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Case Report

Glutaric Acidemia Type 1: A Case Report

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Abstract

Introduction:
Glutaric academia type I is a metabolic disorder that is caused due to deficiency of glutaryl-CoA dehydrogenase. Macrocephaly is a common sign in GA1, although many infants usually appear healthy at birth.

Case Report:
A 5.5 year old boy with GA1 was admitted to NICU. Chief compliance of patient for hospitalization was pneumonia and sepsis and he was intubated and mechanically ventilated. This disease was diagnosed with signs of set developmental delay at 8 months old and during these years; he was under control for nutritional counseling with a nutritionist and pediatrician. Nutritional support for this patient was in NICU.

Conclusion:
Medical treatment combined with nutritional support in GA1 management signs of serious illness; also dietary treatment may control progression of the neurological damage.

Keywords*:*
Glutaric academia, Medical treatment, Neurological damage

Introduction

Glutaric academia type I is an inherited disorder that results from a mutation of a gene located on chromosome 19 then deficiency of glutaryl-CoA dehydrogenase (1). This enzyme catalyzes the dehydrogenation-decarboxylation of Glutaric acid in the degradation pathway of lysine, hydroxylysine and tryptophan(2). It results in the accumulation of glutaric acid, 3-hydroxyglutaric acid and glutaconic acid and may be increased in the urine (3).

Infants with glutaric acidemia type 1 often are born with unusually macrocephaly that is amongst the earliest signs of GA1 (4). Affected patients will develop neurological disease and with acute dystonia viral respiratory or gastrointestinal illness (1).

Prevalence: Glutaric acidemia type I occurs in approximately 1 child in every 30,000 to 40,000 is born (5). The disease is common all over the world, but is more common among the Amish people of the US, the Lake Island Indians in Canada (6,7).

Case Report

A 5.5 years old glutaric academia type 1 boy was admitted to NICU with loss consciousness and metabolic acidemia. Compliance of patient for hospitalization was Pneumonia and sepsis and he is under intubated and mechanically ventilated. This patient was a full term baby with normal

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birth weight. Her disease was diagnosed with signs of set developmental delay at 8 months old and the patient was under control for nutritional counseling with a nutritionist and pediatrician. Feeding problems are common in the group of patients with neurological disease and include chewing and swallowing difficulties resulting from dyskinesia, and reflux and vomiting resulting from truncal hypotonia.

He is the only individual in his family with GA1, but there is a history of death of first child in family. Progress of disease lead to some complications such as dysphasia, growth impairment and developmental delay and Inability to walk.

On his biochemistry, blood sugar was 103 mg/d. Other tests showed Hb 8.2 g/dl, Ammonia 83.9, lactate 49, magnesium 2.3, phosphor 3.5, urea 5, cratinine 0.4, sodium 136 and potassium 4.2.

Food/nutrition-related history: he fed from breast milk up to 2 years old of life. He only consumed milk formula of free lysine and tryptophan for 3months to now. Parents reported that he generally has limited protein diet free of cheese, milk, meat and cerebrals. But a meal of 20 gr lambs was eaten weekly. Now her weight is 11 kg that is under 5 percentile and the ideal body weight for this patient must be 18 kg (for 50 percentile) Percentile. Middle Arm Circumference (MAC) is 11 cm. Nutritional advices for this patient includes receiving 50% of estimated total caloric goal via enteral nutrition via nasogastric tube (gavages: vegetable and olive fat~ 500kcal and 700cc) and via parenteral include IV fluid IL 10% (250 ml/qid).

Protein restriction up to 0.5-1 mg/kg/d was considerate. Supplementation with B12 vitamin (dose: 1 mg/d), carnitine (dose: 50-100 mg /kg/d), B2 vitamin (dose: 100 mg /kg/d), zinc and Selenium were don. Although GA1 is rare, but diet and nutritional advices may have an important role in management of them. Optimal energy, protein intake may play an important role in management such disease.

Discussion

Children with Glutaric academia type I usually have Dystonic problems that are at increased risk for malnutrition (8,9).

