

CASE REPORTS

Intra-arterial injection of acrylic cement as a complication of percutaneous vertebroplasty

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Percutaneous vertebroplasty (PVP) with polymethylmethacrylate (PMMA) is a minimally invasive procedure that provides significant pain relief in a high percentage of patients with osteoporotic fractures. The complication rate of PVP is reported to be below 6%. This case illustrates, for the first time, an arterial PMMA embolus to the aorta and its branches as a complication of PVP. (J Vasc Surg 2012;56:1107-9.)

Percutaneous vertebroplasty (PVP) with polymethylmethacrylate (PMMA) was developed in France, and in 1987, Galibert et al reported the use of PVP for the first time to treat vertebral hemangiomas.¹ Today, percutaneous vertebroplasty has an extended use for the treatment of various conditions that affect the vertebral body such as metastases, osteoporotic compression fractures, and vertebral myeloma.²

Complications of PVP have been rare. Pulmonary embolism and paraplegia have been reported after PVP.^{3,4} There has been no report of intra-arterial injection of acrylic cement in the past. We report a case in which injection of PMMA into a vertebral body resulted in acute bilateral lower extremity ischemia and was diagnosed to be attributable to intra-arterial injection.

CASE REPORT

A 66-year-old woman was admitted to the neurosurgery department with back pain from 2 months ago after falling down from a height of 1 meter. The pain was exacerbated in the last 3 days. The patient had no past medical history and used no medication. Neurologic examination revealed reduced strength of both lower extremities but light touch, vibratory sense, joint position sense, and deep tendon reflexes were normal. Diagnosis of T4, T5, L1, and L2 pathologic fractures were made by performing CT scan. A bone scan revealed multiple nonhomogeneous abnormal areas with increased uptake in ribs, sternum, vertebral column,

proximal of femurs, midshaft of right femur, and scapulae that suggested metastasis as the pathology.

The operation was performed with the patient in a prone position on a supine frame that had biplanar (anteroposterior and lateral) fluoroscopy compatibility under general anesthesia. The vertebral body to be treated was localized under fluoroscopic control. Two skin incisions were made on T5 and L1. A disposable 11-gauge Jamshidi needle was then introduced through the skin incisions over these pedicles, and 5 mL of PMMA (BonOs Inject, Aap, Germany) was slowly injected into the middle of each vertebral body of T4, T5, L1, and L2. The primary aim was to decrease pain and also to slightly increase the anterior vertebral body height. Vertebroplasty was done under fluoroscopic guidance, and the patient was transferred to the recovery room in good condition.

After 12 hours, the patient felt pain and numbness in both lower limbs, and a vascular surgery consult was requested. Physical examination revealed mottling in the abdomen below the umbilicus and both lower limbs from proximal to distal. Both lower limbs were cold below the knee, but the proximal parts of the lower extremities were warm despite the mottling. Femoral and popliteal pulses of both lower extremities were detected, but distal pulses did not exist and both feet had delayed capillary filling. Light touch, vibratory sense, joint position sense, and deep tendon reflexes were absent in both lower extremities below the knee, and the patient could not move her toes or ankles, but she could move the knee joint.

A Doppler sonography revealed triphasic flow pattern in the common femoral and popliteal arteries of both sides, but anterior tibialis and posterior tibialis arteries did not demonstrate any flow.

Acute ischemia of the left and right lower extremities was diagnosed, and the patient was transferred to the operating room for embolectomy about 18 hours after vertebroplasty. Skin incisions were made on femoral artery pulses on both sides and control was taken from common femoral arteries and both superficial and deep femoral arteries, and longitudinal arteriotomy was performed on the common femoral artery proximal to bifurcation. A forceful pulsatile flow of blood was present in both common femoral

