

## PROSPECTIVE CLINICAL STUDY OF INTRACRANIAL TUBERCULOMA WITH ITS C.T. AND M.R.I. CORRELATION

### Neurosurgery

**Dr. Sanghmitra Sarkar**

Associate Professor, Department of Neurosurgery, CNMCH Kolkata.

**Dr. Payoz Pandey\***

Senior Resident, Department of Neurosurgery, CNMCH Kolkata. \*Corresponding Author

### ABSTRACT

Brain tuberculomas make up 5 to 8 per cent of intracranial masses in person in developing countries. The diagnosis of tuberculoma is often difficult. Patients present with signs and symptoms of increased intracranial pressure or with focal neurologic deficits over month to years. Tuberculoma have been reported to mimic glioma, CPA lesions, pinealoma and meningioma. CT and MRI are the imaging techniques usually used in the anatomical localization and characterization of such lesions. MRI is considered superior to CT for better localization and characterization of intracranial tuberculoma.

**Aims and Objectives:** To study the epidemiology and clinical presentation of intracranial of tuberculomas in our patient population. To study the role of C.T and M.R.I scans in the diagnosis and follow up of intracranial tuberculoma in our patient population.

**MATERIALS AND METHODS:** Our study is a prospective analysis of patients who had presented to us with symptoms and signs on presentation suspicious of intracranial tuberculomas from March 2018- March 2020(24 months).in the Department of Neurosurgery, Calcutta National Medical College and Hospital (CNMC &H).

**RESULT ANALYSIS:** 74 patients with tuberculoma of brain were treated at the Neuro-Surgery Department of Calcutta National Medical College and Hospital (CNMC &H). Youngest patient was of 1 & ½ yrs of age and an eldest patient was of 85 years of age. Maximum number of patients between the age group of 11 –30 yrs. 44 Male and 30 were Female. Most common symptoms of raised intracranial pressure is Headache. Vomiting present in > 85% of cases. Photophobia & Papilloedema present in 45.9% & 33.7% of cases respectively. Most common symptom is Hemiplegia/Hemiparesis constitute 75.6% of cases. Dysphasia constitutes 35.1% of cases. Cerebellar syndrome seen only in 45.9% of cases. More than 60% of patients have h/o contact with patients with pulmonary Koch's & 47.2% of cases have past h/o tuberculosis. Fever associated in > 75% of cases. Cervical lymphadenopathy found in 6% of cases. FNAC from lesion showed Tuberculosis only in 2 cases. H/o sexual exposure found in 2 cases. Past H/o blood transfusion found in 2 cases. H/o Drug addiction in 1 case & one patient in Medical profession. On CT scan the most common location was Frontal lobe in 25.6% of the patients and least common was CP angle in 1.3% of patients. A total of 25 patients were operated upon during their course of treatment while rest were conservatively managed. 54% of patients showed complete recovery, 13.5% showed persistent residual lesions. 10.8% were unresponsive to treatment. 5 deaths were recorded in our study.

**CONCLUSION:** Although intracranial tuberculoma is uncommon, it must be included in the differential diagnosis of all masses. This is especially important for those patients who are less than 40-years-old and who have either come from an underdeveloped country or been exposed to tuberculosis. CT is the most accurate method of evaluating both the size and number of lesions. Two patterns are seen, namely, a small enhancing ring with a central punctate lucent area ("micro-ring"), and nodular enhancement. Meningeal enhancement may be observed when there is associated meningitis.

### KEYWORDS

#### INTRODUCTION

Brain tuberculomas make up 5 to 8 per cent of intracranial masses in person in developing countries<sup>1</sup>. Before effective chemotherapy was available for tuberculosis, tuberculoma made up 20 per cent of intracranial lesions in one large series<sup>2</sup>. The incidence of neurotuberculosis in the United States is less than 0.5 per cent<sup>3</sup> and this, in turn, is related to socioeconomic conditions of that community<sup>4</sup> & It is found that intracranial tuberculomas account for 20–40% of the intracranial space occupying mass lesions in the developing countries. Although these tuberculous lesions are located in areas where blood flow is greatest, they can occur anywhere in the brain, mainly in the cerebral or cerebellar hemispheres but rarely in the brain stem and basal ganglia<sup>5</sup>. The increasing prevalence of atypical mycobacterial infections in patients with AIDS and other immunocompromised patient, will undoubtedly lead to a higher incidence of symptomatic tuberculosis of the central nervous system, including tuberculous meningitis and tuberculomas.

