



CANADIAN STROKE BEST PRACTICE RECOMMENDATIONS

Acute Stroke Management during Pregnancy Consensus Statement *Post-Partum Management*

*Ladhani NNN, Swartz R H, (Writing Group Chairs), Lindsay MP (Senior Editor)
on Behalf of the Canadian Stroke Best Practice Recommendations
STROKE IN PREGNANCY Writing Group and the
Canadian Stroke Best Practices*

© 2018 Heart and Stroke Foundation of Canada

Table of Contents

Risk of Stroke in the Post-Partum Period.....	3
Reference List	6

Evidence Tables

Risk of Stroke in the Post-Partum Period

Study/Type	Sample Description	Method	Outcomes	Key Findings and Recommendations
General considerations				
Tate & Bushnell 2012 USA Review	-	-	-	Postpartum period is associated with an increased risk of stroke and cerebral hemorrhage. Cesarean delivery may be a risk factor of postpartum stroke
Stroke during the post-partum period				
Miller et al. 2016 USA Cross-sectional study	135 women aged 18-40 years, admitted from January 2008 through June 2014 with ischemic stroke, TIA, cerebral venous thrombosis or nonaneurysmal subarachnoid hemorrhage due to reversible cerebral vasoconstriction syndrome (RCVS) to a single centre	Medical charts were reviewed for pregnancy status, demographics, medical comorbidities, stroke severity, etiology, and discharge outcomes. The characteristics and outcomes of women admitted with pregnancy-associated stroke were compared with those who were not pregnant	Good outcome (mRS ≤ 2 at discharge), intracranial bleeding, stroke recurrence and discharge disposition	There were 33 women with pregnancy-associated stroke (PAS) and 102 women with non-pregnancy-associated stroke (NPAS) Among women with PAS: 73% of strokes occurred postpartum. 6 suffered from preeclampsia The most common cause of cerebrovascular events was RCVS (n = 12), Women with PAS were less likely to have vascular risk factors such as hyperlipidemia and history of thromboembolism (0% vs. 13.7%, p=0.02 and 0% vs. 12.8%, p=0.02, respectively) and were less likely to be an active smoker or consume alcohol (3% vs. 19.6%, p=0.013 and 6% vs. 9.6%, p=0.013, respectively). Women with PAS were more likely to have RCVS as the stroke mechanism (36% vs 1%, OR=57.7, 95% CI 7-468, p = 0.0001). The majority of women had a good outcome (76% with PAS and 62.8% with NPAS, p=0.077)
Kamel et al. 2014 USA Prospective	1,687,930 women aged ≥ 12 years, who were discharged from hospital following the birth of their first child from all acute care California hospitals and nonfederal ERs from 2005-2010.	All thrombotic events were identified through chart review. The risk of a thrombotic event during the first 6 weeks after delivery was compared to the risk	Stroke, MI, DVT and combined events	The incidence of stroke was significantly higher during the first 6 weeks postpartum vs. 6 weeks + 1 year postpartum (119 events vs. 14), OR=8.5, 95% CI 4.9-14.8 The incidence of stroke was higher during weeks 7-12

Study/Type	Sample Description	Method	Outcomes	Key Findings and Recommendations
cohort study		during a 6-week period, one year later, using a case crossover design, whereby the patient served as their own control. Risk was estimated using conditional logistic regression.		<p>weeks postpartum vs. 7-12 weeks + 1 year postpartum (15 events vs. 9), OR=1.7, 95% CI 0.7-3.8.</p> <p>The incidence of stroke was the same during weeks 13-18 postpartum vs. 13-18 weeks+ 1 year postpartum (9 events vs. 9), OR=1.0, 95% CI 0.4-2.5</p> <p>The incidence of stroke was similar during weeks 19-24 postpartum vs. 19-24 weeks + 1 year postpartum (16 events vs. 15), OR=1.1, 95% CI 0.5-2.2.</p> <p>The risk of combined events was significantly higher from weeks 0-6 and 7-12 weeks compared with the same periods one year later; while the risks were not significantly increased thereafter.</p>
<p>Tang et al. 2009</p> <p>Taiwan</p> <p>Population-based cohort study</p>	<p>This cohort study included 1,132,019 parturients. Cases that had stroke before the index date (90 days minus from the date of delivery) were excluded, as were entries that represented extreme maternal age (≤ 15 or ≥ 50 years old), infant's birth weight (≤ 600 or ≥ 6000 gm), gestational weeks (≤ 19 or ≥ 45) and parity (≥ 11) [0.36%]</p>	<p>Using a dataset linking the birth registries (1999 to 2003) and National Health Insurance hospital (NIH) discharge data, stroke-free survival rates were estimated to examine the effect of pre-eclampsia and eclampsia on the prevalence of stroke. The NIH data covered the years 1996 to 2004 and represented about 97% of Taiwan population. Sociodemographic factors and obstetric complications were used in multivariate logistic regression models to determine adjusted odds ratio or preeclampsia-eclampsia on the risk of hemorrhagic and ischemic stroke during pregnancy and within first postpartum year.</p>	<p>Hemorrhagic and ischemic stroke during pregnancy and within first postpartum year</p>	<p>Incidence of stroke was 21.47 cases per 100,00 deliveries: 139 cases of hemorrhagic stroke 107 cases of ischemic stroke</p> <p>Findings: <i>Adjust relative risk of preeclampsia-eclampsia:</i> <i>Within 3 months antepartum:</i></p> <ul style="list-style-type: none"> • Hemorrhagic stroke: 10.68 (95% CI: 3.40, 33.59) • Ischemic stroke: 40.86 (95% CI; 12.14, 137.47) <p><i>Within first 3 days postpartum:</i></p> <ul style="list-style-type: none"> • Hemorrhagic stroke: 6.45 (95% CI: 1.42, 29.29) • Ischemic stroke: 37.71 (95% CI; 11.08, 108.68) <p><i>From days 3 to 6 weeks postpartum:</i></p> <ul style="list-style-type: none"> • Hemorrhagic stroke: 11.76 (95% CI: 4.05; 34.11) • Ischemic stroke: 11.60 (95% CI: 3.30, 40.82) <p><i>From 6 weeks to 6 months:</i></p> <ul style="list-style-type: none"> • Hemorrhagic stroke: 11.76 (95% CI: 4.05, 34.11) • Ischemic stroke: 11.60 (95% CI: 3.30, 40.82) <p><i>From 6 months to 12 months postpartum:</i></p> <ul style="list-style-type: none"> • Hemorrhagic stroke: 19.90 (95% CI: 7.75, 51.11) • Ischemic stroke: 4.35 (95% CI: 0.58, 32.92) <p>Recommendation: There should be close monitoring of women with pre-eclampsia-eclampsia during pregnancy and up to at least 1-year postpartum.</p>

