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Original Research Article

Diagnostic Yield and Spectrum of Epileptogenic Lesions on MRI in Patients Presenting with New-Onset Seizures: A Prospective Observational Study

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Abstract:

Background: New-onset seizures are a common neurological presentation requiring prompt evaluation to identify underlying structural brain abnormalities. Magnetic resonance imaging (MRI) plays a crucial role in detecting epileptogenic lesions, facilitating accurate diagnosis, guiding treatment, and improving patient outcomes. However, the diagnostic yield and spectrum of MRI-detected epileptogenic lesions vary across different populations.

Aim: To determine the diagnostic yield of MRI and evaluate the spectrum of epileptogenic lesions in patients presenting with new-onset seizures.

Methodology: A hospital-based prospective observational study was conducted in the Department of Radiodiagnosis, Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, Bihar, over a period of one year. A total of 145 consecutive patients with new-onset seizures were enrolled. All patients underwent detailed clinical evaluation, routine electroencephalography (EEG), and MRI brain using a dedicated epilepsy imaging protocol. MRI findings were categorized as epileptogenic lesions, non-epileptogenic lesions, or normal, and correlated with seizure type and EEG findings. Statistical analysis was performed using SPSS version 26.0, with $p < 0.05$ considered statistically significant.

Results: The mean age of the participants was 39.8 ± 17.2 years, with a male predominance (59.3%). MRI identified epileptogenic lesions in 54 (37.2%) patients, non-epileptogenic lesions in 24 (16.6%), while 67 (46.2%) had normal MRI findings. Mesial temporal sclerosis (22.2%) was the most common epileptogenic lesion, followed by gliosis/encephalomalacia (20.4%), developmental cortical malformations (14.8%), and neuroinfective lesions (14.8%). Epileptogenic lesions were significantly associated with epileptiform EEG abnormalities ($p = 0.001$) and focal seizures ($p = 0.002$).

Conclusion: MRI demonstrated a diagnostic yield of 37.2% in detecting epileptogenic lesions among patients with new-onset seizures and showed significant correlation with EEG abnormalities and focal seizure type. Routine epilepsy-protocol MRI should be incorporated into the diagnostic evaluation of patients presenting with first-time seizures to facilitate early etiological diagnosis and appropriate clinical management.

Keywords: New-onset Seizures; Magnetic Resonance Imaging; Epileptogenic Lesions; Epilepsy; Electroencephalography; Mesial Temporal Sclerosis; Diagnostic Yield.

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Introduction

New onset seizures are a frequent neurological emergency and hospital admission in all age groups. A seizure is a sudden event of signs and/or symptoms arising from abnormal, excessive or synchronous neuronal activity in the brain. Seizures may occur once as a result of a reversible metabolic or systemic etiology, but they are frequent if the seizures continue to recur and are unprovoked. Single seizures can occur from reversible metabolic or systemic causes, but recurrent unprovoked seizures are

typical of epilepsy. The underlying etiology is important in determining diagnosis, prognosis, treatment and long-term outcome, and as such should be identified early. Neuroimaging, specifically magnetic resonance imaging (MRI), has become a non-neglectable technique in the assessment of patients with new onset seizures as it has resulted in the identification of structural abnormalities of the brain that could be an epileptogenic focus [1].

The diagnosis of epilepsy is still essentially clinical and based on thorough history taking, eyewitnesses report, thorough neurological examination, electroencephalography (EEG), and appropriate neuroimaging. Of the imaging methods that are available, MRI offers the best soft tissue contrast resolution, multi-planar imaging and good spatial resolution, which is why it is the method of choice for the detection of epileptogenic lesions. MRI can be especially useful in identifying subtle abnormalities of the cortex such as mesial temporal sclerosis, focal cortical dysplasia, low-grade tumors, vascular malformation, gliosis and developmental abnormalities that might not be seen on computed tomography (CT). The diagnosis of epilepsy is greatly helped by the identification of these lesions, as is the prognosis, choice of antiepileptic therapy, and decision on eligibility for epilepsy surgery [2]. The application of MRI has been extensively investigated in patients with drug-resistant epilepsy and those undergoing presurgical evaluation. Relatively few prospective studies have assessed the diagnostic yield of MRI in patients with new onset seizures, however, because identification of an underlying structural lesion may suggest a greater risk of seizure recurrence, help to determine the epilepsy syndrome, and prompt appropriate therapeutic intervention [3].

