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## Prehospital Providers Must Use Caution in Treating Pregnant Trauma Patients



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### Learning Objectives

- >> Understand the normal anatomic and physiologic changes of pregnancy.
- >> Describe the epidemiology of trauma in pregnant trauma patients.
- >> Cite two specific injuries unique to pregnancy.
- >> Explain the pathophysiology of placental abruption.
- >> Describe cautions to be taken in the positioning and packaging of pregnant trauma patients.

### Key Terms

**Alanine aminotransferase (ALT):** An enzyme normally present in blood serum and tissues of the body, especially tissues of the liver.

**Alkaline phosphatase (ALP):** An enzyme in bone, kidneys, intestine, blood and teeth.

**Aspartate aminotransferase (AST):** An enzyme normally present in blood serum and in the heart and liver.

**Atelectasis:** Collapse of alveoli, which prevents the exchange of carbon dioxide and

oxygen by the blood.

**Preeclampsia:** A toxemia of pregnancy with headache, increasing hypertension and pedal edema.

“Ambulance 9: Respond emergent to an MVC at the intersection of Cortez Blvd. and Seventh Street,” the dispatch radio blares off to the crew in the middle of a great lunch at Brother’s Bar-B-Q.

“Ambulance 9 copies, Cortez & Seventh,” Rick responds. Rick is a new paramedic in the system and is being field trained by Lisa.

On arrival, the crew finds a two-vehicle car crash involving a sports-utility vehicle (SUV) that rear-ended a compact car. Minor damage is noted to both vehicles with no passenger-area intrusion. Both vehicles appear to be fairly intact with no hazards present.

A police officer approaches the crew and says, “There are no injuries at this crash, but the lady in the car is pregnant and wants to be checked out.”

The two paramedics split up. Lisa rechecks the driver of the SUV and confirms no complaint of injury. Rick approaches the female patient in the car.

### **On-Scene Assessment**

Rick’s patient is the restrained driver of the vehicle that was rear-ended. The patient is 31 weeks pregnant with her first child. She tells him she was initially worried because she “couldn’t feel the baby,” but the baby is kicking normally now.

Secondary evaluation reveals an awake, alert and oriented 27-year-old female, obviously pregnant with a small abrasion over the left clavicle. There’s no pain on examination or evidence of other injury or complaints. She has a heart rate of 88, blood pressure of 108/70 and a ventilatory rate of 16. The patient tells Rick, “I think I’m fine. I have an OB appointment tomorrow and will talk to my doctor then.”

Lisa comes back and finds Rick filling out a refusal form on the pregnant patient. She immediately intervenes and tells the patient that her baby’s life may be in jeopardy and she should be transported to the hospital for further evaluation.

Rick feels that “his” patient is being taken from his control by the senior paramedic and asks, “Why are we doing this?”

### **A Common Occurrence**

This type of call occurs several times a day throughout the U.S. In most critical trauma patients, the paramedic’s skilled evaluation of mechanism of injury and patient assessment would elicit the appropriate estimation of the injury severity. But in the pregnant trauma patient, subtle presentations after minor mechanism accidents can mask critical injuries. Even a very minor blunt mechanism can result in placental abruption in 3–5% of patients.<sup>1</sup>

The placenta is a flat, circular shaped organ that provides a developing fetus with oxygen and important nutrients. The placenta develops out of the same cells as the baby and attaches to the inside of the uterine wall.

Placental abruption occurs when the placental lining separates from the uterus and can be catastrophic. This abnormal separation can have a fetal mortality rate as high as

20–40%.<sup>2</sup> Many patients, but not all, will have vaginal bleeding. The most common cause of placental abruption is blunt trauma.

The patient may have little to no complaint of injury after the initial traumatic insult. The traumatic force may be as little as a slip and fall from a standing position. The signs and symptoms of placental abruption may be delayed for up to 24 hours after the traumatic injury. When the patient does develop complaint of pain or bleeding, it may be too late to save the fetus and can also put the maternal life at jeopardy.

### Physiological changes

When treating the pulmonary system, EMS providers should be aware of the following normal physiological changes in a pregnant patient. As pregnancy progresses, the diaphragm is pushed upward 4 cm, causing the lungs to shorten by 4 cm and a decrease in oxygen reserve. Residual volume decreases to 800 mL, and functional residual capacity (volume of gas that remains in the lungs at the end of normal expiration) decreases by 20% to 1350 mL. Ligamentous relaxation and outward flaring of the rib margins compensate for this decreased capacity. Vital capacity is essentially unchanged.

