

## Neurological Outcome Following Surgical Treatment of Spinal Metastases

### Abstract

**Background:** Spinal metastases lead to bony instability and spinal cord compression resulting in intractable pain and neurological deficits which affect ambulatory function and quality of life. The most appropriate treatment for spinal metastasis is still debated. **Objective:** The aim of this study is to evaluate clinical outcome, quality of life, complications, and survival after surgical treatment of spinal metastases. **Methods:** Retrospective review of patients with spinal metastases surgically treated at our facility between March 2008 and March 2013 was performed. Evaluations include hospital charts, initial and interval imaging studies, neurological outcome, and surgical complications. Follow-up examinations were performed every 3 months after surgery. **Results:** Seventy patients underwent surgical intervention for treatment of spinal metastasis in our institution. There were 27 women and 43 men. The preoperative pain was reported in 65 patients (93%), whereas postoperative complete pain relief was reported in 16 patients (24%), and pain levels decreased in 38 patients (58%). Preoperative 39 patients were ambulant and 31 patients were nonambulant. Postoperative 52 patients were ambulant and 18 patients were nonambulant. Postoperative complications were experienced in 10 (14.2%) patients, and the patient survival rate was 71% (50 patients) at 3 months, 49% (34 patients) at 1 year. The postoperative 30-day mortality rate was 4.2%. **Conclusion:** Surgical decompression for a metastatic spinal tumor can improve the quality of life in a substantially high percentage of patients with acceptable complications rate.

**Keywords:** *Quality of life, spinal metastases, surgical decompression*

### Introduction

The incidence of metastatic spine disease is increasing with rising cancer incidence and improved treatment. About 5%–10% of patients with cancer develop spinal metastases.<sup>[1]</sup> Vertebral destruction by tumor leads to bony instability and spinal cord compression resulting in intractable pain and neurological deficits which affect ambulatory function and quality of life. The most appropriate treatment for spinal metastasis is still debated, some studies showed that surgery plus radiotherapy have better neurological outcome than radiotherapy alone, others have questioned the role of surgery.

In 2005, multicenter randomized study by Patchell *et al.* showed that patients treated with surgery followed by radiotherapy had a significantly higher ambulatory rate and retained the ability to walk significantly longer than those treated with radiotherapy alone.<sup>[2]</sup> In 2010, Rades *et al.* performed a retrospective analysis comparing outcomes among 108 patients receiving surgery

plus radiotherapy and a matched cohort of 216 patients treated with radiotherapy alone. All evaluated outcomes were similar in the two groups including improvement of motor function, posttreatment ambulatory rate, and regaining the ability to walk.<sup>[3]</sup> In 2012, Kim *et al.* performed a systematic review of literature comparing surgery plus radiotherapy to radiotherapy alone and concluded that surgery can provide a valuable advantage over radiation in terms of restoration of ambulatory function and pain reduction.<sup>[4]</sup>

Indications for surgical intervention include progressive neurological deficit, intractable pain, need for histological diagnosis, radioresistant tumors, and spinal instability. Objectives of surgery are pain reduction and improvement in quality of life and survival rate. The aim of this clinical study is to evaluate clinical outcome, the quality of life, complications, and survival after surgical treatment of spinal metastases.

### Methods

A retrospective review of patients with spinal metastases surgically treated at our facility between March 2008 and March 2013 was

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performed. Evaluations include hospital charts, initial and interval imaging studies, neurological outcome, and surgical complications. Follow-up examinations were performed every 3 months after surgery. The indications for surgery were radiological spinal cord compression, a life expectancy of at least 3 months, signs and symptoms of neurological deficit, intractable pain unresponsive to conservative treatment, and spinal instability. Surgery was denied for patients with life expectancy estimated to be <3 months, widespread visceral metastases, more than 2 noncontiguous levels of spinal cord compression, active systemic infection, and poor cardiopulmonary reserve. Neurological outcome was graded before and after surgery using Frankel grade system.

## Results

Seventy patients underwent surgical intervention for treatment of spinal metastasis in our institution between March 2008 and March 2013. There were 27 women and 43 men. Their ages at the time of surgery ranged from 30 to 85 years (mean 56 years). The average follow-up period was 16 months. The primary sources of metastases were the lung in 13 patients, breast in 12 patients, prostate in 7 patients, renal in 6 patients, colon in 6 patients, skin in 5 patients, thyroid in 4 patients, liver in 3 patients, cervix in 2 patients, and stomach in 2 patients. A primary source was never identified in 10 patients [Table 1]. A total of 28 (40%) patients had prior radiation treatment before undergoing surgical decompression.

The location of spinal metastases was most prevalent in the thoracic spine (54 patients) followed by the cervical spine (11 patients), and lumbar spine (5 patients). A total of 49 (70%) patients had tumor involvement of one vertebral body, and 21 (30%) patients had two locations of metastases within the spinal column. All patients underwent surgical decompression and stabilization by instrumentation. An anterior approach was used for 16 patients, a posterior approach was used for 47 patients, and a combined approach was used for 7 patients.

