

Case Report

A rare case of ischaemic stroke following cervical spine manipulation in an adolescent girl

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ABSTRACT

Stroke in children is associated with a multitude of risk factors compared to risk factors of adult stroke such as hypertension, diabetes or atherosclerosis. A 15-year adolescent girl presented with acute onset weakness involving right upper and lower limb. She complained of neck pain and fever 2 days before the onset of hemiparesis for which her parents took her to traditional healer who performed neck manipulation after which she developed vomiting, tingling numbness and weakness of right upper and lower limb. There was no history of preceding headache, ear discharge or any other contributory history. Clinical examination revealed Glasgow Coma Scale 12/15, power of grade 2/5 in right upper limb and 3/5 in right lower limb, exaggerated deep reflexes, extensor plantar reflex, right sided ptosis and right sided upper motor neuron facial palsy. CT scan brain showed right cerebellar and occipital infarct with posterior inferior cerebellar artery territory involvement. MRI Brain and MR Angiogram showed wedge shaped infarct involving right posterior inferior cerebellum, inferior vermis, ventral aspect of superior medulla, paracentral pons, right cerebral peduncle, tectum of both halves of midbrain with no internal hemorrhage and no vessel abnormality and right vertebral artery was not visualized. Her coagulation profile and cardiac work up were normal. She was treated with antiplatelet drugs, anticoagulants and physiotherapy following which the child gradually improved over a period of one month. In this case, with a positive history of neck manipulation authors can conclude that the etiology of young stroke was induced by neck manipulation. This case has been reported to increase awareness about the ill effects of neck manipulation and counsel parents against performing such procedures for children. Early recognition of pediatric stroke is critical for immediate diagnosis, imaging and treatment with better outcomes.

Keywords: Anticoagulants, Chiropractor, Hemiparesis, Ischemic stroke, Neck manipulation, Physiotherapy

INTRODUCTION

Stroke is a neurological condition that occurs due to sudden occlusion or rupture of cerebral blood vessels and is ischemic or hemorrhagic in nature. Pediatric stroke is rare with an incidence of 1.2-1.3 cases per 100,000 children under 18 years.¹ Mortality due to pediatric stroke is as high as 10-25% and long-term morbidity in the form of neurological deficits can occur in 50-60% of children.¹ The commonest causes of stroke in children are cardiac diseases, hematologic conditions such as sickle cell

anemia, infections, connective tissue disorders, arteriovenous malformations, homocystinuria and trauma.² Children with head or neck trauma are also at risk of developing ischemic stroke due to dissection of the carotid or vertebral arteries. Children with hyperextension or rotational injuries during accidents, sports injuries or chiropractor manipulation can lead to strokes.³ The older child with stroke commonly present with hemiparesis, visual disturbances, speech disturbances, headache, vomiting, altered sensorium or seizures.⁴

Spinal manipulation is performed by chiropractic providers and physiotherapists for treating neck ailments in adults using low velocity or high velocity techniques.⁵ The aim of spinal manipulation is to relieve neck pain as well as increase the range of motion. In high velocity manipulation, firm pressure is applied, the joint is moved through full range of motion and then a quick manual thrust in precise direction to increase joint mobility is delivered.⁵ Chiropractic neck manipulation has been reported as one of the rare causes of stroke in children and adults as forceful thrust used is likely to cause vertebral artery dissection and posterior inferior cerebellar artery injury.⁵ Stroke can develop within hours or couple of days after manipulation. This case highlights the potential dangers of neck manipulation and the relationship between neck manipulation and young stroke.

CASE REPORT

A 15-year adolescent girl presented with symptoms of fever and neck pain for two days without history of photophobia, vomiting or seizures. She was taken by her parents to a traditional healer in her village for relieving neck pain. The healer performed forceful neck manipulation with sudden forceful turning of the neck from side to side. Parents recalled hearing a popping sound in the neck during the procedure. Within few hours of manipulation, she developed dizziness, vomiting, truncal ataxia, speech disturbance, tingling numbness over right half of her body. The symptoms progressed within few hours with inability to move her right upper and lower limbs.

