

Soap bubble appearance in brain magnetic resonance imaging: cryptococcal meningoencephalitis

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ABSTRACT

Although cryptococcal infections begin in the lungs, meningoencephalitis is the most frequently encountered manifestation of cryptococcosis among individuals with advanced immunosuppression. As the infection progresses along the Virchow-Robin spaces, these structures may become dilated with mucoid material produced by the capsule of the organism. We report a case of a 24-year-old man with cryptococcal meningoencephalitis in which magnetic resonance imaging showed clusters of gelatinous pseudocysts in the periventricular white matter, basal ganglia, mammillary bodies, midbrain peduncles and nucleus dentatus with a *soap bubble* appearance.

Keywords: Cryptococcosis. Magnetic Resonance Imaging. Meningoencephalitis.

INTRODUCTION

Cryptococcus neoformans is a ubiquitous saprophytic fungus that may become pathogenic, particularly in immunosuppressed patients¹. Among patients with human immunodeficiency virus (HIV), cryptococcal meningoencephalitis is associated with mild meningeal inflammation and a high fungal burden^{2,3}. Central nervous system (CNS) involvement can be either meningeal or parenchymal. As the infection spreads along the Virchow-Robin spaces, these structures may become dilated with mucoid and gelatinous materials produced by the capsule of the organism. This marked dilatation and filling of the Virchow-Robin spaces is referred to as a gelatinous pseudocyst⁴.

CASE REPORT

A 24-year-old man was admitted to the Natan Portella Institute of Tropical Diseases (Teresina, State of Piauí, Brazil) with a headache, vomiting, drowsiness and mental confusion progressing for two weeks that was associated with seizures. He was infected with HIV-1 but had stopped antiretroviral therapy six months prior. Upon arrival, he was obtunded with normal fundoscopy, generalized myotatic hyperreflexia and abnormal plantar responses. There were no signs of meningeal irritation.

Brain magnetic resonance imaging (MRI) showed multiple and bilateral hypointense T1 and hyperintense T2 cyst-like lesions located on the periventricular white matter, basal ganglia, mammillary bodies, midbrain peduncles and dentatus nucleus without mass effects and mild post-gadolinium enhancement only in the right caudate head (**Figure 1**). No meningeal enhancement was noted. Findings of a lumbar puncture procedure showed an opening pressure of 17cm H₂O. The cerebral spinal fluid (CSF) was clear, the white blood cell count was 1cell/mm³, the CSF glucose was 48mg/dL, and the total

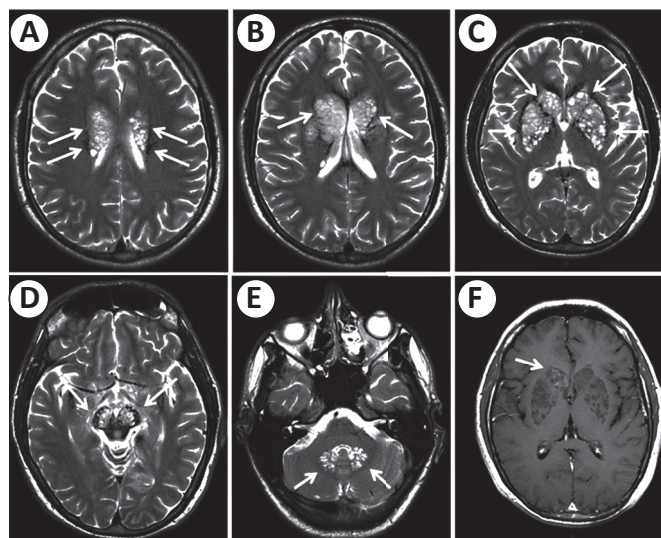


FIGURE 1 - Axial T2-weighted magnetic resonance images showing a cluster of gelatinous pseudocysts with the *soap bubble* appearance (arrows) at the periventricular white matter (A, B), basal ganglia (C), midbrain peduncles (D) and dentatus nucleus (E) without mass effects and with mild enhancements at the T1-post gadolinium only on the right caudate head (F).

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protein was 53mg/dL. India ink staining revealed typical round encapsulated yeast organisms consistent with *Cryptococcus neoformans*. The cluster of differentiation antigen 4 (CD4)+ T-cell count was 6 cells/ μ L, and the human immunodeficiency virus (HIV)-1 viral load was 138,000 units/mm³. A chest X-ray was normal. The patient was started on IV amphotericin B deoxycholate therapy in the intensive care unit. A few days later, his mental status worsened, he developed respiratory failure associated with hemodynamic instability, and he died 18 days after admission.

