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Case Report (Pages: 10119-10123)

Gyrate Atrophy of the Choroid and Retina: A Case Report

Somayyeh Hashemian[1], Rahim Vakili[1, 2], *Azadeh Zare Feizabadi[1]

[1]Department of Pediatric Endocrinology and Metabolism, Akbar Hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

[2]Medical Genetic Research Center, Mashhad University of Medical Sciences, Mashhad, Iran.

Abstract

Introduction

Gyrate atrophy of the choroid and retina is a metabolic disorder, which is inherited in an autosomal recessive pattern. Although gyrate atrophy is rare, it is concerning as it results in blindness. It is characterized by hyperornithinemia, retinal atrophy, leads to progressive myopia and tunnel vision, and Posterior Subcapsular Cataracts. Patients have lower amounts of ornithine aminotransferase.

Case Report

In this study, we report a 17-year-old boy referred to our hospital by an ophthalmologist, with progressive visual loss from 7 years of age. The eye examinations manifested chorioretinal degeneration and high myopia. In lab data, plasma ornithine amount was elevated 10-fold higher than normal. By this finding, he was diagnosed as having Gyrate Atrophy.

Conclusion

Treatment with pyridoxine and low arginine diet can reduce the ornithine plasma level in Gyrate Atrophy. Our report is to describe the first case of gyrate atrophy in pediatric endocrinology department in Iran diagnosed by biochemistry and treated with pyridoxine and low arginine diet.

Key Words: Adolescent, Coronary artery aneurysm, Idiopathic aneurysm, Cardiac catheterization.

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Corresponding Author:

Azadeh Zare Feizabadi (M.D), Department of Pediatric Endocrinology and Metabolism, Akbar Hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

Email: zarefa951@mums.ac.ir

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1- INTRODUCTION

Gyrate Atrophy (GA) of the Choroid and Retina is a rare progressive metabolic disease. Hyperornithinemia develops due to Ornithine aminotransferase (OAT) deficiency (1). The enzyme deficiency has been exhibited in liver, muscle, hair and skin fibroblasts. In GA patient ornithine level increased 10 to 20-fold higher than normal (2). High ornithine level can also be detected in urine and spinal fluid. The clinical manifestations are mostly ophthalmologic, consist of progressive myopia, night blindness, and tunnel vision and posterior sub capsular cataracts in the late teens. The patients also have problems with dark adaptation (3). Funduscopic examination showed chorioretinal deterioration which is characteristic for gyrate atrophy. The majority of patients become blind between the age of 45 and 65 years old (4). Although the most common complaint in GA is visual, hyperornithinemia is companied by Lysinuric protein and low plasma lysine level. Lysine has role in collagen type 1 formation which builds bone strength. So gyrate atrophy can be lead to osteoporosis (5). Some studies report dermatologic symptoms of GA. For the first time, Montagna and Parakkal found out patients with gyrate atrophy had peculiar, and straight hair and they had areas of alopecia in their scalps (3). Namazi et al. in 2016 reported a 40-year-old woman with gyrate atrophy, whose dermatological examinations showed sparse hair all over the body including scalp, eyelids and eyebrows. She also had alopecia in scalp (6). Gyrate atrophy is a high frequency disorder in Finland with an incidence of one case per 50,000 individuals (4); about one third of GA cases are Finish and only seven of them (less than 5%) have been responsive to therapy with Vitamin B6 dietary supplementation (4). Zekušić reported a 10-year-old girl with impaired vision and strabismus in Oct 2018 in Croatia. Ornithine plasma level of 1039 μmol/L and molecular analysis showed homozygous mutation of OAT gene. She was treated with pyridoxine and low arginine diet and L-Lysine which resulted in 53% decrease of ornithine plasma level and significant improvement of ocular findings (6).

2- CASE REPORTS

A 17-year-old boy referred to Emam Reza hospital, Mashhad University of Medical Science, Mashhad, Iran, in April 2017 with progressive visual loss in both eyes and impaired dark adaptation since he was 7 years old. Ophthalmological examination showed high myopia and atrophy of the choroid and retina (**Figures 1, 2**). Laboratory data showed no abnormalities except the plasma ornithine level, that was elevated approximately 15-fold higher than normal, 886.7 μmol/L (normal range 27-63 μmol/L) (**Table.1**). The ammonia was 81 μmol/L, lactate 14 mg/dl and pyruvate was 0.8 mg/dl.

By the ophthalmological findings and high ornithine levels he was diagnosed with Gyrate Atrophy of the choroid and retina. Treatment with pyridoxine tablet 300-500 mg/day and arginine restricted diet was started for him. We referred him to a nutritionist who designed a low arginine diet for him, that included not consuming nuts (including peanuts, pecans, almonds, cashew and grains) which are a high source of arginine. We followed him by checking ornithine level and ophthalmologic examinations periodically. Three months of following treatment with vitamin B6 and arginine restricted diet, led to decrease in the level of ornithine from 886 to 605 μmol/L with about 30% decreasing (**Table 1**). Regarding his vision, although it did not continue to regress, there has been/was very little improvement.

