IN THE NAME OF ALLAH

Pregnancy and the Vascular Lesion

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Importance

A Cerebrovascular lesion in the setting of Pregnancy Presents a Unique Neurosurgical dilemma in which the ***health of two patients - mother and child – are at stake.***

Cerebrovascular disorders during pregnancy and the puerperium are ***infrequent*** but can be ***devastating to the mother and fetus.***

Cerebrovascular disorder during pregnancy results in ***higher maternel and fetal mortality and Morbidity rates*** than in nonpregnant women of the same age.

Incidence:

Uncertain

Estimates range from 0.3 to 9 per 100000 delivers.

Of the maternal deaths however ***12% to 80% are due to cerebrovascular disease.***

Neurovascular Lesions

1. Aneurysmal subarachnoid hemorrhage (SAH)
2. Arteriovenous malformations (AVMS)
3. Intracerebral hemorrhage (ICH) secondary to hypertension.
4. Thrombosis of the intracranial venous sinuses.
5. Moyamoya disease.
6. Venous angiomas.
7. Metastatic choriocarcinoma.
8. Carotid – cavernous fistula.
9. Piturtary apoplexy.

Aneurysmal Subarachnoid Hemorrhage

* Intracranial hemorrhage
  - Intracerebral hematom (ICH)
  - Subarachnoid hemorrhage (SAH)

* SAH accounts for approximately half the cases of intracranial hemorrhage in pregnant patients.

SAH/ Causes

*** Aneurysms (Majority of SAH)**

- AVMS
- Mycotic aneurysms
- Postpartum angiopathy
- Unidefinitiable causes
- Cerebral angioma

*** Aneurysm rupture reportedly occurs 3 times more often then rupture of an AVM**

- Moyamoya disease
- Dural venous sinus thrombosis
- Chorio carcinoma
- Vasculitides
- Brain tumor
- Coagulopathies
- Drugs such as cocaine and phenylpropanolamine

SAH/ Incidence

* 0.01 % to 0.05% of all pregnancies (1 to 5 per 10.000 pregnancy)
* This equates to 1 per 10.000 , which is ***five times higher*** than in nonpregnant patients.
* Mean age for pregnant patients with aneurysmal hemorrhage to be 29.4 years.
* Mean gestational age to be 30.5 weeks.

* SAH accounts for approximately ***5% of maternal mortality*** a figure that has stayed consistent overtimes.
* It is at least the third most common non obstetric cause of maternal death.
* In some regions SAH is the leading cause of non obstetric maternal death.
* Overall mortality rate 35% which is comparable to that in the non pregnant population.

*The second and third trimesters of pregnancy are associated with an ***elevated risk for rupture*** because of the ***increase in cardiac output*** that takes place after the trimester.(85%)

* This risk peaks at 30 to 34 week's gestation.

* Physiological changes : increase in blood volume , stroke volume , cardiac output estrogen levels.

* Aneurysmal rupture is also more common during the ***actual time of labor and delivery*** , presumably because of the ***hypertensive nature of child birth***.

* SAH has been found to affect primiparous women more than multiparous women.

* Okamoto and coworkers found that ***null gravidity*** conferred a ***fourfold*** increased risk for aneurysmal SAH.

* Patients with earlier menarche (defined as onset before the age of 13 years) had a three fold increased risk.

* In a Taiwanese cohort , older age at first pregnancy and earlier pregnancies were risk factors.

* Another study found that older age at first pregnancy was protective.

Management

* Management of SAH is complicated by the fact that ***two patients*** are involved , not just one.

* Treatment of aneurysmal SAH

1- Medical stabilization of the patients.

2- Placement of arterial catheter

3- Monitoring of blood pressure.

4- Treatment of hypertension and hypotension , maternal hypotention should be avoided because the fetus is passively dependent on maternal blood pressure for adequate perfusion and is vulnearble to maternal hypotension.

5- Seizure prophylaxis

6- Treatment with nimodipine in anticipation of vasospasm are important.

7- Continuous fetal heart rate monitoring is essential .

8- Adequate analgesia sedation and antiemosis should be provided.

9- Management of aneurysmal SAH in pregnant patients should be the same as in patients who are not pregnant.

10- Endovascular techniques for treating aneurysms have been used and reported increasingly in pregnant patients with good outcome in both the mother and fetus.

* The risk for recurrent bleeding during the reminder of pregnancy in patients with an untreated aneurysm is 33% to 50% with a maternal mortality rate of 50% to 68%.

* surgical treatment of a ruptured aneurysm was associated with significantly lower maternal and fetal mortality rates than was conservative treatment (Dias and Sekhar).

