An analysis of MRI findings in patients referred with fits

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Abstract

Introduction: Fits are common indications for MRI since it is regarded as the modality of choice in epilepsy imaging. However, no evaluation regarding the efficacy and usefulness of MRI in epilepsy has been performed in Sri Lanka. We intend to demonstrate clinical and demographic details in patients referred for fits, correlating with their MRI findings.

Material & Methods: Data from consecutive patients with fits who underwent MRI brain from June 2012 to March 2013 were analyzed (n=231). Patients with other indications (n=1397) were excluded. Patients' data were obtained from the local database and MRI forms. All MRI's were assessed with the Radiologist Reports. Results were analyzed using Excel 2007.

Results: There were 54.5% (n=126) males and 45.5% (n=105) were females. 1- 15yrs age group consisted of 39.4% (n=91). Majority, 67 % had generalized tonic clonic (GTC) seizures. There were 225 newly diagnosed fits and 6 follow-up cases. MRI findings were abnormal in 57.6% (n=133). Findings in 36.8% were cerebral tumors, out of which 48.9% were gliomas and 16.3% were meningiomas. >15 year group had neoplasms in 48.5% compared to 8.1% in 1-15 year group. Regarding co-morbidities, 9% (n=21) had congenital/perinatal conditions versus 8.2% (n=19) with malignancy

Conclusion: MRI helps in establishing an underlying cause for fits and in management decision-making. MRI findings vary in relation to seizure type, age group etc.

Key Words: Fits; Epilepsy; MR; Imaging

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Introduction

Fits are clinical manifestations of temporary disturbance in the electrical activity of the brain. It is a common symptom, experienced by 4% of all people at least once in life time¹. Recurrent fits are known as 'seizure disorders' or 'epilepsy'². In Sri Lanka seizure disorders or epilepsy is the commonest chronic disabling neurological condition, with a reported incidence of 50 per 100,000 per annum and crude prevalence ranging from 9-11 cases per 1000³. Even though it is a disease seen in all age groups, prevalence of seizures is higher in the 5-20 years age group^{5,8}.

Fit is a common indication for Magnetic resonance imaging (MRI) of brain worldwide, since it is a proven reliable modality to investigate the underlying cause. The first episode of seizure is regarded as an indication for MRI, according to the current internationally accepted medical practice⁴.

MRI is a non-invasive and highly sensitivity imaging modality in neurology. However it is expensive and not widely available. Therefore, in order to provide maximum benefit to the population, it is important to assess its efficacy and usefulness in diagnosis of the underlying cause of epilepsy, in different demographic and clinical categories. No such evaluation has been performed in Sri Lanka. Our aim is to assess variations in MRI findings related to various age groups, special risk factors, different co-morbidities, seizure type etc. This information is useful in forming imaging guidelines and clinical management protocols.

Materials & Methods

A retrospective, descriptive hospital based cross sectional study was conducted at

Neuro surgical division MRI at NHSL. Ethical approval was obtained from the Hospital ethical review committee. Consecutive patients referred for fits who underwent MRI brain from June 2012 to March 2013 (n=231) were analyzed. Demographic data and clinical information were extracted from the local data base and the patients' MRI requisition forms. MRI diagnoses were obtained from the reports done by experienced staff radiologists in the unit. Patients with other indications and incomplete data (n=1397) were excluded from study. The referrals were from many disciplines including general medicine, neuro- surgery, neurology endocrinology and pediatrics.

Routine MRI brain protocol consisting of T1W Axial (5mm thickness) & Sagittal, T2W Axial & Sagittal, FLAIR Axial & Coronal, DWI sequences has been performed in all patients using Siemens Harmony 1T MRI system (Siemens, Erlangen, Germany). Epilepsy protocol was additionally performed if no abnormality was detected with the routine protocol and depending on the clinical indication. Some patients underwent contrast studies as decided by Radiologists. Histopathology was not followed up in this group. Results were analyzed using Microsoft Excel 2007.

Results

Out of 1628 MRI brains, 231 (14.12%) underwent MRI for fits during the study period. There were 225 new diagnoses of fits while 6 were follow-up cases.

54.5% (n=126) of patients were males and 45.5% (n=105) were females ($p>0.05$). 39.4% (91) were in 1-15yrs age group.

Age and Sex Distribution

Age distribution is summarized in Figure 1.

Fig. 1. Age distribution

In the study population MRI findings were abnormal in 57.6% (n=133) while 42.5% (n= 98) of MRI's were negative. With $P<0.05$, there is a statistically significant

difference between the patients with fits, having a positive finding versus those having a negative MRI. MRI findings among males and females is demonstrated in Figure 2

Fig.2. Positive/negative MRI findings Vs sex distribution

There is no statistically significant difference in males with fits having a positive finding compared to females with fits having a positive MRI finding in the study population, $P>0.05$.