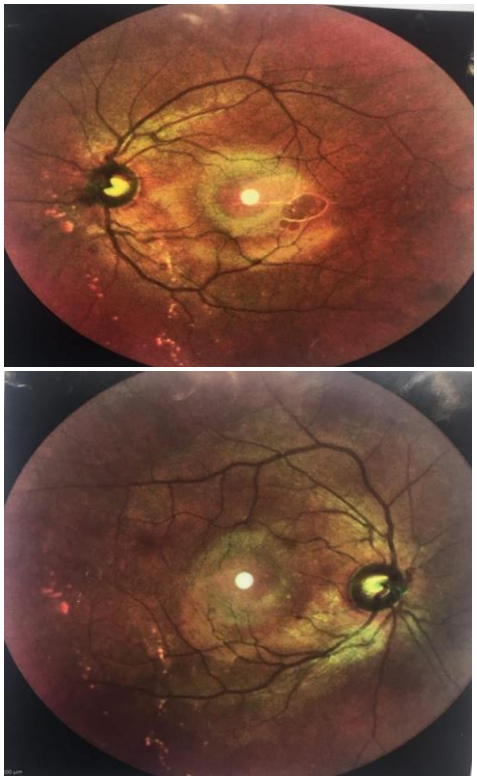

Fig.1: Fundoscopic Image of a 17-year-old male with gyrate atrophy.

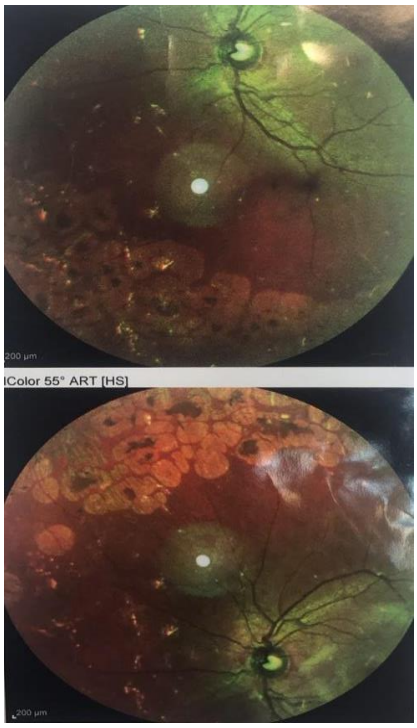

Fig.2: Macular edema and atrophy of choroid degeneration in patient with OAT deficiency.
OAT: Ornithine aminotransferase.

Table-1: HPLC plasma amino acid profile before and 3 months after treatment.

Amino Acid	Result (µM/L)	Result (**A**fter 3-month) (µM/L)	Normal Range (µM/L)
Aspartate	3.4	5.6	3-6
Glutamic acid	22.3	18.3	10-97
Asparagine	79.9	77.5	32-85
Serine	167.2	156.9	65-138
Glutamine	606.8	808.4	428-747
Histidine	135.7	107.6	60-109
Glycine	256.3	339.5	122-322
Threonine	154.8	161.2	67-198
Citrulline	26.7	32.6	16-51
Arginine	158.7	116.6	28-108
Alanine	536.2	708	200-483
Tyrosine	74.6	68.9	38-96
Methionine	49.1	33.3	16-34
Valine	217.6	226.7	132-313
Tryptophan	85.4	64	40-91
Phenylalanine	76.8	65.9	40-74
Isoleucine	104.6	82.6	34-98
Ornithine	886.7	605.5	27-83
Eucine	146.3	137.9	73-181
Lysine	167.9	117.3	119-203

HPLC: High Performance Liquid Chromatography.

3- DISCUSSION

Gyrate atrophy is a rare autosomal recessive disorder that presents with progressive visual loss especially at night, myopia, sub capsular cataracts and reduced dark adaptation ability. Patients experience loss of central vision and finally blindness in fourth to fifth decades. Retinal examination showed chorioretinal degeneration and reduced electroretinogram (ERG) responses and rarely vitreous hemorrhage as a complication (1, 4). Other than ophthalmologic symptoms that mostly exist, it has been reported that GA could present with intellectual problems, muscle weakness, sparse and straight hair and poor feeding and failure to thrive in neonates (3, 7, 8). Our patient only suffers from visual problem and does not have any other findings. Ornithine plasma level increases 5-20 fold in GA patients. So that ornithine plasma level used in GA diagnosis. Urinary lysine, arginine and cysteine excretion also rise with ornithine level more than 400 µmol/L (9). Gyrate Atrophy could be confirmed by molecular genetic study (6), in our patient plasma ornithine base level was 886 µmol/L. Because Arginine produces hyperornithinemia, arginine restricted diet (limitation of nuts and seeds) may be needed for these patients. Arginine restricted diet reduces the plasma ornithine level and slows the visual field problems but does not improve macular edema, if present. It has also been reported that if the diet started at an earlier age chorioretinal lesions will progress much slower (9, 10). Because arginine is an essential amino acid, patients should not restrict arginine to complications like poor growth and skin problems. Also, arginine restriction should be avoided in infants less than 3-4 year-old (11). Some clinical trials showed pharmacological doses of pyridoxine

(vitamin B6) daily, can reduce hyperornithinemia up to 50 % (2). Although in some other studies like Valle in 2001 demonstrated that in Finish population with GA only, less than 5% of patients were responsive to pyridoxine treatment (12). In our patient by using 300 to 500mg/day pyridoxine ornithine plasma level reduced from 886 to 605 µmol/L after 3 months' consumption. The myopia did not regress in our patient but neither did it progress nor become worse. It should be stated that there are some limitations in this case report, such as we could not do the molecular analysis for our patient because of financial issues and the follow-up period was short for judging the long term ophthalmologic results.

4- CONCLUSION

In conclusion, although Gyrate Atrophy of the choroid and retina is characterized by high myopia and hyperornithinemia, it can have other dermatologic or neurological symptoms. This disease can be controlled by pyridoxine and arginine restricted diet to lower the ornithine level and maybe visual improvement but for better evaluating of visual acuity, long term tracking and follow-up, and further studies are necessary.

5- CONFLICT OF INTEREST: None.

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