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Delayed Trans-Tricuspid Intracardiac Cement Embolism After Vertebroplasty: A Case Report With Conservative Management

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Case Report

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Abstract

Background

Intracardiac cement embolism (ICE) is a rare but potentially fatal complication of percutaneous vertebroplasty (PVP). Delayed presentation with initially negative postoperative imaging is particularly challenging. The novelty and clinical implications of this case are reported.

Case presentation:

A 70-year-old man developed chest tightness and exertional dyspnoea three months after L3 PVP for an osteoporotic compression fracture. Early postoperative chest CT had shown no evidence of pulmonary or intracardiac cement embolism. Transthoracic echocardiography demonstrated a linear hyperechoic structure traversing the tricuspid valve from the right atrium to the right ventricle, with minimal mobility and mild tricuspid regurgitation. Repeat contrast-enhanced chest CT confirmed a linear hyperattenuating cement embolus extending across the tricuspid valve. The embolus had contact points with the right atrial and right ventricular walls and showed minimal mobility, with preserved right ventricular systolic function and no cardiac perforation, pericardial effusion, or haemodynamic compromise. After multidisciplinary assessment, conservative management was selected. At six months after diagnosis, symptoms had resolved and serial echocardiography showed no change in the embolus.

Conclusions

Delayed intracardiac cement embolism should be considered in patients with new cardiopulmonary symptoms after vertebral augmentation even when early postoperative imaging is negative. In selected patients with a minimally mobile, stable embolus, preserved cardiac function, and no major cardiac complications, conservative management with careful follow-up may be considered.

Background

Percutaneous vertebroplasty (PVP) is a well-established minimally invasive procedure for osteoporotic vertebral compression fractures. Intracardiac cement embolism (ICE) is rare but potentially fatal. A recent systematic review of 181 reported cases found that symptoms most commonly developed within 48 hours after vertebral augmentation, although delayed presentations ranging from several months to five years have also been described [1]. We describe a delayed trans-tricuspid ICE presenting three months after vertebroplasty that was managed conservatively after multidisciplinary evaluation based on embolus stability and absence of major cardiac complications.

Case Presentation

A 70-year-old man presented with a three-day history of progressive low back pain following a fall. He had severe osteoporosis and a history of percutaneous coronary intervention. Physical examination revealed focal tenderness over L3. Lumbar MRI confirmed an acute L3 osteoporotic compression fracture with bone marrow oedema.

Under local anaesthesia, bilateral L3 PVP was performed on 21 March 2024. PMMA cement containing zirconium dioxide was injected slowly under continuous fluoroscopic guidance; a total of approximately six mL was delivered bilaterally. No obvious cement extravasation was observed during the procedure. Early postoperative chest CT showed no evidence of pulmonary or intracardiac cement embolism.

On postoperative day one, the patient developed chest pain without respiratory symptoms. Chest CT revealed an approximately 20% right pneumothorax, attributed to needle-related pleural injury, with no evidence of pulmonary or intracardiac cement embolism. A chest tube was placed, and the pneumothorax subsequently resolved.

Three months later, he re-presented with intermittent chest tightness and exertional dyspnoea. Transthoracic echocardiography demonstrated a linear hyperechoic structure traversing the tricuspid valve from the right atrium to the right ventricle, with minimal mobility and mild tricuspid regurgitation (Figure 1A,B). Repeat contrast-enhanced chest CT demonstrated a linear hyperattenuating cement embolus extending across the tricuspid valve (Figure 1C,D). No cardiac perforation, pericardial effusion, or haemodynamic compromise was identified. Echocardiography showed preserved right ventricular systolic function, mild tricuspid regurgitation, and a tricuspid regurgitation pressure gradient of 18 mmHg.

