

A Case Report on Stroke Rehabilitation during Pregnancy

Judah Leo G. Capistrano and Cynthia D. Ang-Muñoz

*Department of Rehabilitation Medicine,
College of Medicine and Philippine General Hospital, University of the Philippines Manila*

ABSTRACT

A 34-year-old, G5P4, non-hypertensive patient presented with headache, left hemiplegia, and dysarthria on her third trimester. Cranial computed tomography scan revealed a right capsuloganglionic bleed. The biophysical report was essentially normal. Non-surgical management was instituted. The patient was referred for rehabilitation consisting of physical and occupational therapy with fetal monitoring to facilitate optimal functioning. This case report highlights the importance of early multidisciplinary management of a patient with stroke during pregnancy.

Key Words: stroke, pregnancy, rehabilitation, stroke rehabilitation

Introduction

Stroke or cerebrovascular disease is a neurologic syndrome with different vascular etiologies. Stroke in the young is relatively uncommon. It affects adults aged 40 or below and is rare in women less than 35 years of age. Pregnancy is known to increase the incidence of stroke among young females. The risk of cerebral infarction was reported to be 13-fold higher in pregnant than in non-pregnant women.¹ Stroke in young women of childbearing age occurs at a rate of 10.7 per 100,000 deliveries.² Maternal mortality from stroke in pregnancy has been reported to be as high as 26%.² James et al. reported an incidence rate of 34.2 cases per 100,000 deliveries and concluded that the incidence, mortality and disability from pregnancy-related stroke are higher than previously reported.³ Fetal and neonatal outcomes may also be adversely affected; these

include miscarriages, abortions, fetal deaths, stillbirths, and premature deliveries.^{4,5,6}

Two to three pregnant patients with stroke were admitted annually at the Neurology Ward of the Philippine General Hospital (PGH) from 2004 to 2007, with predominance of ischemic stroke. Two cases of intracranial bleed secondary to arteriovenous malformation (AVM) during pregnancy from the Department of Obstetrics and Gynecology, PGH, were reported from 2006 to 2008.^{7,8} A study on maternal mortality in three charity wards at PGH from 1992 to 1993 revealed that three out of 33 maternal deaths were due to intracranial bleed (2) and AVM (1).⁹ Recent search of the local Herdin database did not show any study on stroke in pregnancy.¹⁰

Stroke during pregnancy is a challenge for the rehabilitation medicine specialist. Aside from improving maternal health outcomes, the viability of the fetus is also a consideration. The rehabilitation medicine specialist is beset with several difficulties. Only a few cases of stroke during pregnancy are referred to Rehabilitation Medicine at an early stage. Specific rehabilitation programs for stroke in pregnancy are not available. Pregnant patients with stroke are managed as high-risk patients with obstetrical considerations and precautions. This case report highlights the importance of a multidisciplinary approach in the rehabilitation of a pregnant patient during the acute stroke period.

Case Report

A 35-year-old, right-handed, G5P4 (4004), patient at 26 weeks age of gestation (AOG), was admitted for the first time at the Obstetrics Ward of a tertiary government hospital in August 2007. Approximately six hours prior to admission, the patient complained of sudden onset of severe headache with nausea, dizziness, vomiting, associated with left-sided weakness and slurring of speech. There was blurring of vision but no loss of consciousness, seizure, head trauma, chest pain or dyspnea. The patient had fever and cough. There were no uterine contractions or vaginal discharge or bleeding. She was previously independent in all areas of activities of daily living (ADL). She had no history of stroke, and no known hypertension, diabetes, cardiac disease, bleeding dyscrasias or pre-eclampsia in previous pregnancies. She had meningitis at age 14 years. She had a history of use of oral contraceptive pills (OCP). No

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Corresponding author: Judah Leo G. Capistrano, MD
Notre Dame de Chartres Hospital
25 Upper Gen. Luna Road,
Baguio City, Philippines 2600
Telephone: (074) 6198530 local 109
Email: docapistrano@yahoo.com

prenatal consultations were done and no medications were taken during the current pregnancy. Previous pregnancies were uncomplicated. All the babies were delivered full term via spontaneous vaginal delivery assisted by a midwife. The family history was significant for pulmonary tuberculosis in the patient's mother. The patient is a high school graduate, a married housewife who lives with her husband and four children. She is a non-smoker and non-alcohol beverage drinker. She denied illicit drug use or abuse.

