prostaglandins, neurogenic peptides) (15). However, scientific evidence is lacking. The recent literature on *uncomplicated* bone pain suggests that a single 8 Gy fraction is as effective as fractionated treatment (15), 70–80% of patients obtaining pain relief within four weeks (16). In the present case of HPOA, a single 8 Gy fraction clearly failed to achieve analgesia in the effected leg within the remaining $3\frac{1}{2}$ weeks of the patient's life. This was despite clinical improvement in his chest symptoms following palliative lung irradiation, suggesting some response in the primary (although corroborative follow-up chest x-ray was not obtained in view of his rapid general decline). Interestingly, it has been observed that resolution of HPOA symptoms and bone scan abnormalities can occur both with chest RT and with systemic chemotherapy even in the absence of lung tumour response (9, 13). There has even been a report of similar improvement in HPOA systemically after irradiation of a concomitant solitary bone metastasis (in the radius) during which time there was progression of the untreated lung primary! (12). It is impossible to know whether the use of a higher radiation dose in the present case would have made any difference.

HPOA remains an enigmatic disease. Whilst RT to the lung can be effective in palliating the musculoskeletal symptoms, its role locally to affected sites is unproven.

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BILATERAL OCCIPITAL LOBE INFARCTION PROBABLY DUE TO DISSEMINATED ZYGOMYCOSIS IN A PATIENT WITH LYMPHOMA

Zygomycosis is a rare life-threatening infection caused by a fungus of the Mucorales order (1, 2). These fungi destroy the elastic tissue of the vessel wall and proliferate in the lumen, inducing thrombosis, hemorrhage, infarction and necrosis. The infection may also metastasize to distant sites (3). Six clinical forms are recognized: rhinocerebral, pulmonary, cutaneous, gastrointestinal, cerebral and disseminated (4). The lungs are usually the initial site of the disseminated form (5), which is more frequent in patients with severe chemotherapy-related neutropenia (6–11), although it can also occur in treatments with steroids or deferoxamine (12).

We describe a patient with Burkitt's lymphoma who developed a bilateral occipital infarction in the course of disseminated zygomycosis.

Case report. A 33-year-old man was admitted to our hospital in July 1993 for evaluation of a 2-month history of upper abdominal pain. A week before admission a palpable mesogastric mass was observed. Fever (up to 30°C), weight loss (8 kg) and night sweats were additional symptoms. On physical examination the right palatine tonsil was hypertrophic; no peripheral lymph nodes were detected. The lungs and heart were normal but the abdomen was slightly distended, a bulky (12 cm main diameter) mesogastric mass was painful, the liver and spleen could not be felt. Genital, rectal and neurologic examinations were negative. The laboratory findings were: WBC count 8.3×10^9/l with a normal differential, Hb 12.3 g/l, platelets 360×10^9/l, ESR 117 mm, uric acid

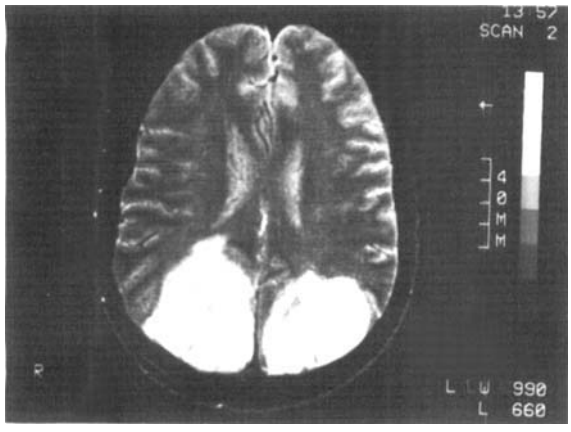

Figure. T2-weighted images (2 000/90) showing an increase of signal intensity in the distribution of both posterior cerebral arteries with predominant involvement in the right occipital lobe. These images indicate ischemic infarction.

0.64 mmol/l (normal 0.21–0.46), and LDH 933 U/l (normal 260–480). Beta-2 micro-globulin 2.1 mg/l (normal 1–3). Serology for HIV was negative. A computed tomographic (CT) cranial scan confirmed the tonsil enlargement, but the nasopharynx appeared normal. A CT scan of the thorax and abdomen showed enlargement of mesenteric and para-aortic lymph nodes. Biopsies from tonsil, stomach and bone marrow revealed involvement of a small non-cleaved malignant lymphoma (Burkitt's type). A cytologic examination of peripheral blood and cerebrospinal fluid (CSF) was negative for tumor cells.

