focal motor seizures (epilepsia partialis continua).[14-16] Our patient's neurologic abnormalities seem to be part of that array. Most of the neurologic abnormalities associated with nonketotic hyperglycemia revert to normal with correction of the hyperosmolar state, as in our patient.

Although hyperglycemia has been observed with palinopsia before,[5,7] its actual significance seems to have been little appreciated. In the 39 cases of palinopsia reviewed in this discussion,[1-13] the reports specifically mentioned the presence or absence of diabetes mellitus or hyperglycemia in only five instances.[5-7] Of those, two of the patients had normal glucose levels, one had diabetes mellitus but normoglycemia during palinopsia, and two had pronounced elevations of blood glucose levels. These latter hyperglycemic patients had reported blood glucose values as high as 699 mg per dl (38.8 mmol per liter) and 534 mg per dl (29.6 mmol per liter), respectively.[5,7] These elevated glucose levels are within the range known to cause epilepsia partialis continua.[14] Adding our case, 50% of patients with palinopsia in whom the glucose level was reported had substantial elevations. This suggests that palinopsia not uncommonly may be triggered by hyperglycemia.

In our patient, the mechanism of palinopsia appeared to be ictal. Palinopsia associated with seizures has frequently been noted in the articles reviewed here. Of 39 patients reported with palinopsia, 25 either had EEG evidence of or were observed to have seizures associated with palinopsia or responded to anticonvulsant therapy. Of these 25, 13 certainly had ictal palinopsia and another 7 had abnormal but nonparoxysmal EEGs. Considering that a surface EEG may be false-negative even during an ictus, an epileptic mechanism appears to be operative in most patients with palinopsia.

In addition to clinical observations, experiments indicate that serum hyperosmolarity and brain dehydration can induce seizures, given a potentially epileptogenic focus.[17] Our patient had no identifiable structural abnormality of his brain, in contrast to the experimental situation and most patients with epilepsia partialis continua due to nonketotic hyperglycemia.[14-17] The two previously reported cases of hyperglycemia with palinopsia did show structural pathology.[5,7] In our patient, the hemianopia and spatial disorientation persisted longer than the "fireworks," palinopsia, and allesthesia. We assume the more persistent manifestations represented a "Todd's paralysis." All of the visual phenomena cleared within two days after treatment of hyperglycemia, supporting this explanation.

Nearly all reported cases of palinopsia (34/39 or 87%) are associated with a homonymous field defect. The defect is often caused by tumor, arteriovenous malformation, hemorrhage, stroke, or trauma. When an anatomic lesion is found by computed tomography or a pathologic examination, it is usually situated at the junction of the occipital, parietal, and temporal lobes, more often in the right hemisphere than the left. When palinopsia is associated with migraine[11] or hyperglycemia (this report), however, no identifiable anatomic lesion need be present.

As for other pathophysiologic mechanisms, there are similarities between palinopic images and normal visual afterimages in some instances, but there are also differences.[2,8,12] Even if palinopsia is due to "exaggeration" of the normal afterimage process, that implies some abnormal mechanism—but what is it? The analogy does not really broaden our understanding of palinopsia or its management. Likewise, the idea of "release hallucinations," similar to the hallucinations of sensory deprivation,[5,6,8,12,18,19] serves mostly to help define a nonictal category of palinopsia but does not give a clue about the neurophysiology involved. No cases of palinopsia have been reported in psychosis, so delusions or psychiatric fantasies are unlikely explanations. As the neurophysiologic basis of migraine is better defined, the results will undoubtedly be relevant to some cases of palinopsia. It is clear at the present level of our knowledge, however, that palinopsia is a dysfunction of the association areas at the junction of temporal, occipital, and parietal lobes, is frequently an ictal phenomenon, and can be triggered by nonketotic hyperglycemia.