The physical examination on admission revealed a non-ambulatory patient, not in cardiorespiratory distress with pulse rate from 80s to 90s with regular rhythm, and a highest blood pressure (BP) measurement of 130/100 mmHg. The chest, lung, and cardiac findings were unremarkable. The patient presented was pregnant with a fundic height of 26 cm, fetal heart rate of 150 beats per minute at the left lower quadrant, in breech presentation. The patient had no edema. She was drowsy, incoherent, with a Glasgow coma score of 14 (E3V5M6). She had left central facial palsy and intact gross hearing; her tongue was deviated to the left. Her left upper extremity (UE) and left lower extremity (LE) were flaccid with muscle grade of 0/5, withdrawing to painful stimulation. The right UE and LE were graded 5/5, normoreflexive with intact sensation. There were no nystagmus, nuchal rigidity, Brudzinski sign or Kernig sign, or clonus. The Babinski test was positive on the left side.

The admitting impression was: pregnancy uterine, 26 weeks AOG by last menstrual period, in preterm labor; cerebrovascular accident. The patient was referred to the Perinatology Service. Baseline biometry showed a single, live, intrauterine pregnancy, in breech presentation, 26 4/7 to 29 weeks AOG, with good cardiac and somatic activities, and biophysical profile (BPP) score of 8/8, which was essentially normal. Neuro-vital signs and fetal monitoring were done. A nasogastric tube was inserted. The patient was normotensive (BP of 100-130/70-90 mmHg, mean arterial pressure [MAP] of 80-130 mmHg). Lipid profile, blood coagulation studies, blood urea nitrogen, serum creatinine, and electrolytes were within normal limits.

The patient was referred to the Neurology Service. A cranial computed tomography (CT) scan showed right capsuloganglionic bleed, ~30 cc, with perilesional edema and no midline shift or ventricular extension of the bleed (Figure 1). As the patient was not in labor, she was transferred to the Neurology Ward Acute Stroke Unit on the second hospital day. The patient remained drowsy but opened her eyes when she was called by name. She could follow instructions, but was dysarthric. Her corneal reflex responses were brisk, but she had preferential gaze to the right. The patient was managed with mannitol, dexamethasone for fetal lung maturity, citicoline, lamotrigine, tramadol, paracetamol, diazepam for seizure, folic acid, and ferrous sulfate. Precautions against increased intracranial pressure (decreased sensorium, seizure, anisocoria, increased severity

in headache, vomiting) and obstetric precautions (uterine contraction, decreased fetal movement, vaginal bleeding or watery discharge) were observed. Transcranial doppler and carotid doppler studies, and 2D echocardiography were not done due to financial constraints. Four-vessel angiography was to be performed after delivery. The Obstetrics-Gynecology Service suggested an antiphospholipid work-up. The patient remained neurologically stable. She was allowed to have soft diet by mouth with aspiration precautions by the seventh hospital day. Cefalexin was given to control acute tonsillopharyngitis.

The patient was referred for stroke rehabilitation on the ninth hospital day. The rehabilitation problems included: left flaccid hemiplegia; dysphagia (patient with nasogastric tube); dysarthria; dependence in self-care skills, bed mobility and transfers; depression; and potential deconditioning. The patient's Functional Independence Measure (FIM) score was 49/126 (18 is total assistance; 126 is complete independence). The rehabilitation goals for this patient were: to promote a normal course of pregnancy and delivery; to achieve the highest possible level of independence in performing self-care skills and mobility; to facilitate safe swallowing and functional communication; to promote optimal functioning post-partum; and to prevent the recurrence of stroke. The rehabilitation program consisted of physical therapy (PT) with range of motion (ROM) exercises, pulmophysiotherapy, training in bed mobility and sitting, and a positioning program. Occupational therapy (OT) for ADL retraining and dysphagia management was prescribed. There were no new neurological deficits, or maternal or fetal complications. The patient was discharged with the nasogastric tube and at bed level on the 13th hospital day with some functional improvement in bed mobility and self-care skills; the patient's FIM score increased to 59/126. There was no improvement in motor strength but she tolerated sitting on