The diagnosis of tuberculoma is often difficult. Patients present with signs and symptoms of increased intracranial pressure or with focal neurologic deficits over month to years<sup>1,2,5,6</sup>. Moreover, up to 2/3 of patients will not have evidence of systemic tuberculosis and 50 per cent of patients will have normal chest radiographs<sup>1</sup>. Cerebrospinal fluid analysis is often not helpful, with slightly elevated protein levels and normal glucose concentrations<sup>7</sup>.

Tuberculoma have been reported to mimic glioma, CPA lesions, pinealoma and meningioma<sup>8,9,10,11</sup>. Modern imaging is often not helpful in differentiating tuberculoma from glioma/metastatic lesions<sup>3</sup>. Differentiation of tuberculomas from other neoplastic and non-neoplastic lesions is essential as tuberculomas can be managed conservatively with anti-tuberculous drugs and unnecessary surgical

intervention can be avoided. CT and MRI are the imaging techniques usually used in the anatomical localization and characterization of such lesions. MRI is considered superior to CT for better localization and characterization of intracranial tuberculoma<sup>8,12</sup>.

#### Aims and Objectives:

- To study the incidence of intracranial tuberculomas in our patient population.
- To study the age and sex distribution of our patients with intracranial tuberculomas.
- To enumerate the clinical presentations of our patients with intracranial tuberculomas.
- To study the role of C.T and M.R.I scans in the diagnosis and follow up of intracranial tuberculoma in our patient population.
- To evaluate the role of early diagnosis and treatment in our patient population.

#### MATERIALS AND METHODS

Our study is a prospective analysis of patients who had presented to us with symptoms and signs on presentation suspicious of intracranial tuberculomas from March 2018- March 2020(24 months).in the Department of Neurosurgery, Calcutta National Medical College and Hospital (CNMC &H). Ethical Committee clearance was taken and an informed consent was taken from the patients at the time of admission. 74 patients with tuberculoma of brain were treated at the Neuro-Surgery Department of Calcutta National Medical College and Hospital (CNMC &H). Patients of above mentioned source presenting with clinical features suspicious of tuberculoma were thoroughly studied. Diagnostic criteria required for the diagnosis of tuberculomas was: consistent signs and symptoms for 4 weeks and cranial CT scan showing single or multiple post contrast lesions with enhancing ring or uniform density with or without

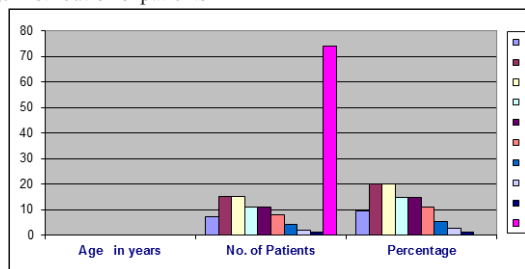
surrounding cerebral oedema and one of the following:

- History of TB in the family
- Chest x-ray (CXR) consistent with tuberculous infection of lungs
- Induration of > 10 mm with Tuberculin skin testing after 48 to 72 hours irrespective of prior Bacillus-Calmette-Guerin (BCG).
- Response to antituberculous therapy OR Mycobacterium tuberculosis (MTB) detected on polymerase chain reaction (PCR) OR Isolation of MTB from CSF or gastric aspirate on acid-fast stain or culture. The aforementioned patients underwent routine blood investigations, mantoux test, sputum for AFB and radiological investigation in the form of chest XRay, CT Brain(plain +contrast), MRI Brain(plain +contrast). Standard diagnostic criterias were used while interpreting CT and MRI brain. Patients in our study group are divided into 3 categories: Patients - managed conservatively.-Patients – need emergency surgery.-Patients - need surgery later. Statistical evaluation was performed. Clinical data for participants was presented as Mean for Continuous Variables and Absolute numbers and Percentages for categorical variables.

