Bone Cement Pulmonary Embolism after Percutaneous Vertebroplasty

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Abstract

Percutaneous vertebroplasty (PVP) is a common procedure for treatment of painful vertebral fractures. Although PVP is considered minimally invasive, complications may occur during the procedure. Bone cement pulmonary embolism (CPE) is a severe and potentially life-threatening complication following vertebroplasty (VP). CPE commonly occurs after performing VP, but hemodynamically it has little clinical impact. Treatment strategies of CPE is still unclear.

Keywords: Cement leakage; Complication; Pulmonary embolism; Vertebroplasty

Case Report

A 36-year-old woman was admitted to outpatient clinic for chest pain. The pain was originating from low back and spreading to right and left lower chest. There was no dyspnea, tachypnea or tachycardia. Vital signs, routine blood work, arterial blood gas analysis and cardiac enzymes were normal. Patient did not use any drugs other than analgesic (Naproxen sodium). She hasn’t got any comorbid disease but she was quite overweight. Chest pain started three days after PVP performed for traumatic vertebral compression fracture. She was discharged two days after the procedure without any complication and symptom. We detected five centimeter-length linear foreign body in the right lower lobe in chest X-ray. In thorax Computerized Tomography (CT) we saw that the foreign body was in the right lower pulmonary artery (Figures 1 and 2). Thorax CT revealed the characteristic appearance of cement leakage at the level of the VP (Figure 3). The presence of cement embolism in the segmental and sub segmental pulmonary arteries of the right lower and middle lobe was also confirmed by CT. Because the patient was asymptomatic for pulmonary embolism, we didn’t start anticoagulation. The patient’s chest pain was attributed to soft tissue cement leakage at the level of vertebroplasty. There hasn’t been any further cement material embolization during three years follow up.

Materials and Methods

We collected data from PubMed database, with the queries: “complication of vertebroplasty”, “bone cement pulmonary embolism.” Only asymptomatic pulmonary cement embolism cases which occurred after vertebroplasty were selected for this review.

Results

There were seven series consisting of a total number of 951 VP cases, of which 72 (8%) developed asymptomatic PCE. Three of the series were retrospective, four of them were prospective. The numbers of case reports were sixteen. Anticoagulation treatment was used in two cases (2.5%), surgical embolectomy was used in three cases (3.5%). Patients received conservative treatment for the pulmonary embolism after surgery in all of these cases. Six publications didn’t discuss their treatment method (25 patients/38%). Eleven publications didn’t begin any treatment besides clinical observation (58 patients/66%) (Table 1).

13 patients (15%) were diagnosed during the surgery of vertebroplasty, 47 patients (54%) post-op in seven days, 23 patients (26%) two months and over and 4 (5%) unknown.

From our brief literature review, it seems to be unclear which therapeutic strategy to be used for asymptomatic bone cement pulmonary embolism. Treatments varies from clinical follow up to anticoagulation.

When we examined the publications in detail, we realized that at the case of Seo et al. [1]. Physicians was performed embolectomy because

Figure 1: Foreign body was in the right lower pulmonary artery.

Figure 2: Foreign body was in the right lower pulmonary artery (Enlarged image).

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of Chest CT showed catheter-like highly-dense 14-cm-length material within inferior vena cava (IVC) and focal thrombosis around the tip of the lesion in the right atrium. They considered the cement in the IVC to be the source of pulmonary thromboembolism or infarction. Therefore, an operation was performed to remove the foreign body in the IVC.

In the case of Dash et al. [2] embolectomy was performed because of the lesion in the right atrium. They considered the cement in the IVC to be the source of pulmonary thromboembolism or infarction. Therefore, an operation was performed to remove the foreign body in the IVC.