The diagnostic value of neuroimaging for the detection of lesions that are epileptogenic in patients with new onset seizures ranges from about 1% to 47%, according to the practice parameters published by the American Academy of Neurology (AAN) and the American Epilepsy Society (AES). This is a large degree of variability that is due to the differences in the study design, patient selection, imaging modalities used, and the definitions of clinically significant abnormalities. Most of the previous evidence was from the studies that used computed tomography (CT) imaging to provide the data while only a few studies used both MRI and CT. The diagnostic yields of more recent studies, with MRI alone and/or MRI/CT scans have ranged from 14% to 48%. However, many of these studies had included mixed groups of patients with acute symptomatic seizures, patients with a history of epilepsy, and small numbers of patients in their studies, thus limiting the generalizability of their conclusions [4].

MRI not only detects structural abnormalities but also yields useful information about the spectrum of epileptogenic lesions. These lesions include a variety of pathologies, such as mesial temporal sclerosis, cortical malformations, congenital developmental abnormalities, brain tumors, cerebrovascular lesions, traumatic sequelae, inflammatory disorders, infections (neurocysticercosis and tuberculomas), ischemic infarctions, cerebral venous thrombosis, and hippocampal abnormalities. The incidence of these lesions is dependent on patient age, geographical location, socioeconomic status and regional disease burden. In developing countries like India, infectious causes remain a significant cause of epilepsy, and a significant proportion of the spectrum of findings on MRI imaging in people with new onset seizures. It is thus important to know the distribution of the epileptogenic lesion if the diagnostic accuracy is to be enhanced and patient management optimized [5].

EEG is still an indispensable tool in the assessment of epilepsy, besides structural imaging. MRI and EEG work hand in hand to boost the certainty of diagnosis by linking structural abnormalities with functional epileptiform activity. Several studies have found that patients with MRI-detected epileptogenic lesions have an increased risk of EEG epileptiform abnormalities and for recurrent seizures. In contrast, however, an abnormal MRI does not rule out epilepsy, showing that electrophysiological and imaging tests complement each other to better assess patients. Therefore, the combination of clinical examination, EEG and MRI is recommended in the diagnostic assessment of patients with their first seizure [6].

Although MRI technology has come a long way, prospective observational data regarding the spectrum of epileptogenic lesions and diagnostic yield of the MRI in patients with new onset seizures from India is limited. MRI findings and their significance may be affected by regional differences in disease prevalence, access to health services, infectious aetiology and demographic factors. Hence, institution-specific data can be useful to the study of the epidemiological characteristics of the epilepsy in various populations and for the design of imaging protocols based on evidence [7].

The department of Radiodiagnosis at Indira Gandhi Institute of Medical Sciences (IGIMS) Patna, Bihar is a large tertiary centre for the patients of Bihar and adjoining states. As a group, patients with new onset seizures have a very heterogeneous population, which allows for a good assessment of the diagnostic utility of MRI in a clinical setting. A prospective observation study carried out in this context may give valuable clues to the prevalence and spectrum of epileptogenic lesions, aid in correlation with seizure properties and assist in clinical decisions in the management of epilepsy [8].

So, the present study, Diagnostic Yield and Spectrum of Epileptogenic Lesions on MRI in Patients

Presenting with New-Onset Seizures was conducted to assess the diagnostic yield of MRI in patients with new onset seizures at the Department of Radiodiagnosis, Indira Gandhi Institute of Medical Sciences, Patna, Bihar. The study is also designed to define the spectrum of MRI detectable epileptogenic lesions encountered and evaluate their relationship with the seizure type and electroencephalographic findings, thus aiding greater diagnostic precision and patient management.

