

Tuberculous Meningitis - A Clinico- Radiological Study

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Abstract

To study the CT-scan changes in brain in patients of tuberculous meningitis and their correlation with stage of disease and its outcome. A prospective, hospital - based, clinico - radiological study of one year duration including 48 pediatric and 44 adult patients. 50% of patients in the stage I had normal CT-Scan and this proportion decreased to 10.53% in stage - II and 6.67% in stage III. A normal CT-scan is associated with complete recovery in 72.22%, partial recovery in 16.67% and death in 11.11% of cases. Abnormal CT-scan is associated with advancing stages of disease and a poor outcome. CT-scan is a valuable tool for diagnosis and monitoring the progress of cases of tuberculous meningitis.

Key Words

Meningitis, Tuberculosis, CT-scan

Introduction

Tuberculosis is a common infectious disease caused by *Mycobacterium tuberculosis*. One third of world's population is infected with tuberculosis, but only 10% of them will develop the clinical disease (1). Tuberculous Meningitis (TBM) was first described as a distinct pathological entity in 1836 (2). At present, TBM is the fifth most common extrapulmonary tuberculosis in the United States (US) accounting for 5.2% of these cases and 0.7% of all reported cases of tuberculosis (3). Incidence of TBM in Indian patients with tuberculosis was reported to vary from 7 - 11.8% (4). Risk factors identified for the development of TBM include extremes of age, alcoholism, diabetes, malignancy, recent corticosteroid use and HIV infection (1).

Diagnosis of TBM purely on clinical grounds is usually impossible and all available investigations have got their limitations. Many studies reported in literature stress the importance of early diagnosis and prompt institution of

antitubercular chemotherapy (1,5-10). So, there is an urgent need of a diagnostic test for TBM that is simple, quick, affordable and widely available.

Neuroimaging in the form of CT-scan has got both diagnostic and prognostic significance in case of TBM (11,12). The present study was designed to study CT-scan Changes in brain in TBM and to correlate the CT-scan changes with the stage and outcome of the disease.

Material & Methods

The study was conducted at Government Medical College Jammu and its associated hospital, SMGS Hospital Jammu from October 2005 and lasted till September 2006. All patients with a clinical and laboratory diagnosis of tuberculous meningitis and consenting to participate were eligible for the study. Inclusion criteria were - i) History of symptoms suggestive of TBM, ii) Clinical signs of meningeal irritation, iii) Fundoscopic findings of papilledema, optic atrophy or choroid tubercles,

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iv) CSF analysis showing lymphocytic pleocytosis, low sugar and high proteins or CSF smear positive for AFB, v) Therapeutic response to antitubercular drugs. Exclusion criteria were :- i) History and laboratory findings including CSF analysis suggesting alternative diagnosis ii) Neuro imaging showing ICH, SAH, brain abscess or other diagnosis iii) CT-scan could not be obtained due to various reasons.

A total of 92 patients, 48 children and 44 adults fulfilled these criteria and were included. A detailed history and physical examination were performed. Apart from routine investigations, CSF analysis and CT-scan were also obtained.

All information was recorded in a proforma and patients were graded into three stages according to British Medical Research Council Classification (13):-

Stage I - Patients with early non-specific symptoms, minimal signs of meningeal irritation, no focal signs, fully conscious and in good general condition.

Stage II - Altered consciousness but patient is not comatose or delirious, signs of meningeal irritation, focal neurological deficits, isolated CN palsies and involuntary movements.

Stage III - Patients are comatose, decorticate or decerebrate posturing, seizures, severe neurological deficits, irregular pulse or respiration.

Outcome at the time of discharge (or death) was graded as -

1. Cured i.e recovered without any deficit
2. Recovered with some residual deficit
3. Expired

CT-Scan was obtained with Wipro-GE-CT1, third generation spiral/helical CT-Scan machine. Data were expressed as percent. Chi - square test was used to test the significance of difference or strength of association.

Results

A total of 92 patients, 48 children and 44 adults,

Table 1. MRC Stage at Presentation

Stage	No. of Pediatric patients (%)	No. of Adult Patients (%)	Total (%)
Stage 1	12(25.00%)	12 (27.27%)	24 (26.09%)
Stage 2	19(39.58%)	19 (43.18%)	38 (41.30%)
Stage 3	17 (35.42%)	13(29.55%)	30(32.61%)
Total	48	44	92

comprised the subjects of study. Plain CT-scan was obtained in all cases but contrast enhanced CT (CECT) could be obtained in 34 cases only. Mean age of pediatric patients was 3.7 years and 39.58% of children were below 1 year of age. Mean age of adult patients was 56.1 years and 45.45% of cases were 65 yrs. of age. 47 patients were males and 45 were females. MRC stage at presentation is shown in *Table 1* :-

CT-Scan findings of patients at presentation is shown in *Table 2*. 18 patients had normal scans whereas 74 patients had one or more abnormality in their CT-Scan. When normal and abnormal scans were correlated with stage of disease at admission, following results were obtained (*Table 3*)

