

Cement pulmonary embolism after vertebroplasty. Case report and literature review

Embolia pulmonar por cemento tras vertebroplastia. Presentación de caso y revisión de la literatura

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Summary

Vertebral fractures can be a painful and disabling problem for patients with osteoporosis, neoplastic and/or metastatic bone lesions. Given their increasing incidence in the elderly population and in oncological patients, multiple conservative and non-conservative managements have been proposed. Among the minimally invasive treatments are vertebral cementation techniques, such as vertebroplasty or kyphoplasty; procedures that have shown high efficacy when it comes to treating compression fractures and reducing intense uncontrolled pain. Some complications associated with these interventions have been described, the most frequent being those derived from cement leakage, since cement can reach the pulmonary circulation after infiltrating through the vertebral and azygos venous system. The manifestations and/or complications of the leak will depend on the amount of embolized cement and the occluded artery. We present the case of a 56-year-old patient who underwent vertebroplasty and kyphoplasty for persistent and severe low back pain associated with vertebral compression fractures who presented a cement leak into the pulmonary artery after the procedure. Despite presenting a pulmonary embolism, the patient had no symptoms or complications during follow-up.

Resumen

Las fracturas vertebrales pueden constituir un problema doloroso e incapacitante para los pacientes con osteoporosis, lesiones óseas neoplásicas y/o metastásicas. Dada su creciente incidencia en la población mayor y en pacientes oncológicos se han propuesto múltiples manejos tanto conservadores como no conservadores. Entre los tratamientos mínimamente invasivos se encuentran las técnicas de cementación vertebral, como la vertebroplastia o la cifoplastia; procedimientos que han demostrado alta eficacia a la hora de tratar las fracturas de compresión y disminuir el dolor intenso no controlado. Se han descrito algunas complicaciones asociadas a estas intervenciones, las más frecuentes son las derivadas de la fuga de cemento, ya que este puede llegar a la circulación pulmonar tras infiltrarse por el sistema venoso vertebral y el sistema ácigos. Las manifestaciones y/o complicaciones de la fuga dependen de la cantidad de cemento embolizado y la arteria ocluida. Se presenta el caso de una paciente de 56 años de edad sometida a vertebroplastia y cifoplastia por lumbago persistente e intenso asociado a fracturas vertebrales por compresión, quien presentó una fuga de cemento a la arteria pulmonar luego del procedimiento. A pesar de que sufrió una embolia pulmonar, la paciente no cursó con sintomatología ni complicaciones durante el seguimiento.

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Introduction

Osteoporotic vertebral fracture (OVF) is the most frequently described fracture with an estimated incidence of 1,400,000 fractures per year, equivalent to 20-25% of postmenopausal women over 50 years of age. OVFs are also the most common type of fracture in elderly patients, with a peak prevalence of more than 40% in adults over 80 years of age (1). These fractures have been shown to double morbidity and mortality in patients after the age of 65 years and have a 3-year survival rate of 5 % (1); similarly, one or more vertebral fractures increase the risk of new fractures by 25 % and are associated with a poorer quality of life (2-4).

Vertebral bone fractures are classified into three groups according to their morphology: anterior wedging, biconcave or crush fractures, the latter being the most frequent in elderly and oncological patients. In the classification according to their etiology are pathological fractures, produced by diseases that injure and weaken the bones. These injuries occur most frequently in the components

of the axial skeleton and in the proximal femur (2) and can occur spontaneously due to increased pressure on the weakened bone, falls from height or by low-impact efforts such as bending, climbing stairs or sneezing. The main cause of pathological fractures in adults are primary and metastatic tumor processes, taking into account that bone invasion is currently described in the literature as part of the natural evolution of some malignant neoplasms in the progression phase, such as prostate cancer, breast cancer and lung cancer, in such a way that it is estimated that these fractures are found in more than 80% of patients with advanced stages of the cancers mentioned (3, 5).

The main method for the identification of vertebral fractures is spinal radiography; this is indicated in symptomatic or asymptomatic patients with risk factors, such as previous pathological fractures, low bone mineral density and/or history of neoplasia (6). Its treatment can be conservative with orthosis and analgesic management by pain clinic. If interventions are required, low invasive alternatives are available, such as subcutaneous vertebroplasty and kyphoplasty, especially in cases of refractory pain. The use of these latter techniques is focused on improving the quality of life in patients with uncontrolled chronic pain and, to a lesser extent, on recovering functionality or movement (7).

Case report

A 56-year-old female patient with a history of left multifocal infiltrating breast cancer and chronic and intense low back pain secondary to vertebral fractures, for which she had received previous surgical and analgesic management. She consulted for exacerbation of pain and functional deterioration. Given the suspicion of metastasis and pathological bone fractures, she was referred to the oncology department. The multidisciplinary evaluation included computed axial tomography (CT) of the thorax, magnetic resonance imaging (MRI) of the lumbosacral spine, bone scintigraphy and fracture biopsy, among other studies.

Chest CT and X-rays showed a significant decrease in the height of the vertebral bodies T11, T12 and L1, compatible with compression fractures; as an additional finding, a nodular lesion with pleural thickening was found in the right lung field. MRI showed an additional recent biconcave fracture at L4. Bone scan revealed multiple osteolytic lesions in the humerus, femoral heads and right sacroiliac region. Due to the findings, the patient underwent lung and lumbar biopsy, lumbar arthrodesis, kyphoplasty of L2-L3 and vertebroplasty of L4. Subsequently, during the imaging follow-up of the nodule, hyperdense material was evidenced along the pulmonary artery with extension to the inferior and middle lobar pulmonary artery (Figures 1 and 2). Taking into account the patient's surgical history, embolized cement material from the spine was diagnosed. Despite the considerable amount of cement, the patient did not present respiratory symptoms, hypoxemia or pulmonary hypertension during follow-up, so interventional management was not indicated.



