Babol university of Medical Sciences
Current Research in Medical Sciences
ISSN: 2538-6212
Student Research Committee
Current Research in Medical Sciences

Early Onset Pompe and Leukoencephalopathy: A Case-Report Study

Soroor Inaloo [1], **Atena Modanlou** [1]*

1. Pediatric Neurology Neonatal Research Center, Shiraz University of Medical Sciences, Shiraz, Iran.

Article Info

Article type:
Case Report

Received: 30 June 2023
Revised: 28 July 2023
Accepted: 2 August 2023

ABSTRACT

Background: Acid maltase deficiency is the cause of Pompe disease (PD), also known as glycogen storage disease type II, which can result in lysosomal glycogen storage. Children, adults, and newborns can all exhibit fundamental characteristics. We described a rare case of Pompe disease (PD) with leukodystrophy manifestations, who was referred two years prior by an orthopedist due to irregular walking.

Keywords: Pompe disease, Glycogen storage disease, Hypertrophy.

Cite this article : Inaloo S & Modanlou A. A female iranian case of pompe disease: A case-report study. *Current Research in Medical Sciences*. 2023; 7(1): 51-54.

Publisher: Babol University of Medical Sciences

Introduction

A mutation in the gene encoding acid -1,4-glucosidase (GAA, OMIM 606800), which maps on chromosome 17, results in glycogen accumulation in numerous tissues and is the cause of the uncommon autosomal recessive condition Pompe disease (PD) (1). The condition is also known as "Type II glycogen storage disease (GSDII)" or "Acid maltase deficiency." It bears the name Johannes Cassianus Pompe after a Dutch pathologist who recorded an autopsy of a 7-month-old girl who was found to have "idiopathic myocardial hypertrophy" and generalized muscle weakness (2). Dr. Pompe shed light on the disease's basic biochemistry, which involves extensive vacuolar glycogen accumulation in almost all organs. The same year, 1932, saw the description of similar incidents (3).

The prevalence of PD seems to differ with ethnicity. It is thought to occur at a frequency of 1/50,000 in Taiwan (4), 1/138,000 in Caucasians, and 1/31,000 in people with African heritage (5). From 0 to 71 years of age, the beginning symptoms might develop at any time of life (6). However, there are limited data delineating the extent of central nervous system (CNS) involvement in children with PD and its impact on developmental functioning. Using brain magnetic resonance imaging (MRI), white matter (WM) hyperintense foci have been described in young children with IPD, the clinical significance of which is unclear. In rare cases, PD is accompanied by leukodystrophy evident on brain MRI (7). In the present study, We described a rare case of PD with leukodystrophy manifestations.

Case Presentation

On December 28, 2022, a 6-year-old girl was admitted to Namazi Hospital (Shiraz, Iran). She was referred to an orthopedist two years ago due to improper walking. Walking 16 m/o and talking was normal. After checking the family history, it was found that the parents were first cousins. Past medical history showed a product of C/S, with a history of neonatal hypoglycemia and polyhydramnios. Weight

* **Corresponding Author:** Atena Modanlou
Address: Pediatric Neurology Neonatal Research Center, Shiraz University of Medical Sciences, Shiraz.
Tel: +989112237942 **E-mail:** a.modanlu@gmail.com

[DOI: 10.22088/crms.7.1.51]

of 14 kg, waddling gait, Gowers' sign, deep tendon reflex (DTR): hypo, minor calf hypertrophy, hypertrophy of the paraspinal muscle, equinovarus deformity of the left foot, and impression (IMP) of limb-girdle muscular dystrophy (LGMD) versus Pompe were all observed during the physical examination. Paraclinical examination revealed creatine kinase 1041 U/L, lactic dehydrogenase (LDH) 1703 U/L, aspartate aminotransferase 298 U/L, alanine aminotransferase 270 U/L.

Echocardiography showed mild left ventricular hypertrophy (LVH). Alpha 1,4 glucosidase activity was 0.1 with a cut-off>3.3. A cystic aneurysm in a basilar artery (~3.0×2.8 cm in size) and an enlarged P1 segment in the left posterior cerebral artery were both detected by head and neck computed tomographic angiography. (Figure 1,2). Genetic study: From lymphocytes in peripheral blood, DNA was extracted. The GAA gene's exons and surrounding sequences were amplified using a polymerase chain reaction. We discovered an exon four compound heterozygous mutation (c. 2015G>A), (c. 2015G>A), and exon 16 (p. R672Q); (p. R672Q) in the patient. The patient has undergone treatment with Myozyme 6 vial every two weeks. Three years later, there was no change in motor activity.

