

ROLE OF MRI IN EVALUATING SEIZURE DISORDERS IN PEDIATRIC AGE GROUP

Radiodiagnosis

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ABSTRACT

Seizure are the most common pediatric age group disorder. pediatric patients with intractable epilepsy represents a challenging clinical population. Accurate etiological diagnosis of the seizures in children is important as it further decides the proper treatment of the children. MRI is an excellent tool that is used in accurately diagnosing the cause of the seizure. It helps in diagnosing, determining the treatment protocol and also helpful in predicting the outcome. Current study has been done not to diagnose the children accurately but also in accessing the most common cause in specific ages of childhood and to determine prognosis, predict long-term intractability to antiepileptic medications and identify potential surgical cases.

Methodology :- Patients referred from the Department of Pediatrics with history of seizure disorder or the patient that presented with acute seizure attack were examined by MRI Brain as per specific protocol in MAGNETOM essenza 1.5 Tesla MRI scanner from SIEMENS at Atmajyoti MRI Centre, New civil hospital, Surat. The various causes of the seizure in pediatric population were examined and their follow up was taken and the most common etiological cause and their most common MRI Brain finding was registered. Prospective study of 100 patients (<18 yrs) referred to department within the period of 1 year having seizure disorder. All patients, irrespective of sex (<18 yrs) having seizure disorder.

Results :- The commonest etiology of seizures is inflammatory granuloma. Early recognition of potentially treatable diseases helps in timely treatment and arrest of progression of disease. It is highly recommended to use MRI as primary investigation for seizures. Every effort should be made to provide facility of MRI for management of seizures in all parts of India.

KEYWORDS

INTRODUCTION

Seizure is an emergency in children. Seizure is a very common cause for hospitalization of children and it results in significant mortality and morbidity. There are very few studies done on neuroimaging in seizures from developing countries like India. Most studies conducted till now have focused on clinical aspect of seizures. Dedicated studies in paediatric population using MRI brain have been even fewer till date in India. Febrile seizures are the most common cause of acute seizures in children worldwide. These account for the majority of seizures seen in children less than 5 years. In tropical countries like India, acute symptomatic seizures which carry a bad prognosis are more prevalent as compared to febrile seizures. Acute seizures therefore turn out to be an important risk factor for neurological and cognitive impairment in children living in these countries. CNS infections are the main cause for these acute seizures. China and India, together harbor 20 % of epileptics worldwide. In the developing countries like ours, brain infections and perinatal insult are common causes. 20% of children with epilepsy are refractory to medical therapy. (3,4) Neuroimaging plays an important role in identifying abnormal structural epileptogenic foci that can be surgically resected. Common epileptogenic structural abnormalities are as follows :-

- Malformation of cortical development
- Hemimegalencephaly
- Tuberous sclerosis complex
- Developmental tumors
- Hypothalamic hamartoma
- Hippocampal sclerosis
- Cavernous malformations
- Sturge-Weber syndrome
- Rasmussen's encephalitis
- Congenital vascular injuries

METHODS :- All the patients that were sent by the department of pediatrics has been subjected to MRI Brain as per this specific protocol

1. Sagittal T1 weighted spin echo (SE), with repetition time (TR) = 450ms, echo time (TE) = minimum, slice thickness = 4mm/0mm, matrix = 256 × 192, field of view (FOV) = According to head size, number of excitations (NEX) = 1.
2. Axial T2 weighted fast spin echo (FSE), with TR/TE = 3000/85 ms, echo train length (ETL) = 12, slice thickness = 3mm/0mm, matrix = 256 × 256, FOV = According to head size, NEX = 1.
3. Axial fast fluid attenuated inversion recovery (FLAIR), with TR/TE/TI (inversion time) = 9000/130/2200, slice

thickness=3mm/0mm, matrix = 256 × 192, FOV = According to head size, NEX = 1.

4. Axial diffusion weighted echoplanar, b = 1000, with TR/TE = 6000ms/min, slice thickness/gap = 3/0 mm, matrix = 256 × 192, FOV = According to head size, NEX = 1.
5. Axial PD with TE=25, slice thickness=3/0, FOV= according to head size.
6. Axial GRE with TR/TE = 15ms/650; flip angle = 20, slice thickness = 5/0, matrix = 256 × 192, FOV = According to head size, NEX = 1
7. Gadolinium enhancement used in suspected inflammation, tumors/metastases, white matter disorders, neurocutaneous disorders

Sedation was given to the children to reduce the movement during the scan. Only few children which didn't respond to the sedation were subjected to the general anesthesia. Any harmful outcomes or side effects associated with MRI scan and drugs was explained to the parents in language they understand and the consent was taken.

