

Understanding the Challenges and Possible Complications Associated with the Management of Elderly Patient with Long

Bone Fracture

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BACKGROUND

Elderly patients who sustain long-bone fractures face substantially higher risks of morbidity and mortality due to frailty, diminished physiologic reserve, and the presence of multiple comorbidities. Cemented hemiarthroplasty, is a common surgical treatment for femoral neck fractures, can precipitate serious perioperative complications such as pulmonary fat embolism, bone cement implantation syndrome, and acute cardiopulmonary instability. These events may lead to sudden hypoxemia, right heart strain, and, in rare instances, systemic embolization resulting in acute ischemic stroke. Effective management requires rapid recognition of evolving complications, coordinated multidisciplinary involvement, and careful alignment of interventions with the patient's overall prognosis and goals of care. This case illustrates the complexity of managing multisystem trauma in a frail elderly patient while balancing aggressive intervention with patient-centered decision-making.

METHODS

A retrospective review of this case was performed, including clinical documentation, radiologic studies, and multidisciplinary team assessments. Relevant literature regarding fat embolism syndrome, perioperative embolic complications, and management of AIS in postoperative trauma patients was reviewed. This case report contains no patient-identifiable data and meets criteria for exemption from IRB oversight per Hartford HealthCare policy.

CASE DESCRIPTION

- An 83-year-old female presented after a mechanical fall, sustaining multiple left-sided rib fractures (L4, 5, 7, 9, 11) and a right femoral neck fracture.
- Initial CT chest demonstrated small bilateral pleural effusions and bibasilar atelectasis; CT head and cervical spine scans were negative for acute injury.
- Initially admitted to the floor, she developed acute hypoxic desaturation, prompting transfer to the ICU for respiratory support via non-rebreather mask.
- Patient was taken to undergo right hemiarthroplasty, during which she experienced acute desaturation requiring an increase in the FiO₂ immediately after cementing the fractured bone.

CRITICAL CARE TIMELINE

- Underwent Right Hemiarthroplasty: Intraoperative desaturation after cementation, with possibility of cement embolism.
- Post-procedure, she was awake and extubated after anesthesia and paralytic meds were reversed. Patient's status was moving all extremities initially, but lethargic and not following commands. Subsequent desaturation requiring re-intubation for hypoxia and poor neurological status; using only propofol for sedation without paralytics.
- On arrival to ICU, she had fixed and dilated pupils, no corneal reflex, no withdrawal to pain in any extremities, however, positive cough and gag, and able for spontaneous breathing on ventilator setup of 100% FiO₂ and Positive End Expiratory Pressure of 5cm H₂O.
- Stroke alert called, CTA head: M1 segment of the right middle cerebral artery (MCA) occlusion (**Figures 1 and 2**) with marked attenuation of bilateral posterior cerebral arteries. CTA perfusion with ischemic core of 109mL: this represents a significant area of brain tissue that has already suffered irreversible damage, and ischemic penumbra of 210mL: this represents area of brain tissue that is hypoperfused (receiving insufficient blood flow) but is still viable and potentially salvageable volumes. CT Head showed characteristic intra-arterial hypodense lesion with the specific density of fat.
- TNK thrombolytic was given, after which, patient exhibited small movements of right food and pupil NPI w/ slight improvement. Followed by mechanical thrombectomy with Thrombolysis in Cerebral Infarction (TICI) score of 3 (complete reperfusion) for MCA occlusion.
- CTA pulmonary angiogram performed revealing multiple bilateral pulmonary emboli with right heart strain. IVC filter placement and chest tube insertion for hemothorax.
- Repeat head CT indicated hemorrhagic conversion with mild diffuse mass effect and 2mm MLS (**Figure 3**), requiring cryoprecipitate and hypertonic saline administration for cerebral edema. MRI brain confirmed hemorrhagic conversion and bilateral acute ischemic infarcts in right MCA territory (**Figures 4,5,6, and 8**) and posterior circulation (**Figure 7**).
- Patient's neurological status deteriorated overnight with acute desaturations and worsening hypoxia. Patient's care was transitioned to comfort measures following multidisciplinary and family discussion.