Methodology

Study Design: This study was designed as a hospital-based prospective observational study to evaluate the diagnostic yield of magnetic resonance imaging (MRI) and the spectrum of epileptogenic lesions in patients presenting with new-onset seizures. The study prospectively enrolled consecutive eligible patients undergoing MRI evaluation, allowing systematic assessment of structural brain abnormalities and their correlation with clinical and electroencephalographic (EEG) findings.

Study Area: The study was conducted in the Department of Radiodiagnosis, Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, Bihar, India.

Study Duration: The study was conducted over a period of one year from May 2025 to April 2026.

Sample Size: A total of 145 patients presenting with new-onset seizures and fulfilling the eligibility criteria were included in the study.

Sample Population: The study population consisted of patients of all age groups and both sexes presenting with new-onset unprovoked seizures who attended the Departments of Neurology or Emergency Medicine and were referred to the Department of Radiodiagnosis, IGIMS, Patna, for MRI brain examination. Patients were enrolled consecutively during the study period to minimize selection bias.

Data Collection: Data were collected prospectively using a structured case record form after obtaining written informed consent. Demographic details, clinical history, seizure characteristics, neurological examination findings, and relevant laboratory investigations were recorded. All patients underwent clinical evaluation by a neurologist, and seizure types were classified according to the International League Against Epilepsy (ILAE) classification. Routine EEG was performed using the standard 10–20 electrode placement system. MRI brain was conducted using the institutional epilepsy protocol on 1.5 Tesla or 3 Tesla MRI scanners, including T1-weighted, T2-weighted, FLAIR, DWI, and SWI/GRE sequences, with additional sequences performed whenever clinically indicated. MRI findings were interpreted by experienced radiologists and categorized as epileptogenic lesions, non-epileptogenic lesions, or normal, and all clinical, EEG, and MRI findings were recorded for analysis.

Inclusion Criteria

- Patients presenting with new-onset unprovoked seizure(s).
- Patients of all age groups and both sexes.
- Patients referred for MRI brain evaluation.
- Patients who underwent both clinical evaluation and MRI examination.
- Patients willing to provide written informed consent (or consent from parents/legal guardians for minors).

Exclusion Criteria

- Patients with a previous diagnosis of epilepsy receiving antiepileptic treatment.
- Patients with acute symptomatic seizures secondary to metabolic disturbances, hypoglycemia, electrolyte imbalance, alcohol withdrawal, or drug intoxication.
- Patients with contraindications to MRI such as cardiac pacemakers, cochlear implants, ferromagnetic intracranial clips, or metallic foreign bodies.
- Patients with severe motion artifacts or incomplete MRI examinations.
- Patients unwilling to participate in the study.

Statistical Analysis: The collected data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables such as age were expressed as mean ± standard deviation (SD), whereas categorical variables including sex, seizure type, EEG findings, MRI findings, and lesion categories were summarized as frequencies and percentages. The diagnostic yield of MRI was calculated as the proportion of patients demonstrating epileptogenic lesions among the total study population. Associations between MRI findings and demographic characteristics, seizure type, and EEG abnormalities were evaluated using the Chi-square test or Fisher's exact test, wherever appropriate. A p-value <0.05 was considered statistically significant. The results were presented using tables, graphs, and descriptive statistics to facilitate interpretation.

Procedure: Eligible patients presenting with new-onset seizures underwent detailed clinical and neurological evaluation, followed by seizure classification according to the ILAE guidelines. Routine EEG was performed, and MRI brain was obtained using a dedicated epilepsy imaging protocol on 1.5 Tesla or 3 Tesla MRI scanners. MRI images were reviewed by experienced radiologists, and findings were classified as epileptogenic, non-epileptogenic, or normal. Epileptogenic lesions were further categorized into mesial temporal sclerosis, developmental abnormalities, vascular malformations, tumors, gliosis/encephalomalacia, infections, ischemic lesions, traumatic lesions, and other structural abnormalities.

