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Fatal pulmonary fat embolism after dorsal spinal fusion

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Abstract Fatal pulmonary fat embolism is a rare complication in elective orthopaedic surgery. It has been described previously as occurring during intramedullary manipulations and in trauma patients. We present the case of a 56-year-old slender housewife with severe radicular complaints because of lumbar spinal stenosis. She underwent a dorsal bilateral decompression of L4/L5 and L5/S1 in combination with an instrumented dorsolateral spinal fusion. Transpedicular fixation of L4/L5/S1 was accomplished by titanium Rodegerts implants. Both iliac crests were used for harvesting autologous

bone grafts. The intra-operative course was uneventful; however, 6 h after surgery, despite resuscitation, she expired. Autopsy revealed macroscopic gross fatty infiltration of lung parenchyma with oedema. We believe there is no relation between this complication and the transpedicular instrumentation. The position of the patient and the extent of the harvesting technique could be critical in preventing this serious complication.

Key words Fat embolism · Spinal surgery

Introduction

Fatal clinical fat embolism is a rare complication in elective orthopaedic surgery. Microscopic fat embolism caused by bone marrow fat drops have been described in over 90% of intramedullary procedures in long bones during total hip and knee implantations, and in trauma patients, especially with femoral shaft fractures. The incidence of clinically noticeable fat embolism syndrome in those patients is 0.5–23% [6, 7], with a mortality of 10–20% [5]. Usually clinical symptoms appear within 3 days, depending on the seriousness of the fat embolism syndrome. Clinical manifestation is restricted by the progression of capillary damage, leading to leakage of fluid, protein loss and haemorrhages in the lung tissues. The correlation between the absolute mass of fat embolism and degree of clinical lung failure is not clear. Intravascular fat drops from the bone marrow activate the coagulation mechanism, leading to hypercoagulation and venous

stasis with macroemboli. Embolism of lungs gives rise to local release of inflammatory mediators with damage of the basement membrane, resulting in respiratory insufficiency, with secondary brain and heart failure [3, 4].

Case report

A 56-year-old slender housewife with severe radicular complaints, because of lumbar spinal stenosis, underwent a dorsal bilateral decompression of L4/L5 and L5/S1 in combination with an instrumented dorsolateral spinal fusion. Transpedicular fixation of L4/L5/S1 was accomplished by titanium (Rodegerts) implants (Fig. 1).

Both iliac crests were used for harvesting autologous bone grafts. The surgical procedure itself was uneventful. However, 6 h after surgery the patient was found unconscious, deeply snoring and with an asystole. Signs of hypoxia due to respiratory obstruction were not present, there were also no signs of an elevated stiffness of the lungs during the resuscitation period. During the resuscitation efforts she expired. Autopsy revealed macroscopic gross fatty infiltration of lung parenchyma with oedema, no obstructed airways and no proof of air embolism (Fig. 2).

No other relevant abnormalities were found.

Fig. 1 Transpedicular screw implant system (Rodegerts; bio-compatible Ti-6Al-7Nb alloy Protasul 100)

Discussion

During the operation there was no abnormal venous bleeding and a normal blood pressure was maintained throughout the procedure. In spite of lying prone with a hard pillow under the pelvis and upper thighs, mild compression of femoral or iliac veins with venous stasis during the surgery could never be excluded. After turning the patient supine, a massive amount of microemboli, coming from the extensive harvesting of spongy bone, might have initiated the fatal macroembolism. In our view there is no relation between this complication and the transpedicular instrumentation. The position of the patient and the extent of the harvesting technique could be critical in preventing this fatal complication.

In the literature only two similar case reports have been published [1, 2], but those cases involved much more extensive corrections of thoracolumbar scoliosis in obese females.

Fig. 2 **A** Slide of lung parenchyma with Sudan staining (enlargement $\times 20$). Grey-black circular fat drops (arrows) are evident on the surface of an environment of erythrocytes and alveolar macrophages. **B** Tissue section of lung parenchyma with Sudan staining (enlargement $\times 10$). Intravascular fat droplets (large arrows) can be seen in arteriola of the pulmonary artery (small arrows). **C** Tissue section of lung parenchyma with haematoxylin-eosin staining (enlargement $\times 20$). Sharp circular fat drops appear as a demarcated optical vacuum (large arrow) in lung arteriole (small arrows)

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