## RESULTS AND ANALYSIS

Youngest patient was of 1 & ½ yrs of age and an eldest patient was of 85 years of age. Maximum number of patients between the age group of 11–30 yrs.

Age Distribution of patients



## SEX DISTRIBUTION:

| SEX OF PATIENTS | NO. OF PATIENTS | PERCENTAGE |
|-----------------|-----------------|------------|
| MALE            | 44              | 59.4       |
| FEMALE          | 30              | 40.5       |
| TOTAL           | 74              | 100        |

## CLINICAL FEATURES OF OUR PATIENT

### A. Symptoms and signs of raised intracranial pressure:

| CLINICAL FEATURES               | NO OF PATIENTS | PERCENTAGE |
|---------------------------------|----------------|------------|
| Headache                        | 68             | 91.8%      |
| Nausea                          | 56             | 75.6%      |
| Vomiting                        | 63             | 85.1%      |
| Impaired level of consciousness | 23             | 31%        |
| Slow mentation                  | 12             | 16.2%      |
| Photophobia                     | 34             | 45.9%      |

### ANALYSIS OF CLINICAL FEATURES

- Most common symptoms of raised intracranial pressure is Headache.
- Vomiting present in > 85% of cases.
- Photophobia & Papilloedema present in 45.9% & 33.7% of cases respectively.

### 2. Focal neurological deficits due to compression of neuronal pathways

| CLINICAL FEATURES          | NO OF PATIENTS | PERCENTAGE |
|----------------------------|----------------|------------|
| Hemiplegia/Hemiparesis     | 56             | 75.6%      |
| Dysphasia                  | 26             | 35.1%      |
| Frontal symptoms and signs | 14             | 18.9%      |
| Cerebellar syndrome        | 34             | 45.9%      |

### ANALYSIS OF CLINICAL FEATURES:

- Most common symptom is Hemiplegia/Hemiparesis constitute 75.6% of cases.
- Dysphasia constitutes 35.1% of cases.
- Cerebellar syndrome seen only in 45.9% of cases

## Constitutional Symptoms and Signs

| CLINICAL FEATURES                                         | NO OF PATIENTS | PERCENTAGE |
|-----------------------------------------------------------|----------------|------------|
| Fever/ Evening rise of temperature.                       | 56             | 75.6%      |
| Night Sweats.                                             | 16             | 21.6%      |
| Chest pain                                                | 14             | 18.9%      |
| Persistent cough                                          | 24             | 32.4%      |
| Haemoptysis                                               | 11             | 14.8%      |
| Weight loss                                               | 17             | 22.9%      |
| Lymphadenopathy                                           | 5              | 0.6%       |
| Past H/o Tuberculosis                                     | 35             | 47.2%      |
| H/o Contact                                               | 47             | 63.5%      |
| H/o of any unprotected sexual exposure                    | 02             | 2.7%       |
| Blood transfusion, Drug addiction, Occupation of patients | 05             | 6.7%       |

### ANALYSIS OF CLINICAL FEATURES:

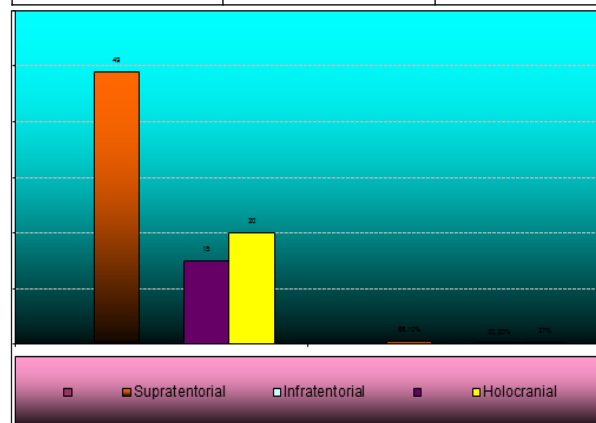
- More than 60% of patients have h/o contact with patients with pulmonary Koch's & 47.2% of cases have past h/o tuberculosis.
- Fever associated in > 75% of cases.
- Cervical lymphadenopathy found in 6% of cases. FNAC from lesion showed Tuberculosis only in 2 cases.
- H/o sexual exposure found in 2 cases.
- Past H/o blood transfusion found in 2 cases.
- H/o Drug addiction in 1 case & one patient in Medical profession.

