

## References

1. Prêtre R, Chilcott M. Blunt trauma to the heart and great vessels. *N Engl J Med* 1997;336:626-32.
2. O'Connor JV, Byrne C, Scalea TM, Griffith BP, Neschis DG. Vascular injuries after blunt chest trauma: diagnosis and management. *Scand J Trauma Resusc Emerg Med* 2009;17:42.
3. Nan YY, Lu MS, Liu KS, et al. Blunt traumatic cardiac rupture: therapeutic options and outcomes. *Injury* 2009;40: 938-45.

## Robotic-Assisted Removal of Intracardiac Cement After Percutaneous Vertebroplasty

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Percutaneous vertebroplasty (PVP) is an increasingly common intervention, and complications resulting from embolization are increasingly observed. We report a case of polymethyl methacrylate (PMMA) embolization resulting in cardiac complications in a frail patient, which was managed with endoscopic robotic-assisted removal of the embolized material.

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Each year more than 700,000 vertebral compression fractures occur in the United States [1]. Osteoporosis is considered to be among the 10 most important worldwide diseases, according to the World Health Organization, leading to vertebral compression fractures, which dramatically increase morbidity and mortality [2].

PVP has been used since 1987 [3] to treat intractable pain resulting from osteoporotic compression fractures. Complications are rare; however, leakage of polymethyl methacrylate (PMMA) cement into the spinal canal, paravertebral tissues, or perivertebral venous system can occur. Leakage into the heart and pulmonary arteries has been reported, and removal of PMMA cement from the heart by open surgical approaches has been described [4]. The following reports the first published case managed by an endoscopic robotic-assisted approach.

A 75-year-old woman with severe steroid-dependent emphysema/chronic obstructive pulmonary disease



Fig 1. Preoperative computed tomographic angiography of chest reveals pericardial effusion and linear density in right atrium crossing into right ventricle; it was initially thought to be artifact.

underwent outpatient T5-6 kyphoplasty and was discharged on the day of the procedure. The following day she presented with increasing chest pain. She was tachycardic and hypotensive. Her chest roentgenogram revealed changes consistent with severe emphysema and a possible widened mediastinum. Cardiac echocardiography revealed a large pericardial effusion confirmed by computed tomographic angiography (CTA), which also revealed a linear foreign body in the right side of the heart, which was initially thought to be an artifact (Fig 1). She was taken to the operating room and subxiphoid pericardial drainage was performed. Five hundred milliliters of blood was drained, and a 1.5-cm hard pointed loose kyphoplasty cement fragment was retrieved from the pericardium. No site of myocardial penetration could be identified. The patient experienced refractory atrial fibrillation and persistent chest pain, with electrocardiographic changes consistent with pericarditis. Repeated surface echocardiography revealed a thin pointed foreign body abutting the right atrial surface extending through the tricuspid valve midway into the right ventricle, which was consistent with PMMA cement.

Given the appearance of the foreign body as well as concern for perforation and ongoing atrial arrhythmias, it was elected to remove the foreign body using an endoscopic technique. Preoperative CTA of the chest, abdomen, and pelvis confirmed the presence of the right-sided foreign body and revealed satisfactory anatomy for retrograde femoral perfusion and a right-sided chest robotic-assisted endoscopic operation. The patient had no significant peripheral vascular disease. Bicaval venous cannulation was accomplished through percutaneous 17F right internal jugular vein cannulation

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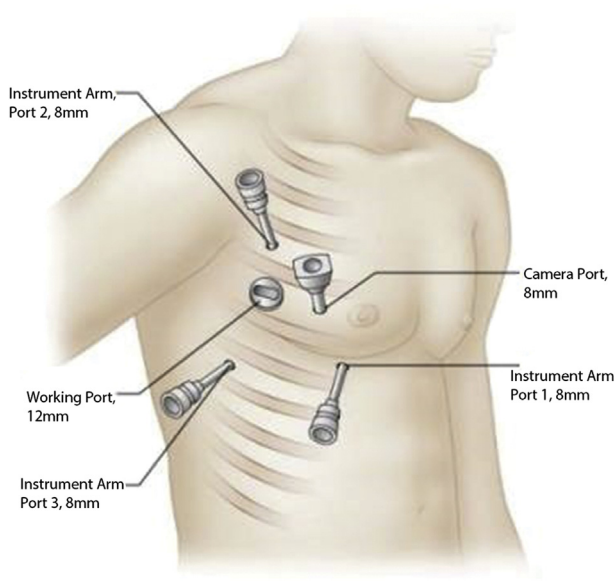


