Low-Field (64mT) Portable Brain MRI in Hospitalized and Emergency Department Patients: Real-World Experience from Our First Two Years

Amy W. Lin[1], Vinu Mathew[1], Shobhit Mathur[1], Yingming Amy Chen[1], Andrew Baker[2], Julian Spears[3], Aditya Bharatha[1]

[1]Department of Medical Imaging, St. Michael's Hospital, University of Toronto, Toronto, Ontario, Canada
[2]Department of Critical Care, St. Michaels' Hospital, University of Toronto, Toronto, Ontario, Canada
[3]Division of Neurosurgery, Department of Surgery, St. Michael's Hospital, University of Toronto, Toronto, Ontario, Canada.

Purpose: Point-of-care portable MRI (pMRI) is a novel technology that allows bedside brain imaging, potentially eliminating the risks and resource demands associated with transporting patients to conventional stationary CT and MRI units. We reviewed our institutional experience with pMRI in hospitalized and emergency department (ED) patients in the first two years after acquiring this technology.

Materials and Methods: We retrospectively reviewed all portable MRI brain scans performed on hospitalized and ED patients at our institution between March 30, 2022 and March 29, 2024. Radiology reports were reviewed and categorized as having new findings not previously documented on imaging, incremental interval changes, or stable/normal findings. The subset of cases with new findings were compared with subsequent conventional stationary CT or MRI brain scans for accuracy.

Results: 194 pMRI scans were performed in hospitalized and ED patients, 192 of which were considered diagnostic quality. Nearly half of the scans had either new findings (30/192 or 16%) or incremental interval changes (58/192 or 30%) that could potentially lead to changes in patient management. The most common new findings not previously documented on imaging were infarcts, hemorrhages, and contusions. The most common incremental interval changes were changes in ventricular size, changes in extra-axial collection size, and changes in mass effect (changes in midline shift, brain herniation, or ventricular compression). Within the subset of patients with new findings that had subsequent conventional stationary CT/MRI brain (0-6 days later), the vast majority (24/26, 92%) were true positives, one was a false positive, and one was indeterminate.

Conclusion: In this largest patient series to date in a real-world setting, pMRI shows promise as a valuable new tool for neuroimaging in hospitalized and ED patients at the bedside that provided actionable information for guiding patient care.

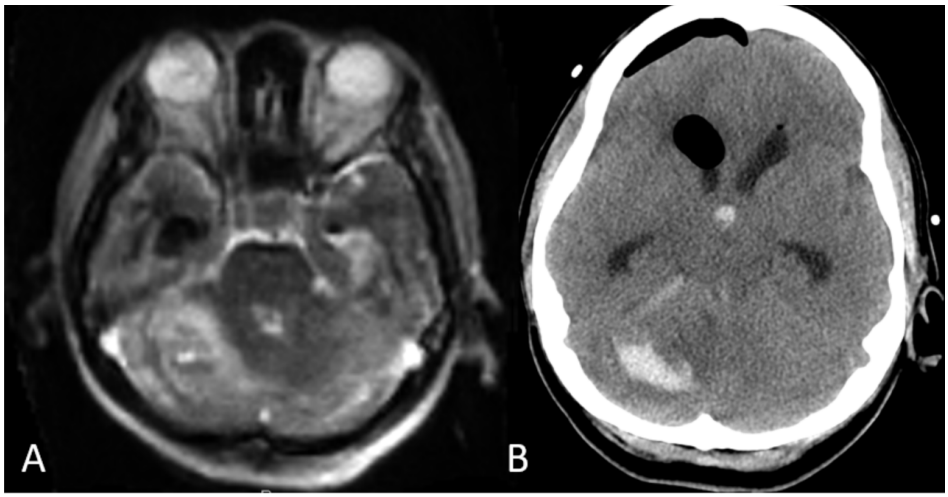

Figure 1 – 51 year old female patient who presented to hospital with acute subarachnoid hemorrhage and hydrocephalus due to anterior communicating artery aneurysm rupture. pMRI performed after EVD insertion (A, T2WI) showed new hemorrhage in the right cerebellum likely representing remote cerebellar hemorrhage, confirmed on subsequent CT head performed later on the same day (B).