These changes predispose the patient to hypoxia and a feeling of shortness of breath. As the diaphragm elevates, lower lobes of the lungs become more difficult to expand, predisposing the patient to **atelectasis**.

Dyspnea occurs in 60% of pregnant women. Therefore, it's especially important to avoid placing a pregnant patient in Trendelenburg position, because she may not be able to breathe adequately.

Oxygen requirements can increase 10–20% above the nonpregnant state in response to fetal growth and increased maternal metabolism.

Tidal volume increases to 600 mL and respiratory rate may increase by 15%, thereby increasing the minute volume by as much as 26–50%. These changes result in a chronic state of hyperventilation and compensated respiratory alkalosis.

Now let's discuss normal physiological changes in a pregnant patient when treating the cardiovascular system.

Pregnancy simulates a stress test for the cardiovascular system. Changes begin at four to six weeks and continue to approximately 34 weeks. All these alterations are designed to protect both mother and fetus and to provide increased oxygen and nutrient delivery to the fetus.

*Cardiac output (CO):* Pregnant women experience a high-output, low-resistance state. CO increases 20–30% or by 1.5 L/min during the first trimester and peaks at 6–7 L/min (40–50% increase) at the end of the second trimester because of catecholamine release, or as a response to the functional 20–30% arteriovenous shunt produced by the low-resistance placental circuit. CO remains increased to term when measured in the lateral recumbent position.

*Heart rate:* The heart rate increases 10–20 bpm over prepregnant levels by the third trimester because of increased blood volume and oxygen demand. Pulses of 80–95 bpm are considered normal in awake and sleeping states. Sustained heart rates of more than 100 bpm may indicate hypovolemia.

*Arterial blood pressure:* Little change happens in the first trimester. During the second

and third trimesters, vessels dilate because of the release of progesterone, resulting in a relative resistance to the vasopressor effects of renin and angiotensin II.

Systolic blood pressure decreases by 5–15 mmHg and diastolic blood pressure by 5–10 mmHg in the second trimester (minimum at 28 weeks gestation) to an average of 102/55 mmHg. The pulse pressure also widens. Blood pressure then rebounds during the third trimester to an average of 108/67 mmHg because of an increase in blood volume and venous congestion.

It's never normal to have a blood pressure higher than the prepregnant level. Pregnant women with **preeclampsia** have lost resistance to angiotensin and have become hyperreactive to renin and angiotensin in the supine position to counterregulate the perceived decrease in blood return. A diastolic blood pressure higher than 90 mmHg may indicate hypertension of pregnancy and is cause to alert a physician.

Now let's discuss normal physiological changes in a pregnant patient when treating the gastrointestinal (GI) system.

*Abdominal wall:* The peritoneum has decreased sensitivity. General laxity and stretching of the abdominal wall often masks typical findings of guarding, rigidity and rebound tenderness, suggesting intraperitoneal injury and making an abdominal assessment by palpation unreliable in trauma.

*Abdominal contents:* Compartmentalization of the abdominal organs displaces the small bowel and other organs laterally and cephalad by the enlarging uterus and changes pain referral patterns. The uterine mass interferes with attempts to palpate abdominal viscera or masses and thus impairs the ability to detect intraperitoneal bleeding clinically.

*Stomach and GI tract:* Loss of gastroesophageal sphincter control coupled with a progesterone-induced suppression in gastric motility causes delayed gastric emptying, prolonged intestinal transit times and an increase in gastric secretions. Such changes generally lead to heartburn and constipation but also may make the patient more prone to vomiting and aspiration during trauma and intubation; they may also mimic a silent abdomen. The bowel is compressed, increasing the likelihood of significant injury. The appendix is in the right upper quadrant during the third trimester.

*Liver and spleen:* These organs become mildly distended, compressed or displaced, making them more vulnerable to injury or rupture. **Aspartate aminotransferase (AST)** and **alanine aminotransferase (ALT)** are normal; **alkaline phosphatase (ALP)** is elevated (placental origin).<sup>4</sup>

### **Prehospital Treatment**

Prehospital treatment should consist of accurate and repeated vital signs, treatment consistent with the patient complaint, IV access and transport to an emergency department capable of caring for pregnant trauma patients. In particular, the facility should have cardiopographic monitoring capabilities.

Also, maintain an adequate airway. Note: Pregnant patients have a decreased oxygen reserve. Their oxygen consumption increases by 15%. With 60 seconds of apnea, their partial pressure of oxygen in arterial blood will drop 29% vs. 11% in non-pregnant women.<sup>3</sup>

All pregnant patients beyond 16 weeks gestation should be considered “full stomachs” and at risk for aspiration. Administer high-flow oxygen to prevent fetal hypoxia.

