MISMANAGEMENT OF PHENYLKETONURIA: AN UNDERLYING CAUSE OF KWASHIORKOR

S. Salehpour MD[1],
D. Babaie MD[2]

Abstract

Objective

Too much restriction of dietary proteins can cause severe protein malnutrition, which can occur in adjusting the diet for some kinds of aminoacidopathies, urea cycle disorder and organic academia. This report presents the case of a 1.5-year-old boy with history of phenylketonuria with a three weeks history of erythematous scaly plaques and edema of his extremities; he had a history of similar skin manifestations three months earlier that resolved spontaneously. The patient had been on very restricted phenylalanine diet.

Diagnosed with Kwashiorkor, a phenylalanine level of 0.4 mg/dl, the child was hospitalized and put on a special diet and given the appropriate antibiotic; after a few days of treatment his condition improved.

We underscore the importance of education for those considering prescription of diet restriction and emphasize the regulation of balanced diet in such patients.

Key words: Phenylketonuria, kwashiorkor, protein malnutrition

Introduction

Phenylketonuria (PKU) is an inborn error of protein metabolism that results from an impaired ability to metabolize the essential amino acid phenylalanine. The term kwashiorkor means “sickness of weaning”. it refers to an inadequate protein intake with reasonable caloric (energy) intake. Edema is characteristic of kwashiorkor but is absent in marasmus (1).

Case report

A 1.5 year-old boy presented with a three week-history of erythematous scaly plaques on his extremities, diaper-region, and face. Three months later similar lesions appeared over much of his body, but resolved spontaneously; the patient developed cracked lips, mucosal ulcers, thinning of the hair, and 2 plus non pitting edema on both extremities, two weeks after the skin lesions (figure1). He was a confirmed case of phenylketonuria since the 11th month of his life, and had hence been on a diet, fed only by analogue X P formula; phenylalanine was omitted totally. His medications include clonazepam and Phenobarbital for seizure disorder. He had also been prescribed folic acid and ferrogluboline.

The child was a full term infant, born without complications. While his past medical history was significant for neurodevelopmental delay and visual inattention, his older brother was and is healthy. On examination, the patient was irritable and diffusely edematous and had a “chubby” appearance. His skin manifestations

1. Assistant professor, Pediatric Endocrinologist, Mofid Children’s Hospital, Shahid Beheshti Medical University
2. Resident, Department of Pediatrics, Mofid Children’s Hospital, Shahid Beheshti Medical University

Corresponding Author:
S. Salehpour MD
Email: shadabshadab@yahoo.com

include multiple annular plaques with hyperkratotic border and desquamated centers and were confluent over the extremities, buttock, and face (figure1); in addition he has angular chelities. Neurological exam revealed poor head control, microcephaly, and poor eye contact. Laboratory studies revealed a hemoglobin of 6.1 and hematocrite 18.3, white blood cell count 18200(poly: 59%) and platlate count 285000 .total protein and serum albumin were 4.9 mg/dL and 2.1mg/dL, respectively. BS, BUN, Cr, Ca, Ph, and tranaminases were in normal ranges. Phenylalanine level was 0.4 mg/dl.

The child was hospitalized and put on a special diet, multivitamins, zinc, folate, albumin, and appropriate antibiotic. The skin lesions improved dramatically using a combination of Mupirocine, Hydrocortisone, and Clotrimazole; oral lesions responded to Nystatin and Metronidazole.

Discussion

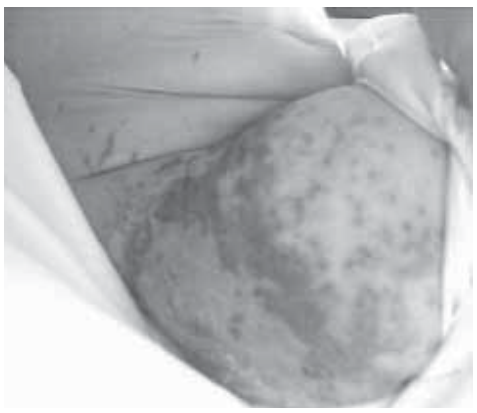
Although the "flaky paint" dermatosis manifested in this child is a classic feature of Kwashiorkor, the disease is known to present in a variety of different ways.