The preoperative pain was reported in 65 patients (93%), whereas postoperative complete pain relief was reported in 16 patients (24%) and pain levels decreased in 38 patients (58%) with overall pain improvement rate of 83%. A total of 32 (46%) patients maintained their Frankel scores while 35 (50%) patients improved and 3 (4%) patients are getting worse [Figure 1]. Preoperative 39 patients were ambulant and 31 patients were nonambulant. Postoperative 52 patients were ambulant and 18 patients were nonambulant. Among 31 nonambulatory patients, 13 were able to ambulate after surgery with 42% improvement in ambulatory function. Of 16 patients who had urine incontinence before surgery, 7 (43%) become continent after surgery [Table 2].

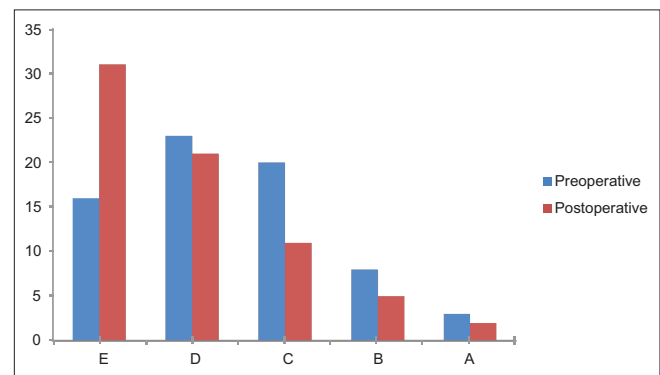
Operative complications were experienced in 10 (14.2%) patients. There was a pulmonary infection in two patients, also another patient had a pulmonary embolism, two

**Table 1: Origin of primary tumors**

Origin of tumor	Number of patients	Incidence (%)
Lung	13	18.5
Breast	12	17.1
Prostate	7	10
Kidney	6	8.5
Colon	6	8.5
Skin	5	7.1
Thyroid	4	5.7
Liver	3	4.2
Stomach	2	2.8
Cervix	2	2.8
Unknown	10	14.2

**Table 2: Clinical features of patients before and after surgery**

Clinical features	Preoperative	Postoperative
Back/radicular pain	65	49
Frankel Grade A	3	2
Frankel Grade B	8	5
Frankel Grade C	20	11
Frankel Grade D	23	21
Frankel Grade E	16	31
Neurological deficit	52	39
Urinary incontinence	16	9
Ambulant	39	52
Nonambulant	31	18



**Figure 1: Frankel grade before and after surgery**

patients develop hematoma, and one of them required surgical evacuation. Wound infection was noted in three patients all of them had radiotherapy before surgery and two patients had deep venous thrombosis.

The median survival duration was 12 months and survival rate was 71% (50 patients) at 3 months, 49% (34 patients) at 1 year, and 27% (19 patients) at 2 years. The postoperative 30-day mortality rate was 4.2% (3 patients)

## Discussion

Spinal metastases represent a significant cause of morbidity in patients diagnosed with malignancies.<sup>[5,6]</sup> Immediate

decompression to relieve cord compression is crucial in patients with an associated neurological deficit. Advances in surgical techniques and newer generation spinal instrumentation have resulted in surgery being more effective in circumferentially decompressing the spinal cord with the ability to stabilize the spine in selected patients with spinal metastases.<sup>[7,8]</sup>

Patients with spinal metastases most commonly present with pain which can be mechanical or radicular. The severity of pain can cause patients to become bedbound despite normal neurological function and affects the quality of life. One of the main goals of surgery is to provide pain relief. Multiple series reporting pain outcomes have shown a 76%–100% improvement of pain after surgery,<sup>[9-11]</sup> also Liang *et al.* showed that 88% of patients with spinal metastasis experience pain relief after surgery.<sup>[12]</sup> Similarly, 83% of patients in our series experience pain improvement.

Maintaining or improving patients' neurological function is one of the most important surgical goals. Ibrahim *et al.* showed that 64% of patients had improved or maintained their preoperative Frankel grade, 53% of patients regained mobility, and 39% of patients regained normal urinary control.<sup>[13]</sup> Quan *et al.* showed that more than 50% of patients regained ambulatory ability and recovered urinary continence after surgery.<sup>[14]</sup> Similarly, in our study, 42% of patients regained ambulatory function and 43% of patients regained normal urinary control after surgery.

The overall rate of complications from surgical procedures for metastatic spine disease has been reported as 29% (range 5%–65%) with wound infection, pulmonary complications, and deep vein thrombosis being the most frequent complication.<sup>[4,7,8]</sup> The complication rate in our series was 14.2% with the wound infection rate being 4.2%. In our study, the 30-day mortality rate was 4.2% which is within the 0-20% range reported in the literature.<sup>[4,7,15]</sup> In Ibrahim *et al.* series the median survival time was 11.7 months and the 1-year survival rate was 52%.<sup>[13]</sup> Liang *et al.* reported a survivorship of 61% at 1 year and median survival time of 15 months.<sup>[12]</sup> Similarly, in our series, survival rate was 49% for 1 year and median survival duration was 12 months.

## Conclusion

Surgical decompression for a metastatic spinal tumor can improve the quality of life in a substantially high percentage of patients with acceptable complications rate.

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## Conflicts of interest

There are no conflicts of interest.

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