

Technical Report

Anterior retropharyngeal approach to C1 for percutaneous vertebroplasty under C-arm fluoroscopy

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Abstract

BACKGROUND CONTEXT: Percutaneous vertebroplasty (PVP) has proven to be a valuable palliative treatment option for patients with medically refractory painful osteolytic metastases of the spine. Percutaneous vertebroplasty of the atlas has been reported in only seven articles and has been performed with different techniques and approaches.

PURPOSE: To describe the technique we used to perform PVP of a lytic lesion of the lateral mass of C1 via anterior retropharyngeal approach guided by C-arm fluoroscopy.

STUDY DESIGN: A technical report.

PATIENT SAMPLE: It included a 75-year-old man with known metastatic lung carcinoma and incapacitating right suboccipital and neck pain refractory to conventional medical treatment. Radiologic evaluation showed revealed osteolytic destruction of C1 and C2, mainly invading the right lateral mass of C1 and the vertebral body of C2.

OUTCOME MEASURES: The right suboccipital and neck pain was measured using the visual analog scale (VAS).

METHODS: Under C-arm fluoroscopy, a novel anterior retropharyngeal approach, through the vertebral body of C2 into the metastatic osteolytic vertebral lesion of C1, was performed to achieve the PVP in C1 followed by a PVP in C2.

RESULTS: Immediately after the operation, the patient reported substantial pain relief (from VAS 9/10 preoperatively to 3/10). At 12 hours postoperatively, the range of motion was also improved. There were no surgery-related complications. The immediately postoperative cervical plain film and computed tomography scan showed adequate filling of the osteolytic lesion without the obvious leakage of bone cement. Clinical follow-up at 3 months revealed that this pain condition was improved and maintained (VAS 1/10).

CONCLUSIONS: When the transoral approach is unsuitable or contraindicated, the anterior retropharyngeal approach could be an efficacious alternative in selected patients with C1 metastasis, providing adequate filling of bone cement and significant pain relief. Based on our preliminary exploration, only assisted by C-arm fluoroscopy, this approach is feasible to achieve PVP in C1 under local anesthesia and intravenous analgesia. Nevertheless, when considering the substantial potential risks, this technically challenging procedure should be performed by experienced operators. © 2015 Elsevier Inc. All rights reserved.

Keywords: Atlas/C1; Vertebroplasty; Metastasis; Anterior; Retropharyngeal approach; Percutaneous; Fluoroscopy

FDA device/drug status: Not applicable.

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J-SY and LC contributed equally to this study.

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Introduction

As the skeleton is most commonly affected by metastatic cancer, secondary spine lesions account for approximately one-third of skeletal metastases, making the vertebral column a leading osseous target for metastatic tumor [1]. Among all spinal metastatic cancers, metastases to the cervical spine are deemed to be far less common than those to the thoracic and lumbar spine, in which metastasis to the upper cervical spine is less common, constituting less than 1% of all spinal metastases [2].

Currently, percutaneous vertebroplasty (PVP) has proven to be a valuable palliative treatment option for selected patients with medically refractory painful osteolytic metastases of the upper cervical spine, allowing reinforcement of the vertebral body and pain alleviation. However, percutaneous cement augmentation of the atlas, to the best of our knowledge, has been described in only seven articles [2–8]. The paucity of related reports reflects that PVP at this level is an extremely challenging procedure, owing to complex anatomy and close proximity of vital structures. We will first report a novel anterior retropharyngeal approach, in which the polymethylmethacrylate (PMMA) is injected under local anesthesia and intravenous analgesia through the vertebral body of C2 into the metastatic osteolytic vertebral lesion of C1 for alleviating intractable suboccipital and neck pain.

Methods

A 75-year-old man with known metastatic lung carcinoma and incapacitating right suboccipital and neck pain refractory to conventional medical treatment was admitted to our institution. The pain was exacerbated by rightward head rotation, it reduced the range of motion, and was intractable to medical treatment. Plain film, computed tomography (CT) scan, and magnetic resonance imaging of the cervical spine revealed osteolytic destruction of C1 and

C2, mainly invading the right lateral mass of C1 and the vertebral body of C2 (Figs. 1–3). There was no instability on flexion/extension C-spine films. There was clear evidence of no fracture or spinal canal involvement. Thoracic CT scan confirmed a massive hydrothorax (Fig. 4).

