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# SPINAL METASTASIS - SINGLE INSTITUTIONAL RETROSPECTIVE STUDY AT A TERTIARY CENTRE – CASE SERIES

**Brig Maneet Gill** Army Hospital (R& R) Delhi Cantt

**Lt Col Chinmaya Srivastava*** Army Hospital (R& R) Delhi Cantt *Corresponding Author

**Dr Lokesh Gautam** Army Hospital (R& R) Delhi Cantt

**ABSTRACT**

**PURPOSE:** A retrospective study of the results of spinal metastasis and neoplastic cord compression was undertaken to determine the effectiveness of surgical treatment in patients undergoing extensive spinal procedures with potential morbidity.

**PATIENTS AND METHODS:** Over a 3-year period (2017 to 2019), a total of 41 patients underwent surgery (27 male and 14 female, mean age 56 years). The surgery was meant for relieving neural compression and ensuring stability of the spine. There were 11 cases of spinal decompression and fixations and 30 cases with only decompressive laminectomies. Before surgery, 18 patients (45%) were non-ambulatory, with paresis being present in 10. In the 11 patients who underwent spinal fixation/instrumentation following decompression, there were circumferential resections in 02 patients (4.8%), anterior resections in 01(2.4%), and posterior resection in 08 (19.5%).

**RESULTS:** Postoperatively 10 patients (55%) improved in pain, ambulatory status and Karnofsky performance status (KPS). The presence of preoperative paraparesis had major impact on outcome.

**CONCLUSION:** Our data suggest that the effective surgical treatment of neoplastic compression requires effective resection along with instrumentation. Long-term survival is feasible in a subset of patients with this aggressive surgical approach.

**KEYWORDS :**

## INTRODUCTION

Compression of the spinal cord and cauda equina is a major cause of morbidity in cancer patients.[1]. It is known that the adenocarcinomas which mostly originate from the lung, breast, prostate, kidney, gastrointestinal tract and thyroid tend to metastasize especially to the spine[2] It was found that the percentage of cancer patients who have had bone metastasis before death is between 50% and 70%, and especially in case of breast cancer this percentage rose up to 85%. Up to 10% of patients who have symptomatic spine metastases can be treated by surgery.[3] Autopsy studies suggest that approximately one in three patients with solid tumors may have metastases to the spine, clinical incidence of symptomatic cord compression is approximately 5%.

Bone is the third most common site of metastases after the liver and the lungs, and about two-thirds of all bone metastases are located in the spine. In a case report by the primary author, involvement of the craniovertebral junction was found to be a potential nidus for skeletal metastasis[4]. 10% of all patients with malignant tumors suffer from spinal metastases at some point in the course of their disease. 10%-20% of these patients have spinal cord compression due to a metastasis.

Many patients are not clinically suspected of having spinal metastases when they are still neurologically intact; as a result, less than half of patients are ambulatory at the beginning of treatment. Pretreatment neurological status still remains the important variable that affects outcome after treatment.

There are various scoring systems for prognosis that are of only limited predictive value and cannot be used as anything more than a rough guide. The prognosis with respect to survival essentially depends on the biology of the primary tumor: two-year survival rates for patients with spinal metastases range from 9% (lung cancer) to 44% (breast or prostate cancer)[5] . In general, only 10% to 20% of patients with spinal metastases are still alive two years after these metastases are diagnosed[5]. The physician must give due consideration to this fact when deciding upon the nature and invasiveness of any treatment that is to be provided.

If the tumor is radiosensitive, radiotherapy is given either as adjuvant treatment after surgery or as the primary treatment for multiple spinal metastases in the absence of an acute neurological deficit

Current management strategies in neoplastic cord compression continue to evolve, with a greater recognition that de novo surgery may be beneficial both for resection of tumor mass and providing stability[6]. Unfortunately, many patients are referred for surgical intervention for emergency decompression when neurologic deterioration is acute and rapid. In emergency situation surgery may be of value in salvage, but has high morbidity [7].

Treatment goals are considered largely palliative with median survival of patients treated by laminectomy ranges from 3 -6 months[8] around three decades back , however with various imaging modalities and more aggressive surgery, the median survival has been doubled in many patients[9].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[10]

Recent studies have called for outcome measures that include quality of life[11]. To determine the results and outcome of patients (including quality of life) with spinal metastases treated by surgery, a retrospective analysis of a three year experience with neoplastic cord compression was performed. Clinical parameters evaluated before treatment included pain, motor deficit, and ambulatory status of the patient. Pain was generally categorized as mild, moderate or severe. Motor functions were classified as non ambulatory paraparetic patients and ambulatory patients, with varying motor deficits.

