A Study Of Role Of Magnetic Resonance Imaging In The Evaluation Of Compressive Myelopathy

[1]N.K. Kadam, [2]Kushal Gehlot

[1]Professor & Head of Department, [2]Assistant Professor,
Department of Radiodiagnosis, RNT Medical College, Udaipur, Rajasthan.

ABSTRACT:

Background: Compressive myelopathy is the spinal cord compression either from outside or within the cord itself and MRI is often used to diagnose this problem. **Objectives & Methods:** A descriptive imaging study of 30 patients was carried out by 1.5 TESLA MRI scanner with the objective to study the various causes of compressive myelopathy and MRI features of them to evaluate the role of MRI in diagnosis of the various causes of compressive myelopathy. **Result:** In this study, 30 cases of compressive myelopathy were studied and we found various different causes for compression. Among these, extradural compression due to trauma (40%) was the most common cause of compressive myelopathy, followed by infectious causes (26.6%), secondary neoplasm (20%) and primary neoplasms (13.3%). **Conclusion:** MRI is very definitive, sensitive, accurate, though costly, but very specific and non invasive, radiation free modality for evaluation of compressive myelopathy.

Key-words: Compressive Myelopathy, MRI, Extradural, Intradural, Intramedullary, Metastasis, Schwanoma, Neurofibroma.

Corresponding Author: Dr. Kushal Gehlot, Assistant Professor, Department Of Radiodiagnosis, RNT Medical College, Udaipur, Rajasthan. drkushalgehlot@gmail.com

INTRODUCTION:

Compressive myelopathy is the term used to describe the spinal cord compression either from outside or within the cord itself. Compression may be due to herniated disc, ossified posterior longitudinal ligaments, post traumatic compression by fracture/displaced vertebra, epidural haemorrhage/abscess or epidural/intradural (Intramedullary and Extramedullary) neoplasm. Plain radiographs have a low sensitivity for identifying traumatic spinal lesions. CT scan is more sensitive to detect fracture of the vertebral body as compared to plain radiograph and MRI, particularly the posterior neural arch and retropulsion fracture, however, less sensitive than MRI for detection of spinal cord injuries/involvement. MRI is the definitive modality in assessing spinal soft tissue injuries, especially in the evaluation of spinal cord, intervertebral discs and ligaments. It also allows differentiate spinal cord haemorrhage and edema which may have a prognostic value.

MATERIAL AND METHODS:

This prospective study was conducted in the Department of Radiodiagnosis, RNT Medical College, Udaipur, Rajasthan. The patients who were clinically suspected as a case of compressive myelopathy, referred from various departments of RNT Medical College and attached hospitals to investigate with an MRI scanner in the Department of Radiodiagnosis were selected for the present study. Approval from the concerning institutional research committee was obtained prior to commencement of the study. Before starting the current study approval from the research committee of the institute was taken. The study group included a sample size of 30 patients

selected by a purposive sampling. All cases who were brought to us for the investigation of compressive myelopathy were selected for the present study. The cases, which were having non-compressive myelopathy and the case which were having degenerative changes, including disc herniation, degenerative facetopathy, ossified posterior longitudinal ligaments, etc. were excluded from the study. All the subjects selected for this study were scanned with PHILLIPS ACHIEVA 1.5 TESLA MRI scanner and the data were analyzed with a descriptive analysis.

RESULTS & DISCUSSION:

In our study of 30 cases of compressive myelopathy, we found different causes for compression and among these traumas (12), infectious causes (08), primary neoplasms (04) and secondary neoplasm (06) were common.

TABLE 1: Causes of compressive myelopathy

MR diagnosis	Number of patients (n=30)	%
Traumatic Myelopathy	12	40
Infection/TB	8	26.67
Secondary Neoplasm /Metastases	6	20
Primary Neoplasm	4	13.33

Out of 30 cases of compressive myelopathy, we had 12 (40%) cases of spinal trauma. Among 12 patients the mode of injury was RTA (70%) and fall from height (30%). In a study conducted by Kulkarni et al,[1] the most common mode of injury to the spinal cord was vehicular accident and least cause was the fall. The similar finding of the mode of injury was also found in our study. The age of the patient in our study ranged from 12-70 years, with mean age 42 years and 10 were males while 2 were females (M:F=5:1). This is in comparison to the study conducted by Yamashita et al.[2] In our study the levels of injuries among the 12 patients were thoracic (58.33%), cervical (41.67%) and lumbar (16.67%), which is comparable to the study conducted by Kerslake et al.[3] The spinal cord abnormalities demonstrated by MR imaging were cord compression and abnormal signal intensities within the spinal cord. Spinal cord compression was observed in all the 12 cases of spinal injury. The causes of spinal cord compression included sub-luxation of vertebral body in 6 patients and epidural hematoma in 5 patients. Abnormal signal intensities from the spinal cord were observed in 11 of 12 patients and 1 patient had no cord changes. 11 patients showed hypointensity on T_1WI and hyperintensity on T_2WI and FLAIR images suggestive of cord edema/contusion. These signal changes are consistent with studies done previously by Hackney et al.[4]

