

Etiology of adult onset seizures: Role of magnetic resonance imaging



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ABSTRACT

Background: Neuroimaging is an important diagnostic tool which aids in detecting structural, vascular, neoplastic, and demyelinating causes of symptomatic seizures and may predict risk of seizure recurrence. Magnetic resonance imaging (MRI) is a sensitive neuroimaging modality which can detect subtle lesions, their exact location, and extent, which cannot be revealed by computed tomography (CT) scan. Because of its excellent soft-tissue contrast and detailed depiction of anatomy, MRI has emerged as the most valuable tool for the localization of underlying pathology. As a result, the goal of this study is to investigate the etiological factors for adult-onset seizures using MRI. **Aims and Objectives:** The goal of this study is to investigate the etiological factors for adult-onset seizures using MRI. **Materials and Methods:** The present study was an observational prospective study of 50 patients presented to the Department of Radiodiagnosis at Basaweshwar Hospital and met the inclusion criteria of the study. The inclusion criteria were to include all those cases who presented with seizures and all of them were subjected to brain MRI. The imaging findings were analyzed, described, and represented in the form of tables and charts. **Results:** The mean age of all patients was 44.05 years, with males being 43.63 years old and females being 44.48 years old. The generalized tonic-clonic seizures were the most common type of seizure in 59 (84.3%). The most common MRI findings were ring enhancing lesion (14%), infarct with gliosis (13.6%), and neoplasm (10.3%). **Conclusion:** MRI was able to detect an underlying lesion causing symptomatic seizures with added advantage of no radiation exposure, and superior neuroimaging modality and should be the investigation of choice in all patients who had a history of convulsions after ruling out systemic and metabolic causes of convulsion.

Key words: Magnetic resonance imaging; Seizures; Etiology

INTRODUCTION

Adult-onset seizures require special attention in terms of etiology, because they are likely to be caused by an identifiable cause.¹ Neuroimaging is helpful in assessing the underlying cause of seizure and may predict relative risk for seizure recurrence. Magnetic resonance imaging (MRI) can detect subtle lesions, their exact site, size, and extent, with high sensitivity and specificity than computed tomography (CT) scan.² A seizure is sudden onset paroxysmal change in neurologic function caused by excessive neuronal electric activity that can result in change in motor, sensory, autonomic, and behavior of the patient, whereas epilepsy is a chronic condition characterized by

unprovoked recurrent seizures. A non-epileptic seizure is a medical manifestation of excessive neuronal activity in the cerebral cortex of the mind. Individuals with epilepsy must face social, psychosocial, and economic consequences in addition to medical consequences.³ The history and physical examination, especially the neurologic examination, are critical in evaluating the patient who is having their first seizure.⁴ It is age dependent, and is typically found better in children and the elderly than in younger adults. The innovative introduction of MRI as an imaging device for seizure assessment has been a tremendous boon, both for radiologist and clinician for the prognosis of cerebral lesions as well as medical control of those patients with neurologic disorders. The International League against

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Epilepsy (ILAE) 2017 categorization divides seizures into three kinds depending on their etiology: focal onset, generalized onset, and undetermined onset.⁵

Because of its outstanding soft-tissue demarcation, allowing for the distinct depiction of anatomy, freedom from beam-hardening artifact in the basal mind that occurs with CT, and capability for multiplanar imaging, MRI has emerged as a diagnostically valuable device for a variety of functions, such as preoperative localization of epileptogenic recognition.

Seizures and epilepsy are mostly diagnosed clinically; nevertheless, neuroimaging plays an essential role in the evaluation of individuals with new seizures.

Most of the research on the use of neuroimaging in seizures in adults has been on either the evaluation of intractable epilepsy or the examination of seizures in the emergency scenario.

Furthermore, the origin and clinical profile of seizures in adults need judgments concerning medication introduction and termination that differ from those in younger patients.⁶

In the prognosis of epilepsy, MRI has recently emerged as a diagnostic tool in comparison to other investigations. Because of its non-radiation nature, MR is the preferred neuroimaging tool. With these facts in mind, the current study was undertaken to investigate the etiological factors for adult-onset seizures using MRI.

Aims and objectives

To investigate the etiological factors for adult-onset seizures using MRI.

MATERIALS AND METHODS

Prospective hospital-based observational studies of fifty patients with the clinical diagnosis of seizures were included in the present study. All patients who had clinical impression of seizure were subjected to MRI. The data for the study were collected from all adult patients with new onset seizures referred to the department of radiodiagnosis. Informed and written consent was taken from patients. For quantitative data analysis, descriptive statistics such as mean and standard deviation were used initially, and for qualitative data analysis, the number and percentage were used.

