CNS VASO-OCCLUSIVE DISEASE IN CHILDREN

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INTRODUCTION

Stroke is rare in children, with an incidence of 2.6 to 3.1/1 000 000. Cerebral infarction occurs among children of all ages. The causes of stroke may be thrombotic, embolic, or hemorrhagic. Most commonly, pediatric stroke is caused by structural abnormalities of cerebral vasculature, inflammatory conditions that involve cerebral vessels, or congenital heart disease. Diagnosis still relies heavily on clinical recognition of the cardinal signs of focal cerebral injury. Topographic determination of the injured cerebral area has been enhanced by the advent of neuroradiologic methods such as MRI. Nonetheless, several disorders may mimic presentation of focal cerebral infarction; differentiating them from stroke depends heavily on an accurate history and physical examination.

CASE REPORT: MOYAMOYA DISEASE IN A BEDOUIN CHILD.

A female child born to first-degree consanguineous Bedouin parents , living in Ezzaria town near Jerusalem came to medical attention for the first time at 20 months of age. This full term infant was a product of uneventful pregnancy, home delivery without complications. Birth weight was 2.5 kg. She developed normally without any significant medical illness till the age of 20 months, when after awaking from a sleep she developed abnormal movement. She had sudden blinking of right eye and tonic-clonic movements of the right hand, with crying, for about 30min which resolved spontaneously. There was no history of fever, vomiting or diarrhea, but she had dry cough for the last week .No history of drug ingestion or head trauma. Upon arrival to the hospital she was fully conscious, temperature was 36.7º C, respiratory rate: 28/min, blood pressure: 88/43mmHg , pulse: 150 beats/min, weight: 10.230 kg
(10%) , height: 77cm (< 5%) , HC: 45.5 cm ,O_2sat: 95%. On examination, she had mild congested throat, good air entry bilaterally, harsh breathing, no heart murmur, soft abdomen,

spleen and liver not enlarged. Meningeal signs were negative, she had abnormal gait with mild right sided limping.
Laboratory investigations showed:

- CBC: Hg: 11.8 g/dl, MCV: 77, WBC: 12 000/mm³, Platelets 518 000 /mm³.
- ABG: PH:7.42, p_{CO2}:34, p_{O2}:72, HCO_3:21,BE:-2, O_2Sat:94%
- Calcium:9.4 mg/dl , Creatinin: 0.4 mg/dl , Random blood sugar:108 mg/dl .

Chest X-ray revealed left upper lobe hazy infiltration.
Brain CT scan was normal.
EEG noted a focal activity in temporo-parietal area.

The patient was treated with Erythromycin for chest infection and discharged home in good general condition with no focal neurological deficit.

One week later, she presented with one day history of focal left sided convulsion with loss of consciousness for about 5 minutes, followed by weakness of left side .Temperature was 36.7º C , blood pressure 88/57mmHg , respiratory rate 28/min, heart rate 159 beats/min. She looked ill, distressed, dehydrated. She had evident left sided hemiplegia with facial involvement on the same side.

Investigations on admission were not significant:

- CBC: Hb: 10.9 g/dl, WBC: 7 600/mm³, Platelets 314 000/mm^3.
- ESR: 15 mm/1^{st} hour.
- Na: 139 meq/L, K: 4.0 meq/L. Cholesterol: 87 mg/dl, Triglycerides: 108 mg/dl, SGOT: 55 IU/L , SGPT: 11 IU/L, Alkakine phosphatase: 303 IU/L, Total Protein: 5.9 g/dl, albumin: 3.9 g/dl.
- Blood Gases: pH: 7.48, P_{CO2}:24, P_{O2}:76, O_2 Sat: 96%, HCO_3: 18, BE: -4.
- Urine Analysis: Free.
- Blood Culture: Negative.
- CSF analysis: T. cell's: 0.0, Protein: 5mg/dl, Glucose: 74 mg/dl. CSF Culture: Negative.
  CSF Lactic acid: 1.1 mmol/L (N=0.6-2.4).
- Serum Lactic acid: 0.9 mmol/L.
- Protein C, S, Anti thrombin III, Leiden factor V were within normal range.

- ANA: Negative.
- Plasma amino acids: Concentration of homocystein and methionin were normal.
- Urine organic Acids: showed no specific or diagnostic feature.
- Repeated Brain CT: showed large low attenuation area in right parietal region (figure 1).
- Cardiac echography was normal.