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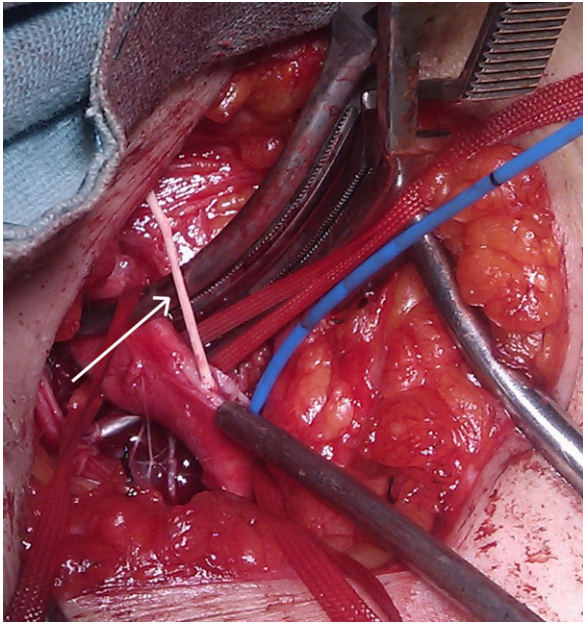


Fig 1. Polymethylmethacrylate (PMMA) cement from popliteal artery.

arteries. A Fogarty 3F catheter was advanced from the common femoral artery through the popliteal artery. The balloon was inflated and fragments of cement were extracted from 60 cm within the popliteal artery (Fig 1). It was not possible to extract all of the cement because of the rigidity of PMMA, and the Fogarty catheter could not be advanced more than 60 cm. The arteriotomies were then closed with a continuous running stitch of number 6-0 prolene. The duration of the operation was about 2 hours with an estimated blood loss of 400 mL. Fasciotomies were not performed because the ischemia was acute and the calf muscles were not tense. The distal pulses of both lower extremities were checked after the operation and were not detected. Completion arteriography was not performed because it could not differentiate between cement and dye. The patient was transferred to the intensive care unit.

An X-ray of both legs after the operation demonstrated cement as opacity in the posterior and anterior tibialis arteries (Fig 2).

The patient became hypotensive and anuric the next day and her creatinine rose to 1.8 and resistant hyperkalemia was detected, which did not respond to routine medical therapies. Disseminated intravascular coagulation with seven international normalized ratio and 86,000 platelet count occurred as well. The patient's blood pressure was about 85/55 mm Hg and central vein pressure was used for monitoring the patient's hydration status, and dopamine infusion was started. Acidosis occurred and the lowest arterial pH was 6.927. Mesenteric ischemia was suspected, but the patient's vital signs were not stable enough to transfer her to radiology for evaluation of this diagnosis. The patient died 29 hours after the operation despite intensive supportive care.

DISCUSSION

PVP with PMMA is a minimally invasive procedure that provides significant pain relief in a high percentage of



Fig 2. X-ray showed cement in arteries.

patients with osteoporotic fractures.⁵ Originally, the percutaneous procedure was designed to treat painful vertebral destructions caused by hemangiomas,⁶ but today, there are numerous other indications for percutaneous vertebroplasty. This procedure provided spinal stabilization in patients with malignancies but did not produce consistent pain relief.⁵

The complication rate of PVP is reported to be below 6% per treated level. Treatment failure and complications observed are related to cement leakage, insufficient pre-treatment evaluation, anesthesia, or patient position during treatment.^{5,7} Rib fracture is the most common complication after PVP.⁸ Another common complication is cement leakage.⁹

Although leakages into surrounding tissues as well as leakages into paravertebral veins are common complications after percutaneous vertebroplasty,¹⁰ no case of arterial migration of PMMA cement to lower extremities has been described in the literature previously. In this case, the injection of PMMA into one of the lumbar arteries may have caused its migration into the aorta and small arterial branches, which caused abdominal wall and lower extremity mottling despite the presence of blood flow in major vessels. PMMA cement hardens a few minutes after preparation, and this complication can be explained by the fluid consistency of the PMMA at the moment of injection. The

cement may be mixed more consistently to prevent intravascular injection. Intra-arterial flow pressure in this vertebral artery may have been less than the pressure of the injected cement, and this allowed retrograde arterial flow of the PMMA into the aorta. Intra-arterial injection of the cement may occur if the needle is positioned incorrectly, and fluoroscopic guidance can be used to verify needle positioning.

Our patient died 2 days after intra-arterial injection of the cement. This may be due to hyperkalemia, acidosis, and release of free radicals from ischemic tissues after occlusion of small arterial branches. Biplane fluoroscopy is useful in detecting and preventing this lethal event. This case illustrates, for the first time, an arterial PMMA embolus to the aorta and its branches as a complication of PVP.

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