On examination she was conscious but drowsy with Glasgow coma scale of 12/15. Her vital signs were stable with pulse rate of 72 beats/minute, blood pressure 110/70 mmHg, respiratory rate 20 cycles/min with SpO₂ in room air was 99%. There were no neurocutaneous markers, no papilledema or signs of meningeal irritation. Apart from mild pallor, her general and systemic examination of cardiovascular, respiratory and abdomen were normal. Neurological examination revealed right sided hemiparesis, right UMN facial palsy, right sided ptosis and features suggestive of posterior inferior cerebellar artery stroke. The power was 2/5 in right upper limb and 3/5 in right lower limb, exaggerated deep tendon reflexes on the right with extensor plantar reflex. The child was admitted in Pediatric Intensive care unit for further management and consultation from neurologist, cardiologist and hematologist were obtained.

Her investigations were: Hb-7.6 g/dl, total leucocyte count 6500/cmm, normal differential count, peripheral smear- microcytic hypochromic red cells, serum ferritin was 8.72 ng/ml, Platelet count -4.70 lakhs/cmm. Coagulation profile, lipid profile were normal:, Prothrombin time -14.3 secs, activated PTT- 26 seconds, serum fibrinogen - 560 mg/dl, Antithrombin-3- 131%, Protein C- 115%, Protein S - 105%, Total cholesterol - 88

mg/dl, Triglycerides - 79 mg/dl, HDL - 21 mg/dl). Cerebrospinal fluid examination was normal. Her liver function tests, renal function tests, CXR, glucose, electrolytes, HIV serology and ECG were normal.

Computed Tomography brain at admission showed right cerebellar and occipital infarct with posterior inferior cerebellar artery occlusion. MRI Brain done after 24 hours showed a wedge-shaped infarct in right posterior inferior cerebellum, inferior vermis, ventral aspect of superior medulla, paracentral pons, right cerebral peduncle, tectum of both halves of midbrain with no internal hemorrhage (Figure 1). Ultrasound Doppler of carotid and vertebral arteries showed no significant abnormality. Neurologist advised Magnetic Resonance Angiography which showed right vertebral artery was not visualized which may be attributed to hypoplasia or thrombus, bilateral posterior communicating arteries appeared dominant and seen reconstituting the posterior cerebral and basilar arteries and bilateral internal carotid, anterior cerebral and middle cerebral arteries were normal (Figure 2). Rheumatology evaluation was done to rule out vasculitis for which ANA, lupus anticoagulant and anticardiolipin antibodies were normal.

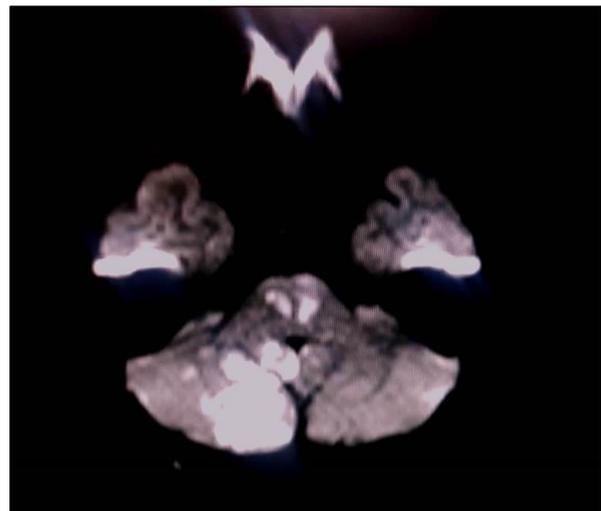


Figure 1: Magnetic resonance imaging of brain.

MRI T1W Sagittal showed wedge-shaped infarct with restricted diffusion and low ADC seen in right posterior inferior cerebellum, inferior vermis, ventral aspect of superior medulla, paracentral pons, right cerebral peduncle, tectum of both halves of midbrain with no internal hemorrhage.

Supportive care was provided for fluid and electrolyte management, nasogastric feeding, monitoring of vital signs and antiepileptic drugs to prevent seizures. She received clopidogrel 75 mg twice daily, subcutaneous low molecular weight heparin at 100 units/kg/day, oral iron and folic acid. Child was started on rehabilitation program with muscle strengthening exercises to improve functional activity. The hemiparesis, ptosis and facial

palsy gradually improved symptomatically within next four weeks. Child started to walk alone without support and there was no residual neurological deficit at discharge. The child is being followed up and repeat MRI taken 3 months after discharge was normal.