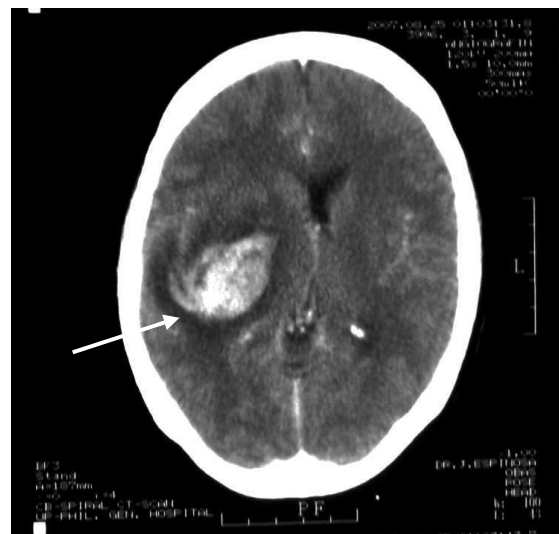


Figure 1. Cranial CT scan showing right capsuloganglionic bleed

high back rest position. She tolerated the soft diet. A home program was provided to facilitate further recovery and to minimize potential complications from prolonged immobility. The patient was advised out-patient follow-up with Neurology, Perinatology, High Risk, and Rehabilitation Medicine Services. She was lost to follow-up in Rehabilitation Medicine.

The patient was readmitted at the Obstetrics Ward in October 2007 at 36 weeks and 4 days AOG and had a term, cephalic, live birth by spontaneous vaginal delivery.

Discussion

Stroke is a rare but potentially devastating occurrence during pregnancy and the postpartum period. Physiologic changes in circulation, vascular tissue structure, coagulability and pre-eclampsia-eclampsia,¹¹ and increase in venous stasis and fluctuating blood pressure² make stroke a major contributor to serious morbidity and mortality in pregnancy. Identification of risk factors and implementation of preventive measures are essential. The management strategies and outcomes are dependent on the health status of the pregnant woman. The diagnosis and management of pregnancy-related stroke is largely similar to that of stroke in non-pregnant patients but with the added consideration of maternal and fetal risks.^{2,12} Post-stroke rehabilitation plays an integral role in the survival and well-being of both the mother and the fetus/child.

A U.S. study showed an overall incidence rate for stroke (first-ever and recurrent) at 259 per 100,000 population.¹³ Incidence rates increased exponentially with age and were consistently higher for males than for females.¹³ The incidence of stroke is low in women of reproductive age. Stroke incidence in women aged 35 to 44 years was reported at 20.6 per 100,000 in the U.S.¹⁴ and ranged from eight per 100,000 in Moscow, Russia, to 55 per 100,000 in Kuopio, Finland.^{14,15} Hypertension, thrombophilia, sickle cell disease, meningitis, head trauma, and other conditions have been associated with stroke in pregnancy. This patient had a history of meningitis. African-American women are at an increased risk; other risk factors include women aged 35 years and older, lupus, blood transfusion, and migraine headaches.³ Childrearing practices with high gravidity and parity¹⁶ and the use of OCP^{5,17} have been implicated. The possible risk factors in this patient include age, high gravidity, and OCP use. She did not have prenatal consultations.

The timing of presentation of stroke in pregnancy is variable: during the first to third trimesters, puerperium, or postpartum. Strokes tend to occur during the third trimester and postpartum period, and cluster in the first post-partum week.¹⁸ Jaigobin also reported most strokes presented during the third trimester and puerperium.¹⁹ The risks of cerebral infarction and intracerebral hemorrhage (ICH) are increased in the six weeks after delivery but not during pregnancy

itself.²⁰ This patient presented with stroke on her third trimester, consistent with the reported increase in stroke incidence.

