Published in final edited form as:

Neoreviews. 2020 May ; 21(5): e342–e344. doi:10.1542/neo.21-5-e342.

Neonatal Trauma Following Motor Vehicle Collision in Pregnancy

Laura N. Shashy, MD^{*}, Amanda M. Craig, MD[†], Lauren A. Sanlorenzo, MD, MPH^{*}, Sarah S. Osmundson, MD, MS[‡]

^{*}Division of Neonatology, Department of Pediatrics, Monroe Carell Jr. Children's Hospital at Vanderbilt, Nashville, TN

[†]Department of Obstetrics and Gynecology, Vanderbilt University Medical Center, Nashville, TN

[‡]Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, Vanderbilt University Medical Center, Nashville, TN

PRESENTATION

A gravida 2, para 0–0–1–0 woman with an uneventful antenatal course is a restrained driver in a head-on, high-speed motor vehicle accident at a reported gestational age of 27 weeks and 4 days. Her airbag did not deploy because it was not operational. Her presentation is significant for tachycardia, normal blood pressure, and abdominal and hip pain. Bedside ultrasonography confirms fetal heart tones, breech position, and normal amniotic fluid index. Maternal physical examination demonstrates nasal trauma, bruising in the distribution of a seatbelt, and vaginal bleeding. Trauma computed tomography (CT) of the chest, abdomen, and pelvis shows no maternal injuries. Electronic fetal monitoring is significant for a category III tracing: baseline fetal heart rate (FHR) in the 180s, with minimal variability and recurrent late decelerations and contractions every 3 minutes. The decision for emergent cesarean delivery is made in the setting of nonreassuring fetal status with concern for placental abruption.

BIRTH HISTORY

The boy is limp, cyanotic, and apneic with no spontaneous movement. Apgar scores are 1, 1, and 4 at 1, 5, and 10 minutes after birth, respectively. He undergoes intubation and receives chest compressions, emergency umbilical vein catheter placement, and intravenous epinephrine in delivery room resuscitation. Umbilical arterial and venous cord gases at delivery were 7.14 and 7.13, respectively.

EVALUATION

On admission, the infant has a temperature of 97.8°F (36.6°C), heart rate of 176 beats/min, respiratory rate of 62 breaths/min, blood pressure of 57/24 mm Hg, and oxygen saturation of 94% on respiratory support and supplemental oxygen. Initial evaluation demonstrates a

AUTHOR DISCLOSURE Drs Shashy, Craig, Sanlorenzo, and Osmundson have disclosed no financial relationships relevant to this article. This commentary does not contain a discussion of an unapproved/investigative use of a commercial product/device.

1,350-g (93rd percentile) premature boy. On examination, he is pale, with bruised abdomen and extremities, poor perfusion, and swelling of the proximal portion of the right lower extremity. He undergoes intubation and has tachypnea and retractions. No murmur is present. He receives surfactant, volume resuscitation with normal saline and packed red blood cells, and inotropic support for hypotension, with a mean blood pressure of 16 mm Hg.

During placement of umbilical arterial and venous catheters, he has an episode of hypoxia and bradycardia, with hypotension prompting urgent additional evaluation with echocardiography, abdominal ultrasonography, and head ultrasonography, results of which are unremarkable. Echocardiography reveals no pericardial effusion. Abdominal ultrasonography shows distended bowel loops with increased echogenicity but no blood or fluid collections. Head ultrasonography shows no acute bleeding. Chest and abdominal radiograph is shown (Fig 1).

Venous blood gas demonstrates significant metabolic acidosis and an elevated serum lactic acid. His white blood cell count is $17,000/\mu\text{L}$ ($17 \times 10^9/\text{L}$), hemoglobin concentration is 11.4 g/dL (114 g/L), and platelet count is $156 \times 10^3/\mu\text{L}$ ($156 \times 10^9/\text{L}$). A significant coagulopathy is demonstrated, with a prothrombin time of 55.4 seconds, partial thromboplastin time of 168 seconds, and international normalized ratio of 6.3.

DISCUSSION

The infant is treated with epoetin alfa, mechanical ventilation, total parental nutrition, and antibiotics. Despite continuous blood product replacement required for anemia and thrombocytopenia and inotropic support, the metabolic acidosis and lactic acidosis continue. He remains coagulopathic with notable increased swelling of his right thigh. Repeat head ultrasonography after a period of hypoxia, hypotension, and acutely worsened anemia on day 2 demonstrates bilateral grade 4 germinal matrix hemorrhage with hemorrhage within the posterior fossa. In the setting of symptomatic bleeding and maximal medical support, the goals of care are transitioned to comfort.

Neonatal birth depression and anemia after emergent delivery are concerning for placental abruption after a traumatic motor vehicle collision (MVC). Disseminated intravascular coagulation and progressive right thigh swelling raises concern for fracture, which is confirmed on radiography (Fig 1). Fetal femur fracture is noted on maternal trauma CT consistent with trauma from MVC (Fig 2). Maternal injuries related to the MVC were minimal, indicating risk of direct injury to the fetus in the setting of normal amniotic fluid and relatively minor maternal injuries. Currently, there is no report of in utero fetal femur fracture induced by an MVC.

One of 12 pregnancies is affected by trauma. (1) The most common types of trauma include MVCs and blunt abdominal trauma. (1) Of traumatic injuries during pregnancy, 90% are classified as minor, yet a majority, up to 70%, of fetal losses after trauma are a result of minor injuries. (1)

Placental abruption is a primary concern after trauma in pregnancy, and can occur in up to 40% of severely injured pregnant women. (2) Maternal assessment after trauma includes physical examination, laboratory studies, imaging studies including ultrasonography, FHR monitoring, and tocodynamometric monitoring. Tocodynamometric monitoring is recommended for a minimum of 4 hours after direct abdominal trauma in pregnancy; if at least 6 contractions per hour are detected during the first 4-hour period, then 24 hours of monitoring is recommended. (3)(4) Vaginal bleeding, significant uterine tenderness, nonreassuring FHR patterns, or significant maternal injury are additional indications for prolonged monitoring. These may be signs of ongoing placental abruption. Ultrasonography has a poor sensitivity (24%) but high specificity (96%) for detecting placental abruption. (5) The Kleihauer-Betke test, or flow cytometry, should be performed in all pregnant women with major trauma to assess for fetomaternal hemorrhage. (1)

Adverse fetal outcomes and fetal death after MVCs are associated with increased crash severity, improper seat belt use, and significant maternal injury. (6) These adverse outcomes include preterm birth, placental abruption, premature rupture of membranes, and stillbirth. (7) There is no current report of in utero fetal femur fracture beyond a diagnosed skeletal anomaly or a neonatal femur fracture after breech delivery. Skeletal fractures without additional fetal trauma can occur and can lead to ultimate death after delivery. In addition, infants born prematurely after MVCs may not tolerate complications of trauma and neonatal death may be more likely than with term infants.

Lessons for the Clinician

- Motor vehicle collisions are the most common type of trauma during pregnancy. (1)
- Risks to the fetus and neonate after maternal trauma can include placental abruption but also direct traumatic injury despite minimal injury to the mother.
- Adverse fetal outcomes and fetal death after MVCs are associated with increased crash severity, improper seat belt use, and significant maternal injury. (3)

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- Know the maternal and fetal risks and the management of a traumatic injury in a pregnant woman.

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Figure 1.
Fetal chest and abdominal radiograph. Arrow designates femur fracture.

Figure 2. Maternal abdominal trauma computed tomography. Arrow designates in utero fetal femur fracture.