Figure 1. Simple CT, axial view. Hyperdense material is evidenced in the main pulmonary artery with extension to the middle and inferior pulmonary arteries.

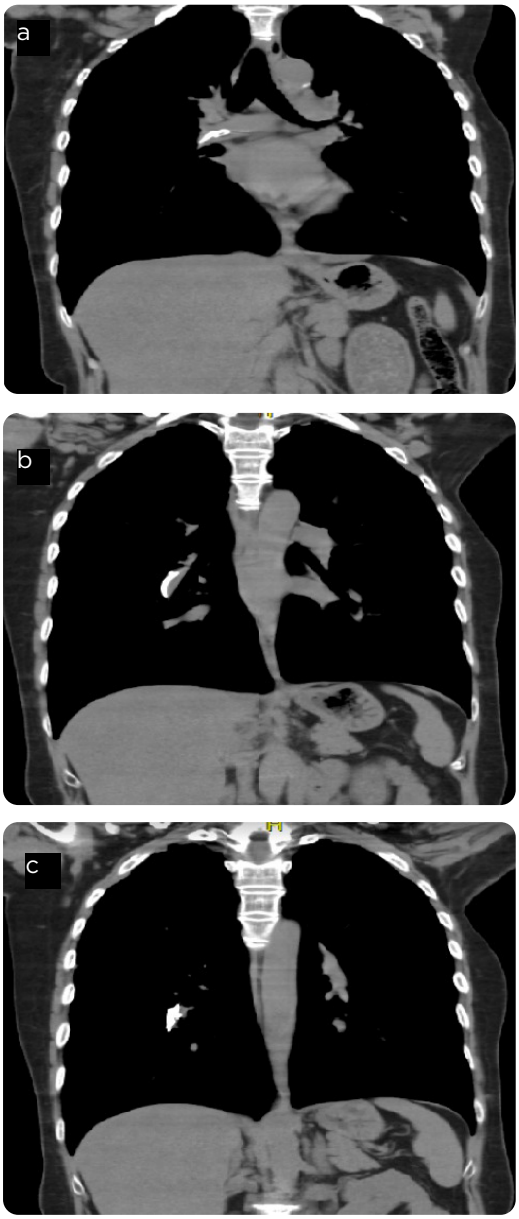


Figure 2. Simple CT, coronal sections. Hyperdense foreign body is evidenced extending along the main (a), middle (b) and inferior (c) pulmonary arteries on the right side.

Discussion

Percutaneous vertebral cementing techniques are increasingly used in the treatment of vertebral compression fractures, whether osteoporotic or neoplastic, due to their efficacy in pain management and minimal invasiveness. During percutaneous vertebroplasty, with the aid of real-time imaging guidance, a needle cannula is inserted through the pedicle into the vertebral body and then cement is injected under high pressure. In kyphoplasty, a large needle is used through which an inflatable balloon is inserted into the vertebral body, creating a cavity filled with cement (8). Thanks to the cement, the spine is stabilized and pain is reduced.

As for complications, although these are minimally invasive interventions, there are cases in which secondary events occur that can endanger the health of patients. Leakage of cementing material is the most documented cause of complications after vertebroplasty or kyphoplasty (30-75% in vertebroplasty, 8.6-33% in kyphoplasty) (9). Manifestations may be local or systemic and depend on the amount of extravasated cement and the vessels affected. The event most associated with leakage is pulmonary cement embolism (PCE), whose risk after vertebroplasty and kyphoplasty is 0.9% and 0.4%, respectively (9-11). Few cases have been described of cement leakage after the procedures and their repercussions, which can go unnoticed in asymptomatic events, manifest with respiratory symptoms typical of pulmonary thromboembolism and even lead to cases of multiple cardiac perforation and/or death (10). Asymptomatic cases are usually incidental findings during the analysis of imaging tests in which small emboli are evidenced in the bifurcations and terminal branches of the pulmonary arteries; fatal cases have been associated with large volumes of cement (9-15 mL) that leak, reach the heart cavities and cause perforation of the walls or embolize the central pulmonary arteries (8, 9). To decrease the risk of PCE, the use of inferior vena cava (IVC) filters has been proposed; however, their use is currently controversial. The IVC filter is a device used in patients with deep vein thrombosis to prevent the passage of emboli to the lung, so it has come to be thought that it could function equally well as a filter for embolized foreign material, such as cement. Due to the lack of studies, the recommendation is still under debate; however, cases have been described in which the filter has succeeded in trapping the cement, preventing possible PCE (12).

There is currently no standard for the treatment of PCE, so its management depends on the severity and symptomatology of the patient. In asymptomatic patients without complications, good monitoring and clinical-radiological follow-up is sufficient, while some patients with central embolism may require anticoagulation with heparin initially and then with dicoumarinics for 3-6 months (4). Percutaneous endovascular intervention may be another option for material removal in patients with contraindications to anticoagulation (10, 12). Cases have been described in which surgical thrombectomy is required, especially in patients with heart failure and large central emboli (13).

In conclusion, although vertebral cementation techniques have proven to be effective in the treatment of fractures and pain, vertebroplasty has shown a significantly greater reduction in pain than kyphoplasty and a higher risk of leakage and recurrent fracture (11). Considering the findings of patients after surgery, it is important to be alert to abrupt onset manifestations such as tachypnea, tachycardia, dyspnea, cyanosis, chest pain, cough, hemoptysis and diaphoresis, signs that should clinically guide the diagnosis for a correct analysis and imaging follow-up or intervention, as necessary.

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