

AMSER Case of the Month

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52-Year-Old Man with Altered Mental Status After a Skiing Injury

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Patient Presentation

- **Patient:** 52-year-old male
- **Chief Complaint:** Right thigh pain
- **Past medical history:**
 - Incomplete T10 paraplegia due to remote MVC
 - Some sensation, minimal motor function in the lower extremities at baseline
- **History of present illness:**
 - Hit by another skier while adaptive skiing
 - Felt immediate right leg pain, believes he hit his head
 - Developed altered mental status, possible right-sided mouth droop with grimacing later that night
 - Subsequently developed acute hypoxemic respiratory failure, requiring intubation

What imaging studies should we order?

Select the applicable ACR Appropriateness Criteria

Adult. Altered mental status. Suspected intracranial pathology or focal neurologic deficit. Initial imaging.

Name	Category	Adult RRL	Peds RRL
CT head without IV contrast	Usually appropriate	☼☼☼ 1-10 mSv	☼☼☼ 0.3-3 mSv [ped]
MRI head without and with IV contrast	May be appropriate	O 0 mSv	O 0 mSv [ped]
MRI head without IV contrast	May be appropriate	O 0 mSv	O 0 mSv [ped]
MRI head with IV contrast	Usually not appropriate	O 0 mSv	O 0 mSv [ped]
CT head with IV contrast	Usually not appropriate	☼☼☼ 1-10 mSv	☼☼☼ 0.3-3 mSv [ped]
CT head without and with IV contrast	Usually not appropriate	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]

Select the applicable ACR Appropriateness Criteria

Adult. Acute hip pain, traumatic. Initial imaging. (Closest applicable criteria)

Name	Category	Adult RRL	Peds RRL
Radiography hip	Usually appropriate	☼☼☼ 1-10 mSv	
US hip	Usually not appropriate	○ 0 mSv	○ 0 mSv [ped]
MRI hip without and with IV contrast	Usually not appropriate	○ 0 mSv	○ 0 mSv [ped]
MRI hip without IV contrast	Usually not appropriate	○ 0 mSv	○ 0 mSv [ped]
Bone scan hip	Usually not appropriate	☼☼☼ 1-10 mSv	
CT hip with IV contrast	Usually not appropriate	☼☼☼ 1-10 mSv	
CT hip without and with IV contrast	Usually not appropriate	☼☼☼ 1-10 mSv	
CT hip without IV contrast	Usually not appropriate	☼☼☼ 1-10 mSv	

CT Head Findings (Unlabeled)



CT Head Findings (Labeled)



- No acute intracranial hemorrhage
- No mass effect
- No loss of grey-white differentiation

Radiograph Findings (Unlabeled)



Radiograph Findings (Labeled)



Acute, comminuted, severely displaced, and angulated right mid-femoral diaphyseal fracture

Case Continued

- Patient: 52M
- PMH: Incomplete T10 paraplegia
- History of present illness:
 - Ski crash
 - Right leg pain
 - AMS
 - AHRF
- **CT head without contrast:** No acute intracranial hemorrhage
- **XR femur:** Severely displaced, comminuted, and angulated right femur fracture
- **Etiology of AMS:** *Remains unclear...*

