ORIGINAL RESEARCH PAPER

Radiodiagnosis

KEY WORDS:
Mycobacterium Tuberculosis, Central Nervous System, Extrapulomonary,

IMAGING SPECTRUM OF CNS TUBERCULOSIS

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ABSTRACT

Tuberculosis (TB), caused by Mycobacterium tuberculosis, accounts for eight million deaths per year worldwide. Tuberculosis involvement of central nervous system (CNS) is an important and serious type of extra-pulmonary involvement.

AIMS &OBJECTIVES: To assess the various features of CNS Tuberculosis with imaging modalities like CT and MRI.

MATERIALS AND METHODS: A prospective study of 35 patients is done in the Department of Radiodiagnosis, Government General Hospital, Kurnool Medical college, Kurnool. Patients from all the age groups including both men and women with clinically diagnosed Tuberculosis are included. The diagnosis of TB was based on established clinical, AFB sputum positive and previously diagnosed pulmonary and extrapulmonary TB. Patients are evaluated with the help of CT and MRI.

RESULTS: A total of 35 patients were imaged of which ring enhancement is noted in 30 patients, meningeal involvement seen in 15, infarcts are seen in 5, lesions are single in 10 and multiple in 25 patients, calcifications are seen in 5 patients.

CONCLUSION: CNS Tuberculosis is a major cause of morbidity and mortality in patients with tuberculosis. MR imaging plays a key role in diagnosis because of its inherent sensitivity and specificity in detecting CNS lesions earlier. We conclude that imaging techniques helps in improved detection and characterisation of CNS tuberculosis and may help in better management of these patients.

INTRODUCTION

Tuberculosis (TB), caused by Mycobacterium tuberculosis[1], accounts for eight million deaths per year worldwide. Tuberculosis involvement of central nervous system (CNS) is an important and serious type of extra-pulmonary involvement. Approximately 10% of all patients with tuberculosis have CNS involvement [2]. However, its prevalence is greater in immunocompromised patients and it is seen in up to 15% of cases of acquired immunodeficiency syndrome-related TB [3]. CNS tuberculosis usually results from haematogenous spread. It may result from direct rupture or extension of a subpial or subependymal focus (Rich focus).

AIMS &OBJECTIVES

To assess the various features of CNS Tuberculosis with imaging modalities like CT and MRI.

MATERIALS AND METHODS

A prospective study of 35 patients is done in the Department of Radio diagnosis, Government General Hospital, Kurnool medical college. Patients from all the age groups including both men and women with clinically diagnosed Tuberculosis are included. The diagnosis of TB was based on established clinical, AFB sputum positive and previously diagnosed pulmonary and extra pulmonary TB. Patients are evaluated with the help of CT and MRI.

RESULTS

A total of 35 patients were imaged of which ring enhancement is noted in 30 patients, meningeal involvement seen in 15, infarcts are seen in 5, lesions are single in 10 and multiple in 25 patients, calcifications are seen in 5 patients.

DISCUSSION

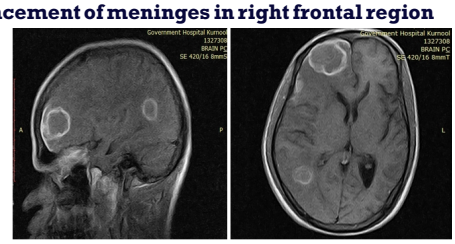
Spectrum of lesions in CNS TB

- TB meningitis
- Tuberculous granuloma (tuberculoma)
- Miliary and leptomeningeal granuloma
- Tuberculous cerebellar abscess
- Tuberculous encephalopathy
- Tuberculous cerebritis
- Vasculitis and infarction
- Cranial neuropathy
- Non-osseous spinal cord tuberculosis
- Calvarial tuberculosis
- Subdural and epidural abscess

TB MENINGITIS

TB meningitis is the most common manifestation of CNS TB in all age groups [4]. It may result from either haematogenous spread or rupture of Rich focus. Pre-contrast MR imaging generally cannot detect signal from meningeal inflammation or basal exudates in early stages. However, in later stages widening of subarachnoid spaces with associated T1 and T2 shortening of CSF may be seen. On contrast administration, T1 images show diffuse meningeal enhancement around basal cisterns and sylvian fissures (Fig: 1)

Fig:1 Contrast sagittal and axial images of MRI brain showing multiple ring enhancing lesions with enhancement of meninges in right frontal region

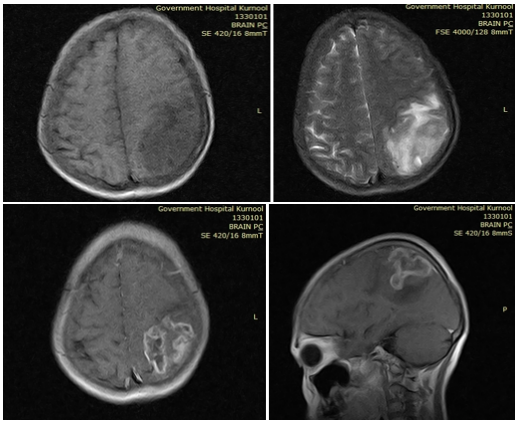


TUBERCULOMA

Tuberculoma is most common parenchymal lesion in CNS TB. These lesions may be solitary or multiple. The usual locations of granulomas are the cortico-medullary junction and periventricular region as expected from haematogenous dissemination. Non-caseating granuloma, Granuloma is usually iso-/hypo-intense on T1 and hyper-intense on T2-weighted images. On gadolinium administration, this show homogeneous enhancement.

