Stroke in pregnant and postpartum women

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DISCLOSURES

FINANCIAL DISCLOSURE

- The speaker has nothing to disclose

UNLABELED/UNAPPROVED USES DISCLOSURE

- The speaker has nothing to disclose
OBJECTIVES

- Describe epidemiology of stroke in pregnancy
- List changes in pregnancy that lead to ischemic or hemorrhagic stroke
- Discuss safety of different radiological procedures and common treatment methods in pregnancy
Ischemic stroke
Hemorrhagic stroke

Subarachnoid hemorrhage

Intracerebral hemorrhage

www.mayoclinic.org
Epidemiology and Timing of Stroke

- 13-29 per 100,000 deliveries in the US
- Many strokes happen due to conditions which existed before pregnancy
- Strokes happen more commonly later in pregnancy and postpartum.

Sidorov et. al, Expert Rev. Card. Ther
Strokes secondary to condition not specific to pregnancy

- Carotid and vertebral artery dissections
- Cardiac arrhythmias
- Heart valve disease
- Aneurysm
- Artery-venous malformation
- Sickle cell disease
- Hypercoagulable state

Sidorov et al, Expert Rev. Card. Ther
Stroke Risk Factors During Pregnancy

Increase in the level of estrogen:
1. Increase in pro-coagulants
2. Increase in blood pressure
3. Hyperlipidemia
4. Glucose intolerance

Increase in the level of progesterone:
1. Vasodilation with increase of plasma volume

Placental abnormalities resulting in pre-eclampsia/eclampsia

CVT
RCVS (Multifactorial)

Sidorov et. al, Expert Rev. Card. Ther
Coagulation System During Pregnancy

- Increase in plasminogen activator inhibitor
- Rise in Activated Protein C resistance
- Increase in factor VII
- Increase in Fibrinogen level
- Factor V activity
- Drop in Protein S

Sidorov et. al, Expert Rev. Card. Ther
Timing of Ischemic Stroke in Pregnancy

Yoshida et al., Stroke

The graph shows the timing of ischemic strokes during pregnancy and postpartum, categorized into arterial and venous cases. The y-axis represents the number of cases, and the x-axis indicates different time periods: T1, T2, T3, Delivery, Post Partum <24H, and Post Partum ≥24H.
Timing of Hemorrhagic Stroke in Pregnancy due to Aneurysm and AVM

Yoshida et. al, Stroke
Hemorrhage from HTN and HELLP During Pregnancy

Yoshida et. al, Stroke
Pre-eclampsia and Eclampsia

- 5-10% of all pregnancies
- Ischemic and Hemorrhagic Stroke

Severely elevated blood pressure

- Vasoconstriction & endothelial injury
- Disruption of blood brain barrier (PRES)

Ischemic Stroke

Hemorrhagic Stroke

Sidorov et. al, Expert Rev. Card. Ther
Posterior Reversible Vasoconstriction Syndrome (PRES)

- 31 y.o. woman; 36 weeks pregnant presented with:
  - Headache
  - Generalized tonic-clonic seizure
  - Encephalopathy
  - Blindness (only counts fingers)
- No previous history of seizures or hypertension
- BP on arrival to ED: 218/113 mmHg
Posterior Reversible Vasoconstriction Syndrome (PRES)

Tchao et al, Case Rep. Rad
Posterior Reversible Vasoconstriction Syndrome (PRES)

Management:
- Aggressive BP management, magnesium showed to be beneficial
- Delivery
- Repeat imaging may be warranted in 12 weeks

Prognosis:
- Favorable if hemorrhages are small
- ICH may lead to permanent damage
Follow-up 12 weeks:

- Complete resolution of a headache
- Blood pressure 131/80mmHg, does not require BP medications
- Left visual field has still patchy loss – followed by neuro-ophthalmologist for formal visual field evaluation
Reversible Cerebral Vasoconstriction Syndrome (RCVS)

- Thunderclap headache like never before, confusion
- Diagnosis: Clinical presentation + Images
  - Head CT or MR may be normal
  - Vascular imaging shows vasospasm
    - CT angiogram
    - MR angiogram
    - Conventional angiogram
- Complications:
  - Ischemic or hemorrhagic stroke
Reversible Cerebral Vasoconstriction Syndrome (RCVS)

- 35 y.o. woman; 2 weeks postpartum
- PMH: Migraines with aura
- Current presentation: sudden thunderclap headache and numbness with **weakness** and tingling on left face, arm and leg, disorientation
- Similar presentation 1 week ago, but no weakness; treated for migraine exacerbation and D/C from ED; Head CT was normal
- Conventional treatment of headache does not help
Reversible Cerebral Vasoconstriction Syndrome (RCVS)
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Reversible Cerebral Vasoconstriction Syndrome (RCVS)

- Differential: Vasculitis, Atherosclerotic disease

- Treatment:
  - Headache management (narcotics are ok)
  - Observation
  - Calcium channel blockers (nimodipine, verapamil)

- Prognosis:
  - Good, long term complications are rare
  - Recurrence is rare

- Follow up 12 weeks:
  - Complete resolution of symptoms
Cerebral Venous Sinus Thrombosis (CVT)

- **When:** 3d trimester and puerperium
- **Presentation:** Progressive headache and encephalopathy
- **Diagnosis:** CT-venogram, MR-venogram, angiogram
- **Treatment:** Anticoagulation (warfarin, heparin, NOACs?)