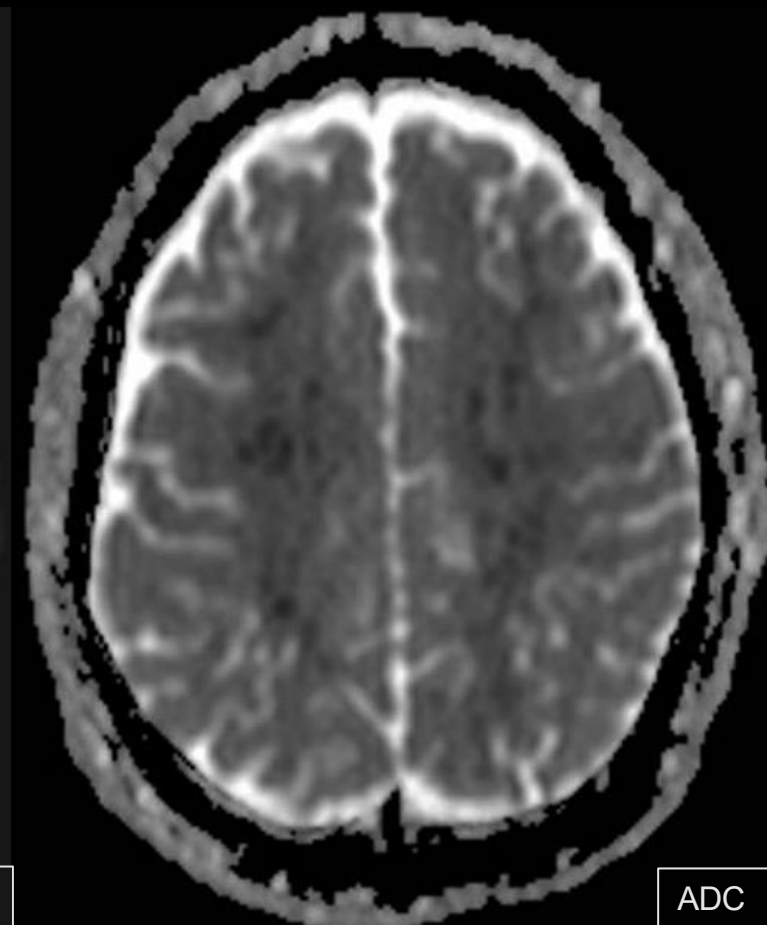
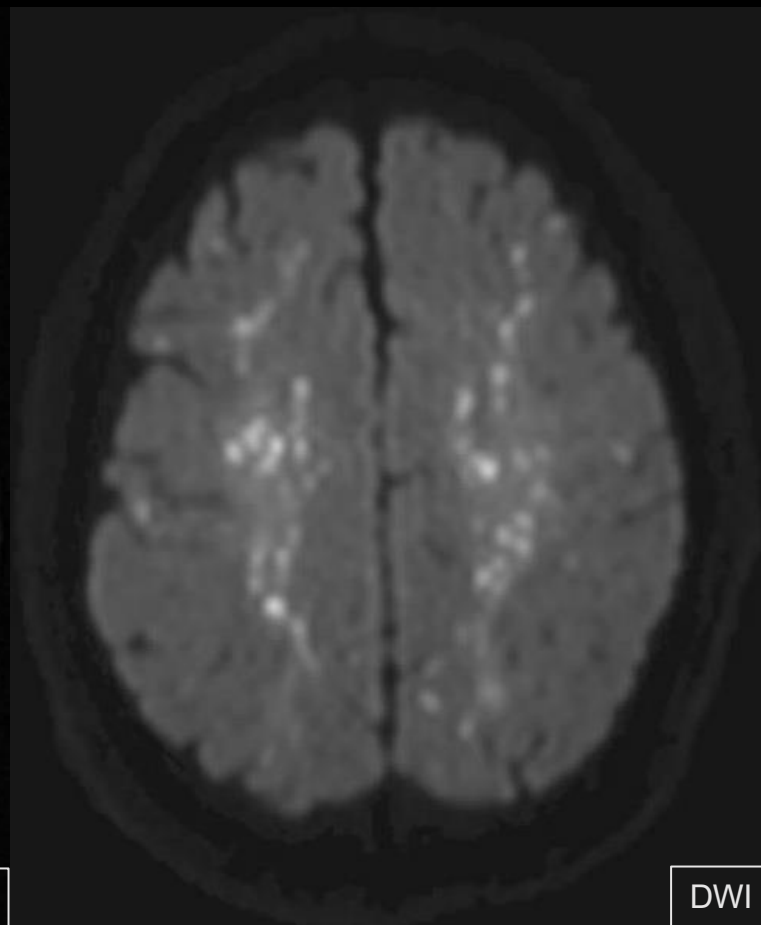
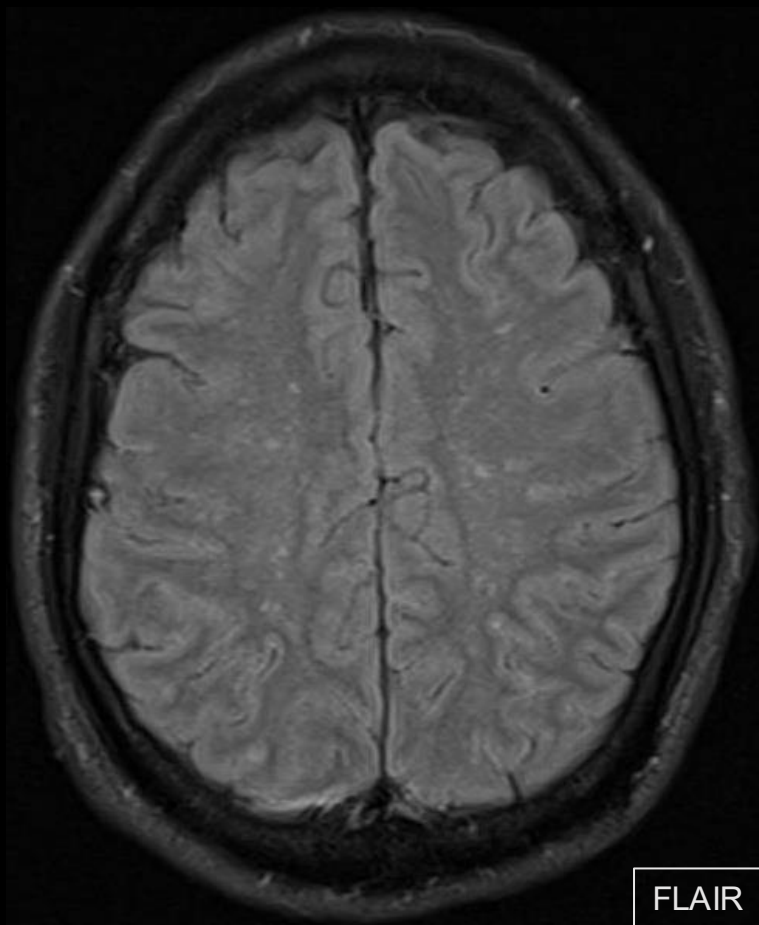
What imaging study should we order for persistent unexplained altered mental status after a negative CT?

