Clinical Article

Online ISSN : 2314-8969
Print ISSN: 2314-8950
www.esa.org.eg

Egy Spine J 12:21-26, 2014

NEUROLOGICAL OUTCOME FOLLOWING SURGICAL TREATMENT OF SPINAL METASTASES

Neurological Outcome Following Surgical Treatment of Spinal Metastases

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Abstract

Background Data: Spinal metastases lead to bony instability and spinal cord compression resulting in intractable pain and neurological deficits which affects ambulatory function and quality of life, the most appropriate treatment for spinal metastasis is still debated.

Purpose: The aim of this study to evaluate clinical, quality of life, complications and survival outcomes after surgical treatment of spinal metastases.

Design: It is a retrospective study.

Patients and 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 three months after surgery

Results: 70 patients underwent surgical intervention for treatment of spinal metastasis in our institution. There were 27 women and 43 men. 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 non-ambulant. Postoperative 52 patients were ambulant and 18 patients were non-ambulant. Postoperative complications were experienced in 10 (14.2%) patients, 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 metastatic spinal tumor can improve quality of life in a substantially high percentage of patients with acceptable complications rate. (2015ESJ080)

Keywords: Spinal metastases, Surgical decompression, Quality of life

Introduction

The incidence of metastatic spine disease is increasing with rising cancer incidence and improved treatment, 5-10% of patients with cancer develop spinal metastases.[7] Vertebral destruction by tumor leads to bony instability and spinal cord compression resulting in intractable pain and neurological deficits which affects 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,[10] 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. In 2010 Rades et al,[12] performed 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, post-treatment ambulatory rate, and regaining the ability to walk. In 2012 Kim et al,[6] performed 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.

Indications for surgical intervention include progressive neurologic deficit, intractable pain, need for histological diagnosis, radio resistant 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 to evaluate clinical, quality of life, complications and survival outcomes after surgical treatment of spinal metastases.

Patients and 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 three months after surgery. Neurological outcome was graded before and after surgery using Frankel's grade system and pain was assessed using Visual Analog Scale. Patients were evaluated with plain radiography and magnetic resonance imaging. Plain x-rays were obtained at each follow up visit.The indications for surgery were radiological spinal cord compression, life expectancy of at least three 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 less than 3 months, widespread visceral metastases, more than 2 non-contiguous levels of spinal cord compression, active systemic infection, and poor cardiopulmonary reserve. All patients underwent surgical decompression and stabilization by instrumentation. Anterior approach was used for 16 patients, posterior approach was used for 47 patients, and a combined approach was used for 7 patients (Figure1).

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 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 (Table1). Twenty eight patients (40%) had prior radiation treatment before undergoing surgical decompression.

The location of spinal metastases was most prevalent in the thoracic spine (54 patients), followed by cervical spine (11 patients) and lumbar spine (5 patients). Forty nine patients (70%) had tumor involvement of one vertebral body and 21 patients (30%) had two locations of metastases within the spinal column.

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%.

Preoperative Frankel grades were: 3 patients Frankel A, 8 Frankel B, 20 Frankel C, 23 Frankel D and 16 Frankel E, while postoperative Frankel grades were: 2 patients Frankel A, 5 Frankel B, 11 Frankel C, 21 Frankel D and 31 Frankel E. Thirty two patients (46%) maintained their Frankel scores while 35 patients (50%) improved and 3 patients (4%) getting worse (Figure 2). Preoperative 39 patients were ambulant and 31 patients were non-ambulant. Postoperative 52 patients were ambulant and 18 patients were non-ambulant. Among 31 non-ambulatory 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 were a pulmonary infection in two patients, also another patient had pulmonary embolism, two patients developed hematoma 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, the patient 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).

