



Original Research

Clinical evaluation of percutaneous kyphoplasty in the treatment of osteolytic and osteoblastic metastatic vertebral lesions



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HIGHLIGHTS

- Kyphoplasty, a minimally invasive procedure.
- Clinical outcomes of kyphoplasty in the treatment of osteolytic and osteoblastic metastatic vertebral fracture.
- Retrospective study reveals that kyphoplasty achieves statistically significant pain relief, function improvement, and preventing further local kyphotic deformity for treating osteoblastic and osteoclastic metastatic spinal lesions.

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ABSTRACT

Percutaneous vertebral augmentation (Percutaneous vertebroplasty, PVP and Percutaneous kyphoplasty, PKP) for the treatment of metastatic spinal lesions has been considered as a preferred alternative to relieve pain and rebuild spinal stabilization relying on minimally invasive procedure. However, there have been few reports on clinical outcomes of percutaneous kyphoplasty in the treatment of osteolytic and osteoblastic metastatic vertebral fracture. We report our experience for 81 kyphoplasty procedures performed in 45 patients with thoracic and lumbar vertebral lesions caused by metastases. 4 out of the 45 patients were withdrawn at 1-year follow-up. 41 patients demonstrated good clinical result. The osteoblastic group performed a better pain relief in visual analog scale (VAS) score after the treatment than the osteoclastic group 3 days, 1 month, 3 months and 1 year after the KP. And the Oswestry Disability Index (ODI) scores of the osteoblastic group is lower than that of the osteoclastic group just in 3 days after the KP. And there were no significant difference between the two groups of ODI scores 1 month, 3 month and 1 year after the KP. And there were no statistical differences of the radiographic parameters including VB height variation and local kyphosis angle (LKA) between the two groups. Kyphoplasty results in an effective, minimally invasive procedure for the stabilization of thoracic and lumbar metastatic vertebral lesions, including both osteoblastic and osteoclastic types, which achieves statistically significant pain relief, function improvement, preventing further local kyphotic deformity, and VB height.

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1. Introduction

Up to 40% of cancer patients develop spinal metastases depending on primer tumor, including breast(21%), lung(14%), prostate(8%), renal(5%), gastrointestinal(5%), and thyroid(3%) cancers [1–3]. On the basis of radiographic appearance of the lesions,

78.3% of vertebral destruction are classified as osteolytic, 20.1% are mixed, and 1.6% are osteoblastic [4]. Osteolytic lesions are much more common than osteoblastic-related lesions, which consist of pure osteoblastic and mixed lesions (Figs. 1 and 2).

Through the CT scans, osteolytic changes show worm-eaten, inconsecutive, hollow bone trabecula or vertebral wall. Differently, pure osteoblastic changes may correspond to nodula deposits (rounded areas), mottled deposits (irregular zones of bone sclerosis that are interspersed between areas of normal appearing bone), and diffuse deposits (larger zones of increased attenuation) [5]. In addition, spinal magnetic resonance imaging (MRI), bone scintigraphy (BS), and positron emission tomography-computed

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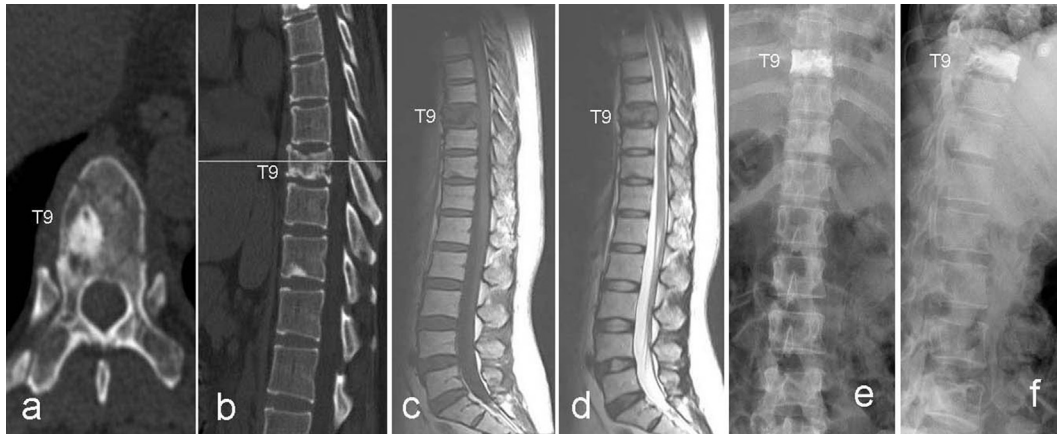


Fig. 1. Preoperative CT (a,b), MRI scans including T1 and T2 sequences (c,d) and postoperative X-ray (e,f) in kyphoplasty for the treatment of osteoblastic metastatic vertebral lesions.

