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Research Article

Radiological profile of neurocysticercosis in children in North India

Amitesh Yadav, Rajesh K. Yadav*, D. K. Singh, Anu Sharma, K. Bharat, K. M. Shukla

Department of Pediatrics, U.P. Rural Institute of Medical Sciences & Research, Saifai, Etawah, U.P., India

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***Correspondence:**
Dr. Rajesh K. Yadav,
E-mail: rajeshsaifai@gmail.com

ABSTRACT

Background: Neurocysticercosis (NCC) is defined as an infection of the brain and its coverings by tapeworm (*Taenia solium*). NCC is a leading cause of acquired epilepsy worldwide. There are few studies in children with neurocysticercosis.
Methods: 61 patients were selected for study (July 2012 to December 2013.) who met the definitive or probable diagnosis of neurocysticercosis as per the criteria for neurocysticercosis. Contrast enhanced CT scan (CECT) of the head was done in all 61 children.
Results: All 61 patients present with seizures. Focal seizures present in 34 (55.7%) children, were more common than generalized seizures. CECT brain single lesion was present in 57 (93.4%) patients. Most common site was parietal lobe in 38 (55.7%). In this study in CECT brain Colloidal stage, observed among 40 (65.5%) was the most common stage of NCC. Among cases, 30 (49.2%) of the patients, the size of lesion in CECT brain was 5-10 mm, in 20 (32.8%) it was <5 mm. However, the Size of lesion in CECT Brain was >10 mm in only 11 (18%).There was no statistical difference between the groups in Size of lesion in CECT Brain.
Conclusions: Majority of patients with NCC presented with clusters of symptoms comprising of seizure, headache and vomiting. Focal seizures were more common type of seizures .CECT brain evolved as the most useful modality of screening of patients with NCC. Most of the patients had solitary lesion on CECT brain. Colloidal stage was the most common stage on CECT Brain. Most of lesion involved parietal lobe.

Keywords: CECT, Colloidal stage, Electroencephalography, Neurocysticercosis

INTRODUCTION

Neurocysticercosis is the most common parasitic disease of the human nervous system. Its prevalence varies greatly according to the geographical region and is not yet precisely known.[1] Neurocysticercosis caused by Taenia solium, is a leading cause of Acquired epilepsy worldwide.[2] Neurocysticercosis predominantly affects adults in their third or fourth decade of life; it is uncommon in children and elderly people.[3] Reports of cysticercosis are very unlikely in children younger than 2 years because the incubation period of T. *solium* is long. The disease is recognized mainly in children older than 7 years, owing to this incubation period.

Clinical presentation of NCC varies from an asymptomatic infection to sudden death. Differences in the clinical picture depend on the number, size, stage and localization of cysts and the patient's immune response. Seizures are the commonest Presentation of NCC (50-80%).[4] Various types of seizures have been described among patients with NCC including generalized, focal and rarely myoclonus and acquired epileptic aphasia. In general, it seems that about half the cases have partial seizures and the other half generalized seizures, a proportion similar to that of the general population.[5]

Neuroimaging is the mainstay of diagnosis of NCC. A set of objective diagnostic criteria has been proposed which

is revised diagnostic criteria for neurocysticercosis.[6] Radiologically, [on contrast - enhanced computed tomography (CECT)], the lesion is typically single, small (<20 mm), well - defined, contrast enhancing (ring / disk) (hence, single, small , enhancing computed tomography lesions or SSECTLs), with or without surrounding edema and associated with minimal mass effect and no midline shift. Usually, there is no evidence of persistent focal neurological deficit and raised intracranial pressure.[7] As Clinical presentation and Radiological finding of NCC is variable in children. So our present study attempts to study the type of seizure and its relation to CECT finding in children with neurocysticercosis from in Department of Paediatrics, U.P. Rural Institute of Medical Sciences and Research, Saifai, Etawah, UP, India.