When considering the widely metastatic nature of his disease, with the goals of pain relief, preservation of neurologic function, stabilization of the vertebral column, and prevention of pathologic fracture, PVP was proposed in a multidisciplinary meeting. Permission for a clinical trial was granted by the institutional review board from the hospital, and informed consent about potential complications was obtained from the patient.

The patient was placed in the supine position on a radiolucent table, whose neck was oriented in a hyperextensive position using an inflatable, adjustable pillow placed behind his neck. The entire process of PVP was performed under a double control by anteroposterior and lateral C-arm fluoroscopy, with basic monitoring such as electrocardiography, pulse oximetry, and noninvasive monitoring of blood pressure. After aseptic draping, local anesthesia was provided with a 5 mL of 1% lidocaine, combined with intravenous analgesia using 100 µg of fentanyl. Further PVP was achieved in C2 and C1 sequentially.

Once the level of C3 was demarcated, a 5-mm skin incision was made medial to the right sternocleidomastoid muscle. Care was taken while approaching the anterior cervical spine, keeping the carotid artery lateral and the tracheoesophagus medial, by using the index and middle fingers of the left hand. Subsequently, the operator inserted these fingers inside toward the anterior inferior edge of the vertebral body of C2. Through the skin incision, between these two fingers, a puncture-needle complex, incorporating a nonbeveled sheath of the vertebroplasty needle outside and a blunted K-wire inside, was inserted cranially and medially and placed on the anterior surface of C2 (Fig. 5, Left). After its correct placement was confirmed, the sharp stylet replacing the inner K-wire was subsequently inserted

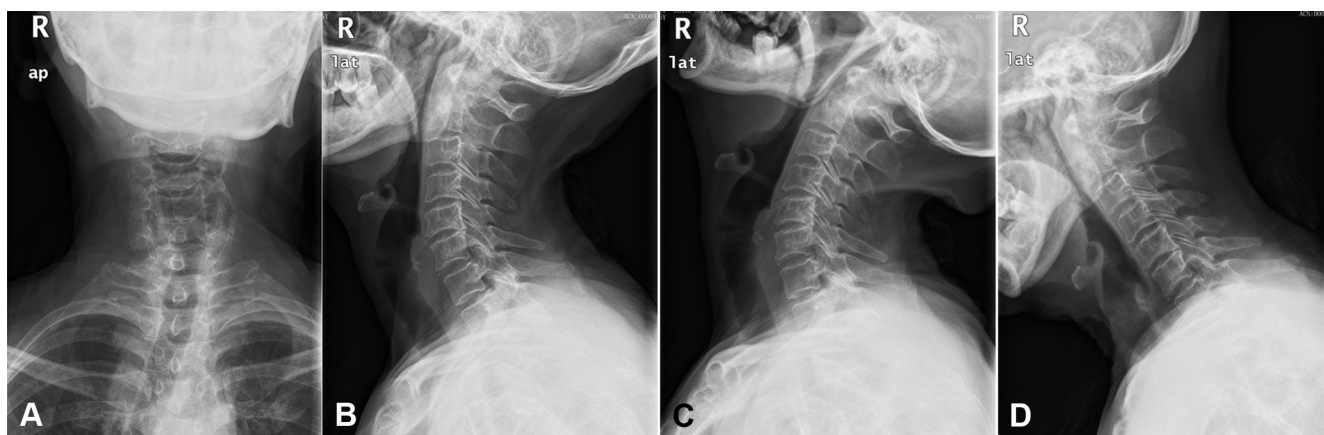


Fig. 1. Preoperative cervical (A) AP and (B) lat radiographs demonstrate lytic lesions involving C1 and C2. (C and D) There is no instability on flexion/extension C-spine films. AP, anteroposterior; lat, lateral.

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