DISCUSSION

Cryptococcosis is the most frequent opportunistic fungal infection that involves the CNS in patients with acquired immunodeficiency syndrome (AIDS) or in other immunocompromised patients^{5,6}. The absence of clinical signs of meningeal irritation and CSF pleocytosis reflects the paucity of inflammation due to the severe condition of immunosuppression in these patients^{1,3}.

The radiology of this disease demonstrates the ease by which the fungi multiply and disseminate within the host under an incipient immunologic response^{7,8}. Central nervous system involvement is secondary to a hematogenous spread and usually results from the reactivation of a prior silent pulmonary infection¹. Meningitis is often the primary manifestation and is most pronounced at the base of the brain. Parenchymal involvement is seen as cryptococcomas, dilated Virchow-Robin spaces or enhanced cortical nodules⁹. The meningeal infection along the base of the skull may extend along the Virchow-Robin spaces, which may dilate with mucoid gelatinous material produced by the capsule of the organism. Because membranes are not formed between these spaces and the adjacent brain parenchyma, these cysts have been called *gelatinous pseudocysts*^{2,3}.

The gelatinous pseudocysts tend to exhibit a *soap bubble* appearance by MRI, as observed in the present case (**Figure 1**). These pseudocysts appear as multiple, small, round or oval cysts in the basal ganglia, thalami, midbrain, cerebellum and the periventricular regions with a low to intermediate T1WI signal (from mucin), a high T2WI signal and a low T2-

FLAIR signal^{4,7-9}. Significant contrast enhancements of the pseudocysts, cryptococcomas or meninges are rarely noted in immunocompromised patients due to their underlying immunosuppression and the non-immunogenic nature of the polysaccharide capsule^{2,4}. Immunocompetent patients tend to present with localized neurological disease, more intense inflammatory responses and improved clinical outcomes^{4,10}. The demonstration of pseudocyst clusters in the basal ganglia and thalami in immunocompromised patients strongly suggests a cryptococcal infection^{4,7-9}. These lesions reflect the pathological mechanism of CNS invasion by the fungus.

REFERENCES

1. Lin X, Heitman L. The biology of *Cryptococcus neoformans* species complex. *Annu Rev Microbiol* 2006; 60:69-105.
2. Charlier C, Dromer F, Lévêque C, Chartier L, Cordoliani YS, Fontanet A, et al. Cryptococcal neuroradiological lesions correlate with severity during cryptococcal meningoencephalitis in HIV-Positive patients in the HAART era. *PLoS ONE* 2008; 3:1950.
3. Moretti ML, Resende MR, Lazera MS, Colombo AL, Shikanai-Yasuda MA. Guidelines in cryptococcosis - 2008. *Rev Soc Bras Med Trop* 2008; 41:524-544.
4. Jain KK, Mittal SK, Kumar S, Gupta RK. Imaging features of central nervous system fungal infections. *Neurol India* 2007; 55:241-250.
5. Oliveira JF, Greco DB, Oliveira GC, Christo PP, Guimarães MDC, Oliveira RC. Neurological disease in HIV-infected patients in the era of highly active antiretroviral treatment: a Brazilian experience. *Rev Soc Bras Med Trop* 2006; 39:146-151.
6. Park BJ, Wannemuehler JA, Marston BJ, Govender N, Pappas BG, Chiller TM. Estimation of the current global burden of cryptococcal meningitis among persons living with HIV/AIDS. *AIDS* 2009; 23: 525-530.
7. Andreula CF, Burdi N, Carella A. CNS Cryptococcosis in AIDS: Spectrum of MR findings. *J Comput Assist Tomogr* 1993; 17:438-441.
8. Miszkil KA, Hall-Kraggs MA, Miller RF, Kendall BE, Wilkinson ID, Paley MS, et al. The spectrum of MRI findings in CNS cryptococcosis in AIDS. *Clin Radiol* 1996; 51:842-850.
9. Corti M, Villafañe MF, Negroni R, Arechavala A, Maiolo E. Magnetic resonance imaging findings in AIDS patients with central nervous system cryptococcosis. *Rev Iberoam Micol* 2008; 25:211-214.
10. Saigal G, Post MJD, Lolayekar S, Murtaza A. Unusual presentation of central nervous system cryptococcal infection in an immunocompetent patient. *AJNR Am J Neuroradiol* 2005; 26:2522-2526.