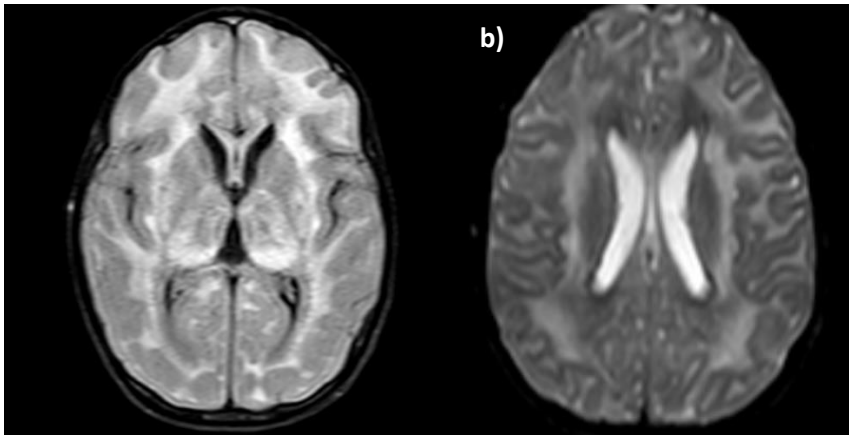

Figure 1. The basilar artery can be seen to the right of a spherical, high-density shadow on computer tomographic angiography (CTA) images (a–b). It was roughly 3.0 cm×2.8 cm in size. The vertebral artery shifted to the left as a result of compression on P1 of the left posterior cerebral artery.

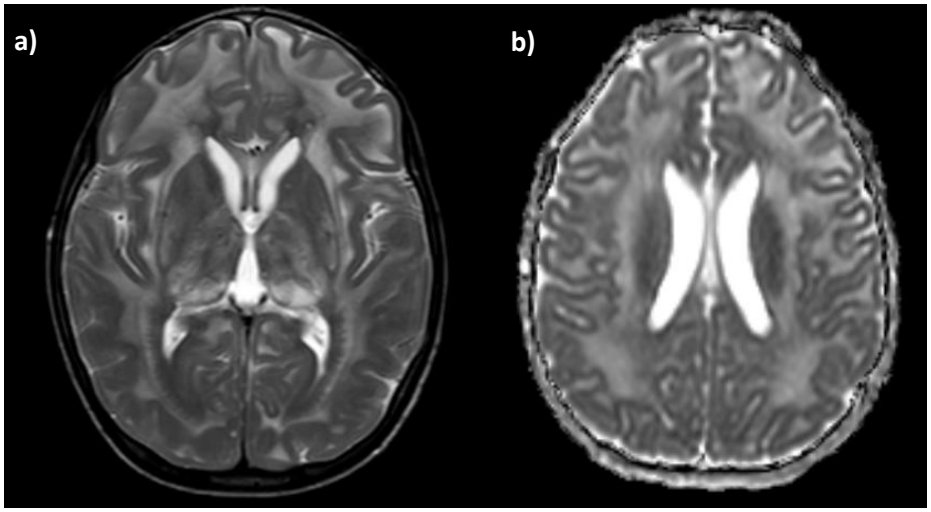

Figure 2. The basilar artery can be seen to the right of a spherical, high-density shadow on computer tomographic angiography (CTA) images (a–b). The size was about 3.0 cm×2.8 cm. The vertebral artery shifted to the left as a result of compression on P1 of the left posterior cerebral artery.

[DOI: 10.22088/crms.7.1.51]

Discussion

The systemic disease known as Pompe is uncommon, autosomal recessive, inherited, and can affect a variety of bodily tissues and organs, including the smooth, respiratory, cardiac, skeletal, and skeletal muscles (8). Age of onset affects both the clinical symptoms and prognosis. PD encompasses a continuum of patients broadly classified into two groups; infantile PD (IPD; with cardiomyopathy in the first year of life) and late-onset PD (LOPD) to describe all others (9).The early onset is typically associated with lower levels of residual enzyme activity, severe clinical symptoms, a faster rate of development, and a worse prognosis (10). More clinical symptoms, such as an intolerance to tiredness, a lack of capacity to squat, run, or jump, chest tightness in response to exercise to control asthma, abrupt respiratory failure, and other skeletal and respiratory muscle symptoms, are present in late-onset patients. Three categories are used to group late-onset cases (10). We described a rare case of PD with leukodystrophy manifestations. While initial case reports suggested infantile Pompe patients may suffer delayed myelination (11), recent evidence suggests that patients may be at risk of chronic progressive leukodystrophy in late childhood (12).

Additionally, abnormalities in the corticospinal tracts are often associated with hyperreflexia or spasticity. In our study, children were either areflexia, hyporeflexic, or normal; spasticity was not observed. However, spasticity was described in a CRIM-negative 4-year-old girl with severely progressive WM hyperintense foci (12). In the Korlimarla et al. study, five of the younger children with IPD (ages 6y to 12y) had extensive involvement of the u-fibers, along with extensive brain WM hyperintense foci. The older children with IPD (ages 12y to 18y) had no u-fiber involvement (13). Previously, however, sparing of u-fibers was described in children with IPD (14,15-12). as seen in Krabbe disease, ALD, and MLD (16-18). More investigation is needed to comprehend better the impact of early versus late u-fiber involvement in children with IPD.