Decreased lung volumes and increased oxygen metabolism results in rapid desaturation when compared with the non-pregnant patient. Use caution with spinal immobilization and strap positioning/tightening. Place the pregnant patient in the left lateral position to avoid supine hypotension syndrome. Liberally use IV fluids.

### Potential Consequences

Prehospital emergency providers must be cognizant that any abrupt traumatic deceleration has the potential to cause placental abruption in the pregnant trauma patient. The patient can have little or no outward signs and symptoms of injury, but may still have a one in 20 chance of losing the baby in the next 24 hours.<sup>4</sup>

Very rarely will a potential mother be willing to take this chance with her child's life when aware of the risks involved after even minor trauma. An informed consent of treatment and the consequences of non-treatment must always be given to the patient so they realize the potentiality of negative results.

If the introductory scenario played out without the experienced paramedic's intervention, this patient may have been released with the intention of an evaluation the next day unaware of the risk she may be taking. Failure to recognize the potential for injury and delaying the care of a patient with placental abruption can have catastrophic consequences.

### Conclusion

With the experienced and knowledgeable EMS provider providing the patient with the consequences of waiting to be evaluated, the patient will often consent to treatment and transport. If they do not, at the very least they've had the opportunity to make an informed decision.

By recognizing the potential for injury with even minor mechanisms of injury in pregnant trauma patients, field providers will be increasing the baby's, and mother's, chance of survival. **JEMS**

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### Anatomical Landmarks

**Right upper quadrant (RUQ):** Contains liver, (rib protection), gall bladder and part of the colon.

**Left upper quadrant (LUQ):** Contains spleen, lateral and posterior position (rib protection), stomach and part of the colon.

**Right lower quadrant (RLQ):** Two portions of the large intestine and the appendix.

**Left lower quadrant (LLQ):** The descending and sigmoid portions of the colon.

**Small intestine:** occupies the central part of the abdomen around the umbilicus; some also lies in all four quadrants.

**Urinary bladder:** Lies just behind the pubic symphysis and lies in both lower quadrants.

**Umbilicus:** Is within the fourth lumbar vertebra and the superior edge of the iliac crest,

the rim of the pelvic bone.

### **Quick Tips for Assessing Pregnant Trauma Patients Unique Challenges**

- > “Two for one” patients who need to be carefully assessed.
- > “Normal” vital signs are different during pregnancy.
- > Minor trauma can be major for the fetus.

### **Epidemiology of Trauma**

- > The No. 1 cause of maternal morbidity & mortality in pregnancy.
- > The No. 1 cause of death of women of childbearing age.
- > It affects 6–7% of all pregnant women.

### **Major Causes of Trauma in Pregnancy**

- > Traffic collisions (2/3 of all cases)
- > Falls (most likely during second and third trimesters)
- > Domestic abuse (directed toward abdomen)

### **Minor Trauma**

- > Nine out of 10 traumatic injuries during pregnancy
- > Most frequent in the third trimester
- > Pregnancy-related complications up to 10%
- > Highest after assault
- > Can result in fetal loss (1–3%, usually from abruption)

### **Clinical Data on Mechanisms of Fetal Loss**

- > Abruptio placentae (50–70%)
- > Loss of maternal life (about 10%)
- > Direct fetal injury (<10%)
- > Unrecognized cause (>10%)
- > Maternal hypovolemic shock (<5%)

### **Key Components of the Patient History**

- > Mechanism of injury
- > Estimate the age of gestation
- > Complications with previous pregnancies
- > Previous C/S = increased risk of uterine rupture
- > Pre-existing medical problems
- > Determine the fetal viability
- > Fetal age <22 weeks is non-viable
- > If fetus non-viable, direct all resuscitative efforts toward the mother
- > PIH/pre-eclampsia
- > Fetal movements
- > Vaginal fluid or bleeding
- > Any direct blows to abdomen
- > Any domestic abuse
- > Use of seat belts

### **Watch for Supine Hypotension Syndrome**

- > After 20 weeks gestation, the uterus can occlude the intravascular circulation (IVC) in the supine position.
- > Displacing the gravid uterus from the IVC can increase cardiac output by 25%.
- > No pregnant woman >20 weeks gestation should lie supine for any sustained period.

**Source:** Marc Eckstein, MD, 2011 EMS Today Conference & Exposition presentation.

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