Fig 2. Port placement for endoscopic intracardiac procedure.

and 22F right common femoral vein cannulation. Because of the small size of the femoral artery (6 mm), a 17F Bio-Medicus common femoral artery cannula (Medtronic, Inc, Minneapolis) and a 14-gauge BD Angiocath (BD, Franklin Lakes, NJ) right superficial femoral artery shunt were used. Standard right-sided endoscopic port placement included an 8.5-mm camera port in the fifth intercostal space and a 12-mm working port in the fifth intercostal space, left and right arm ports in the third and seventh intercostal spaces, and an atrial lift port in the fifth intercostal space (Fig 2). Lung adhesions were taken down. CO<sub>2</sub> insufflation was used.

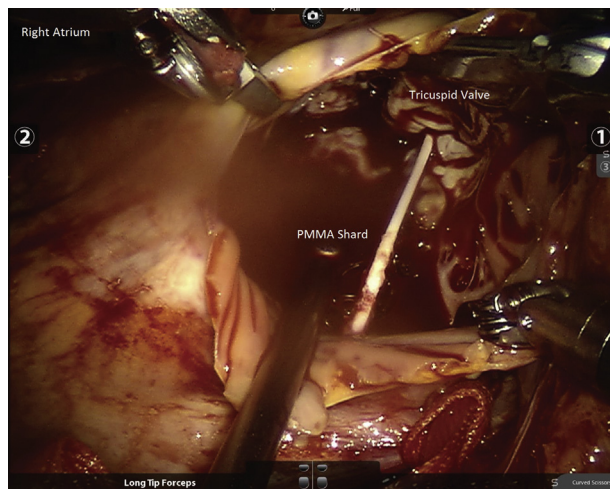


Fig 3. Intraoperative view of polymethyl methacrylate (PMMA) shard abutting the right atrial wall crossing through the tricuspid valve into the right ventricle.

The pericardium was opened and the venae cavae isolated. Warm beating-heart cardiopulmonary bypass was initiated, and the right atrium was opened at the site of the protruding PMMA fragment. The 7 × 2 mm fragment was excised from the right atrial wall (Fig 3). The free end traversed the tricuspid valve extending well into the right ventricle. Patient discharge was anticipated on the fourth postoperative day when she suddenly experienced subcutaneous air and required a second CT followed by talc pleurodesis, after which she was discharged in normal sinus rhythm with no further complications.

Review of the literature reveals reports of asymptomatic pulmonary cement embolism after vertebroplasty [5, 6] successfully managed nonoperatively. Additionally, endovascular retrieval of a cement fragment embolus in the pulmonary artery has been reported [7]. Finally, surgical removal by median sternotomy has been reported [8]. The endoscopic approach offers enhanced visualization of right-sided chambers and pericardial space, allowing for extraction of foreign bodies from the right side of the heart without rib spreading and with less tissue trauma compared with sternotomy or mini-thoracotomy approaches.

### Comment

Patients presenting with chest pain or cardiac arrhythmias after PVP should be evaluated for potential cardiac embolization with cardiac echocardiography and chest roentgenology. Cardiac chamber perforation, impending perforation, pericarditis, and new-onset cardiac arrhythmias associated with embolization represent indications for surgical intervention. An endoscopic approach may be advantageous in selected patients to limit invasiveness of foreign body removal from the right side of the heart and shorten recovery.

