New-onset Seizures in Adults: Low Diagnostic Yield of Gadolinium Contrast in Initial Brain MRI Evaluation

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INTRODUCTION

- In absence of neoplasm or infection, the diagnostic accuracy of MRI without contrast versus contrast-enhanced MRI for detecting epileptogenic structural abnormalities is not well-defined in the literature.
- Historically, guidelines for appropriate imaging protocol in the workup for these patients have placed equal appropriateness on both non-contrast MRI of the brain and MRI of the brain with/without contrast.[1-3]
- More recently, the American College of Radiology (ACR) has updated their recommendation for these patients to include an initial MRI brain without contrast, with the subsequent use of contrast if needed.[4]
- These new guidelines are based largely on expert opinion, as there remains a paucity of data regarding the utility of contrast in this patient population.[5,6]

OBJECTIVE

To determine whether epileptogenic lesions are identifiable on non-contrast MRI in patients with new-onset seizure, and to determine if intravenous (IV) GBCM adds diagnostic value in absence of suspected neoplasia or infection.

METHODS

- Imaging and clinical data were reviewed for 103 consecutive patients admitted for phase-1 seizure monitoring with the following criteria:
  1) MRI-brain performed with/without intravenous contrast
  2) No clinical suspicion for CNS infection
  3) No history of CNS neoplasia, or suspected metastatic disease
- Readers designated cases as lesional or non-lesional. Lesional cases were further categorized as either visualized on noncontrast sequences only, contrast sequences only, or both.

RESULTS

Characteristic	*Value*
No. of patients	103
Patient sex	
Female	58 (56.3%)
Male	45 (43.7%)
Age (y)(SD)	39.5 (± 12.1)
Epileptogenic lesion detected	29 (28.1%)
Mesial temporal sclerosis	7 (6.7%)
Encephalomalacia	7 (6.7%)
Cortical dysplasia	5 (4.9%)
Grey matter heterotopia	4 (3.9%)
Dysembryoplastic neuroepithelial tumor	2 (1.9%)
Astrocytoma	1 (0.9%)
Cavernous malformation	1 (0.9%)
Tuberous sclerosis complex	1 (0.9%)

Table 1. Demographic and Clinical Characteristics of Study Population

29/103 (28%) patients had epileptogenic lesions [74/103 (72%) were non-lesional studies]

29/29 (100%) lesional abnormalities were detected on non-contrast sequences
(sensitivity 100%[95CI: 88-100], specificity 100% [95CI: 95-100])

23/29 (79.3%) lesional cases were visualized on both non-contrast and post-contrast sequences

6/29 (20.7%) were visualized only on noncontrast sequences.

No lesional cases were detected exclusively on post-contrast sequences

- With an observed non-lesional extraneous contrast MR-imaging rate of 72%, estimated excess cost of contrast MR-imaging per 1,000 patients using Medicare fee data was **$103,680 USD**.

The following figures are representative cases included in the study, showing a lesion visualized on both non-contrast and post-contrast sequences (Figure 1), and lesion visualized best on non-contrast sequence with less conspicuity on post-contrast sequence (Figure 2).

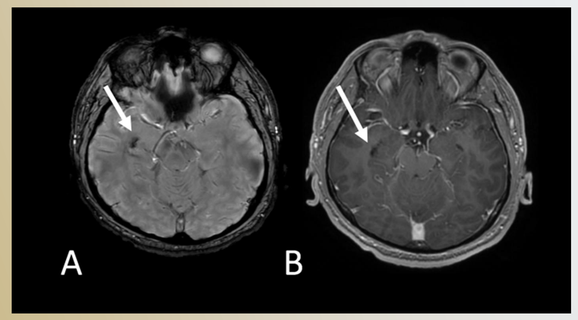

Figure 1. 35-year-old man presenting with seizures localizing to the right temporal lobe. A: Susceptibility weighted images demonstrate a focus of susceptibility (arrow) in the right mesial temporal lobe just lateral to the temporal horn of the lateral ventricle. B: Postcontrast T1 images demonstrate corresponding T1 hypointensity without enhancement (arrow). Imaging findings favored a cavernous malformation, which was subsequently confirmed histologically.

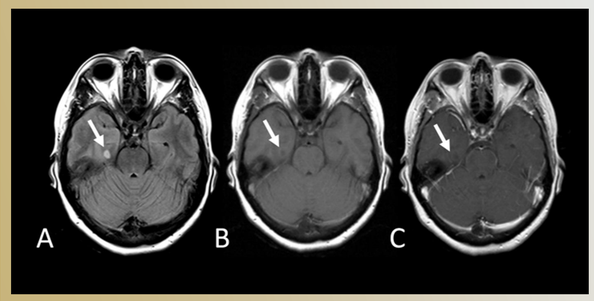

Figure 2. 42-year-old woman presenting with seizures localizing to the right temporal lobe. A: Axial T2/FLAIR sequence demonstrating an ovoid focus of T2/FLAIR hyperintensity in the right mesial temporal lobe (arrow). B: Precontrast T1 weighted sequence demonstrating the lesion to be mildly T1 hypointense C: Postcontrast T1 image demonstrating no associated contrast enhancement. Overall findings were presumed to reflect a low grade primary glioneuronal neoplasm.

CONCLUSION

- Our study found that non-contrast MRI may be adequate for initial evaluation of new-onset seizures in adult patients without suspicion for neoplasm or infection.
- Readers were able to detect all potentially epileptogenic lesions using only noncontrast MR sequences.
- Benefits of limiting the use of GBCM include:
  - Reducing the incidence of contrast reactions.
  - Mitigating the potential detrimental effects of gadolinium deposition in brain & other tissues.
  - Reduce imaging time & costs.
- Future research should expand the number of cases in a larger prospective study with independent readers to allow for inter-reader variability analysis.

SELECTED REFERENCES

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DISCLOSURES

The authors have no disclosures to report.