Cementoplasty and the Oncologic Population

J C Hodge

ABSTRACT

The first and only description of percutaneous cementoplasty, to date, has been described in the French medical literature in 1994. In this series of 12 cases, radiologists successfully instilled a cement derivative into the acetabulum under fluoroscopic control[1]. As in these cases, the major indication for cementoplasty is to provide pain control and stabilization of an osteolytic lesion. Potentia1 complications include physical or thermal damage to the adjacent neurovascular structures, either during needle positioning or from cement leakage, respectively. Although no absolute contraindications exist, one should proceed cautiously in patients with coagulopathies. Results may be suboptimal as well in patients with pathologic fractures.

Keywords: methyl methacrylate, osteolytic, osteoporosis, metastases

Singapore Med J 2000 Vol 41(8):407-409

INTRODUCTION

Cementoplasty, like vertebroplasty, refers to a palliative therapy whereby methyl methacrylate is placed into an osseous lesion under fluoroscopic guidance[2,3].

The methyl methacrylate solution is prepared by mixing a white powder, consisting of polymethyl methacrylate, methyl methacrylate-styrene-copolymer and barium sulfate, with a flammable liquid monomer composed of methyl methacrylate, NN-dimethyl-p-toluidine, and hydroquinone. Because of the potentia1 of the lipid solvent to cause contact dermatitis, the person preparing the cement mixture should double glove. Due to the potential hazardous effects from the vapors of the lipid solvent (irritation to the eyes, respiratory tract, and liver), all personnel in the fluoroscopy suite should wear masks. To reduce prolonged inhalation of the hazardous vapors, and because the cement mixture hardens within a few minutes of its preparation, the cement mixture should only be prepared when the needle(s) for inserting the cement has been adequately positioned.

The volume of cement injected depends on the size of the lesion and the patient's tolerance for pain (a moderate amount of pain occurs during the cement injection, likely due to its thermal properties). Typically volumes of 3 to 7 cc's are injected into an average-sized lesion. A three cc syringe is ideal for the injection, providing little resistance to cement instillation. The radiologist should terminate the injection once extraosseous cement is identified. This reduces the risk of thermal injury to the soft tissues.

Although cardiac arrest, pulmonary embolism, stroke, myocardial infarct, and sudden death have been reported with the intraoperative use of bone cement, these are extremely rare. Of these, only pulmonary embolism has been reported following vertebroplasty[2]. These untoward reactions have all been related to the leakage of cement into the cardiovascular system. More frequent adverse reactions observed with the intraoperative use of cement include transient hypotension and thrombophlebitis. These, however, have not been observed with the percutaneous use of cement.

The ideal candidate for cementoplasty is one with disabling pain attributed to an osteolytic lesion due to metastatic disease or multiple myeloma. The onset of pain control is fairly rapid with this technique, occurring between one and 72 hours post-injection. However, pain control may not be long-lasting with cementoplasty alone. Therefore, radiotherapy should be administered, within days or weeks of cementoplasty (either before or after the procedure), as a method of providing long-term pain control.

Although cementoplasty has been described in the acetabulum, this article suggests that this technique can have utility in the long bones as well, either weight-bearing or non-weight-bearing. Whereas this technique may result in improved mobility in the weight-bearing skeleton, it can result in an improvement in the quality of life, albeit temporary, for those with osteolytic malignancy at any site. The following case presentations illustrate the utility of cementoplasty in clinical practice.

The Royal Victoria Hospital
687 Pine Avenue West
Montreal, QC
H3A 1A1, Canada

Jacqueline C Hodge, MD

Tel: (514) 842 1231, 4367
Fax: (514) 843 1517
Email: jchodge@rad.mgh.mcgill.ca

Fig. 1 This single frontal radiograph of the right humerus, in a 48-year-old Chinese man with gastric cancer, demonstrates an oblong osteolytic metastasis in the proximal diaphysis.