### References

- Orenstein BW. Interventional update: vertebral augmentation—comparing kyphoplasty and kiva procedures. *Radiology Today* 2014;15:14.
- Edidin AA, Ong KL, Lau E, Kurtz SM. Life expectancy following diagnosis of a vertebral compression fracture. *Osteoporosis Int* 2013;24:451–8.
- Galibert P, Deramond H, Rosat P, Le Gars D. Preliminary note on the percutaneous treatment of vertebral angioma by percutaneous acrylic vertebroplasty. *Neurochirurgie* 1987;33:166–8.
- Lim SH, Kim H, Kim HK, Baek MJ. Multiple cardiac perforations and pulmonary embolism caused by cement leakage after percutaneous vertebroplasty. *Eur J Cardiothorac Surg* 2008;333:509–11.
- Cadeddu C, Nocco S, Secci E, Deidda M, Pirisi R, Mercurio G. Echocardiographic accidental finding of asymptomatic cardiac and pulmonary embolism caused by cement leakage after percutaneous vertebroplasty. *Eur Hear J Cardiovasc Imaging* 2009;10:590–2.
- Toutier J-P, Cottez S. Pulmonary cement embolism after vertebroplasty. *N Engl J Med* 2012;366:258.
- Bose R, Choi JW. Successful percutaneous retrieval of methyl methacrylate orthopedic cement embolism from the

pulmonary artery. *Catheter Cardiovasc Interv* 2010;76:198-201.

8. Lim SH. Multiple cardiac perforations and pulmonary embolism caused by cement leakage after percutaneous vertebroplasty. *Eur J Cardiothoracic Surg* 2008;33:509-11.

## Aortogastric Fistula Caused by a Foreign Body in a Hiatal Hernia

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Foreign body ingestion is more common in children than in adults, and sharp foreign body ingestion is extremely rare. We report a 93-year-old woman who was unaware of foreign body ingestion and who presented with sudden hematemesis and circulatory collapse. Computed tomography showed a hiatus hernia and part of the stomach herniating in the posterior mediastinum. Additionally, a needle-shaped object was seen penetrating the aorta through the herniated gastric wall. Therefore, immediate endovascular repair of the aorta was performed. Subsequent endoscopy identified a bamboo stick. Therefore, emergent laparotomy and gastrotomy were performed to retrieve the stick, followed by repair of the hernia. The postoperative recovery was uneventful. Such cases are associated with high morbidity, mandating long-term follow-up.

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Foreign body ingestion predominantly occurs at the extremes of age. Adults with gastrointestinal motility or structural disorders, mental retardation, or psychiatric illness are at high risk of injury from foreign body ingestion, and such injuries are common among children with tracheoesophageal fistula, stenotic lesions of the gut, or a history of previous gastrointestinal operations. Sharp metallic objects, dentures, fish bones, and poultry bones are notorious for causing esophageal perforation with or without penetration of adjacent viscera. Pneumo-mediastinum, soft tissue emphysema, mediastinitis, hemothorax, hemopericardium, cardiac tamponade, and massive upper gastrointestinal tract hemorrhage secondary to aortoesophageal fistula formation are some of the adverse events of foreign body ingestion. Here, we report the case of a patient with an aortogastric fistula caused by a foreign body in a hiatal hernia.

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A 93-year-old woman had experienced back pain for several days, and she had a sudden fall and lost conscious after experiencing worsening back pain and hematemesis. She was transferred to our hospital in an ambulance. On arrival at the emergency department, she regained consciousness, and her blood pressure was 82/58 mm Hg. Emergent computed tomography showed a hiatus hernia and part of the stomach herniating in the posterior mediastinum. Additionally, a needle-shaped object was seen penetrating the aorta through the herniated gastric wall (Fig 1), and a hematoma was seen in the posterior mediastinum. Leakage of contrast medium into the stomach was also noted. However, no apparent signs of mediastinitis were noted. Her hemoglobin level was 3.0 g/dL. Therefore, she was immediately transferred to the operating room, and emergent endovascular repair of the aorta was performed. A Gore TAG thoracic endoprosthesis (31 mm × 15 cm, W. L. Gore & Associates, Flagstaff, AZ) was passed through the right femoral artery to the descending aorta, and an intraoperative aortogram confirmed the disappearance of leakage from the aorta. Subsequent gastrointestinal endoscopy showed a bamboo stick penetrating both the anterior and posterior gastric walls (Fig 2). However, the bamboo stick was too long to be retrieved endoscopically. Therefore, emergent laparotomy and direct gastrotomy were performed to



Fig 1. Computed tomographic view with contrast medium, showing a sharp foreign body piercing the aorta through the stomach.