METHODS

The present study is an observational study carried out in the Department of Paediatrics, U.P. Rural Institute of Medical Sciences and Research, Saifai, Etawah, U.P., India during July 2012 to December 2013. Any child aged more than 1 year and less than 14 years with convulsion and without meningeal signs was taken in to study. The study was approved by research and ethical committee of our institute.

Inclusion criteria

Child of age between 1 year to 14 years, coming under definitive or probable diagnosis of neurocysticercosis as per the revised diagnostic criteria for neurocysticercosis.[6] Thus, the diagnosis will be based on clinical and CECT scan, MRI not done due to non-affordability of the patients.

Revised diagnostic criteria for neurocysticercosis[6]

1. *Absolute*

- Histological confirmation of parasite from biopsy of brain or spinal cord lesion
- Scolex on CT or MRI
- Subretinal parasites on fundoscopic examination

2. *Major*

- Lesions highly suggestive of NCC on CT or MRI (cyst without scolex, enhancing or calcified lesion)
- Positive serum immunoelectrotransfer blot (EITB) detection of anticysticercal antibodies.
- Resolution of intracranial cystic lesions after therapy with albendazole or praziquantel
- Spontaneous resolution of small single enhancing

3. *Minor*

- Lesions compatible with NCC on neuroimaging
- Clinical manifestations suggestive of NCC
- Positive CSF ELISA for Cysticercosis
- Cysticercosis outside the CNS

4. *Epidemiological*

- Contact with *Taenia solium* infection
- Living area where cysticercosis is endemic
- History of travels to disease endemic areas

5. *Definitive diagnosis*

- One absolute criterion
- Two major plus one minor plus one epidemiologic criterion

6. *Probable diagnosis*

- One major plus two minor criteria
- One major plus one minor plus one epidemiologic criterion
- Three minor plus one epidemiologic criteria

Exclusion criteria

Subjects with Mantoux positivity and evidence of tuberculosis, HIV-reactive patients, cases with known malignancy, patients in moribund condition and whose guardian will not give consent were excluded from study.

A detailed medical history with emphasis on the description of the seizure, (seizure, type of seizure, headache, vomiting, loss of consciousness, loss of vision, behavioural change, fever, subcutaneous nodule, rashes, worm in stool, pain in abdomen, memory loss), anthropometric measurements, General examination, head to toe examination and systemic examination, including neurological examination was performed.

Diagnostic evaluation

It includes haemoglobin, peripheral blood smear, total and differential leukocyte counts, microscopic examination of stool done for taeniasis, work-up for tuberculosis (erythrocyte sedimentation rate, Mantoux test, chest radiograph), ELISA for HIV, EEG, contrast-enhanced CT scan of brain, Number, site, stage, size of the lesions, presence of scolex, and perilesional edema were noted.

Stool- for evidence of *Taenia solium* infestation Three consecutive daily stool samples were examined for the presence of proglottids and scolex of *Taenia solium*.

CECT head

Contrast enhanced CT scan of the head was performed on a 64 slice SOMATOM sensation SIEMENS CT scanner (Siemens). At the time of the initial CT scan emphasis was laid on the following characteristics of the lesions: (a) no. of lesion (b) side (c) site (d) stage (e) size (f) Scolex (g) perilesional oedema.

The data was recorded on pre structured proforma, value ere expressed in mean and percentage. P-value <0.05 was considered significant. All the analysis was carried out by using SPSS 16.0 version (Chicago, Inc., USA).

RESULTS

In this study total 61 children were diagnosed as neurocysticercosis as per diagnostic criteria. All 61 children were clinically present with seizures. 34 (55.7%) have focal seizures while 27 (44.3%) present with generalized seizures.

Demographic and clinical features

Most common age group was between 6-10 years (54.1%) mean age was 8.7±2.8. Male (60.7%) were affected more than the female (39.3%). Hindu (86.9%) was affected more than Muslims. Most common presentation was seizure associated with headache and vomiting (41%), isolated seizure was present only in 09 children (14.8%), summarized in Table 1.

