MAGNETIC RESONANCE IMAGING IN CHILDHOOD EPILEPSY

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ABSTRACT

One hundred and seventy children of chronic seizures with strong clinical suspicion of an underlying intracranial lesion as its cause were studied by Magnetic Resonance Imaging (MRI). Maximum number of patients were between 6-12 years, males outnumbering females. Structural abnormalities were seen in 158 of the 170 patients. The study revealed tuberculoma as the commonest lesion in this series (n=64) followed by cysticercosis (n=27). Three patients were seen to have glioma. An interesting finding was disappearing lesion in 6 children. MRI proved to be an excellent modality in demonstrating and characterising the intracranial lesion.

Key words: *Cysticercosis, Magnetic resonance imaging, Seizures.*

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Seizures is one of the common clinical problem encountered in pediatric neurology practice. In India the prevalence rate of epilepsy has been estimated to be 9/1000 of general population. Joshi *et al.*(1) had 19% patients of epilepsy in their neurological clinics. In adults, the onset of seizures suggests neoplasia or a vascular lesion, these are uncommon in the pediatric age group. In our country due to prevalence of tuberculosis, granulomatous lesion is a common cause of seizures. Prior to advent of newer imaging modalities, EEG was the only investigation available for evaluation of these patients as arteriography and pneumoencephalography were not only invasive but also had low yield in demonstrating therapeutically significant lesions. In this report we document our experience with the latest non invasive modality, magnetic resonance imaging (MRI), in childhood seizures.

Material and Methods

Over a period of last four years (from September, 1986 to October, 1990), 517 patients with clinical diagnosis of secondary epilepsy were referred to our Centre for MRI. Of these 170, were in the pediatric age group which formed the basis of this study.

All these patients were examined on 1.5 Tesla scanner. If required sedation was given with triclofos syrup or intravenous diazepam. The examination was performed in head surface coil in supine position. T_1, T_2 and proton density images were obtained in axial, sagittal and if required, in coronal plane. Scans were obtained with slice thickness of 5 mm and interslice gap of 0-50%.

The clinical details with type of seizure and neurological examination was

recorded. Of the 64 patients with tuberculoma, histopathological diagnosis was available in 14 cases. In the remaining cases diagnosis was based upon (*i*) patients showing persistence of lesion in two consecutive CT/MR studies with a minimum gap of six weeks; during the period the patient being on anticonvulsant drugs, (*ii*) response to antitubercular drugs, and (*iii*) MRI features being similar to the ones seen in histopathologically proven cases. Positive serology test for cysticercosis and/or skin biopsy showing evidence of cysticercosis coupled with response to praziquintal formed the basis of diagnosis of cysticercosis. Demonstration of scolex on MRI was taken to be a definite feature of cysticercosis.

Results

There were 100 males and 70 females with maximum number of patients being in age group of 6-12 years.

The MRI diagnosis in various pediatric age groups is shown in *Table I.* Tuberculomas (n=64) forming the largest group were seen in T_2 weighted images as a central hyperintensity and peripheral rim of hypointensity with adjacent hyperintense edema of varying degrees. These characteristic features of tuberculoma have earlier been described by Gupta *et al.*(2).

Neurocysticercosis forming the second largest group was seen only in 6-12 year age group. The eccentrically placed mural nodule representing scolex is diagnostic of

TABLE I—*MRI Diagnoses*

Lesions		Tub.	NC	Men.	Atr.	Vasc	Misc.
Age (yrs.)							
0-1	M	0	0	6	0	1	4
	F	0	0	2	0	0	1
1-3	M	5	0	1	0	1	1
	F	0	0	1	0	0	0
3-6	M	0	0	1	0	1	4
	F	3	0	1	2	2	2
6-12	M	32	16	2	5	4	16
	F	24	11	2	3	4	12
Total (n=170)		64	27	16	10	13	40

Tub.—Tuberculoma, NC—Neurocysticercosis, Atr.—Atrophy, Men.—Meningitis, Misc.—Miscellaneous, Vasc.—Vascular.

neurocysticercosis(3) (*Fig. 1*). Vascular lesions (n=13) comprised of arteriovenous malformation in 6 and infarcts in 7 patients.

Miscellaneous group of 40 children included congenital brain malformations like agenesis of corpus callosum (n=9), demyelinating diseases (n=5), tumors (n=3), focal gliosis (n=3) and tuberous sclerosis in 2 patients. All patients of focal gliosis, tumor and tuberous sclerosis were in 6-12 years age group (*Fig. 2*).

There were 6 children with initial MR suggestive of a granulomatous lesion, but it resolved completely on follow up scans without any specific treatment. These lesions were placed under the group of "Disappearing lesion" and their definite cause could not be ascertained. In 12 children MRI was within normal limits.

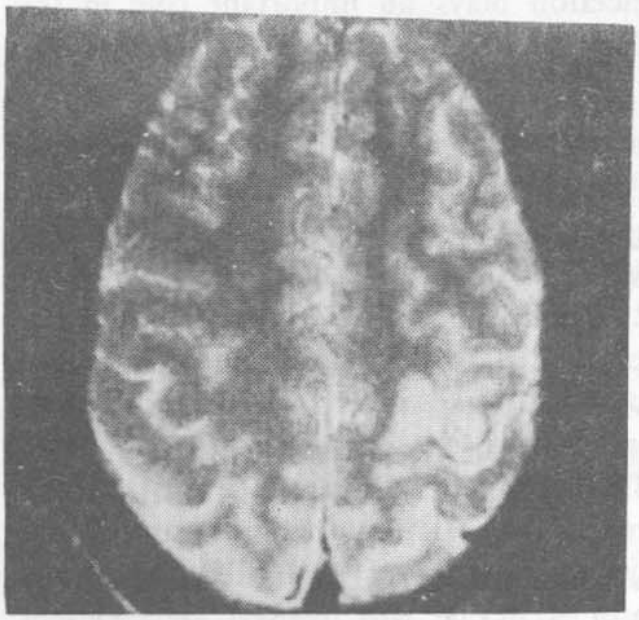

Fig. 1. Axial T_2 image showing a left parietal lesion with a central hyperintensity and a peripheral rim of low intensity. Within the hyperintense region a small eccentric low intense nodule (scolex) is suggestive of the diagnosis of cysticercosis. Surrounding the lesion is hyperintense edema.

