

**A case of pediatric stroke in a healthy male child - cryptogenic stroke in children**

<sup>1</sup>Dr. Raimy Mathew, Pushpagiri Institute of Medical Sciences and Research Centre Thiruvalla Pathanamthitta Kerala

<sup>2</sup>Dr. Jacob Abraham, Pushpagiri Institute of Medical Sciences and Research Centre Thiruvalla Pathanamthitta Kerala

<sup>3</sup>Dr. Carol Sara Cherian, Pushpagiri Institute of Medical Sciences and Research Centre Thiruvalla Pathanamthitta Kerala

**Corresponding Author:** Dr. Raimy Mathew, Pushpagiri institute of Medical Sciences and Research Centre Thiruvalla Pathanamthitta Kerala

**How to citation this article:** Dr. Raimy Mathew, Dr. Jacob Abraham, Dr. Carol Sara Cherian, “A case of pediatric stroke in a healthy male child - cryptogenic stroke in children”, IJMACR- November – December - 2022, Vol – 5, Issue - 6, P. No. 382 – 386.

**Copyright:** © 2022, Dr. Raimy Mathew, et al. This is an open access journal and article distributed under the terms of the creative commons attribution noncommercial License 4.0. Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**Type of Publication:** Case Report

**Conflicts of Interest:** Nil

**Abstract**

Acute ischemic stroke (AIS) in the pediatric age group is a complex disease with a variety of etiologies that differ from those in an adult population. The difference is primarily because of predominance of congenital and genetic causes. Even though pediatric stroke is rare, with an estimated annual incidence of 1–6 per 100,000 children, early diagnosis and initiation of treatment will result in excellent prognosis<sup>1</sup>. Hence it is imperative to diagnose it early to avoid potential devastating consequences.

We report a healthy 10-year-old male child who presented with acute onset of weakness of left upper and lower limbs with left UMN facial palsy of 6 hours duration. Neuroimaging showed acute non-hemorrhagic infarcts. He was treated with antiplatelet drug (Aspirin), physiotherapy and he made a remarkable deficit free recovery. He was thoroughly evaluated considering all possible etiologies but no conclusive evidence were

found and his stroke was labelled as cryptogenic in origin. Majority of pediatric stroke are finally reported being cryptogenic in origin, as no clear etiology is often found. Cryptogenic strokes comprise 30 to 40% of all adult ischemic strokes and approximately 50% in children<sup>2</sup>. Paucity of cases reported and has resulted in no clear guidelines for the management of stroke in children being available.

**Keywords:** Acute Ischemic stroke in children; cryptogenic stroke; Antiplatelet drugs

**Introduction**

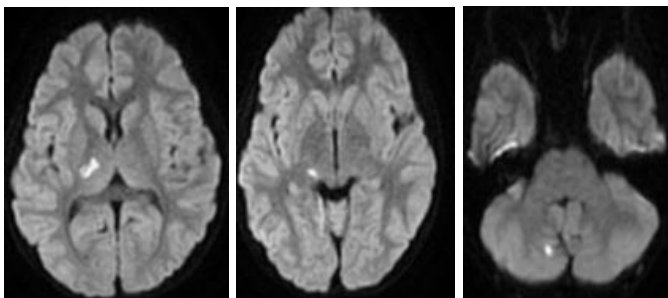
Any acute onset focal deficit in children should be considered as stroke unless proven otherwise. Stroke occurs due to the occlusion or rupture of cerebral blood vessels, subdivided as ischemic, hemorrhagic or both. Pediatric acute ischemic stroke is a rare medical emergency with an incidence 1–6 per 100,000 children<sup>1</sup>. The etiologies of stroke in children are more varied than in adults. In spite of the long list of known causes, many

strokes are cryptogenic with their cause remaining undetermined. Studies in the adult population show anti-thrombotic drugs, including Aspirin, to be effective when administered using recommended guidelines, while the role of thrombolytics is controversial in children. We report a case of a 10-year-old male child with middle cerebral artery territory infarcts, who after exhaustive workup, did not have a clear etiology to his stroke and was hence labelled to be cryptogenic in origin.

### Case report

A 10-year-old, developmentally normal child, presented to the emergency department with a history of acute onset of left side hemiparesis with deviation of angle of mouth towards the right side. He had no preceding fever, vomiting, seizures, head injury, headache, bleeding manifestations or history of any drug intake. There is a history of transient hemianopia of left side 1 month prior to this episode and underwent thorough ophthalmic evaluation for the same which was found to be normal. He had no other risk factors or a significant family history.