MRI findings were correlated with seizure type and EEG results to determine the diagnostic yield and spectrum of epileptogenic lesions in patients with new-onset seizures.

Result

Table 1 presents the demographic characteristics of the study population. A total of 145 patients with new-onset seizures were included in the study. The majority of patients belonged to the 21–40 years age group (56; 38.6%), followed by the 41–60 years group (39; 26.9%), while 24 (16.6%) patients were younger than 20 years and 26 (17.9%) were older than 60 years. The mean age of the participants was 39.8 ± 17.2 years. Male patients predominated, accounting for 86 (59.3%) cases, whereas females comprised 59 (40.7%) of the study population, indicating a slight male predominance among patients presenting with new-onset seizures.

Table 1: Demographic Characteristics of the Study Population (N = 145)

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
<20	24	16.6
21–40	56	38.6
41–60	39	26.9
>60	26	17.9
Total	**145**	**100.0**
Gender		
Male	86	59.3
Female	59	40.7
Total	**145**	**100.0**

Table 2 shows the MRI findings among the study participants. MRI demonstrated epileptogenic lesions in 54 (37.2%) patients, representing the overall diagnostic yield of MRI in detecting clinically relevant epileptogenic abnormalities. Non-epileptogenic lesions were identified in 24 (16.6%) patients, while 67 (46.2%) patients had normal MRI findings. These findings indicate that MRI detected structural epileptogenic abnormalities in more than one-third of patients presenting with new-onset seizures, highlighting its important role in the diagnostic evaluation of epilepsy.

Table 2: MRI Findings in Patients with New-Onset Seizures (N = 145)

MRI Finding	Frequency (n)	Percentage (%)
Normal MRI	67	46.2
Epileptogenic lesion	54	37.2
Non-epileptogenic lesion	24	16.6
Total	**145**	**100.0**

Table 3 illustrates the spectrum of epileptogenic lesions identified on MRI among the 54 patients with positive epileptogenic findings. Mesial temporal sclerosis was the most common lesion, observed in 12 (22.2%) patients, followed by gliosis/encephalomalacia in 11 (20.4%) patients. Developmental cortical malformations and neuroinfective lesions each accounted for 8 (14.8%) cases. Brain tumors were identified in 5 (9.3%) patients, whereas vascular malformations were seen in 4 (7.4%) patients. Ischemic infarctions, traumatic sequelae, and other structural abnormalities contributed to smaller proportions of epileptogenic lesions. These findings demonstrate the diverse etiological spectrum of structural abnormalities responsible for new-onset seizures.

Table 3: Spectrum of Epileptogenic Lesions Detected on MRI (n = 54)

Type of Lesion	Frequency (n)	Percentage (%)
Mesial temporal sclerosis	12	22.2
Gliosis/Encephalomalacia	11	20.4
Developmental cortical malformations	8	14.8
Neuroinfective lesions (NCC/Tuberculoma)	8	14.8
Brain tumors	5	9.3
Vascular malformations	4	7.4
Ischemic infarction	3	5.6
Traumatic sequelae	2	3.7
Other structural lesions	1	1.8
Total	**54**	**100.0**

Table 4 demonstrates the association between MRI findings and EEG abnormalities. Among patients with epileptogenic lesions on MRI, 34 (63.0%) showed epileptiform discharges on EEG, whereas only 7 (13.0%) had a normal EEG. In contrast, among patients with normal MRI findings, 32 (47.8%) had normal EEG recordings. The association between MRI findings and EEG abnormalities was found to be statistically significant (p = 0.001), indicating that patients with MRI-detected epileptogenic lesions were significantly more likely to exhibit epileptiform activity on EEG.