Inclusion criteria

1. Age above 18 years.
2. New onset seizures (provoked and unprovoked).

Exclusion criteria

1. Patients with psychogenic seizures.
2. Patients with known contraindications to MRI such as ferromagnetic implants and claustrophobia.
3. Trauma
4. Poisoning
5. Metabolic seizures.

Data collection procedure

The study included all adult patients who were referred to the Department of Radio-Diagnosis and Imaging sciences with clinical diagnosis of seizures. A provisional diagnosis was made based on the radiological findings and clinical findings. Cases were monitored until treatment was completed. The patients chosen for the study were adult patients with clinically diagnosed seizures according to the ILAE 1981 criteria.

A detailed history was taken, and a clinical examination was performed. The duration of the illness, the type of seizures, and any associated illness were all noted. To rule out any neurological deficits, a thorough clinical and neurological examination was performed.

Biochemical tests were performed in accordance with the protocol and found to be within normal limits. All the patients underwent MRI scanning, and procedure was briefly explained to the patient including the risks of contrast examination. Each patient's clinical history was documented. A detailed pro forma was completed, and all patients underwent routine tests. MRI was done on an MR system with a head coil and the patient in a supine position. As a precaution, emergency drugs were kept on hand. The scans were carefully examined on the monitor before being captured on film for future reference. All patients' MRI findings were documented in accordance with the protocol. Every effort was made to produce high-quality scans while avoiding artifacts.

Statistical analysis

For quantitative data analysis, descriptive statistics such as mean and standard deviation were used initially, and for qualitative data analysis, the number and percentage were used. IBM SPSS 25.0 version software was used to analyze the data.

RESULTS

The majority of patients are belonged to the age group of 21–40 years (40%) and 41–60 years (40%). The mean age of all patients was 44.05 years, mean age of males was 43.63 years, and mean age of females was 44.48 years. The

minimum age of the patient was 19 years and maximum age was 95 years (Table 1).

In the study, male patients were 24 (48%) and female patients were 26 (52%) (Table 2).

In the present study, the majority of the seizures cases were observed that 42 (84%) cases type of seizures was generalized tonic-clonic seizure (GCTS), 5 (10.0%) cases type of seizures was complex partial seizure, and number of simple partial seizures cases were 3 (6%) (Table 3).

In the present study reveals that in 3(6%) patients were normal. In 47 (94%) of patients, study showed MRI findings. Ring-enhancing lesion constitutes 13 (26%) patients - the most common MR diagnosis in patients presenting with seizures, followed by infarct with gliosis 6 (12%) and neoplasm constitutes 5 (10%) (Table 4).

Furthermore, no statistically significant difference in the distribution of MRI findings of normal study, infarct with gliosis, atrophy, and neoplasm between males and females

was found ($P>0.05$). Although there is a statistically significant difference in the gender distribution of MRI findings of thrombosis, ring-enhancing lesion, and PRES ($P<0.05$), all 5 thrombosis patients were men, ring-enhancing lesions were more common in women, and all 7 patients were females.

DISCUSSION

The mainstay involving the assessment of any affected person with seizure includes identity of the reason of the seizure after comparing clinically the kind of seizure and figuring out whether or not the reason is treatable or otherwise. Patients supplying with seizures may have extensive variety of MRI abnormalities relying on the etiology.

MRI can reliably identify and localize the intracranial abnormality so that further management can be planned accordingly. The clinical history of each patient was recorded, and all underwent routine biochemical investigations as per pro forma.

The mainstay of any afflicted individual with seizure is determining the cause of the seizure after comparing clinically the kind of seizure and determining whether or not the cause is curable or not. Individuals with seizures may have a wide range of MRI abnormalities depending on the cause. MRI can consistently diagnose and localize intracranial abnormalities, allowing for appropriate therapy.

Adult-onset seizures are significant because they are frequently associated with secondary causes. If the cause is properly determined by history, clinical examination, and appropriate tests, including neuroimaging, the presenting seizures can be treated appropriately, minimizing associated morbidity and death.

The majority of patients in the present study were between the ages of 21 and 40 (40%) and 41 and 60 (40%). The mean age of all patients was 44.05 years, with men being 43.63 years old and females being 44.48 years old. The patients had a minimum age of 19 years and a maximum age of 95 years.