The cord signal intensity has the prognostic implication where patient with cord edema (8) recovered completely / partially. This has also been shown by studies done by Hackney et al[4] and Flanders et al.[5] Of the 5 cervical injury patients, 4 patients expired during the period of hospitalization. This may be attributed to the severity of cord compression and multisegment involvement of the cord changes.

In our study 30 cases (20%) were of metastatic disease of the spine as a cause of compressive myelopathy. Intraspinal, extradural masses that caused cord compression, extended from an abnormal part of the vertebra in all the 6 patients. This is substantiated by a study conducted by Lien et al[6] in which 100% showed extradural masses extended from an abnormal part of a vertebra. Out of 6 patients, 4 (66.67%) showed more than one lesion. This is in comparison to study done by Lien et al[6] in which 78% had more the one lesion, which include vertebral metastases in addition to those compressing the cord. In our study most common site of involvement was the

thoracic spine (66.67%). This is in comparison to the study done by Livingston et al[7] where the site of epidural tumor in thoracic spine was 68%.

The three most common primary tumors with metastases to the spine and extradural space were lung carcinoma (33.33%), breast (carcinoma 16.67%) and prostate (16.67%). In our study, we had 2 patients with primary carcinoma bronchus, 1patient had breast carcinoma, 1 case had lymphoma, 1 had carcinoma prostate, and 1 patient was with unknown primary carcinoma. We used T_1WI, T_2WI and STIR sequence and post contrast to image spinal metastases. T_1WI was useful in the detection of bone marrow metastases and STIR helped in picking up more marrow lesions. IV Gd-DTPA was used in 5 out of 6 patients, which showed mild homo to heterogeneous enhancement. Observation has shown that post-contrast MR does not improve the detection of extradural spinal metastases even though it has great value in intradural disease.

In the present study, there were 4 cases of primary intradural, extramedullary neoplasms, among which 2 were neurofibromas and 2 were meningiomas. All the 4 cases showed spinal cord compression. Of the 2 cases of neurofibromas MR diagnosed 1 case as neurofibroma, while in another case MR could not differentiate between meningioma and neurofibroma. In our study, 8 cases of infective spondylitis were associated with compressive myelopathy. Seven cases were in the thoracic region and 1 in the lumbar region. X-ray showed some abnormality in 5 cases. MRI showed vertebral body destruction with pre and para vertebral collection of 1 case. Cord edema was associated with 1 case. Study by Roos Dea et al[8] showed thoraco-lumbar junction as the most common affected site as in our cases. They showed rim enhancement around the intra – osseous and paraspinal soft tissue abscess.

We had one case of epidural abscess compressing the spinal cord who presented with sudden onset of weakness in both lower limbs. MRI showed extradural soft tissue posterior to the cord extending from T_4-T_9 level, causing compression of the spinal cord. It was isointense on T_1WI and hypointense on T_2WI and showed peripheral minimal enhancement. The study conducted by Namaguchi et al[9] showed the thoracic region as the most common site of involvement and signal intensities of the abscess as comparable to our study. We had one case of chronic hypertrophic pachymeningitis as a rare cause of compressive myelopathy. X-ray was normal and MRI showed diffuse irregular, thickened leptomeninges from T_7-T_9 level, which was isointense to cord on T_1WI, hypointense on T_2WI and FLAIR. Post contrast, showed homogenous intense enhancement.

TABLE 2: Causes, according to various compartments

Causes	Number of patients (n =30)	Extradural (n=26)	Intradural Extramedullary (n=4)
Spinal injury	12(40%)	12(46.15%)	0
Infective/TB	8(26.67%)	8(30.78%)	0
Primary neoplasms	4(13.33%)	0(0%)	4(100%)
Secondary neoplasms /metastasis	6(20%)	6(23.07%)	0
Spinal Epidural Abscess	1(3.3%)	1(3.8%)	0

(One of the infective lesions associated with spinal epidural abscess.)

