Use of Fluconazole in the Treatment of *Candida albicans* Hydrocephalus Shunt Infection

Infection of the cerebrospinal fluid (CSF) with *Candida albicans* is uncommon and constitutes a severe complication in patients with a hydrocephalus shunt. Treatment in these cases generally includes removal of the shunt and antifungal chemotherapy (1, 2). Amphotericin B is still widely considered the drug of choice for treatment of systemic candidiasis. Unfortunately, penetration of amphotericin B into the CSF is poor and intraventricular administration, which is not devoid of risks, is often deemed necessary for treatment of CSF infections (1–3). Fluconazole has been found to be an effective and well tolerated antifungal agent in several clinical settings (4). Due to its good penetration across the blood/brain barrier it has been used successfully to treat fungal infection such as cryptococcal meningitis (5). Fluconazole has not previously been evaluated in the treatment of fungal infections in patients with a hydrocephalus shunt. We describe a case of ventriculoperitoneal shunt infection due to *Candida albicans* successfully treated with intravenous fluconazole.

A female infant born prematurely at 29 weeks of gestation developed hydrocephalus secondary to intraventricular hemorrhage. At the age of 60 days a ventriculoperitoneal shunt was inserted. Ten days later she became febrile and shunt malfunction was evident. *Candida albicans* was grown from the CSF, which showed mild inflammatory changes. The MIC of fluconazole for the pathogen was 0.2 μg/ml (agar diffusion method). Intravenous fluconazole in a single daily dose of 6 mg/kg (= 18 mg) was started and after two days *Candida albicans* was eliminated from the CSF, which subsequently remained sterile. On day 4 after the start of fluconazole therapy the ventriculoperitoneal shunt was removed and an external ventricular drainage catheter inserted. *Candida albicans* was not grown from the distal tip of the catheter. Fluconazole therapy was continued until day 13, when a new ventriculoperitoneal shunt was placed. The drug was well tolerated. The patient experienced no further problems in a 19-month follow-up period. Fluconazole trough concentrations in the serum and CSF (24 h after administration) were determined by HPLC (courtesy of Dr. K.W. Brammer, Pfizer Central Research, UK). On day 4 and day 8 of therapy fluconazole serum trough levels were 8.6 and 12.1 μg/ml respectively, while cerebrospinal fluid trough levels were 6.6 and 8.6 μg/ml respectively, well above the MIC for the pathogen.

The high and prolonged concentrations of fluconazole consistently above the MIC for the pathogen, correlated well with the rapid sterilization of CSF observed in this patient. Shunt removal is a crucial measure in the treatment of CSF fungal infection, likewise the administration of antifungal agents. The CSF pharmacokinetics of amphotericin B and its safety profile, particularly when given intraventricularly, are not advantageous for treatment of shunt infection. Although further experience is needed, the favourable results with fluconazole reported here suggest the drug warrants consideration in this therapeutic setting.

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References

1. **Bayston R:** Hydrocephalus shunt infections and their treatment. Journal of Antimicrobial Chemotherapy 1985, 15: 259–261.
2. **Shapiro SF, Javed T, Mealey J:** *Candida albicans* shunt infection. Pediatric Neuroscience 1989, 15: 125–130.
3. **Fisher JF, Dewald J:** Parkinsonism associated with intraventricular amphotericin B. Journal of Antimicrobial Chemotherapy 1981, 12: 97–99.
4. **Hay RJ:** Antifungal therapy and the new azole compounds. Journal of Antimicrobial Chemotherapy 1991, 28, Supplement A: 35–46.
5. **Sugar AM, Saunders C:** Oral fluconazole as suppressive therapy of disseminated cryptococcosis in patients with acquired immunodeficiency syndrome. American Journal of Medicine 1988, 85: 481–489.