The patient was treated with supportive measures: correction of fluids and electrolytes, vitamins, physiotherapy, and was started on carbamazepine. Her general condition improved especially weakness of her left leg significantly decreased. The facial palsy resolved. No convulsions were stated during the two weeks of hospitalization. Follow-up evaluation showed nearly resolution of her left sided weakness, return to normal gait and use of her left hand.

At the age of 27 months, she presented with 2 days history of fever, runny nose and cough. One day later, she was noticed to have right sided weakness (limping on the right leg, less use of her right hand). On examination, she was conscious, afebrile, respiratory rate 32/min, blood pressure 111/71mmHg, heart rate 150 beats/min,
O_2 sat: 98% . She was hypoactive but meningeal signs were negative. Cranial nerves showed no deficit. She had right sided weakness (power 3/5 on both hands and legs) with facial involvement on the same side, deep tendon reflexes were exaggerated on both knees, babinski sign was positive on the right side. Repeated brain CT showed a large low attenuation area on right parietal region and a large new one on the left fronto-parietal region (figure 2).

MRA demonstrated severe stenosis of both supraclenoid internal carotid arteries and multiple stenosis on both middle and anterior cerebral arteries (figure 3 and 4). The management was supportive with Biotin, Q 10 enzymes, B complex, and low dose of aspirin (100 mg once daily). The patient progress was satisfactory, the weakness significantly improved and she started to use her right hand better, with mild limping on the right side.

DISCUSSION

Recurrent attacks of alternating hemiplegia (ischemic stroke), with no underlying metabolic, coagulation or cardiac cause raised the suspicion of arterial occlusion in this infant. Brain MRA showed changes typical for Moyamoya disease.

Reviewing the literature, this is one of the youngest reported cases of Moyamoya disease. The youngest reported case was a 4 months old infant (1). A second case has been described in a 20-month-old girl with Down syndrome who presented with seizure and hemiparesis (2).

Moyamoya disease (MMD) is a progressive occlusive disease of the cerebral vasculature with particular involvement of the circle of Willis and the arteries that feed it. Moyamoya ("puff of smoke") characterizes the appearance on angiography of abnormal vascular collateral networks that develop adjacent to the stenotic vessels. Pathologically, MMD is characterized by intimal thickening in the walls of the terminal portions of the internal carotid vessels bilaterally. Approximately, 10% of cases of Moyamoya syndrome are due to a genetic cause (autosomal recessive trait) and are termed primary Moyamoya syndrome .Two genetic locations have been identified as significant in primary Moyamoya syndrome: 3p26-p24.2 and 17q25 (3). Secondary Moyamoya syndrome refers to cases in which the syndrome is a consequence or result of another underlying disorder (Neurofibromatosis type I, sickle cell disease (4), tuberous sclerosis, meningitis, retinitis pigmentosa, fibromuscular dysplasia, atherosclerosis, Down syndrome, and Fanconi's anemia and following radiation therapy to the skull base of children(5)) . MMD occurs primarily in Asians, but it also can occur (with varying degrees of severity) in Caucasians, African Americans, Haitians, and Hispanics. About 10 years ago, Goto and Yonekawa reported the worldwide distribution of Moyamoya disease at that time (6). The female-to-male ratio was 1.8:1. Moyamoya syndrome may occur at any age, it most often occurs between the ages of five and ten years and during the third and fourth decades of life. Symptoms vary with age of onset. Cerebral ischemic events are more common in children. Children with Moyamoya syndrome may have convulsions, involuntary muscle movements, hemiplegia or paralysis of one limb. Some children may show signs of mental retardation. Patients tend to develop one or more of the following visual disturbances: blindness in one

half of the visual field of one or both eyes (hemianopia), diplopia, bilaterally (right and left) decreased visual acuity, and the inability to recognize objects. Later onset is characterized by bleeding. Adults are more prone to intracranial bleeding below the middle covering of the brain (subarachnoid). This may be followed by accumulation of excessive amounts of watery fluid in the optic disks (papilledema) and fainting. Neurosis (mainly anxiety) usually occurs in adult Moyamoya patients. Patients usually have sudden interruptions of the blood supply to the brain (cerebral infarctions), which can lead to brain death.

DIAGNOSIS

In the presence of atypical features such as young age and absence of obvious risk factors for stroke the diagnosis is suspected. Cerebral angiography is the admitted standard for diagnosis. The following findings support the diagnosis: stenosis or occlusion at the terminal portion of the internal carotid artery or the proximal portion of the anterior or middle cerebral arteries, abnormal vascular networks in the vicinity of the occlusive or stenotic areas and bilateralism of the described findings. Magnetic resonance angiography (MRA) can be performed. Any of these findings on MRA may reduce the need for conventional angiography. In Moyamoya disease, color-coded ultrasound is diagnostic for the lesion of the internal carotid artery.