REFERENCES

1. Critchley M: Types of visual perseveration: 'Palinopsia' and 'illusory visual spread.' Brain 1951; 74:267-299
2. Bender MB, Feldman M, Sobin AJ: Palinopsia. Brain 1968; 91:321-338
3. Jacobs L: Visual allesthesia. Neurology (NY) 1980; 30:1059-1063
4. Swash M: Visual perseveration in temporal lobe epilepsy. J Neurol Neurosurg Psychiatry 1979; 42:569-571
5. Brust JCM, Behrens MM: 'Release hallucinations' as the major symptom of posterior cerebral artery occlusion: A report of 2 cases. Ann Neurol 1977; 2:432-436
6. Cummings JL, Syndulko K, Goldberg Z, et al: Palinopsia reconsidered. Neurology (NY) 1982; 32:444-447
7. Michel EM, Troost BT: Palinopsia: Cerebral localization with computed tomography. Neurology (NY) 1980; 30:887-889
8. Cleland PG, Saunders M, Rosser R: An unusual case of visual perseveration. J Neurol Neurosurg Psychiatry 1981; 44:262-263
9. Meadows JC, Munro SSF: Palinopsia. J Neurol Neurosurg Psychiatry 1977; 40:5-8
10. Lance JW: Simple formed hallucinations confined to the area of a specific visual field defect. Brain 1976; 99:719-734
11. Klee A, Willanger R: Disturbances of visual perception in migraine. Acta Neurol Scand 1966; 42:400-414
12. Kinsbourne M, Warrington EK: A study of visual perseveration. J Neurol Neurosurg Psychiatry 1963; 26:468-475
13. Landis T, Cummings JL, Benson DF, et al: Loss of topographic familiarity. Arch Neurol 1986; 43:132-136
14. Singh BM, Strobos RJ: Epilepsia partialis continua associated with nonketotic hyperglycemia: Clinical and biochemical profile of 21 patients. Ann Neurol 1980; 8:155-160
15. Guisada R, Arieff AI: Neurologic manifestations of diabetic comas. Metabolism 1975; 24:665-679
16. Maccario M: Neurologic dysfunction associated with nonketotic hyperglycemia. Arch Neurol 1968; 19:525-534
17. Vastola EF, Maccario M, Homan R: Activation of epileptogenic foci by hyperosmolality. Neurology (Minneapolis) 1967; 17:520-526
18. Cogan DG: Visual hallucinations as release phenomena. Albrecht von Graefes Arch Klin Exp Ophthalmol 1973; 188:139-150
19. Heron W, Scott TH: Visual disturbances after prolonged perceptual isolation. Can J Psychol 1956; 10:13-18

An Unusual Cause of D-Lactic Acidosis

CUONG HUU NGHIEM, MD
HUM DAC BUI, MD
ROBERT H. CHANEY, MD
Pomona, California

D-LACTIC ACIDOSIS has been well documented in patients with the short-bowel syndrome.[1-4] Abnormal colonic bacterial flora have been found to be responsible for the D-lactic acid production, and symptoms can be treated with enteric antibiotics. We report an unusual case of D-lactic acidosis caused by a mechanism not previously described.

(Nghiem CH, Bui HD, Chaney RH: An unusual cause of D-lactic acidosis. West J Med 1988 Mar; 148:332-334)

From the Department of Internal Medicine (Dr Nghiem and Dr Chaney) and Surgical Service (Dr Bui), Lanterman Developmental Center, California Department of Developmental Services, Pomona; and the Department of Medicine, University of California, Los Angeles, School of Medicine, and Loma Linda University School of Medicine (Dr Chaney), Loma Linda, California.

Reprint requests to Cuong Huu Nghiem, MD, Lanterman Developmental Center, 3530 Pomona Blvd, PO Box 100, Pomona, CA 91769.

Report of a Case

The patient, a 29-year-old man with mental retardation associated with hydrocephalus, severe kyphoscoliosis, and quadriplegia, had had dysphagia with malnutrition for one year. He had been fed through a nasogastric tube an elemental diet that included in 237 ml (8 oz) 250 calories, 33.1 grams carbohydrate, 14.5 grams protein, 5.5 grams fat, 220 mg sodium, 490 mg potassium, and 625 mosm. This was a temporary measure while awaiting a percutaneous endoscopic gastrostomy for feeding purposes. When the gastrostomy was accomplished, feeding was started on the tenth postoperative day with a similar formula but administered at 50% strength at 25 ml per hour. The feeding was increased progressively in strength and amount and was well tolerated at the rate of 100 ml per hour. On day 54 after the gastrostomy placement, the original mushroom-type gastrostomy tube was replaced with a number 16 French Foley catheter. The feeding was again given continuously at the same rate.