There are more reported cases of pregnancy-related non-hemorrhagic stroke than the hemorrhagic type. Ischemia or infarction may be caused by vascular thrombosis, embolism, vasospasm, or marked reduction in systemic perfusion pressure. Most non-hemorrhagic strokes in pregnancy are due to arterial occlusion.^{17,19} Cerebral venous thrombosis (CVT) is more common in pregnancy-related stroke than stroke unrelated to pregnancy, and 73% of these cases occurred postpartum.¹⁹ Postpartum CVT and pre-eclampsia-eclampsia are major causes of cerebral infarction and cerebral hemorrhage, respectively.²¹ Women with history of pre-eclampsia were 60% more likely to have non-pregnancy-related ischemic stroke than those without history of pre-eclampsia. Similar patterns were observed in women with pre-eclampsia, suggesting an association between a history of pre-eclampsia and ischemic stroke even beyond puerperium.²² Strokes associated with pre-eclampsia-eclampsia may be cardioembolic; at risk are women with rheumatic valvular heart disease, arrhythmia, and other cardiac diseases.

Hemorrhagic stroke, either intraparenchymal hemorrhage (IPH) or subarachnoid hemorrhage, during pregnancy is rare. In one study, only four patients with IPH were identified among nearly 90,000 women delivering from 1984 through mid-1990 (4.4 per 100,000 deliveries).⁴ In another study, IPH (4.6 per 100 000 deliveries) was as common as ischemic stroke (4.3 per 100 000 deliveries), suggesting that pregnancy may increase the risk of cerebral hemorrhage; this study however, included IPH in the puerperium and 2 weeks post-partum.⁴

The incidence of ICH during pregnancy appeared to be slightly more common in Taiwan (43% to 69%) compared with data from Western studies (33% to 52%).⁵ Eclampsia is the main causative factor in both non-hemorrhagic stroke and IPH. Sharhar et al. reported that IPH associated with eclampsia usually has a poor prognosis.⁴ This patient presented with a hemorrhagic stroke, the exact etiology of which is undetermined. She remained normotensive and was not on anti-hypertensive medications during her stay in the ward. Screening for antiphospholipid antibodies through serology, and AVM and aneurysm by cerebral angiography were not performed.

Stroke rehabilitation provides comprehensive care to patients from acute in-patient rehabilitation to out-patient or home therapy settings. The critical period for stroke rehabilitation is from the first days to weeks after a stroke. There is a significant reduction in combined death and dependency in three models of stroke care studied, with greatest reduction in mortality in post-acute (rehabilitation) units and significant reductions in length of hospital stay in combined stroke and rehabilitation units.²² It was reported

that stroke outcomes were dependent on the initiation of early rehabilitation and not on the duration of rehabilitation.²³

Pregnancy per se is not considered a contraindication for stroke rehabilitation. However, the program should be prescribed in coordination with the obstetrician and the neurologist, with appropriate precautions for the welfare of both mother and fetus. The guidelines for stroke rehabilitation during pregnancy are lacking. For women who do not have risk factors for adverse maternal or perinatal outcomes, the American College of Obstetricians and Gynecologists has provided the following exercise recommendations: mild to moderate routine exercise (moderate intensity is equivalent to 3 to 4 METS), two to three times a week preferable to intermittent activity; avoidance of exercise in the supine position after the first trimester due to decrease in cardiac output; and avoidance of any type of exercise involving the potential for even mild abdominal trauma.²⁴ There should be adequate hydration and caloric or carbohydrate intake during exercises. Use of ratings of perceived exertion to monitor response to exercise intensity is recommended over heart rate monitoring due to the variability in maternal heart rate responses to exercise.²⁵ Several physiologic and morphologic changes of pregnancy persist four to six weeks postpartum. Thus, pre-pregnancy exercise routines should be performed gradually based on a woman's physical capability.^{24,25}

Using these recommendations and with awareness of the signs and symptoms for discontinuing exercise (see below), exercise during pregnancy is reported to be safe.²⁶ Exercise is important in maintaining mobility and function of joints and limbs. Active ROM exercises prevent or minimize muscle atrophy and deconditioning, and improve body circulation. Pregnant women are thus encouraged to undergo a supervised exercise program to promote healthy maternal status.