* Unruptured aneurysms should be treated if they are symptomatic or enlarging.

- After ward the pregnancy can be allowed to progress to term.

- Such an approach of treatment of the aneurysms followed by ***delivery of the child*** has been found to result in good outcomes for both patients.

- In more ***complicated cases*** , however , it has been a good that ***treatment of the aneurysm*** should follow delivery of the ***child via cesarean section.***

* The optimum mode of delivering a child in a patient with a treated or treated ancarysm ***is debatable.***

Vaginal delivery is preferred by most clinicians with just ***three indication for cesarean sections.***

1- If the clinical state of the mother is severe.

2- If the aneurysm is diagnosed after time of labor .

3- If the internal between labor and treatment of the aneurysm is less than 8 days. (Mosie wicz and co-worker.

* Every pregnant patients with SAH should deliver via cesarean section.

* Therapy should not be with held from the patient because she is pregnant.

* ***Hyperthermia during neurosurgery usually is well tolerated*** by the fetus , although hypotension should be avoided if at all possible.

* If the patient ***required neurosurgery near term, cesarean section*** just prior to the craniotomy may avoid fetal compromise if the fetus is matura.

* Other wise , there is usually ***no maternal benefit to terminating the pregnancy.***

* Patients who experience an intracranial ***hemorrhage within 2 months of delivery*** or who have ***an unrepaired aneurysm should not perform the valsalva maneuver during labor. epidural anesthesia and assisted vaginal delivery are indicated.***

Out Comes

* In most series , ***maternal mortality*** rates from SAH rang from ***30% to 50%*** . But rates a high as 83% have been reported.

* Overall maternal mortality rate from aneurysmal ***SAH to be 35%*** , similar to that in the non pregnant population.

* The ***fetal mortalit***y rate was ***17%***.

* The maternal mortality rate after SAH varies directly with clinical (Hunt and Hess) grade , with a peak reached at Hunt and Hess grade V.

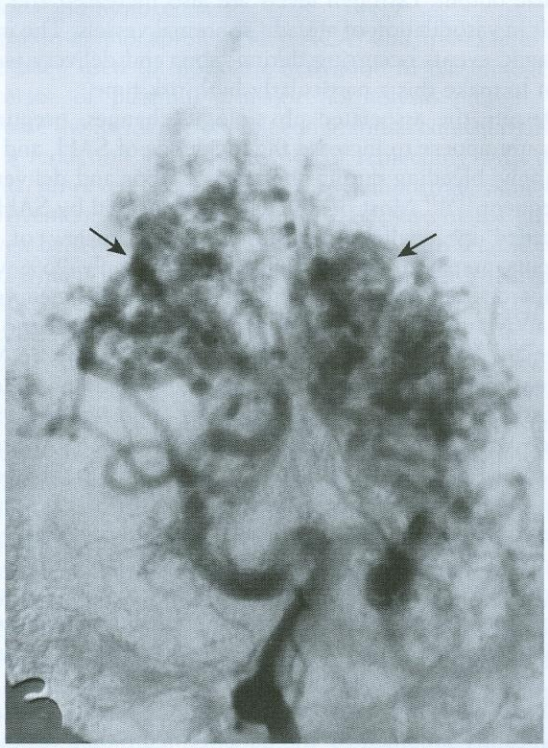
* The maternal mortality rate in patient ***undergoing antepartum surgery for ruptured aneurysms (11%)*** was significantly ***lower than*** that for patients ***not undergoing surgery (63%)***

* The ***fetal mortality*** rate was significantly ***better after surgery 5%)*** than without surgery ***(27%).***

ARTERIOVENOUS MALFORMATIONS (AVMs)

* AVMs account for 21% to 48% of hemorrhages during pregnancy and the puerperium.
* Whether pregnancy confers an increased risk for AVM ruptur is contraversial.
* Some authors have found an ***increased risk for rupture*** and attributed such findings to the ***augmented cardiac output*** associated with pregnancy howevers do not find such an increased risk.
* In untreated ruptured AVMs , sadasivan and colleagues found the incidence of rebleeding to be 27%.

FIGURE 48–6
Conventional cerebral angiography documents large, bilateral cerebral arteriovenous malformations (*arrows*).



Management

* Management of AVMs during pregnancy follows the principle of ***intervening only of needed.***
* Sadasivan and associations propose the practice of ***operating on the AVM only in emergency situations***.
* In stable patients delivery of the child should come first.
* Given the ***hypertensive nature of natural childbirth*** most authors advocate obstetric management via ***cesarean section.***

* During pregnancy ***total blood volume can increase*** by up to 40% while ***cardiac output can increase*** by up to 60% to match the ***increasing vascular bed*** demanded by the fetus. ***Arterial pressures*** can very during pregnancy ; however , ***hypertension*** can occur near delivery.

