NEUROCYSTICERCOSIS IN CHILDREN

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ABSTRACT

Twenty seven cases (13 male, 14 female) in the age group of 3-12 years with cerebral cysticercosis were studied and followed upto 3.9 years (mean 1.85±0.91 years). Seizures (partial 76% and generalized 23.8%) was the feature in 21 patients (77.7%) and raised intracranial tension in 15 (55.5%). Five patients (18.2%) had meningoencephalitis, while 4 (14.8%) had obstructive hydrocephalus due to intraventricular cysts in the 4th ventricle. Twenty two patients received cysticidal drugs (praziquantel or albendazole), while 8 had surgical intervention (CSF diversion, cyst removal, subtemporal decompression or extirpation of the cortical cyst). Mortality was 18.2%. Survivors had epilepsy in 18 patients (81.8%), dementia in 2 (9%), mental subnormality in 6 (27.2%) and hyperkinesia in 12 (54.5%).

Key words: *Cysticercosis cerebri, Praziquantel, Albendazole, Intraventricular cyst.*

Cerebral cysticercosis is being diagnosed with increasing frequency after the advent of computerised tomography (CT). Most of the available literature on the disease concern adult patients and only a few series exist(1-6) that focus specifically on this entity in children. Some authors(1,5,6) believe childhood cysticercosis is benign and does not need any specific treatment. On the contrary, others do not share this view because of its associated high morbidity and/or mortality in their respective series(2-4). However, they have not used the cysticidal drugs. Both praziquantel and albendazole have been reported to the quite promising in the treatment of cysticercosis(7-13). This study highlights the clinical profile of childhood cerebral cysticercosis and the role of cysticidal drugs in the outcome.

Material and Methods

All twenty seven children (13 male and 14 female) admitted in G.B. Pant Hospital from September, 1984 to August, 1987 in the age range of 3 years to 12 years (mean 8.6±2.72 years) with neurocysticercosis were included in this study. The diagnosis of cysticercosis was made on CT scan appearances and positive CSF ELISA for

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cysticercosis, complimented in some with MRI and/or histopathological examination of the cyst. All had roentgenograms of chest, skull and thighs, hemogram, cerebrospinal fluid examination and EEG. Twenty four cases received specific cysticidal drug (praziquantel 50 mg/kg body weight per day for 15 days or albendazole 16 mg/kg body weight for 30 days), alongwith steroids and symptomatic treatment for seizures and raised ICP (if present), while four patients had only CSF shunting procedure done. All were followed up for 6 months to 3.9 years (mean 1.85±0.91 years).

Results

The duration of symptoms ranged from 3 days to 8 months (average 4.8 months). Fifteen patients (55.5%) had features of raised ICP in the form of headache and/or vomiting, blurring of vision, while twenty one (77.7%) had seizures (*Table I*). Seventeen of these (80.9%) had one type of seizure, while four (19%) had more than one pattern (*Table II*). Thirteen (48.1%) had papilledema, 4 of these had secondary optic atrophy. Seven (25.9%) had pyramidal signs; 2 unilateral, while 5 had bilateral.

On CT scan (*Table III*), twenty three patients (85.1%) had parenchymatous lesions, while four (14.8%) had features of obstructive hydrocephalus. The cyst in these cases was not seen on intravenous contrast CT. One had communicative hydrocephalus. Twenty two patients (81.4%) had positive CSF ELISA for cysticercosis, a

TABLE I—*Clinical Features of Neurocysticercosis*

Feature	Number	Percentage
Seizures	21	77.7
Features of raised intracranial tension	15	55.5
Papilledema	13	48.1
Fever	09	33.3
Pyramidal signs	07	25.9
Signs of meningeal irritation	04	14.8
Subcutaneous nodules	03	11.1
IVth and VIth cranial nerve palsy	03	11.1