Indications for surgery included maximum safe tumor resection in patients with radioresistant tumors, decompression of the cord and the spine stabilisation with tissue diagnosis. The surgical approaches were tailored to the site of compression based on various imaging studies including NCCT bony windows including sagital, axial cuts to look for the screw purchase and the osteoprotic nature of the bone . PET CT for uptake of the lesion in various body parts and vertebral segments. Contrast MRI to know the soft tissue component of the lesion.

## RESULTS

The surgical series consisted of 41patients with a median age of 56 years. The major primary tumor site in spine was thoracic followed by lumbar and cervical segments (Table 1). The most common primary tumor sites included prostate, breast, lungs and kidneys (Table 2). In 23 patients (55%), spinal involvement represented the first presentation of their malignancy in the form of clinical features including pain, parasthesia and varying degree of motor and sensory deficits with sphincter involvement depending on the site of the lesion.

**Table 1: Tumor sites in spine**

| INVOLVED SEGMENT | | PERCENTAGE |
|---|---|---|
| THORACIC | 29 | 71 |

| | | |
|---|---|---|
| LUMBAR | 09 | 22 |
| CERVICAL | 03 | 07 |

The surgical procedures included cage placement in lower thoracic with anterolataeral thoracotomy to high cervical corpectomy with bone graft and cervical plate placement (Fig 1 & Fig 2) with multilevel pedicle screw stabilisation in thoracic and lumbar levels and tissue diagnosis (Secondary deposits) (Fig 3).

**Table 2: Primary origin**

| PRIMARY TUMOR SITE | NO | PERCENTAGE |
|---|---|---|
| LUNG | 17 | 41 |
| KIDNEY | 09 | 22 |
| BREAST | 08 | 19 |
| PROSTATE | 07 | 12 |

**Table 3: Procedure**

| PROCEDURE | NO |
|---|---|
| DECOMPRESSION & FIXATION | 11 |
| DECOMPRESSIVE LAMINECTOMY | 30 |

**Table 4: Instrumentation**

| INSTRUMENTATION | NO |
|---|---|
| CIRCUMFERENTIAL INSTRUMENTATION | 02 |
| ANTERIOR INSTRUMENTATION | 01 |
| POSTERIOR INSTRUMENTATION | 08 |

In the 11 patients who underwent spinal fixation/instrumentation following decompression, there were circumferential resections in 2 patients (4.8%), anterior resections in 1(2.4%), and posterior resection in 08 (19.5%). (Table 3&4)

Postoperatively, patients were considered improved if they became ambulatory or maintained ambulation following discharge. In the overall group, 35 patients (82%) were considered improved and benefitted from surgery in the form of increase in KPS, ODI and improvement in paraparesis; 04 patients (9.75%) were considered not improved and had the same preop status , 02 patients worsened had because of postoperative morbidity with delayed hospital discharge with post op CSF leak (Table 5 & 6)

**Table 5**

| CLINICAL OUTCOME | NO OF PATIENTS |
|---|---|
| CLINICAL IMPROVEMENT | 35 |
| NO IMPROVEMENT | 04 |
| SYMPTOMS WORSENED | 02 |

**Table 6: Outcome parameters (34/41 patients showed significant improvement)**

| N:34 | PRE OP | POST OP |
|---|---|---|
| KPS | 50-60% | 70-80% |
| ODI | 40-60% | 20-40% |
| MRC POWER GRADE | 3/5 | 4/5 |

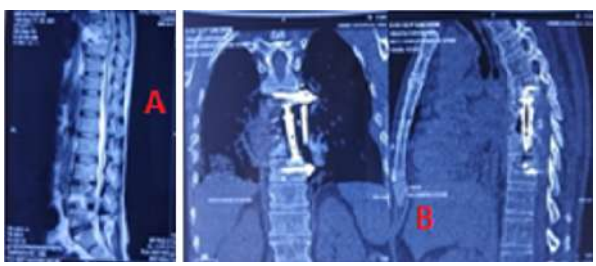


**Fig 1. A. Preop , B. Post Op**


**Fig 2. A. Preop , B. Post Op**

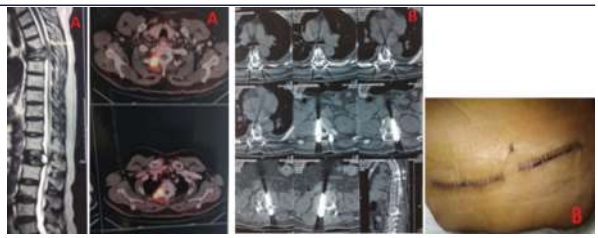


**Fig 3. A. Preop , B. Post Op**

## DISCUSSION

Spinal cord compression represents a major therapeutic problem in oncology. There is a debate regarding the timing of surgery for these patients. Several studies have shown that the surgical approach with instrumentation was associated with more favourable results.

