Cerebral MR Manifestations of Pompe Disease in an Infant

Chueng-Chen Lee, Cheng-Yu Chen, Ting-Ywan Chou, Fu-Hwa Chen, Chau-Chin Lee, and Robert A. Zimmerman

Summary: We present the cerebral MR findings of a 5-month-old girl with biopsy-proved Pompe disease and discuss the imaging characteristics with known central nervous system disease.

Index terms: Storage diseases; Brain, magnetic resonance; Infants, diseases

Pompe disease, a type II glycogen-storage disease, is a lysosomal disorder caused by a deficiency of α-1,4-glucosidase (acid maltase). The disorder is characterized by glycogen accumulation in the lysosomes of skeletal muscles, heart, liver, and central nervous system, which results in early onset of organomegaly, hypotonia, cerebral dysfunction, failure to thrive, and early death. Radiologic evaluation of Pompe disease has focused primarily on the heart and liver (1, 2). We present the magnetic resonance (MR) imaging findings in biopsy-proved Pompe disease.

Case Report

A 5-month-old girl presented with shortness of breath and progressive muscle weakness 1 month before hospitalization. On physical examination, she was extremely floppy, had mild congestion of the pharyngeal wall, macroglossia, coarse breath sounds with rhonchi over both lung fields, regular heart beat with apical systolic murmur, hepatomegaly, and grade 4 muscle power of the extremities. The liver, heart, and muscle enzyme levels were elevated: SGOT, 288 U/L; SGPT, 194 U/L; creatine kinase (CK), 998 U/L (CK-MB, 72 U/L); and lactic dehydrogenase (LDH), 762 U/L (LDH1:LDH2, 1.65). The specific enzyme assay for acid maltase was not performed. Results of other laboratory studies were normal. The chest X-ray film showed cardiomegaly with infiltration of both upper lung fields. Electrocardiography showed a diffuse enlarged QRS complex, short PR interval, and left ventricular hypertrophy. Echocardiography displayed hypertrophy of the ventricular septum and walls, poor myocardial contractility, and mild mitral regurgitation. A clinical diagnosis of Pompe disease was made in light of profuse myotonic discharges on EMG and quadriceps muscle biopsy findings, which showed a remarkable vacuolar myopathy with almost total loss of underlying myofibrillar structure, intense periodic acid–Schiff staining for glycogen, and strong acid phosphatase activity.

MR of the heart with electrocardiography-gated spin-echo revealed increased thickness of the interventricular septum and walls, a marked dilated left ventricle caused by mitral regurgitation, and patchy consolidation of the both upper lungs (Fig 1A). T1-weighted MR images of the brain revealed multifocal dural thickening that enhanced after intravenous gadolinium administration. Open opercula and focal pachygyria over bilateral perisylvian regions (Fig 1B through D) also were noted. The myelination of the cerebral white matter was normal for age on T2-weighted images. At follow-up, the patient deteriorated clinically, with swallowing and breathing difficulties as well as profound weakness in the limbs. She died after a pulmonary infection at 13 months of age.

Discussion

Like the other lysosomal storage diseases, the neuropathologic abnormalities of Pompe disease result from an accumulation of undegraded macromolecules (glycogen) in all cells of the central nervous system axis, particularly glial cells in the gray and white matter of the brain and anterior horn cells in the spinal cord (3, 4).

In the present case, cerebral MR revealed multifocal dural thickening with gadolinium enhancement. There also was opening of the opercula and pachygyria over the bilateral perisylvian regions. Dural thickening could be found on postcontrast T1-weighted MR images in a variety of conditions such as leptomeningeal metastasis, pachymeningeal fibrosis, intracranial hypotension, sarcoidosis, and deposition of excessive metabolite in the dura and leptomeninges (5–7). The dural thickening in our case may be attributed to glycogen deposi-
tion in the dura. Similar MR findings of dural thickening have been reported in patients with mucopolysaccharidosis in which deposition of mucopolysaccharide in the dura has been observed (8). The perisylvian pachygyria and bilateral underopercularization found in our case probably are isolated abnormalities and maybe unrelated to the lysosomal disorder. It is conceivable, however, that the underdevelopment of the neocortex and disorder of the neuronal migration can be attributed to early involvement of the germinal cells by the excessive glycogen deposition before 12 weeks of gestation. More cases are needed to study the effects of excessive deposition of glycogen on the developing brain.

References