TABLE II—*Seizure Pattern*

Seizure	Single Type		More than one type	
	Number	Percentage	Number	Percentage
Partial	12	57.0	4	19.0
Simple	4	19.0	4	19.0
Complex	2	9.5	3	14.2
Simple–Complex	1	4.7	2	9.5
Simple–Gen. Tonic-clonic	5	23.8	1	4.7
Generalized	5	23.8	–	–
Tonic-clonic	3	14.2	–	–
Myoclonic	1	4.7	–	–
Akinetic	1	4.7	–	–
Total	17	80.9	4	19.1

TABLE III—*CT Features in Neurocysticercosis*

Feature	Number	Percentage
Multiple low density lesions with or without enhancement	18	66.6
Diffuse bilateral low density pattern	9	33.3
Chinked ventricles	9	33.3
Calcified lesion	6	22.2
Scolex	5	18.5
Meningeal enhancement	5	18.5
Obstructive hydrocephalus	4	14.8
Upto 3 lesions	3	11.1
Solitary lesion	2	7.4
Communicative hydrocephalus	1	3.7

feature of active cysticercosis(14). Pleocytosis (mononuclear cell) with normal sugar and mild elevation of protein in the CSF, was a feature of four cases. Eighteen patients (66.6%) had EEG abnormalities of sharp waves and/or slowing, eight focal, four generalized, while 6 had multifocal or focal dysarrhythmia with generalization. Two patients had eosinophilia, while seven had elevated ESR.

Outcome: With these presentations, the patients could be categorized into four groups: Epilepsy (44.4%), Epilepsy with raised ICP (22.2%), Meningoencephalitis (18.2%) and Obstructive hydrocephalus (14.8%). These groups had a correlation with the outcome (*Tables IV & V*).

(A) *Patients with Epilepsy*

Twelve patients received cysticidal drugs(7) praziquantel, 4 albendazole, 1 praziquantel and albendazole, alternate course). The drug course was uneventful in five except migraine like headache in one case which responded to analgesics. The rest of seven patients had seizures during 6-10 days of starting the drug. Five had headache, nausea or vomiting during the first week of treatment. Two developed papilledema and also had nuchal stiffness. Three patients received intravenous mannitol in addition to steroids.

In the follow up two patients developed mental subnormality while 6 had hyperkinesia. The seizures were persistent in all except the one who had myoclonic seizures. She was the only one not on antiepileptic drugs. Seizure control was good except in two, who had seizures at variable intervals while still on polytherapy. Follow up CT scans (*Fig. 1*) showed reduction calcification or disappearance of the lesions, while one patient also developed mild ventricular dilatation.

(B) *With Epilepsy and Raised ICP*

Six cases received cysticidal drugs (3 praziquantel, 2 albendazole, 1 praziquantel/

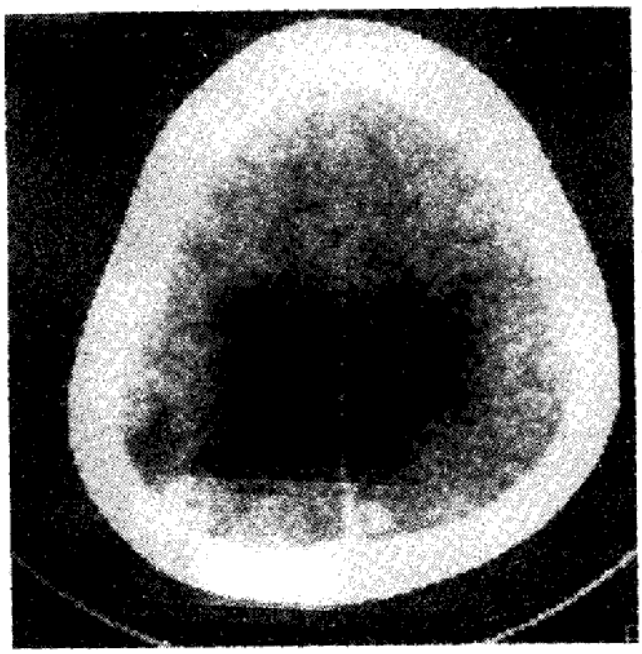


Fig. 1. Cysticercosis with epilepsy (a) CT showing multiple enhancing lesions on either hemisphere, note edema surrounding right parietal lesions.