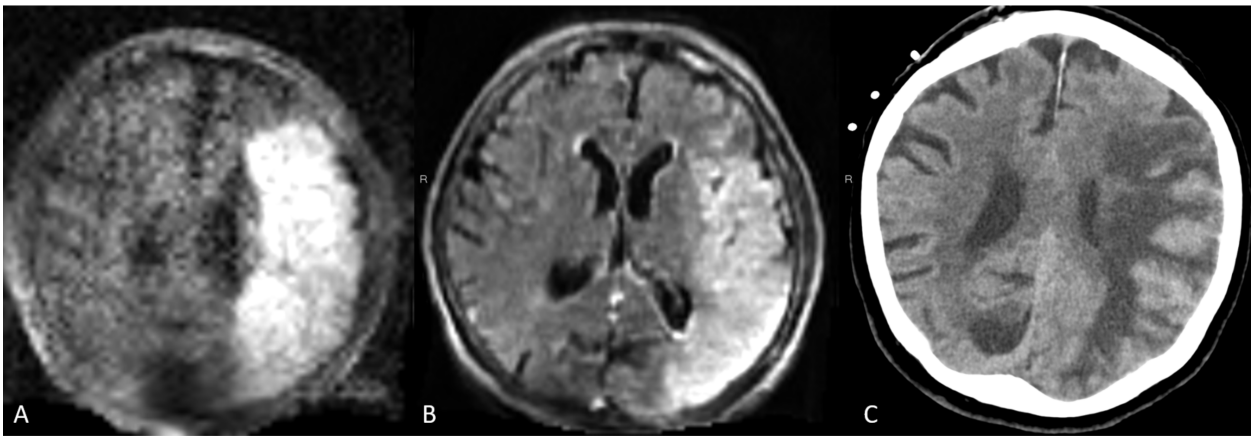

Figure 2 – 79 year old female who presented to hospital with cerebellar infarct and obstructive hydrocephalus, with fluctuating level of consciousness in the ICU. pMRI showed new left MCA territory infarct on DWI (A) and FLAIR (B), confirmed on subsequent CT head (C) performed 3 days later.

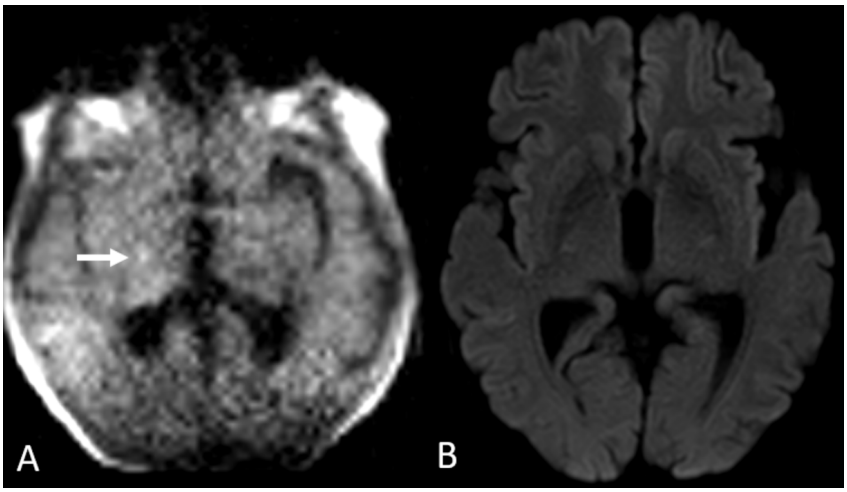

Figure 3 – 75 year old female who presented to hospital with new left-sided weakness. pMRI DWI sequence (A) showed questionable punctate focus of diffusion restriction in the right thalamocapsular region (arrow) raising the possibility for an acute infarct. Conventional stationary MRI brain several hours later showed no diffusion restriction in this area (B).