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Case report

## STROKE IN A CHILD AS A COMPLICATION OF IRON DEFICIENCY ANEMIA: A CASE REPORT

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### ABSTRACT

Stroke is characterized by the sudden loss of blood circulation to an area of the brain, resulting in monoparesis, hemi paresis and dysphasia. Nutritional anemia is a common problem all over the world. Especially Iron deficiency anemia is common cause for nutritional anemia in developing countries. It has been a common cause stroke in the literature. We report a case of 6 year old girl presented with severe iron deficiency anemia and developed stroke. She was successfully treated with blood transfusion, oral iron supplementation and anticoagulation. There are number of confirmed case reports regarding anemia as a risk factor for stroke in children.

**Keywords:** Children, Iron Deficiency Anemia, Stroke.

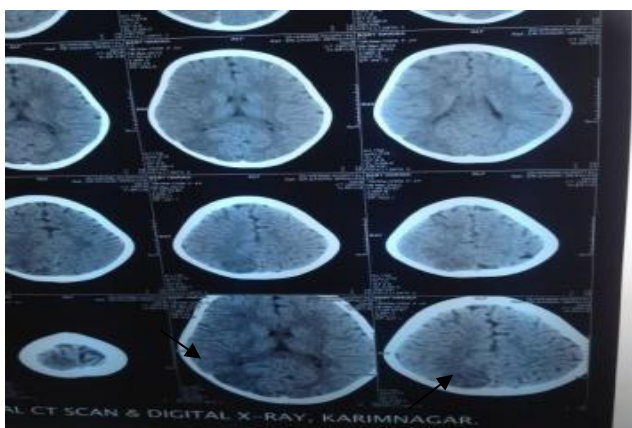
### INTRODUCTION

Acute infarct presenting as stroke is a rare cause in children. They will present with nonspecific clinical features. Diagnosis may be delayed because of the nonspecific presentation. Cerebrovascular diseases are having higher mortality and morbidity in children, current incidence ranging between 2- 5/10000 children per year for childhood stroke.<sup>1</sup> Children may present with raised intracranial pressure symptoms and signs like headache, vomiting, seizures and encephalopathy. Risk factors for stroke are dehydration, cyanotic congenital heart disease (untreated), iron deficiency anemia, infections and prothrombotic factors.<sup>2</sup> Almost 25% of children all over the world are affected with Iron deficiency anemia (IDA).<sup>3</sup> NFH survey (NFHS-3) data shows that 7 out of every 10 children in India are suffering with anemia. Iron deficiency as a one of the causative factor leading to stroke. We report a child who presented with severe anemia and developed stroke. We also reviewed the literature.

### CASE REPORT

A 6 year female child born to non consanguineous parents brought to casualty with chief complaints of weakness of left upper and lower limb. There is no history of fever, convulsions, head injury, ear discharge, worm infestation and repeated blood transfusions. No history of similar illness in the past. No history of genetic or neurological disorders in the family and child belongs to class IV Kuppuswamy's socioeconomic scale. On examination, severe pallor present, no icterus, cyanosis, clubbing and lymphadenopathy. On Central Nervous System examination child is conscious, coherent, speech normal. On motor system examination her muscle tone was normal, but reduced muscle power and reflexes were brisk on left side. The rest of her systemic examination was normal. Laboratory analysis of child's haematological profile showed haemoglobin-5.4gm/dL, hematocrit-22.9 %, 723

Serum Ferritin-6ng/mL, Iron-8 µg/dL, Total iron binding capacity-524 µg/dL, Transferrin-366 µg/dL, Iron saturation-1.5 %, RBCs-4.1 millions/cu mm, MCV-55.2fL, and MCH-12.8pg/cell, MCHC-23.1% which were all below normal limits, and the peripheral blood picture showed microcytic, hypochromic anemia admixed with few pencil forms and tear drop cells. The patient is having platelet count of 600,000/cu.mm (thrombocytosis). The hemoglobin electrophoresis (Hb A0 94.6%, Hb A2 1.5%), osmotic fragility, sickling test and lipid panel were normal. The other laboratory parameters including antinuclear antithrombin II, protein C and S antigen, bleeding time, prothrombin time, partial thromboplastin time were also within normal limits. The patient was treated with stroke protocol, CT scan (Fig 1) of the head was done, which revealed hypodensity noted in right parietal and occipital region rest of the cerebral parenchyma, basal ganglia, thalami, posterior fossa structures, ventricle system and bony calvarium appears normal. No intra or extra axial fluid and midline shift or mass effect seen. Findings suggestive of acute infarct in right high parietal and occipital region Fig 1 showing hypodensity noted in right parietal and occipital region.



**Fig 1; Hypodensity noted in right parietal and occipital region**

With this history, examination findings and investigations, we made a provisional diagnosis of stroke secondary to iron deficiency anemia. The child was started on acetylsalicylic acid (5mg/kg/day) (which blocks prostaglandin synthetase action, in turn inhibits prostaglandin synthesis and prevents formation of platelets aggregating thromboxaneA2), subcutaneous Low-molecular-weight heparin (100U/kg/day) and oral iron therapy. She had been

evaluated by the physiotherapy department and a programme of rehabilitation has been arranged which consists of muscle strengthening exercises to improve functional activity out any weakness. As the child's condition was improved quickly, MRI with MRV was not done.

## DISCUSSION

Iron is important for the neuronal maturity and development. Iron deficiency anemia is associated with motor developmental delay, behavioral problems like decreased concentration, attention span, breath hold spells, febrile seizures, pica, stroke, cranial nerve palsies.<sup>4</sup> Current pediatric literature described IDA has been associated with stroke.<sup>5,6</sup> Hartifield et al described the three children with cerebral sinus thrombosis and three children with arterial stroke.<sup>7</sup> Maguire et.al study found anemia is more common in children with stroke than in controls (53%:9%).<sup>8</sup> IDA children are 10 times more prone to develop stroke than normal healthy children. There are various pathophysiological mechanism proposed to explain association between iron deficiency and stroke. Iron plays important role in normal thrombopoiesis.<sup>9</sup> Normal levels of iron acts as inhibitor of thrombopoiesis. Low levels of iron stimulates the thrombopoiesis resulting in increased platelets. This thrombocytosis is responsible for hypercoagulable state.<sup>5</sup> Iron deficiency increases erythropoietin levels, which stimulates megakaryocytes. Microcytosis due to iron deficiency decreases the cell deformability and increases the viscosity, resulting in abnormal flow patterns.<sup>10</sup> Whenever there is increase in metabolic demand at tissue levels in conditions like infection or stress results in anemic hypoxia which predisposes to venous thrombosis.<sup>11</sup> In our case the child is having severe IDA with left hemiparesis with thrombocytosis. On evaluation no other predisposing factors for stroke were present in this child. MRI or MR is preferred imaging modality for investigating stroke. Treatment of stroke includes symptomatic treatment along with anticoagulation therapy. Low molecular weight heparin is preferred in the absence of any major haemorrhage.<sup>12, 13</sup> So iron deficiency anemia may not be benign, especially during infections which may predispose for developing stroke.

## CONCLUSION

Stroke is a life threatening serious medical emergency. Early diagnosis can prevent permanent neurological damage and death. Iron deficiency anemia in one of the common preventable cause of stroke. With proper counseling and management, we can overcome the stroke, behavioral abnormalities & febrile convulsions (under 6years) in iron deficiency anemia.

**Conflict of interest: Nil**

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