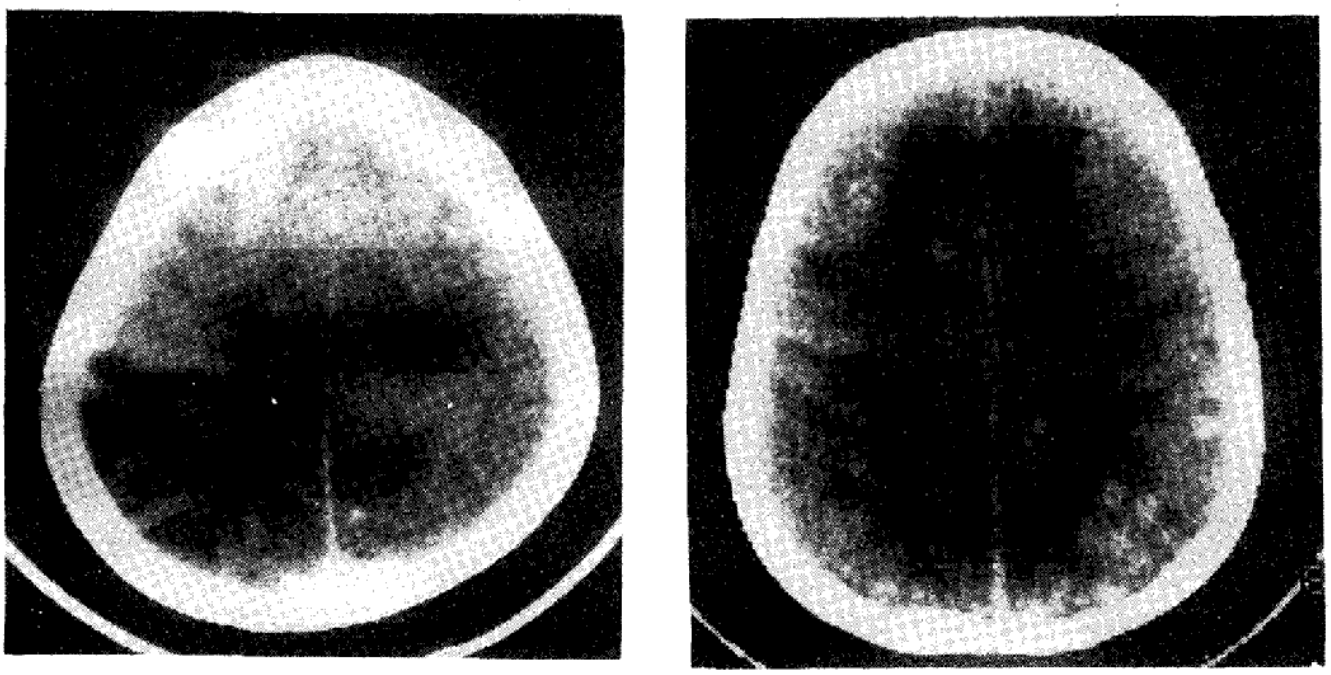
TABLE IV—*Outcome with Medical Treatment*

Clinical syndrome	Number	Drug used	Follow up
Epilepsy	12 (44.4%)	Praziquantel –7 Albendazole –4 Praziquantel/ Albendazole –1 (alternate course)	Seizure persistent in 11 (except one with myoclonic seizures) On monotherapy-9, Polytherapy-2 Mental subnormality-2 Hyperkinesia-6
Epilepsy + Raised ICP	6 (22.2%)	Praziquantel –3 Albendazole –2 Praziquantel/ Albendazole –1 (alternate course)	Death-2 Dementia-1, Mental subnormality-3, Hyperkinesia-4 Seizures persistent in 4, on monotherapy-1, polytherapy-3
Meningo-encephalitis	5 (18.2%)	Praziquantel –1 Albendazole –2	Death-3 Dementia-1, Mental subnormality-1, both had hyperkinesia, seizures persistent in 2, on polytherapy