### ANALYSIS OF GENERAL INVESTIGATIONS:

| INVESTIGATION                   | NO OF PATIENTS | PERCENTAGE |
|---------------------------------|----------------|------------|
| E.S.R > 20 mm                   | 59             | 79.2%      |
| Increased Lymphocyte count      | 44             | 59.4%      |
| Mantoux Test                    | 11             | 14.8%      |
| Chest X-ray – Positive findings | 36             | 48.6%      |
| Sputum for A.F.B                | 12             | 16.2%      |

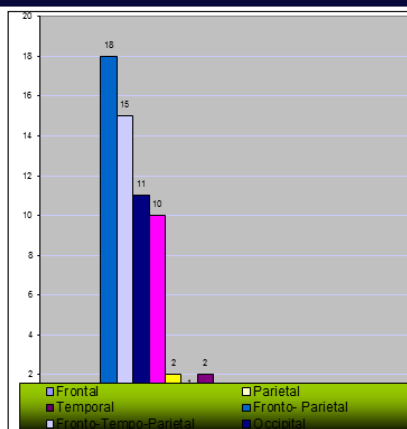
### C.T SCAN FEATURES:

| C.T SCAN REPORT | NO. OF PATIENTS | PERCENTAGE |
|-----------------|-----------------|------------|
| Supratentorial  | 49              | 66.1%      |
| Infratentorial  | 15              | 20.2%      |
| Holocranial     | 20              | 27%        |



### C.T Scan Features

| C.T SCAN REPORT       | NO. OF PATIENTS | PERCENTAGE |
|-----------------------|-----------------|------------|
| Frontal               | 19              | 25.6%      |
| Parietal              | 05              | 6.7%       |
| Temporal              | 06              | 8.1%       |
| Fronto- Parietal      | 18              | 24.3%      |
| Fronto-Tempo-Parietal | 15              | 20.2%      |
| Occipital             | 11              | 14.8%      |
| Cerebellar            | 10              | 13.5%      |
| Brain-stem            | 2               | 2.7%       |
| C-P Angle             | 1               | 1.3%       |
| Vermian               | 2               | 2.7%       |



#### MANAGEMENT PROTOCOL OF OUR PATIENTS:

| MANAGEMENT                                            | NO. OF PATIENTS | PERCENTAGE |
|-------------------------------------------------------|-----------------|------------|
| MANAGED CONSERVATIVELY                                | 54              | 72.9%      |
| EMERGENCY SURGERY FOLLOWED BY CONSERVATIVE MANAGEMENT | 20              | 27%        |
| SURGERY FOLLOWING CONSERVATIVE MANAGEMENT             | 13              | 17.5%      |

#### OPERATIVE PROCEDURE UNDERTAKEN IN OUR CASES:

| OPERATIONS                                                      | NO. OF PATIENTS | PERCENTAGE |
|-----------------------------------------------------------------|-----------------|------------|
| V.P Shunt                                                       | 12              | 16.3%      |
| Suboccipital Craniectomy & drainage of tubercular abscess       | 8               | 10.8%      |
| Fronto/parietal Craniotomy & total/sub-total removal of lesions | 5               | 6.7%       |

#### OUTCOME :

| RESULTS                     | NO. OF PATIENTS | NO. OF PATIENTS |
|-----------------------------|-----------------|-----------------|
| Complete Recovery           | 40              | 54%             |
| Persistent residual lesions | 10              | 13.5%           |
| Unresponsive                | 8               | 10.8%           |
| Absconded                   | 11              | 14.8%           |
| Death                       | 5               | 6.7%            |

