Reversible temporal lobe edema: An early MRI finding in Menkes disease

Dear Sir,

Menkes disease is an X–linked neurodegenerative disease of impaired copper transport to different tissues caused by mutation of the P-type ATPase 7 gene. Copper deficiency causes mitochondrial damage in the brain through inactivation of cytochrome c oxidase and leads to apoptotic death via the mitochondrial pathway.[1] Here, we report a 6–month–old-boy, who was admitted with hypotonia. He had distinctive pale skin and light brown tangled hair, more concentrated frontocentrally but very sparse in the temporal areas. Laboratory analysis of blood revealed lactate level of 4.6 mmol/L (N: 0.5–2.2 mmol/L), copper level of 0.1 μg/ml (N: 0.9–1.1 μg/ml), and ceruloplasmin level of 4.98 mg/dL (N: 20–60 mg/dL). Microscopic examination of hair revealed a pili torti appearance. Based on these clinical and laboratory findings, the patient was diagnosed with Menkes disease. At the follow-up examination, the patient had brief tonic eye deviation and clonic movements of the left side of the body. Electroencephalography showed sharp and slow wave complexes in the right hemisphere. Cranial magnetic resonance imaging (MRI) was performed using a 1.5 Tesla scanner (Symphony, Siemens, Germany) and T2–weighted images showed a high–intensity lesion in the right temporal lobe as well as gyral enlargement and a narrowing of the Sylvian fissure [Figure 1]. Diffusion-weighted MRI demonstrated low intensity and an increased apparent diffusion coefficient, indicative of vasogenic edema [Figure 2]. H1 MRS showed lactate peaks in the temporal lobe and bilateral basal ganglia. MRI conducted again at the age of 9 months showed only cerebral atrophy.

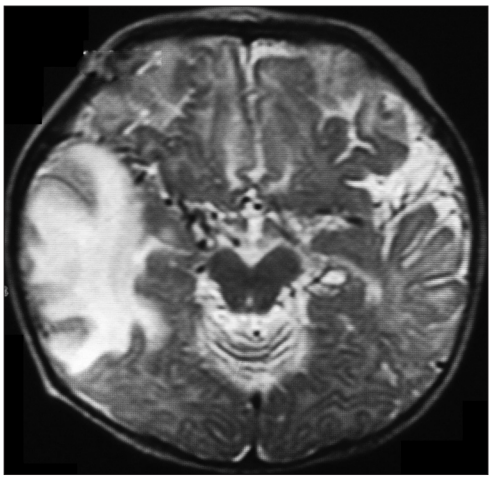

Figure 1: Right temporal lobe edema at T2-weighted MRI

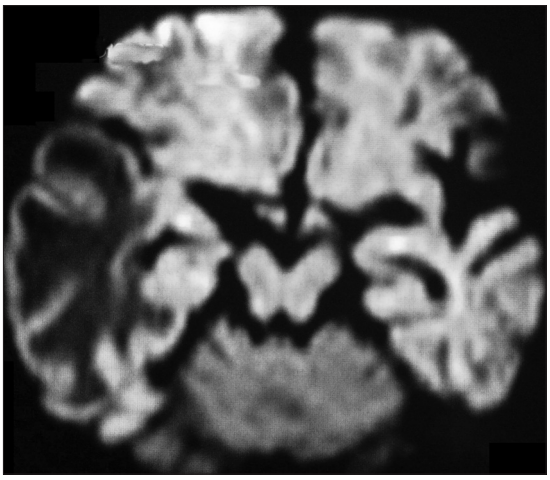

Figure 2: Diffusion-weighted MRI demonstrated low intensity at right temporal lobe

Typical MRI findings of Menkes disease are cerebral atrophy, infarction, subdural collections, and white matter lesions.[2] The features of the disease are a direct consequence of dysfunction in several copper-dependent enzymes. Decreased lysyl oxidase and dopamine-beta-hydroxylase activity impairs the crosslinking of elastin and collagen and neurotransmitter synthesis, respectively. Cu/Zn superoxide dismutase deficiency may lower the protection against oxygen free radicals and theoretically have cytotoxic effects.[3]

Temporal lobe edema in Menkes disease has only been previously reported in four cases. The first case was a 5–month–old boy presenting with bilateral temporal lobe hyperintensities on T2-weighted images. Repeated MRIs showed the disappearance of lesions at 6 months of age, and the diffuse atrophy of cerebrum, cerebellum and brainstem at 12 months of age.[4] The second case was a 7–month–old boy with a transient left temporal lobe lesion and low cytochrome c oxidase activity in platelets.[5] The third case was a 5–month–old boy with hyperintensities in the putamen, head of caudate nuclei, and bilateral temporal lobes. Diffusion–weighted MRI revealed cytotoxic edema of the putamen and caudate nuclei and vasogenic edema of the temporal lobes.[6] The most recent case was a 7–month–old boy with left temporal edema of vasogenic nature, which disappeared by the time a second image was taken at 8 months of age.[7] In all four cases as well as ours, the patients had seizures before cranial imaging was done. The age group of all four patients and localization of the lesion was similar to our case, and in the latter three cases MRS revealed lactate peaks in the basal ganglia and temporal lobes, as in our case.

The transient nature and localization of findings have similarities with stroke-like lesions in MELAS syndrome. Stroke–like episodes are characterized by neuronal hyperexcitability, neuronal vulnerability, increased capillary permeability, and focal hyperaemia. It has been hypothesized that increased capillary permeability provoked by epileptic activities in the presence of mitochondrial capillary angiopathy may cause edematous brain lesions.[8]

We concluded that transient temporal lesions are early findings in the progressive course of Menkes disease and energy metabolism failure induced by seizures seems to be responsible for vasogenic edema.

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