A multidisciplinary team including orthopaedic surgeons, cardiologists, and cardiac surgeons considered the embolus to have contact points with the right atrial and right ventricular walls and to be minimally mobile. Given the preserved right ventricular function and the absence of cardiac perforation, haemodynamic compromise, or significant valvular dysfunction, conservative management was considered appropriate because the potential risks of surgical extraction were judged to outweigh the expected benefits. Anticoagulation was not initiated specifically for the cement embolism, as PMMA is a foreign material rather than a thrombus and evidence supporting anticoagulation for intracardiac cement embolism remains limited [4]. At six months after the diagnosis of intracardiac cement embolism, the patient's symptoms had resolved. Serial echocardiography demonstrated no change in the position, morphology, or mobility of the embolus, and right ventricular function remained preserved.

Discussion and Conclusions

This case is distinguished by three features: (i) delayed presentation — symptoms emerged three months after vertebroplasty despite the absence of intracardiac cement on early postoperative imaging; (ii) a trans-tricuspid course, with the embolus traversing the valve from the right atrium to the right ventricle; and (iii) an embolus that had contact points with the right atrial and right ventricular walls and

showed minimal mobility, while right ventricular function was preserved and no cardiac perforation occurred.

Because intracardiac cement embolism is uncommon, evidence regarding its optimal management remains limited. A recent systematic review of 181 reported cases demonstrated considerable heterogeneity in management strategies, including conservative treatment, percutaneous retrieval, and open surgical removal [1]. Management was thus individualised, reflecting the absence of high-quality evidence to guide treatment selection. Notably, a case of intracardiac cement embolism resulting in tricuspid regurgitation ultimately required surgical removal and biological tricuspid valve replacement [2], and a case series described massive cardiopulmonary cement embolism with cardiac perforation requiring cardiothoracic surgical intervention [3] — contrasts that underscore the importance of individualised assessment. Conversely, conservative management may be reasonable in selected haemodynamically stable patients with a minimally mobile, stable embolus, preserved cardiac function, and no evidence of major cardiac complications.

In our patient, these features favoured conservative management after multidisciplinary assessment because the expected benefits of retrieval were limited and the potential procedural risks, including tricuspid valve injury and cardiac complications, remained considerable. Surgical removal remains an important option for intracardiac cement emboli, particularly in patients with mobile emboli, cardiac perforation, progressive valvular dysfunction, or haemodynamic instability. However, in our patient, the embolus demonstrated minimal mobility and remained unchanged during follow-up, suggesting a lower risk of acute migration.

In conclusion, this case highlights that delayed intracardiac cement embolism should be considered in patients with new cardiopulmonary symptoms after vertebral augmentation even when early postoperative imaging is negative. It is a single case with six-month follow-up, and long-term outcomes remain unknown. The precise timing and mechanism of embolisation cannot be definitively established. Nevertheless, this case suggests that in carefully selected patients with stable, minimally mobile intracardiac cement emboli, conservative management with careful follow-up may be considered, consistent with observations in other reported cases [5].

Abbreviations

PVP	Percutaneous vertebroplasty
ICE	Intracardiac cement embolism
PMMA	Polymethylmethacrylate
CT	Computed tomography
RV	Right ventricle
RA	Right atrium
TV	Tricuspid valve
TAPSE	Tricuspid annular plane systolic excursion
TR	Tricuspid regurgitation
TRPG	Tricuspid regurgitation pressure gradient

Declarations

Conflict of Interest: None

Ethics approval and consent to participate: Ethics approval was waived because this study was a single case report and did not involve experimental intervention, in accordance with institutional policy.

Consent for publication: Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Availability of data and materials: The datasets generated and/or analysed during the current study are not publicly available due to patient privacy concerns but are available from the corresponding author on reasonable request.

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Authors' contributions: Jianhang Lin: data acquisition, drafting the manuscript. Haosen Wang: data interpretation, critical revision. Yu Li: cardiology assessment, critical revision. Tao Huang: study conception, final approval. All authors read and approved the final manuscript.