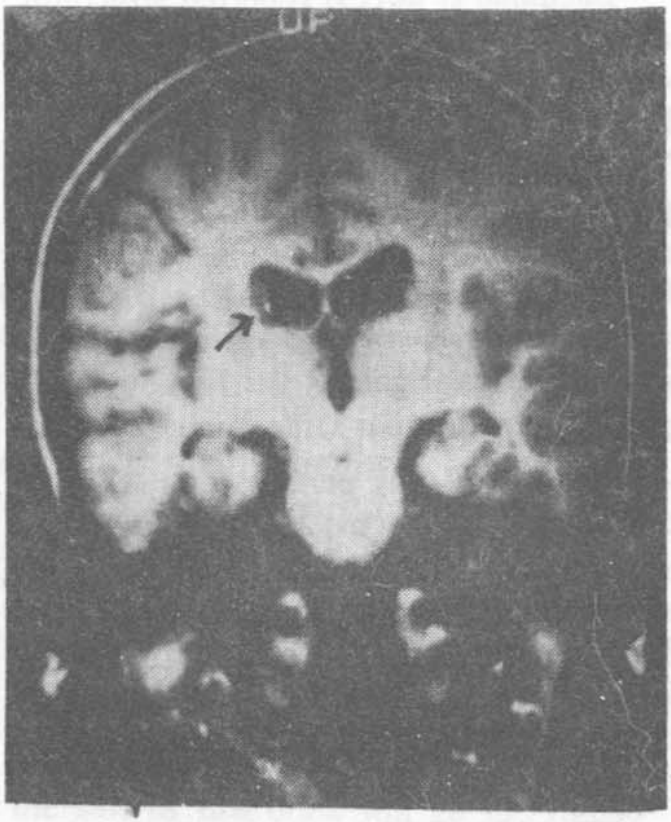

Fig. 2. Coronal T_1 image showing an isointense subependymal nodule in right lateral ventricle—Tuberous sclerosis.

Discussion

The epilepsies comprise a hetrogenous group of disorders characterised by recurrent epileptic seizures. An acquired lesion is found in 26-50% of the cases(4-6). It is, however, certain that causative lesions in developing countries are different from the ones in Western countries(1).

The present series showed a higher incidence in males as has been observed by earlier workers(5,7); however, some studies have shown no sex difference(6) or higher incidence in females(8).

We found positive MR study in 158 of the 170 cases. Riela *et al.*(9) reported positive MR in 45%, Jabbari *et al.*(10) in 43% and Heinz *et al.*(11) in 53% of their cases with epilepsy. Brookes *et al.*(12) had 100% positive MR in their analysis of intractable complex partial seizures. However, these studies were not confined to pediatric age group. These data suggest that patient

selection plays an important role in the MR positivity rates.

Joshi *et al.*(1) in their series of 2,128 patients found an underlying brain lesion in 32% of their cases. These included head injury (13.5%), infections (9%), birth injuries (3%), vascular lesion (2%), tumors (2%) and tuberous sclerosis in 0.4% patients. The present series had maximum number of cases of infections like tuberculomas (n=64), cysticercosis (n=27) and MR features of meningitis (n=16). As the present series did not include cases of head injury, it correlates well with findings of Joshi *et al.*(1). MR proved an excellent modality for differentiating tuberculomas and cysticercosis. The inherent superior soft tissue contrast resolution makes it the only available modality for diagnosing demyelinating diseases with greater confidence.

Bachman *et al.*(13) reported structural abnormalities in 30% of their children with chronic seizure disorder, the commonest being focal or generalized atrophy (13%). They found only 2% patients with therapeutically significant lesions. The present series had 10 of the 170 patients with features of focal atrophy, which probably represents site of recurrent epileptic discharge. Focal gliosis seen in another 3 patients probably has same origin.

Yang *et al.*(14) performed computed tomography (CT) in 256 children with seizure disorder. The overall incidence of abnormalities in the entire group was 33%. The abnormal neurological examination increased the incidence to 64%. Only 7 children (2.7%) had intracranial abnormalities requiring surgery.

The high positive rate of MRI in the present series may partly be due to the fact that the study children had strong clinical suspicion of an underlying brain pathology and most of them had positive CT scan.

"Disappearing lesions" have been earlier reported from our country in various CT studies(15,16). In the present study we had 6 children with initial MR showing a lesion suggestive of granulomatous lesion which resolved completely on non-specific drugs. As on CT, MRI failed to document the cause of these lesions.

The study concludes granulomatous lesions like tuberculoma and cysticercosis account for maximum number of cases of secondary epilepsy in our country. Tumors, vascular lesions, tuberous sclerosis, congenital brain malformations are uncommon cause of secondary epilepsy. MRI is an excellent modality in evaluation of a patient with clinically suspected secondary epilepsy.

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