* Although these hemodynamic alterations during pregnancy have been thought to play a ***participating role in the occurrence of AVM hemorrhage*** , it is unclear as to whether there is an increased statistical risk.

* It is a however , believed that ***pregnancy does increase the risk of hemorrhage*** , it generally tends to occur in the ***second and the third trimesters and the early postpartum period.***

* If a pregnant patient presents with a hemorrhage from an AVM, the ***risk of rebleed*** during the some pregnancy can be up ***to 27%*** ; this risk can be mitigated only with total resection of the AVM.

* ***Treating an AVM during pregnancy , however , entails, risk to both mother and fetus.***

* Given its risk to the fetus and its slow rate of occlusion , ***radiosurgery is not a viable option during*** pregnancy.

* ***Endovascular therapies*** even as an of exposing the fetus adjunct , pose added risks ***radiation, intravenous (IV) contrast*** agent , and ***embolic solvents.***

* Therefor , ***micro surgical resection may be the only tool of the patient*** wishes to have treatment be fore delivery.

* In general , definitive ***treatment of the AVM should be deferred until after the pregnancy is over.***

* The patient needs to be followed in ***a high- risk pregnancy setting*** and ***delivered by cesarean section*** .

* If a patient present with ***a life –threating intracranial hemorrhage*** , immediate ***surgical evacuation is necessary for stabilization.***

* Other wise , a careful discussion with the patient and the family should be done regarding the risks of hemorrhage and disability with intervention.

* Pregnant patients with unruptured AVMs should consider ***definitive treatment after parturition*** .

* These patients may present ***with seizures*** that are best controlled ***medically with anticonvulsants***.

* The patient should be aware that although these medications may pose a minimal teratogen risk , especially in the first trimester , they provide the safest option for both mother and child as opposed to immediate surgical treatment.

Post partum cerebral vasospasm

* Cerebral vasospasm is a rare complication of pregnancy and usually occurs during the post partum period and ***for 3 weeks after delivery.***

* The cause is not understood , but evidence indicates that post partum vasospasm is a ***variant of eclampsia.***

* Clinical findings include severe headache , ***fluctuating neurological deficits*** and stroke.

* Hyperdynamic therapy combined with ***nimodipine*** may be an effective treatment of this disorder.

Carotid- Cavernous Fistula

* The ***spontaneous formation*** of a carotid-cavernous fistula is rarely associated with pregnancy and the puerperium.
* Hemodynamic changes , combined with alterations in blood vessel walls concomitant with pregnancy , may predispose to this lesion.
* The most common initial symptom is unilateral ***frontal headache*** often accompanied by ipsilateral ***conjuctival injection*** and ***visual symptoms***.
* This lesion tends to occur during ***the second half of pregnancy*** or the ***puerperium***.
* The fistula ***resolve spontaneously in 60% to cases*** although successful treatment by embolization of ***the carotid*** artery has been reported.

Intracerebral Hemorrhage (ICH)

* Although some ICH is secondary to AVMs, others are ***spontaneous in nature.***

* Non –AVM-relater ICH accounts ***for 5% of maternal mortality*** and ***half to the cases of intracranial hemorrhage.***

* Roughly ***a third of cases*** are associated ***with eclampsia.***

Moyamoya disease

* There have been a couple of cases of moyamoya disease manifested during pregnancy .

* Miyakawa and coauthors recommend ***elective cesarean section*** in such cases given that intracranial hemorrhage is associated with bearing down and active labor provokes ***hyperventilation – induced cerebral ischemia and hypertension.***

