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Are older patients with solitary spinal metastases fit for total en-bloc surgery?

Peng Liu[1], Libo Jiang[1], Yun Liang, Houlei Wang, Hao Zhou, Xilei Li, Hong Lin, Xiaogang Zhou, Jian Dong*

Department of Orthopaedic Surgery, Zhongshan Hospital, Fudan University, Shanghai, China

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ABSTRACT

Objective: Due to radical resection, total en-bloc spondylectomy (TES) is associated with significant levels of surgical injury and spinal instability, particularly in elderly patients with solitary spinal metastases (SM), whether the possible benefits outweigh the risk requires intense consideration. Our aim was to compare and analyze the impact of age on patient prognosis.

Patients and Methods: This study investigated TES in 78 consecutive patients with solitary SM, who were divided into Group A (> 65 years, n = 32) and group B (< 60 years of age, n = 46). Surgical outcomes were assessed according to survival time, local recurrence, neurological function, pain, and quality of life before and after surgery. Differences between groups were statistically compared using analysis of variance (ANOVA) or chi-square tests.

Results: There was no significant difference between the two groups in terms of surgery duration, blood loss, blood transfusion or the duration of hospital stay ($p > 0.05$). Furthermore, there was no significant difference in the median survival time between the two groups ($p > 0.05$). However, the perioperative complication rate in group A was higher than that in group B ($p < 0.05$). There was no significant difference in terms of local recurrence rate when compared between group A and group B ($p > 0.05$), and there were no significant differences in terms of improvements in neurological function, Visual Analogue Scale and Karnofsky scores of patients between the two groups ($p > 0.05$).

Conclusion: Older patients can experience survival and local recurrence rates that were similar to those of younger patients. Although older patients are at increased risk of perioperative complications, this factor does not appear to lead to serious adverse outcomes. Older patients are still good candidates to receive TES to cure solitary SM after careful preparation and strict selection.

1. Introduction

Over recent years, our ability to cure primary tumors has significantly improved. However, as survival rates for cancer patients increase, so does the incidence of metastasis [1]. The spine is an important target organ for metastasis, and accounts for 50% of all bone metastases [2,3]. With the development of surgical techniques and spinal instrumentation, surgery has become an important method for the treatment of spinal metastases (SM) [4,5]. This is particularly important for neurological deficits caused by metastatic epidural spinal cord compression; decompression combined with radiotherapy shows much greater efficacy in terms of improving neurological impairment when compared with surgery or radiotherapy alone [6,7].

The surgical methods used to treat spinal tumors can be divided into palliative curettage, debulking surgery, and total en-bloc spondylectomy (TES). The first two methods have clear disadvantages, such as tumor cell contamination and residual tumor tissue [8]. TES, however, adopts a more radical resection approach than in other surgical procedures and thus provides a tumor-free margin (the entire vertebra affected is resected, along with its accessories) [9]. Therefore, in terms of surgical strategies, the local recurrence rate and the tumor-related mortality are all better with TES than with other two surgical methods [10,11]. However, because of the radical resection, TES involves greater surgical injury and spinal instability, particularly in elderly patients with SM. Thus, whether the possible benefits outweigh the risk requires intense consideration.

In this study, 78 consecutive adult patients with definitive solitary metastases of the thoracolumbar spine and undergoing TES were

* Corresponding author at: Department of Orthopaedic Surgery, Zhongshan Hospital, No.180 Fenglin Road, Shanghai 200032, China.
E-mail address: dong.jian@zs-hospital.sh.cn (J. Dong).
[1] Co-first authors.

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divided into two age groups to compare and analyze the impact of age on patient prognosis. This study aimed to advance our understanding of whether TES is beneficial for patients with SM at an advanced age.