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
Non ambulant	31	18

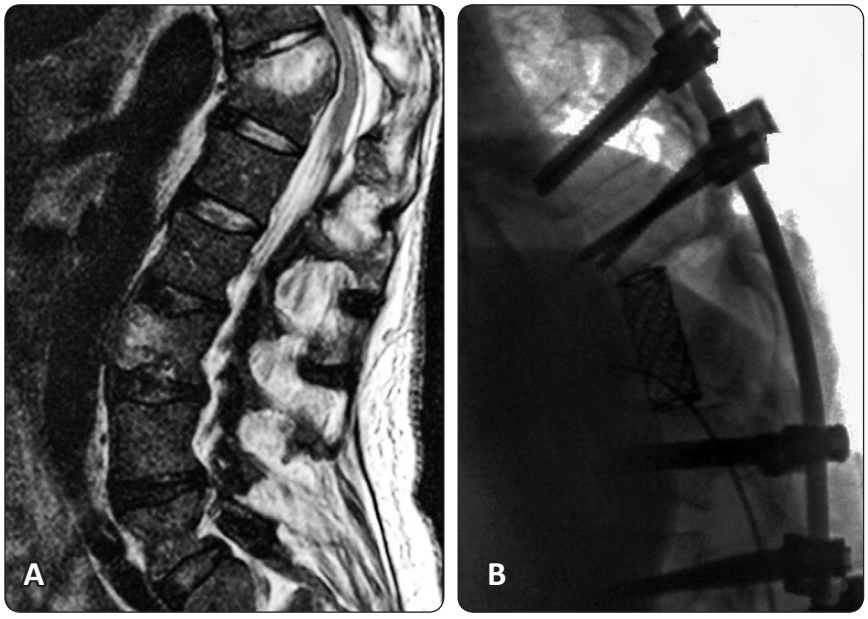
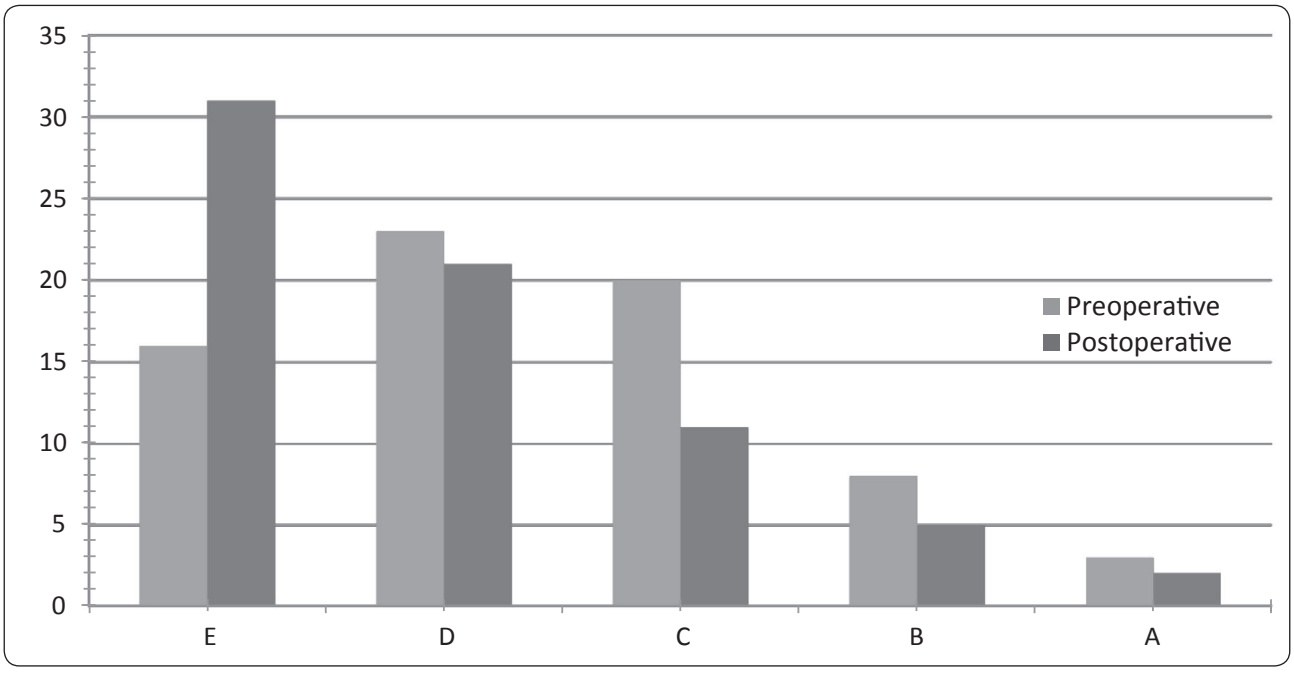


Figure1. A 65 years old male with lung cancer and spinal metastases (A) Sagittal T2-weighted MR image showing spinal metastases involving T11 and T12 vertebrae causes narrowing of spinal canal. (B) X ray showing T11 and T12 corpectomy, anterior titanium mesh cage and T9 to L2 posterior fixation.

