bral hemispheres. The lateral scintigrams of Figs. 3 and 4B show that this activity does not extend along the course of the sagittal sinus into the occipital areas, which would be the case if it were blood-pool activity. Also, if this were the case, the 24-hr scintigrams should have shown considerable activity at the base of the skull, in the region of the paranasal sinuses, and in the soft tissues. The scintigrams of Fig. 4B show that this did not occur.

In short, I do not believe that significant blood-pool activity is demonstrated in Figs. 3 and 4B. The activity lies primarily within the subarachnoid space and in the parasagittal region, with perhaps some activity within altered tissues adjacent to the subarachnoid space, as discussed in the article. Parasagittal and interhemispheric activity during scinticisternography is common and occurs with tagged human serum albumin as well as with the chelated radionuclides.

ROBERT R. McCLELLAND
St. Paul-Ramsey Hospital
St. Paul, Minnesota

Scan Findings in Rhinocerebral Mucormycosis

Drs. Zwas and Czerniak (*1*) report that "there has been no mention of an in vivo demonstration by isotopic methods of organs involved in mucormycosis." I find their report very interesting and timely in an era when specialists in diverse fields care for immunosuppressed patients. Yet I must point out that in a clinical study (*2*) we described a patient with an abscess detected on a technetium brain scan; correlative findings of angiography, pneumoencephalogram, electroencephalogram, operation, and autopsy were also given. A review of the recent literature indicates that angiography has been performed in cerebral mucormycosis much more frequently than have brain scans (*3*). Brain scans were reported normal in a patient with a cerebral lesion shown on arteriogram and autopsy (*4*) and in another with an abscess confirmed at operation (*5*).

I sincerely hope that reports of aggressive diagnostic approaches to these patients will continue to appear.

RICHARD D. MEYER
UCLA School of Medicine
Los Angeles, California

REFERENCES

1. ZWAS ST, CZERNIAK P: Head and brain scan findings in rhinocerebral mucormycosis: Case report. *J Nucl Med* 16: 925–927, 1975

2. MEYER RD, ROSEN P, ARMSTRONG D: Phycomycosis complicating leukemia and lymphoma. *Ann Intern Med* 77: 871–879, 1972

3. MEYER RD, ARMSTRONG D: Mucormycosis: Changing status. *CRC Crit Rev Clin Lab Sci* 4: 421–451, 1973

4. HAMEROFF SB, ECKHOLDT JW, LINDENBERG R: Cerebral phycomycosis in a heroin addict. *Neurology* 20: 261–265, 1970

5. CHMEL H, GRIECO MH. Cerebral mucormycosis and renal aspergillosis in heroin addicts without endocarditis. *Am J Med Sci* 266: 225–231, 1973

Reply

We would like to thank Dr. Richard D. Meyer for his courteous and interesting comment on our case report and especially for his valuable citations from the literature.

Aspergillosis, candidiasis, and phycomycosis are clearly not new fungal infections. The first good clinical descriptions appeared in the literature during the early fifties in cachectic, cancerous, hematologic, and diabetic patients. In the sixties were added reports of patients who suffered from phycomycosis following transplantation and immunosuppressive treatments. The mechanism of the fungal infestation is usually the same: pathogenization of the saprophytes in the sinuses and respiratory tract, which progresses per continuum to produce pulmonary and rhinocerebral disease. Meyer et al. described a large and interesting group of 26 cases, diagnosed post mortem except for three patients successfully treated with amphotericin B. Among them was a patient with a cerebral infection in whom a brain scan and brain biopsy unfortunately did not reveal the diagnosis.

Dr. Meyer has also provided clinical observations in a new group of mucormycosis-susceptible patients: heroin addicts. Here the mechanism of infestation seems to be different; it is hematogenous due to the injection of infected drugs. The clinical picture is also different, the onset being usually sudden and fatal. The cerebral manifestations are due to acute encephalitis, with thrombosis of the cerebral vessels due to penetration of their walls by the hyphae. The pathogenic phycomycetes cited in the literature are found mainly in the family Mucoraceae and its genus *Mucor*, the other two genera being *Rhizopus* and *Absidia*. The *Mucor* species most frequently implicated are *M. mucedo*, *M. ramosus*, and *M. rhizopodiformis*.

We wish to make three specific points about our report:

1. In the two cases presented, *M. mucedo* was identified early in the course of the disease by examination of the nasal conchae and nasal mucous excretion. Thus, the diagnoses were made in living patients and not post mortem as is more common in the literature.

2. We performed brain scans in these cases to investigate specific patterns that might provide an early diagnosis of invading intracranial mucormycosis. The brain and bone scans presented a large triangular shadow in the naso-orbital region of the calvarium. (We recently examined a kidney-transplant patient with frontal pains and nasal excretions who was suspected of developing mucormycosis. However, the nasal mucus and the brain scan were normal. We will follow this patient for early detection and treatment, if necessary.)

3. We performed followup head scans using not only pertechnetate, but also bone-seeking agents in order to differentiate between a possible bone lesion and a meningocerebral lesion. These scans have been adequate for followup and evaluation of therapy: the patient presented is still alive 3 years later.

The above considerations and clarifications may explain the full meaning of our mention of an "in vivo demonstration by isotopic methods," namely, a description of scanning patterns and followup examinations of organs involved in mucormycosis. We feel that our report fulfills the hope expressed at the end of Dr. Meyer's letter, that is, that our report contributes to the aggressive approach towards early and safe radionuclidic diagnosis of invading rhinocerebral mucormycosis. Moreover, it can be useful for followup management of therapy.

TZILA S. ZWAS
PINCHAS CZERNIAK
Sheba Medical Center
Tel Hashomer, Israel