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Trauma in pregnancy

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ABSTRACT

Trauma is the leading non-obstetric cause of death during pregnancy and approximately 6–8% of all pregnancies are complicated by injury, both accidental and intentional. The initial evaluation and management of the injured pregnant patient often requires a multidisciplinary, collaborative team to provide the optimal outcome for both mother and fetus. It is important to recognize that even minor mechanisms of injury may result in poor outcomes for both fetus and mother. Injured pregnant patients meeting admission criteria experience a progressive increase in the number of complications as well as the number of patients that require delivery. There exists opportunity to identify patients who require admission and provide supportive measures that may reduce the complications of prematurity. Patients that are admitted may benefit from a multidisciplinary approach including on-going care from obstetricians or maternal-fetal medicine physicians. Placental abruption is the most common pregnancy complication, and may occur with even minor mechanisms of injury. Increasing severity of trauma increases the frequency of abruption, admission, delivery, and fetal demise.

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Introduction

Trauma complicates 1 in 12 pregnancies, although the exact incidence is not known.¹ Non-obstetrical and obstetrical complications can occur as a consequence of trauma. Maternal deaths as a result of trauma are a leading cause of non-obstetric mortality.² Trauma is also a leading cause of mortality worldwide.³ For the obstetrical patient, complications from trauma during pregnancy include contractions, preterm labor, fetal maternal hemorrhage, spontaneous abortion, premature rupture of membranes, preterm birth, uterine rupture, placental abruption, and intrauterine fetal demise.

The estimated incidence and prevalence of injury was summarized in a systematic review of the available literature.⁴ The authors were able to assess that estimated incidence or prevalence of injuries in pregnancy by comparing the rates to non-pregnant women from multiple sources, and estimated that the relative incidence of injuries from trauma.

The most common type of trauma was domestic violence, which increased from 5239/100,000 women to 8307/100,000 live births which was a 58% increase during pregnancy. The risk of homicide also increased during pregnancy from 2.3/100,000 women to 2.9/100,000 live births. Trauma from motor vehicle collisions, falls, burns, suicide, penetrating trauma, and toxic exposure all decreased during pregnancy.⁴

Domestic violence

Domestic violence occurs the most frequently of all the reported traumas in pregnancy and is reported to occur in 4–8% of all pregnancies.⁵ Using the National Vital Statistics Reports for 2015,⁶ it is estimated that as many as 159,109–318,219 pregnant women are affected by intimate partner violence. The types of violence include intimate partner violence, although abuse itself can include physical,

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psychologic, sexual, and reproductive coercion.⁷ A retrospective cohort study in Massachusetts of linked natal and hospital data (emergency department, observations, and inpatient) for women presenting with assault used IC-9 codes to find that 42.2% of initial injuries were to the head and neck. Torso injuries were identified in 21.5% of patients during pregnancy versus 8.7% during the postpartum period, and the leading physical injury was a contusion or superficial injury in 25.4% of patients.⁸

The risks to pregnancy associated with intimate partner violence or domestic violence is extensive. Reported risks include poor pregnancy weight gain, infection, anemia, tobacco, stillbirth, pelvic fracture, placental abruption, fetal injury, preterm delivery, and low-birth weight. A population-based study examined 4,833,286 deliveries from the Vital Statistics-Patient Discharge Database in California during the years 1990–1999, determined 2070 patients were assaulted and then hospitalized (0.04%). Admitted patients had an increased risk of prematurity (24%) OR = 2.4 (95% CI: 1.8–3.3), maternal death (0.71%) OR = 19 (95% CI: 2.7–144.7), fetal death (9.3%) OR = 8 (95% CI: 4.6–14.3), and uterine rupture (0.7%) OR = 46 (95% CI: 6.5–337.8). The study further analyzed other immediate risks that followed assault which includes preterm premature rupture of membranes of 7.6-fold increase (95% CI: 3.9–14.7, $P < 0.000$) and blood transfusions.⁹