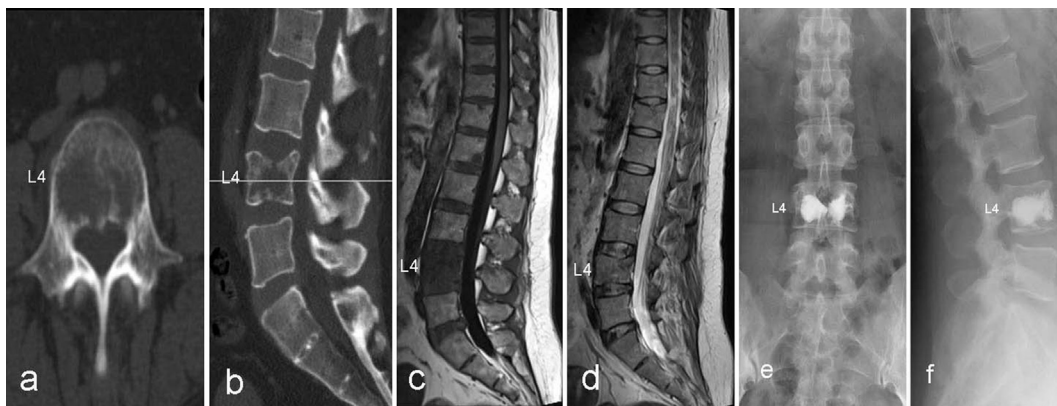


Fig. 2. Preoperative CT (a,b), MRI scans including T1 and T2 sequences (c,d) and postoperative X-ray (e,f) in kyphoplasty for the treatment of osteolytic metastatic vertebral lesions.

tomography (PET-CT) are also useful for diagnosis and identification of types of metastatic spinal lesions [6,7].

The patients suffering from metastatic spinal tumors mainly complain painful and debilitating symptoms, which are challenging to be treated. Conservative treatments of analgesics, chemotherapy, hormone therapy, radiotherapy and bisphosphonates are sometimes ineffective or short-acting. Traditional surgery is also adopted due to highly invasive, high risk of surgical complications and their short life expectancies [8]. Nowadays, percutaneous vertebral augmentation (Percutaneous vertebroplasty, PVP and Percutaneous kyphoplasty, PKP) for the treatment of metastatic spinal lesions has been considered as a preferred alternative to relieve pain and rebuild spinal stabilization relying on minimally invasive procedure [9,10]. As a prior choice, kyphoplasty is a modified procedure of vertebroplasty, involving inflation of a balloon to create a newly formed cavity within pathological vertebral body, which rebuilds height and decreases leakage rates of bone cement [11,12]. Metastatic spinal fractures with posterior column compromise or neurological syndrome are mentioned as a contraindication to BKP. Up to date, few studies have evaluated the efficacy and safety of PKP in treatment of osteolytic or osteoblastic metastatic vertebral compressive fracture separately [5,13,14], and no reports on comparing superiority of PKP for this two kinds of pathological spinal lesion.

In this study, we retrospectively reported clinical and radiological outcomes of PKP for the treatment of osteoblastic and osteolytic metastatic spinal fracture, in order to evaluate the

feasibility, efficacy and safety of PKP in the treatment of metastatic spinal lesions.

2. Material and methods

2.1. Study population

From January 2006 to January 2011, 81 kyphoplasty procedures (57 thoracic affected vertebra and 24 lumbar affected vertebra) were performed on 45 patients with severe back pain caused by metastases, 27 females and 18 males with a mean age of 61.5 years (range: 35–83 years). Among the 45 patients, 9 were osteoblastic lesions, 36 were osteolytic lesions. The patients had metastatic lesions of the spine caused by secondary cancers of the breast cancer ($n = 13$), lung cancer ($n = 9$), prostate cancer ($n = 6$), stomach cancer ($n = 5$), liver cancer ($n = 4$), rectal cancer ($n = 3$), cervical cancer ($n = 2$), renal cancer ($n = 2$) and ovarian cancer ($n = 1$).

2.2. Preoperative diagnosis

Diagnoses were established on the basis of patient history and radiographic evaluation. Diagnoses of spinal metastases were established based on histologic examination of bone aspirates obtained during the kyphoplasty procedures.

All patients presenting with metastatic vertebral fracture were evaluated by a multidisciplinary team, which included an

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