Cement Pulmonary Embolism: A Common and Potentially Serious Complication of Vertebroplasty

Brigid Hallinan DO
Lehigh Valley Health Network

Yehia Y. Mishriki MD
Lehigh Valley Health Network, Yehia.Mishriki@lvhn.org

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Introduction:
Vertebroplasty is a surgical intervention used to treat symptomatic vertebral compression fractures. It is typically performed as a minimally invasive procedure to restore vertebral height and relieve pain associated with osteoporotic fractures. The procedure involves injection of a cement polymer, commonly polymethylmethacrylate (PMMA), into the vertebral body, allowing for improved stability and pain relief. This treatment is particularly beneficial for patients with refractory to conservative medical therapy. It is worth noting that vertebral compression fractures are common in patients with osteoporosis, and vertebroplasty can significantly improve their quality of life.

While the signs and symptoms can be similar to those of thrombosis, patients with a history of osteoporosis and severe osteoporotic compression fractures are at increased risk for spinal cord damage due to vertebroplasty. The incidence of complications associated with vertebroplasty is relatively low, but it is important to monitor patients for signs of cord compression or other neurological deficits post-operatively.

Anticoagulation is initiated with unfractionated heparin and she was bridged with warfarin. Her fever and tachycardia resolved in the next two and four days, respectively, however, she remained dependent on supplemental oxygen until post-operative day 11. On post-operative day 13, she was discharged to inpatient rehabilitation in stable condition.

Discussion:
Introduction: Several studies have looked at the incidence of cement leakage and pulmonary complications in patients undergoing vertebroplasty. They have shown that when chest x-ray or chest CT was obtained on all patients post-vertebroplasty regardless of symptoms, the incidence of asymptomatic cement leakage and embolization was quite high, with up to 26% of patients demonstrating evidence of cement pulmonary emboli on chest CT. Thus, because symptoms of cement PE are often mild or absent and post-procedure imaging of the chest is not routinely performed, this condition is believed to be often missed in clinical practice. If left undetected and untreated, cement pulmonary embolism could potentially cause not only acute cardiopulmonary problems, but potentially irreversible pulmonary parenchymal damage if extensive.

Pathogenesis: Vertebral bodies are highly vascularized entities and form a valveless network of arteries after vertebroplasty: interdisciplinary management. Vertebral compression fractures decrease bony hindrance of the venous drainage and facilitate migration of cement fragments into the systemic venous circulation. Tocci et al suggested three factors that appear to play a role in the development of cement PE: insufficient polymerization of the polymethylmethacrylate at the time of injection, needle positioning with respect to the basivertebral vein and overfilling of the vertebral body.

Clinical Features: While the signs and symptoms can be similar to those of thrombotic PE, including hypoxemia, dyspnea, tachycardia, hemoptysis, chest pain, palpitations, arrhythmia, low-grade fever and hypotension, the majority of affected patients are asymptomatic. Only an estimated 1% of cases with osteoporotic compression fractures and 2%-5% of those with osteolytic metastases will be symptomatic. While less common, severe and fatal cases have been reported.

Cement PE can be diagnosed by detection of radiopaque material within the pulmonary vasculature on chest x-ray (Figure 1) or by areas of high attenuation on chest CT. Unlike thrombotic PE, cement emboli are best visualized in the bone window of CT due to their density. In some cases, intravenous contrast is used (Figures 2a, 2b, 3a, 3b).

To date, there have been no guidelines published on the detection and management of cement PE. Routine post-procedure screening chest x-rays to screen for this complication may be of benefit, as prompt initiation of anticoagulation may prevent superimposed thrombotic progression and further aggressive occlusion in affected patients.

Treatment: Recommended acute treatment is with unfractionated heparin, with transition to low molecular weight heparin or warfarin prior to discharge. While optimal duration of anticoagulation therapy for this condition is unknown, six months may allow for sufficient endothelialization of the polymethylmethacrylate embolus. In the rare case of cement PE complicated by respiratory or right heart failure with a large central embolus, embolectomy may be necessary.

Conclusion: In conclusion, cement PE is a common post-operative complication of vertebroplasty that physicians should be aware of to allow for prompt detection and treatment.

References:

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Brigid Hallinan, DO; Yehia Mishriki, MD
Lehigh Valley Health Network, Allentown, Pennsylvania