Case Report
JCAM

Effectiveness of Exchange Transfusion in Hyperlipoproteinemia Type 1

Hiperlipoproteinemi Tip 1'de Exchange Transfüzyonun Etkinliği

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Öz

Hiperlipoproteinemi Tip–1, lipoprotein lipaz (LPL) eksikliği sonucunda ortaya çıkan, lipoprotein metabolizmasının bir bozukluğudur. Akut pankreatite bağlı tekrarlayıcı karın ağrısı, eruptif ksantomlar, hepatosplenomegali ve lipemia retinalis hastalığın önemli klinik bulguları arasındadır. 40 günlük erkek hasta ishal, beslenememe, kusma ve sürekli ağlama şikâyetleri ile başvurdu. Plazmasının beyaz kremsi görünümde olması nedeniyle lipid düzeyleri çalışıldı. Plazma trigliserit (TG) düzeyi 47450 mg/dl, total kolesterol düzeyi ise 1614 mg/dl idi. Teknik problemler nedeniyle plazmaferez uygulanamadı. Alternatif tedavi olarak exchange transfüzyon (ET) uygulandı. TG düzeyi ET'den sonra ilk saatte 47450 mg/dl'den 3791 mg/dl'ye düşürüldü ve yağdan fakir diyet ve omega-3 yağ asidi desteği ile 300 mg/dl civarında tutuldu. Plazmaferez teknik olarak imkânsız olduğunda, plazmaferezin alternatif tedavisi olarak şiddetli hipertrigliseridemisi olan infantlara exchange transfüzyon uygulanabilir.

Anahtar Kelimeler

Exchange Transfüzyon; Hiperlipoproteinemi Tip–1; LPL Geni

Abstract

Hyperlipoproteinemia Type-1 is a disorder of lipoprotein metabolism caused by the deficiency of lipoprotein lipase (LPL). Recurrent abdominal pain due to acute pancreatitis, eruptive xanthomas, hepatosplenomegaly, and lipemia retinalis are major clinical findings of the disorder. A 40-day-old boy presented with diarrhea, poor feeding, vomiting, and constant crying. Due to the white creamy appearance of his plasma, lipid levels were obtained. His plasma triglyceride (TG) level was 47450 mg/dl and total cholesterol level was 1614 mg/dl. Plasmapheresis was not applied because of the technical problems. Exchange transfusion (ET) was performed as an alternative therapy. The TG level was reduced from 47450 mg/dl to 3791 mg/dl in the first hour after ET and it was maintained at around 300 mg/dl by treatment with a low-fat diet and supplementation of omega-3 fatty acid. Exchange transfusion can be applied to infants with severe hypertriglyceridemia as an alternative treatment to plasmapheresis when plasmapheresis is technically impossible.

Keywords

Exchange Transfusion; Hyperlipoproteinemia Type-1; LPL Gene

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Introduction

Lipoprotein lipase (LPL) deficiency, also known as familial chylomicronemia or Hyperlipoproteinemia Type-1, causes lipolysis deficiency and chylomicron accumulation. It is a rare, autosomal recessive inherited inborn error of metabolism that occurs in early infancy or childhood. Fasting serum triglyceride (TG) levels are usually above 1000 mg/dl [1].

The disorder occurs due to homozygous or compound heterozygous mutations in five different genes. These genes are *LPL, APO-C2, APO-A5, GPIHBP1,* and *LMF1*. LPL deficiency occurs in 95% of LPL mutations with a frequency of 1/1000000 [1,2].

Growth retardation, eruptive xanthomas, lipemia retinalis, hepatosplenomegaly, and recurrent abdominal pain due to acute pancreatitis are major findings of the disorder. Plasmapheresis is the most commonly used treatment option in LPL deficiency [3].

Here we present a case of LPL deficiency with severe TG elevation in which exchange transfusion (ET) was used successfully, without any complication.

Case Report

A 40-day-old boy presented with complaints of poor feeding, constant crying, diarrhea, and vomiting. In physical examination, his body weight was 4300g (25-50% percentile), height was 54cm (25-50% percentile), and head circumference was 38cm (25% percentile). He was born weighing 3500 grams by ceserean section, at term, the first child of a non-consanguineous Turkish couple.

He was referred to our hospital due to the white creamy appearance of his plasma and his lipid levels were obtained. Plasma TG level was 47450 mg/dl (N: 35-150), total cholesterol level was 1614 mg/dl (N: 70-200), and HDL cholesterol level was 89 mg/dl (N: 0-90). LDL cholesterol level was not measured. Liver-renal function tests, amylase, lipase levels, and abdominal ultrasonography were normal.

Plasmapheresis was not applied because our hospital's apheresis device is not suitable for use in children under 25 kg. For this reason, we decided to perform exchange transfusion (ET) by attaching a central venous catheter. After informed consent was obtained from the family, ET was performed using 180 ml of whole blood per kg.

