CLINICAL ARTICLE

J Korean Neurosurg Soc 39 : 92-95, 2006

Percutaneous Vertebroplasty Following Postural Reduction in Unstable Vertebra Plana; Is it a Contraindication?

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Objective : Severe vertebral body collapse (vertebra plana) is considered a contraindication to vertebroplasty by most authors. The purpose of this study is to determine the efficacy of vertebroplasty in treating severe compression fracture patients with osteoporosis.

Methods : 16 patients underwent 18 vertebroplasties following postural reduction for vertebra plana. The fractures were defined vertebrae that have collapsed to more than 75% of their original height. Imaging and clinical features were analyzed, including involved vertebrae level, vertebral height after postural reduction for 2 days, injected cement volume, clinical outcome and complications.

Results : Involved veretebra were located from level T7 to L4. Vertebral body collapse averaged 79% (range 12~25%) of the original height. After pillow reduction for 2 days, vertebral body height increased 35% of the original height (range 15~45%). The kyphotic wedge was 12° before procedure and was decreased 7.0° after vertebroplasty. The mean injected cement volume was 3.8ml (range 2.0~4.9ml). After the procedure, surgical outcome was excellent in 8 (50%) of 16 patients, good in 7 (42%) and unchanged in one (8%). The mean pain score (VAS score) prior to vertebroplasty was 8.3 and it changed 3.2 after the procedure. Cement leakage to the adjacent disc (5 cases) and paravertebral soft tissues (4 cases) developed but there were no major complications.

Conclusion : We propose that vertebra plana due to osteoporosis is not a contraindication to vertebroplasty. Vertebroplasty following postural reduction for severe compression fracture is safe and effective treatment.

KEY WORDS : Vertebra plana · Osteoporosis · Postural reduction · Vertebroplasty.

Introduction

Percutaneous vertebroplasty(PV) has emerged as an effective treatment of painful osteoporotic compression fracture[7]. But fractures with greater than 70% loss of vertebral height are technically difficult to perform and severe vertebral body collapse is considered a contraindication to vertebroplasty[1,3,5,10,11]. The purpose of our study is to determine the efficacy of percutaneous vertebroplasty in treating severe vertebral body compression fractures which is greater than 75% loss of their original height (vertebra plana) in patients with osteoporosis.

Materials and Methods

In 248 consecutive patients, 369 percutaneous vertebroplasties were performed in our institution during last 3 years. Of these 16 patients (2 men, 14 women, mean age 69.4 years) underwent 18 vertebroplasties to treat severe osteoporotic compression fracture (vertebra plana). Severe vertebral compression fractures were defined as vertebrae that had collapsed to more than 75% of their original height. The extent of vertebral body collapse was measured from the height of maximal collapse on lateral radiographs or midsagittal magnetic resonance(MR) images. These patients had not responded to conservative treatment, which included all type of medication or nerve blocks. Vertebroplasty was performed at only one level in 14 patients, and two levels in 2 patients.

Prior to and after vertebroplasty, the patient's degree of pain was recorded by using the visual analog scale method (a scale of 0-10, with 10 indicating the most pain). After vertebroplasty, patients were asked whether their pain was completely relieved (excellent), partially relieved(good), unchanged, or worse(poor).

• Received : March 22, 2005 • Accepted : July 29, 2005

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We performed hyperextension reduction using pillow for 2 days. and analyzed increased vertebral height, injected cement volume, surgical outcome and complications.

Results

The extent of vertebral body collapse averaged 21% (range, 12~25%) of the original height. Involved vertebrae were located from levels T7 to L4. The levels were T7(n=1), T8(n=1), T9(n=2), T10(n=1), T11(n=2), T12(n=4), L1(n=3), L2(n=2), L3(n=1) and L4(n=1). After postural reduction for 2 days, vertebral height increased to 35% of the original height (range 15~45%). The kyphotic wedge was 12° before procedure and was decreased 7.0° after vertebroplasty. We performed vertebroplasty using 11-gauge needle except 2 patients. All procedures were performed by manual method.

