A risk too great? Stroke implications with manual therapy for the pregnant patient: A scoping review

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Purpose

Although chiropractic care typically includes the care of pregnant patients, the research literature on safety for this patient group is relatively sparse. Pregnancy and particularly the puerperium are associated with an increased risk for stroke.[1] Recent new evidence suggests less obvious risks for stroke, including the near-epidemic of obesity along with the Covid-19 pandemic. A systematic review of COVID-19 risks described how this infection activates coagulation pathways and thrombosis, with pregnancy possibly acting as a trigger increasing the risk for stroke.[2] The purpose of this scoping review is to update and address the potential stroke risks in an effort to improve safety and efficacy when treating this population. A scoping review is an overview of the current background evidence relevant for clinical practice.

Background

Spinal manipulative therapy for the pregnant and peripartum patient is common and addresses biomechanical complaints during this period of change.[3] Early research showed that 31% of pregnant patients sought complementary care and that chiropractic care was the third most common type of care they chose.[4]

Care for the pregnant patient is not restricted to chiropractors who have special skills in this area, but there are those who specialize in pregnancy and pediatrics who more likely treat pregnant patients.[5] Safe and responsible management of the pregnant and peripartum patient requires knowledge of the process of pregnancy and the associated risk factors. The effect of high force rotary maneuvers in the upper cervical spine on the vertebral artery and the possible risk for stroke is not clearly understood.[6] Although severe adverse effects of spinal manipulative therapy in the cervical spine are rare,[7,8,9] studies among antepartum and postpartum women are lacking. There are studies published recommending lower force techniques for children[10,11] but, as of yet, no guidelines exist for pregnant patients at risk for stroke.

This report outlines specifically the risks for stroke in the pregnant patient. Maternal stroke is an acute ischemic or hemorrhagic cerebrovascular event which complicates pregnancy or the postpartum period. Pregnancy associated stroke has a three-fold higher risk compared to stroke in young non-pregnant adults.[12] Stroke occurs most commonly in the third trimester, during delivery and six weeks post-partum.[13]

Stroke in the pregnant patient is rare. The rate varies from 21 to 201 events per 100,000 deliveries,[7,8] with an average rate of 40 incidents per 100,000 deliveries.[14]

The incidence of stroke is increasing with a 50% increase during delivery and over 80% increase in the postpartum period measured during ten-year periods from the mid 90's to the mid 2000's.[15] The mortality and morbidity are high and climbing, accounting for up to 13% of maternal deaths.[1,16,17] All maternity care givers must be able to assess women experiencing stroke related symptoms. Stroke symptoms depend on the part of the brain affected by the insult. Weakness, numbness, vision and speech abnormalities can all occur.[18]

An increased risk for stroke is a contraindication for high force manipulation of the upper cervical spine. By identifying the factors that increase the risk for stroke, treatment can be more safely adapted while addressing common mechanical problems in these patients. Using manual therapies, we are clearly obliged to identify vulnerable patients with an increased risk for stroke and update our treatment techniques.[19]

The goal of this paper is to focus specifically on women with an increased risk for stroke, particularly the pregnant and peripartum woman, and make recommendations for care with manual therapy.

Methods

A search was performed on the primary search engines PubMed, and Research Gate using the keywords, "pregnancy stroke" migraine; "stroke race" pregnancy; "stroke women" pregnancy; "hormones stroke" pregnancy; obesity "stroke pregnancy"; "manual therapy" stroke. Articles from the past 25 years were selected. Articles not in English were excluded as well as case reports, commentaries, pilot studies and letters to the editor. References from selected articles were hand searched. Seven hundred and seven articles were found. Fifty-two were found relevant and used for this investigation.

