**Bacterial Infections in the CNS in the Immune & Immune Compromised Host**

Bacterial infections of the CNS require prompt diagnosis and treatment to avoid irreversible neurological deficits. MRI is the primary imaging method for the evaluation and monitoring of infection. Newer imaging techniques such as diffusion-weighted MR imaging, diffusion-tensor imaging, dynamic susceptibility contrast-enhanced perfusion imaging, MR spectroscopy and susceptibility-weighted imaging complement the role of conventional MR in the diagnosis and distinguishing CNS infections from cystic or necrotic neoplasms.

Anatomically, bacterial infections can be divided into four main categories: 1) meningitis, 2) cerebritis and abscess, 3) subdural and epidural empyema, and 4) ventriculitis. Meningitis refers to the inflammatory infiltration of leptomeninges and CSF. It is more frequently related to hematogenous spread from a distant infection. MRI can demonstrate obliteration of subarachnoid space and basal cisterns as well as meningeal enhancement. MRI is most useful for the detection of complication.

The imaging findings of bacterial abscesses vary according to the pathologic stages of the lesions and can be divided into: early cerebritis, late cerebritis, early capsule, and late capsule. The MR findings of cerebritis are nonspecific. In capsular stage, abscesses appear as a ring enhancing mass with hyperintense cavity contents on DWI, hypointense lesion margin on T2W and prominent perifocal edema. Their treatment response can be monitored with ADC and appearance of T2W hypointense rim.

Empyemas are extra-axial collection of pus frequently related to chronic paranasal sinusitis, mastoiditis, infection secondary to craniotomy or complications of meningitis. Empyemas show crescentic (subdural) or lentiform (epidural) extraaxial fluid collection with strong contrast-enhancing rim. Differentiation empyema and sterile fluids (effusions) has been easily done with DWI, given that ADC is low in empyema and high in sterile fluids.

Ventriculitis is the infection of ventricular ependyma related to meningitis, ruptured brain abscess or ventricular catheter. On contrast-enhanced MR, the ependymal lining of the ventricles enhances intensely. Ventriculomegaly with debris level is often present.

In recent years, the incidence of tuberculosis increases both in immunocompetent and immunocompromised individuals due to immigration, AIDs, increasing use of
immunosuppressive drugs and organ transplants. The two distinct radiologic forms of CNS tuberculosis are meningeal tuberculosis and parenchymal tuberculoma.

Spinal infections can be classified as extradural, subdural and intradural based on the anatomic location. Epidural abscess typically results from adjacent infection or bacteremia. Subdural abscesses are rare with predisposing factors include immunocompromised state, alcoholism and intravenous drug abuse. Intradural spinal infections include meningitis and intramedullary abscess. Spinal meningitis is typically seen as contrast enhancement outlining spinal cord and nerve roots. Intramedullary abscesses appear as a ring-enhancing mass within spinal cord. The most common organisms cultured from spinal cord abscesses are Staphylococcus aureus and Streptococcus. Majority of intramedullary abscesses are idiopathic. Some result from contiguous spread from adjacent infection e.g. dermal sinus tract.