Fig. 2 Utilizing fluoroscopic guidance, methyl methacrylate is instilled into the metastasis, via an 11-gauge Manon biopsy needle. Although there has been further endosteal scalloping since the plain radiograph, no pathologic fracture is present.

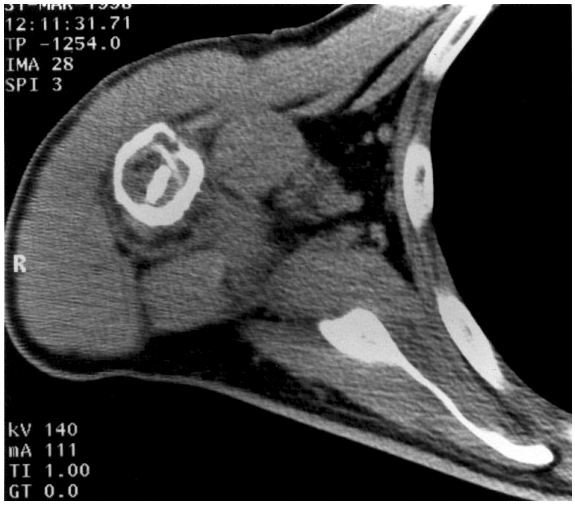

Fig. 3 Transaxial computerized tomography (CT), soft tissue window, following fluoroscopy, confirms the intraosseous placement of methyl methacrylate and absence of cortical breakthrough.

CASE REPORT

Case 1

Radiographs of the right humerus were performed in a 48-year-old male with metastatic gastric carcinoma because of severe, unrelenting, disabling arm pain (Fig. 1). After confirming normal coagulation factors, the patient was scheduled for percutaneous cementoplasty, performed on an outpatient basis. Immediately following the procedure, the patient received radiotherapy to the arm.

Utilizing C-arm fluoroscopy, the largest of the three right humeral lesions was localized and 4cc of methyl methacrylate introduced into the lesion via an 11g Manon biopsy needle (Fig. 2). Computerized tomography (CT), performed immediately after cementoplasty, confirmed the intraosseous position of the cement and the absence of cortical breakthrough (Fig. 3). By 72 hours, the patient and family noted a (subjective) 70% reduction in pain. The patient was now able to use his right arm to eat and perform other activities of daily living, functions which he had been unable to perform for weeks prior to cementoplasty. His pain remained stable for four months until follow-up radiographs, performed for increasing pain, demonstrated progressive metastatic disease.

Case 2

A 70-year-old woman with metastatic lung cancer underwent dorsa1 spine and right humeral radiographs for severe, increasing back and arm pain which hampered her ability to sleep. She had no function of her right arm and remained bedridden. Dorsal spine radiographs, demonstrating osteolytic lesions with destruction of the pedicles at T6, T7, and T8, precluded vertebroplasty for two reasons. First, there was no single level to which the pain could be attributed, and secondly the degree of vertebral destruction excluded the transpediculate approach which is utilized to enter the vertebra. Despite the presence of a pathologic fracture, three cc of cement were placed into the humeral lesion under fluoroscopic guidance (Fig. 4). No complications were noted on post-procedure CT scan of the humerus (Fig. 5). The parent's family reported (subjective) 70% pain relief within 48 hours of cementoplasty. The patient had increased use of her right arm, but no improvement in her ability to sleep.

DISCUSSION

As with vertebroplasty, the primary goal of cementoplasty is pain relief, complete or partial. However, because the potential for adverse effects is much less severe than with vertebroplasty, the pre-procedure evaluation of these patients is not nearly as stringent. Basic hematologic laboratories, such as

prothrombin, prothrombin time, and hemoglobin/ hematocrit should still be obtained because of the large gauge needle that is necessary in this type of intervention. However, pre-procedure CT is not essential. The presence of a pathologic fracture does not necessarily preclude the injection of cement into the osseous structure. Rather, the success of the technique may be more dependent upon the porosity of the involved bone. Patients with highly permeative or advanced lesions may have little or no response to percutaneous cement injection because the integrity of the bone is so poor that the bone fails to contain the cement within its margins for sufficient time until it can congeal.