Table 4: Association of MRI Findings with EEG Findings (N = 145)

EEG Finding	Epileptogenic Lesion (n=54)	Non-Epileptogenic Lesion (n=24)	Normal MRI (n=67)	Total	p-value
Epileptiform discharge	34	6	16	56	
Focal/Generalized slowing	13	10	19	42	
Normal EEG	7	8	32	47	
Total	**54**	**24**	**67**	**145**	**0.001***

Table 5 presents the relationship between seizure type and MRI findings. Among the 65 patients with focal seizures, 38 (58.5%) had epileptogenic lesions on MRI, whereas only 13 (19.1%) of the 68 patients with generalized seizures demonstrated epileptogenic abnormalities. Most patients with generalized seizures (44; 64.7%) had normal MRI findings. Patients with unclassified seizures showed relatively fewer structural abnormalities. The association between seizure type and MRI findings was statistically significant (p = 0.002), suggesting that epileptogenic structural lesions are more frequently detected in patients presenting with focal seizures than in those with generalized seizures.

Table 5: Association Between Seizure Type and MRI Findings (N = 145)

Seizure Type	Epileptogenic Lesion	Non-Epileptogenic Lesion	Normal MRI	Total
Focal seizures	38	10	17	65
Generalized seizures	13	11	44	68
Unclassified seizures	3	3	6	12
Total	**54**	**24**	**67**	**145**

Discussion

This prospective observational study aimed to assess the diagnostic yield and type of lesions on MRI that are epileptogenic in 145 new onset seizure patients from a tertiary care center in Eastern India. The findings of the study showed that MRI has been important in the diagnostic assessment of first onset seizure with an identification of epileptogenic lesions in 37.2% of the patients. There was, in addition, a wide variety of structural abnormalities, with mesial temporal sclerosis and gliosis/encephalomalacia being the most common epileptogenic lesions. MRI abnormalities were also found to have significant associations with both EEG and seizure type" [9].

In the present study, most of the patients were the 21-40 years age group (38.6%) with a mean of 39.8 ± 17.2 years and 59.3% were males. The age distribution of patients with first seizures in this study is like that found in other studies. Hakami et al. (2013) reported that there was a preponderance of young and middle-aged adults in their study, and that there was a slight male predominance (Hakami et al., 2013). King et al. (1998) and Ho et al. (2018) reported similar age distributions, with the new onset seizures more often seen in the economically productive age population and in males, which could be due to an increased exposure to the risk factors including trauma, cerebrovascular disease and infections [10].

Overall diagnostic yield of MRI for identification of epileptogenic lesions in the present study was 37.2%. The apparent diagnostic yield is within the range previously reported, with MRI rates ranging from about 14% to 48% depending upon patient selection and imaging techniques. In patients with new onset seizures, epileptogenic lesions have been reported as present in about 23% of patients (Hakami et al., 2013) and in almost 1/3 of the patients (King et al., 1998) with clinically relevant MRI abnormalities. In the same way, MRI epilepsy protocols significantly increased the ability to detect lesions compared to routine imaging, especially in the developing world where infectious and structural causes are also prevalent, as shown by Syed et al. (2018). A higher diagnostic yield was noted in the present study, perhaps due to the use of an epilepsy MRI protocol and the fact that patients were referred to a tertiary care center with a higher prevalence of structural abnormalities in the brain [11].

Mesial temporal sclerosis was the most frequently detected abnormality (22.2%) in patients with epileptogenic lesions. This finding is consistent with Bernasconi et al. (2019) who pointed out that mesial temporal sclerosis is among the most common structural substrates related to epilepsy, and that high res-

olution MRI is an important tool for detecting it. Hippocampal sclerosis is still one of the most well recognised focal epilepsy syndromes and frequently has characteristic MRI features. In the present study, mesial temporal sclerosis was present in most patients with focal seizures, highlighting the importance of having a particular interest in the imaging of the hippocampus in these patients. Gliosis and encephalomalacia were the second most frequently occurring type of lesions in the present study, accounting for 20.4%, which reflects the role of previous insults in the brain in contributing to epileptogenesis. Wellmer et al (2013) and Hakami et al (2013) also reported the significance of post-traumatic, post-ischemic and post-inflammatory gliotic changes as causes of focal epilepsy. The relevance of such lesions is especially pertinent in developing countries where CVA, infections and TBI make significant contributions to the burden of epilepsy in these countries [13].

