

## PREGNANCY AND PODIATRIC TRAUMA

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The traditional treatment of common foot and ankle traumatic injuries as well as other acute conditions that occur during pregnancy can trigger uncertainty and anxiety for both the patient and the podiatric physician. This scenario is often unfamiliar. Treatment of conditions ranging from an infected ingrown toenail to a dislocated, trimalleolar ankle fracture raise serious issues regarding preoperative, intraoperative, and postoperative care. Concerns regarding the injured pregnant woman as well as the fetus include radiation exposure, leukemia, anticoagulation, pain management, surgery and anesthesia. Because the fetus is fully dependent on the physiology of the pregnant patient, proper patient resuscitation is the best fetal resuscitation in severe, life-threatening situations. A coordinated approach that utilizes an experienced multidisciplinary team may consist of an obstetrician, perinatologist, anesthesiologist, radiologist and the most appropriate specialty surgeon with the nursing staff should be involved in caring for the pregnant trauma patient. In stable, less serious injuries and conditions a consultation or conversation with the patient's Ob/Gyn is very helpful.

General trauma has become one of the leading causes of morbidity and mortality of women in the world, resulting in nearly one million deaths per year. Trauma affects 8% of pregnancies and is the leading cause of maternal death in the US.<sup>1</sup> It is estimated that physical trauma complicates approximately 1 in every 12 pregnancies.

Nearly 50,000 people in the US die each year in motor vehicle accidents. Approximately two-thirds of all trauma during pregnancy results from motor vehicle accidents. Motor vehicle accidents are the most significant contributor to fetal death due to trauma. There is an increased risk of seat belt-related injuries to the fetus beginning in the second trimester. Airbag deployment during pregnancy does not appear to be associated with an increased risk for either maternal or fetal injury.<sup>2</sup>

Domestic violence is another common cause of trauma during pregnancy that is involved in 10% of cases. Approximately 0.3% to 0.4% of traumatized pregnant patients require hospital admission. As many as 24% of these patients die as a result of their injuries. Falls, direct assaults to the abdomen, penetrating injuries and gunshots are other causes of maternal trauma.<sup>3</sup>

Anatomic and physiologic changes observed during

pregnancy can influence patterns of injury, the pathophysiological responses of the patient to the injury, the severity of the trauma and the management of the patient. The pregnant female experiences obvious weight gain with generalized loss of balance. There are numerous changes and compensations that affect the cardiovascular, respiratory, gastrointestinal, genitourinary, neurological and musculoskeletal systems that can make the pregnant female more prone to falls and accidents and can seriously influence their response to trauma. The pregnant female can become anemic and hypotensive with possible pregnancy-related osteoporosis as well as hypercoagulable with an increased chance of deep vein thrombosis.

The gestational age at the time of the injury is most valuable in determining the need for fetal assessment as well as managing the mother's condition. The fetal age in weeks or trimester to a lesser degree can predict the physiologic changes that affect the treatment of the pregnant patient who is injured. Gestational age is important for decisions related to further fetal surveillance and patient care. Fetal ultrasound provides useful information regarding fetal well-being including fetal motion, bradycardia, tachycardia, and placental integrity.

One of the most anxiety-provoking aspects of fracture care is radiation exposure to the mother and fetus and possible teratogenesis. Table 1 lists guidelines that address these concerns.

There has been debate concerning the risks of developing leukemia subtypes associated with intrauterine exposure to diagnostic radiographic studies. More recent literature has found that direct prenatal fetal exposure to x-ray examination was not associated with a significant overall risk for childhood leukemia, lymphatic leukemia, or myeloid leukemia. Finally, direct patient shielding with a 0.5 mm lead apron over the abdomen and pelvis should always be utilized for plain x-rays. The patient-image intensifier using the C-arm fluoroscopy unit should be as short as possible limiting the patient dose.<sup>4</sup>

Given the hypercoagulable state of pregnancy, and immobilization following some fracture repair anti-coagulation has become a critical issue. Untreated deep DVTs have lead to 16% pulmonary embolisms in 16% of patients, and have become the leading cause of maternal death. Warfarin is known to cross the placenta and

Table 1

### GUIDELINES FOR RADIOGRAPHIC EXAMINATION OR EXPOSURE DURING PREGNANCY

- Women should be counseled that x-ray exposure from a single diagnostic procedure does not result in harmful fetal effects.
- Specifically, exposure to less than 5 rad has not been associated with an increase in fetal anomalies.
- Concern about high dose ionizing radiation exposure should not prevent medically indicated diagnostic x-ray procedures from being performed in pregnancy.
- Other imaging procedures not associated with ionizing radiation (magnetic resonance imaging, ultrasonography) should be considered instead of x-rays when appropriate, as they are not known to be linked with adverse fetal effects.
- Use of radioactive isotopes of iodine is contraindicated during pregnancy.
- Radiopaque and paramagnetic contrast agents are unlikely to cause harm and may be of diagnostic benefit, but these agents should be only if the potential benefit justifies the potential benefit to the fetus.