There is no well-defined endpoint for terminating the injection of methyl methacrylate. However, as earlier studies with vertebroplasty have shown, the amount of pain relief the patient experiences is not related to the volume of cement instilled into the lesion[2]. To minimize the potential for pulmonary emboli, it is probably best to terminate the procedure if soft tissue cement leakage, in particular intravenous cement, becomes apparent. The potential for radiculopathy to adjacent nerves, in the case of soft tissue extravasation of cement is probably less significant than in vertebroplasty given the lack of bony confinement (i.e. the spinal canal) of the structures to a small space. The extent of the risk of thermal damage to the surrounding soft tissues is not clear. However, this is probably insignificant in this population given the short life expectancies of this patient population.

CT scan should probably be performed routinely subsequent to cementoplasty to assess for an iatrogenic pathologic fracture which may develop during needle placement. The soft tissue detail provided by CT can also serve as a baseline examination should the patient later develop local or systemic symptoms related to cement injection.

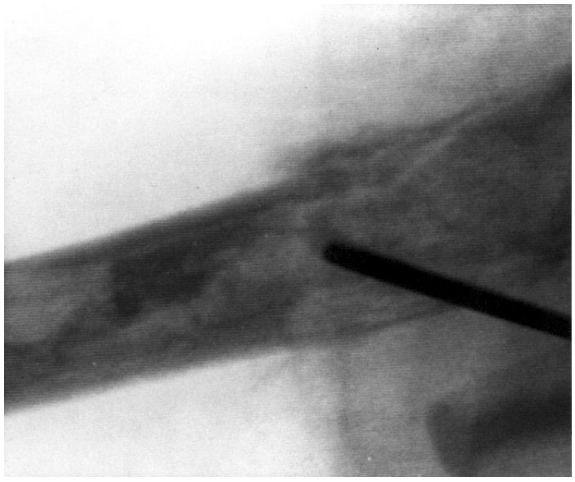

Fig. 4 Fluoroscopically guided placement of methyl methacrylate in a 70-year-old woman with metastatic lung cancer involving the proximal right humerus. A minimally displaced pathologic fracture is present.

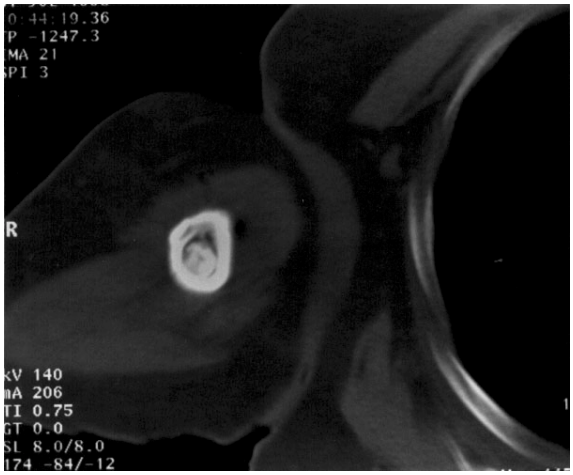

Fig. 5 Transaxial CT, soft tissue window, following fluoroscopy. This scan demonstrates that the methyl methacrylate in confined to the medullary cavity, despite the pathologic fracture indentified at fluoroscopy.

REFERENCES

1. Cotton A, Chabanne B, Deprez X, et al. Cimentoplastic percutanee des osteolyses malignes du cotyle. Rev im Med 1994; 6:287-91.
2. Cotton A, Boutry N, Cortel B, et al. Percutaneous vertebroplasty; state-of-the-art. Radiographics 1998; 18:311-20.
3. Hodge JC. The role of vertebroplasty in palliative carc. J Hong Kong coll Radiol 1998; 1:118-22.