Blood glucose, electrolytes, complete blood count, and liver and renal function tests were within normal limits after the ET. Heart and respiratory rates and arterial blood pressure were within normal ranges. Within the first hour after ET, the TG level was reduced from 47450 mg/dl to 3791 mg/dl. The TG and total cholesterol levels of the patient following ET are shown in Table 1.

48 hours after the procedure, oral feeding was started with a formulation containing 8% fat (50% consisted of medium chain triglycerides), 15% protein, and 77% carbohydrate.

Table 1. The TG and total cholesterol levels of the patient after ET

Time	TG level (mg/dl)	Total cholesterol level (mg/dl)
First hour after ET	3791	381
12th hour after ET	1710	310
24th hour after ET	1178	254

Abbreviations: TG: Triglyceride, ET: Exchange Transfusion

On day 15, TG levels were measured as 629 mg/dl, total cholesterol was 251 mg/dl, HDL cholesterol was 17 mg/dl, and LDL cholesterol was 107 mg/dl. 2 g/day of omega-3 fatty acid was added to his diet.

The TG level was maintained around 300 mg/dl by treatment with a low-fat diet and supplementation of omega-3 fatty acid. Molecular genetic analysis of the patient was performed. A compound heterozygous mutation [p. T211A (c.613A>G)/p. R270C (c.808C> T] was identified in the *LPL* gene and lipemia retinalis was detected in his ophthalmological examination.

Discussion

Seizures, encephalopathy, pancreatitis, severe psychomotor retardation, spasticity, and blindness are some of the complications associated with severe TG elevations. Wilson et al. [4] reported a 5-week-old infant with encephalopathy due to lipid deposition in the brain. Spasticity and severe psychomotor retardation were observed at 6 months old, and blindness at 18 months in this patient.

The use of a low-fat diet and omega-3 fatty acids causes a decrease in TG levels in the treatment of patients with hypertriglyceridemia, but it may not be sufficient alone to achieve a rapid reduction of severe TG elevations. Therefore, emergency treatment should be done to avert a severe pancreatitis episode and/or other complications.

Plasmapheresis is one of the treatment option for cases with severe TG elevation. Different plasmapheresis techniques have been used in treatment of adult patients with severe TG elevation since 1978. The beneficial effect of plasmapheresis is believed to be due to the removal of excessive proteases from the plasma and replacement of consumed protease-inhibitors with new ones from donor plasma. Plasmapheresis is limited in infants due to hemodynamic effects and hemorrhagic events caused by extracorporeal procedures. The plasma filtration technique is preferred by some centers because it requires less extracorporeal circulating fluid volume. The indications for the use of plasmapheresis are medical emergencies such as pancreatitis with excessively elevated TG levels (TG>1000 mg/dl) [3]. Although our patient did not have pancreatitis, he had poor feeding, vomiting with diarrhea, and was constantly crying. Stefunutti et al. [5] reported a 3-month-old patient with severe TG elevation who had plasmapheresis without pancreatitis, similar to our case.

Exchange transfusion has been used extensively since the 1940s to prevent the development of kernicterus at severe indirect bilirubin elevations [6]. In the literature, very few patients have been shown to have had an exchange transfusion due to severe triglyceride elevation.

Önal et al. [7] reported a 6-month-old patient with resistant myoclonic and tonic seizures who had a lipoprotein lipase deficiency. The seizures were not controlled with infusion of phenobarbital and midazolam. This patient's TG level was 51300 mg/dl. It was not decreased with medical treatments and so, due to the technical problems in plasmapheresis, exchange transfusion was performed. In our case we chose exchange transfusion for a similar reason and we observed a significant decrease in triglyceride levels.

Various complications can be seen after an exchange transfusion. The most common complications are thrombocytopenia, hypocalcemia, hyperkalemia, apnea, bradycardia, hypotension, encephalopathy, and catheter-related events. Steiner et al. [6] reported that transfusion-related complications were transient. Complications were observed most often in preterm and/or very ill newborns. None of these complications developed after the exchange transfusion in our case.

In conclusion, it is necessary to determine treatment methods that can be applied in the acute period before medical treatment in cases with severe TG elevation. We consider that most of the complications related to exchange transfusion are temporary. Due to the hemodynamic effects and hemorrhagic events of plasmapheresis, and for low-weight children who cannot receive plasmapheresis, exchange transfusion may be performed.

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Author Contributions

PSU and MK designed the case report. PSU prepared the manuscript. SG and FK analyzed and evaluated the data. ID and TG provided health care to the patient. The final manuscript was approved by all of the authors.

Conflict of interest

The authors have no financial or personal relationships that could pose any conflict of interest.

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Ethical approval

Our single case report does not require ethics committee approval. Written consent was obtained from the parents.

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