RESULTS :-

4-10% of children suffer at least one episode of seizure in the first 16 years of life. The incidence is highest in children < 3 years of age, with a decreasing frequency in older children. There were total of 100 cases that were examined. out of these 100 cases most of the patients presented in the age group of 6-10 years (33 patients) followed by 11-15 years. In almost all the age groups number of male affected had always out numbered the number of females, except in 16-18 years of age group. out of total 100 patients, 58% males and 42% females.

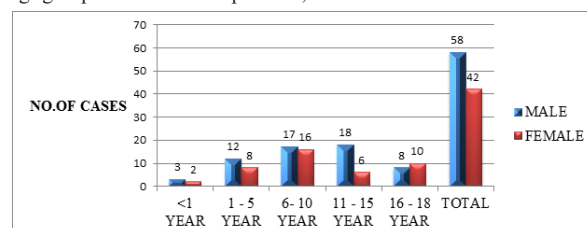
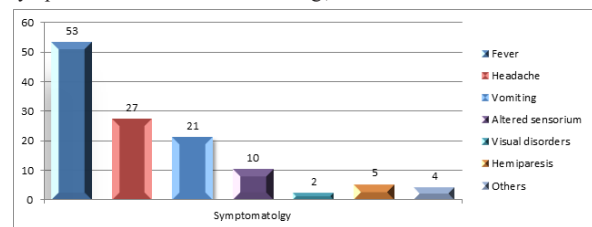


Table 1 AGE and SEX distribution of the cases

Symptomatology :- Children in different age groups presents with accompanying different complaints apart from seizure. In my study, the most common complaint with which patients presented was fever followed by headache and then vomiting. Fever was present in 53 % of

the patients followed by headache in 27 %,vomiting in 21% altered sensorium in 10 %. Few children presented with a combination of the symptoms such as fever and vomiting , fever and headache etc .



MRI finding Observed

There are various MRI findings that were noticed in these patients with majority of them are in combination and rarely existed as a single feature .The most common single MRI finding was normal i.e majority of the cases were idiopathic with no underlying Brain abnormality.

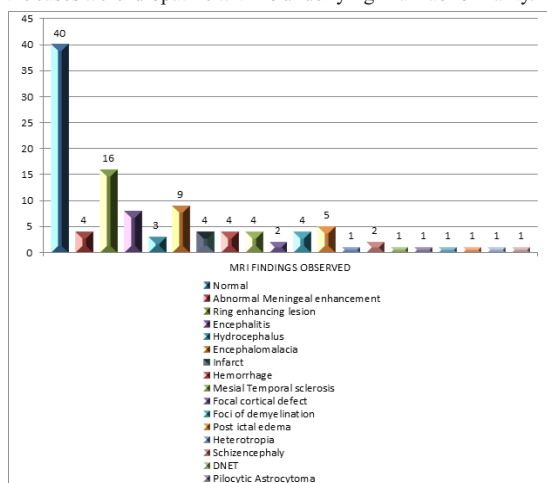


Table 2 Various MRI findings in children presented with Seizures

Ring enhancing lesions were the second most common cause of Seizures in children . The various differentials in the category of ring enhancing lesion are :-

1. Neurocysticercosis
2. Tuberculoma
3. Metastasis
4. Abscess
5. Hemorrhage

In my study there were only 2 of them were present as neurocysticercosis and Tuberculoma . A total of 16 cases were found to have ring enhancing lesion on MRI brain out of which 9 were found to have tuberculoma and 7 were found to have Neurocysticercosis . Accurate diagnosis of either of the condition is important as either of them have different treatment and are curable if treated properly .

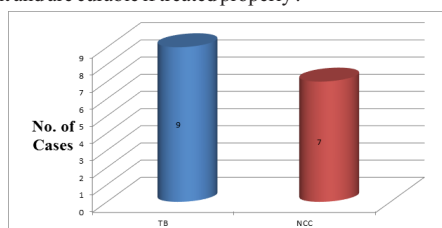
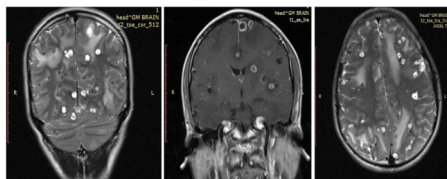