Select the applicable ACR Appropriateness Criteria

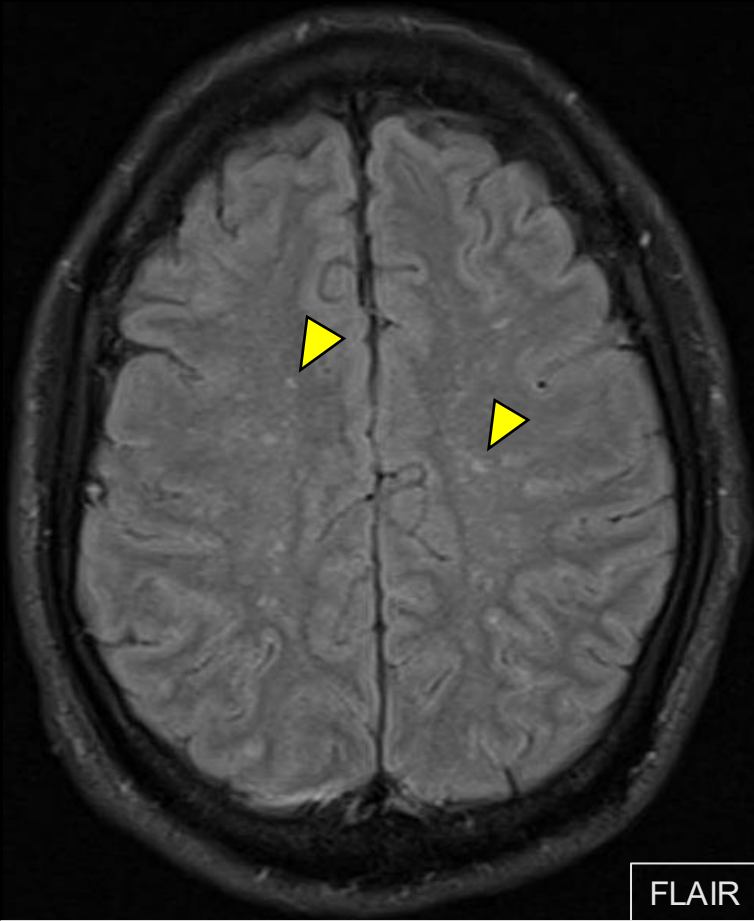
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CT head without and with IV contrast	Usually not appropriate	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]

