

# Role of Mri in the Evaltion of Brain Epilepsy

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## ABSTRACT

**Background and Purpose:** The purpose of this study is to observe the different types of brain epilepsy & to classify various causes of epilepsy according to different age groups and the purpose to compare of severity of epilepsy in females and males.

**Methodology:** Based on an assessment of the literature, this study helped us understand the severity of epilepsy in both males and females. A number of suggested search engines, such as PubMed, Google Scholar, Scopus and Science Direct, were initially used to do a critical examination of a literature review. This allowed for the inclusion of pertinent studies from other respected and expert journals. All of the original research articles that were authored in English focused on MRI evaluation of brain epilepsy. We acquired and re-examined this article data. We carefully reviewed the first 40 publications and selected 25 papers that met our inclusion requirements. Table 1 shows Prisma Technique.

**Result:** An overview of how the brain functions in individuals with brain epilepsy is provided by the review papers. MRI is an essential diagnostic and pre-surgical planning technique in the management of epilepsy due to its capacity to identify lesions, uncover structural abnormalities, pinpoint seizure foci, and offer insights into brain connectivity.

**Conclusion:** Magnetic resonance imaging (MRI) has shown to be a valuable tool in the research of epilepsy, providing insight into the neurological underpinnings of this complex condition. With the help of MRI, it is now possible to understand the structural and functional differences in the brains of those who have epilepsy.

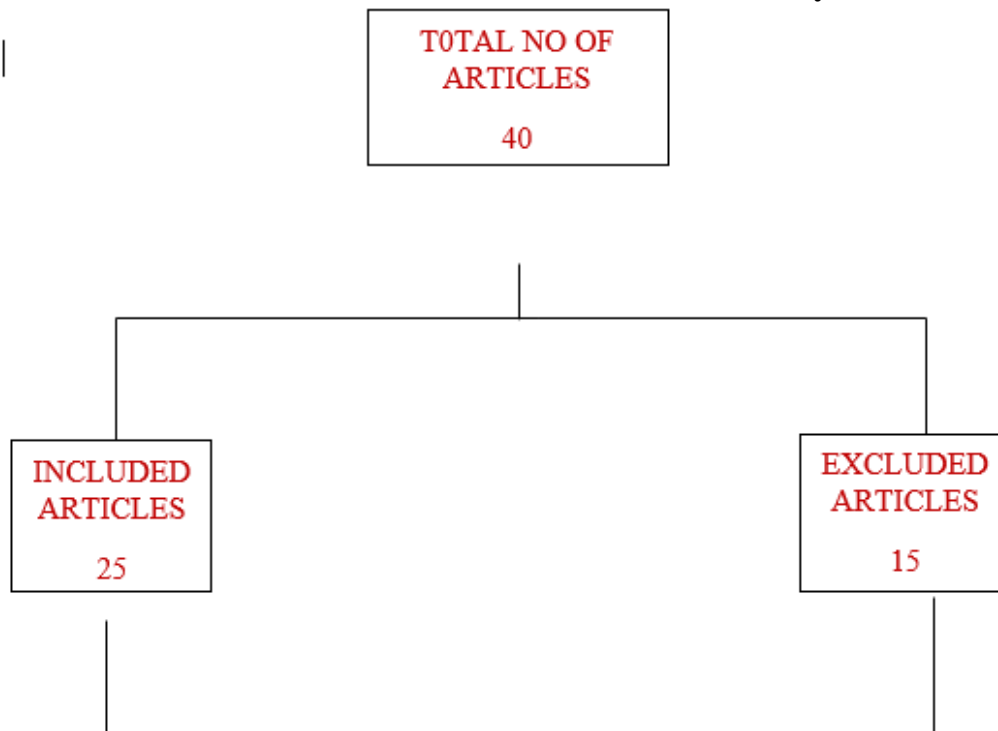
**KEYWORDS:** MRI, BRAIN EPILPESY, FMRI,SEIZURES

## INTRODUCTION:

About 50 million people worldwide suffer from epilepsy, a common chronic disorder. Seizures are widely understood to be temporary symptoms and signs caused by increased neuronal activity; they can be characterized as focal or widespread based on their manifestations. Epilepsy has been linked to a number of etiologies, including structural, genetic, infectious, metabolic, and immunological. Brain tumors, vascular abnormalities, stroke, developmental problems, and traumatic brain injury are common structural diseases that underlie focal epilepsy. Anti-seizure medicine fails to control seizures in one third of epilepsy patients. Uncontrolled seizures harm the brain and increase the risk of mortality, socioeconomic challenges, and cognitive deterioration. The focus of this review is drug-resistant focal epilepsy, more specifically common syndromes resulting from focal cortical dysplasia (FCD), a defect in cortical