TREATMENT

Medical treatment is advised for patients experiencing mini-strokes. Aspirin, vasodilators (calcium- channel blockers) and/or anticoagulants may be prescribed. Surgical treatment has been reasonably successful, especially among children, and various surgical approaches have been developed. Response of patients to these complex and very complicated surgeries varies. Genetic counseling may be of benefit for patients and their families if they have the hereditary form of Moyamoya syndrome.

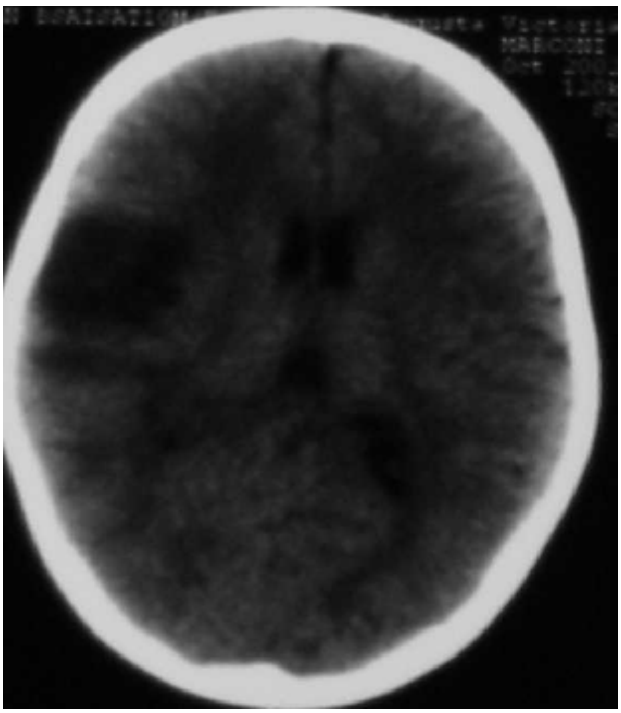


FIGURE 1

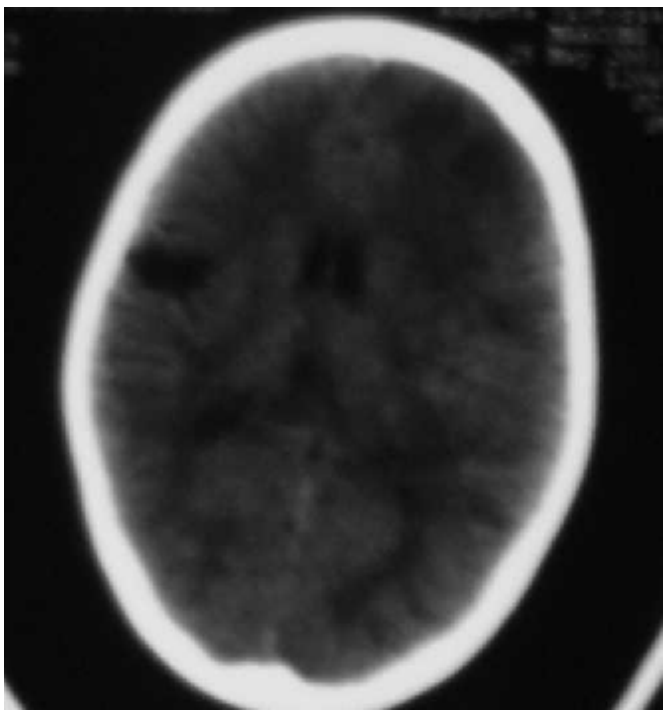
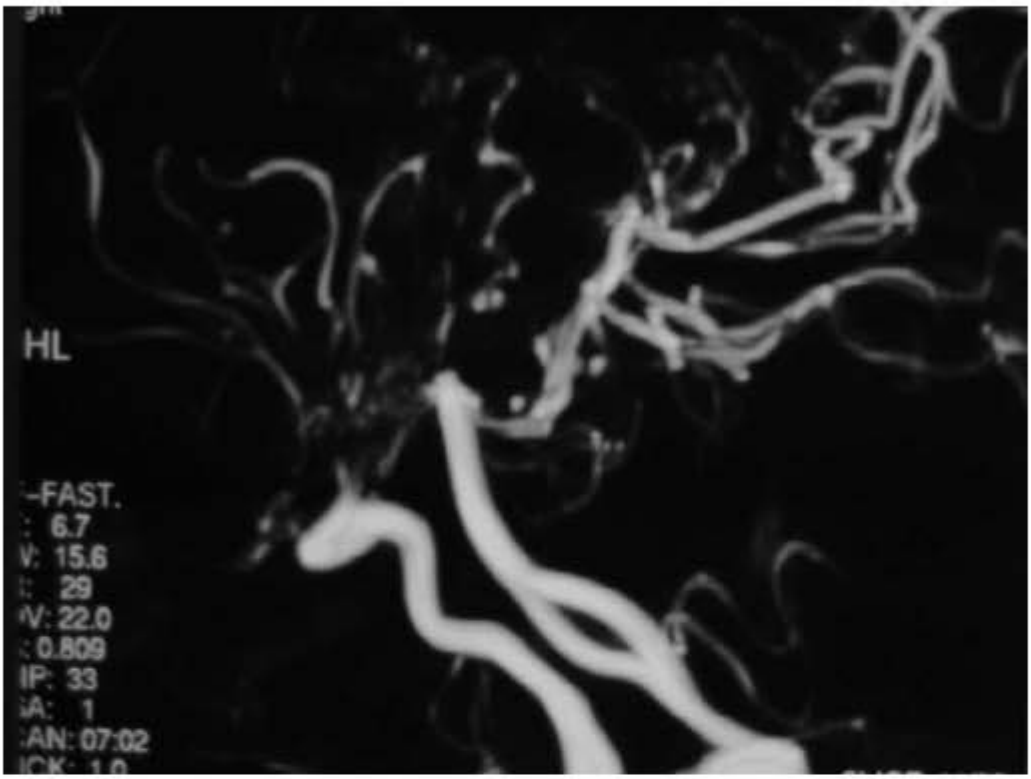


