth in severe cases[2]. The clinical presentation and prognosis of FMH depend significantly on gestational age, the volume of blood lost, and the rate of hemorrhage. Red blood cell transfusion is the primary treatment for neonatal anemia caused by FMH, while exchange transfusion may be considered in cases of severe anemia accompanied by cardiac failure[9].

Women with Rh-negative blood are at particular risk of sensitization during pregnancy, even with standard doses of anti-D immunoglobulin (Ig) [2,12]. As little as 0.1 mL of fetal red blood cells can trigger sensitization in susceptible women, with 30% of these women exposed to such volumes and about 15% becoming sensitized without anti-D Ig[12]. As a result, it is best practice to screen all Rh-negative women for FMH after delivery, measuring the volume of hemorrhage in cases with positive results. FMH quantification is also essential for diagnosing obstetric complications in women without Rh incompatibility, as large volumes of FMH can lead to severe fetal anemia or fetal death, necessitating immediate interventions such as blood transfusion[1,13].

The diagnosis of FMH requires specific maternal blood tests, such as the Kleihauer-Betke test or flow cytometry, to detect fetal cells in maternal circulation. However, these tests are not routinely conducted during the perinatal period, leading to potential underdiagnosis[9,13]. Early and accurate diagnosis of FMH is critical for assessing neonatal risks, guiding family planning, and ensuring enhanced obstetric monitoring in subsequent pregnancies[13]. Additionally, challenges in obtaining results stem from variations in technician expertise and laboratory capabilities. The Kleihauer-Betke test may underestimate FMH if fetal hemoglobin levels are reduced or overestimate it in maternal conditions like hereditary persistence of fetal hemoglobin[14]. Flow cytometry, while more accurate and objective, remains less widely adopted due to its higher cost and the scarcity of trained personnel[15].

Conclusion

This case highlights the challenges of diagnosing and managing spontaneous massive FMH, a rare but significant cause of severe neonatal anemia. Despite an uneventful pregnancy, the neonate presented with profound anemia and respiratory distress, with the diagnosis confirmed by the Kleihauer-Betke test. Timely transfusion of packed red blood cells ensured a positive outcome.

The variable clinical presentation of FMH underscores the need for heightened vigilance, particularly in neonates with unexplained anemia. Diagnostic tools such as the Kleihauer-Betke test or flow cytometry are critical, and early intervention can prevent significant morbidity and mortality. Routine post-delivery screening for FMH in Rh-negative women and those with neonatal anemia is essential for improving outcomes. Enhanced clinician awareness and access to advanced diagnostic methods will further aid in addressing this condition effectively.

Funding

Authors declare no funding was received for this work.

Conflict of interest

Authors declare no conflict of interest is involved in this work.

References

1. Bianchi D. W, & Romero R. (2003). Biological implications of bi-directional fetomaternal cell traffic: a summary of a National Institute of Child Health and Human Development-sponsored conference. The Journal of Maternal-Fetal & Neonatal Medicine, 14(2), 123–129. doi: 10.1080/jmf.14.2.123.129.
2. Wylie, Blair J. MD, MPH; D'Alton, Mary E. MD. Fetomaternal Hemorrhage. Obstetrics & Gynecology 115(5): p 1039-1051, May 2010 doi: 10.1097/AOG.0b013e3181da7929.
3. Christensen R, Lambert D, Baer V, et al. Severe neonatal anemia from fetomaternal hemorrhage: report from a multihospital health-care system. J Perinatol **33**, 429–434 (2013). doi: 10.1038/jp.2012.142.
4. Li Peng, Hua Shu, Peng Lin, et al, 2024. "Case Report: Fetomaternal Hemorrhage and Its Association with Pronounced Neonatal Anemia." Frontiers in Pediatrics 12. doi: 10.3389/fped.2024.1423786.
5. Zheng Y, Li D, Li X, et al. Spontaneous massive fetomaternal hemorrhage: two case reports and a literature review of placental pathology. BMC Pregnancy Childbirth **23**, 530 (2023). doi: 10.1186/s12884-023-05826-9.
6. Osman, Mahmoud M, Eiman S. "Massive Fetomaternal Hemorrhage with a Favorable Neonatal Outcome: A Case Report." International Journal of Contemporary Pediatrics 8(2): 370. doi: 10.18203/2349-3291.ijcp20210131.
7. Gică, Nicolae, Radu Botezatu, et al, 2021. "Severe Neonatal Anemia Due to Spontaneous Massive Fetomaternal Hemorrhage at Term: An Illustrative Case with Suspected Antenatal Diagnosis and Brief Review of Current Knowledge." Medicina 57(12): 1285. doi: 10.3390/medicina57121285.
8. Kumpel, Belinda, Matthew Hazell, et al, 2023. "Fetomaternal Haemorrhage and Laboratory Methods for Its Determination." The Global Library of Women's Medicine. doi: 10.3843/glowm.418853.
9. Marciano, Alessandra, Luisa Di Luca, Eugenia Maranella, et al, 2017. "How to Manage Fetomaternal Hemorrhage? Description of Five Cases and Literature Review." DOAJ (DOAJ: Directory of Open Access Journals). doi: 10.7363/070101.
10. Giacoia, George P. Severe Fetomaternal Hemorrhage: A Review. Obstetrical & Gynecological Survey 52(6): p 372-380, June 1997.
11. Kumpel, B. M, A. P, MacDonald, et al, 2013. "Quantitation of Fetomaternal Haemorrhage and F Cells in Unusual Maternal Blood Samples by Flow Cytometry Using anti-D and anti-HbF." Transfusion Medicine 23(3): 175–86. doi: 10.1111/tme.12030.
12. Bowman JM, Chown B, Lewis M, et al. Rh isoimmunization during pregnancy: antenatal prophylaxis. Can Med Assoc J. 1978 Mar 18; 118(6): 623-7. PMID: 77714; PMCID: PMC1818025.
13. Stroustrup, Annemarie, Callie Plafkin, et al, 2014. "Impact of Physician Awareness on Diagnosis of Fetomaternal Hemorrhage." Neonatology 105(4):250–55. doi: 10.1159/000357797.
14. Audette, Melanie C, Katie Mclean, et al, 2021. "Diagnostic Accuracy of Kleihauer–Betke (Kb) Testing to Predict Fetal Outcomes Associated with Fetomaternal Hemorrhage: A Retrospective Cohort Study." Journal of Perinatology 42(1): 91–96. doi: 10.1038/s41372-021-01185-5.
15. Kim, Yeowon A, and Robert S, et al, 2011. "Detection of Fetomaternal Hemorrhage." American Journal of Hematology 87(4): 417–23. doi: 10.1002/ajh.22255.