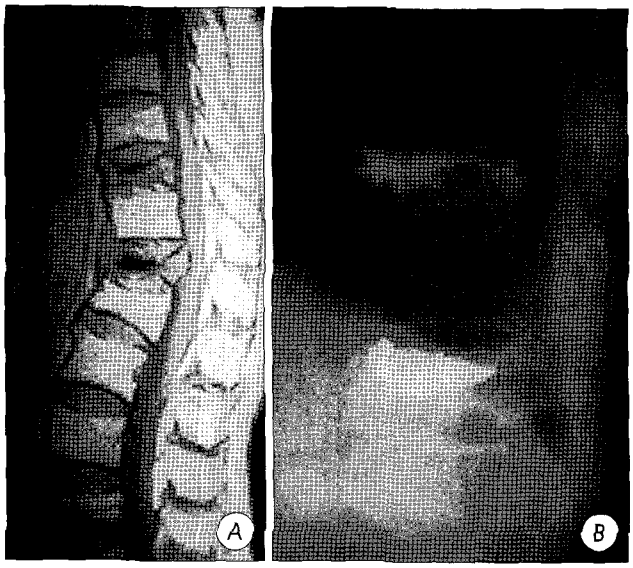

Fig. 1. Images in a 80-year-old woman with T10 and T12 compression fracture. A : Sagittal magnetic resonance image shows T10 compression fracture and T12 vertebra plana (about 85% vertebral body collapse). B : Lateral x-ray obtained after injection of methylmethacrylate. There is a good anterior filling of the vertebral body without any evidence of leakage into the epidural space.

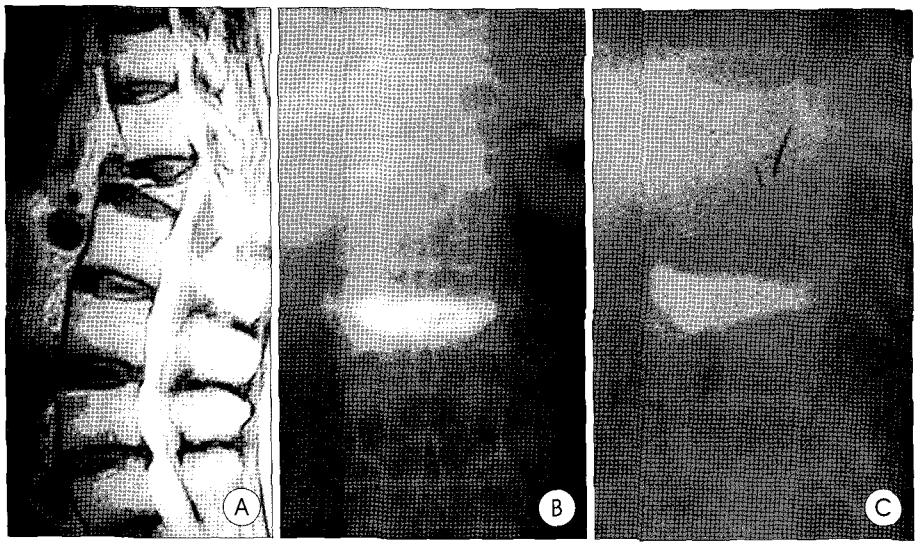

Fig. 2. Images in a 82-year-old woman with vertebra plana for severe compression of L1 vertebral body. A : Sagittal T2 weighted MR image shows severe compression fracture of L1 and increased signal intensity due to fluid and edema (about 15% of original height). B, C : Simple X-rays obtained after methylmethacrylate injection show complete filling of L1 vertebral body without any leakage.

The mean injected cement volume was 3.8ml (range 2.0~4.9ml). A single pedicle was injected in 12 vertebroplasties, and both pedicle were injected in 6 vertebroplasties. Radiographic complications include polymethylmethacrylate(PMMA) leakage into adjacent disc (5 cases of 18, 28%) and paravertebral soft tissues (4 cases of 18, 22%). But there were no major complications such as pulmonary embolism or epidural leakage. The mean pain score (VAS scale) prior to vertebroplasty was 8.3 and changed to 3.2 after the procedure. Surgical outcome was excellent in 8(50%) of 16 patients, good in 7 (44%) and unchanged in one (6%)(Fig. 1, 2).

Discussion

Percutaneous vertebroplasty is currently indicated for palliative therapy for pain that is medically uncontrolled osteoporotic compression fracture. The specific contraindications to the procedure have previously been stated as being significant spinal canal compromise, severe collapse of the vertebral body (vertebra plana), active infection and in some cases fractures involving the posterior vertebral body cortex[1-3,8,9].