Caseating solid granuloma: On MR imaging, it is usually hypo-intense on T1 and hypo-intense on T2-weighted images [5]. This relative hypo-intensity is attributed to granulation tissue and compressed glial tissue. Granuloma with central liquefaction, It appears centrally hypo intense on T1, and hyper-intense on T2-weighted images with a peripheral hypo-intense rim on T2W images. Post contrast T1 images show rim enhancement (Fig: 2).

Fig: 2 T1hypointense, T2 hypo intense conglomerate lesion with irregular thin walled rim enhancement with surrounding edema in left parietal region



DISSEMINATED/ MILIARY TUBERCULOMA

This is a subtle clinical event demonstrated in patients with miliary pulmonary tuberculosis who have no clinical brain involvement. On T2 images, there is diffuse infiltration of the brain with multiple small granulomas. Post-contrast shows numerous round areas of intense enhancement.

TUBERCULOUS ABSCESS

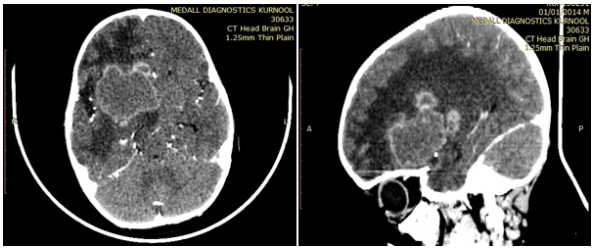
Tuberculous abscesses are rare and are characterized by a central area of liquefaction with pus. They occur in less than 10% of patients with CNS TB and are more common in the elderly and immunocompromised. They may be solitary or multiple and are frequently multiloculated[4].The tuberculous abscess is hypodense with peripheral edema and mass effect on CT. On T2-weighted images, central necrotic area has increased signal intensity. Post contrast images demonstrate ring enhancement that is usually thin and uniform, although it may be irregular and thick especially in immunocom pro mised patients (Fig: 3).

Fig: 3 Axial section CECT of brain showing ring enhanc ing lesion with gross edema with enhancing wall

TUBERCULOUS ENCEPHALOPATHY

Tuberculous encephalopathy, a syndrome exclusively present in infants and children [6], has been described in Indian children with pulmonary tuberculosis. The characteristic features are the development of diffuse cerebral disorder in the form of convulsions, stupor, and coma, without signs of meningeal irritation or focal neurological deficit. On imaging there is severe unilateral or bilateral cerebral edema.T2 images show hyperintensity (Fig: 4)

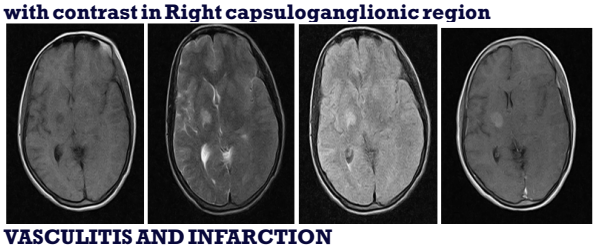
Fig: 4 Axial and sagittal sections of CECT brain showing large conglomerate lesion with ring enhancement and disproportionate perilesional edema in the right parietal region in a patient presented with convulsions and stupor



TUBERCULOUS CEREBRITIS

TB cerebritis is a rare entity. This has specific clinical, radiological, and pathological manifestations. On MR imaging, focal cerebritis is seen hypo-intense on T1, hyper-intense on T2 and small areas of patchy enhancement on contrast scan (Fig: 5)

Fig: 5 MRI axial sections of brain showing T1 hypoin tense,T2/FLAIR hyperintense showing enhancement with contrast in Right capsuloganglionic region



VASCULITIS AND INFARCTION

Intracranial vaculitis is common finding in patients dying from TB meningitis. Vasculitis is a major factor contributing towards residual neurological deficits. Infarction resulting from vascultits is more common in infants and children.The usual sites of infarction are basal ganglia, cerebral cortex, pons, and cerebellum. The middle cerebral artery territories are commonly affected and the infarcts are frequently bilateral.

CRANIAL NEUROPATHIES

Cranial nerve involvement is seen commonly in association with TB meningitis.The causes are partly due to vascular cerebral artery compromise resulting in ischaemia of nerve or may be due to entrapment of the nerves by exudates. Large tuberculomas may cause compression over the nerves, resulting in compression neuropathy. Commonly affected are II, III, IV, and VII cranial nerves. On MR imaging, the affected nerves appear thickened and may show hyper-intensity on T2weighted images. On contrast, the proximal portion of the nerve root is commonly affected and may show enhancement

NON-OSSEOUS SPINAL CORD TUBERCULOSIS

Non-osseous spinal cord tuberculosis can occur in the form of tuberculomas. These lesions are either extramedullary or intr amedullary. Extramedullary lesions are more comm on. Intramedullary tuberculomas are very rare. Cervico-thoracic cord is commonly involved. MRI features include CSF loculation, and obliteration of the spinal subarachnoid space. There is loss of outline of the spinal cord in the cervico-thoracic spine, and matting of the nerve roots in the lumbar region. Spinal cord involvement in the form of infarction and syringomyelia may occur as a complication of arachnoiditis. Parenchymal TB myelitis and tuberculoma formation may also occur.

DURAL AND SUBDURAL PATHOLOGY

Tuberculous pus formation occurs between the dura and the

leptomeninges and it may appear loculated. It is hyper-intense on T2W and iso- to hypo-intense on T1W images. The dural granulomas appear hypo- to isointense on T2W, and iso-intense on T1W images. Post-contrast images show rim enhancement.

CONCLUSION

CNS Tuberculosis is a major cause of morbidity and mortality in patients with tuberculosis. MR imaging plays a key role in diagnosis because of its inherent sensitivity and specificity in detecting CNS lesions earlier. We conclude that imaging techniques helps in improved detection and characterization of CNS tuberculosis and may help in better management of these patients.

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