#### DISCUSSION

Intracranial tuberculosis is an important CNS infection in developing countries where tuberculosis is endemic<sup>8,13</sup>. In these regions, tuberculosis is the most common infectious cause of CNS space-occupying lesions in persons with and without HIV infection<sup>14</sup>. As observed by others, papilledema and focal neurologic signs were more common in children, and signs of meningeal irritation were more common among adults<sup>15</sup>. Cranial nerve involvements was also seen more frequently in our study cohort than in other literature series, and is likely due to the increased incidence of meningeal involvement<sup>16</sup>. Cerebrospinal fluid evaluations is not always possible in patients with CNS tuberculoma because of the frequent increased intracranial pressure present which is a contraindication for lumbar puncture. Where spinal taps were performed, patients exhibited typical CSF findings of mononuclear pleocytosis, elevated protein, and hypoglycorrhachia, although 35% of subjects had neutrophilic CSF pleocytosis<sup>1,17,18</sup>. As noted in other studies, 25% of patients had evidence of pulmonary tuberculosis, either active or inactive, on chest x-ray<sup>16</sup>. As noted in other studies, 25% of patients had evidence of pulmonary tuberculosis, either active or inactive, on chest x-ray<sup>2</sup>. In literature, 15% to 40% patients are reported to have multiple tuberculomas<sup>3,15</sup>; in our study, 69% cases had multiple CNS lesions. The mean number of lesions (4.5 per patient) in our study appears to differ notably from the number of lesions (2.1) seen in patients with concomitant HIV infection<sup>14</sup>. Locations of lesions were supratentorial (56%), infratentorial (12%), or both (32%); supratentorial lesions and brainstem tuberculoma (198/0) were more common in our series than in previous reports<sup>15,19</sup>. In India and Africa, the incidence of brainstem tuberculoma varies from 2-8%. These differences could be explained

by the increased utility of MRI in the diagnosis of intracranial mass lesions in our study cohort (more than one-third of our patients underwent MRI) compared to studies in the pre- or early-MRI era<sup>13,15</sup>.

Previous studies have suggested that most patients with intracranial tuberculoma can be treated successfully with antituberculous therapy without surgical intervention<sup>3,5,6</sup>. Empiric antituberculous therapy, pending drug susceptibility results, should take into account local resistance patterns and typically includes four-drugs, Isoniazid, Pyrazinamide and Rifampicin plus streptomycin or ethambutol. Such regimens are also effective for patients with concomitant tuberculous meningitis<sup>16</sup>. As for patients with meningeal involvement, the judicious use of corticosteroids is indicated for selected patients with CNS tuberculoma including those with clinical signs or symptoms of mass effect and increased intracranial pressure, and patients with large lesions<sup>11,20</sup>. The prognosis of intracranial tuberculoma cannot be reliably predicted from our study due to the unavailability of long-term follow up in a majority of subjects. Mortality was at least 11% and may have been higher because long-term outcomes were available in only 39 patients. Of these, 17 (41%) patients had complete recovery. The radiographic outcome of patients with intracranial tuberculomas is variable and does not always appear to correlate with length of treatment or clinical recovery. Tuberculomas may resolve, decrease or increase in number and size, or remain unchanged after completion of therapy<sup>21</sup>. Complete clinical recoveries was seen in some patients despite persistence of lesions, while some patients had no recovery despite complete resolution of tuberculomas. Tuberculosis (TB) is a serious health problem in poor countries and a leading cause of death. Approximately eight millions new cases of TB and three millions deaths are reported annually<sup>8</sup>. However, TB of central nervous system (CNS) is the most severe and life-threatening form of disease. Early diagnosis and prompt antituberculous therapy is important for optimal outcome, but diagnosing tuberculosis in patients remains difficult<sup>12</sup>. The incidence of CNS TB is closely related to the prevalence of tuberculous infection in general.

#### CONCLUSION

Although intracranial tuberculoma is uncommon, it must be included in the differential diagnosis of all masses. This is especially important for those patients who are less than 40-years-old and who have either come from an underdeveloped country or been exposed to tuberculosis. CT is the most accurate method of evaluating both the size and number of lesions. Two patterns are seen, namely, a small enhancing ring with a central punctate lucent area ("micro-ring"), and nodular enhancement. Meningeal enhancement may be observed when there is associated meningitis. Radionuclide scanning is not reliable in the evaluation of intracranial tuberculoma. Finally, a normal chest radiograph and a normal spinal fluid profile do not rule out intracranial tuberculoma.

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