Study/Type	Sample Description	Method	Outcomes	Key Findings and Recommendations
<p>Witlin et al. 2000</p> <p>USA</p> <p>Retrospective study</p>	<p>20 women without previous neurologic deficit with clinical and neuroimaging diagnoses of postpartum stroke. Mean age was 26.1 years. Mean gestational age at delivery was 37.2 weeks.</p>	<p>Medical records were reviewed for all women with a coded discharge diagnosis of cerebrovascular disorders complicating pregnancy. Demographic data, summary of labor and delivery records, laboratory findings, drug use (prescription and illicit), type of anesthesia, and neuroimaging studies were reviewed for all pregnant women with the discharge diagnoses of intracranial hemorrhage, cerebral aneurysm or arteriovenous malformation, hypertensive encephalopathy, and arterial or venous cerebral infarction. Women were followed up through either resolution of the acute event or lack thereof. Cerebrovascular events associated with trauma, neoplasm or infection and women with late postpartum eclampsia were excluded.</p>	<p>Presentation and etiology of post-partum stroke</p>	<p>Causes of stroke included cerebral infarction (n = 13; 7 venous, 6 arterial), intracerebral hemorrhage (n = 5; 1 cocaine-induced, 1 anatomic malformation), cerebritis (n = 1) and cerebral atrophy (n = 1).</p> <p>The median time at onset of stroke was 8 days postpartum (range, 3-35 days).</p> <p>There were 2 maternal deaths, both caused by severe intracerebral hemorrhage. Intracerebral hemorrhage was associated with the poorest outcome (2 deaths and 1 residual neurologic deficit). Eight women had residual neurologic deficit.</p> <p>The risk of stroke was not increased with Cesarean delivery (vs. vaginal) OR=1.3, 95% CI 0.1-16.8, p=0.6.</p> <p>Incidence of cesarean delivery was greater in the cohort of women with postpartum stroke than in the overall obstetric population (OR=3.2; 95% CI 1.2-8.5, p=0.015).</p> <p>All women were either normotensive or had well-controlled hypertension at postpartum discharge.</p> <p>New-onset hypertension or exacerbation of existing hypertension occurred after the acute neurologic insult; subsequent mean (+/-SD) arterial blood pressure was 128.9 +/- 24.0 mm Hg.</p>

Reference List

- Kamel H, Navi BB, Sriram N, Hovsepian DA, Devereux RB, Elkind MS. Risk of a thrombotic event after the 6-week postpartum period. *N Engl J Med* 2014;370(14):1307-1315.
- Leffert LR, Clancy CR, Bateman BT, et al. Patient Characteristics and Outcomes After Hemorrhagic Stroke in Pregnancy. *Circ Cardiovasc Qual Outcomes* 2015;8(6 Suppl 3):S170-8
- Miller EC, Yaghi S, Boehme AK, Willey JA, Elkind MS, Marshall RS. Mechanisms and outcomes of stroke during pregnancy and the postpartum period: a cross-sectional study. *Neurol Clin Pract* 2016; 6(1): 29-39.
- Tang CH, Wu CS, Lee TH, Hung ST, Yang CY, Lee CH, Chu PH. Preeclampsia-eclampsia and the risk of stroke among peripartum in Taiwan. *Stroke* 2009;40(4):1162-8.
- Tate J and Bushnell C. Pregnancy and stroke risk in women. *Women's Health (London, England)* 2011; 7(3): 363-374. Doi: 10.2217/whe.11.19.
- Witlin AG, Mattar F, Sibai BM. Postpartum stroke: a twenty-year experience. *Am J Obstet Gynecol* 2000; 183(1): 83-8.