Presenting Type Of Seizure

Regarding the presenting type of seizure, the majority, 67 % were referred for generalized

tonic clonic seizures (GTC). (Fig 3) tonic clonic seizures (GTC) (Fig 3).

As shown in Figure 4, those presenting with GTC have a higher chance (61.9%) having positive findings on MRI ($CI\pm 7.65$) while all cases of multi-focal fits have negative MRI.

Fig. 3 Presenting seizure type

Fig. 4 Relationship of Presenting seizure type to MRI findings

Fig. 5 Age group vs. MRI findings

Age Groups and MRI Findings

There is a statistically significant difference in detecting a positive MRI finding in >15 years age group compared to 1-15 years age group ($P < 0.05$). It is demonstrated in Figure 5.

Cerebral neoplasm was the MRI diagnosis in 36.8% ($n=49$) of which gliomas were 48.9% and meningiomas 16.3%.

Table 1 illustrates the MRI findings, Table 2 analyzes types of neoplasms and MRI findings with the age distribution are shown in Table 3.

Table 1.

MRI findings	Number	Percentage %
Neoplasms	49	36.84%
Atrophy/gliosis/encephalomalacia	27	20.30%
Focal ischaemic changes	13	9.77%
Infective	8	6.01%
Delayed/demyelination	6	4.51%
Periventricular ischaemia	7	5.26%
Congenital or morphological	6	4.51%
Eg: microcephaly, HPE, ACC, etc		
Miscellaneous	17	12.78%

Table 2.

Tumor type	Number	Percentage %
Glioma	24	48.98
Meningioma	8	16.33
Metastasis	4	8.16
Oligodendroglioma	2	4.08
Ganglioglioma	1	2.04
Ependymoma	1	2.04
others	9	18.4

Table 3

MRI finding	% in 1-15 years n= 38	% in >15 years n=95
Neoplasms	8.12	48.42
Atrophy/gliosis/encephalomalacia	31.58	10.52
Focal ischaemic changes	10.53	7.36
Infective	0.00	7.36
Delayed/demyelination	7.89	3.15
Periventricular ischaemia	2.63	6.32
Congenital morphological E.g.: microcephaly, HPE,ACC,etc	13.16	4.21
Miscellaneous	26.09	12.65

Presence of Co-Morbidities

Analysis of co-morbidities showed that 9% (n=21) had congenital/perinatal conditions

and 8.2% (n=19) had a malignancy as a co-morbidity. However the majority (67.5%) had no co-morbidity (Table 4).

Table 4.

Co-morbidities	Number	Percentage
Perinatal or congenital	21	9.1%
Infections	5	2.2%
Malignancies	19	8.2%
Endocrine	3	1.3%
Other conditions	27	11.7%
No co-morbidity	156	67.5%

Discussion

An abnormal brain MRI was found in 57.6% of our study population. A study by the neuro imaging unit in Florida reveals that, in patients with first seizure, an epileptogenic lesion was identified by MRI in 14% while in intractable epilepsy MRI identifies the pathologic substrate in 82-86%⁴. There is a difference in the proportions of patients who had a positive MRI in the two study populations. This is due to the fact that, in their setup the first episode of seizure was indicated for MRI⁴ whereas in ours, patients either present late or undergo other imaging modalities^{3,4}.

Reported prevalence of seizures is more in the 5–20 year age group^{5,8}. In our study also the commonest age group was 1-15 years. Cause of most seizures is not detected and considered idiopathic (70%)⁵. In our study an abnormality was not detected in 42.5% and the >15 year age group have a higher chance of having a positive finding on MRI.

MRI is 100% sensitive in detecting an epileptogenic neoplasm^{6,9}. Cerebral neoplasms is the most frequent (36.8%) MRI diagnosis in our study group. Glioma is the commonest neoplasm followed by Meningioma. This trend was more marked in > 15 years age group. Patients presenting with generalized tonic clonic (GTC) seizures had a higher frequency of lesion detection on MRI compared to other seizure types. There was no statistically significant difference regarding the presence of underlying cause for epilepsy between male and female patients.

Awareness of these possible correlations between presenting clinical patterns and MRI findings is useful for radiologists to identify epileptogenic lesions.

There were some limitations in our study. We could not review histopathology reports

to confirm the radiological diagnosis as specimens are sent to different hospitals. Another limitation is that these MRI scans have been done with a 1T system which has less sensitivity compared to higher field systems.

In conclusion, performing MRI in patients with fits significantly contribute to the detection of underlying cause. We also noted a variation of MRI findings in relation to seizure type, age group etc. which is helpful in MRI interpretation.

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