Table 1: Demographic and clinical features of study patients.

Features	Numbers (%)
Age in years	
1-5	09 (14.8%)
6-10	33 (54.1%)
11-15	19 (31.1%)
Sex	
Male	37 (60.7%)
Female	24 (39.3%)
Religion	
Hindu	53 (86.9%)
Muslim	08 (13.1%)
Clinical presentation	
Only seizures	09 (14.8%)
Seizures and headache	12 (19.7%)
Seizure and vomiting	08(13.1%)
Seizures , headache and vomiting	25 (41%)
Seizures + Vomiting +Headache +Others	07 (11.5%)
Pattern of seizure	
Recurrent	39 (63.9%)
Single	22 (36.1%)
Type of seizure	
Focal	34 (55.7%)
Generalised	27 (44.3%)

CECT finding at enrolment

In our study most of the lesions were solitary, there were five subjects with multiple (more than 1 lesion) and five had calcified lesion. Colloidal stage was observed among 65.5%, nodular stage was seen in 13.1% patients. Vesicular stage was found in 13.1% of the, hence, colloidal stage came out to be the most common presentation on CECT (brain). The mean size (Mean±SD) of lesion in our study was 6.81±3.55 mm. 32.8% children had lesion size <5 mm on CECT and the size between 5-10 mm was observed in 49.2% while 18% have size >10 mm, summarized in Table 2.

Table 2: CECT finding at enrolment.

Features	Numbers (%)
Side	
Left	28(45.9%)
Right	33 (54.1%)
Numbers	
Single	57 (93.4%)
Multiple	04 (6.6%)
Site	
Frontal	11 (18%)
Occipital	12 (19.7%)
Parietal	38 (55.7%)
Stage	
Vesicular	08 (13.1%)
Colloidal	40 (65.5%)
Nodular	08 (13.1%)
Calcified	05 (8.2%)
Size	
<5mm	20 (32.8%)
5-10mm	30 (49.2%)
>10mm	11 (18.0%)

DISCUSSION

In our study most common age group was between 6-10 years (54.1%) mean age was 8.7±2.8 years. Male (60.7%) were affected more than the female (39.3%). NCC was more common in Hindu (86.9%). All children present with seizure, most common presentation was seizure associated with headache and vomiting (41%), isolated seizure was present only in 09 children.

CECT was useful modality; it can help in recognizing the ring enhancing lesion as well as identifying the stage of lesion in NCC. In our study most of the lesions were solitary, there were five subjects with multiple (more than 1 lesion) and fiver had calcified lesion. In our study, colloidal stage was observed among 65.5%, nodular stage was seen in 13.1% patients. Vesicular stage was found in 13.1 % of the, hence, colloidal stage came out to be the most common presentation on CECT (brain).similar results were obtained by Pati TB et al.[8] The difference in

staging in some studies can be subjected the different staging used in their studies and to the radiologist reporting done in the institute.[9]

The mean size (Mean±SD) of lesion in our study was 6.81±3.55 mm. 32.8% children had lesion size <5 mm on CECT and the size between 5-10 mm was observed in 49.2% while 18% have size >10 mm. There was no statistical difference (p>0.05) in terms of size but clinically majority of the study group had smaller size <10 mm. Similar results have been reported in studies of Chaurasia et al.[9]

CONCLUSION

There are very less number of studies in neurocysticercosis in children which studied clinical presentation and CT scan finding. In this study Majority of patients with NCC presented with clusters of symptoms comprising of seizure, headache and vomiting. Focal seizures were more common type of seizures than generalised. CECT brain evolved as the most useful modality of screening of patients with NCC in recognizing the ring enhancing lesion and identifying the stage. On CECT brain solitary lesions were more common than multiple lesions. Among the four stages of NCC Colloidal stage was the most common in children on CECT Brain. Most of lesion involved parietal lobe with frontal and occipital showing equal presentation.

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