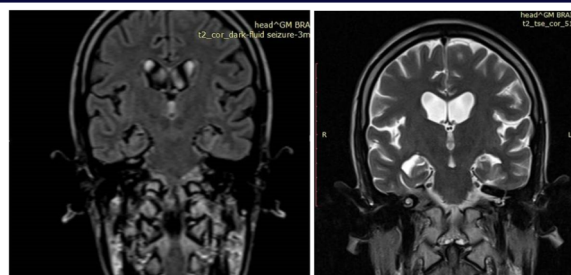
Table 3 Ring enhancing lesions

Few of the cases are as follows

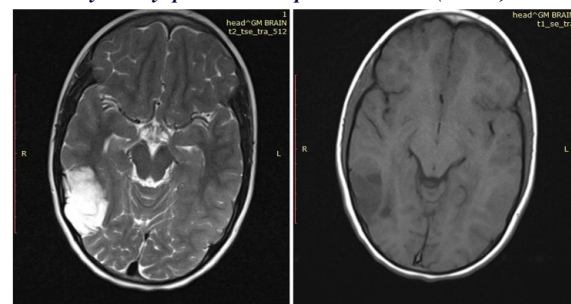
Case 1 NEUROCYSTICERCOSIS



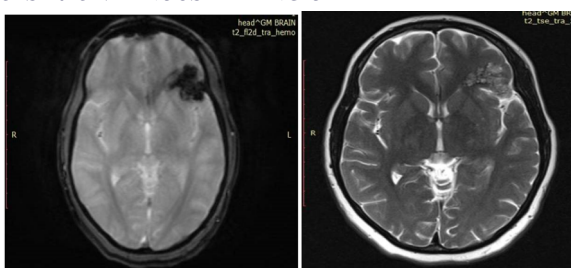
CASE 2 HIPPOCAMPAL SCLEROSIS



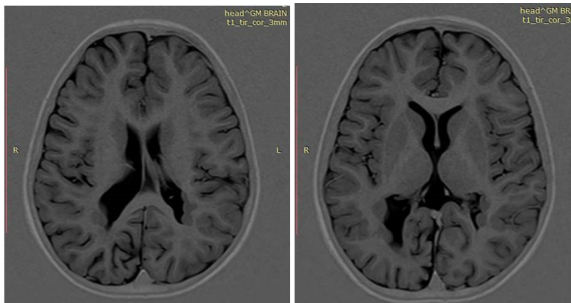
CASE 3 Dysembryoplastic neuroepithelial tumour(DNET)



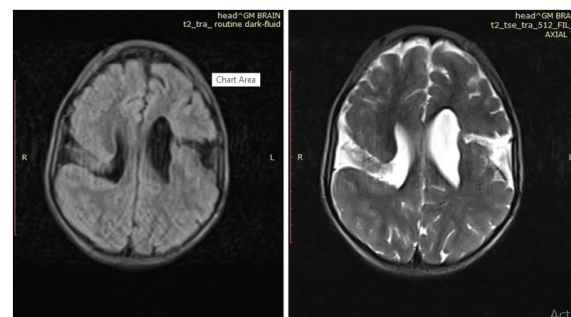
CASE 4 CAVERNOUS HEMANGIOMA



CASE 5 HETEROTROPIA



CASE 6 OPEN LIP SCHIZENCEPHALY



CONCLUSION

To conclude it can be said that

- Common age group was 6-10 years in girls and 11-15 years in boys.
- Majority of cases were idiopathic (40%) with no imaging abnormality.
- Most common causes in cases where underlying disease was present were infective (25%) {TB > NCC} followed by hypoxic ischemic encephalopathy (9%) , Developmental disorder (8%) and others.

- The most common cause in neonates was hypoxic ischemic encephalopathy.
- Most common imaging findings were abnormal granulomatous lesion (22.2%) followed by gliotic / encephalomalacic changes (12.5%).
- High resolution MRI can assist in classification, determine prognosis, predict long-term efficacy to antiepileptic medications and can also identify potential surgical candidates.

REFERENCES

1. Friedman MJ, Shariëff GQ. Seizures in children. *Pediat Clin North Am.* 2006;53:257–277. doi: 10.1016/j.pcl.2005.09.010. [PubMed][Cross Ref]
2. Wang W, Wu J, Wang D, et al. Epidemiological survey on epilepsy among rural populations in five provinces in China. *Zhonghua Yi Xue Za Zhi* 2002; 82:449–52—Li SC, Schoenberg BS, Wang CC, et al. Epidemiology of epilepsy in urban areas of the People's Republic of China. *Epilepsia* 1985;26:391–4.
3. Weaver DF, Pohlmann-Eden B. Pharmacoresistant epilepsy: Unmet needs in solving the puzzle(s). *Epilepsia.* 2013;54(Suppl 2):80–85. PMID: 23646978, [http:// dx.doi.org/10 .1111/epi.12191](http://dx.doi.org/10.1111/epi.12191)
4. Prabhu, S., Mahomed, N.. Imaging of intractable paediatric epilepsy. *South African Journal of Radiology*, 19, dec. 2015
5. Vincent LAI, Henry KF MAK. Neuroimaging in Paediatric Epilepsy. *The Hong Kong MEDICAL DIARY*, 2009 May; 14(5)