Figure 2. Frankle grade befor and after surgery



Discussion

Older Patients are more likely to be affected by bony metastases than younger patients.[9] Ibrahim et al,[4] reported that the mean age of patients with spinal metastases was 61 years, in our study the mean age was 56 years. The source of spinal metastases included a wide variety of cancers with breast, lung, prostate and kidney being the common primary sites reported in the literature,[4,6,11] similarly in our study the commonest origin was lung (18%) followed by breast (17%) and prostate (10%). The thoracic spine is the most frequent location of spinal metastases (65%) followed by lumbosacral (25%) and cervical spine (10%).[6] In our study spinal metastases was most frequent in thoracic spine (77%) followed by cervical (16%) and lumbar spine (7%).

Spinal metastases represents a significant cause of morbidity in patients diagnosed with malignancies.[13,14] Immediate decompression to relieve cord compression is crucial in patients

with 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 spine metastases.[2,5]

Patients with spinal metastases most commonly present with pain which can be mechanical or radicular, the severity of pain can cause patients to become bed-bound despite normal neurological function and affect quality of life, one of the main goals of surgery is to provide pain relief. Multiple series reporting pain outcomes have shown a 76% to 100% improvement after surgery[1,3,15] and Liang et al,[9] showed that 88% of patients with spinal metastasis experience pain relief after surgery, 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,[4] 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. Quan et al,[11] showed that more than 50% of patients regained ambulatory ability and recovered urinary continence after surgery, 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% (5–65%) with wound infection, pulmonary complications, deep vein thrombosis being the most frequent complication.[2,5,6] 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.[5,6,8] In Ibrahim et al,[4] series the median survival time was 11.7 months, and the 1-year survival rate was 52%. Liang et al, [9] reported a survivorship of 61% at one year and median survival time of 15 months, similarly in our series the patient survival rate was 49% at 1 year. The median survival duration was 12 months.

In our study, surgical treatment of spinal metastases resulted in significant pain alleviation as well as improvement of ambulatory ability and sphincter function and thus improving the quality of remaining life of cancer patients.

Conclusion

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

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الملخص العربي

نتائج العلاج الجراحى لأورام العمود الفقرى الثانوية

المقدمة: أورام العمود الفقرى الثانوية قد تؤدي إلى عدم اتزان العمود الفقرى والضغط علي الحبل الشوكى مما يؤدى إلى ألم شديدة وخلل بالوظائف العصبية والتي تؤثر على الوظائف الحركية ونوعية الحياة. حتي الان مازال هناك جدل حول العلاج الافضل لاورام العمود الفقرى الثانوية.

الهدف: الهدف من هذه الدراسة هو تقييم نتائج العلاج الجراحى لاورام العمود الفقرى الثانوية من الناحية الاكلنيكية ونوعية الحياة والمضاعفات والبقاء على قيد الحياة.

تصميم الدراسة: دراسة سريريه بأثر رجعى.

طريقة البحث: تتضمن الدراسة المرضى الذين يعانون من اورام ثانوية في العمود الفقرى في الفترة ما بين شهر مارس ٢٠٠٨ و شهر مارس ٢٠١٣ وقد تم مراجعة السجلات الطبية والاشعات والنتائج العصبية ومضاعفات الجراحة وقد تم اجراء فحص دورى علي المرضى كل ثلاثة اشهر بعد الجراحة.

النتائج: خضع٧٠مريضا لالتدخل الجراحى لعلاج اورام ثانوية في العمود الفقرى . تتضمنت الدراسة ٢٧ امرأة و٤٣ رجل. كان ٦٥ (٩٣٪) مريضا يعانون من الآم قبل الجراحة اما بعد الجراحة فقد تعافى ١٦(٢٤٪) مريضا بشكل كامل و ٣٨(٥٨٪) مريضا بشكل جزئى من الألم .كان ٣٩ مريضا يستطعون الحركة و٣١ مريضا لا يستطعون الحركة قبل الجراحة اما بعد الجراحة فقد كان ٥٢ مريضا يستطعون الحركة و١٨ مريضا لا يستطعون الحركة وقد عانى ١٠(١٤.٢٪) من المرضى من مضاعفات ما بعد الجراحة وكان معدل البقاء ٧١٪ (٥٠مريضا) في الثلاثة أشهر الاولى و٤٩٪ (٣٤مريضا) في السنة الاولي و كان معدل الوفيات خلال الثلاثين يوما الاولى بعد العملية الجراحية ٤.٢٪.

الخلاصة: العلاج الجراحي لاورام العمود الفقرى الثانوية يمكن ان يودي الي تحسن ملحوظ في حياة نسبة كبيرة من المرضى بالرغم من حدوث بعض المضاعفات.