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CASE REPORT

A Case Report of Decreased Fetal Movement During Fetomaternal Hemorrhage

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ABSTRACT

Fetomaternal hemorrhage is a rare, potentially catastrophic event for a fetus. Leakage of the fetus's blood into the mother's circulation can cause fetal anemia, hydrops, and even death. The prevailing symptom is decreased fetal movement, and signs can include a sinusoidal electronic fetal monitor pattern, a positive Kleihauer-Betke test, or changes in fetal Doppler blood flow. A mother's report or perception of decreased fetal movement coupled with a nonreactive nonstress test or abnormal ultrasound findings should prompt an investigation into underlying causes.

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Fetomaternal hemorrhage occurs when a significant amount of blood is transferred from the fetal circulation to the maternal circulation, which results in fetal anemia (Christensen et al., 2013). The blood of the mother and fetus mix in small amounts (<0.1 mL) in approximately half of all pregnancies at the time of birth (Bowers, Myers, Gilbert-Barness, & Pomerance, 2006; Wilcock & Kadir, 2004). However, the transfer of a sufficient volume of fetal blood into the maternal circulation to make the fetus hemodynamically unstable is uncommon. Incidence rates vary significantly and range from one in 300 births with greater than 30 mL fetal blood loss (Adeniji et al., 2008) to one in 9000 births with diagnosed fetal/infant anemia (Christensen et al., 2013). Other authors reported incidence rates between these extremes at approximately one in 1000 births with significant fetal anemia/fetomaternal transfusion (Bakas, Liapis, Giner, Paterakis, & Creatsas, 2004; Cosmi, Rampon, Saccardi, Zanardo, & Litta, 2012; Huissoud, Fraser, Rudigoz, & Audibert, 2010; Kuin, Rosier-van Dunné, & Plötz, 2013; Markham, Charsha, & Perelmuter, 2006; Stroustrup, Plafkin, & Savitz, 2014; Sueters, Arabin, & Oepkes, 2003; Thomas, Mathew, Moral, & Vaclavinkova, 2003; Zuppa et al., 2008). The wide variation of the reported incidence rates is most likely due to the rarity of the condition and that most of the applicable literature is presented in case studies or based on small case series (Christensen et al., 2013).

The amount of blood loss required to affect the fetus is variable and is related to the cause and whether the loss is acute (e.g., trauma) or chronic (e.g., isoimmunization). The amount of critical blood loss can vary greatly according to the ability of the fetus to react. Markham et al. (2006) reported that approximately 50% of the fetal blood volume must be lost to the maternal circulation before fetal compromise occurs. While the total amount of blood lost is an important factor, fetal well-being is also affected by how rapidly the blood loss occurs. The fetus may be more severely affected by a smaller volume if the loss is rapid (acute), such as after a traumatic event, than by much greater volume if the loss occurs over a longer period of time (chronic). During chronic loss, the fetus has the opportunity to compensate in a number of ways, including increasing the production of red blood cells (Markham et al., 2006).

Etiology & Risk Factors

The etiology of FMH is unclear. Through some unknown mechanism, the normal placental barrier is disrupted between the circulations of the fetus and mother, and the fetus's whole blood crosses into the mother's circulation (Stroustrup et al., 2014). It

The amount of blood loss that causes fetal compromise is variable and may depend on how rapidly the loss occurs.

has been hypothesized that a disruption of the placental trophoblast allows the fetus's erythrocytes to pass into the mother's blood (Singh & Swanson, 2014).

Since FMH can have devastating consequences, the need to diagnose and intervene is important. Unfortunately, with this rare condition, clear causes and risk factors have not been established. Presumed risk factors include any procedure or condition during pregnancy that could cause a disruption in normal circulation, such as amniocentesis, chorionic villus sampling, fetal transfusion, or abdominal trauma (Bakas et al., 2004; Cosmi et al., 2012). Markham et al. (2006) grouped the potential risk factors into categories: fetal factors (such as twin-to-twin transfusion), placental abnormalities (such as placenta previa or abruptio), maternal trauma (such as a motor vehicle accident), interventions (such as cesarean birth or amniocentesis), and other factors (such as cocaine abuse). However, the authors stated that 82% of FMH cases were without an identifiable cause.

Christensen et al. (2013) reviewed instances of newborn anemia in 219,853 live births in the Salt Lake City area and found no cases of fetal anemia diagnosed antenatally. In this study, there were no clear risk factors evident that would trigger an evaluation for fetomaternal hemorrhage. These authors noted that the most prevalent symptom was maternal report of decreased fetal movement. Stroustrup et al. (2014) found similar results and stated that the cause of FMH is unknown and cannot be identified in 80% of cases.

Diagnosis

The symptoms associated with FMH are generally vague, but decreased fetal movement is most often reported. During routine prenatal care, a woman is advised by her provider to monitor fetal movement. Protocols differ, but generally starting in the third trimester, women are instructed to pay attention to fetal kicks and movements as indicators of fetal well-being and to report a slowing or absence of fetal movement. The optimal number of kicks or movements has not been determined, however, an absence or slowing for a particular fetus is cause for further investigation (Preboth, 2000). Decreased fetal movement was mentioned in the reviewed studies as the symptom that brought the woman to the provider's office or hospital or as an aside when care was provided. Bakas et al. (2004) reported that the first and most significant warning sign of FMH was the mother's report of decreased fetal movement leading to further studies, including electronic fetal monitoring, fetal ultrasonography, and Doppler flow studies confirming fetal compromise. Sinha, Giles, and Pathak (2012) reported a case of an idiopathic, asymptomatic fetomaternal hemorrhage causing fetal demise that had no other identified compromising events except reduced fetal movement.

Nonstress testing (NST) via electronic fetal monitoring (EFM) is a noninvasive way to assess fetal well-being and is an aid to the diagnosis of FMH. The mother is placed on the external fetal monitor to evaluate her contractions and the heart rate of the fetus. The fetal heart rate pattern is evaluated for baseline, variability, and the presence of accelerations and/or decelerations. A nonreactive NST warrants further evaluation for fetal compromise. A particular fetal heart rate pattern, termed sinusoidal, has been associated with fetal anemia. A sinusoidal fetal heart rate pattern has a smooth sine wave-like undulating pattern with a cycle frequency of 3 to 5 beats per minute (National Certification Corporation, 2010). Sinusoidal patterns have been reported as indicators of fetal anemia (Modanlou & Murata, 2004) but are not diagnostic of FMH as they are also associated with other conditions (e.g., butorphanol administration). Sinusoidal patterns should be considered as a part of the whole clinical picture.

Ultrasound evaluations for fetal well-being, consisting of fetal biometrics, umbilical blood flow velocities, and measurement of the peak flow velocity of the middle cerebral artery, provide a noninvasive method to help predict severe fetal anemia. Ultrasound biometrics, in the form of fetal measurements, can determine signs of hydrops or ascites, which are late signs of fetal compromise associated with FMH. Doppler velocimetry of the umbilical cord is also an adjunct to fetal anemia diagnosis. A significant elevation in the umbilical vein maximum flow velocity can signal fetal anemia. Sueters et al. (2003) recommend an evaluation of Doppler flow in cases of mothers reporting diminished or absent fetal movements. Goh and Zalud (2011) stated that the measurement of umbilical artery Doppler flow is a very good tool to diagnose the well-being of twins in a