Results

Stroke affects women disproportionally and is one of the most common causes of death in women and a primary cause of disability.[20] Vascular risk factors occurring in both men and women are the primary cause of stroke.[21] These risk factors include hypertension, hyperlipidemia, diabetes mellitus, smoking and atrial fibrillation.[21]

The risk for stroke in women is influenced by sex hormones, endogenous and exogenous estrogens, and hormonal changes due to pregnancy and changes during the transitional periods in life.[20] The timing of menarche influences the risk for stroke, particularly a very early and/or very late onset of menarche has been linked to an elevation in the risk for stroke.[21,22] Women who have a shorter reproductive lifespan have a significantly increased risk for stroke and particularly those who experience a younger age of onset of menopause.[22] The use of combined oral contraceptives (COC) among women has been associated with an increased risk for stroke (pooled relative risk 7 to 32-fold),[22,23] compounding the risk when other cardiovascular risk factors are present. These are specifically: smoking (up to 19-fold), age younger than 20 or older than 35 (up to 5-fold), and migraine headache (4-8-fold).[24] When the use of COC, smoking and migraine with aura are combined, there is a 73% increased risk for stroke.[24]

Pregnancy, the third trimester and the puerperium (6 weeks postpartum) particularly, are associated with an elevated risk for stroke with up to a 9 to 15-fold increase.[26,27,28] Eclampsia and preeclampsia are the strongest risk factors contributing to stroke during pregnancy accounting for 25 - 57% of strokes and obesity elevates this risk 12-fold.[30] Compared to women with normal weight, the hazard ratio of ischemic stroke increased from 1.40 (95% (CI) 1.27-1.54) in obese women to 4.71 (95% CI 3.88-5.72) among women with severe obesity.[30]

Women diagnosed with infection at the time of delivery have a 2.4 times -10.5 times risk of having a stroke regardless of their hypertensive status.[31] Genitourinary tract infections occur in about 20% of pregnancies[32] and increase the risk for preeclampsia 1.3-fold.[33] Box 1 lists more comprehensively the risk factors for stroke in the pregnant patient.

The condition not associated with pregnancy that has the greatest influence on the risk for stroke is a history of migraine headache (RR 16.9, 95% CI 9.7-29.5).[34] There is evidence that a history of any type of headache is associated with a 2.4-fold higher risk of developing preeclampsia (OR 2.4, 95% CI 1.7-3.3).[35] Migraine headache (MH) is an important risk factor for hypertensive and vascular diseases during pregnancy increasing the risk for stroke 2 to 9-fold.[36,37,38] Twenty-four percent of women 30-39 years of age are estimated to suffer from migraine headaches.[39]

Women with a history of migraine before pregnancy had a 3.5-fold higher risk of preeclampsia (95% CI 2.2-5.4), while if migraine persisted into pregnancy, the risk increased 4-fold (95% CI 1.9-8.2) as compared with women with normal blood pressure.[35] Both migraine and pregnancy are associated with hypercoagulability, compounding the risk for stroke. Migraine is an independent risk factor when presenting as a secondary headache significantly increasing the risk for gestational hypertension as well.[40] A migraine headache which worsens during pregnancy increases the risk for hypertension 13-fold[34] as well as the risk of developing preeclampsia.[40]

Race and ethnicity both are associated with the incidence and severity of strokes. Non-Hispanic black, Hispanic and Asian pregnant women have a two-fold increased risk for stroke,[23] while Hispanics have greater risk of mortality following stroke.[41] Pregnancy induced complications such as pregnancy induced hypertension, gestational diabetes mellitus and preeclampsia are associated with an increased long-term risk for stroke.[41]