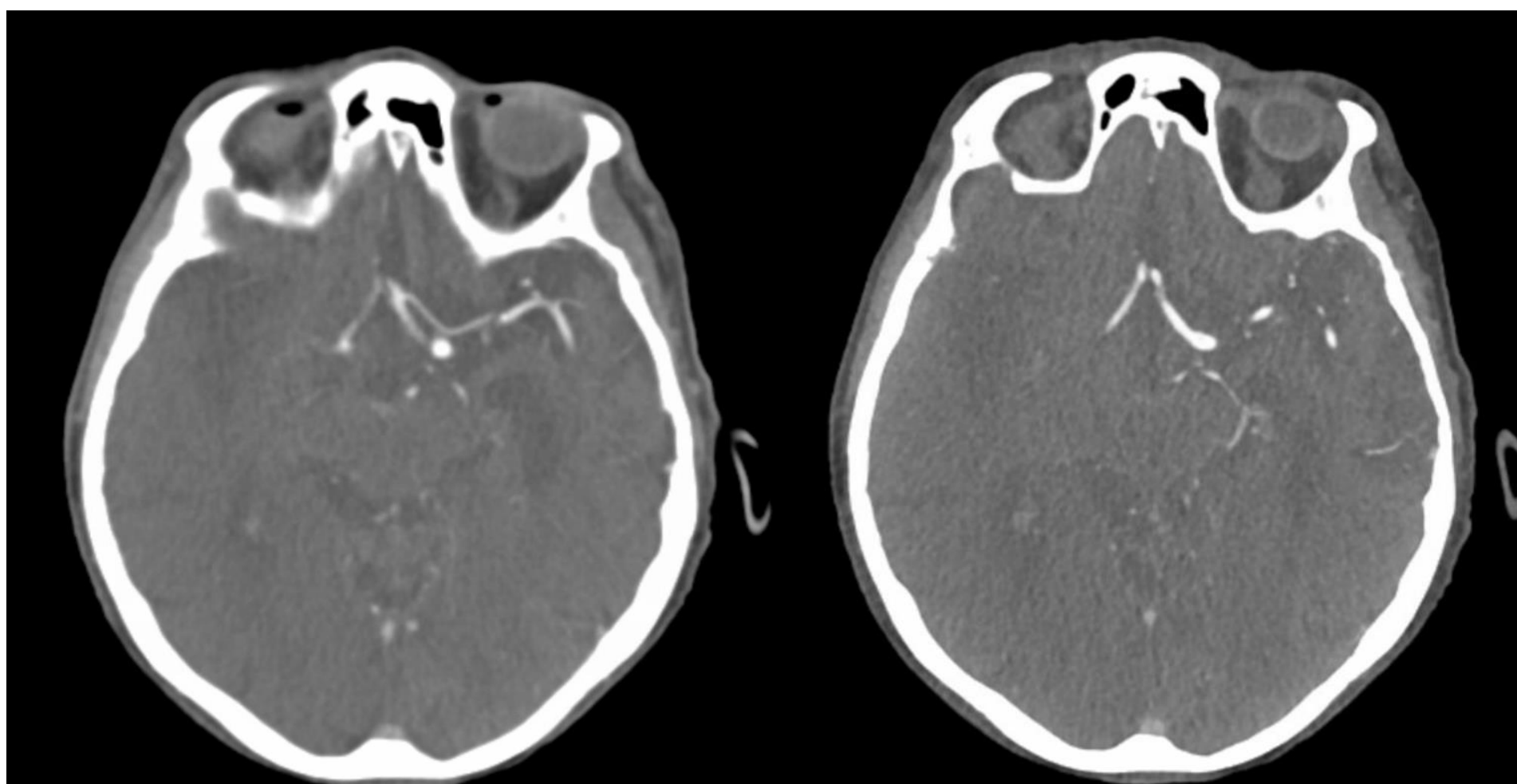


Figure 1. and 2. Head CT Angiogram

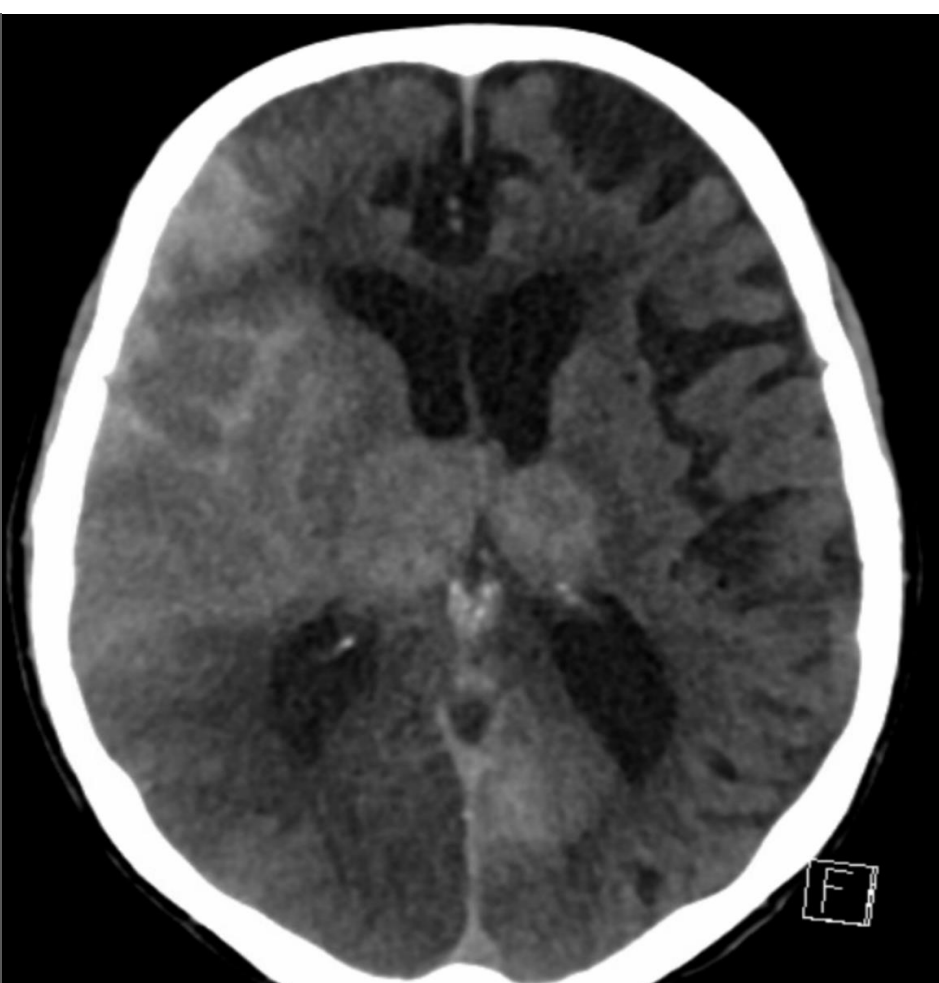


Figure 3. Head CT scan

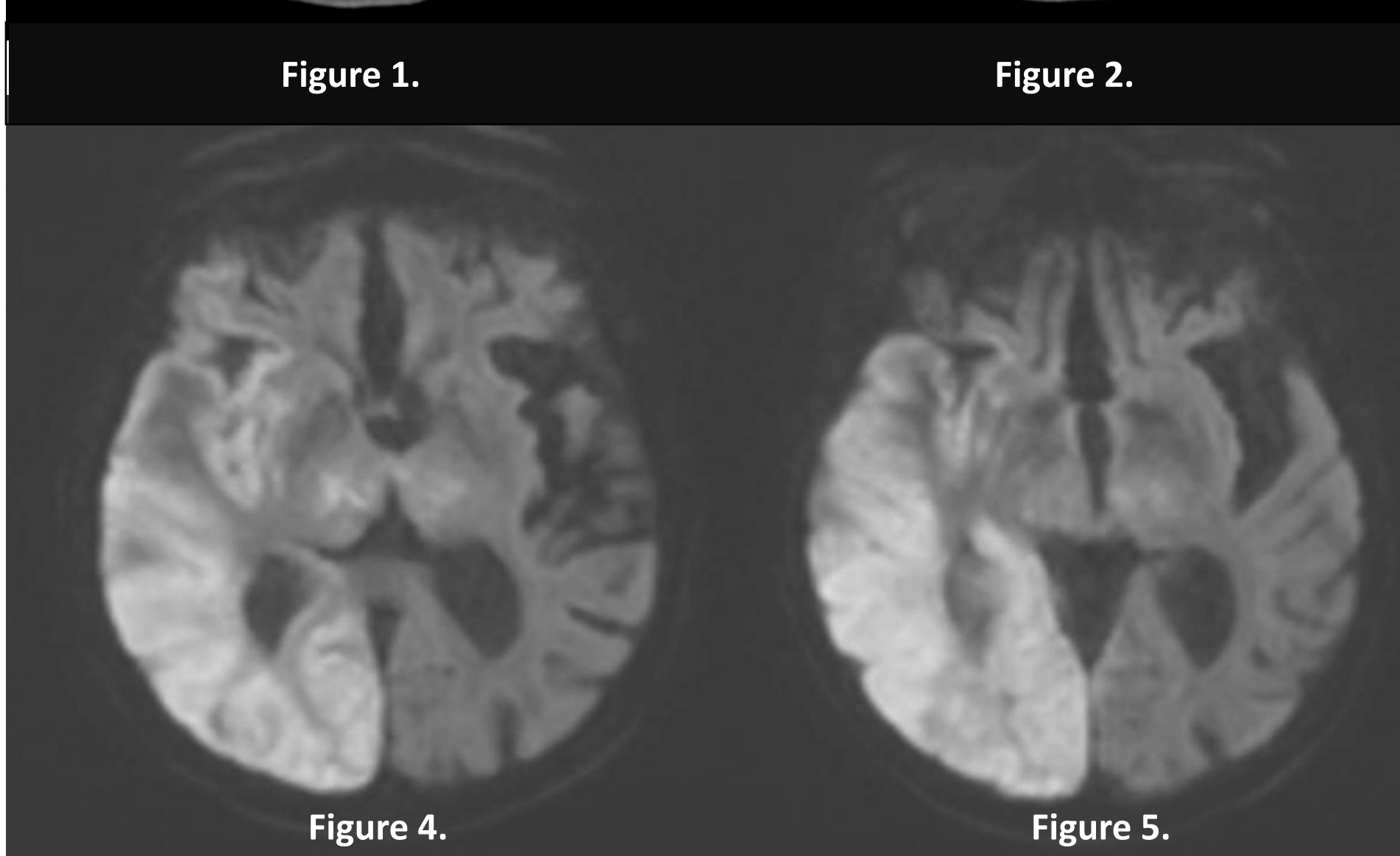


Figure 4. 5. 6. 7. MRI Brain

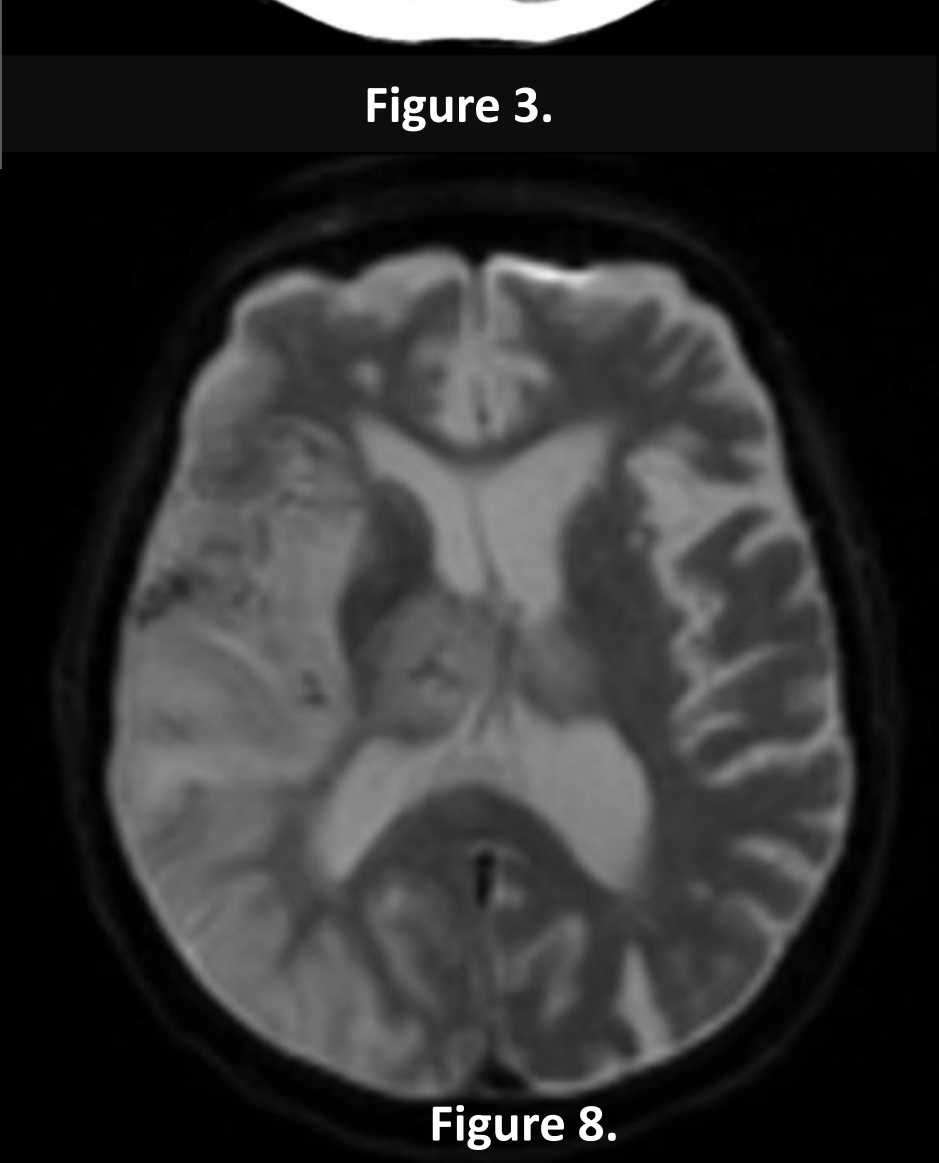


Figure 8. T2-weighted MRI

DISCUSSION

- This case highlights the complexity of managing an elderly patient with multisystem trauma, emphasizing the need for rapid identification of complications and a coordinated, multidisciplinary approach.
- The acute intraoperative desaturation immediately after cementation raised concern for pulmonary fat