TABLE V—*Outcome with Surgical Intervention*

Procedure	Number	Follow up
CSF diversion	2	Death-1 Dementia-1 Seizure persistent (on polytherapy) & hyperkinetic
CSF diversion with suboccipital craniotomy and cyst removal	4	Asymptomatic-3 One developed seizure after 3 months CT showed parenchymatous lesions Treated with praziquantel, seizures controlled with monotherapy
Subtemporal decompression craniotomy with excision of cyst	2 1	Death-2 Seizure controlled (on monotherapy)

and albendazole, alternate course) alongwith antiedema measures and anticonvulsants. One had CSF shunting prior to starting cysticidal drugs due to associated communicative hydrocephalus. This patient alongwith another, who needed subtemporal decompression, while on cysticidal drugs died due to unmanageable cerebral edema. Five had deterioration in mentation and in their clinical state during first four days of cysticidal drug treatment. They also had seizures during <7-12 days, three had recurrent seizures and were managed with anticonvulsant drugs. In the follow up, one developed dementia, three mental subnormality and four hyperkinesia. One had



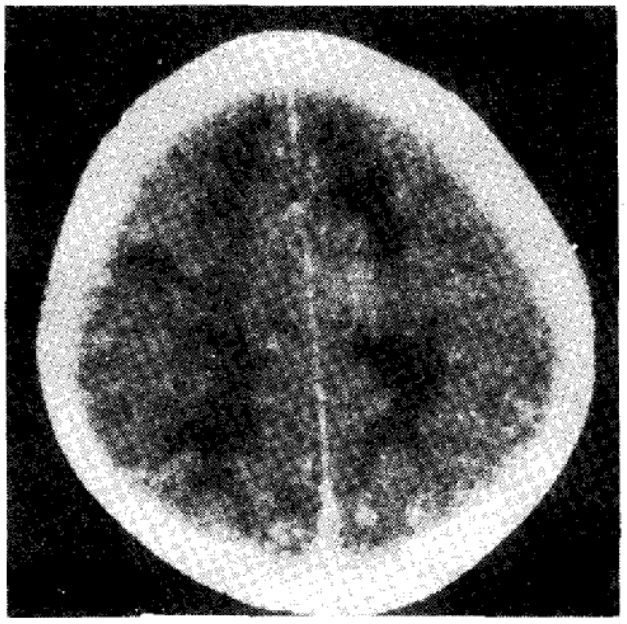
(b) After completion of albendazole therapy, note the edema in right parietal region has increased. Subsequent scan after 3 months was normal.

Fig. 2. Cysticercosis with raised ICP and epilepsy (a) Contrast CT showing multiple round lesions, some are with surrounding edema.

transitory hemiparesis. All the four had seizures, one had status and three were on polytherapy. Only one patient had seizure control with monotherapy. The follow up CT scan (*Fig. 2*) showed improvement, *i.e.*, reduction, disappearance of calcification of the lesions, while two had in addition cortical atrophy and mild dilatation of the ventricles.

(C) *With meningo-encephalitis*

Two of the five cases of meningo-encephalitis did not receive cysticidal drugs and both of them died due to unresponsive cerebral edema within 5 days and 17 days of hospitalization, respectively. Another three patients received cysticidal drugs (1 praziquantel, 2 albendazole) in addition to antiedema measures, supportive care and anticonvulsants. There was deterioration in



(b) Two months after praziquantel therapy, note reduction in the number of lesions. Subsequent scan was normal.

their clinical state during the first two weeks of treatment due to exaggeration of the features of raised ICP. Two had seizures and one needed subtemporal decompression. Seizures were managed with anticonvulsants. One of these three died while one developed dementia, and other had mental subnormality. Both of them had hyperkinesia. The one with dementia had features of communicative hydrocephalus (*Fig. 3*) and had CSF shunting done. Both of the survivors had seizures in their follow up and even status. They were on polytherapy. Follow up CT scans showed cortical atrophy and multiple calcified lesions.