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Figures

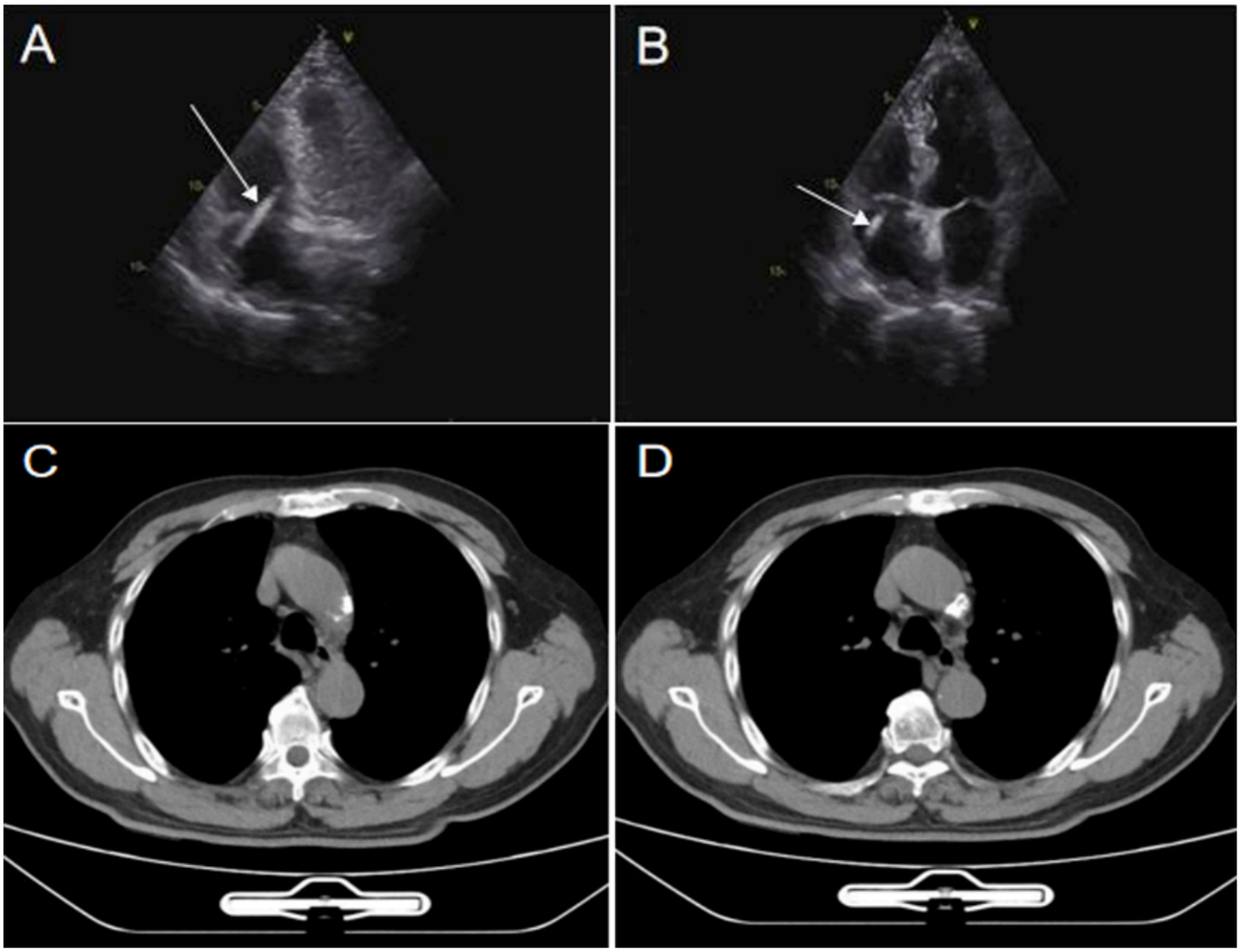


Figure 1

Multimodality imaging of trans-tricuspid intracardiac cement embolism. (A, B) Transthoracic echocardiography (apical four-chamber view) showing a linear hyperechoic cement embolus (arrows) traversing the tricuspid valve from the right atrium (RA) to the right ventricle (RV). (C, D) Contrast-enhanced chest computed tomography demonstrating the intracardiac cement embolus crossing the tricuspid valve, with its linear hyperattenuating appearance clearly visible.