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Case Report

The methodology of locating painful responsible vertebrae in osteoporotic vertebral compression fractures

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Abstract: For vertebroplasty, it is necessary to determine certain vertebrae which should be primarily treated in multilevel osteoporotic vertebral compression fractures (OVCFs). The case presents that a 63-year-old female patient suffering from back pain, has received vertebroplasty four times to achieve pain relief, including total fourteen vertebrae. Retrospectively, it is choosing improper vertebrae to be treated that fails to relieve pain repeatedly. We come up with the term of painful responsible vertebrae which cause back pain in OVCFs, and illustrate clinical evidence of imaging, especially magnetic resonance imaging (MRI) scans, to locate painful responsible vertebrae preoperatively.

Keywords: Verteproplasty, osteoporotic fractures, responsible vertebra, magnetic resonance imaging

Introduction

OVCFs is the most common complication resulting from loss of bone mass and altering construction of bone trabecula, occurring in 20% of those over the age of 70 years [1]. Since its introduction in 1987, the vertebroplasty (VP) has been considered as an optimal treatment with effectiveness in 87% of patients for OVCFs due to the efficacy of pain relief and vertebral stability [2-5]. Chronic back pain may develop in up to 75% of patients with OVCFs because of pseudarthrosis or progressive kyphosis [6]. In VP, cement injection into the vertebrae may have an analgesic effect by consolidating microfractures and reducing the mechanical stress associated with weight and activity, and also by destroying local sensory nerve endings by cytotoxic and exothermal action in the course of cement polymerization [3]. We define painful responsible vertebrae that cause back pain and should be prior to be operated on in multilevel OVCFs, in order to relieve pain primarily. Non-localized painful responsible vertebrae to be treated may result in no pain relief postoperatively. We illustrate the importance and methods of preoperative location of the painful responsible vertebra by the case as follows.

Case report

A 63-year-old Chinese female patient suffered from OVCFs with low back pain. Preoperatively, MRI scans of posterior part of thoracic 8 showed hypointense on T1-weighted imaging (T1WI), hyperintense on T2-weighted imaging (T2WI) and short tau inversion recovery (STIR) sequences. And MRI scans of thoracic 11 showed hypointense on T1WI, hyperintense on T2WI and STIR sequences (**Figure 1**). The patient received vertebroplasty of the tenth, eleventh and twelfth thoracic vertebrae in on December 15, 2011. However, the procedure did not achieve significant pain relief for her postoperatively. Before the second operation in 2012, MRI scans of lumber 2 vertebral body showed hypointense on T1WI, hyperintense on T2WI and STIR sequences (**Figure 2**). The patient received vertebroplasty three times on February 8 (lumbar 1-5, thoracic 8-9), April 5 (thoracic 5 and 7) and May 27 (thoracic 4 and 6) respectively in the same hospital, involving total fourteen vertebrae (**Figure 3**).

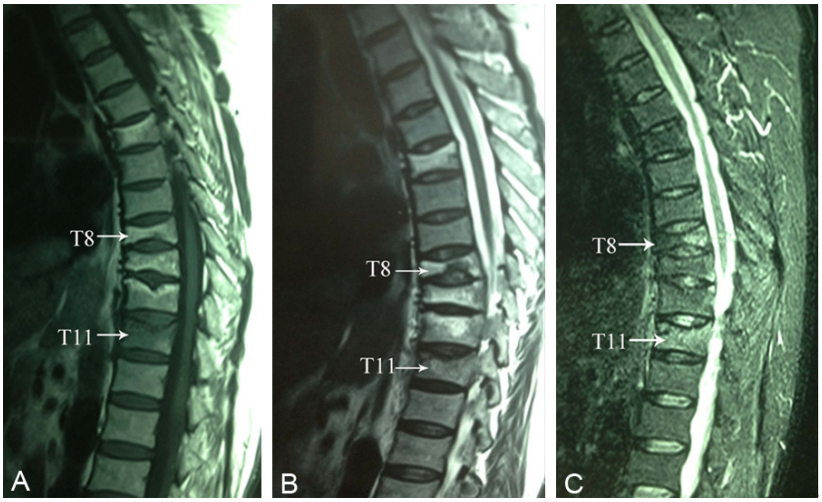

Figure 1. MRI scans on May 27, 2011. MRI scans of posterior part of thoracic 8 showed hypointense on T1WI, hyperintense on T2WI and STIR sequences. And MRI scans of thoracic 11 showed hypointense on T1WI, hyperintense on T2WI and STIR sequences. The obvious edema signal is considered as evidence of fresh fracture in painful responsible vertebrae of T8 and T11.