Examination revealed intact higher mental functions, nystagmus of left eye with left facial nerve palsy. He had left sided hypotonia with a power of 3+ /5, extensor plantar reflex and diminished deep tendon reflexes on the left side. There was no signs of meningeal irritation or other cerebellar signs. Other systems were unremarkable at presentation.



Neuroimaging (MRI with MRA) showed acute non-hemorrhagic infarct involving right thalamus, posterior limb of internal capsule and right cerebellar hemisphere. Hematological and biochemistry panels were within normal limits. Bleeding /coagulation disorders work up done were non-contributory. Cardiac evaluation done was normal. He was managed with antiplatelet medication and initiated him on physiotherapy. The child started showing improvement within a week. On follow up, he was recovered with no neurological deficits.

### Discussion

Pediatric AIS are defined as a stroke occurring between the ages of 1 month and 18 years. The reported annual incidence of cerebral infarction in children all over the world varies between 1 to 6 for 100, 000<sup>1</sup>. There is a paucity of cases reported in India and paediatric stroke have constituted less than 1 percent of all paediatric admissions and 5 to 10 percent of all strokes in <40 years<sup>3</sup>. Ischemic strokes in adults are usually thrombotic or embolic in nature while cryptogenic strokes in adults comprise 30 to 40% of stroke etiology while more than 50% of Paediatrics strokes is labelled as being cryptogenic.<sup>2</sup> Cryptogenic stroke are classified as those that remain without a definite cause even after extensive work-up. Stroke aetiology may remain undetermined for the following reasons

The cause of stroke is transitory or reversible hence diagnostic work-up is not done at the appropriate time. Atrial fibrillation (AF) as an underlying cause may be asymptomatic. Secondly all known causes of stroke may not fully investigate. Some causes of strokes along with patent foramen ovale may only be hypothesized based a epidemiological likelihood. Whatever the cause, unclear

etiological diagnosis prevents initiation of appropriate secondary prevention strategies<sup>4</sup>.

Stroke have become an increasingly recognized cause of morbidity and even mortality in children nowadays. In children, AIS most commonly occur between 1-5 years of age and is least common in the age group of 1 year and > 15 years<sup>5</sup>. Males carry a significantly higher risk of all types of stroke than females<sup>6</sup>. Black children are at

a higher risk than Caucasian and Asian children. Approximately 10% of all childhood stroke results in fatality and 70% survivors end up having epilepsy. Multiple risk factors are often present in as many as 25% of children with stroke<sup>6</sup>. Three main categories of etiology should be considered are Arteriopathy, cardiac disease, and hematologic disease<sup>7</sup>

Other causes are shown in Table 1

Cerebral Arteriopathy	Transient/Focal (Primary CNS /systemic vasculitis, fbromuscular dysplasia), arterial dissection, Moya disease and syndrome
Cardiac	Congenital heart disease, Endocarditis, Valvular disease, Arrhythmia, Congenital/acquired cardiomyopathy, cardiac catheterization, PFO
Hematological	Sickle cell disease, Thrombophilia, Iron deficiency Factor 7,8, Protein C & S deficiency
Genetic	PHACE syndrome (Posterior fossa anomalies, hemangioma, arterial anomalies, cardiac anomalies & eye anomalies)
Infection	Meningitis, Varicella, Mycobacterium tuberculosis, Neuroborreliosis
Miscellaneous	Air/fat embolism, drugs like Cocaine, L-asparaginase, Lymphoma, Leukemia, severe dehydration, MELAS (Mitochondrial Encephalopathies, Lactic acidosis, Stroke like episodes)
Trauma	Head and neck will cause dissection of the carotid or vertebral arteries

Emergency management of a child with ischemic stroke involves stabilization, securing airway, providing supplemental oxygen, establishing IV access, monitoring of vital signs and mental status regularly. An emergency CT or MRI with angiography and venography of the head in the ED should not be delayed. First line investigations include an ECG, Echo, Chest X-ray and blood investigations, including a complete blood count, blood and CSF cultures, biochemistry, liver enzymes, cardiac markers, coagulation factors, urine analysis and urine drug screen are part of the work up. Empiric

intravenous antibiotics and antivirals along with isotonic fluids for maintenance therapy is advice.