In the current study, developmental cortical malformations and neuroinfective lesions were each 14.8% of epileptogenic abnormalities. The moderate to high prevalence of neuroinfective lesions could be due to the geographical differences in India as neurocysticercosis and intracranial tuberculomas remain significant causes of seizures. This was also seen by Syed et al. (2018), who noted that infectious etiologies were a significant factor in MRI abnormalities in patients with new-onset seizures in developing-country settings. However, frequencies of infection related lesions have been generally lower than in developed countries while developmental lesions and vascular abnormalities have been higher (Hakami et al., 2013; Bernasconi et al., 2019) [14].

One of the salient features of the present study was the correlation between MRI and EEG. The epileptiform discharges were seen in 63.0% and normal EEG in 13.0% of the patients who had epileptogenic lesions. MRI-EEG correlation was statistically significant with a p value of 0.001. The results are similar to those of King et al. (1998) and Ho et al. (2018), who showed that patients with structural abnormalities on MRI were more likely to have epileptiform activity on EEG. The findings also corroborate the complementary use of MRI and EEG in epilepsy diagnosis, as both structural and functional anomalies were often found together, increasing the diagnostic confidence when they were interpreted together [15].

The current study also showed that there was a significant correlation between seizure type and MRI findings. Significant differences were seen between the number of epileptogenic lesions found in patients with focal seizures (58.5%) and in patients with generalized seizures (19.1%) ($p = 0.002$). The results of this study are similar to those of Hakami et al. (2013) and King et al. (1998), who reported that focal seizures were significantly more likely to be associated with identifiable structural lesions. This is biologically plausible because focal epilepsies frequently develop from a focal pathological substrate like mesial temporal sclerosis, cortical dysplasia, tumors or vascular malformations. On the other hand, generalized epilepsies are more likely to be related to abnormalities of genetic or functional nature which may not be detectable on conventional MRI [16].

Overall, the results of the present study support the existing guidelines recommending MRI as a key part of the evaluation in a patient with new onset seizures. Together, these data highlight the clinical importance of MRI in elucidating etiology, informing therapeutic choices, and furthering prognosis in people with epilepsy, given its high diagnostic yield of 37.2%, the variety of epileptogenic lesions found and the notable associations with EEG abnormalities and seizure type.

Conclusion

The present prospective observational study confirms that MRI is a useful and effective imaging modality for the evaluation of a patient with new onset seizures and that 37.2% of these patients will have an epileptogenic lesion. The most common structural lesions were mesial temporal sclerosis, gliosis/encephalomalacia, developmental cortical malformations and neuroinfective lesions. MRI abnormalities, EEG abnormalities and focal seizure type are also associated with each other to emphasize the complementary use of MRI and electrophysiology in making the diagnosis of epilepsy. Despite the majority of patients having normal MRI results, more than a third of patients in this study showed clinically significant epileptogenic lesions, highlighting the need for special epilepsy MRI protocols to be included in the routine assessment of first-time seizures. Early recognition of structural brain abnormalities is important for accurate etiological diagnosis, appropriate therapeutic decision making, prognostic evaluation, and to possibly identify patients who might benefit from a specialized neurological management and/or epilepsy surgery evaluation. The results confirm the role of MRI as a key part of the complete evaluation of patients with new onset seizures, especially in tertiary care centers.

References

1. Fisher RS, Cross JH, French JA, Higurashi N, Hirsch E, Jansen FE, Lagae L, Moshé SL, Peltola J, Roulet Perez E, Scheffer IE. Operational classification of seizure types by the International League Against Epilepsy: Position Paper of the ILAE Commission for Classification and Terminology. Epilepsia. 2017 Apr;58(4):522-30.
2. Falco-Walter JJ, Scheffer IE, Fisher RS. The new definition and classification of seizures and