Chalasan and Kumar observed similar findings, with 46.9% being between the ages of 21 and 40.⁷ The majority of patients in the study by Muralidhar and Venugopal reported 64%,⁸ Hirani and Shrivastva reported (54%),⁹ and Pannem and Chintha reported 31–50 years (55%),¹⁰ were likewise above the age of 40.

In the present study, the male-to-female ratio was 1.08:1. Studies by Muralidhar and Venugopal revealed a 2.12:1 male

Table 1: Age distribution

Age (years)	n (%)
<20	3 (6)
21–40	20 (40)
41–60	20 (40)
61–80	5 (10)
81–100	2 (4)

Table 2: Gender distribution

Gender	n (%)
Male	24 (48)
Female	26 (52)

Table 3: Type of seizures

Type of seizures	n (%)
GTCS	42 (84)
CPS	5 (10)
SP	3 (6)

GTCS: Generalized tonic-clonic seizure, CPS: Complex partial seizure, SP: Simple partial seizures

Table 4: Magnetic resonance imaging findings

Findings	n (%)
Infarct with gliosis	6 (12)
Thrombosis	4 (8)
Ring enhancing lesion	13 (26)
Atrophy	1 (2)
Pres	5 (10)
Neoplasm	5 (10)
Others	13 (26)
Normal	3 (6)

preponderance,⁸ Hirani and Shrivastva reported a 1.17:1 male preponderance,⁹ whereas Sendil et al., observed a 1.63:1 male preponderance.¹¹

Type of seizures

GCTSs were the most common form of seizure, occurring in 84% of patients. Adults had a greater prevalence of generalized tonic-clonic seizures, according to Pannem and Chinta reported 96%¹⁰ Kanitkar et al., reported 70%,¹² Sendil et al., revealed 64%¹¹, and Hirani and Shrivastva reported 60%.⁹

Generalized seizures become less common as people become older, but focal seizures become more common. In the present study, 65% of patients over the age of 60 experienced focal seizures, whereas 35% had generalized seizures. Sinha et al., observed a similar conclusion in their study on new onset seizures in senior patients (aged over 60 years), with the majority (69.7%) experiencing focal seizures.¹³ Sendil et al.,¹¹ and Hirani and Shrivastva saw a similar tendency.⁹ Some researchers observed that CVA (stroke) (27%) was responsible for seizures.¹⁰

MRI brain was performed on 94% of all patients; 6% of patients had normal results. Ring-enhancing lesion constitutes 13 (26%) patients - the most common MR diagnosis in patients presenting with seizures, followed by infarct with gliosis 6 (12%) and neoplasm constitutes 5 (10%). Sinha et al., also discovered that 44.2% of patients had normal MRI brains, whereas the remaining patients had ischemic infarcts (16.3%), intracranial hemorrhage (14%), tumor (11.6%), calcified granuloma (7%), NCC (4.6%), and gliosis (2.3%).¹⁴ Pannag and Ravi reported that MRI brain was normal in 46% of cases, and the most common pathological findings on MRI were tuberculoma (9.7%), tumor (9%), mesial temporal sclerosis (3%), neurocysticercosis (2.4%), encephalitis (2.4%), vascular malformation (1%), and progressive multifocal leukoencephalopathy (0.6%).¹³ Whereas, in another study, 21.2% of patients exhibited acute and chronic stroke MRI abnormalities, with roughly 8% having acute infarction and 13% having gliosis as a result of past ischemic or hemorrhagic cerebrovascular accidents or trauma.²

Limitations of the study

We were constrained since this was a single-center study with a small sample size in a available resource context.

CONCLUSION

Each instance of adult onset seizure must be handled cautiously and with a tailored strategy. Identification and understanding of the etiological factors and seizure types

aid in the better management of these patients. Primary care physicians play a critical role in recognizing patients with adult-onset seizures and encouraging them to undergo neuroimaging to arrive at an accurate etiological diagnosis. The future prospective therapy of adult-onset seizures seems bright and persuasive in light of recent breakthroughs in neuroimaging methods. Hence, we conclude that MRI plays a significant role in patients presenting with seizures to confirm or rule out any underlying structural lesions.

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Author's Contribution:

GA- Concept and design of the study, prepared first draft of manuscript and revision of the manuscript; **NP-** Interpreted the results; reviewed the literature and manuscript preparation; **SR-** Concept, coordination, statistical analysis and interpretation, preparation of manuscript and revision of the manuscript.

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