Six hours after feeding was recommenced, the patient started having one to two episodes of loose stools per day. The loose bowel movements became profuse two days later and consisted of five to eight yellow, watery stools per day. His vital signs remained normal, with temperature 37.4°C, blood pressure 100/80 mm of mercury, heart rate 80 per minute, and respirations 20 per minute. Serum electrolytes and arterial blood gas determinations showed an acidosis with an anion gap of 27 mEq per liter (Table 1). Renal and liver function tests were within normal limits. Stool culture and stool swab were negative for pathogens, and examination for ova and parasites was negative, although a special culture for atypical bacteria was not done. There was no evidence of primary cardiovascular, renal, or hepatic abnormality; ischemia; neoplasm; or diabetes mellitus. Because of persisting diarrhea, the tube feeding was discontinued and the patient was maintained on fluids given intravenously. Within six to eight hours, the diarrhea subsided. The metabolic acidosis was corrected with an intravenous infusion of bicarbonate.

After the patient stabilized, and with the tube left unadjusted in place, the formula feeding was restarted at 25 to 50 ml per hour. In six to eight hours, severe diarrhea again developed, followed by metabolic acidosis with lethargy, flaccidity of the extremities, hypothermia, bradycardia, and hypotension. His temperature was 35°C, blood pressure 90/60 mm of mercury, the heart rate between 46 and 50 beats per minute, and rhythm was sinus. There were no localizing neurologic signs. Serum electrolytes and arterial blood gas measurements again showed a severe metabolic acidosis with an anion gap of 30 mEq per liter (Table 1). There was no evidence of ketones in the blood or urine. The serum D-lactic acid level was 5.7 mEq per liter (normal = 0), and the urine D-lactic acid value was 200 mEq per liter (normal = 0). An electroencephalogram was moderately abnormal, with mixed slow and fast rhythms and a suggestion of a right central irritative process.

A barium study of the gastrostomy tube showed kyphoscoliosis, a hiatal hernia with an intrathoracic stomach, and the catheter tip in the transverse colon (Figure 1).

The feeding tube was then removed. The patient was treated with an intravenous infusion of bicarbonate. No antibiotics or *Lactobacillus acidophilus* were given. The diarrhea stopped within six hours and did not recur. The patient recovered and tolerated well the formula feeding at 100 ml per hour via a nasogastric tube. He underwent a laparotomy for a feeding gastrostomy two months later. Since then, he has continued to do well and has gained weight satisfactorily.

Comments

This patient's clinical findings resemble those of patients with D-lactic acidosis resulting from the short-bowel syndrome, either after extensive small bowel resection[1,2] or after a jejunoileal bypass operation for obesity.[3,4] The findings have included metabolic acidosis with lethargy, weakness, dehydration, and occasional hypotension. The syndrome may be suspected when there is an increased anion gap that cannot be explained by uremia or ketonemia. It is confirmed by elevated levels of D-lactic acid in serum and urine. Stool cultures have had high counts of non-spore-forming anaerobic bacteria including *Bifidobacterium, Lactobacillus,* and *Eubacterium.*[3] Fermentation by these colonic organisms produces D-lactic

TABLE 1.—*Laboratory Findings During 2 Episodes of Diarrhea*

Laboratory Values	*Episode 1*	*Episode 2*	*Normal*
Bicarbonate, mEq/liter	7.00	12.00	25±4
Anion gap, mEq/liter	27.00	30.00	8-14
pH	7.27	7.21	7.40
Lactic dehydrogenase, units/liters	..	61.00	47-140
D-Lactate			
Blood, mEq/liter	..	5.70	0
Urine (spot), mEq/liter	..	200.00	0