A modified program of cyclophosfamide, vincristine, etoposide, high-dose methotrexate (MTX) and cytarabine was administered for 4 weeks. Chemoprophylaxis with intrathecal MTX was included. The patient achieved a complete remission without evidence of lymphoma in multiple biopsies. However, cytologic examination of CSF revealed atypical lymphocytes suggesting malignant lymphoma involvement. A second course of chemotherapy with holocranial radiation was started, and after 5 additional intrathecal doses of MTX, a cytologic examination of CSF proved negative.

On October 12 a severe cytopenia was observed and 4 days later the patient appeared febrile with headache and fluctuating visual disturbances. Chest x-rays showed reticulonodular bilateral pulmonary infiltrates. Pupillary reflexes and fundoscopy were normal. Treatment with ceftazidime, amikacin and G-CSF was initiated and radiotherapy was discontinued. Two days later the patient's condition deteriorated, with impairment of consciousness and progression of the pulmonary infiltrates to cavitation. Cultures from blood and urine were negative. A CSF tape was normal and without any evidence of bleeding, infection or malignant cells. Magnetic resonance (MR) showed bilateral occipital infarction (Fig. 1). Because of persistent fever, amphotericin B was started on 20 October. Seven days later, the patient remained febrile with 3.7×10^9/l WBC and $25\,000 \times 10^9$/l platelets. Neurologic examination disclosed consciousness improvement, but left homonymous hemianopsia and left hemiparesis became evident. Chest x-ray showed a necrotizing bilateral pneumonia. New cultures and serological tests were negative, and echocardiography was normal. The thrombocytopenia and the patient's condition meant that bronchoscopy, open biopsy of the lung or cerebral arteriography had to be excluded. On 5 November an esophagogastroscopy was performed because of hematemesis. A gastric ulcer located in the fundus was observed and a biopsy revealed presence of necrotic tissue.

On 11 November the patient died from a massive gastric bleeding. A limited autopsy was authorized by his family, excluding the cranial cavity. Multiple hemorrhagic infarcts were present in the lungs, kidneys and thyroid with prominent vascular colonization by zygomycetes hyphae. The gastric ulcer was perforated but covered by the liver and no hyphae were detected, nor were there any viable neoplastic remnants present.

Discussion. The increase in incidence of zygomycosis is probably related to the use of more aggressive chemotherapy protocols. The premortem diagnostic rate continues to be low due to the lack of specific clinical findings and failure to culture the fungus (9). As diagnosis can be made mainly by histologically visualizing the irregular, non-septated and right-angled branching hyphae or by growing them in the laboratory (13).

In the disseminated form, the fungi can reach the brain through a systemic pathway, without causing damage to rhinosinusal structures or cranial nerves. Disseminated zygomycosis with brain damage has been uniformly fatal, even though amphotericin is used in the early stages (14).

Other alternative diagnoses were considered. Cerebral lymphomatous involvement was unlikely, given the vascular distribution of the lesions. Meningoencephalitis was rejected on the grounds of the radiological image, negative CSF tapes and absence of meningeal signs. A necrotizing leukoencephalopathy related to MTX and radiotherapy was less likely, as this complication appears several months after therapy, causing periventricular white matter damage (15). Progressive multifocal leukoencephalopathy (PML) was considered because of its frequent association with cancer, but it was unlikely due to the vascular changes and the absence of demyelinating lesions.

Finally, a cerebral infarction in a cancer patient without cardiac disorders but with a pulmonary infiltrate can be explained by two different mechanisms: a septic embolism or vasculitis. Septic embolism appears more frequently than vasculitis in cancer patients (14% of all cerebrovascular disorders) (16). It is also well known that large infarctions in the posterior brain are usually induced by embolisms (17, 18). Septic embolisms can exhibit two neurological patterns in cancer patients: a stroke-like evolution with focal signs or progressive encephalopathy without focal deficits. The latter pattern appears more often in cancer patients (16). In addition, in 17–21% of cerebral embolisms focal deficits are fluctuating (19).

A reasonable explanation for cerebral involvement is the passage of colonized tissue to the pulmonary veins in a damaged area. Embolic material can reach the vertebral-basilar system up to the upper bifurcation where it is reduced to fragments and these emboli can reach both posterior cerebral arteries. According to Symond & Mackenzie (20), the most common cause of bilateral occipital infarction is the embolization of calcarine arteries and thrombi that are often derived from the vertebral-basilar system. Amphotericin B was precociously started in our patient but it proved ineffective. Although the brain was not available at the postmortem examination, we believe that the cerebral lesion was probably a consequence of a mycotic septic embolism in the course of a disseminated pulmonary zygomycosis.

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