

## Original Article

## ROLE OF MRI IN FUNCTIONAL PROGNOSIS OF METASTATIC CORD COMPROMISE

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**Objective:** Primary objective of our study was to establish the strength of association of MRI findings at presentation with clinical outcome of patient i.e Motor deficit and Sphincter control. Secondary objectives included Incidence of tumors affecting spinal cord and Correlation of motor weakness and sphincter control with patient presentation.

**Methods:** This retrospective study was conducted in Department of Radiology, Shaukat Khanum Memorial Cancer Hospital and Research Center, Lahore, between Jan 2013 and June 2013. The study included series of 64 patients, including 38 men and 26 women, ranging between 35 and 70 years (mean,  $48.5 \pm 13$  years), presenting with symptoms and signals of spinal stenosis.

**Results:** Results for tumors involving less than 25%, N: 24 (37%) were included in this group. All showed stable appearance or improvement on follow up. Data was not significant (when expecting stability/improvement in 75-100% of patients). When further divided into 2 groups. Improvement was seen in (6)  $p > 0$  and stability in (18)  $p < 0.05$  significant. Results for tumors involving less than 25-50%, N: 26 (40.6%). 45% showed improvement, when expecting stability/improvement in 50-75% of patients. Data was statistically insignificant data with  $p > 0.05$ . Moreover, the results for tumors involving less than 50-75%, N: 4 (6.2%). 50% showed improvement/stability post treatment. 50% showed progression. In patients tumors involving less than 75-100%, N: 10 (15%). 20% showed improvement. Statistically significant data with  $p < 0.05$ . Cord signal was compromised in 28 (34.3%). 22 had muscular weakness. Improvement was seen in 45%. 12 had sphincter dysfunction. 50% showed improvement in clinical symptoms.

**Conclusion:** MRI has a potential to predict the functional outcome in patients with metastatic cord compromise.

**Key words:** MRI, metastatic cord compression, functional outcome.

### Introduction

Metastases to the spine are a common problem in a large oncology center. Between 5% and 10% of all cancer patients develop spinal metastases during the course of their disease. Treatment options available for metastatic spine tumors include radiation therapy (RT), surgery, and chemotherapy. RT is accepted as the first-line choice for most patients with metastatic spinal tumor. Early diagnosis of metastatic spinal disease is important because functional outcome depends on neurologic condition at the time of presentation. Magnetic resonance imaging (MRI) has revolutionized assessment of metastatic spinal tumor. MRI is the most sensitive and specific modality for imaging spinal metastases. However, role of MRI in functional prognosis of a patient has not been studied before.

### Methods

It is a retrospective study. N: 64, patients were included in study. MRI was done in all cases using 1.5 Tesla GE scanner. Sag T2 and T1 sequences

followed by selected Axial T2 and T1 sequences were obtained. Review of Initial presentation in terms of motor power and sphincter control was recorded. Treatment (xrt) was radiotherapy in all cases. Follow up was done both clinically and radiologically.

• All patients with clinical and radiological cord compromise undergoing XRT were included. Excluded group included those patients who refused treatment, or those whose data of clinical presentation in terms of exact motor power and sphincter control was not documented in clinical notes. Method of interpretation was by selecting site of maximum compromise on sagittal T2 image and selecting corresponding axial section. It was followed by dividing it into 4 compartments for % calculation.

- Tumor involving 0-25% of spinal canal
- Tumor involving 25-50% of spinal canal
- Tumor involving 50-75% of spinal canal
- Tumor involving 75-100% of spinal canal

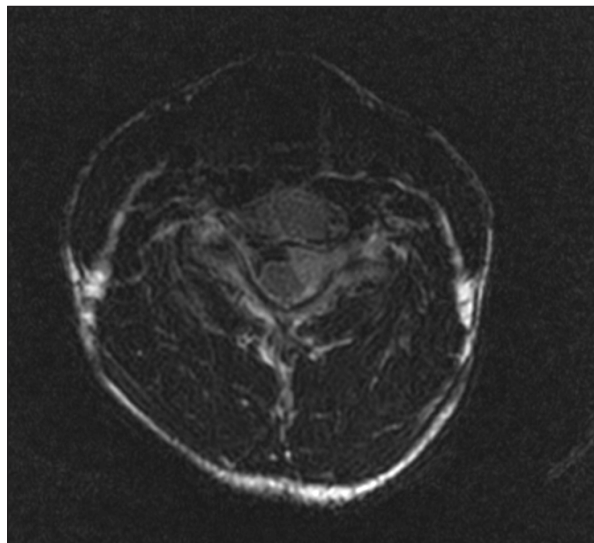
Calculation of total canal compromise was done along with cord signal change. Reviewing the outcome to calculate significant association between