MRI Brain Findings (Unlabeled)

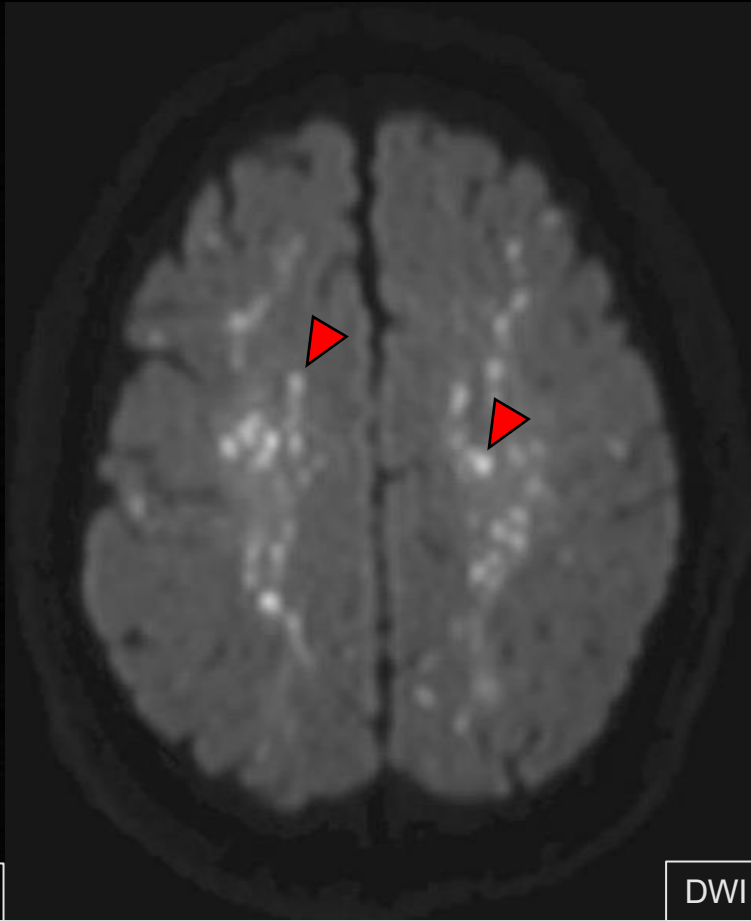


MRI Brain Findings (Labeled)