History should include (birth, developmental, family & past medical history) and a thorough examination should look for dysmorphology, blood pressure, cyanosis, heart defects & murmur, bruits in the neck & over skull, neuro cutaneous stigmata of Neuro fibromatosis-1, PHACES and Fabry's disease To reduce the proportion of strokes of undetermined aetiology (cryptogenic), the following evaluations as part of the assessment should be performed in stages as shown in Table 2<sup>5</sup>

Second level investigations	Trans-thoracic echocardiography (TTE), Compressive ultra-sonography (CUS), Trans-esophageal echocardiography (TEE), Contrast trans-cranial Doppler (TCD), ECG Holter, Brain and cerebral vessel MRI
-----------------------------	---

Third level investigations	Antinuclear antibodies, anti-ds DNA, anti-SM, antiphospholipid, lupus anticoagulant activity, deficiencies of protein C, protein S and antithrombin, intra-arterial angiography, cerebrospinal fluid analysis, genetic study (factor V G1691A mutation, prothrombin G20210A variant, CADASIL, MELAS; Fabry disease and collagen vascular disease, dermal and skeletal muscle biopsy
----------------------------	---

Anti-platelet drugs are widely described for use in adult literature and has shown reduction in the rate of further strokes. The prophylactic use of anti-thrombotic drugs remains controversial in the paediatric age. However, anti-thrombotic drugs are being given to paediatric patients at some institutions despite a paucity of supporting literature<sup>8</sup>

Children who suffer with AIS generally recover better than adults, but the effects may still be long lasting and detrimental. Epilepsy occurs in 20% children with stroke, hence long-term treatment for seizure with antiepileptic drugs is needed. Baclofen and trihexyphenidyl is used for spasticity and dystonia. Stroke and Transient Ischemic Attack recurrence is 7-35% of children. and 5-year recurrence rate is 50%, hence secondary prevention of stroke is of utmost importance. In 4 large population-based studies, the risks of recurrence of stroke after cryptogenic stroke were 1.6% at 7 days, 4.2% at 1 month, and 5.6% at 3 months<sup>9</sup>. Aspirin (1-5mg/kg/day), Clopidogrel and Warfarin are used for prophylaxis, though Aspirin is the preferred drug. Warfarin is used for stroke of cardiogenic origin & arterial dissection. Children with sickle cell disease are advised for regular blood transfusion till HLA matched bone marrow transplantation is possible.

### Conclusion

AIS in the paediatric patient are rare but potentially devastating disease. Acute stroke is an emergency, and delay in diagnosis and treatment results in poor outcome. A sudden onset of focal neurological deficit in children is a stroke until otherwise proven<sup>10</sup>. Anti-platelet drugs

should be considered and initiated in the ED as recurrence rate is high.

### Reference

1. Dubey S, Ghosh R, Chatterjee S, Lahiri D, Sengupta S, Chatterjee S, Das G, Biswas S, Ray BK. Pediatric stroke: the clinical and etiological spectrum: an observational study from a tertiary care stroke clinic, Kolkata, India. Indian J Phys Med Rehabil. 2020 Oct 22; 30:74-80.
2. George MG. Risk factors for ischemic stroke in younger adults: a focused update. Stroke. 2020 Mar;51(3):729-35.
3. WA say M, Khatri IA, Kaul S. Stroke in south Asian countries. Nature reviews neurology. 2014 Mar;10(3):135-43.
4. Guercini F, Acciarresi M, Agnelli G, Paciaroni M. Cryptogenic stroke: time to determine aetiology. Journal of Thrombosis and Haemostasis. 2008 Apr;6(4):549-54.
5. Lee Y, Lin KL, Wang HS, Chou ML, Hung PC, et al. (2008) Risk factors and outcomes of childhood ischemic stroke in taiwan. Brain and Development 30(1): 14-19.
6. Fullerton HJ, Wu YW, Zhao S, Johnston SC (2003) Risk of stroke in children: ethnic and gender disparities. Neurology 61(2): 189-194.
7. The International Stroke Trial (IST) (1997) A randomized trial of aspirin, subcutaneous heparin, both, or neither among 19435 patients with acute ischaemic stroke. International Stroke Trial Collaborative Group. Lancet 349(9065): 1569-1581

8. Nowak-Gottl, Streeter R, Sabire G, Kirkham F (2003) Antithrombotic drug treatment of pediatric patients with ischemic stroke. *Pediatric Drugs* 5(3): 167-175
9. Lovett JK, Coull AJ, Rothwell PM. Early risk of recurrence by subtype of ischemic stroke in population-based incidence studies. *Neurology*. 2004; 62:569–573.
10. Jeong G, Lim BC, Chae JH. Pediatric stroke. *Journal of Korean Neurosurgical Society*. 2015 Jun 1; 57(6): 396-400.