Neurosurgical complications of HIV

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The number of people in sub-Saharan Africa living with HIV in 2010 was 24 million, accounting for 67% of the global disease burden.[1] HIV is neuro-invasive, gaining access to the central nervous system (CNS) through peripherally infected leucocytes.[2]

Among patients with AIDS, 10% will have signs of neurological dysfunction at first presentation, with 60% ultimately manifesting signs of neurological disease sometime during the course of their illness. The neurosurgical manifestations of this disease may be related to secondary infection, direct nervous system invasion or HIV-associated neoplasms. These complications present as either focal mass lesions of the brain and spine or cerebrospinal fluid (CSF) flow disturbances. As most focal lesions are treatable medically, neurosurgical intervention seldom exceeds biopsy, abscess aspiration or CSF diversion.

Conditions commonly encountered in South Africa relate to reactivation of opportunistic infections, with or without hydrocephalus. Neoplasms occur somewhat less frequently. Given South Africa's high tuberculosis (TB) prevalence, TB-related illnesses are common – either TB meningitis and/or TB abscess. Spinal TB is also common and presents as spondylodiscitis with a paravertebral psoas abscess. *Nocardia*, *Aspergillus* and *Candida* may all present with meningo-encephalitis, or as intracranial mass lesions.

Toxoplasmosis

CT scan reveals multiple contrast-enhancing lesions, typically at the grey/white interface, basal ganglia and thalamus. These findings

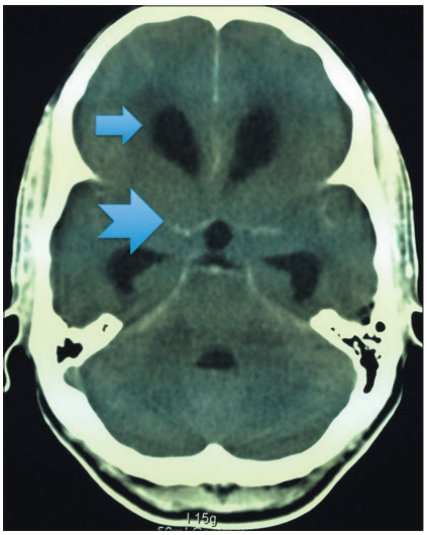

Fig. 1. CT scan – patient with TBM. Note the emerged ventricles and some contrast enhancement around the circle of Willis. The contrast enhancement is often much brighter. The large arrow indicates large ventricles, the small notched arrow indicates contrast enhancement in the circle of Willis.

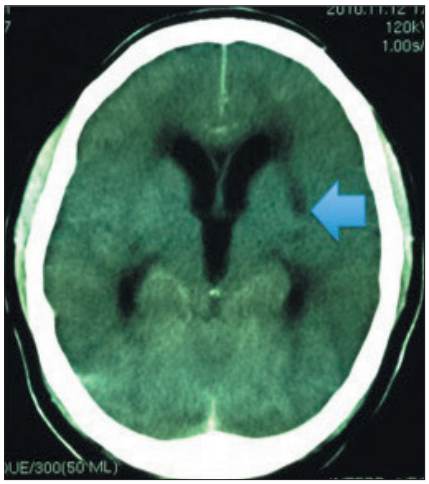

Fig. 2. CT scan – patient with TBM and hydrocephalus. Note the small infarct in the left internal capsule. This is as a result of the vasculitis associated with TBM. The infarct is indicated by the small arrow.

are often sufficient to make the diagnosis and commence medical therapy. Serology, though helpful, is not always positive. Lesions resolve with pyrimethamine/sulfadiazine or trimethoprim/sulfamethoxazole (Bactrim) within 2 - 4 weeks.

Tuberculosis

TB affects both the brain and spine. It occurs early in AIDS, and as a result the immune response may be significant. The CT scan in TB meningitis (TBM) shows contrast enhancement of the basal meninges, which sometimes extends to the convexity (Fig. 1).[3]

The dense exudative response results in obstruction of the CSF absorption pathways leading to hydrocephalus (Fig. 2).