embolism or cement embolism, underscoring the importance of vigilance during orthopedic procedures involving long-bone fractures.
- The discovery of a right M1 of MCA occlusion, requiring urgent reperfusion, was successfully managed with TNK followed by mechanical thrombectomy, achieving in TICI 3 recanalization. However, the subsequent hemorrhagic conversion due to TNK use illustrates the delicate risk balance required in managing anticoagulation therapies in this population.
- While CT can show diffuse edema and scattered low-attenuating areas, MRI is generally considered the diagnostic modality of choice for cerebral fat embolism. MRI can reveal a "starfield pattern" on diffusion-weighted imaging, indicating multiple microinfarcts, and susceptibility-weighted imaging can show profuse microhemorrhages. In this case CT head showed characteristic intra-arterial hypodense lesions with specific fat density.
- Concurrent bilateral pulmonary fat emboli often manifest on CT as ground-glass opacities, nodular opacities, and septal thickening. Right heart strain can occur due to increased pulmonary vascular resistance caused by fat emboli in the pulmonary capillaries, leading to pulmonary hypertension and increased right ventricular pressure, which may result in right ventricular failure. In this case a subsequent hemothorax further complicated the clinical picture.
- The difficulty of treating simultaneous cardiopulmonary, neurologic, and hemodynamic instability in a frail elderly patient is significant because there is no specific treatment for fat embolism; management is primarily supportive. This involves maintaining adequate oxygenation and ventilation, ensuring hemodynamic stability, and providing supportive care in an intensive care setting.

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