Cumhuriyet Tıp Derg 2010; 32: 115-117
*Cumhuriyet Med J 2010; 32: 115-117*

# Glycogen storage disease type 1a: a case report

## *Tip 1a glikojen depo hastalığı: olgu sunumu*

**Adnan Ayvaz, Fatoş Tanzer**

Department of Pediatrics (A. Ayvaz, MD, Specialist; Prof. F. Tanzer, MD), Cumhuriyet University School of Medicine, TR-58140, Sivas.

**Abstract**

Glycogen storage disease type Ia (GSD Ia) is a rare autosomal disorder. Type I is the most serious of all hepatic glycogenosis because it leads to a complet blockage of glucose releases from liver. The production of glucose from glycogen or glyconeogenesis is impaired. The most marked characteristic of the disease is severe fasting hypoglycemia with concomitant lactic acidosis, elevation of free fatty acids, hyperlipemia, elevated transaminases, hyperuricemia and metabolic acidosis. We report a 4-month-old female case which we described a glycogen storage disease type Ia based on clinical and laboratory studies.

**Keywords:** Glycogen storage disease type Ia, GSD Ia

**Özet**

Glikojen depo hastalığı tip Ia nadir görülen otozomal bir hastalıktır. Tip I, hepatik glikojenozlar içerisinde, glukozun karaciğerden salınmasında tam bir blok olduğu için en ağır formudur. Glikozun, glikoneogenez veya glikojenden üretimi bozulmuştur. Hastalığın en belirgin özelliği ağır açlık hipoglisemisi ile birlikte laktik asidoz, serbest yağ asitleri yüksekliği, hiperlipemi, karaciğer enzimlerinin yüksekliği, hiperürisemi ve metabolik asidozdur. Bu yazıda, laboratuar ve klinik bulgulara dayanarak, glikojen depo hastalığı tip Ia olarak tanımladığımız dört aylık bir kız olguyu sunduk.

**Anahtar Sözcükler:** Glikojen depo hastalığı tip Ia

**Geliş tarihi/Received:** September 9, 2009; **Kabul tarihi/Accepted:** November 20, 2009

**Corresponding author:**

Dr. Adnan Ayvaz, Çocuk Sağlığı ve Hastalıkları Anabilim Dalı, Cumhuriyet Üniversitesi Tıp Fakültesi, TR-58140 Sivas. Eposta: aayvaz@ttmail.com

## Introduction

Glycogen storage disease type I (GSD I) is an autosomal disorder results from a deficiency of any of the proteins of the microsomal membrane-bound glucose-6-phosphatase complex. In classic type Ia glycogen storage disease (von Gierke Disease), glucose-6-phosphatase is deficient. Type Ib is due to defective microsomal transport of glucose-6-phosphate. Type Ic to defective transport of phosphate and Id to defective transport of glucose [1].

In a molecular studies, types Ib and Ic have been classified as GSD I non-a since both are formed as a result of glucose-6-phosphate translocase mutations.

Type I is the most serious of all hepatic glycogenosis because it leads to a complet blockage of glucose releases from liver. The production of glucose from glycogen or glyconeogenesis is impaired. The most marked characteristic of the disease is severe

fasting hypoglycemia with concomitant lactic acidosis, elevation of free fatty acids, hyperlipemia, elevated transaminases, hyperuricemia and metabolic acidosis [1].

In the present study, we report a rare case which we described as glycogen storage disease type Ia based on clinical and laboratory studies.

## Case report

The history revealed that she was the product of a full-term pregnancy, complicated with lung infection during second day and hospitalized for 16 days based on the diagnosis of respiratory distress syndrome type 2. It had been given phototherapy for neonatal jaundice.

It was found diabetes mellitus in her mother and there was consanguinity between the parents (second cousin).

Four-month-old patient's weight was 5400 g (25-50%), height 56 cm (25-50%) and head circumference 36.8 cm (below 3%). She had a baby-doll face. Her liver and spleen were palpated 10.3 cm and 7.8 cm below the costae, respectively. Other systemic examination findings were normal.

Her laboratory examination results were as follows; blood glucose 54 mg/dL; triglycerides 1338 mg/dL; cholesterol 178 mg/dL; lactic acid 29 mg/dL (<30); uric acid 5.7 mg/dL (2.5-4.3) and ALT 213 U/L (17-63), AST 84 U/L (14-41). Routine urine test was normal. In uric amino acids, generalized aminoaciduria was found. Liver biopsy was made. Hepatocyte was swollen because of extensive storage of glycogen and lipids (periodic acid shift (+)). Glucose-6-phosphatase enzyme was deficient.