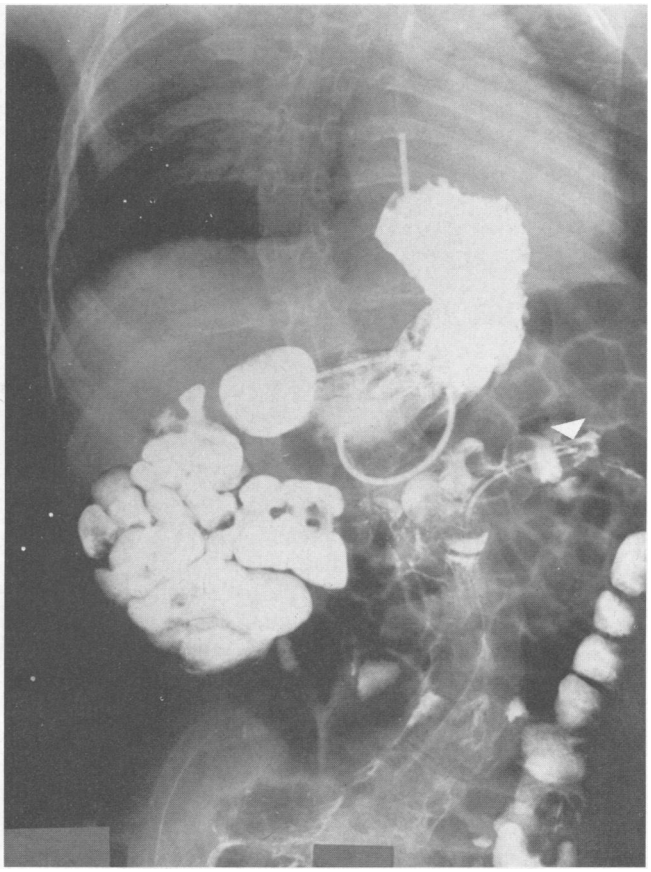

Figure 1.—A supine film was taken with the patient held in a position to minimize his usual fetal position and pronounced scoliosis. The stomach, with nasogastric tube still in place, is largely intrathoracic. The tip of the Foley catheter is located in the transverse colon **(arrowhead).**

acid,[1-3] and absorption of fermentation products into the blood causes the acidosis.[5] Administering vancomycin hydrochloride or neomycin can normalize the colonic flora, with resolution of the D-lactic acidosis.[1,3,4] Schoorel and coworkers in 1980, instead of using antibiotics, recolonized the fecal flora with gram-negative bacteria with satisfactory results.[2]

Duran and associates in 1979 described a case of D-lactic aciduria in a mentally retarded child who had neither intestinal disease nor had had a bowel operation.[6] A similar case of D-lactic acidosis was recently reported in a 60-year-old man who had not undergone a surgical procedure of the bowel and did not have a history of diarrhea.[7] The source of D-lactic acid in those two cases is speculative.

In the case reported here, there was no evidence of abnormal colonic flora. The treatment consisted of neither dietary change, administration of antibiotics, nor recolonization of the fecal flora. Removing the gastrostomy tube, which had been misplaced in the transverse colon, resolved the D-lactic acidosis and the diarrhea.

REFERENCES

1. Oh MS, Phelps KR, Traube M, et al: D-Lactic acidosis in a man with short-bowel syndrome. N Engl J Med 1979; 301:249-252
2. Schoorel EP, Giesberts MAH, Blom W, et al: D-Lactic acidosis in a boy with short bowel syndrome. Arch Dis Child 1980; 55:810-812
3. Stolberg L, Rolfe R, Gitlin N, et al: D-Lactic acidosis due to abnormal gut flora: Diagnosis and treatment of two cases. N Engl J Med 1982; 306:1344-1348
4. Carr DB, Shih VE, Richter JM, et al: D-Lactic acidosis simulating a hypothalamic syndrome after bowel bypass. Ann Neurol 1982; 11:195-197
5. Dunlop RH, Hammond PB: D-Lactic acidosis of ruminants. Ann NY Acad Sci 1965; 119:1109-1132
6. Duran M, Van Biervliet JPGM, Kamerling JP, et al: D-Lactic aciduria, an inborn error of metabolism? Clin Chim Acta 1977; 74:297-300
7. Mason PD: Metabolic acidosis due to D-lactate. Br Med J [Clin Res] 1986; 292:1105-1106

Repeated Pentostatin (2'Deoxycoformycin)-Induced Remissions in a Patient With Advanced Chronic Lymphocytic Leukemia