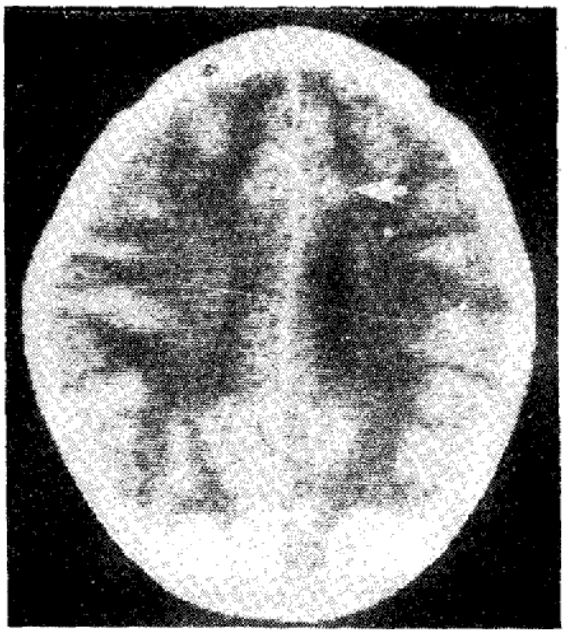
(D) *With Obstructive Hydrocephalus*

All the four cases had CSF shunting procedure and later on removal of the isolated 4th centricular cyst. In the follow up three of them were asymptomatic, while one had seizures after 3 months of removal of the 4th ventricular cyst. Repeat CT showed parenchymatous lesions of low density. She was treated with praziquantel. She had to untoward symptom except mild headache responsive to analgesics. Her seizures were controlled while on antiepileptic medication (monotherapy).

Discussion

In this study, epilepsy was the most common clinical manifestation (78%) with partial seizures in 76% and generalized in 24%, followed by raised intracranial pressure (56%). Epilepsy had been reported in 43% to 98% among children with cerebral cysticercosis(1,2,4,6) with predominent generalized seizures in 78.3%(2) or partial and/with generalized seizures in all(6).

Raised intracranial tension reported in 0-55%(1-6) of children with cerebral



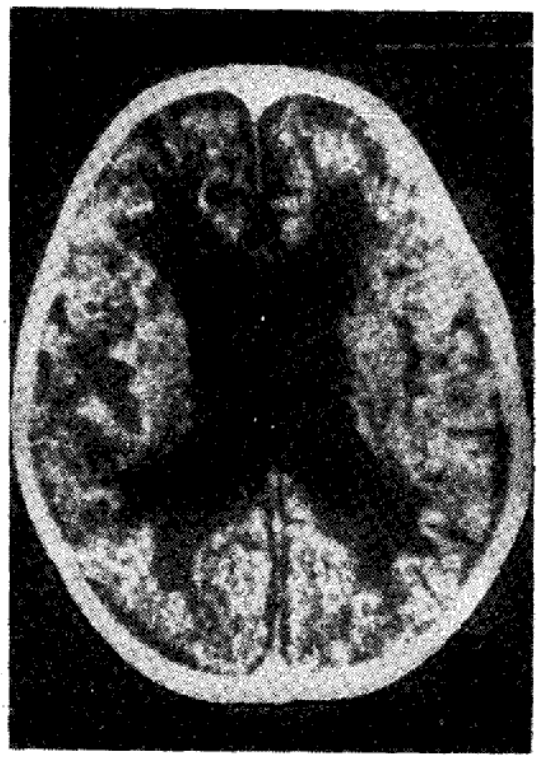


Fig. 3. Cysticercosis with meningoencephalitis (a) Contrast scan showing diffuse bilateral symmetrical edema in white matter, note marginal enhancing round lesions (arrow). (b) One month after albendazole therapy, note dilatation of lateral ventricles.