## Discussion

Glycogen storage disease type Ia is characterized by severe fasting hypoglycemia, lactic acidosis, elevation free fatty acids, hyperlipemia, elevated liver transaminases, hyperuricemia and metabolic acidosis.

Affected patients may be symptomatic in the neonatal period and may have hepatomegaly, hypoglycemic convulsions and ketonuria. However, the condition often remains undiagnosed until hypoglycemic symptoms reappear in the course of inter current illnesses or when the infants begins to sleep longer at night between 3 to 6 month of age.

Our patient to complicate with lung infection on her second day and hospitalized for 16 days based on the diagnosis of respiratory distress syndrome and had been given phototherapy due to jaundice. Her liver had also been palpated to be 3 cm when discharge. When our patient was readmitted to our clinic with the complained of bloated abdomen, the liver of patient was 10.3 cm in 4 month of age. Infants with GSD are chubby and their linear growth usually lags. The liver grows slowly. Because of the accumulation of lipids the liver is usually soft and the edges may be difficult to palpate. The liver that extends down to the iliac crest is generally found by the end of the first year when serum triglycerides reach very high levels. With increasing activity of the child at around the birthday the frequency of manifestation of hypoglycemic symptoms and convulsions tends to increase.

A number of late complications have been observed in patients with type I GSD most patients have osteoporosis. Hyperuricemia may result in symptomatic gout after adolescence. Pancreatitis, hepatic adenomas, Fancony's syndrome may also develop. In our patient generalized aminoaciduria was found.

If GSD type I is suspected, liver biopsy should perform the diagnosis. In our patient's liver biopsy hepatocyte was swollen because of extensive storage of glycogen and lipids and the glucose-6-phosphatase enzyme was deficient.

With the increase in the number of the findings related to GSD genetics in recent years,

now, DNA-based diagnosis of GSD Ia from corionic villus specimen of carriers is possible and molecular genetic assays are reliable [2, 3]. In 51 Japanese GSD Ia patients, the most common mutation was detected to be 727G→T, the second was to be R83H while in 32 Taiwanese Chinese patients, 16 were 727G→T and 13 were R83H mutations (3). In two studies performed in our country, R83H mutant allele was established to be the highest [4, 5]. In our patient were not performed molecular studies.

The treatment is symptomatic. Patients have to be fed every 2-3 hours both daytime and at night. Raw corn starch is useful we advised to our patient to follow a diet based on raw corn starch.

Studies on gene treatment have been intensively performed in recent years. Since animal models of disease GSD Ia and Ib resemble to abnormalities those humans, studies on gene treatment have been carried out on animal models through adenovirus and adeno-associated-virus [6].

## References


1. Hoffman GF, Nyhan W, Zschocke J, Kahler SG, Mayatepek E. Inherited Metabolic Diseases. A Wolter Kluwer Company, 2002; 210-4.
2. Akanuma J, Nishigaki T, Fujii K, Matsubara Y, Inui K, Takahashi K, Kure S, Suzuki Y, Ohura T, Miyabayashi S, Ogawa E, Iinuma K, Okada S, Narisawa K. Glycogen storage disease type Ia molecular diagnosis of 51 Japanese patients and characterization of splicing mutations by analysis of ectopicalli transcribed mRNA from lymphoblastoid cells. Am J Med Genet 2000; 91: 107-12.
3. Chiang SC, Lee MY, Chung MH, Wang TR, Ko TM, Hwu WL. Glucose-6-phosphatase gene mutations in Taiwan Chinese patients with glycogen storage disease type Ia. J Hum Genet 2000: 45; 197-9.
4. Terzıoglu M, Emre S, Ozen H, Saltık IN, Kocak N, Ciliv G, Yuce A, Gurakan F. Glucose-6- phosphatase gene mutations in Turkish patients with glycogen storage disease type Ia. J Inherit Metab Dis 2001; 24: 881-2.
5. Huner G, Podskarbi T, Schutz M, Baykal T, Sarbat G, Shin YS, Demirkol M. Molecular aspects of glycogen storage disease type Ia in Turkish patients. J Inherit Metab Dis 1998; 21: 445-6.
6. Chou JY, Mansfield BC. Gene therapy for type I glycogen storage diseases. Curr Gene Ther 2007; 7: 79-88.