Discussion
Cement leaks into the external vertebral venous plexuses have frequently been reported. There is also a potential risk of cement migration into the inferior vena cava and pulmonary embolism [4]. The frequency of local leakage of bone cement is relatively high (about 80–90%), moreover, the rate of cement leakage into the perivertebral veins (seen in up to 24% of vertebral bodies treated) with consequent pulmonary cement embolism varies from 4.6 to 6.8% (up to 26% in radiologic studies) [5,6].

It is assumed that in many cases, many embolisms remain undetected. In the majority of those cases, cement leakage does not cause any problems and is usually detected during routine radiological work up. Those types of cement leakages after PVP seem to be harmless and require no further therapy [7,9,10,22]. Nevertheless, pulmonary cement embolisation leading to death can be the after effect of uncontrolled leakage.

Conclusion
Due to potential hazards of radiation exposure, Chest X-ray is not a routine work-up after VP. That may be the reason why a significant portion of PCE patients are still diagnosed incidentally and there is no clear diagnostic or treatment standard for PCE. Chest X-ray should be taken after VP for recognition of pulmonary leakage. We suggest routine Chest X-ray evaluation after the procedure and CT scan, especially in the cases where cement leakage is detected during the procedure. Thereby serious cardiopulmonary complications due to delayed or missed diagnoses can be prevented.

The results show that there is no clear diagnostic or treatment standard for asymptomatic PCE. In cases of asymptomatic patients with peripheral PCE we recommend no treatment besides clinical follow-up; in cases of asymptomatic central PCE, however, we recommend to proceed routine treatment of pulmonary embolism as in the guidelines. In cases with large sized peripheral emboly in systemic circulation or intracardiac emboly, we recommend surgical resection because of potential cardiopulmonary complications.

References
1. Seo JS , Kim YJ, Choi BW, Kim TH, Choe KO (2005) MDCT of pulmonary embolism after percutaneous vertebroplasty. AJR Am J Roentgenol 184: 1364-1365.
2. Dash A, Brinster DR (2011) Open heart surgery for removal of polymethylmethacrylate after percutaneous vertebroplasty. Ann Thorac Surg 91: 276-278.
3. Baumann A, Tauss J, Baumann G (2006) Cement embolization into the vena cava and pulmonary arteries after vertebroplasty: interdisciplinary management. Ann Rheum Dis 31: 558–561.
4. Weil A , Chiras J, Simon JM, Rose M, Sola-Martinez T, et al. (1996) Spinal metastases: indications for and results of percutaneous injection of acrylic surgical cement. Radiology 199: 241-247.
5. Choe DH , Marom EM, Ahrar K, Truong MT, Madewell JE (2004) Pulmonary embolism of polymethyl methacrylate during percutaneous vertebroplasty and kyphoplasty. AJR Am J Roentgenol 183: 1097-1102.
6. Antonio Krueger, Christopher Bilemel, Ralph Zettl, Steffen Ruchholtz (2009) Management of pulmonary cement embolism after percutaneous vertebroplasty and kyphoplasty: a systematic review of the literature. Eur Spine J 18: 1257-1265.
7. Pizzoli AL, Brivio LR, Caudana R, Vittorini E (2008) percutaneous CT-guided vertebroplasty: personal experience in the treatment of osteoporotic fractures and dorsolumbar metastases. Orthop Clin North Am 49:449-458
8. Geraci G, Lo Iacono G, Lo Nigro C, Cannizzaro F, Cajuozzo M, et al. (2013)
Asymptomatic bone cement pulmonary embolism after vertebroplasty: case report and literature review. Case Rep Surg 2013; 591432.

9. Grados F, Depriester C, Cayrolle G, Hardy N, Deramond H, et al. (2000) Long-term observations of vertebral osteoporotic fractures treated by percutaneous vertebroplasty. Rheumatology (Oxford) 39: 1410-1414.