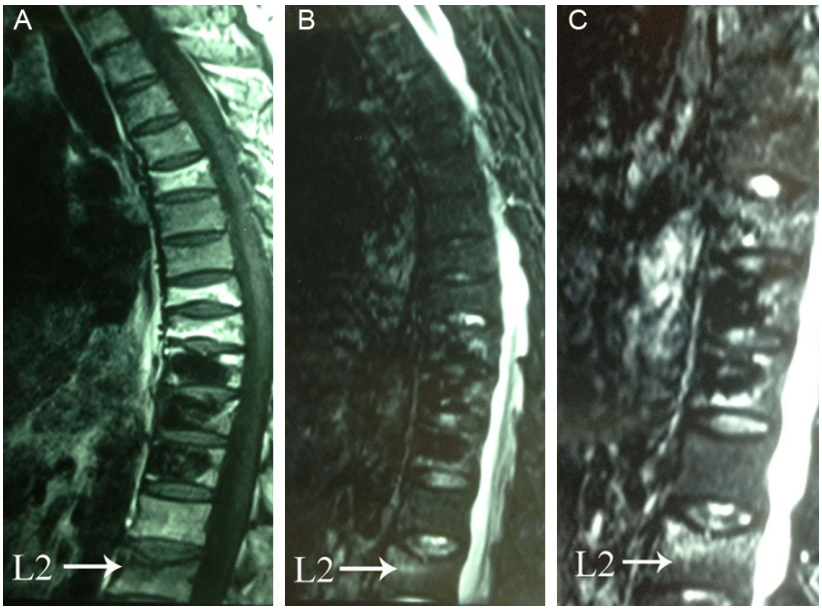

Figure 2. MRI scans on February 8, 2012. MRI scans of L2 vertebral body showed hypointense on T1WI (A), hyperintense on T2WI (B) and STIR (C) sequences. The obvious edema signal is considered as evidence of fresh fracture in painful responsible vertebrae of L2, and healed fracture of T8 is presented with normal signal intensity on T1WI, T2WI and STIR sequences.

Discussion

In general, multilevel OVCFs exist in the same patient, including fresh and healed fractures [7]. It might be micromotion of intravertebral clefts within fresh fracture of painful responsible vertebrae that lead to back pain [8]. Also, healed OVCFs without intravertebral clefts and bone marrow edema are usually not recommended for PVP because these patients experience little or no pain relief postoperatively [7]. So identifying painful responsible vertebrae contributes to determining which vertebral level should be treated. Often, patients with multiple fractures of uncertain age don't have clear localized pain upon physical examination. Preoperative radiography has low sensitivity for the detection of intravertebral clefts, whereas MRI has high sensitivity [8]. Thus, for preoperatively locating painful responsible vertebrae, we recommend assessment of MRI sequences with T1WI, T2WI and STIR in terms of actual image evidence such as vertebral compression and special bone marrow edema signal.

MRI is extremely useful to demonstrate characteristic changes in the marrow signal that varies with different age of OVCFs. Fresh OVCFs show a focal band-like area of hypointense adjacent to the fractured endplate on T1WI and hyperintense on T2WI. The hyperintense on STIR sequences showing intraspongious edema, testifies a recent fracture and is predictive of a favorable response to vertebroplasty. Furthermore, healed OVCFs gradually revert to normal signal intensity on T1WI, T2WI and STIR sequences [9]. On May 27, 2011, the obvious bone marrow edema signal of thoracic 8 and 11 vertebral body considered as candidates of

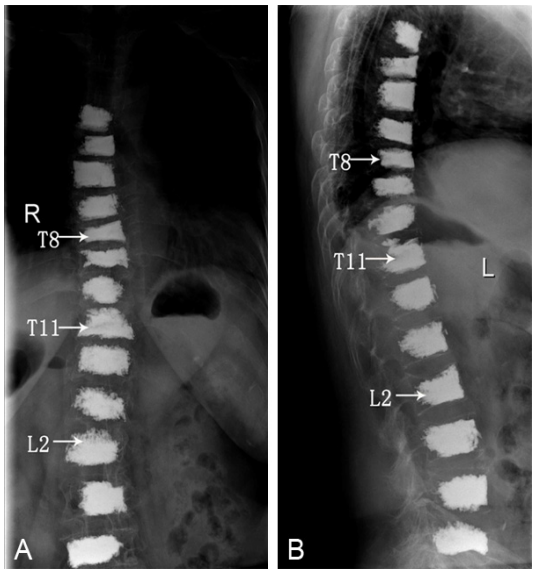

Figure 3. Postoperative AP (A) and lateral (B) view by X-ray.