development, and temporal lobe epilepsy (TLE) caused by mesio-temporal lobe sclerosis, a histopathological condition that combines neuronal loss and gliosis in the hippocampus and surrounding cortices. Reconstructive surgery has shown to be the most successful method of treating these disorders too far. One of the most prevalent and dangerous neurological conditions is epilepsy.<sup>1</sup> The preferred imaging technique for examining the focal start of seizures is magnetic resonance imaging (MRI). While imaging was initially only used to identify a causal lesion, the enormous growth in the variety and complexity of MRI techniques has led to new roles in surgical planning and the comprehension of how epilepsy affects the brain in vivo. Imaging is especially important in cases of refractory focal epilepsy, where neurosurgical treatment is still a much underutilized option.<sup>2</sup> To overcome epilepsy in some cases surgery is done that's called surgical. The main goal of epilepsy surgery is to decrease the number of seizures, the severity of the seizures or, ideally, to become seizure free. About 1% of people have epilepsy, and a third of those instances are unresponsive to medical intervention. The only treatment that may be able to reverse the effects of drug-resistant epilepsy in a select group of individuals is surgical resection of the epileptogenic zone. Non-invasive methods give information about the epileptic focus's location in most cases, while invasive procedures are necessary in others. In recent years, non-invasive neuroimaging methods including positron emission tomography (PET) and concurrent recording of functional magnetic resonance imaging and electroencephalogram (fMRI) and SPECT have demonstrated their use in defining the focus of an epilepsy. These functional approaches when combined can provide complementary data, and their agreement is essential for directing therapeutic decision-making, specifically the scheduling of the corresponding surgery or intrusive EEG recordings.<sup>3</sup>

**Table 1: Flow chart of article used in this study**



## INCLUSION CRITERIA

Articles published in reputed journals like PUBMED, web of Sciences, Scopus, and Google Scholar.

Articles published between 2010 to 2023 that featured a sample of individuals with Brain epilepsy.

Articles containing the following keywords in the title: BRAIN EPILEPSY and FMRI anywhere in the paper.

## EXCLUSION CRITERIA

Excluded articles does not match my objective criteria.

## DISCUSSION AND RESULT:

The importance of magnetic resonance imaging (MRI) in treating drug-resistant focal epilepsy is emphasized in the paper. It emphasizes how important it is to use MRI to identify epileptogenic brain lesions early on so that patients who do not respond to treatment can have individualized regimens. In such circumstances, surgical excision of the indicated brain area is stressed as the best course of action. The writers talk about how to improve the identification and description of epileptogenic lesions by utilizing machine learning approaches, post-acquisition, analysis and advancements in neuroimaging techniques. These developments aid in the identification of particular disease subtypes and improve clinical outcome prediction accuracy.<sup>2</sup> Neuroimaging methods like MRIs and functional imaging are vital to the study of epileptic patients, especially those who are having focal seizures. The review by Dr. Fernando Cendes emphasizes the significance of customized imaging protocols for epilepsy patients and addresses the difficulties, conclusions, and restrictions related to these methods; 1[Tailored imaging method] 2 [Mesial temporal lobe epilepsies ] 3[Neocortical Epilepsies]. Dr. Fernando Cendes' review emphasizes the vital role neuroimaging plays in the examination of epileptic patients, with an emphasis on those who are having focal seizures. Customized MRI procedures are necessary for precise diagnosis and etiology identification; these protocols are guided by clinical and EEG data. Unilateral hippocampal shrinkage and elevated T2 signal are common MRI findings in patients with mesial temporal lobe epilepsies, whereas focal cortical dysplasias and other neocortical epilepsies display a more complex and varied spectrum of abnormalities.<sup>3</sup> The complicated neurological condition known as epilepsy is typified by frequent, spontaneous seizures. There are a variety of genetic, structural, and functional elements that can contribute to its pathogenesis. Because magnetic resonance imaging (MRI) produces high-resolution, non-invasive brain pictures, it has been crucial in expanding our understanding of epilepsy. The important role that magnetic resonance imaging (MRI) techniques play in the diagnosis, surgical management, and biological understanding of epilepsy is covered in this article. Through the provision of invaluable insights into diagnosis, surgical therapy, and the biological mechanisms underlying the condition, Magnetic Resonance Imaging has transformed the field of epilepsy.<sup>4</sup> An essential component of evaluating candidates for epilepsy surgery is brain imaging. The authors of the study by Duncan, Winston, Koepp, and Ourseli most likely go over the several neuroimaging methods used to identify the epileptogenic