10. Bernhard J, Heini PF, Villiger PM (2003) Asymptomatic diffuse pulmonary embolism caused by acrylic cement: an unusual complication of percutaneous vertebroplasty. Ann Rheum Dis 62: 85-86

11. Pleser M, Roth R, Wörsdörfer O, Manke C (2004) Pulmonary embolism caused by PMMA in percutaneous vertebroplasty. Case report and review of the literature. Unfallchirurg 107: 807-811.

12. MacTaggart JN, Pipinos II, Johanning JM, Lynch TG (2006) Acrylic cement pulmonary embolous masquerading as an embolized central venous catheter fragment. J Vasc Surg 43: 180-183.

13. Choe DH, Marom EM, Ahkar K, Truong MT, Madewell JE (2004) Pulmonary embolism of polymethyl methacrylate during percutaneous vertebroplasty and kyphoplasty. AJR Am J Roentgenol 183: 1097-1102.

14. Quesada N, Mutlu GM (2006) Images in cardiovascular medicine. Pulmonary embolization of acrylic cement during vertebroplasty. Circulation 113: e295-296.

15. Abdul-Jalil Y, Bartels J, Alberti O, Becker R (2007) Delayed presentation of pulmonary polymethylmethacrylate emboli after percutaneous vertebroplasty. Spine 32: 589-593.

16. Serra L, Kermani FM, Panagiotopoulos K, De Rosa V, Vizzioli L (2007) Vertebroplasty in the treatment of osteoporotic vertebral fractures: results and functional outcome in a series of 175 consecutive patients. Minimally Invasive Neurosurgery. 50: 12–17.

17. Schneider L, Pitt M (2007) Pulmonary embolization of acrylic cement during percutaneous vertebroplasty. Intern Med J 37: 423-425.

18. Kim YJ, Lee JW, Park KW, Yeom JS, Jeong HS, et al. (2009) Pulmonary cement embolism after percutaneous vertebroplasty in osteoporotic vertebral compression fractures: incidence, characteristics, and risk factors. Radiology 251: 250-259.

19. Venmans A, Lohle PN, van Rooij WJ, Verhaar HJ, Mali WP (2008) Frequency and outcome of pulmonary polymethylmethacrylate embolism during percutaneous vertebroplasty. AJNR Am J Neuroradiol. 29: 1983-1985

20. Venmans A, Klazen CA, Lohle PN, van Rooij WJ, Verhaar HJ, et al. (2010) Percutaneous vertebroplasty and pulmonary cement embolism: results from VERTOS II. AJNR Am J Neuroradiol 31: 1451-1453.

21. Fornell-Pérez R, Santana-Montesdeoca JM, Junquera-Rionda P (2010) [Multiple pulmonary embolisms caused by acrylic cement after vertebroplasty]. Arch Bronconeumol 46: 493-494.

22. Nesnidal P, Stulik J, Sebesta P (2010) Pulmonary polymethylmethacrylate embolism: a rare complication of percutaneous vertebroplasty. 77: 337–340.

23. Luettmer MT, Bartholmai BJ, Rad AE, Khallmes DF (2011) Asymptomatic and unrecognized cement pulmonary embolism commonly occurs with vertebroplasty. AJNR Am J Neuroradiol 32: 654-657.

24. Tourier JP, Cottes S (2012) Images in clinical medicine. Pulmonary cement embolism after vertebroplasty. N Engl J Med 366: 258.

25. Sifuentes Giraldo WA , Lamúa Riazañecaro JR, Gallego Rivera JL, Vázquez Díaz M (2013) Cement pulmonary embolism after vertebroplasty. Revumatol Clin 9: 239-242.

26. Geraci G, Lo Iacono G, Lo Negro C, Cannizzaro F, Cajozzo M, et al. (2013) Asymptomatic bone cement pulmonary embolism after vertebroplasty: case report and literature review. Case Rep Surg 2013: 591432.

27. Lee SH, Kim WH, Ko JK (2013) Multiple pulmonary cement embolism after percutaneous vertebroplasty. QJM 106: 877-878.