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Imaging of CNS Infections

BELAHSEN F.

University hospital of Fez Morocco

belahsenfaouzi@gmail.com



Disclosure of conflict of interest

NONE

Learning objective

- To recognize a CNS infection on brain imaging
- To recognize the radiological signs suggestive of neuromeningeal tuberculosis
- To identify radiological signs suggestive of a specific germ
- To propose an etiological diagnosis of a nervous system infection in an immunocompromised patient

Key message (1)

- **CNS infections** are variable and multiple and depend on the *state of immunity* of the patients.
- **The classification of CNS infections** can be done according to the *organism responsible*, the *location and structures affected* in the CNS and according to the *route of transmission*.
- The 2 main neuroimaging modalities used in most medical centers are computed tomography (CT) and magnetic resonance imaging (MRI)
- **MRI** is the main radiological tool in diagnosing CNS infection due to the high anatomical resolution and tissue contrast, multiplanar acquisition and high sensitivity to contrast enhancement.
- It allows for identifying various infectious patterns and differentiates them from vascular pathologies or neoplasms. It may raise suspicion about a specific pathogen.

Key message (2)

- For **TB meningitis**, MRI show hypersignal on FLAIR in the basal cisterns and contrast studies will show uniform and intense enhancement of the cisterns extending into the Sylvian fissures.
- The **Tuberculomas** is hypointense on T2-weighted sequence with associated irregular ring enhancement. Liquefied areas may be T2 hyperintense. They can also possess a military appearance with many lesions only a few millimeters in size.
- During **Herpes encephalitis**, FLAIR can show asymmetric hypersignal of the temporal lobes and insula. SWI may show petechial hemorrhages.
- For **Toxoplasmosis** MRI show multiple areas of T2 hyperintensities, with nodular or ring-like enhancement surrounded by vasogenic edema. A small enhancing nodule within and adjacent to the enhancing ring (eccentric target sign) is highly suggestive of toxoplasmosis.

Key message (3)

- During **Cryptococcal infection**, gelatinous pseudocysts appear on MRI as rapidly growing, nonenhancing ‘cysts’, hypointense to brain parenchyma on T1 and hyperintense on T2 with FLAIR suppression similar to CSF signal. Perilesional edema and contrast enhancement are generally not seen. They tend to concentrate within dilated Virchow-Robin spaces in or around the basal ganglia and the corticomedullary junction.
- MR suggestive of **Progressive Multifocal Leukoencephalopathy (PML)** include the presence of bilateral asymmetric white matter lesions that are hyperintense on T2-WI and hypointense on T1-weighted imaging, and involve the subcortical “U” fibers with “scalloped” appearance. PML lesions usually have no significant mass effect and no contrast enhancement. DWI may detect areas of active disease more effectively than other sequences.

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