Surgical treatment of metastatic lesion of the spine. A review of 51 consecutive cases operated

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Abstract Metastatic lesions of the spine have recently become a debated topic in orthopaedics, because more and more patients survive long enough to require surgical treatment. The aim of this study is to review a series of 51 patients affected by metastatic lesions of the spine. Fifty-one patients affected by metastatic lesions of the spine were treated between 1987 and 2000. In 5 cases the cervical spine was involved, in 27 the thoracic and in 19 the lumbar spine. Surgery was planned according to the following labelling factors: type of malignancy, life expectancy, neurological involvement, pain, site of lesion, lesion extension and spine stability. Surgical treatment consisted of: minimally invasive cord decompression in 3 cases, posterior stabilization in 21, posterior stabilization and cord decompression in 13 cases, anterior resection and reconstruction of anterior column associated or not at posterior stabilization in 14 cases. Two patients died due to complications related to surgery. At the last available follow-up of 4 (±2.5) years, 29 patients had excellent results, 16 had good results, 2 fair and 2 poor results. One fair and 1 poor result had recurrence of the metastatic lesions of the spine and needed another operation. We believe that surgical treatment of metastatic lesion of the spine has a positive cost/benefit ratio for the patient’s condition; in fact most of our patients had improvement of quality of life. The labelling factors of each lesion have to be carefully studied together with the oncologist to decide the correct surgical option because unsatisfactory results could be sometimes related to incorrect evaluation of the evolution of the neoplasm.

Key words Metastatic lesions • Spine • Surgical treatment

Introduction

Bone is one of the sites most frequently involved by metastatic lesion from several types of malignancies [1, 2] and the spine is the most frequent site of bone metastases [2–5].

In autopsy study several authors have shown that the rate of metastatic lesions of the spine (MLS) increases in a caudal direction along the vertebral bodies from the cervical to the lumbar regions of the spine [4, 6, 7], and this phenomenon seems to be correlated to the increasing volume of bone marrow within the vertebral bodies from the cervical to the lumbar spine.

Metastatic lesion of the spine is mainly diagnosed by the oncologist, who asks the orthopaedic surgeon to perform an intervention which may vary from symptomatic
The most frequent initial symptom of MLS is pain [1, 8–13]. Back pain caused by MLS at the beginning can simulate a radiculopathy due to degenerated disc disease, although it usually worsens at night, it resists usual analgesics, it lasts for relatively long periods and it progressively worsens with the evolution of the metastatic disease [14]. Irritation of an intercostal nerve may falsely suggest thoracic or abdominal disease. Sometimes diffuse pain can be present below the level of the MLS. Patients with cervical or thoracic spinal cord compression may experience pain in the legs. This is thought to be due to irritation of the spinothalamic tracts of the spinal cord.

Neurologic symptoms may result from compression due to direct invasion by MLS from the osseous structures to the spinal canal. In that case there is a slow progression of the neurologic symptoms from irritation to paralysis.

Spinal canal damage may also be caused by deformity due to MLS. With the collapse of the vertebral body, retropulsion of tumour and bony fragments into the canal may produce gradual neurological deterioration or, more frequently, acute deficits.

The aim of surgical treatment depends on several neoplasm and metastatic lesion labelling factors. Neoplasm labelling factors are usually studied by the oncologist, radiotherapist or general surgeon, who ask the orthopaedic surgeon to evaluate MLS labelling factors in order to plan surgical intervention.

The aim of the study is to review a series of 51 patients affected by metastatic lesions of the spine who had undergone surgical treatment.

**Materials and methods**

From 1987 to 2000 we surgically treated 51 patients affected by metastatic lesion of the spine. Twenty-eight were male and 23 female, with a mean age of 62 years (range, 40–77 years). In 17 cases the primitive tumour derived from the thyroid, 8 from the breast, 8 from the lung, 5 from the prostate, 5 from the kidney, 4 from multiple myeloma, 3 from non-Hodgkin lymphoma and in 1 from adenocarcinoma of unknown origin.

Eighteen patients presented solitary metastatic lesion and 33 presented other metastatic lesions (skeleton, lung, liver, brain etc.). Forty-three patients had a single spinal localized, 3 on the cervical spine, 25 on the thoracic spine and 15 on the lumbar spine. Eight cases presented multiple localized, 3 cervicodorsal and 5 dorsolombar.

Surgical strategy was planned according to a classification proposed in a previous paper [15], which considers labelling factors of the neoplasm (Table 1) and labelling factors of the metastatic lesion of the spine (Table 2).

Metastatic lesions of the spine can be studied by standard radiographs, CT scan and MRI. Studying vascularization of MLS may be very useful for planning surgical intervention: arteriography should be performed routinely to plan, when possible, preoperative embolization of the MLS. This technique facilitates the intraslesional or extralesional resection by reducing bleeding during surgery.

According to the labelling factors of the neoplasm and metastatic lesion of the spine, surgical treatment may be based on one or more of the following procedures:

- posterior decompression;
- posterior stabilization;
- intraslesional resection and substitution/reconstruction;
- extraslesional resection and substitution/reconstruction.

Four patients with isolated osteolysis of the vertebral body without fracture or deformity, presenting solitary metastasis or multiple metastasis of a curable neoplasm, sensitive to therapies and in good condition with a life expectancy of more than 2 years, were classified as type 1A (Fig. 1). These patients were treated by a posterior stabilization performed by titanium instrumentation combined with extraslesional anterior column resection. An anterior column resection was then performed in a second operation. Depending on the age and general condition of the patient and life expectancy, anterior reconstruction was performed with cages and PMMA or autologous bone graft.

Twenty-one patients, presenting isolated osteolysis of vertebral bodies without fracture or deformity, solitary metastasis or multiple metastasis of relatively controllable neoplasm, sensitive to some therapies and in fair condition with a life expectancy

| Type of primitive tumour and its curability | A. High differentiation | B. Low differentiation | C. Anaplastic |
| Presence of other metastatic lesion | A. None | B. At follow-up | C. At diagnosis |
| Response to non-surgical treatment | A. Sensitive | B. Sensitive to some | C. Unsensitive |
| Previous surgery/radiation therapy | A. None | B. Surgery | C. Radiation therapy |
| General condition of the patient | A. Good | B. Fair | C. Poor |
| Life expectancy | A. More than 2 years | B. 1–2 years | C. Less than 1 year |

**Table 2** Labelling factors of metastatic lesion of the spine