Age > 35	(RR 2.0, 95% CI 1.4-2.7)
Afro-American ethnic origin	(RR 1.5, 95% CI 1.2-1.9)
Chronic Hypertension	(RR 6.1, 95% CI 4.5-8.1)
Heart disease	(RR 13.2, 95% CI 10.2-17)
Thrombophilia	(RR 16.0, 95% CI 9.4-27.2)
SLE	(RR 15.2, 95% CI 7.4-31.2)
Diabetes mellitus	(RR 2.5, 95% CI 1.3-4.6)
Smoking	(RR 1.9, 95% CI 1.2-2.8)
Thrombopenia	(RR 6.0, 95% CI 1.5-24.1)
Alcohol use	(RR 2.3, 95% CI 1.3-4.6)
Preeclampsia	(RR 4.4, 95% CI 3.6-5.4)
Postpartum infection	(RR 25.0, 95% CI 18.3-34)
Electrolyte imbalance	(RR 7.2, 95% CI 5.1-10.0)
Blood transfusion	(RR10.3, 95% CI 7.1-15.1)

Box 1. Identified risk factors for stroke and vascular disorders during pregnancy[27]

Discussion

Safe and responsible management of the pregnant and peripartum patient requires knowledge of the process of pregnancy and the associated risk factors. The objective of this scoping report was to identify specific risk factors for stroke in the pregnant patient in order to increase safety and efficiency when treating this subgroup of patients. Headache during pregnancy is a very common presentation to the chiropractor. A typical patient is presented in Box 2 (next page).

Headache, first and foremost, is a hallmark risk for stroke because of its associated maladies. A thorough

understanding of the patient presenting with headache is imperative as it may signal the onset of preeclampsia and/or stroke. That said, the majority of headaches are benign and may be safely treated with appropriate techniques. Women with a history of primary headaches are more susceptible to acute arterial hypertension during pregnancy, particularly those whose headaches worsen during pregnancy.[34] Primary headaches otherwise usually improve or remit during pregnancy (60-80% improve).[34] A high frequency of attacks and the recent onset of migraine headache is related to an increased risk for stroke.[42]

Secondary headaches commonly occur in pregnancy due to hypercoagulability, hormonal changes and anesthesia for labor.[43] Longer headache duration during pregnancy may herald the sign of a secondary headache.[43,44] Clinically the most common cause of a secondary headache in the pregnant patient is a stroke.[45] Hypertensive disorders of pregnancy with preeclampsia are also a major cause of secondary headaches during pregnancy. Preeclampsia presents as a progressive bilateral (temporal, frontal, occipital or diffuse) pulsating headache which can be associated with visual changes similar to the typical visual aura of migraine. The headache of preeclampsia is often aggravated by physical activity similar to a migraine headache. It fails, however, to respond to the over-the-counter remedies which may be the herald symptom of preeclampsia.[46] The African American race, obesity and nulliparity are all risk factors for preeclampsia.[43,44] Preeclampsia affects 4% of pregnancies in the US and increases the risk for stroke 4-fold.[47] This risk is provoked by preexisting genitourinary tract infection, chronic hypertension, pro-thrombolytic conditions and coagulation disorders.[36]

A 26-year-old pregnant woman presented with a severe headache, duration 8 weeks. She had a history of anxiety, and migraine headaches with aura, and particularly when pregnant. She reported that in the 2 years since she was treated last with chiropractic care, she had not had many headaches at all. She presented 2 years ago pregnant with her second child complaining of severe headaches and jaw pain. She responded well to manual therapy using an instrument to address reduced mobility in the joints of the upper cervical spine while avoiding high force and rotary stress in this area. Her mother has migraine headaches and had a blood clot while pregnant. The patient describes a pulsating headache, tinnitus, and pressure in the head. She recognized this type of headache and had had it before. She did not want to follow recommendations of her GP to have a computer tomography due to her concerns for risk to the fetus. She wanted to be treated with manual therapy for the headache. Her blood pressure was 110/70, The clinical examination revealed kyphosis with forward head positioning and an open scissors posture between the pelvis and the torso. The neurological examination including cranial nerves, deep tendon reflexes, strength and sensation of facial muscles were all unremarkable. Lab tests were normal. The patient agreed to modified manual therapy to the cervical spine. The patient was treated with deep tissue therapy to the cervical paraspinal muscles, the muscles of the jaw and face. An activator instrument was used to address reduced mobility of the upper cervical spine with the head positioned in slight rotation and lateral flexion. She received acupuncture following manual therapy. The patient experienced relief after the first treatment. There were no adverse effects of treatment.