SUMMARY OF MANAGEMENT OPTIONS

Cerebrovascular Disease

Management Options	Evidence Quality and Recommendation	References
Ischemic Stroke (Arterial) and Transient Ischemic Attacks		
General supportive measures (see Chapter 78)	—/GPP	—
Search for cause/associated factors:	III/B	62,66
• Investigate CBC, clotting and thrombophilia screen, renal and liver function routinely; other investigations determined by possible cause.		
• Treat thrombolic/embolic conditions (see Chapters 41, 42, 43, and 78).		
• Cause is unknown in 20%–40%.		
Consider anticoagulation with heparin if no evidence of hemorrhage on MRI or CT.	III/B	62,66
Indications for surgery are as for nonpregnant patients.	III/B	62,66
Cerebral Venous Thrombosis		
Control seizures.	III/B	107,111
Ensure adequate hydration.	III/B	107
One randomized case-controlled study suggests anticoagulation beneficial.	Ib/A	116
No experience in pregnancy with thrombolytic therapy.	III/B	117
Subarachnoid Hemorrhage		
Diagnosis		
(following high index of clinical suspicion) by, in order:	IV/C	119
• CT scan.		
• Lumbar puncture.		
• Cerebral angiography (or MRI).		
Management—Prenatal		
Arrange for interdisciplinary care with neurosurgeons.	—/GPP	—
In general, normal neurosurgical principles of management apply in pregnancy, though care needed intraoperatively with		
• Hypotension.	IV/C	132
• Hypothermia.	IV/C	136
Anticonvulsants, high-dose steroids, mannitol, and nimodipine (safe in limited pregnancy experience) are used depending on clinical picture/problems.	IIb/B	137
Use caution with EACA.	Ia/A	139
Trend for early surgery.	III/B	119
Embolization prior to or without surgery is a new development.	IV/C	131
Management—Labor and Delivery		
Regional analgesics preferable to narcotics and general anesthetics.	—/GPP	—
No evidence to support blanket policy of elective cesarean section, but most advocate	III/B	40,119, 127,129
• Minimizing pushing in second stage.		
• Cesarean section for normal obstetric reasons.		
• Consider life-support machine and care in patient with brain death to gain fetal maturity.		

STROKE

Definition : (WHO)

Neurological deficit of cerebrovascular cause that persists beyond 24 hours or is interrupted by death within 24 hours.

Incidence: 0.004% to 0.2% of all deliveries.

The risk for stroke in a pregnant patient is 13 times higher than in an age – matched nonpregnant patient.

Generally the risk for stroke in a pregnant patient is at its peak during delivery.

Specifically the risk is greatest 2 days before delivery and 1 day after.

An increased occurrence of stroke 6 weeks after delivery.

Racial differences in pregnancy – related stroke with an increased in patients of Asian decent.

causes

* arterial occlusio
* Venous thrombosis
* Preeclampsia

- Stroke / Arterial embolism or thrombosis
  - 60% to 80% of cases of ischemic stroke.
- Second and third trimesters of pregnancy and during the first week after delivery
  - Hypercoagulable state in the latter stages of pregnancy and the puerperium.

- Stroke / Radiological and laboratory investigation .
  - CT
  - MRI
  - Angiography
- Laboratory investigation : CBC , electrolyte, ESR coagulation studies U/A.
  - CX Ray , EEG , echocardiogram
- Transesophageal echocardiography is superior to transthoracic echocardiography.
  - Carotid duplex ultrasound
  - MRA for extra cranial carotid disease

- Stroke / Treatment
- Antiplatelet agents
- Anticoagulation
- Appropriate medical care:
- Antibiotics
- Anticonvulsant

- Stroke / Intracranial venous thrombosis (IVT)
  - Incidence:
    - 1/2500 to 1/10000 deliveries
- 20% to 40% of cases of ischemic stroke during.
  - Pregnancy
- It is more common in pregnant women than in nonpregnant women.
  - This disease tends to develop in multiparous women ……to 4 weeks after child birth.
- With most cases occurring in the second or third postpartum week.

- (IVT)
- More than 70% of cases involve occlusion of multiple venous sinuses or cerebral veins .
- Cortical veins are involved more commonly than deep cerebral and cerebellar veins.

(IVT)

Signs & Symptoms

Headache is most common initial symptom.

Nausea and vomit tony

Seizures

Focal neurological deficits

Freer

Altered mental status

- IVT/ Diagnosis
  - Clinical findings
  - Radiological studies
    - + CT
    - +MRI
- Investigation of possible predisposing factors
  - Coagulation studies

- IVT/ Treatment
- Adequate hydration
- Treatment of elevated intracranial pressure
- Hydrocephalus
- Seizure
- High doses of heparin (1000IU/h to start , PTT> 1.5 to 2 times contract)
- Endovascular fibrinolysis + heparinization
- Surgical thrombectomy
- Treatment of underlying predisposing disorders such as sinusitis.

- IVT (Intracranial venous thrombosis)
  - Mortality rates 33%
- Recovery without significant neurological disability 59%

- Stroke / Postpartum Cerebral Angiopathy (PCA)
  - PCA is a disorder of blood vessels in recently pregnant patients.
    - Subdivided in to three categories:
  - Primary PCA occurs without a known etiology.
    - Secondary PCA results from medications, particularly ergat derivatives.
  - Tertiary PCA occurs in the setting of eclampsia
    - Angiography in patients with PCA reveals irregular narrowing of affected blood vessels.

THE END