baseline MRI and patients' functional outcome was also performed. Frequency of patients expected to show clinical improvement/stability was hypothesized to be inversely related to degree of cord compromise. Results calculated using 2x2 tables and applying Fischer's test/chi-square tests as needed.

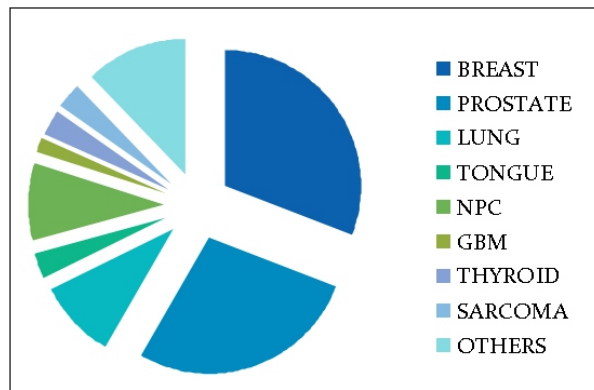
Null hypothesis is illustrated in **Fig 1**.

**Table-1:** Null hypothesis.

| Cord Compromise | Frequency Expected |
|-----------------|--------------------|
| 0-25%           | 75-100%            |
| 25-50%          | 50-75%             |
| 50-75%          | 25-50%             |
| 75-100%         | 0-25%              |



**Fig-1:** Method of calculation of degree of spinal stenosis

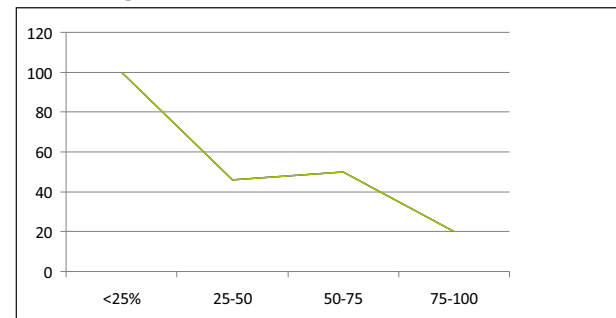


**Fig-1:** The incidence of metastatic disease  
Method of calculation of degree of spinal stenosis is

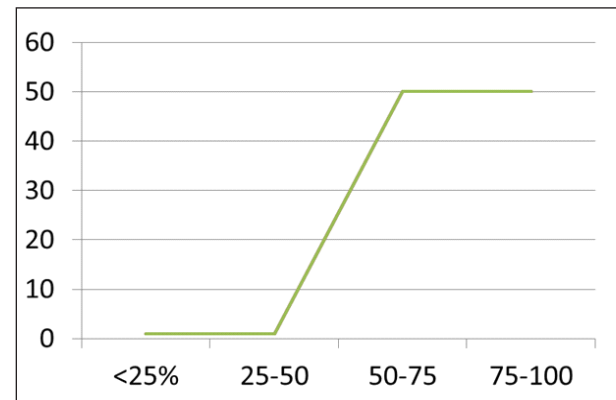
illustrated in **Fig 2**. Control of variables was done by random sampling with all tumors included. Treatment bias was not a confounding variable as all patients except for two patients received XRT.1 refused treatment and 1 underwent surgical decompression

**Results**

The incidence of metastatic disease in our patients is seen in **Fig 3**.



