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Original Research Article

INFLAMMATORY GRANULOMA OF BRAIN: CT SPECTRUM AND CLINICAL PROFILE

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ABSTRACT

Background: Granuloma of the central nervous system is the most common radiological abnormality seen in patients with acute-onset seizures in India and many other developing countries. Neurocysticercosis (NCC) is the most likely cause of this granuloma. A single degenerating cyst is the most frequent finding associated with NCC in the Indian subcontinent. **Materials and Methods:** This prospective observational study was conducted in Department of Radiology at Shri Ramkrishna Institute of Medical Sciences and Sanaka Hospitals, Durgapur, West Bengal during December 2024 to January 2025. All patients presenting with radiological evidence of single ring enhancing granuloma of brain were included in the study. The study was commenced after obtaining approval from the Institutional Ethical Committee. All patients were followed up during the entire study period. They were asked to report for recurrence of seizures in addition to a monthly follow-up. CT scans with contrast were done at the end of 6 and 12 months for regression, persistence, enlargement, resolution, and calcification. **Result:** A total of 50 patients were included in the study; granuloma is more common in the age group from 10 to 20 years. Second most common age group is from 21 to 30 years. Granuloma is more common in the female is probably due to gender bias in seeking medical attention. In this study, most of the patients presented with focal seizures followed by seizures of generalized from the onset. In this study, perilesional edema was seen in 24 patients. Thick and irregular wall sign of tuberculoma was seen in 21 patients. **Conclusion:** Focal seizures are the most common seizure type followed by generalized seizures. Majority of the granuloma occurred in parietal lobes. Follow-up CT at 6 and 12 months revealed complete resolution of lesions in most of NCC patients and resolving lesions in most of the tuberculoma patients.

INTRODUCTION

Granuloma of the central nervous system is the most common radiological abnormality seen in patients with acute-onset seizures in India and many other developing countries. Neurocysticercosis (NCC) is the most likely cause of this granuloma. A single degenerating cyst.[1] is the most frequent finding associated with NCC in the Indian subcontinent. Single cysticercus granuloma is one which measures<20 mm in diameter, may be associated with cerebral edema not severe enough to produce midline shift, and occur in patients with seizures and normal neurological status, without evidence of active systemic disease. When this granuloma resolves spontaneously, either disappearing or changing into a calcified nodule, the diagnosis of NCC is very likely. The second most common cause of these Computed Tomography (CT) detected granuloma is tuberculoma, in patients with these granuloma similar clinical and neuroimaging features are also present. Granuloma visualized on CT scanning is the most common radiological abnormality in Indian patients with new-onset seizures.[2] In 1980, Tandon and Bhargava.[3] first reported these lesions; at that time these CT-enhancing lesions were presumed to be tuberculoma and often were treated with empirical anti-tuberculous drugs. Subsequently, histopathological studies of brain tissue biopsy samples have suggested that, in majority, CT-enhancing lesions represent dying.[4] cysticercal lesions (larval stage of tapeworm Taenia solium).In a developing country like ours where both tuberculosis and cysticercosis are common, it is difficult to differentiate between tuberculoma and a cysticercal granuloma. Some granuloma "heal" by becoming calcified. These patients require only antiepileptic therapy, and this medication may be withdrawn safely after the lesion has resolved on CT scanning. Anticysticercal drugs given for the enhancing lesions for 14 days with steroids and antituberculous therapy (ATT) is administrated for the tuberculous granulomas. For

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patients presenting with a headache and other symptoms, symptomatic therapy was instituted.

MATERIALS AND METHODS

This prospective observational study was conducted in Department of Radiology at Shri Ramkrishna Institute of Medical Sciences and Sanaka Hospitals, Durgapur, West Bengal during December 2024 to January 2025. All patients presenting with radiological evidence of single ring enhancing granuloma of brain were included in the study. Patients with physiological calcification and calcified granulomas, neonates and infants, patients who are pregnant, patients with claustrophobia, patients with primary malignancy, and patients who are HIV positive. The study was commenced after obtaining approval from the Institutional Ethical Committee. Written informed consent was obtained from those who were willing to participate in the study after explaining to them about the nature of the study, additional sequences of imaging and the need for follow-up in the prescribed format and in the regional language. Left thumb impression was obtained from those patients who are illiterate. A detailed history was obtained from patients presenting with imaging evidence of single ring enhancing granuloma brain. All patients were treated with antiepileptic drugs (AEDs) for the entire study period. A course of steroids of 1 mg/kg was started on patients who had signs of increased intracranial tension or imaging evidence of profound perilesional edema. No serological or cerebrospinal fluid tests for NCC were included in the study. All patients were followed up during the entire study period. They were asked to report for recurrence of seizures in addition to a monthly follow-up. CT scans with contrast were done at the end of 6 and 12 months for regression, persistence, enlargement, resolution, and calcification.