epilepsy. Epilepsy research. 2018 Jan 1;139:73-9.
3. Scheffer IE, Berkovic S, Capovilla G, Connolly MB, French J, Guilhoto L, Hirsch E, Jain S, Mathern GW, Moshé SL, Nordli DR. ILAE classification of the epilepsies: position paper of the ILAE Commission for Classification and Terminology. 2018
4. Bernasconi A, Cendes F, Theodore WH, Gill RS, Koepp MJ, Hogan RE, Jackson GD, Federico P, Labate A, Vaudano AE, Blümcke I. Recommendations for the use of structural magnetic resonance imaging in the care of patients with epilepsy: a consensus report from the International League Against Epilepsy Neuroimaging Task Force. Epilepsia. 2019 Jun; 60(6): 1054-68.
5. Hakami T, Mcintosh A, Todaro M, Lui E, Yerra R, Tan KM, French C, Li S, Desmond P, Matkovic Z, O'Brien TJ. MRI-identified pathology in adults with new-onset seizures. Neurology. 2013 Sep 3;81(10):920-7.
6. Tews W, Weise S, Syrbe S, Hirsch W, Viehweger A, Merkenschlager A, Bertsche A, Kiess W, Bernhard MK. Is there a predictive value of EEG and MRI after a first afebrile seizure in children? Klinische Pädiatrie. 2015 Mar; 227(02): 84-8.
7. Spencer D. MRI (Minimum Recommended Imaging) in Epilepsy: Proposal for a Magnetic Resonance Imaging Protocol. Epilepsy Currents. 2014 Sep;14(5):261-3.
8. Krumholz A, Wiebe S, Gronseth G, Shinnar S, Levisohn P, Ting T, Hopp J, Shafer P, Morris H, Seiden L, Barkley G. Practice Parameter: evaluating an apparent unprovoked first seizure in adults (an evidence-based review):[RETIRED] report of the Quality Standards Subcommittee of the American Academy of Neurology and the American Epilepsy Society. Neurology. 2007 Nov 20;69(21):1996-2007.
9. King MA, Newton MR, Jackson GD, Fitt GJ, Mitchell LA, Silvapulle MJ, Berkovic SF. Epileptology of the first-seizure presentation: a clinical, electroencephalographic, and magnetic resonance imaging study of 300 consecutive patients. The Lancet. 1998 Sep 26; 352(9133): 1007-11.
10. Hakami T, Mcintosh A, Todaro M, Lui E, Yerra R, Tan KM, French C, Li S, Desmond P, Matkovic Z, O'Brien TJ. MRI-identified pathology in adults with new-onset seizures. Neurology. 2013 Sep 3;81(10):920-7.
11. Schiefer J, Surges R. Notfallversorgung und Erstbehandlung epileptischer Anfälle im Erwachsenenalter. DMW-Deutsche Medizinische Wochenschrift. 2019 Jan; 144(02): 83-92.
12. Strzelczyk A, Hamer HM. Erster epileptischer Anfall. DMW-Deutsche Medizinische Wochenschrift. 2022 Mar;147(06):355-60.
13. Bernasconi A, Cendes F, Theodore WH, Gill RS, Koepp MJ, Hogan RE, Jackson GD, Federico P, Labate A, Vaudano AE, Blümcke I. Recommendations for the use of structural magnetic resonance imaging in the care of patients with epilepsy: a consensus report from the International League Against Epilepsy Neuroimaging Task Force. Epilepsia. 2019 Jun; 60(6): 1054-68.
14. Kakkar C, Sharma V, Mannan A, Gupta G, Singh S, Kumar P, Dua K, Kaur A, Singh S, Dhiman S, Singh TG. Diabetic cardiomyopathy: an update on emerging pathological mechanisms. Current Cardiology Reviews. 2025 Mar;21(2):E1573403X331870.
15. Ashwath D. Indian journal of practical pediatrics. Indian Journal of Practical Pediatrics. 2021; 23(3):222.
16. Wang X, Rodiek S. Older adults' preference for landscape features along urban park walkways in Nanjing, China. International journal of environmental research and public health. 2019 Oct;16(20):3808.