Cerebral Venous Sinus Thrombosis (CVT)

- 28 y.o. right handed woman; 34 weeks pregnant
  - Progressive headache for week
  - Blurry vision, especially when she bends forward
  - Headache cannot be controlled, 2 ED visits
  - Recent worsening of a headache + left side numbness and weakness

- Exam:
  - Left facial droop, left hemiparesis and sensory loss papilledema
Cerebral Venous Sinus Thrombosis (CVT)
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Cerebral Venous Sinus Thrombosis (CVT)

- **Key points:**
  - There is no venous infarct
  - Headache is secondary to increase ICP

- **Treatment:**
  - Anticoagulation 3-6 months
  - Observation
  - Acetazolamide, if benefits outweigh the risk (Class C)
Peripartum cardiomyopathy

- Decrease in pumping function of the heart due to diffuse weakness in heart muscle (decrease in EF)
- Heart function returns to normal >50%
- Systemic embolism: 20-25%
- Ischemic strokes: 5%
- Presents like typical embolic stroke with occlusion of large vessel

Sidorov et. al, Expert Rev. Card. Ther
Peripartum cardiomyopathy

- 22 y.o. woman, 1 week postpartum presents with sudden onset of right side weakness and speech difficulties
- NIHSS 7 (Right hemiparesis and aphasia)
- No previous medical history
- Not on any medication
- No headache at presentation
- 5 hours last known well
Peripartum cardiomyopathy
Peripartum cardiomyopathy
Peripartum cardiomyopathy
Peripartum cardiomyopathy

- Next day... Neuro ICU
- Echocardiogram: EF=10-15%
- Patient requires pressor
- Anticoagulation is started for secondary stroke prevention...
Role of nurse in evaluation of pregnant with stroke

- Recognize change in patient’s condition
- Understand what this change may mean
- Know consequences of your decisions
- Know what medications patient takes
- Report to physician:
  - New focal neurological findings
  - Change in mental status
  - Blood pressure
Role of physician in evaluation of pregnant with stroke

- Develop appropriate protocol for evaluation of pregnant with suspected stroke
  - Covers diagnostic tests for all conditions associated with pregnancy
  - Minimizes risk of for women and infant
  - Collaborate with other specialties including OBGYN, cardiology, hematology etc.
Safety of medications in pregnancy

- **Aspirin < 150mg:** Safe *(second and third trimester, first trimester unknown)*
- **Clopidogrel:** Safe *(can provoke hemorrhage)*
- **Warfarin:** Do NOT use first trimester *(15-56% risk of miscarriage and 30% risk of developmental abnormalities if used in weeks 4-8)*
- **Heparin:** Safe *(does not cross placental barrier)*
- **Dabigatran, rivaroxaban, apixaban:** No data to confirm safety
- **Thrombolysis:** Safe, risk of bleeding in one study 8%

Sidorov et. al, Expert Rev. Card. Ther
Safety of radiological tests in pregnancy

- **Head CT**: Safe (less than 5 rad exposure), there might be a slight risk of leukemia in child
- **Head and neck CTA**: Safe if used once, may increase risk of hypothyroidism, especially in premature infant
- **MRI**: Safe, but advised not to use in first trimester
- **MRI with contrast**: No agreement, Category C

Sidorov et. al, Expert Rev. Card. Ther
Questions 1

The most common type of stroke during pregnancy is:

- A. Ischemic
- B. Intracerebral hemorrhage
- C. Subarachnoid hemorrhage
- D. Subdural hematoma
- C. Spinal cord infarction
Reversible Cerebral Vasoconstriction Syndrome (RCVS) commonly presents with thunderclap headache.

- True
- False
Questions 3

- Cerebral sinus thrombosis (CVT) is more common in third trimester and postpartum
  - True
  - False
Questions 4

What is the risk of performing CT angiography during pregnancy?

- A. It leads to eclampsia
- B. Infants may develop hypothyroidism
- C. Pregnant have higher risk of anaphylaxis with iodine contrast
- D. Infants may develop kidney abnormalities later in life
Question 5

Warfarin is safe in the first trimester of pregnancy.

- True
- False