Mucormycoses are invasive infections due to non-septate, filamentous fungi. In persons receiving immunosuppressive treatment.\(^1\) Cerebral rhinocerebral mucormycosis are those of space-occupying lesions with ring-enhancing lesions featuring focal signs; however, a case with features of thrombotic stroke has been reported.\(^1\)

All the clinical patterns of mucormycosis are rapidly fatal. A large study of 59 subjects with haematological malignancies with a proven or probable diagnosis of mucormycosis showed a mortality >80% within 3 months of the diagnosis and, in most patients, the cause of death was mucormycosis itself rather than the progression of the underlying disease; the only predictor of survival was the use of liposomal amphotericin B treatment.\(^4\)

Additionally, mucormycosis is usually reported as an unexpected finding during autopsy in subjects with advanced HIV infection.\(^5\)

We report the case of a 45-year-old man who in September 2002 was admitted to our hospital because of fever, latero-cervical lymphadenopathy and rhinolalia. During the admission, he was found to be HIV-infected with moderate immune-depression (HIV plasma RNA load: 230 000 copies/mL; CD4: 270 cells/mm\(^3\)). A latero-cervical lymph node biopsy showed a diffuse, large, CD20+, CD10+, B cell non-Hodgkin lymphoma. Antiretroviral treatment with zidovudine, lamivudine and lopinavir/ritonavir was initiated with rapid virological suppression and immunological recovery (after 1 month HIV plasma RNA load: <400 copies/mL; CD4: 350 cells/mm\(^3\)). Fifteen days after the diagnosis of lymphoma, the patient started six cycles of chemotherapy with rituximab, cyclophosphamide, doxorubicin, etoposide and intrathecal prophylaxis with methotrexate and cytosine arabinoside,\(^6\) with complete remission of disease until November 2004, when routine tests revealed circulating blasts, with a 65% bone marrow infiltration of pre-B cells CD19+ CD19/DR−, Ph-negative, CD20−, CD10−; acute lymphoblastic leukaemia (ALL) was diagnosed.

Chemotherapy consisted of an induction phase with cyclophosphamide, asparaginase, vincristine and idarubicin, followed by a seven-cycle consolidation phase with cyclophosphamide, vincristine, idarubicin, prednisone and intrathecal prophylaxis with methotrexate and cytosine arabinoside. At the end of the induction phase, the patient had grade IV pancytopenia associated with fever, right orbital pain with ophthalmoplegia, impaired vision and paralysis of the third cranial nerve. Magnetic resonance imaging (MRI) of the brain showed ring-enhancing lesions surrounded by oedema in the left cerebellum and in the right frontal cortical lobe; the latter lesion involved the white matter, the ocular nerve and the optical chiasm (Figure 1a). Additionally, features of right sphenoidal sinus inflammation were observed. A lumbar puncture was negative for infections and abnormal cells. A culture of the sinus aspirate showed colonies of *Mucor*. Antimycogram showed sensitivity to all antifungal drugs; a treatment with liposomal amphotericin B (dose of 3 mg/kg daily) was initiated and, after 2 months, both of the lesions appeared reduced in size and less oedematous. We repeated a culture of the sinus aspirate, which was negative. The consolidation treatment for ALL was continued and was followed by a complete remission; HIV infection continued to be well controlled (CD4: 450 cells/mm\(^3\); HIV plasma RNA load: <50 copies/mL). The maintenance treatment with cyclophosphamide, purinethol and methotrexate was discontinued due to grade IV pancytopenia. In December 2005 and June 2006, ALL relapsed again so that a rescue therapy with vincristine, daunorubicin and steroids was started. From April 2005, owing to partial but not complete resolution of MRI lesions (Figure 1b), liposomal amphotericin B was empirically reduced to a dose of 5 mg/kg twice weekly and from August 2005 until February 2007 to 5 mg/kg weekly. This treatment is still ongoing, and, to date, no clinical or radiological relapse of mucormycosis has been observed. No drug-related toxicities have been observed throughout the follow-up.

Rhinocerebral mucormycosis is an uncommon disease associated with a high rate of mortality; few cases have been reported in HIV-infected patients, probably because AIDS patients primarily have a deficiency of T cell-dependent cellular immunity and only rarely have a bone marrow suppression leading to a severe neutropenia as observed in persons with haematological
malignancies. Therapy with liposomal amphotericin B was found to be predictive of survival in a large study not including HIV-infected patients; most of these patients died within 3 months due to mucormycosis itself, and those who responded to antifungal treatment died because of the clinical progression of the underlying haematological malignancy. To our knowledge, this is the first report assessing a 2-year-long survival in a patient with both advanced HIV infection and a haematological malignancy. Such prolonged survival, despite the relapse of the underlying haematological disease, suggests that the weekly long-term administration of liposomal amphotericin B at high dosage might prevent the clinical and the radiological progression of mucormycosis, even if its complete eradication does not seem achievable. Additionally, this approach might allow the administration of a full dose chemotherapy for the underlying haematological disease. Liposomal amphotericin B has usually moderate long-term toxicity, involving primarily kidneys or liver; as a consequence, periodic evaluation of renal and hepatic parameters is required. The duration and the correct dosage of the maintenance treatment for rhinocerebral mucormycosis are both unknown. We might speculate that the antifungal treatment should be continued until the underlying cause of immune-suppression persists; therefore, the clinical implications of this approach are not well understood. Additionally, economic and care-providing implications need to be considered when treating these subjects for a prolonged period. The empirical administration schedule of liposomal amphotericin B proposed in this case report may represent a possible option to treat mucormycosis in rare conditions.

Transparency declarations
None to declare.

References