Outcome of patients at discharge is shown in *table 4* Similarly correlation of normal and abnormal CT-Scans with outcome is shown in *table 5*

Discussion

In present study TBM affected all ages with predilection for extremes of age. Both sexes were equally affected. At the time of admission, 26.09% of patients were in MRC stage-I whereas 41.30% were in stage II and 32.61% were in stage III of the disease. Stage of disease appears to correlate with duration of symptoms prior to admission. 70.83% of stage I cases had symptoms for <10 days whereas 80% of stage III patients had symptoms for 10 days ($p < 0.001$). CT-scan has high diagnostic sensitivity and prognostic accuracy in TBM. A normal scan in a drowsy patient virtually excludes the diagnosis of TBM. In large series of studies of CT-scan in TBM, hydrocephalus was seen in 59 - 83%, meningeal enhancement in 64% and cerebral infarction in 17-53% of cases where as tuberculomas were seen in 10-28% of cases (11-15). In present study, basal meningeal enhancement was seen in 27 (79.41%) out of 34 cases where CECT was done. Hydrocephalus was seen in 54.35%, infarcts in 14.13% and

Table 2. CT Scan Changes at Presentation

Outcome	No. of Pediatric patients (%)		No. of Adult Patients (%)		Total (%)
Basal meningeal enhancement*	14	73.68%	13	86.67%	27 79.41%
Hydrocephalus	29	60.42%	21	47.73%	50 54.35%
Infarcts	3	6.25%	10	22.73%	13 14.13%
Tuberculomas	5	10.42%	4	9.09%	9 9.78%
Normal	9	18.75%	9	20.45%	18 19.57%

* CECT done in 34 cases (19 pediatric, 15 adult)

Table.3 Normal and abnormal Scans were Correlated with Stage of Disease at Admission

CT- Scan	No. of Patients (%) Stage 1	No. of Patients (%) Stage 2	No. of Patients (%) Stage3
Normal (N=18)	12 (66.67%)	4 (22.22%)	2(11.11%)
Abnormal (n=74)	12 (16.22%)	34(45.95%)	28(37.84%)

(P < 0.001)

Table 4. Outcome of Patients at Discharge

Outcome	No of Patients (%)	No of Patients (%)	Total (%)
Cured	20 (41.67%)	22(50.00%)	42(45.65%)
Recovered with deficit	18(37.50%)	13(29.55%)	31(33.70%)
Expired	10(20.83%)	9(20.45%)	19(20.65%)
Total	48	44	92

Table.5 Outcome in patients with normal versus Abnormal CT Scan

CT Scan	No. of Patients Cured (%)	No. of Patients Recovered With Deficit	No. of Patients expired
Normal (n=18)	13(72.22%)	3(16.67%)	2(11.11%)
Abnormal(n=74)	29(39.19%)	28(37.84%)	17(22.97%)

P<0.05

tuberculomas in 9.78% of cases. These findings are in accordance with large case series reported in literature (11-15). A normal scan was obtained in 19.57% of cases. The probability of having a normal scan decreased with advancing stages of disease i.e 50% in stage I, 10.53% stage II and 6.67% stage III (P<0.001). When CT - scan changes were correlated to the stage of disease, meningeal enhancement showed no definite relationship. On the other hand, proportion of patients having hydrocephalus, tuberculomas or infarcts increased with advancing stage of disease. This is similar to observations made by other study groups (11,14-16). In our study, 16.67% of patients had

hydrocephalous in stage I which increased to 73.33% in stage III. Figures for cerebral infarcts were 4.16% and 23.33% and for tuberculomas these were 8.33% in stage I and 13.33% in stage-III respectively. When correlated to outcome, 72.22% of cases with a normal scan recovered completely, 16.66% recovered with some residual deficit and 11.11% expired in the hospital. Basal meningeal enhancement and tuberculomas showed no definite relationship with the outcome of cases. Presence of hydrocephalus or cerebral infarcts worsened the prognosis. 33.33% of patients who recovered completely had hydrocephalus, 77.42% of cases who recovered with deficit had

hydrocephalus while 63.16% of cases who expired had hydrocephalus in their CT-Scans ($p < 0.05$). The respective figures for infarcts were 2.38%, 25.81% and 21.05% ($P < 0.05$). On the whole, 30.95% of patients who recovered without deficit had normal scans while 69.05% had one or the other abnormality; 9.68% of patients who recovered with deficit had normal scans (i.e. 90.32% had some abnormality in CT-scan) whereas among those who expired 10.53% had normal and 89.47 had abnormal scans. Although all these findings are on expected lines of clinical experience, yet they highlight the importance of getting a CT-scan done in a patient suspected of having TBM.

Conclusion

Basal meningeal enhancement is a sensitive diagnostic finding in TBM but with no prognostic significance. Presence of hydrocephalus or cerebral infarcts worsens the prognosis. Tuberculomas are uncommon in TBM and have little prognostic value. A normal CT-scan most of the times indicates a good prognosis. To conclude, CT-scan is valuable tool in the diagnosis and to assess the prognosis in a case of TBM.

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