There is limited literature on the effectiveness of exercise during pregnancy with stroke in particular. Evidence suggests that the risk for pre-eclampsia may be reduced by exercise. Leung et al. reported that the cardiovascular benefits of increased regular physical activity documented in healthy non-pregnant women may extend to prevention of pre-eclampsia through several mechanisms: "improved blood flow, reduced blood pressure, enhanced placental growth and vascularity, increased activity of antioxidant enzymes, reduced oxidative stress, and restored function of vascular endothelium."²⁷

Pregnant women can undergo aerobic exercise provided there are no absolute contraindications such as: hemodynamically significant heart disease, restrictive lung disease, incompetent cervix/cerclage, multiple gestation at risk for premature labor, persistent second- or third-trimester bleeding, placenta previa after 26 weeks of gestation, premature labor during the current pregnancy,

ruptured membranes, pre-eclampsia/pregnancy-induced hypertension.²⁸ If complications arise during exercise, pregnant women should be evaluated by a physician immediately. Indications for pregnant women to terminate exercise are: vaginal bleeding, dyspnea prior to exertion, dizziness, headache, chest pain, muscle weakness, calf pain or swelling (rule out thrombophlebitis), preterm labor, decreased fetal movement, and amniotic fluid leakage.²⁸

Stroke rehabilitation plays an essential role in the management of stroke patients, more so during pregnancy. The goal of stroke rehabilitation in pregnant women is to promote maternal health which will dictate the outcome of a successful delivery. Rehabilitation for this patient aims to prevent deconditioning, and improve mobility and self-care skills during the acute stroke period. In the absence of published guidelines, the rehabilitation medicine specialist needs to modify and individualize exercise prescription for pregnant patients undergoing stroke rehabilitation. Exercise prescription requires knowledge of potential maternal risks, specifically from neurologic deficits, changes in hemodynamics, weight gain, and ligamentous laxity. Inquiry on pre-pregnancy and pre-stroke fitness level is also vital for patients with mild neurologic impairments who would benefit from a more intensive stroke rehabilitation program. Depending on the rehabilitation problems, other interventions such as OT, speech and language therapy and psychological services may be included. Considering the high mortality rate in stroke during puerperium and postpartum period, efforts are focused on preparing the pregnant woman for stress from labor and childbirth. Hypertension must be controlled while maintaining optimal blood circulation to both mother and fetus. Caesarian section may be indicated in high-risk patients with stroke.

Stroke in pregnancy is rare but its complications are serious. The risk for recurrence of stroke after pregnancy is low (0% to 1%).^{2,5} Satisfactory perinatal outcomes have been reported. In one study on 23 women with 35 pregnancies, there were 24 term deliveries.⁵ This patient delivered a full-term baby boy with high APGAR scores. Monitoring of women with a history of stroke in pregnancy should be continued beyond childbirth and throughout the lifespan.²⁹ Issues concerning prophylactic anticoagulation for ischemic strokes, counseling on future pregnancies, and monitoring of maternal function should be addressed.

Conclusion

Stroke in young women is rare; stroke in pregnancy is uncommon. Stroke during the third trimester of pregnancy is rarely seen in the medical rehabilitation setting. This case report presents a rare case of hemorrhagic stroke during the third trimester of pregnancy with high risk of mortality and loss of function. Managing a pregnant stroke patient poses a challenge to the obstetrician, pediatrician, neurologist, neurosurgeon, and rehabilitation medicine specialist,

necessitating a multidisciplinary team approach starting in the acute stroke period, with monitoring not only during the current pregnancy but after delivery and during subsequent pregnancies. The key to a satisfactory outcome is the mother's early functional recovery and general well-being through comprehensive medical and rehabilitation management including determination of the etiology of the bleed through appropriate tests, and correction or reduction of risk factors.

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