Stroke And Pregnancy: A Literature Review

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Abstract

Stroke in pregnancy is associated with an increased incidence of stroke in young women. Although the incidence is rare, it has implications for the management of childbirth and the patient itself. Pregnancy and the puerperium are protrombotic conditions. During pregnancy and 6 weeks postpartum, all women have an increased risk for developing thromboembolic disease. Maternal physiological changes during pregnancy are characterized by changes in hormonal status, including the hemostasis and hemodynamic systems. It also increases morbidity and mortality due to stroke in pregnancy.

INTRODUCTION

The latest report from the Confidential Inquiry into Maternal Death in the United Kingdom, states that thromboembolism is a direct cause of postpartum death. The incidence of postpartum stroke or related to pregnancy varies between 11-26 deliveries per 100,000 population. Several studies show the incidence of stroke in young women of reproductive age of approximately 10.7 per 100,000 and some of these rates are related to pregnancy and childbirth. Of 3300 deliveries, it can be seen that stroke is related to pregnancy every 9 months to 2 years. This is the reason that the need for management with a multidisciplinary team includes neurologists, obstetricians, and medical rehabilitation services to overcome this condition. In one study it was found that the incidence of ischemic stroke was 11 / 100,000 deliveries with the postpartum period being the most frequent phase resulting in the incidence of ischemic stroke. In the same study also revealed that the incidence of intracerebral hemorrhage 9 / 100,000 births. This also happens a lot in the post partum period (Rosamond et al, 2008)

Table 1

Adapted from : Rosamond et al, 2008

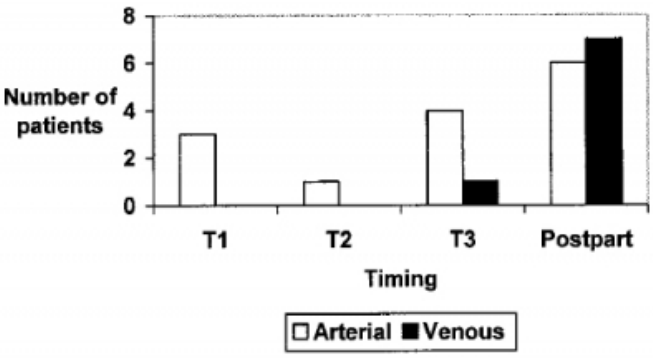
TABLE 1. Frequency of Stroke Associated With Pregnancy

Frequency	All Strokes	Infarction	Hemorrhage
No. of events per 100 000 deliveries	67	41	26
Corrected no. of events per 100 000 deliveries*	26	18	8

Tendency of the incidence of arterial strokes tends to increase in the third trimester and postpartum period, whereas venous strokes occur mostly in the puerperium (Bogousslavsky, 1992)

Figure 1

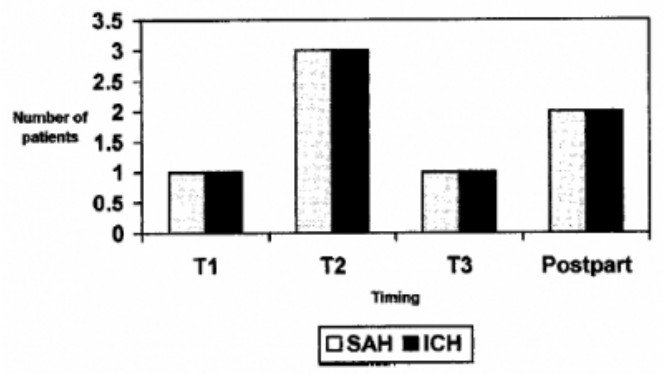
Insidence thrombosis in pregnancy (Sharhar et al, 1995)



A cohort study in Sweden said that of 1 million deliveries in an 8-year period there was an increased risk of both ischemic stroke and bleeding on the second day before and 1 day after delivery.

Figure 2

Incidence of Haemorrhage in pregnancy (Sharshar et al, 1995)



This incidence rate decreases after 6 weeks post partum period. In this study also revealed that an estimated 10-13% mortality in patients with stroke associated with pregnancy. This condition is also affected by race (black women have a higher incidence), age (older age increases the risk of death) and prenatal care (Sahrshar et al, 1995).

PATHOPHYSIOLOGY

Maternal changes during pregnancy

Maternal physiological changes during pregnancy are characterized by changes in hormonal status, including the hemostasis and hemodynamic systems. The relationship between this adaptation condition and the risk of ischemic stroke remains unclear and the relationship between the two is very complex. (Bremme, 2003)

Normally, pregnancy is significantly associated with changes in venous flow and molecular mediators of hemostasis so that to balance this condition will result in a hypercoagulable effect. (Liang et al, 2006)

a. Changes in hemostasis

These procoagulant changes occur immediately in the postpartum period. It is thought to be related to the detachment of the placenta and the formation of a thromboplastin agent at that site. The process of blood coagulation and fibrinolysis will return to the condition before pregnancy within 3 weeks after delivery. (Awada et al, 1985; Kittner et al, 1996)