Although up to 80% of hydrocephalus in TBM is communicating, a small percentage is not, thus presenting a potentially fatal complication if lumbar puncture (LP) is performed prior to imaging. Also, with advanced immune suppression, co-infection is not uncommon, so patients with TB meningitis may have a second, unrelated mass lesion that can complicate LP.

In adults, hydrocephalus resolves in many cases once on a course of TB treatment, and permanent CSF diversion is seldom required. Tuberculoma or TB abscess occurs frequently – tuberculomas show focal, irregular enhancement on CT, while abscesses are often loculated, ring-enhancing lesions with significant surrounding oedema and require aspiration, which will allow for diagnostic confirmation and reduction in mass effect.

Cryptococcosis

Cryptococcal infections occur with CD4 counts less that 200 cells/mm^3, usually presenting as meningitis. Imaging will often be unremarkable, with little or no basal enhancement and no ventriculomegaly, sometimes even atrophy.[4] This may be misleading, as at LP the opening pressure may be significantly elevated and the patient experiences relief of symptoms on drainage of CSF.

Management involves initiation of anti-cryptococcal therapy and repeated LP until pressures normalise. Persistently elevated intracranial pressure (ICP) with ongoing symptoms necessitates insertion of a lumbar drain to provide continuous controlled CSF drainage. If the CSF pressure remains elevated after at least 14 days of lumbar drain, permanent CSF diversion may be indicated,[5] but this is seldom necessary.

Atypical abscess

Brain abscesses typically present with a demonstrable aetiology – most commonly rhinogenic, otogenic or dental, but this may not be the case in HIV. Cerebral abscesses are a surgical emergency and warrant immediate aspiration to relieve pressure and

provide a specimen for culture. Common organisms isolated include *Nocardia*, *Aspergillus*, *Listeria*, *E. coli* and *Candida*. Appropriate antibiotics and antifungal agents administered parenterally are the primary treatment after surgery.

HIV-related vasculopathy

Increasingly recognised as a distinct entity, this presents with multiple cerebral ischaemic infarcts or haemorrhagic stroke. Uncontrasted CT may reveal subarachnoid haemorrhage or intracerebral haematoma.[6] Angiography demonstrates diffuse fusiform arterial dilatation or, less commonly, saccular aneurysms.

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The diffuse fusiform nature of the lesions precludes surgical or endovascular intervention. Current management includes commencement or optimisation of antiretroviral therapy, with angiographic resolution reported in some cases.[7] Large, accessible haematomas may be surgically evacuated in suitable patients.

Primary CNS lymphoma (PCNSL)

This is defined as extranodal lymphoma arising in the CNS in the absence of systemic disease. It is the most frequent brain tumour in AIDS patients, with an overall incidence of 6 - 12%. The tumour is almost exclusively B-type non-Hodgkin's lymphoma and occurs at a CD4 count of <50 cells/mm^3. There is a close association between Epstein-Barr virus and HIV-associated lymphoma.

Presentation includes seizures, cognitive impairment and functional motor weakness, depending on the area of infiltration. Imaging characteristics can be difficult to distinguish from toxoplasmosis. CT shows isodense or hypodense lesions enhancing inhomogeneously with contrast. They tend to follow a periventricular growth pattern. The diffusely infiltrative nature of PCNSL sometimes leads to involvement of the corpus callosum, distinguishing it from toxoplasmosis.

Oncology referral is mandated. Stereotactic biopsy is an option where diagnosis is uncertain. Management involves chemotherapy and radiotherapy.[8] When compared with non-HIV lymphoma, HIV-related lymphoma has a poor prognosis.

Summary

In South Africa, the high HIV prevalence along with the disparity in antiretroviral availability and access result in clinicians treating a variety of HIV-related disorders. These range from advanced AIDS in the antiretroviral-naïve patient to drug-related complications in those on long-term therapy. It is important that primary care clinicians respond to neurological symptoms and signs as these patients require referral to a facility where they can be managed by a multidisciplinary team, including neurology, neurosurgery and infectious diseases. Balancing benefit against the surgical risks of patients with advanced immune suppression and diminished reserve and healing capacity may be difficult.

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