2. Methods and materials

2.1. Patients

This retrospective study evaluated 49 men and 29 women (age range: 29–77 years). All patients were recruited between 2008 and 2016 and were diagnosed with definitive solitary SM by postoperative pathology reports. Patients were divided into two age groups: Group A (> 65 years, n = 32) and group B (< 60 years of age, n = 46). Spinal tumor was found in the thoracic spine (n = 48) or in the lumbar spine (n = 30). Of these cases, 62 patients had one pathological vertebra, fourteen patients had two pathological vertebrae, and two patients had three pathological vertebrae. The primary malignancies included lung cancer (n = 19), liver cancer (n = 12), kidney cancer (n = 10), prostate cancer (n = 9), breast cancer (n = 7), thyroid cancer (n = 6), colon cancer (n = 3), rectal cancer (n = 3), gastric cancer (n = 3), osteosarcoma (n = 2), unidentified cancer (n = 2), uterus cancer (n = 1) and ovarian cancer (n = 1) (Table 1). Overall, 28 of the 78 patients underwent primary tumorectomy. Furthermore, 20 of the 78 patients had treatable basic illnesses including diabetes, hypertension, gastric ulcer, emphysema, and colitis. Informed consent was provided by the patients before surgery. Approval for this study was obtained from the institutional ethics committee in our hospital.

2.2. Indications for surgical treatment and preoperative diagnosis

Surgical indications included severe pain, neurological deficits, instability of the spine, insensitivity to radiotherapy, and pathological biopsy to identify the primary site. Of these, the Spine Neoplastic Instability Score (SINS) classification system [12] was used to quantify the tumor-related instability of the spine (higher scores corresponded to severe instability). Pre-conditions for radical surgery included no further detectable lesions, favorable prognostic characteristics and more than 6 months of predicted metastases-free survival. All patients were diagnosed with solitary SM before surgery based on needle biopsy or imaging examinations. For all patients, the extent of the spinal tumor was assessed with CT scans and MRI and was further classified into types 1–7 based on the affected anatomic site and the extent of the tumor. Of these, type 1, 2 and 3 lesions were considered intracompartmental, whereas type 4, 5, and 6 lesions were considered extracompartmental while type 7 was a multiple-skip lesion [13] (Table 1). In 26 of the 78 patients, preoperative angiography examination showed tumors with an abundant blood supply, and interventional embolization was thus used to reduce blood loss during surgical procedures.

2.3. Surgical procedures, chemoradiotherapy and follow-up

The patient was placed in a prone position, and dorsal skin was sterilized. C-arm radiography was used to locate the pathological vertebra. Pedicle screws were placed into adjacent vertebrae at two or three levels above and below the resected vertebra. The subsequent procedure included en-bloc laminectomy and corpectomy if the position of the screws was shown to be satisfactory by radiography. Appropriate artificial vertebra, or titanium mesh filled with autologous iliac bone or allogeneic bone, was placed into the space of the vertebra remaining by the debridement for anterior column reconstruction (Fig. 1), as described previously [14,15].

Table 1
Demographic data for patients with spinal metastases.

Variable	Group A (n = 32)	Group B (n = 46)	χ^2/F	p
Gender (Male/Female)	22/10	27/19	0.817	0.366
Age (Years, *mean ± SD*)	71.00 ± 3.42	49.89 ± 6.06	316.928	0.000**
SINS (*mean ± SD*)	10.66 ± 2.29	9.57 ± 1.53	6.358	0.014*
Basic illnesses (Yes/No)	7/25	13/33	0.404	0.525
Primary tumorectomy (Yes/No)	10/22	18/28	0.509	0.475
Pathological vertebra				
Site (Thoracic/Lumbar)	21/11	27/19	0.383	0.536
Number (1/2/3)	27/5/0	35/9/2	1.718	0.424
Primary malignancy				
Lung	12	7	14.003	0.300
Liver	3	9		
Kidney	4	6		
Prostate	4	5		
Breast	1	6		
Thyroid	2	4		
Colon	2	1		
Rectal	2	1		
Gastric	1	2		
Osteosarcoma	0	2		
Unidentified	0	2		
Uterus	1	0		
Ovarian	0	1		
Degree of malignancy				
High	16	22	0.477	0.788
Moderate	7	8		
Low	9	16		
Surgical classification (Type)			4.346	0.501
1	0	2		
2	5	7		
3	7	6		
4	6	12		
5	9	8		
6	5	11		
7	0	0		

* and ** indicate significant difference at $p < 0.05$ and $p < 0.01$, respectively. SINS indicate Spine Instability Neoplastic Score.