*Data from ACOG Committee on Obstetric Practice, ACOG Committee Opinion. Number 299, September 2004.*

potentially cause fetal bleeding and teratogenicity. Unfractionated heparin (UFH) is associated with heparin-induced thrombocytopenia (HIT), bleeding and osteopenia with long-term therapy. This can lead to vertebral fractures and osteoporosis.

A better alternative to UFH is low-molecular weight heparin (LMWH) which is associated with lower incidence of HIT and osteoporosis. Another alternative is fondaparinux, a synthetic antithrombotic agent that specifically binds to antithrombin. Fondaparinux is as effective as LMWH with regard to anticoagulation with no effect on bone.<sup>5</sup>

Opioids have been the standard medication for pain management both in the preoperative and postoperative patient. Goodman claimed perioperative opioid use should raise little concern about teratogenicity. The risk for respiratory depression of the fetus is only pertinent if delivery occurs at the same time as the surgery.<sup>6</sup> Merperidine (Demerol) has historically been used extensively worldwide. Questions still exist regarding its efficacy and side effect profile.

Table 2

### CATEGORIES OF MEDICATION SAFETY IN PREGNANCY

- A Well-controlled studies show no risk in first trimester, no evidence of risk in later pregnancy
- B Animal and human studies do not show fetal risk; no controlled studies confirm risk in pregnancy; no evidence of risk in later pregnancy
- C Animal studies show adverse fetal effects; no controlled studies in pregnancy
- D Studies show fetal damage; use may be acceptable when conditions threaten woman's life
- E Studies in animals and humans show fetal damage; absolutely contraindicated in pregnancy

Cyclobenzaprine (Flexeril) is the only known safe muscle relaxant for use in pregnant women. Nonsteroidal anti-inflammatory drugs are contraindicated because of their effects on the ductus arteriosus, and they can also inhibit labor in the third trimester.

Gestational age plays an important role in determining which medications are safe during each phase of fetal development. The medication risk labels can change during a 9-month pregnancy, depending on the vulnerability of the fetus at any given trimester. The safety of medications during pregnancy are categorized in Table 2.

Every year 75,000 pregnant women undergo nonobstetrical surgery. Many pregnant women are safely anesthetized daily without adverse effects to fetus or mother. Nearly all anesthetics and analgesics used in pregnancy are category C. Almost all teratogenic medications have the same effect on animals as on humans, which makes animal study results very reliable and applicable. In selected cases a spinal or epidural anesthetic is preferred over a general anesthetic. In addition plain xylocaine can be used safely as a local anesthetic with attention not to exceed the toxic dose.

Goals of surgical fracture management include safe, expedient, stable, and appropriate treatment done in a timely fashion. In most cases, emergency surgery may be safely performed on a pregnant patient. All fractures that need reduction and fixation should be treated as such regardless of the pregnancy status. Most extremity fractures are managed in the same manner they would be in a non-pregnant patient. In cases where surgery is not absolutely indicated the patient may make her own decision regarding surgical versus nonsurgical treatment after she weighs the risks against the benefits of surgery

and anesthesia and its clinical consequence for the patient and the fetus. Some patients who may be of advanced maternal age or who have lost a pregnancy may choose to avoid surgery and deal with a late stage reconstruction if necessary as in a subtle Lisfranc joint fracture dislocation.

There has been an evolution of surgical technique and associated newer fixation devices and instrumentation. The surgeon should choose the fixation technique that requires the least amount of radiation without compromising the final result. An open procedure may be preferred to a percutaneous technique. An external fixator may be considered for some fractures that are intra-articular.

The evaluation and treatment of the pregnant patient with foot and ankle injuries presents a challenging opportunity to the podiatric physician. The judicious use of radiologic testing for diagnostic purposes and clinical decision making must be carefully considered in an expedient time frame. The appropriate decisions should be made regarding radiographic imaging, fetal monitoring, the timing and indications for surgical intervention and the

proper use of medications and anesthesia in the perioperative course. The obstetrician should be consulted and the need for fetal monitoring should be decided. An organized approach by a knowledgeable multidisciplinary team maximizes the likelihood of an optimal outcome for both the pregnant patient and the fetus.

## REFERENCES

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