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Role of Susceptibility Weighted Imaging in Acute Ischemic Stroke: A Cross-Sectional Study

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Abstract: ***Introduction: Acute ischemic stroke (AIS) is a major cause of morbidity and mortality worldwide. Imaging plays a pivotal role in early detection and clinical decision-making. Objective: To assess the diagnostic and prognostic value of Susceptibility Weighted Imaging (SWI) in acute ischemic stroke. Material and Methods: A cross-sectional study was conducted on 86 patients with suspected AIS. MRI including SWI was performed within 7 days of symptom onset. SWI findings were correlated with NIHSS scores, treatment status, and discharge outcomes. Results: SWI abnormalities were present in 39.5% of patients. Microbleeds were the most common finding (16.3%), followed by hemorrhagic transformation (11.6%) and susceptibility vessel signs (9.3%). Hemorrhagic transformation was significantly associated with thrombolytic therapy (p = 0.021). Conclusion: SWI offers valuable diagnostic and prognostic information in AIS. Its routine integration into stroke imaging protocols is recommended.***

Keywords: Susceptibility Weighted Imaging, Acute Ischemic Stroke, Microbleeds, Hemorrhagic Transformation, SVS, MRI

1. Introduction

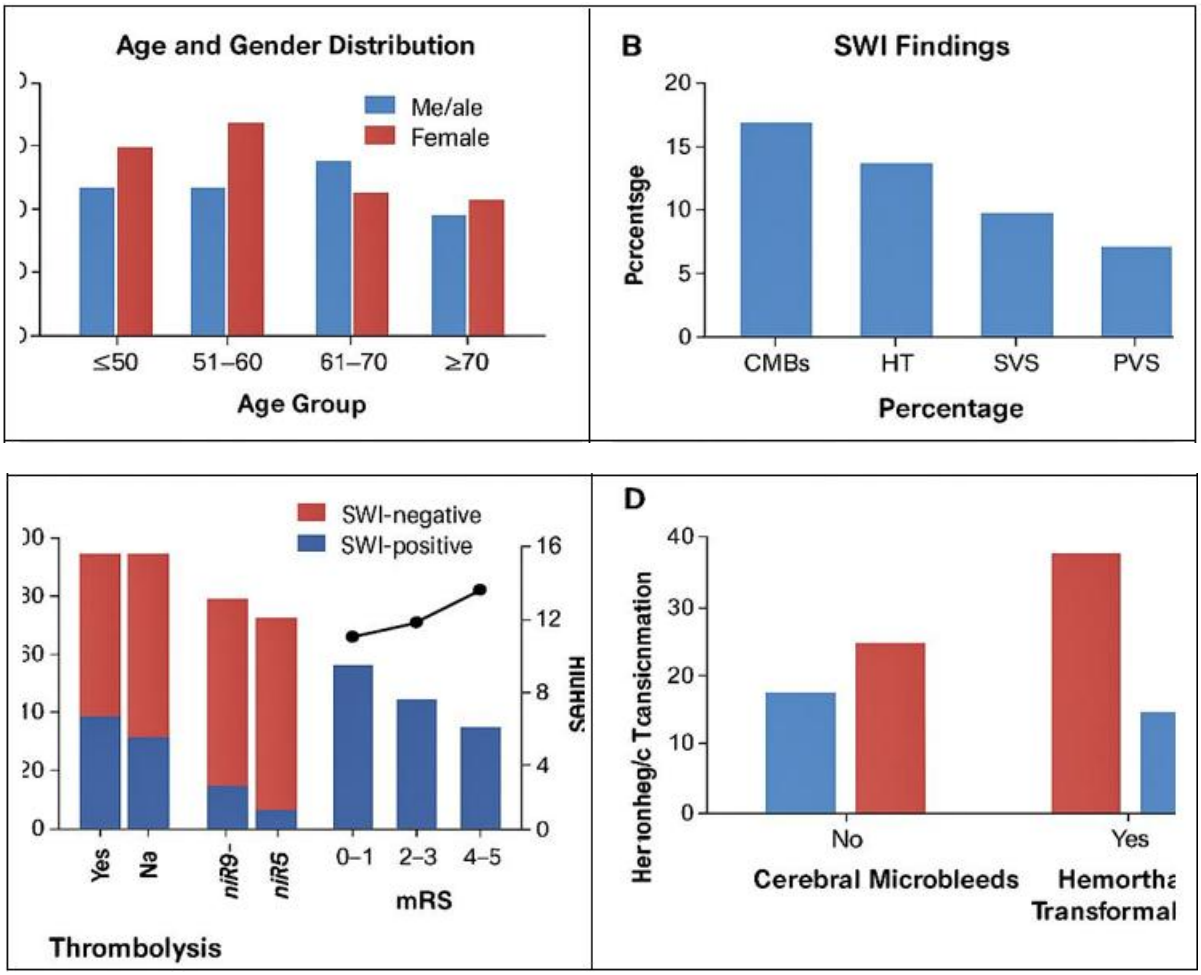
Acute ischemic stroke (AIS) results from sudden obstruction of cerebral blood flow, leading to brain tissue damage. While traditional imaging like CT and conventional MRI have diagnostic roles, their sensitivity in early stages is limited. Susceptibility Weighted Imaging (SWI), a high-resolution MRI sequence, detects subtle differences in tissue susceptibility and is valuable in identifying microbleeds, thrombus-related signal changes, and hemorrhagic transformations. This study evaluates the diagnostic potential of SWI in AIS.

