Intrathecal Cement Leakage as a Rare and Serious Complication Of Percutaneous Vertebroplasty: Case Report and Literature Review

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Percutaneous vertebroplasty is used to treat vertebral hemangioma, osteoporotic fractures, osteolytic metastases, and myeloma. The procedure is widely performed in Taiwan and universally but not free of complication. Intrathecal cement leakage is a rare and serious complication and can be prevented. We report a case of vertebroplasty-induced intrathecal leakage of bone cement and review the literature.

Vertebroplasty has been gaining popularity for treating vertebral fractures. It is also now extensively used in Taiwan and universally. It is an efficient treatment but is not free of complications. We reported a case of rare and serious complication of percutaneous vertebroplasty.

CASE REPORT

This 63 year-old female had compression fracture of L1 due to falling down to the ground. She received percutaneous vertebroplasty of L1 at other hospital. However, symptoms did not improve much. Urine retention and constipation were noted after vertebroplasty. Pain over bilateral lower limbs for months with progression was noticed. She came to our hospital and CT scan showed intrathecal cement leakage with spinal cord compression (Fig. 1). MRI confirmed the rare and serious complication after percutaneous vertebroplasty (Fig. 2). Right laminar and dural puncture, medial to the normal pedicular entry was the cause of intrathecal cement leakage (Fig. 3). Persisted pain with numbness at bilateral lower legs was told by the patient and implantation of spinal cord stimulator was performed. Neuropathic pain of bilateral lower legs gradually improved.

DISCUSSION

Galibert et al. [1] first reported vertebroplasty in 1987 for the minimally invasive treatment of hemangiomas, which, since then, has been adopted for use in the treatment of intractable, focal, intense pain localized to a vertebral fracture. Initially introduced for the treatment of vertebral hemangioma, the indication was soon broadened to osteoporotic fractures, osteolytic metastases, and myeloma. It was said to be a safe and effective procedure for

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treating painful osteoporotic vertebral compression fracture [2-6]. In recent years, complications associated with vertebroplasty have become the subject of clinical studies [7-8]. Immediate complications associated with vertebroplasty and kyphoplasty can be separated into 2 categories, procedural and cement leakage. Reported procedural complications include infection, fractures of the transverse process, pedicle, sternum and ribs, and respiratory distress [9].

During percutaneous vertebroplasty, bone cement such as polymethyl methacrylate may be passed to several unwanted locations, including

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**Figure 1.** CT scan axial image a. and sagittal image b. show intrathecal cement leakage. The spinal cord is compressed by the hyperattenuated bone cement (arrow).

**Figure 2.** T2-weighted fast-spin-echo sagittal a. and axial b. images. Bone cement is low in signal intensity. Leaked bone cement is found inside the intrathecal space and causes spinal cord compression (arrow).
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the lumbar venous plexus, pulmonary artery, disk space, epidural space in the spinal canal, intervertebral foramina, and paravertebral region. Leakage of cement outside the vertebral body was common, ranging from 3.3 to 75.6%. Although the majority was asymptomatic, a few devastating clinical adverse effects were reported (mean rate 2.4%, ranging from 0.4 to 15.4%) [10]. In a systemic review of 69 clinical studies [9], cement leakage occurred in 41% of vertebrae during vertebroplasty and 9% of vertebrae during kyphoplasty. The distribution of leaks was 32% and 11% epidural, 32.5% and 48% paraspinal, 30.5% and 38% intradiscal, 1.7% and 1.5 pulmonary, and 3.3% and 1.5 foraminal for vertebroplasty and kyphoplasty, respectively.

Intradural cement leakage caused by percutaneous vertebroplasty with polymethyl methacrylate is a devastating complication. Perforation of medial wall of the pedicle and penetration of dura by the needle is a possible cause [11]. The needle tip should not cross the medial border of the pedicle on the anteroposterior view before it has crossed the posterior cortex of the vertebral body on the lateral view [11]. In the case of medial perforation of the pedicle, the needle should be left in place and not removed until cement application through a contralateral needle is completed [12]. Good quality of image monitoring and clear visualization of cement should be helpful to prevent complications [11]. In our case, medial deviation of the puncturing point is noted (Fig. 3). The needle tract passed through the lamina and perforated the dura, allowing bone cement to extend posteriorly to the intrathecal space along the needle tract.

The volume of polymethyl methacrylate cement injected during percutaneous vertebroplasty varies for different vertebral bodies and different operators. Larger volumes injected may be associated with greater risk of complications related to cement leakage. Kaufmanna et al. [13] describe an analysis of the association between clinical and procedural variables, including cement volume injected, and the clinical outcomes of 158 patients treated with single-level vertebroplasty. They found there was no significant association between the volume of cement injected and the clinical outcomes of postprocedure pain and medication use. Therefore, vertebroplasty operators need not feel compelled to achieve particular cement volumes injected in the pursuit of better clinical outcomes but should strive to achieve the maximal safe filling of individual vertebral bodies.

Teng et al. [14] propose that the following factors should increase the safety of vertebroplasty: (1) adequate opacification of bone cement; (2) efforts to prevent the needle from breaking the medial wall of the pedicle or passing through the spinal canal as it is advanced into the vertebral body; (3) constant monitoring of the injection of bone cement by using high-resolution biplanar fluoroscopy; (4) immediate cessation of injection when the cement reaches the posterior one fourth of the vertebral body; (5) injection of bone cement with intermittent release of injection pressure.

In conclusion, percutaneous vertebroplasty is common in many practices worldwide but not free of complication. Intrathecal cement leakage is a rare and devastating complication. Knowledge of the procedure can provide complication avoidance.

REFERENCE

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經皮椎體成形術後之罕見嚴重併發症－鞘膜內骨泥滲漏：病例報告及文獻回顧

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經皮椎體成形術可用來治療椎體血管瘤、骨質疏鬆、骨蝕性轉移，以及骨髓瘤造成之脊椎椎體骨折。經皮椎體成形術廣泛的應用在台灣與世界各地，但並非沒有併發症。鞘膜內骨泥滲漏是罕見而嚴重的併發症，但是可以預防的。我們報告經皮椎體成形術後造成鞘膜內骨泥滲漏的一個病例，並回顧相關文獻。