Percutaneous Vertebroplasty Performed with an 18-Gauge Needle for Treatment of Metastatic Severe Compression Fracture of the Cervical Vertebral Body

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ABSTRACT

Percutaneous vertebroplasty (PVP) is considered technically difficult in patients with severe vertebral body compression, especially in the cervical spine. In this study, PVP was successfully performed with the use of an 18-gauge angiographic needle in four patients with severe cervical compression fractures from metastatic disease. There were no complications, and relief of pain was immediate in all patients. This technique may be an alternative treatment for intractable pain secondary to severe cervical compression fractures.

ABBREVIATION

PVP = percutaneous vertebroplasty

Percutaneous vertebroplasty (PVP) has been widely applied in the treatment of osteoporotic compression fractures, vertebral metastasis, multiple myeloma, and invasive hemangioma (1–4). With rare procedure-related complications, this procedure has been shown to achieve excellent pain relief and rapid fracture stabilization in thoracolumbar vertebral diseases (2–4). However, PVP for the cervical spine is much more challenging because of the complex neck anatomy (5–10). Severe compression fracture, which is defined as a fracture greater than two thirds of the original height of the vertebral body, has been considered one of the relative contraindications for vertebroplasty because it is technically difficult to penetrate the severely compressed vertebra (11). However, for well experienced interventionalists, vertebral augmentation of severely compressed thoracolumbar vertebrae has been successful, and has proven to be effective in relieving pain (11). However, PVP of severely metastatic compressed cervical vertebrae is still a technically demanding procedure. Here we report our modified technique in treating four patients with five severe cervical compression fractures in which the vertebrae were successfully punctured and augmented by 18-gauge angiographic needles.

MATERIALS AND METHODS

Our institutional review board approved this retrospective study, and informed consent to undergo the procedure was obtained from each patient. The demographic and clinical data of patients are provided in the **Table**. This report describes four patients with pathologically confirmed primary cancer lesions and computed tomographic (CT) evidence of metastasis causing severe cervical vertebrae collapse (ie, more than a two-thirds reduction in vertebral height; **Fig 1**). All patients had previous CT and magnetic resonance (MR) imaging examinations to rule out other causes of neck pain. The target vertebra was identified by the elicitation of pain by direct pressure or percussion under fluoroscopic visualization. All patients had severe pain caused by metastatic cervical vertebral cancer that lasted for at least 1 month and did not respond to medical treatments such as opioid analgesic agents and hormone therapy.

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Table. Demographic and Clinical Data of Patients Treated by PVP

Pt. No./Age (y)/Sex	Primary Cancer Location	Metastasis Location	Pain Score					Cement Amount (mL)	Follow-up (wk)
			Before PVP	1 Day after PVP	Day of Discharge	1 Mo after PVP	Final Follow-up		
1/46/F	Breast	C5, C6	9	2	2	2	2	1.5, 2.0	28
2/72/M	Esophagus	C7	9	2	2	2	2	1.7	12
3/65/M	Lung	C6	9	1	1	1	1	1.8	20
4/47/F	Breast	C7	8	2	2	2	3	2.2	12

Subjective pain is quantified according to a verbal analgesic scale of 0–10 (0, no pain; 10, maximum pain).
PVP = percutaneous vertebroplasty.

Patients' life expectancy was expected to be greater than 3 months, and PVP was offered to patients only after a consensus was achieved among a team of surgeons, oncologists, and radiation therapists.

PVP was performed under fluoroscopic guidance with a C-arm digital angiographic system (Angiostar; Siemens, Erlangen, Germany), which allows for anteroposterior and lateral views. The patient was placed in supine position with slight neck hyperextension, and 3 mL of 1% lidocaine was infiltrated in the subcutaneous tissue at the selected needle puncture site. By using the left index and middle fingers, the tracheoesophageal complex was pushed toward the opposite side by a right-handed operator. Following this, these fingers were inserted inside toward the front of the target cerebral body. An additional 2 mL of 1% lidocaine was administered on the anterior longitudinal ligament and periosteum of the anterior vertebral body (10). With fluoroscopic guidance, a 7-cm, 18-gauge angiographic needle (ArcRoyal, Meath, Ireland) was advanced to the surface of the cervical vertebral body via a right anterolateral approach. The needle was further advanced through the anterior destroyed cortex into the junction between the middle and posterior thirds of the target vertebral body (Fig 2). Polymethylmethacrylate bone cement (Corinplast 3; Corin, Gloucester, United Kingdom) was prepared according to the manufacturer's instructions, with a ratio of powder to liquid of 2:1, and 10% barium sulfate powder (content by weight) was added for better opacification. The preparation was then injected into the vertebral body through the 18-gauge puncture needle under constant lateral fluoroscopy. Injection was stopped when the cement reached the posterior vertebral wall or entered an extraosseous space such as the intervertebral disc. The fluoroscopy times for the puncture and for the entire PVP procedure, as well as the amount of bone cement used for PVP on each vertebra, were recorded.

To assess the analgesic effect, all patients were followed postprocedurally at 1 day, the day of discharge, 1 month, and the day of last follow-up (12–28 wk). Patients were asked to quantify their pain according to a verbal analgesic scale of 0–10, with 0 indicating no pain and 10 indicating the maximum pain, before PVP and at each follow-up interval. Any PVP-associated complications were also recorded.

RESULTS

In patient 1, two cervical compression fractures (C5 and C6 levels) were treated in the same session (Table). The average fluoroscopy times for the puncture and for the entire PVP procedure of each vertebra were 1.8 minutes ± 0.3 (range, 1.5–2.2 min) and 5.4 minutes ± 0.6 (range, 5.0–6.5 min), respectively. The mean pain score on the verbal analgesic scale was 8.8 ± 0.5 (range, 8–9) before