It is essential for GA-1 a carefully monitored dietary regime. All protein of food contains the amino acids tryptophan and lysine. As these amino acids are not broken down normally in this disease. Strauss et al reported low protein diet and emergency regimen in GA-1 patients improved 35% of whom developed basal ganglia disease (10). Sseveral studies indicated the use of a diet contains lysine-free, tryptophan-reduced AA supplements to maintain adequate total protein intake has been associated with the most favorable neurologic outcome and normal growth (5,11) although these recommend-ations may also increase the risk of tryptophan deficiency, which is associated with neurological dysfunction (11). On the other some cohort studies found no significant effect of dietary treatment on the outcome (12,13).

In addition to diet in these patients require Riboflavin supplements can stimulate enzyme production as cofactor; outcome (12,13). Lipkin and kolker indicated no firm evidence that riboflavin improves the neurological dysfunction of this disease (11).

Supplemental treatment with L-carnitine is usually administered in addition to a restricted diet to prevent carnitine decadency and to ensure mitochondrial homeostasis (14,15). The dose generally ranges from 50 to 100 mg/kg daily and should be adjusted to keep plasma free carnitine levels within the upper normal range (8).

Conclusion

Although GA1 is rare, but diet and nutritional advices may have an important role in management of them. Optimal energy, protein intake may play an important role in management such disease.

Reference

1. Barić I, Zschocke J, Christensen E, Duran M, Goodman S, Leonard J, et al. Diagnosis and management of glutaric aciduria type I. Journal of inherited metabolic disease. 1998; 21(4):326-40.

2 .Goodman SI, Kratz LE, DiGiulio KA, Biery BJ, Goodman KE, Isaya G, et al. Cloning of glutaryl-CoA dehydrogenase cDNA, and expression of wild type and mutant enzymes in Escherichia coli. Human molecular genetics. 1995;4(9):1493-8.

3. Chow SL, Rohan C, Morris AA. Rhabdomyolysis in glutaric aciduria type I. J Inherit Metab Dis.2003; 26(7): 711–2.

4. Chow S, Rohan C, Morris A. Case Report: Rhabdomyolysis in Glutaric Aciduria Type I. Journal of inherited metabolic disease. 2003; 26 (7):711-2.

5. Kölker S, Christensen E, Leonard J, Greenberg C, Burlina A, Burlina A, et al. Guideline for the diagnosis and management of glutaryl-CoA dehydrogenase deficiency (glutaric aciduria type I). Journal of inherited metabolic disease. 2007; 30(1):5-22.

6. Morton DH, Bennett MJ, Seargeant LE, et al. Glutaric aciduria type I: a common cause of episodic encephalopathy and spastic paralysis in the Amish of Lancaster County, Pennsylvania. Am J Med Genet. 1991; 41:89-95.

7. Haworth JC, Booth FA, Chudley AE, deGroot GW, Dilling LA, Goodman SI, et al. Phenotypic variability in glutaric aciduria type I: Report of fourteen cases in five Canadian Indian kindreds. J Pediatr. 1991 Jan; 118(1):52-8.

8. Shaw V, Lawson M. Clinical paediatric dietetics: John Wiley & Sons; 2008.

9. Strauss KA, Puffenberger EG, Robinson DL, Morton DH. Type I glutaric aciduria, part 1: Natural history of 77 patients. Am J Med Genet C Semin Med Genet. 2003 Aug 15; 121C (1):38-52.

10. Kölker S, Garbade SF, Greenberg CR, Leonard JV, Saudubray J-M, Ribes A, et al. Natural history, outcome, and treatment efficacy in children and adults with glutaryl-CoA dehydrogenase deficiency. Pediatric research. 2006; 59(6):840-7.

11. Strauss KA, Lazovic J, Wintermark M, Morton DH. Multimodal imaging of striatal degeneration in Amish patients with glutaryl-CoA dehydrogenase deficiency. Brain. 2007 Jul; 130 (Pt 7):1905-20. Epub 2007 May 3.

12. Boneh A, Beauchamp M, Humphrey M, Watkins J, Peters H, Yaplito-Lee J. Newborn screening for glutaric aciduria type I in Victoria: treatment and outcome. Mol Genet Metab. 2008; 94: 287–29.

13. Kölker S, Christensen E, Leonard JV, Greenberg CR, Boneh A, Burlina AB, et al. Diagnosis and management of glutaric aciduria type I–revised recommendations. Journal of inherited metabolic disease. 2011; 34(3):677-94.

14. Mader I, Zschocke J, Dichgans J, Schulz JB. Adult onset glutaric aciduria type I presenting with a leukoencephalopathy.Neurology.2002; 59:1802–4.