Table 2

Homeostasis during pregnancy (Bremme, 2003)

Procoagulant factors	
Fibrinogen (factor I)	↑
von Willebrand factor	↑
Factors VII, VIII, IX, X, XII	↑
Factors V, XIII	↑↓
Factor XI	C
Factor II	C
Coagulation inhibitors	
Protein S	↓
Protein C, antithrombin III	=
Fibrinolytic factors	
Tissue plasminogen activator	↓
Plasminogen activator inhibitor 1 and 2 (PAI-1, PAI-2)	↑
Thrombin activatable fibrinolysis inhibitor (TAFI)	↑
Others	
Platelet count	↓
Prothrombin fragment 1+2	↑
Thrombin-antithrombin complex	↑
D-dimer, fibrinopeptide-A	↑

↑: increase; ↓: decrease; =: no significant change; ↑↓: early increase followed by decrease; C: controversial data.

This hypercoagulation condition is associated with venous stasis which increases the risk of thromboembolic complications, especially in the third trimester of pregnancy and the puerperium.

b. Hemodynamic changes

In the first 10 weeks of pregnancy, the transfer of body fluid volume will increase along with increasing total body fluids which will continue for 1-2 weeks after delivery. After that it will gradually decrease to normal (Awada et al, 1985; Kittner et al, 1996). This hypervolemic condition is associated with increased fetal and placental requirements resulting in a 30-50% increase in cardiac output, stroke volume, and heart rate. Half of these changes occur during the first 8 weeks of pregnancy which peak at 25-30 weeks of pregnancy. During labor, there is a progressive increase in cardiac output of approximately 30%. Likewise with heart rate. Then on the first day of labor, there is a sharp decrease in stroke volume, heart rate, and cardiac output which gradually decreases to 50% above before the condition of pregnancy for 2 weeks after delivery and returns to normal within 6-12 Sunday. As a consequence of decreased systemic vascular resistance, blood pressure begins to decrease in the seventh week, with the lowest level in weeks 12 to 32, then progressively returns to pre-pregnancy conditions. Venous compliance will increase in pregnancy

which will reduce blood flow, increase stasis, and reduce orthostatic pressure. Changes in the structure of collagen and elastin in the arterial wall will reduce distensibility during pregnancy. (Hunter et al., 1992; Jaigobin et al., 2000)

RISK FACTORS

Based on data obtained from the Nationwide Inpatient Sample in the United States in the period 2000-2001, it is known that there are many medical conditions associated with stroke in pregnancy, such as hypertension, diabetes, heart disease, sicke cell disease, anemia, thrombocytopenia, and thrombophilia. (Awada et al, 1985; Kittner et al, 1996)

Bad lifestyle such as drinking alcohol, smoking and using drugs are significantly related to stroke in pregnancy. Pregnancy and childbirth complications such as infection, transfusion, postpartum hemorrhage, and electrolyte imbalance will increase the risk of stroke in pregnancy. Delivery with a cesarean section for indications of eclampsia will also increase the risk of stroke in pregnancy. (Awada et al, 1985; Kittner et al, 1996; Witlin et al, 1997)

NEUROIMAGING INVESTIGATIONS

Neuroimaging investigations are needed to help diagnose stroke patients. In the condition of pregnancy, resulting in limited imaging modalities performed because there are several modalities that can harm the fetus. The imaging modality that can be performed in pregnancy is Magnetic Resonance Imaging (MRI) which is evidence that it does not harm the fetus. CT or CT perfusion cannot be performed because the radiation effect is feared to have a negative effect on fetal development. (Skidmore et al, 2001; Jeng et al, 2004)

TREATMENT

1. Antiaggregation

The level of safety of aspirin in the first trimester of pregnancy remains unclear, although from several retrospective studies there is no real significance of malformations in the use of aspirin in pregnancy. (Lepercq et al, 2001)

There are no concrete studies on the safety effects of using clopidogrel in pregnancy. While dipiridamol administration there is no disruption of fetal development during pregnancy although it is not supported by many studies. (Sacco et al, 2006)

2. Anticoagulants

UFH and Low Molecular Weight Heparin do not have teratogenic effects as long as the drug does not cross the placental barrier and there is no bleeding in the fetus, although there is a possibility of uteroplacental junction bleeding. Several studies have significantly said that the use of UFH and LMW is safe for the fetus (Lepercq et al, 2001; Sacco et al, 2006; Hodgman et al, 1982)

PROGNOSIS

There are 26% of deaths in pregnant women who experience an acute stroke. The possibility of re-stroke can occur in patients with hypercoagulable conditions such as patients with antiphospholipid syndrome and primary thrombocytosis (James et al, 2005; Ros et al, 2000)

CONCLUSION

Stroke in pregnancy increases the incidence of stroke at a young age. This condition will also increase morbidity and mortality for both mother and fetus. A good and comprehensive management will reduce mortality and will improve the quality of life of patients.

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