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ORIGINAL ARTICLE

Has the percutaneous vertebroplasty a role to prevent progression or local recurrence in spinal metastases of breast cancer?



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KEYWORDS

Percutaneous vertebroplasty;
Recurrence;
Progression;
Antitumor effect;
Breast cancer;
Metastasis

Summary

Objective: To evaluate the effectiveness of percutaneous vertebroplasty (PV) on the prevention of progression or local recurrence in patients with spinal metastases from breast cancer.

Materials and methods: Retrospective study on 55 patients between 27–78 years of age (mean age: 55 years) treated for metastatic breast cancer in the same institution (Curie institute, Paris, France), who underwent percutaneous vertebroplasty (PV) (number of vertebrae treated = 137) for spinal metastases from January 2000 to December 2009 at the Pitié-Salpêtrière hospital. Statistical correlation between the local tumor progression/recurrence, and the presence of an epidural or a paravertebral metastatic extension at diagnosis, the rate of cement filling the lesion (< 50%, ≥ 50% but incomplete, complete/almost complete) and radiotherapy was evaluated using Chi² and Fisher's exact test.

Results: The rate of local tumor progression/recurrence of the vertebrae treated by vertebroplasty was 14% (19/137). No statistically significant correlation between either the rate of cement filling of the lesion, or the presence of an epidural or paravertebral metastatic extension, and progression/local recurrence after vertebroplasty was found. No influence of radiotherapy in preventing local progression/recurrence was noted. Distant new bone metastases were observed in 47 out of 55 patients (86%).

Conclusion: The low rate of local tumor progression/recurrence after a vertebroplasty may support the hypothesis of an antitumor effect of the cement.

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Introduction

The incidence of spinal metastases is increasing over the past years due to a longer life expectancy of patients with cancer [1]. Spinal metastases may cause high morbidity when symptomatic and can be life-threatening if located in the upper cervical spine [2,3]. Treatment of patients with spinal metastases has evolved greatly over the last two decades but controversy exists regarding the management of those lesions and the relative merits of each method.

Since its introduction in the late 1980s, percutaneous vertebroplasty (PV) has progressively developed and become a routine procedure in our institution for the treatment of spinal metastases. Two major roles of PV are well established in the literature: pain relief and spinal stabilization [4–7]. Improvement of pain has been reported from 73% to 97% in patients with spinal metastases [8–10]. Increased strength and stiffness of the vertebral body leading to prevention of vertebral collapse and spinal cord compression has also been reported [11]. A third role, an antitumor effect, has been suggested [8,12–14]. This possible additional role of PV, as a result of cytotoxicity, thermal effects and ischemia, may explain the rarity of local recurrence after PV suggested by some authors [8,12,14]. The aim of this study was to evaluate the rate of local recurrence after PV in patients with spinal breast cancer metastases and to evaluate the associated risk factors of local recurrence after PV.

Materials and methods

Study design

Retrospective study involving patients treated for metastatic breast cancer, who consecutively received one or more acrylic PV for spinal metastases at the Pitié-Salpêtrière Hospital (Paris, France) between January 2000 and December 2009. All patients were managed for their breast cancer at the same institution (Institut Curie [Paris, France]). Two radiologists (B.R. and S. T.), with respectively 6 and 7 years of experience in diagnostic radiology, reviewed the imaging studies and the clinical data available before and after the PV. Images were reviewed on the Picture Archiving Communicating System (PACS) (Agfa, Mortsel, Belgium).

Patients

All the patient demographics are summarized in Table 1 and Fig. 1.

Sixty female patients, between 27 and 78 years of age (mean age 55 years), with a total of 155 vertebrae were first reviewed. Patients with a follow-up up to 4 months were excluded as well as those with no imaging studies or clinical reports available after the PV. Five out of 60 patients (18 vertebrae) were thus excluded: 4 patients passed away before 4 months of follow-up; 1 patient had no available data. Finally, 55 consecutive patients with 137 vertebrae were included in our study.

Seventy-six percent of the patients presented an infiltrating ductal adenocarcinoma, 16.5% an infiltrating lobular adenocarcinoma, 5% a poorly differentiated adenocarcinoma and 2.5% a mixed adenocarcinoma. Ninety-three percent of the patients had hormone receptors (for progesterone and/or estrogen).

Pre-, post-procedural and follow-up imaging

All PV were proposed after consensual decision from multidisciplinary meeting with oncologists, orthopedists, radiotherapists and interventional radiologists. PV treatment was decided based on symptoms and the risk of vertebral collapse. MRI and CT studies were routinely performed before the procedure. Based on images, we determined the tumour's size and the presence of an epidural or paravertebral mass extension. The rate of filling of the lesion by cement was semi-quantitatively evaluated on CT studies performed immediately after the vertebroplasty and was graded as follow: up to 50%, over 50% but incomplete and complete/almost complete filling ($\approx 100\%$) (Fig. 2).

Spinal X-ray, CT scans, MRI, bone scintigraphy and FDG PET-CT were performed as required by the attending clinician. Mean delay for imaging follow-up was 36 ± 31 months (range 4–105 months) after the PV. The median period for follow-up was 26 months.

Comparing pre-procedure with follow-up imaging studies, progression or local recurrence was considered in cases of:

- increase in tumour's size;
- onset or increase in epiduritis or paravertebral extension;
- onset of spinal compression;
- onset or increase in PET-FDG or bone scintigraphy uptake.

Vertebrae that additionally received radiotherapy were identified. The onset of new bone metastatic lesions beyond the cementoplasty was systematically assessed on imaging follow-up.

Technical aspects of PV

All PVs were performed under conscious sedation after local anaesthesia (2% lidocaine) in a C-arm flat panel neuro-angio suite (Angiostar, Siemens Erlangen, Germany). Twenty milligrams of polymethylmethacrylate (PMMA) powder (Biomet V, Biomet, Dordrecht, The Netherlands) was mixed with 5 mL of liquid polymer and with 5 mg of tungsten powder to increase its radiopacity. When the mixture had the consistency of a paste, it was injected under fluoroscopic guidance. One or more injection of 2–9 mL of cement may be performed until resistance is met or cement reaches the posterior wall [15]. Vertebrae biopsies were performed before the procedure in all cases, at least at one of the treated levels. Immediately after the PV, all patients had controlled studies with plain X-rays (lateral and anteroposterior views) and CT focused on the treated vertebrae.

Treatments received after the PV

During the following months after the PV procedure, 87% of the patients received additional chemotherapy, 21%

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