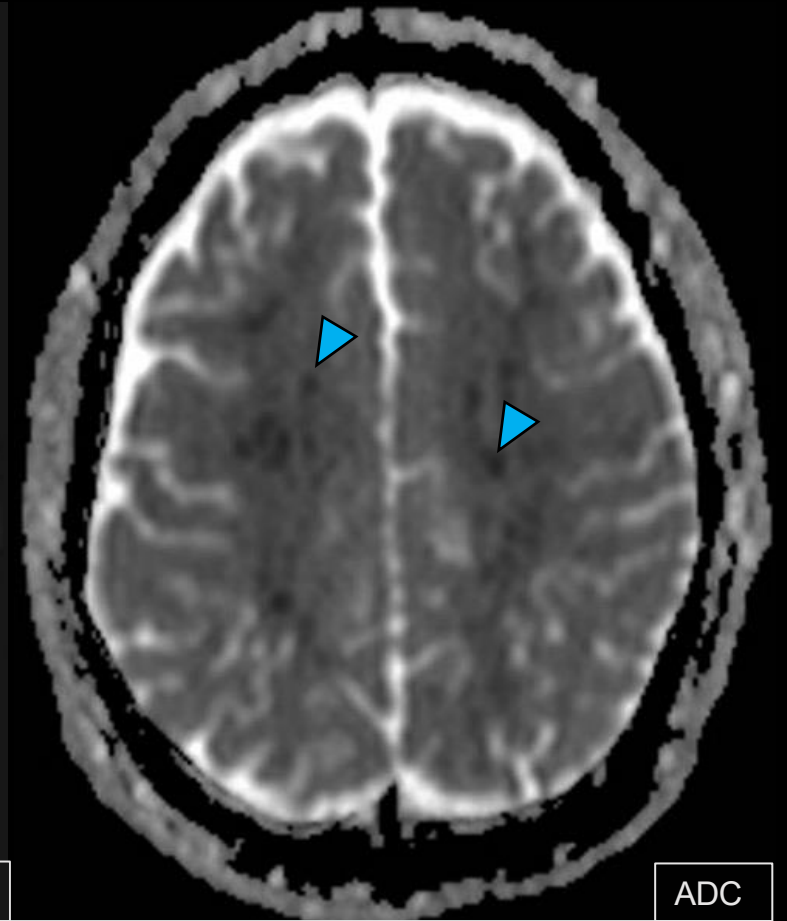
FLAIR

Scattered bilateral punctate white-matter hyperintensities ►



DWI

Scattered punctate areas of restricted diffusion—the “starfield pattern” ►



ADC

Corresponding ADC hypointensities confirm restricted diffusion ►

Final Diagnosis:

Cerebral Fat Embolism Syndrome

Discussion

- **Fat embolism syndrome:**
 - A rare, potentially fatal complication most often associated with long-bone fractures and pelvic trauma^{1,2}
 - Fat particles enter the microcirculation, cause direct tissue damage, and induce a systemic inflammatory response^{1,2}
 - Classically presents with a petechial rash, respiratory distress, and neurological disturbances, although few patients develop the complete triad²
 - Diagnosed clinically using nonspecific diagnostic criteria; imaging findings support the diagnosis²
- **Cerebral fat embolism syndrome:**
 - A manifestation of fat embolism syndrome affecting the cerebral circulation
 - Symptoms typically appear 12-72 hours after injury, ranging from confusion to seizures or even coma²
- **In this case:**
 - Femur fracture, altered mental status, and acute hypoxemic respiratory failure fit two components of the classic triad

Discussion

- **Imaging findings of cerebral fat embolism syndrome:**
 - CT: Often normal or nonspecific; less sensitive than MRI³
 - DWI/ADC: In the acute stage (1-4 days after injury), scattered punctate foci of restricted diffusion with corresponding ADC hypointensities produce the characteristic “starfield pattern”^{3,4}
 - FLAIR: May show corresponding punctate white-matter hyperintensities³
- **Management:**
 - Primarily supportive¹
 - Early fixation of long-bone fractures may reduce the risk of fat embolism syndrome¹
- **Outcomes:**
 - Most patients can expect a complete recovery of pulmonary and neurologic abnormalities¹
 - However, severe cases can result in persistent disability or even death¹

References:

1. Kwiatt ME, Seamon MJ. Fat embolism syndrome. *Int J Crit Illn Inj Sci*. 2013;3(1):64-68. doi:10.4103/2229-5151.109426
2. Shaikh N, Alali B, Amara UE, et al. Fat embolism syndrome: evolving perspectives on diagnosis and care. *Cureus*. 2025;17(11):e96136. doi:10.7759/cureus.96136
3. Alrasheed AS, Elazrag AM, Alqahtani MS, Alabbas F. Pathophysiology, clinical manifestations, and prognostic insights of cerebral fat embolism: a literature review. *Front Neurol*. 2026;16:1732428. doi:10.3389/fneur.2025.1732428
4. 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;35(6):1052-1057. doi:10.3174/ajnr.A3605