Among these, severe compression fractures have been described as a contraindication to PV, mainly due to technical difficulties in the insertion of large-gauge trocars or needle into a significantly compressed vertebral body. For this reason, weill et al, in a study of PV in 37 patients with vertebral body metastases, excluded patients for the procedure if there was collapse to less than one-third of the original height of the vertebral body[11]. Other authors have been less strict and have used 75~80% collapse as a cutoff[1]. Also, severe compression fractures may be more frequently associated with fractures of the posterior vertebral body cortex; thus, there may be increased likelihood of a leak of PMMA into the spinal canal[1]. Some may also believe that because of severe collapse, the amount of PMMA that can be injected may be limited. However, it appears clear from previous literature that the volume of

cement injected is not related to the patient's outcome with respect to pain control. Thus, some patients may have an excellent outcome despite only a small amount of cement being injected[4].

Despite the above, O'brien's recent report of six patients with greater than 65~70% loss of vertebral body height in low thoracic or lumbar vertebrae treated with PV demonstrated subjectively reduced pain and a diminished need for analgesics with no complications in five of six patients after treatment[6]. They suggest that the operators were able to inject PMMA successfully by using a bilateral transpedicular approach and positioning the bone needles in the lateral sides of the vertebral bodies. Another recent report described successful PV in a series of 37 patients with 48 severe osteoporotic compression fractures, also with less than one third of original vertebral body height remaining[7]. Complete or partial pain relief was obtained in 47% and 50% of patients, respectively. In these series, there was a significant incidence of cement leakage into the adjacent disc(35%) or paravertebral soft tissues(8%), but these occurrences were asymptomatic like our study.

In this study, we have shown that it was feasible to perform percutaneous vertebroplasty in patients with severe vertebral compression. Compression fractures results from mainly hyperflexion forces. We can restore the vertebral height some degree by postural hyperextension reduction by using pillow and, we did not find it more difficult than vertebroplasty in noncollapsed vertebrae technically, although we were probably more cautious and serious when we performed the procedure in these patients.

Our study demonstrates that PMMA leakage into the adjacent disc is common. The patients did not have side effects from the leakage of small amounts of PMMA into the disc and the paravertebral soft tissues. On the basis of results of other studies and the present study, it does not appear that there is a direct relationship between the rate of PMMA leakage and the severity of vertebral body compression. The smaller mean amount of PMMA injected into the severely compressed vertebra that had PMMA leakage is likely to reflect the extra care that was taken when vertebroplasty was performed in patients with collapsed vertebral bodies. In our practice, the procedure was terminated once leakage into the disc or paravertebral tissue was observed.

We also noted no case of pedicle fracture when using larger 11-gauge needle. We prefer the larger needle, because it is substantially easier to position than is the thinner 13-gauge needle.

Although based on our successful experience, the clinical course and management of severe compression fracture have not yet been clearly described in the literature, and will have to be analyzed on the basis of larger series with longer follow-up periods.

Conclusion

Percutaneous vertebroplasty is becoming a standard care for palliative pain control associated with vertebral compression fracture. It provides also pain relief and vertebral stabilization for severe osteoporotic compression fracture. We propose that severe compression fracture such as vertebra plana is not a contraindication to vertebroplasty.

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Commentary

Authors concluded that the unstable vertebra plana by osteoporotic compression fractures is not contraindicated for percutaneous vertebroplasty in this paper. Despite successful outcome, this paper failed to demonstrate the their conclusion. First of all, author had mistake nomenclature as well as definition. Severe compression fractures of the spine is one of many condition that cause the vertebra plana, which means flat vertebra. The authors defined severe compression fractures in the cases of more than 75% collapse compared to original vertebral height in maximal collapse area. Thus, it did not mean flat collapse or even complete vertebral collapse (vertebra plana). Actually the cases shown in this paper was not inappropriate for the definition of the vertebra plana[1-3]. Secondly, postural reduction using hyperextension is effective

for compression fractures with intact posterior column structure, especially posterior longitudinal ligament. If the vertebra plana by compression force is occurred, it will be close to burst fractures nor compression fracture, and it may be suitable to apply spinal traction rather than hyperextension for the reduction.

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