

## Diagnostic Utility of Susceptibility Weighted Imaging (SWI) Sequences in Cerebral Fat Embolism Syndrome

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### Introduction

Cerebral fat embolism (CFE) syndrome is a rare, yet potentially devastating, clinical entity occurring in up to 2% of orthopedic traumas. Its clinical and radiographic presentation can often mimic diffuse axonal injury (DAI), which often complicates the clinical picture. With the use of SWI sequences, in addition to the traditional DWI sequences, CFE can be easily recognized radiographically, in comparison to DAI, and can further aid in accurate and prompt medical diagnosis and decisions.

### Methods

We present two CFE cases involving high speed car accidents resulting in long bone fractures and subsequent neurologic decline prompting a neurosurgical consultation for "DAI and cerebral edema". The first case demonstrates an abnormal radiographic presentation while the second case demonstrates the classic CFE MRI appearance. Both had profound changes in mental status requiring neurosurgical consultation and in one case an intraventricular pressure monitor was required.

### Results

MRI characteristics of CFE have been previously described and the pathognomonic "starfield" pattern seen on DWI was first described in 2001 by Parizel et al.<sup>1</sup> The radiographic presentation in acute CFE is seen on SWI as diffuse petechial hemorrhage isolated to the deep white matter.<sup>2,3</sup> This is seen as small susceptibility artifacts throughout the subcortical white matter. These signals are usually small and symmetric, characteristic for the showering of fat emboli in all vascular territories. This is also pathognomonic for CFE.<sup>2</sup>

### Conclusions

It is important to be able to differentiate reversible from irreversible brain injury. There is much emphasis on the use of DWI to document both CFE and DAI. However, this sequence is often positive in both scenarios, sometimes leading to diagnosis confusion. Therefore, these two entities can be better distinguished based on clinical history and with the addition of SWI sequences to all MRI protocols.

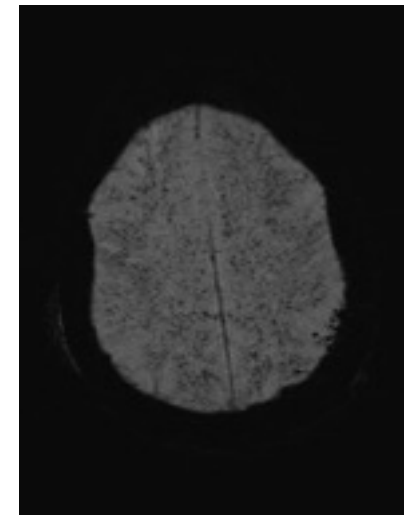
### Learning Objectives

By the conclusion of this session, participants should be able to describe the radiographic findings of CFE and differentiate it from DAI in a trauma patient.

### References

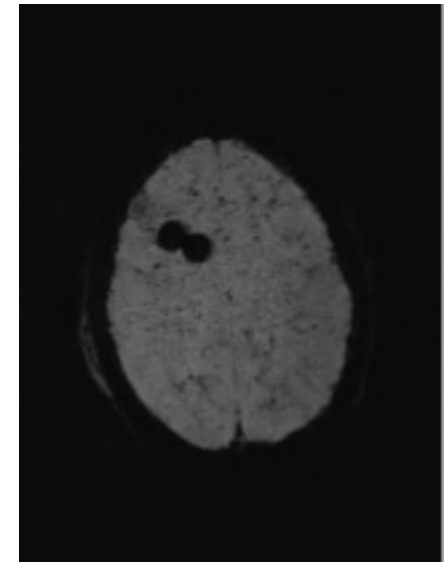
1. Parizel PM, Demey HE, Veeckmans G, et al. Early Diagnosis of Cerebral Fat Embolism Syndrome by Diffusion-Weighted MRI (Starfield Pattern). *Stroke*. 2001;29:42-2944.
2. Kuo KH, Pan YJ, Lai YJ, Cheung WK, Chang FC, Jarosz J. Dynamic MR Imaging patterns of Cerebral Fat Embolism: A Systematic Review with Illustrative Cases. *AJNR AM J Neuroradiol*. 2014;105:2-1057.
3. Suh S, Seol H, Seo W, Koh S. Cerebral Fat Embolism (Susceptibility-Weighted Magnetic Resonance Imaging). *Arch Neurol*. 2009;117:0.

#### SWI sequence, patient #1



Diffuse small hypointense signals on SWI within subcortical white matter demonstrating typical petechial white matter hemorrhages.

#### SWI sequence, patient #2



Diffuse small hypointense signals on SWI characteristic of petechial white matter hemorrhage. Large right frontal susceptibility artifact due to passage of right external ventricular drain