Conclusion

We describe a case of a female Pompe patient diagnosed with Gowers's sign positive, mild calf hypertrophy, hypertrophy of paraspinal muscle, and equinovarus deformity of the left foot. We need to improve our knowledge about clinical presentations of PD, and patients need to be observed and followed up closely and regularly.

Acknowledgment

The authors are very grateful to the Imam Reza Hospital staff in Shiraz, Iran, for their assistance during this study. Most importantly, the authors would like to thank all the participants for permitting them to participate in this study.

Availability of data and materials

All data generated or analyzed during this study are included in this published article.

Compliance with Ethics Guidelines

Not applicable.

Competing Interests

The authors declare that they have no conflict of interests.

[DOI: 10.22088/crms.7.1.51]

Consent for publication

Not applicable.

Funding

No funding.

References

1. Kohler L, Puertollano R, Raben N. Pompe disease: from basic science to therapy. Neurotherapeutics. 2018;15(4):928-42.
2. Pethe MS, Karle MS, Rane MS, Vichare MR. Pompe Disease: A review on rare disorder of glycogen storage. Int j pharm res appl. 2021; 6(4): 284-294.
3. Putschar and Walter. Uber angeborene Glykogenspeicher-Krankheit des Herzens. “Thesaurismosis glycogenica” (v. Gierke). Beitr Pathol Anat Allg Pathol. 1932; 90:222.
4. Kishnani PS, Hwu WL, Mandel H, Nicolino M, Yong F, Corzo D, Infantile-Onset Pompe Disease Natural History Study Group. A retrospective, multinational, multicenter study on the natural history of infantile-onset Pompe disease. J Pediatr. 2006 ;148(5):671-6.
5. Winkel LP, Hagemans ML, van Doorn PA, Loonen MC, Hop WJ, Reuser AJ, Van der Ploeg AT. The natural course of non–classic Pompe’s disease; a review of 225 published cases. J Neurol. 2005;252(8):875-84.
6. Liu Y, Yang Y, Wang B, Wu L, Liang H, Kan Q, Cao Z, Zhao Y, Zhou X. Infantile Pompe disease: A case report and review of the Chinese literature. Exp Ther Med. 2016;11(1):235-8.
7. Korlimarla A, Spiridigliozzi GA, Crisp K, Herbert M, Chen S, Malinzak M, Stefanescu M, Austin SL, Cope H, Zimmerman K, Jones H. Novel approaches to quantify CNS involvement in children with Pompe disease. Neurology. 2020;95(6): e718-32.
8. Schuller A, Wenninger S, Strigl-Pill N, Schoser B. Toward deconstructing the phenotype of late-onset Pompe disease. Am J Med Genet C Semin Med Genet. 2012;160 (1):80–88.
9. Kishnani PS, Corzo D, Nicolino M, et al. Recombinant human acid [alpha]-glucosidase: major clinical benefits in infantile-onset Pompe disease. Neurology. 2007;68(2):99-109.
10. Peric S, Fumic K, Bilic K, Reuser A, Rakocevic Stojanovic V. Rupture of the middle cerebral artery aneurysm as a presenting symptom of late-onset Pompe disease in an adult with a novel GAA gene mutation. Acta Neurol Belg. 2014;114(2):165–166.
11. Chien YH, Lee NC, Peng SF, Hwu WL. Brain development in infantile-onset Pompe disease treated by enzyme replacement therapy. Pediatric research. 2006;60(3):349-52.
12. Broomfield A, Fletcher J, Hensman P, et al. Rapidly Progressive White Matter Involvement in Early Childhood: The Expanding Phenotype of Infantile Onset Pompe? JIMD Reports. 2018; 39:55- 62.
13. Korlimarla A, Spiridigliozzi GA, Crisp K, Herbert M, Chen S, Malinzak M, Stefanescu M, Austin SL, Cope H, Zimmerman K, Jones H. Novel approaches to quantify CNS involvement in children with Pompe disease. Neurology. 2020;95(6): e718-32.
14. Ebbink BJ, Poelman E, Aarsen FK, et al. Classic infantile Pompe patients approaching adulthood: a cohort study on consequences for the brain. Dev Med Child Neurol. 2018;60(6):579-586.
15. Messinger YH, Mendelsohn NJ, Rhead W, et al. Successful immune tolerance induction to enzyme replacement therapy in CRIM-negative infantile Pompe disease. Genet Med. 2012;14(1):135-142.
16. Cheon J-E, Kim I-O, Hwang YS, et al. Leukodystrophy in Children: A Pictorial Review of MR Imaging Features. RadioGraphics. 2002;22(3):461-476.
17. Barkovich AJ, Deon S. Hypomyelinating disorders: An MRI approach. Neurobiol Dis. 2016; 87:50-58.
18. Schiffmann R, van der Knaap MS. Invited article: an MRI-based approach to the diagnosis of white matter disorders. Neurology. 2009;72(8):750-759.

[DOI: 10.22088/crms.7.1.51]