Box 2 delineates the history and management of a pregnant headache patient presenting to a chiropractor.

Hypertension in pregnancy is common and is defined as a systolic blood pressure of at least 130mm Hg or diastolic blood pressure of at least 80mm Hg. In the US, approximately 25% of women of reproductive age have hypertension.[48] Of these, less than half are aware of their diagnosis and, when diagnosed, only 10% have their blood pressure controlled.[48] Further, racial differences exist; more than half of non-Hispanic black women aged 20-years or older are afflicted with hypertension.[20] Hypertension is an important risk factor for stroke and can easily be monitored in combination with the clinical visit. The history is specific for the pregnant patient and should provide vital details highlighting any important risk factors (Box 1). This illustrates the need for a special skill set when managing this patient group. Understanding the woman's hormonal history (including prior pregnancies), family history of clotting, her headache history, her history of cardiovascular health and relevant lifestyle factors will offer some clues when assessing the risk for stroke. Monitoring blood pressure at every visit is crucial as high blood pressure may herald the onset of preeclampsia.

The recent trend of an increasing rate of stroke among pregnant women is likely attributed to older age in pregnancy, increasing rates of obesity,[49] smoking, diabetes and hypertension.[49,50] A large study in Sweden from 1982 to 2014 showed a significant increase in the risk for early stroke in overweight young women, and a marked increase in obese women.[30] Overweight and obesity in pregnancy provoke a systemic inflammatory response which are thought to contribute to the development of preeclampsia.[30] As with other infections, it is likely that the Covid-19 infection activates a similar inflammatory pathway triggering an increased risk for clotting and subsequently stroke,[2] though the risk for acute respiratory distress and pneumonia is higher.[51] The particular risks for the pregnant patient associated with COVID-19 may take many years to fully understand. The clinician must remember that symptom-free patients infected with COVID may present for treatment, highlighting the need for vigilance in assessing risk factors and adapting treatment.

It is not uncommon clinically to meet a pregnant patient handicapped with pelvic girdle pain resulting in immobility.

Decreased mobility increases the risk for clotting in these patients, compounding their other risk factors for stroke. When treating other areas than the cervical spine, it is important to advise against breath holding during treatment as it causes an overshoot in blood pressure and should be avoided.[52] Though the headache that patients experience may not be classified as severe, as a clinician, all the risk factors must be evaluated when deciding appropriate management for the patient at hand. Those patients with an increased risk for stroke and particularly multiple risk factors should be managed with alternative treatment techniques avoiding high force manipulation to the upper cervical spine. These are listed in Box 3.

Conclusion

Although severe adverse effects of spinal manipulative therapy in the cervical spine are rare, studies among antepartum and postpartum woman are lacking. The treatment techniques chosen for the upper cervical spine in the pregnant patient and women who have high risk for stroke should be carefully considered. An increased risk for stroke is a contraindication for high force manipulation of the upper cervical spine. The effect of high force rotary maneuvers in the upper cervical spine on the vertebral artery and the possible risk for stroke is not clearly understood. Therefore, alternative maneuvers should be considered particularly in this patient group who also have risk factors for stroke. For safe management of the high-risk pregnant patient, other techniques are recommended allowing for reduced force and more neutral positions of the upper cervical spine during treatment.

By identifying the factors that increase the risk for stroke, treatment can be more safely adapted while addressing common biomechanical problems in pregnant and peripartum patients, including neck pain and headache. A continuous update of skills and vigilance is required when dealing with vulnerable patient groups.

Activator instrument avoiding end range rotation of the upper cervical spine
Mobilization techniques modifying force and rotary components to the upper cervical spine
Deep tissue therapy addressing cervical paraspinal musculature
Stair step technique
Acupuncture

Box 3. Manual therapy techniques to reduce the risk for stroke.

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