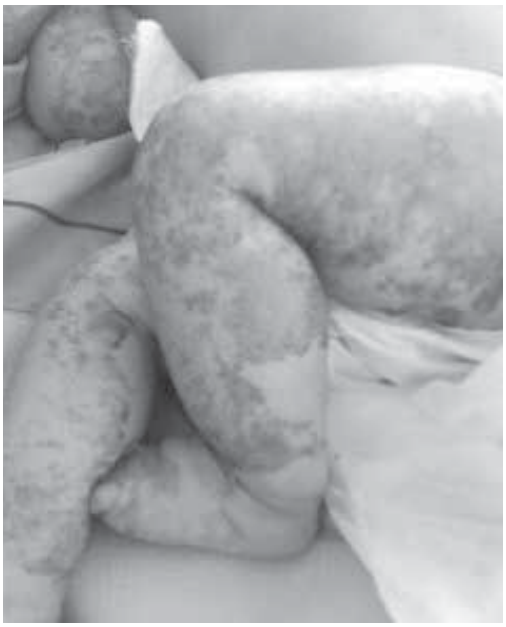
Many researchers of kwashiorkor have documented the role of other nutritional deficiency, including riboflavin, niacin, B6, and B12, as an etiologic factor for the lack of appearance of clinical signs and symptoms (2). Most probably because it found almost only in protein–rich foods, riboflavin deficiency is very common in kwashiorkor patients, and may hence account for the prevalence of angular ostomatitis and angular cheilitis in kwashiorkor (3, 4). Another deficiency that may be confused with or overlap kwashiorkor is essential free fatty acid (EFA), that manifests as xerosis of the skin, dry thickened, erythematous desquamating plaques, and alopecia with hypopigmentation of the remaining hair (4, 5-8). Deliberately restricted dietary intake may induce protein energy malnutrition including anorexia nervosa, lactate intolerance, and urea cycle and related metabolic disorders, phenylketonuria, hereditary tyrosinemia, and organic aciduria (2). In our case, highly restricted phenylalanine diet resulted in signs and symptoms indicating kwashiorkor, with his plasma phenylalanine levels being 0.4 mg/dL on admission; Plasma phenylalanin concentrations of normal infants range from 2 to 6 mg/dL. Such low concentrations of plasma phenylalanin in patients with PKU result in malnutrition, poor growth and mental retardation (9, 10). Hanley & et al (10) reported hypoproteinemia in 5 of 32 infants treated with Lofenalac. Although low plasma levels of phenylalanine can cause a syndrome of anemia, disseminated skin rashes and diarrhea, but existence of edema and specific dermatologic eruptions, as well as characteristic hair changes can indicate a kwashiorkor diagnosis rather than a simple phenylalanine deficiency. Ten days after treatment, phenylalanine levels returned to normal range (6mg/dL) in our patient. Generally, a phenylalanine-restricted diet consists of protein hydrolysates, amino acid mixtures, fruits and vegetables, and a minimal amount of natural animal products (usually milk in the early stages of life) to meet the minimum daily requirement for phenylalanine needed for growth but in this case he had been fed only by analogue XP formula, depriving him of the minimal phenylalanine requirement.

In children with PKU, diet therapy could influence the immune system not only by

antigenic charge, but also by producing changes in plasma lipids. It has been known to cause a marked reduction of arachidonic acid levels in both plasma total lipids and phospholipids of children with PKU during dietary intervention (11).

To conclude, we underscore emphasize the importance of education for those considering prescription of diet restriction and regulation of balanced diet in such patients. Regular follow up and food guidelines are necessary for these children and their parents.





Figures 1(a-c): The child's buttocks and upper extremities show the desquamative rash with hyperpigmented borders "flaky-paint" dermatosis

References

1. Protein-Energy Malnutrition. Available from: http:// www. emedicine .com/ eMedicine Specialties > Dermatology > METABOLIC DISEASES. [Article Last Updated: May 21, 2007]

2 . Eastlak JP, Grand KK, Levy ML, Nigro JF. Dermatosis in a child with kwashiorkor secondary to food aversion. Pediatric dermatology 1999;16:295-102

3. Prevdiville JS, Manfredi LN. Skin signs of nutritional disorders Semin dermato l992; 11:88-97

4. Kulapongs P, Edelman R, Suskind R, Olson RE. Defective local leukocyte mobilization in children with kwashiorkor. Am J Clin Nutr 1977; 30:367-370

5. Olumide YM. Nutrional dermatoses in Nigeria .Int J Dermatol 1995; 34: 11-16.

6. Solomons NW, Torun B. Infantile malnutrion in tropics. Pediatr Ann 1982; 11: 991-1002.

7. Van den Biggelaar I, van den Broeck J. Nutrition-related hair signs in Zairian preschool children and associations with anthopometry. Trop Geogr Med.1995; 47:248-251.

8. Hansen AE, Wiese HF, Boelsche AN, Hoggard ME, Adam DJD, Davis H. Role of linoleic acid in infant nutrition. Pediatrics 1963; 31: 171-192

9. Acosta P.B, Yannicelli S, Marriage B, Steiner R, Gaffield B, Arnold G, et al. Protein Status of Infants with Phenylketonuria Undergoing Nutrition Management. Journal of the American College of Nutrition, 1999:18 (2), 102–107.

10. Hanley WB, Linsoa L, Davidson W, Moes CAF: Malnutrition in early treatment of phenylketonuria. Pediatr Res, 1970; 4:318–327,

11. Galli C, Agostoni C, Mosconi C, Riva E, Salari PC, Giovannini M. Reduced plasma C-20 and C-22 polyunsaturated fatty acids in children with phenylketonuria during dietary intervention. J Pediatr 1991; 114: 562-567.