Motor vehicle accidents

Motor vehicle accidents account for a significant portion of trauma during pregnancy. In a retrospective review of linked national data in Sweden, an estimated 207/100,000 live births were complicated by a motor vehicle accident.¹⁰ The mortality risk was 1.4 maternal fatalities and 3.7 fetal fatalities for every 100,000 pregnancies.¹⁰ The reported number of pregnant patients that seek medical attention after a motor vehicle collision is 87%,¹¹ although it is not known how many of those patients are evaluated in an emergency room or an Ob triage. A cross-sectional study from self-reported data in 22 states to the Centers for Disease Control and Prevention estimated that 92,500 pregnant women are hurt each year in motor vehicle collisions, and that most women do not report being counseled about seat belt use during prenatal visits.¹² The greatest obstetrical risk is that of abruption which may occur from shear force (coup) or tensile force (counter coup), and may complicate up to 40% of severely injured patients following a motor vehicle collision.¹³

Burns

Burn injuries have a mechanism of injury that differs significantly from other forms of trauma. There is direct thermal injury to tissue, inhalation injury to the lung, and accumulation in the maternal blood stream of toxic substances released by combustion. The estimated incidence of burns is 0.17/100,000 person-years in the obstetric patient versus 2.6/100,000 person-years in the non-obstetric patient.^{4,14} In a review by Parikh et al., the effect of total body surface injuries were systematically reviewed and summarized ($N = 139$ cases) to determine

the effect of total body surface area burned (TBSAB) on maternal and fetal outcomes. There was an effect of TBSAB on maternal mortality, but when controlling for maternal mortality, there was no effect of TBSAB on fetal mortality.¹⁵ Fetal survival was dependent on maternal survival.¹⁵

Management of trauma

The initial evaluation of a pregnant trauma patient may occur in either the Emergency Department (ED) or present to an obstetrical triage area.¹⁶ Significant or major trauma resulting from motor vehicle accidents, domestic violence, burns, homicide, transportation by Emergency Medical Services, or prior to fetal viability are more likely to present to an ED. Minor trauma, domestic violence, falls, late 2nd or 3rd trimester gestational age, and patients delaying their presentation after a waiting period may be more likely to present to Ob triage. Regardless of where and when the patient presents, both areas of the hospital need to be prepared for pregnant trauma patients. Centers must develop and implement specialized multidisciplinary teams, training, education, protocols, and equipment to be highly functional in multiple locations within the hospital.

Trauma centers and neonatal intensive care units (NICU) have designated levels of service which influence where patients are stabilized or transported to. Each state designates its own process to review centers and establish levels of care, and services may differ from state to state, or by location. Trauma centers have 5 levels of service with a Level I center considered a comprehensive regional resource that is a tertiary center and critical to the trauma system. The American College of Surgeons will verify services at each center, but does not designate. Designation of NICU levels occur at the state or local level, with Level III or IV signifying the most comprehensive neonatal care within the system. Recently ACOG and the Society of Maternal-Fetal Medicine proposed designation for maternal levels of care. Maternal levels of care include designation of a Birth Center, Level I (Basic Care), Level II (Specialty Care), Level III (Subspecialty Care), and Level IV (Regional Perinatal Health Care Center) with specific requirements defined elsewhere.¹⁷ Obstetrical trauma patients should be expected to present to all levels of maternal or neonatal care. Maternal Levels of Care do not integrate trauma because Trauma Levels already incorporate pregnancy with the expectation that pregnant patients will receive the same level of trauma care as non-pregnant patients. The Emergency Medical Treatment and Labor Act^{18,19} stipulates that:

- An individual(s) designated as qualified by hospital policy must perform an appropriate medical screening exam and determine if an emergency condition exists.
- If an emergency medical condition exists, that patient may be transferred if there is written certification that the benefits outweigh the risks.
- When deemed necessary, arrange transfer to an appropriate facility once the patient is stabilized or if the benefits of transfer outweigh the risks. The patient may decline, but the transfer should be carried out by qualified personnel and equipment.

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