painful responsible vertebrae, which should be operated on primarily. However, on December 15, 2011, the surgeon performed vertebroplasty on thoracic 10, 11 and 12 vertebrae excluding painful responsible thoracic 8 vertebra, and the thoracic 10 and 12 vertebrae without bone marrow edema signal were treated prophylactically. Predictably, the postoperatively significant back pain was not relieved completely.

On February 8, 2012, the lumbar 2 painful responsible vertebra with bone marrow edema signal should be treated, whereas the thoracic 8 vertebra turned to be healed fractures. Surprisingly, the lumbar 1, lumbar 3-5 and thoracic 8-9 vertebrae were preventatively operated on. Similarly, the patient suffered from the next two preventative operations on April 5 (thoracic 5 and 7) and May 27 (thoracic 4 and 6) respectively in 2012. In this case, prophylactic vertebroplasty on non-localized painful responsible vertebrae failed to relieve the back pain. Furthermore, L2 compression fracture may result from adjacent VP at T10-12 vertebrae which caused stress to L2. We suppose the L2 compression fracture could be avoided if selective VP was performed at T8 and T11 in the initial surgery. We suggest that VP should be performed on the certain painful responsible vertebrae rather than all the vertebrae with OVCFs, which gets rid of prophylactic treatment and complications.

Conclusion

1) A vertebrae with compressive fracture and hyperintense by MRI STIR may be a painful responsible vertebrae.

2) Multiple VP has a drawback that it could cause pressure fracture of adjacent vertebrae.

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Disclosure of conflict of interest

None.

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References

[1] Chen D, An ZQ, Song S, Tang JF, Qin H. Percutaneous vertebroplasty compared with conservative treatment in patients with chronic painful osteoporotic spinal fractures. J Clin Neurosci 2014; 21: 473.

[2] Galibert P, Deramond H, Rosat P, Le GD. [Preliminary note on the treatment of vertebral angioma by percutaneous acrylic vertebroplasty]. Neurochirurgie 1987; 33: 166.

[3] Teyssedou S, Saget M, Pries P. Kyphopasty and vertebroplasty. Orthop Traumatol Surg Res 2014; 100: S169.

[4] Hulme PA, Krebs J, Ferguson SJ, Berlemann U. Vertebroplasty and kyphoplasty: a systematic review of 69 clinical studies. Spine (Phila Pa 1976) 2006; 31: 1983.

[5] McGraw JK, Cardella J, Barr JD, Mathis JM, Sanchez O, Schwartzberg MS, Swan TL, Sacks D. Society of Interventional Radiology quality improvement guidelines for percutaneous vertebroplasty. J Vasc Interv Radiol 2003; 14: 827.

[6] Pneumaticos SG, Triantafyllopoulos GK, Evangelopoulos DS, Hipp JA, Heggeness MH. Effect of vertebroplasty on the compressive strength of vertebral bodies. Spine J 2013; 13: 1921.
[7] Yuan WH, Teng MM, Hsu HC, Sun YC, Chang CY. Are Non-contrast MR Images enough for Detection of Fracture Levels Prior to Percutaneous Vertebroplasty in Patients with Osteoporosis? Interv Neuroradiol 2008; 14 Suppl 2: 79.
[8] Nieuwenhuijse MJ, van Rijswijk CS, van Erkel AR, Dijkstra SP. The intravertebral cleft in painful long-standing osteoporotic vertebral compression fractures treated with percutaneous vertebroplasty: diagnostic assessment and clinical significance. Spine (Phila Pa 1976) 2012; 37: 974.
[9] Masala S, Schillaci O, Massari F, Danieli R, Ursone A, Fiori R, Simonetti G. MRI and bone scan imaging in the preoperative evaluation of painful vertebral fractures treated with vertebroplasty and kyphoplasty. In Vivo 2005; 19: 1055.