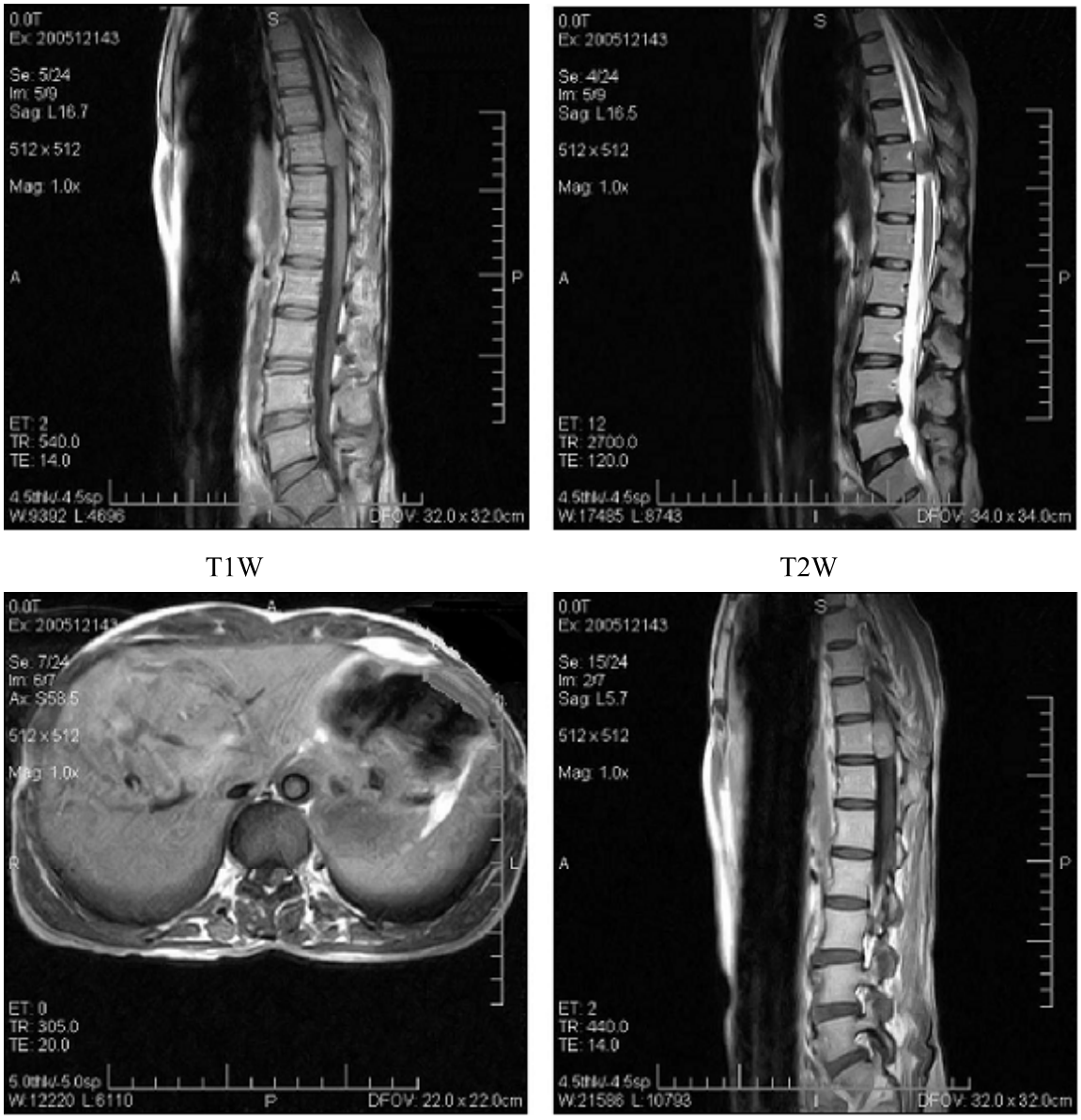

FIG-1: Intradural extramedullary lesion showing isointense to cord on sagittal T1W (A) , hypointense on sagittal T2W (B) and avid enhancement on post contrast axial and sagittal image (C & D) consistent with meningioma..

CONCLUSION:

MRI is the definitive modality in assessing soft tissues of the spine and spinal cord abnormalities. It is the best modality to evaluate cord edema/contusion and the integrity of the intervertebral discs and ligaments. MRI is very sensitive and considered the imaging modality of choice to detect and characterize the spinal tumors and spinal infections. MRI I could successfully characterize the spinal tumor based on location into Extradural / Intradural and assess the integrity of the spinal cord, intervertebral discs and ligament after acute spinal trauma. So in the end, I can conclude that MRI is very

definitive, sensitive, accurate, though costly, but very specific, non invasive, radiation free modality for evaluation of Compressive myelopathy.

Conflict of Interest: None.

Source of Funding: Nil.

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Cite this Article as: Kadam NK, Gehlot K. A Study Of Role Of Magnetic Resonance Imaging In The Evaluation Of Compressive Myelopathy. Int Res Pub Med Sci 2015;1(3):52-56.