

H70 A Lethal Fat Embolism Syndrome (FES) Related to Spine Surgery: A Presentation of Two Clinical Case Reports

*Davide Radaelli**, Università degli studi di Trieste, Trieste 34149, ITALY; *Martina Zanon, MD*, Trieste, ITALY; *Martina Montanaro, MD*, Trieste, ITALY; *Alessandro Manfredi*, Department of Medicine, Surgery and Health, Trieste 34149, ITALY; *Eleonora Valentinuz*, University of Trieste, Trieste 34127, ITALY; *Stefano D'Errico, MD, PhD*, University of Trieste Department of Surgical, Medical and Health Sciences, Trieste 34149, ITALY; *Paolo Frisoni, MD*, University of Ferrara, Ferrara 44121, ITALY; *Letizia Alfieri, MD*, University of Ferrara, Ferrara 44121, ITALY; *Margherita Neri, MD, PhD*, University of Ferrara, Ferrara 44100, ITALY

Learning Overview: After attending this presentation, attendees will understand the importance of a scrupulous autopsy to define the causes of death following spinal surgery.

Impact on the Forensic Science Community: This presentation will impact the forensic science community due to the rarity of reports about FES related to neurosurgical procedures. The autopsy technique and the methodological approach to histological investigations will also impact the forensic science community.

FES is a clinical condition characterized by the obstruction of small vessels by fat emboli; it presents with neurological, respiratory, hematological, and cutaneous manifestations. Its death rate is variable depending on the number of vessels and organ systems involved. It generally occurs after long bone fracture (especially femur fractures). Spinal arthrodesis is often needed to stabilize the spinal column after different spinal disorders like traumatic fractures, idiopathic disease (such as scoliosis), metastatic tumor, infection, or degenerative disorder. In the literature, there are only four cases reported of FES-related deaths occurring after spinal elective surgery; it is considered a rare complication of this procedure. Although spinal fusion surgery can be associated with serious and various complications, perioperative mortality is generally considered a rare event; the death rate reported in the literature is about 0.13% of all procedures. Two cases of lethal FES related to spinal fusion surgery are presented.

Case 1: A 64-year-old woman with chronic obstructive pulmonary disease, atrial fibrillation, and chronic kidney disease was admitted to a private surgical clinic to undergo posterior spinal fusion surgery for degenerative scoliosis presenting with lumbar canal stenosis and neurological deficit. All procedures were performed well with surgical screws and side bar correctly positioned in cemented vertebrae. After three hours of surgery, the patient had a significant desaturation that progressed to hypoxemia and severe bradycardia, requiring resuscitation maneuvers. Resuscitation failed. At autopsy, no significant pathology was seen except for polyvisceral congestion and pulmonary edema, with several Cardiopulmonary Resuscitation (CPR) - related fractured ribs. No blood clots or emboli were found in the pulmonary arteries or heart chambers. Microscopic examination revealed the presence of optically empty vacuoles that interrupted red blood cells that were pushed peripherally in the vessels of the lung, brain, and kidneys. Immunohistochemical analysis (using anti-CD16 and anti-fibrinogen antibodies) permitted FES to be ruled as the cause of death.

Case 2: A 51-year-old healthy woman accessed a private surgical clinic for an elective spinal arthrodesis due to progressive and symptomatic idiopathic right convex scoliosis. The surgical procedures were performed without complications. She was briefly monitored in a postanesthesia room and subsequently discharged to the surgical ward in stable condition. Two hours later, the patient was found unconscious and in cardiac arrest by the nurses. Despite CPR maneuvers, the patient was declared dead. Autopsy results were not significant: polyvisceral congestion and about 600cc of blood collection in the peritoneal cavity without any macroscopic arterial or venous vessel damage were found. Ventral and dorsal study of the spinal column in conjunction with radiographic images confirmed the correct position of screws and bars. Microscopic examination found the presence of optically empty vacuoles involving a large number of pulmonary vessels, with blood cells displaced peripherally. Positivity of Sudan III and Oil Red O stains revealed that the cause of death was a massive (Grade III of Falzi's semiquantitative morphometry) FES.

In conclusion, two FES-related deaths after posterior columnar stabilization are presented. Despite it being a rare complication of this type of procedure and that the mortality rate of elective posterior spinal fusion is low (0.13%), forensic pathologists should be aware of FES in assessing these cases.

FES, Spine Surgery, Unexpected Death