Klimo et al. conducted a meta-analysis in which they compared the outcomes of treating metastatic spinal disease with radiotherapy versus surgical decompression. The primary outcome evaluated was ambulation, while secondary outcomes included pain control, sphincter function, survival, and post-treatment complications and concluded surgery as a primary treating modality with better outcomes than radiotherapy [12]

The researchers found that surgical patients had a 1.3 times greater chance of maintaining ambulatory function than those treated with radiation alone. In addition, patients who were non-ambulatory preoperatively were twice as likely to regain their ambulatory function following surgical decompression than radiotherapy alone. Pain was improved in an average of 90% of patients (range: 71% - 100%) who underwent surgical resection of their spinal metastasis, compared to 70% (range: 54% - 83%) who received radiation alone. Sphincter function was restored in 66% of surgical patients and only 26% of radiation-treated patients. The average one-year survival rates for surgical patients were 41%, while it was 24% in radiation-treated patients. However, the researchers acknowledged that the most significant factor that determined post-treatment survival was the primary histology of the spinal metastases. No significant radiotherapy complications were reported by the literature, while surgical complications occurred in 23% of cases and included wound infections, hardware migration, deep vein thrombosis/pulmonary embolisms, and new-onset neurologic deficits. Mortality within 30 days of the operation occurred in 6.3% of cases [12]

The growing advances in surgical interventions have begun to challenge this current paradigm. As techniques become established and widely practiced, surgery has proven to be a viable therapeutic option that can provide patients with comparable, if not superior, outcomes to radiation therapy [13].

The reduced morbidity and improved survival and neurologic function that result from surgical approach should justify the strategy of identification of the patients who best benefit from de novo surgery. A further important clinical consideration in selecting patients for de novo surgery is that the strategy of using RT as initial treatment in all patients' results in significantly increased surgical morbidity as wound related complications in patients who subsequently require an operation [14].

Biopsy is indicated whenever the histological nature of the lesion and its degree of malignancy are uncertain. CT-guided needle biopsy frequently fails to yield enough representative tissue for diagnosis, particularly when only a small portion of the tumor mass is located outside of bone; thus, open biopsy is often a better option. Current thinking is to perform early radical resection of a single lesion in the spine and to administer radiation therapy to eradicate the disease. This approach allows for decompression, stabilization, and suppression of local recurrence.

Radiation therapy cannot reverse compression secondary to bone, and the therapeutic response is delayed several days, even in patients with highly radiosensitive tumors (eg, lymphoma, neuroblastoma, seminoma, and myeloma). Radical surgery not only provides stabilization, it also confers tissue diagnosis and reduces tumor burden. It is particularly beneficial in patients whose disease progresses despite radiotherapy and in those with known radiotherapy-

resistant tumors. Surgical decompression and stabilization, with radiotherapy, is the most promising treatment.

Even when the tumor involves the posterior lateral aspect of the spine, posterior decompression provides no additional relief or substantial functional advantage. Laminectomy supplemented with stabilization with neutralizing fixation devices, such as pedicle screws, does offer pain relief and a degree of functional recovery in a substantial number of patients. Our current data suggest that median and long-term survival (> 2 years) can be improved over historic median survival times of 6 months bysurgery tailored to remove all gross tumor of the spine. Clearly, this improved median and long-term survival can also be partially attributed to patient selection; as a tertiary cancer center, patients with complex spinal neoplasms compressing the cord who had failed radiation were referred for tumor resection. These patients had more extensive local tumor and were considered candidates for aggressive surgery involving all the three columns requiring anterior and posterior stabilisation either a staged or single staged procedure.

Radiotherapy remained the primary treatment of choice in managing metastatic spinal disease. Being non invasive with good precision radiotherapy will be an important armamentarium for spinal metastasis as palliative care. However, with onset of surgical modalities started challenging the radiotherapy, surgery has proven to be an equally viable therapeutic option given in terms of functional improvement, symptom resolution, and life expectancy extension.

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