

# Neurology of Pregnancy

## A Case-Oriented Review



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### KEYWORDS

• Pregnancy • Stroke • Eclampsia • Multiple sclerosis • Epilepsy

### KEY POINTS

- The anatomic and physiologic changes of pregnancy, although advantageous, may in some instances predispose to pathology.
- Treatment of women with an ischemic stroke during pregnancy should be based on their stroke characteristics. Both intravenous t-PA and endovascular therapy should be offered for qualifying strokes.
- Eclampsia and reversible cerebral vasospasm syndrome have a shared pathology and occur along a clinical spectrum.
- Pregnancy has no effect on multiple sclerosis severity or disability.
- Women with epilepsy planning to become pregnant should have their seizures under optimal control, on the least teratogenic anticonvulsant that controls their epilepsy, and be maintained on folate. Serum levels of many antiepileptic medications need to be followed in pregnancy because of altered metabolism.
- Compression neuropathies in pregnancy and the postpartum period are common and usually resolve.

### PREGNANCY PHYSIOLOGY

In pregnancy, the blood volume increases by about 1500 mL mainly because of the expansion of plasma volume. In fact, the blood volume may increase by 10% by 7 weeks of pregnancy.<sup>1</sup> The red cell mass also increases, but not in proportion to the change in plasma volume. This results in the physiologic anemia of pregnancy, which is maximal by 30 to 32 weeks. In pregnancy, blood pressure (BP) decreases to reach a nadir at 28 weeks of gestation. The decrease in BP is caused by lower systemic vascular resistance. The result is an increase in cardiac output and heart rate.<sup>2</sup> Thus the hemodynamic changes of pregnancy are characterized primarily by volume expansion and a decrease in vascular resistance.<sup>3</sup>

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Drug metabolism is affected in several ways. First, systemic absorption is altered for many medications. In addition, glomerular filtration rate increases by 40% to 50% in pregnancy with increased renal clearance of medications. Both the increase in maternal total body water and the decrease in albumin changes drug distribution and the bioavailability or free drug. Finally, alterations in hepatic function may affect drug metabolism. Serum levels of medication may also be decreased by the induction of the cytochrome P-450 system and because of increased hepatic extraction related to increased blood flow.<sup>4</sup>

Pregnancy is a hypercoagulable state particularly in the last trimester and postpartum as a means to prepare for labor and delivery. Fibrin generation is increased. This occurs because of increased levels of the procoagulant factors II, VII, VIII, IX, X, XII, and XIII, and because of a decrease in the anticoagulant proteins antithrombin III, protein S, and acquired resistance to activated protein C. Uncomplicated pregnancy is accompanied by substantial increase in markers of thrombosis and fibrinolytic activation, the latter reflected by increased D-dimer levels.<sup>5</sup>

Lastly, pregnancy is a state of relative immune tolerance. This immune tolerance seems to be mediated by regulatory T cells, which suppress maternal recognition of the semiallogeneic tissue of the fetus.<sup>6</sup> Immune tolerance may affect those disorders that are T-cell mediated.

### **CASE 1: ACUTE ISCHEMIC STROKE DURING PREGNANCY**

A 28-year-old woman G2P1 (G = gravidum, number of pregnancies; P = partum, number of births) at 30 weeks gestation was last seen well at 10 AM. She was found on the ground not speaking or moving her right side at 10:50 AM. On initial examination, she was mute with a left gaze deviation and a dense right hemiplegia.

#### **Questions**

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- What is the most appropriate initial imaging test?
- Should she receive intravenous tissue plasminogen activator (IV t-PA)?
- Is she a potential candidate for intra-arterial (IA) therapy?
- What are the most likely mechanisms for stroke during pregnancy?

#### **Imaging During Pregnancy**

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Imaging during pregnancy is often necessary. In general, MRI is the imaging modality of choice. There have been no fetal harmful effects related to MRI in field strengths up to 3 T. The mother's health is the most important factor in maintaining the health of the fetus. Therefore radiation and contrast concerns should not delay critical imaging. Computed tomography imaging raises concern about fetal exposure to ionizing radiation. The level of radiation exposure from most diagnostic imaging is far below that known to cause fetal anomalies. However, not all effects of radiation are dose dependent. Therefore a risk-benefit analysis should be done to weigh the importance of a computed tomography scan on deciding emergent therapy. In an emergency the most appropriate imaging to take care of the mother and give the necessary answer to enable treatment is appropriate. In this case, a head computed tomography without contrast was done and was unremarkable.

#### **Safety of Intravenous Tissue Plasminogen Activator in Pregnancy**

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Acute stroke treatment within 3 hours from onset with IV t-PA is a Food and Drug Administration approved treatment of ischemic stroke, and the American Stroke Association/American Heart Association endorses the extension of the treatment window

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