RESULTS

A total of 50 patients were included in the study; granuloma is more common in the age group from 10 to 20 years. Second most common age group is from 21 to 30 years. Granuloma is more common in the female is probably due to gender bias in seeking medical attention. In this study, most of the patients presented with focal seizures followed by seizures of generalized from the onset. Granuloma is predominantly in the parietal region. The second most common region is over the frontal region. Common size of granuloma is between 10 and 20 mm. The second most common <10 mm. [Table 1]
In this study, perilesional edema was seen in 24 patients. Thick and irregular wall sign of tuberculoma was seen in 21 patients. Other CT findings have been summarized in table 2. On follow-up, the disappearance of tuberculosis granuloma was noted after 9 months in 18 patients, 5 patients required 18-24 months course, 3 patients required prolonged treatment course for more than 2 years. After 6 months follow-up CT showed the disappearance of cysticercosis granuloma in 24 patients.

Table 1: Table showing distribution of patients based on their clinical profile and findings

Clinical profile	Number (%)
Age group of the patients	
<10 years	6 (12%)
10-20 years	17 (34%)
21-30 years	11 (22%)
31-40 years	9 (18%)
>40 years	7 (14%)
Gender	
Male	17 (34%)
Female	33 (66%)
Seizure semiology at presentation	
Focal seizure	31 (62%)
Complex partial seizure	1 (2%)
Generalized from onset	18 (36%)
Location of the granuloma	
Frontal	12 (24%)
Parietal	28 (56%)
Temporal	5 (10%)
Occipital	3 (6%)
Cerebellum	1 (2%)
Brain Stem	1 (2%)
Size of the granuloma	
<10 mm	18 (36%)
10-20 mm	21 (42%)
>20 mm	11 (22%)

Table 2: Table showing CT findings of the study population

CT Brain findings	Number (%)
Perilesional edema	24 (48%)
Thick and irregular wall sign of tuberculoma	21 (42%)
Thin and regular wall signs of cysticercosis	26 (52%)
Conglomerate lesion indicating tuberculoma	11 (22%)

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Calcified lesion with edema	9 (18%)
Scolex in the lesion indicating cysticercosis granulaoma	8 (16%)

DISCUSSION

A total of 50 patients with single ring enhancing lesions were taken up for study. Single enhancing lesions according to Rajshekhar and Chandy predominately affects males the age group of 20-30 years.[5] In our study, it is 11-30 yearsand predominately female population. The greater incidence in our region is due to gender bias in seeking medical attention. Focal seizure is most common seizure type in our study which is in accordance with Chopra et al. study.[6] In our study granuloma predominately affects the parietal regions and frontal regions. Brain stem and cerebellum involvement were observed in 1 patient each. 26 patients with single ring enhancing granulomas were due to NCC and 21 were due to tuberculoma. Patients are having lesion more than 20 mm in size are taken as definite tuberculomas,<10 mm in size are as NCC and size between 10 and 20 mm with irregular wall and severe perilesional edema are taken us tuberculomas. Conglomerate lesions are common in tuberculoma patients. Single granuloma measuring <20 mm in diameter, regular outline, may be associated with perilesional edema not severe enough to produce midline shift, is taken as cysticercal granuloma. Tuberculoma by contrast is usually irregularly shaped solid and more than 20 mm in size. They are often associated with severe perilesional edema, midline shift, and focal neurological deficit. Fluid attenuated inversion recovery suppression of signal core in ring enhancing lesion rules out tuberculoma and seen in NCC.

There is a wide variation in the rates of complete resolution mentioned by different authors.[7,8] ranging from 22% to 100% at 6 months/12 months after the first CT scan. In this study, the follow-up contrast CT revealed a complete resolution among 48% of NCC patients in 1 year. Patients treated with ATT for tuberculoma in the partial resolution were present in 18 patients (36%) and complete resolution in 21 (42%) patients at 1 year. For patients without resolution at 1 year duration of ATT was extended for 15-18 months. An extended period of ATT was given more than 2 years for 3 patients. AEDs were given for 2-3 years for tuberculoma. AEDs are given for patients with cysticercus granuloma till the disappearance of lesions.[9] Injection dexamethasone 8mg twice daily given during the acute symptoms and a tapering dose of prednisolone 1 mg/kg for 8 weeks for tuberculoma and 2 weeks for cysticercosis. Symptomatictreatment was given for a headache and other non-specific complaints.[10]

CONCLUSION

Focal seizures are the most common seizure type followed by generalized seizures. Majority of the granuloma occurred in parietal lobes. Follow-up CT at 6 and 12 months revealed complete resolution of lesions in most of NCC patients and resolving lesions in most of the tuberculoma patients. Patients treated with injection streptomycin are associated with greater resolution of lesions. An extended period of ATT more than 2 years may be required for resistance tuberculoma. AEDs are required till complete resolution of lesions in NCC and for 2-3 years in tuberculous granulomas.

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