2. Materials and Methods

This observational cross-sectional study included 86 adult patients with clinically suspected AIS who underwent MRI, including SWI, within 7 days of symptom onset. Radiological features such as microbleeds, hemorrhagic transformation (HT), and susceptibility vessel signs (SVS) were recorded. Clinical parameters like NIH Stroke Scale (NIHSS) and Modified Rankin Scale (mRS) were assessed. Statistical analysis was conducted using SPSS.

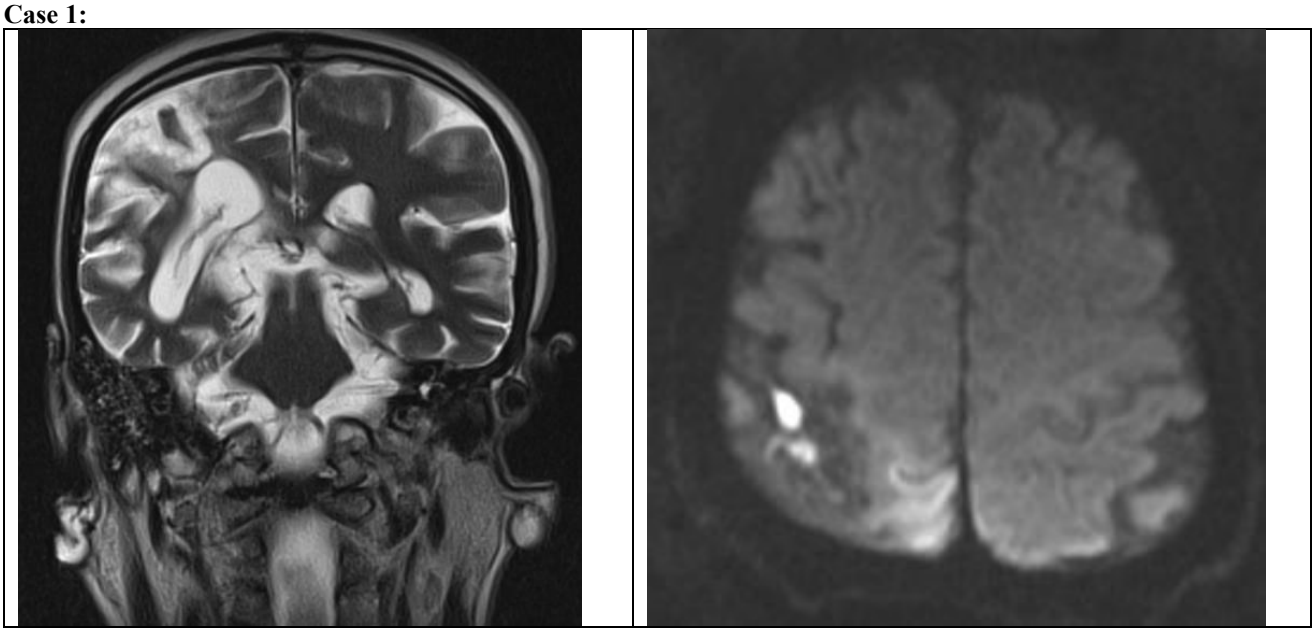
3. Results

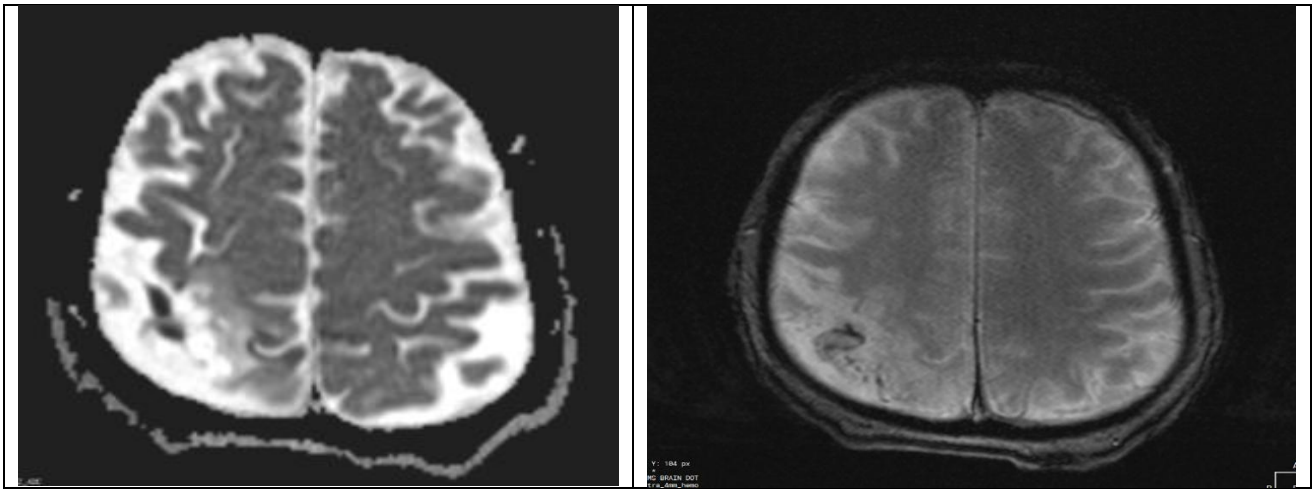
Out of 86 patients, SWI abnormalities were present in 39.5% (n = 34). Microbleeds were noted in 16.3% (n = 14), HT in 11.6% (n = 10), and SVS in 9.3% (n = 8). Among patients with thrombolysis, HT was more frequent (20.6%) versus non-thrombolysed (7.7%, p = 0.021). Significant associations were found between SWI findings, NIHSS scores, and mRS outcomes.



Illustrative cases:

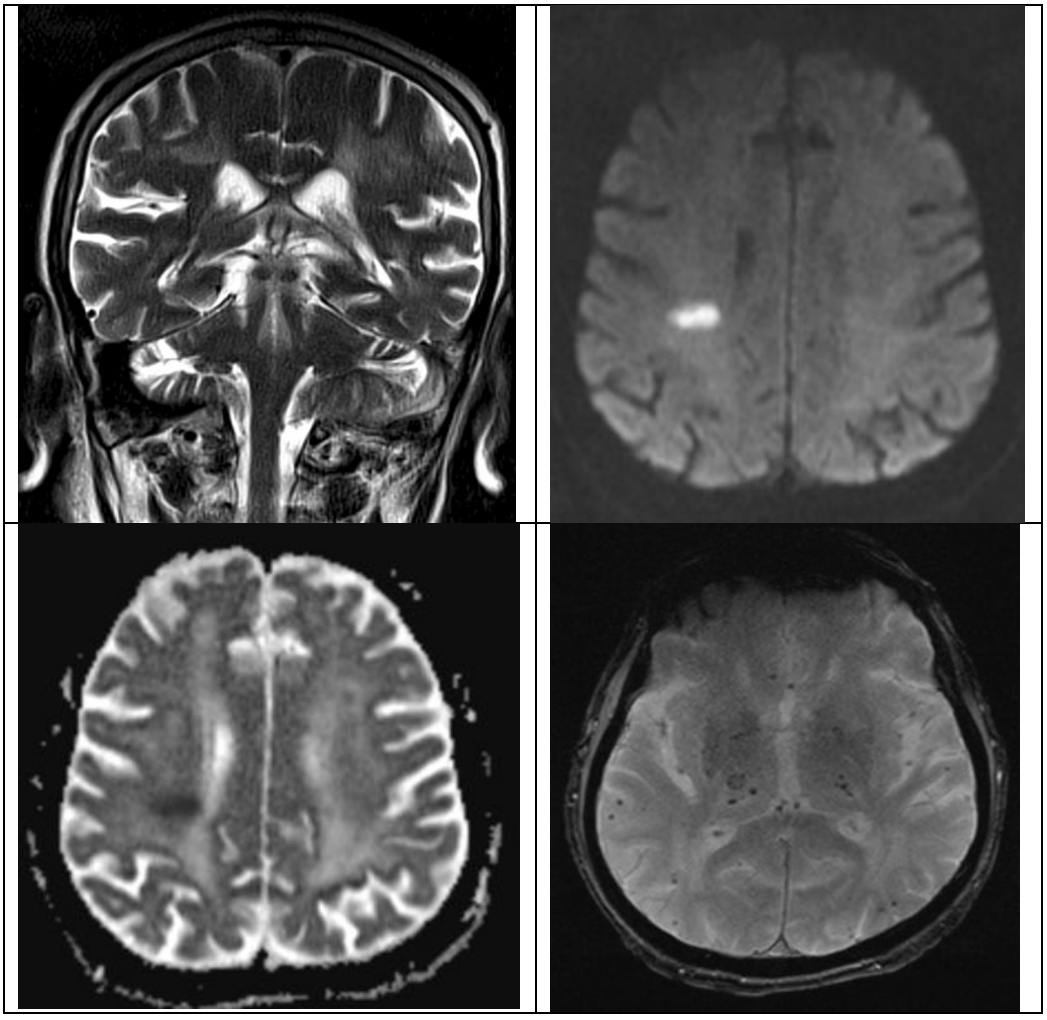
Case 1:





A 79-year-old male patient came with history of altered sensorium and generalized weakness, T2 hyperintensities noted in right parieto-occipital region showing diffusion restriction on DWI and signal drop on ADC – S/O Acute Infarct. On SWI – Foci of blooming noted – likely sequalae of chronic haemorrhage.

Case 2:



A 73-year-old male patient came with history of left sided upper limb weakness and known case of hypertensive, A well-defined T2 hyperintense area showing diffusion restriction on DWI and signal drop on ADC noted in right corona radiata with e/o blooming on SWI.

4. Discussion

SWI enhances early detection of hemorrhagic and thrombotic complications in AIS, which are not evident on conventional MRI. Its high sensitivity for cerebral microbleeds and susceptibility vessel signs provides a reliable indicator for prognosis and risk stratification. Incorporating SWI into acute

stroke imaging protocols can significantly aid therapeutic decision-making, particularly in patients considered for thrombolysis.

5. Conclusion

SWI offers valuable diagnostic and prognostic information in acute ischemic stroke, especially in identifying microbleeds, thrombi, and hemorrhagic transformation. Its routine integration into stroke MRI protocols is recommended for better treatment planning and outcome prediction.

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