FIGURE 2

FIGURE 3



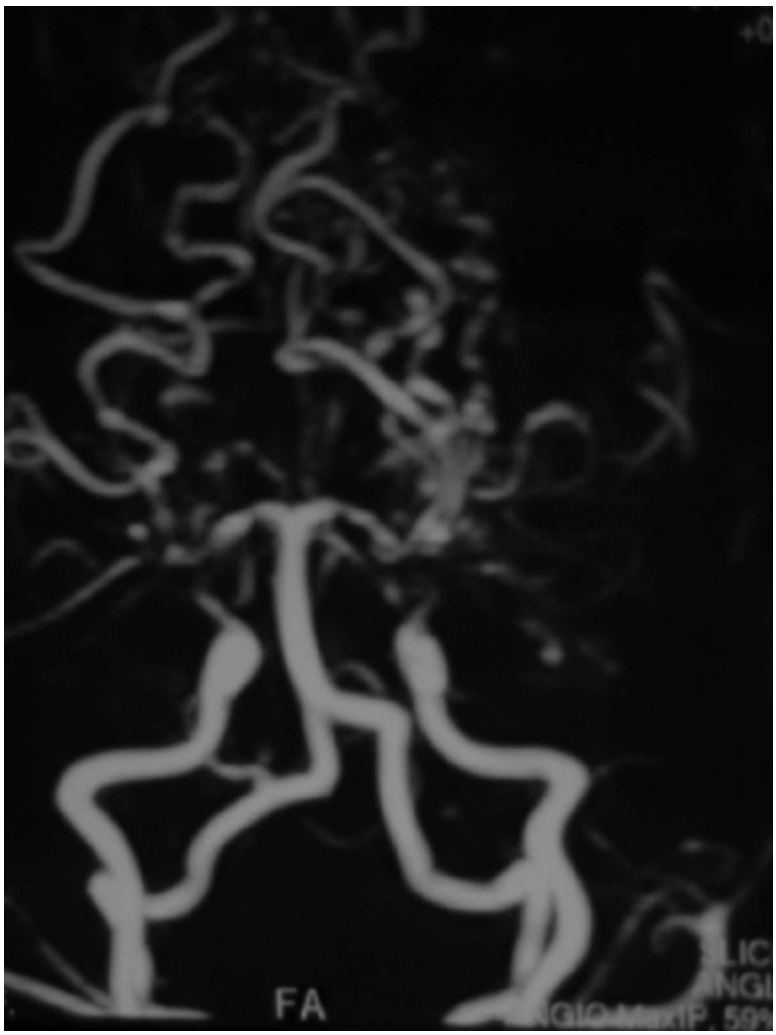


FIGURE 4

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