**Fig-4:** Relationship of motor control with degree of cord compromise.



**Fig-5:** Relationship of sphincter control with degree of cord compromise.

Results for tumors involving less than 25%, N: 24 (37%) were included in this group. All showed stable appearance or improvement on follow up. Data was not significant (when expecting stability /improvement in 75-100% of patients). When further divided into 2 groups, improvement was seen in (6) p> 0.and stability in (18) p< 0.05 significant. In patients tumors involving less than 25-50%,N: 26 (40.6%), 45% showed improvement, when expecting stability/ improvement in 50-75% of patients, data was statistically insignificant with p > 0.05. Moreover, the results for tumors involving less than 50-75%, N:4 (6.2%), 50% showed improvement/stability post treatment. 50% showed progression. In patients with

tumors involving less than 75-100%, N: 10 (15%), 20% showed improvement. Statistically significant data with  $p < 0.05$ . Cord signal was compromised in 28 (34.3%). 22 had muscular weakness. Improvement was seen in 45%. 12 had sphincter dysfunction. 50% showed improvement in clinical symptoms.

## Discussion

Spinal cord compression is a surgical emergency and if unrecognized or untreated, can result in irreversible neurological damage and disability. Diagnosing the presence or absence of metastatic compression of the spinal cord or cauda equina and predicting the level on the basis of clinical signs alone is difficult and frequently inaccurate.<sup>3</sup> MRI has a high sensitivity for identifying metastatic disease; however, its role in functional prognosis has not been studied before. Our study is unique in this sense.

We noticed that all patients with motor compromise occupied anterolateral compartment as expected, anatomically.<sup>4</sup> Another important finding was that only 6/64 (2.5%) cases showed more than 50 % decrease in radiological size, and all these patients had intact sphincters. Of note is that all six belonged to 25-50% group. However insufficient data renders further investigation impossible in this aspect. We also noted that less than 25% and more than 75% cord compromise is significant predictor of patient % outcome. Motor control has proportionate relationship with degree of cord compromise (**Fig**

**4**). Sphincter control however has neither significant association nor proportionate relationship with cord compromise (**Fig 5**). Sphincter control has slightly better outcome with compromised cord signal, which however was not statistically significant. Previous studies<sup>5</sup> (1990-2003) never commented on patient outcome in relation with baseline MR examination. Some studies<sup>6</sup> discussed effects of radiotherapy which we kept constant. Previous studies divided the interpretations into 3 parts. i.e. Total, partial and no compromise; we did it in four for better quantitative evaluation.

Our results including more or less compared with previous studies<sup>7</sup> when accounting for correlation of MRI findings with clinical presentation, however we do not have any study to compare the functional prognosis predicted on baseline MR with radiation therapy as constant. We believe a larger sample size would result in statistically significant data for 25-50% and 50-75% cord compromise. It was noticed that some of the patients who had intact sphincters at the time of presentation showed more than 50% reduction in tumor size. This association may be studied in future.

## Conclusion

MRI has a potential to predict the functional outcome in patients with metastatic cord compromise.

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## References

1. Andreasson I., Petren-Mallmin M., Strang P., Nilsson S., Nyman R., Hemmingsson A. Diagnostic methods in planning palliation of spinal metastases. *Anticancer Research*. 1990;10:731733
2. Bayley, Milosevic, Blend, Logue, Gospodarowicz, Boxen, Warde, McLean, Catton, Catton A (2001) prospective study of factors predicting clinically occult spinal cord compression in patients with metastatic prostate carcinoma. *Cancer*. 92(2):303310. United States.
3. Loblaw D. A population-based study of malignant spinal cord compression in Ontario. *Clinical Oncology*. 2003;15 (4): doi:10.1016/S0936-6555(02)00400-4
4. NICE (UK). Metastatic spinal cord compression: Diagnosis and management of adults at risk of and with metastatic spinal cord compression. NICE; 2008. <http://www.nice.org.uk/guidance/cg75/>
5. Solberg A., Bremnes R. M. Metastatic spinal cord compression: diagnostic delay, treatment, and outcome. *Anticancer Research*. 1999;19:677684.
6. Turner S M. B. T. I. B. J. Malignant spinal cord compression: a prospective evaluation. *Int J Radiat Oncol Biol Phys*. 1993;26:141146.
7. Venkitaraman R, et al. Detection of occult spinal cord compression with magnetic resonance imaging of the spine. *Clinical Oncology*. 2007;19:528531