cysticercosis has been attributed to cerebral edema(1,2,4,15,16) contrary to accompanying hydrocephalus in adults(17,18). Four patients (14.8%) had CT appearances of obstructive hydrocephalus. Obstructive hydrocephalus in cysticercosis may result from mechanical obstruction to CSF flow by the cyst or secondary to granular ependymitis, while communicative hydrocephalus as a result of basal arachnoiditis or racemose type. Intraventricular cyst occur in 11-20%(19-23) of intracranial cysticercosis, while 7% have solitary cysts, being more frequent in 4th ventricle. The predilection for 4th ventricle is perhaps attributable to migration effect of the cyst(24). All the four patients had 4th ventricular, solitary non-enhancing (on intravenous contrast) cyst. Contrast enhancement of the ventricular cyst is a feature of associated ependymitis(23). Presence of ependymitis implies impending difficulty in complete surgical removal of the cyst. CSF shunting is an indication in intraventricular cyst(26). However, cyst removal should be sought if there is no evidence of ependymitis or arachnoiditis or it has tumour like behavior(25). Surgical exploration is also indicated when diagnosis is uncertain. Cyst rupture during surgery has been considered a dangerous event by some(29) and not so by other(26,30). CSF shunt relieves hydrocephalus in 50-90% of cases (18,27,28) with a necessity for repeat shunting in 25-68%(18-25) and mortality of 0-24%(25,28). Zee *et al.*(23) observed the patients who had no ependymitis did not require subsequent shunts. Cyst was successfully removed on surgery, after initial CSF shunting procedure in all the four cases and none required repeat shunting.

Eleven children had raised intracranial pressure without hydrocephalus, signifying predominance of cerebral edema over hydrocephalus as a cause of raised intracranial tension. Its common occurrence among children(20) could be due to intense humoral response to more dose of antigenic stimulus from degenerating cyst or to altered response(15,31).

The mortality and morbidity (mainly epilepsy, mental subnormality, hyperkinesia, dementia) in this series is high as compared to other(1-6). The overall mortality is 5/27 (18.5%); 3/5 of patients with meningoencephalitis and 2/6 with raised ICP and epilepsy. Three of them (1 with meningoencephalitis and two with raised ICP and epilepsy) had received cysticidal drugs alongwith measures to control cerebral edema. Lopez-Hernandez and Garaizr(2) reported mortality upto 17.2% of symptomatic group, while Thomsom *et al.*(4) had 3.2%. In both these series, cysticidal drugs were not used. Rodriguez-Carbajal *et al.*(16) observed mortality upto 10% in acute encephalitic phase of cysticercosis despite appropriate measures in treatment. Our findings support this view. The use of cysticidal drugs perhaps did not influence the outcome. Although radiological improvement (reduction, disappearance or calcification of the lesions) did occur, however, all the survivors who had initial seizures except the one with myoclonic seizures, continued to remain epileptic and required anti-epileptic drugs. This observation is contrary to almost cure (53%) or improvement (80-91%) reported by various authors(10,11). Among the survivors 18 (81.8%) had epilepsy, 2 (9%) dementia, 6 (27.2%) mental subnormality and 12 (54.5%) hyperkinesia. It is difficult to isolate the contribution of the disease, recurrent seizures, antiepileptic drugs, cysticidal drugs or even social factors in their development.

Thus this study, although with limita-

tion of small sample concludes, cysticercosis in children is not a benign entity. A larger epidemiological study is being planned to precisely bring out this point.

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NOTES AND NEWS

PROPOSAL FOR CHAPTER IN EMERGENCY AND CRITICAL CARE

During the IAP National Conference at Hyderabad, it was proposed that a Chapter on Emergency and Critical Care should be formed within the Academy. To consolidate the idea and plan the activities of the proposed Chapter, it is decided that a meeting of interested members shall be held at Nagpur Conference of IAP on 9th January, 1992, immediately preceding the PALS course. All the members who are interested in the subspeciality of Emergency and Critical Care are requested to join the meeting.

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