ROBERT O. DILLMAN, MD
ALICE L. YU, MD, PhD
CHONG-NIANG QIAO, MD
La Jolla, California

BECAUSE OF ITS PREVALENCE and relatively favorable prognosis (median survival of more than five years), chronic lymphocytic leukemia (CLL) is the most common type of leukemia in the western world.[1] In advanced disease, combination chemotherapies including alkylating agents and steroids produce responses in more than 60% of patients.[2-8] More aggressive regimens have not produced superior results and have been associated with increased morbidity.[9,10] Most patients eventually become refractory to standard agents and die of complications related to overwhelming systemic disease. Treating advanced disease is very difficult because of severe anemia, thrombocytopenia, and neutropenia that are often made worse with cytotoxic therapy. There is a need to identify new effective agents for treating this disease. We describe the case of a patient who, despite previous treatments with multiple regimens, had repeated near-complete remissions following brief courses of the intravenous (IV) administration of pentostatin (2'deoxycoformycin).

ABBREVIATIONS USED IN TEXT

ADA = adenosine deaminase
CLL = chronic lymphocytic leukemia
Ig = immunoglobulin
IV = intravenous

Report of a Case

In 1973 at age 59, chronic lymphocytic leukemia was diagnosed in this man. The diagnosis was later confirmed by the typical clinical syndrome and the classic immunologic phenotype with CLL cells expressing immunoglobulin (Ig) M and IgD with only λ light chains and the T65 antigen.[11,12] Between 1973 and 1977 he received an undefined amount of chlorambucil. From 1977 to 1985 he was followed at the San Diego Veterans Administration Medical Center. His disease indices and therapies during that period are shown in Figure 1. In 1979 he had progressive anemia with an increasing lymphocyte count. The monthly administration of chlorambucil was started at single doses of 30 to 40 mg per m^2 and prednisone at 20 mg per day for five days each month. He had a good response but in June 1979 was admitted with respiratory failure and hilar adenopathy. Transbronchial biopsy tissue was histologically consistent with a drug-induced hypersensitivity reaction. A regimen of daily prednisone was started, and his respiratory condition returned to normal. When his disease began to progress, the prednisone therapy was discontinued.

Therapy was restarted with cyclophosphamide, 750 mg per m^2 given IV on day 1; vincristine sulfate, 2 mg given IV on day 1; and prednisone, 80 mg a day by mouth for seven days in three-week cycles. He had a good response, but after six cycles respiratory failure and hilar adenopathy again developed, attributed to a recurrent lung hypersensitivity reaction due to alkylating agents. With the discontinuation of therapy, all symptoms disappeared; the vincristine and prednisone regimen was later discontinued because of disease progression.

By late 1981, he had accumulated a substantial tumor burden. Experimental therapy with a murine monoclonal antibody, T101, was given without a sustained response.[13] He was then given a single agent, bleomycin sulfate, 15 units IV weekly, again with a good response. This, too, had to be discontinued, however, because of respiratory difficulty. After his disease progressed, he had additional trials of T101 monoclonal antibody therapy followed by a regimen of fluorouracil, without response. Splenic irradiation, bleomycin-vincristine, prednisone, and cyclophosphamide were given serially with some decrease in tumor burden, but they also produced severe thrombocytopenia and transfusion-dependent hypoplastic anemia.

(Dillman RO, Yu AL, Qiao CN: Repeated pentostatin (2'deoxycoformycin)-induced remissions in a patient with advanced chronic lymphocytic leukemia. West J Med 1988 Mar; 148:334-337)

From the Department of Experimental Clinical Oncology, Scripps Clinic and Research Foundation, La Jolla; the Hematology/Oncology Section, Veterans Administration Medical Center, San Diego; and the Department of Pediatrics, University of California, San Diego, School of Medicine, La Jolla, California.

This work was supported in part by the Veterans Administration and by grant No. ROI-CA-27740 from the National Cancer Institute.

Reprint requests to Robert O. Dillman, MD, Director, Experimental Clinical Oncology, Scripps Clinic and Research Foundation (MS312), 10666 N Torrey Pines Rd, La Jolla, CA 92037.