Figure 2: Magnetic resonance angiography.

MRA showed right vertebral artery was not visualized, bilateral posterior communicating arteries appeared dominant and seen reconstituting the posterior cerebral and basilar arteries. Bilateral internal carotid, anterior cerebral and middle cerebral arteries were normal.

DISCUSSION

The majority of ischemic strokes in children occur in those with predisposing cardiac, vascular or hematological conditions contrary to adults who have atherosclerosis as the predisposing factor. Early recognition of stroke and immediate diagnosis and treatment is imperative along with identification of risk factors of stroke to prevent recurrences.¹ Neck manipulation is a potentially dangerous procedure, especially when performed by untrained individuals with adverse effects reported as dissection of vertebral artery, dissection of internal carotid artery, dural tears, nerve injuries, disc herniation and cervical cord edema.⁵ There are case reports of adult patients who developed vertebral artery dissection following chiropractic neck manipulation. There is a case report of a young woman who developed symptoms of vertebral artery dissection following cervical spine manipulation with an infarct in the inferior half of cerebellar hemisphere with fourth ventricular compression causing obstructive

hydrocephalus. The woman required ventriculostomy and recovered completely.⁶ There is report of three deaths following neck manipulation which occurred due to thrombus in vertebral artery and spinal cord infarction in two patients.⁷ There are only few reported cases of stroke following cervical spine manipulation in pediatric population.

Author's patient had a wedge-shaped infarct involving right posterior inferior cerebellar artery territory, parts of midbrain, paracentral pons and right cerebral peduncle. The extensive area of infarct can explain all the neurological symptoms of hemiparesis, ptosis, facial nerve palsy and posterior circulation stroke symptoms. Hemiparesis is a rare complication after neck manipulation since mostly patients develop vertebral artery aneurysms and posterior inferior cerebellar artery infarct after cervical spine manipulation.⁷ An average of 1 in 20000 neck manipulations result in ischemic infarct or vertebral artery aneurysm. Stroke can occur due to mechanical compression of artery or excess stretching of arterial wall, but pathogenesis may be unclear in some patients. Another theory for ischemic stroke may be transient vasospasm of the arteries caused by forceful neck manipulation. Author's patient had a complete recovery since she sought immediate medical care within few hours of the neurological insult. Forceful rotation of the neck from side to side was performed by untrained person and it is known that neck manipulation techniques like rotation, extension and lateral flexion can lead to young stroke.⁸ The risk of stroke also depends on the amount of force used for neck manipulation. The most common symptoms are headache, dizziness, vertigo, hemiparesis, gait ataxia. Majority of patients before onset of stroke present with headache or neck pain.

Author's patient had iron deficiency anemia with Hb 7.6 gm/dl, microcytic hypochromic red cells, thrombocytosis and low ferritin levels. Some case reports have suggested an association of stroke with Iron Deficiency Anemia (IDA) in children and adults. The mechanisms of stroke include hypercoagulable state secondary to IDA, thrombocytosis secondary to IDA and anemic hypoxia induced by IDA.⁹ She also had elevated fibrinogen levels of 560 mg/dl which is known to be a risk factor for stroke. Although not much is known about co-relation between hyperfibrinogenemia and stroke, studies have reported that increased fibrinogen is associated with higher risk of mortality in stroke. Her serum fibrinogen level repeated after 6 months was normal. This patient had history of neck manipulation with two added risk factors of iron deficiency anemia and hyperfibrinogenemia which were probably responsible would have contributed to ischemic stroke.

The diagnosis is established by CT angiogram, MRI and MRA. Most patients are managed with heparin followed by warfarin or antiplatelet agents alone like Aspirin and Clopidogrel. Early detection of stroke and immediate management result in better outcomes.⁹ Positive outcome

can be achieved after 3 weeks with physiotherapy and medications. In India, there are many non-chiropractors who perform neck manipulation and it may lead to complications like what happened in this case, hence parents should be aware about the ill effects of neck manipulation before taking their child to a chiropractor.

CONCLUSION

Stroke should be considered as a random and unpredictable complication of any neck movement including neck manipulation. The sudden onset of headache and neurological symptoms following neck manipulation should alert physicians about possibility of development of acute stroke. History taking should include any recent visits to the chiropractor. This report is to promote awareness about the ill effects of neck manipulation.

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