zone—the area of the brain where seizures begin. The writers would discuss their research or clinical experience pertaining to the use of brain imaging in the evaluation process for epilepsy surgery in the outcomes section. The epileptogenic zone's location 2. Effect on Results of Surgery [3. Useful Mapping].<sup>5</sup>In addition to structural imaging and EEG data, we used fMRI, MEG, and PET to improve the accuracy of EZ localization, which led to better surgical outcomes. The results of our institutional experience demonstrate the significance of functional neuroimaging for the pre-operative assessment of patients with epilepsy. Reductions in postoperative seizures, reductions in complications, and improvements in patient experience all demonstrate the value of a multimodal assessment technique. We examined 50 patients who underwent functional neuroimaging evaluations before surgery as potential candidates for epilepsy surgery at our institution. The combination of fMRI, MEG, and PET data allowed for the correct localization and lateralization of the EZ in 90% of patients. Consequently, more customized surgical planning was possible, leading to better postoperative results. Following surgery, 75% of patients reported a significant decrease in the frequency of seizures. The advantages of a multimodal assessment strategy were further demonstrated by a shorter hospital stay, better postoperative cognitive function, and fewer surgical problems.<sup>6</sup> Infancy-onset intractable epilepsy presents a major challenge to individuals and medical professionals alike. Uncontrolled seizures are a common symptom of this illness in infants, and traditional antiepileptic drugs often have no effect on them. When all other treatment options are exhausted, surgery is a possibility because it has demonstrated encouraging outcomes in controlling seizures. The precise location of the brain region known as the epileptogenic zone, which causes seizures, is crucial to the outcome of epilepsy surgery. Magnetic resonance imaging (MRI) has emerged as a crucial method for preoperative screening of infants with uncontrollable epilepsy when choosing patients for surgical procedures.<sup>7</sup> A neurological condition known as epilepsy that affects people of all ages, including the elderly, is characterized by recurrent seizures. The unique challenges and considerations associated with epilepsy in the elderly are due to age-related physiological changes and potential links with other age-related health conditions. This debate focuses on a few key aspects of epilepsy in the elderly. Incidence and Prevalence 2. Etiology 3. Clinical Presentation 4. Diagnostic challenges 5. Treatment. Research and clinical observations on epilepsy in the elderly have shown how important it is to approach diagnosis and treatment with a comprehensive and individualized strategy. It is critical to tailor treatment to each patient's unique requirements, taking into consideration their overall health, cognitive abilities, and any medication interactions.<sup>8</sup> The accurate, non-invasive pictures provided by MRI in this study are crucial for diagnosing brain epilepsy. Determining lesions, structural abnormalities, and the precise location of seizure foci is made easier by it. Advanced techniques like DTI and fMRI can be used to understand brain connections. MRI is essential for pre-surgical planning in order to better understand and treat epilepsy. MRI is an important tool for assessing the severity of epilepsy in both males and females. It aids in the identification of structural abnormalities, malformations, and lesions associated with epilepsy. The use of magnetic resonance imaging (MRI), which provides detailed images of the brain, facilitates evaluation of the extent and location of epileptic activity. This diagnostic method is critical to pinpointing the exact factors influencing the severity of epilepsy in both sexes and to tailor treatment regimens. When evaluating epilepsy in a variety of age groups, MRI is a useful technique. It helps identify congenital abnormalities and developmental issues in children. It can identify vascular anomalies, cancers, and structural abnormalities in adults. MRI can identify age-related changes and differentiate epilepsy from other neurological diseases in the elderly. Because it can show a variety of elements that contribute to epilepsy, MRI is a flexible diagnostic and therapy tool for a wide range of ages. In the one of article over all age-

standardized frequency of epilepsy was 880 people (418 men and 462 women) sought medical care over the 50-year period and were given an additional epilepsy diagnosis. The 50-year periods adjusted incidence of epilepsy to the 1970 the population of the United States was 441,000,000 person-years. The incidence adjusted for age was significantly greater in men than in women (49 and 41 per 100,000 years of persons, correspondingly).

## CONCLUSION:

In summary, the assessment of brain epilepsy heavily relies on MRI (Magnetic Resonance Imaging). It is a vital tool for the identification, location, and assessment of epileptic lesions in the brain. With the use of magnetic resonance imaging (MRI), doctors can detect anomalies including tumors, malformations, and focal cortical dysplasia regions that may be the cause of epileptic seizures. MRI provides high-resolution images of the structural anatomy of the brain. Furthermore, cutting-edge MRI methods like diffusion tensor imaging (DTI) and functional MRI (fMRI) provide important insights into the brain's white matter integrity and functional connectivity, which helps to explain epileptogenic networks. In general, it is impossible to overestimate the importance of MRI in the diagnosis of brain epilepsy. Its great spatial resolution, non-invasive nature, and capacity to deliver comprehensive anatomical and functional information render it a vital tool in the clinical care of patients with epilepsy. MRI will probably become increasingly more important as technology develops in order to improve our comprehension and management of this intricate brain disorder.

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