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ROLE OF MAGNETIC RESONANCE IMAGING IN EVALUATION OF COMPRESSIVE MYELOPATHY

Radiodiagnosis

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ABSTRACT

AIM: To assess the role of Magnetic Resonance Imaging as the primary modality in the diagnosis of lesions associated with compressive myelopathy.
METHODOLOGY: Patients presenting with symptoms and signs suggestive of compressive myelopathy were included in the study.
RESULTS: Magnetic resonance imaging is highly sensitive and sp
ecific in evaluating lesions like Pott's spine, traumatic spine lesions, cord contusion, cord edema, spinal tumors and metastatic lesions.
CONCLUSION: Magnetic resonance imaging is the definitive modality in assessing soft tissues of the spine and spinal cord abnormalities, to evaluate cord edema/contusion and integrity of the intervertebral discs and ligaments, to detect and characterize the spinal tumors and spinal infections. Thus MRI is very definitive, sensitive, accurate, though costly but very specific, non invasive, radiation free modality for evaluation of Compressive myelopathy.

KEYWORDS

Magnetic resonance imaging, spine, spinal cord, compressive myelopathy.

INTRODUCTION:

Myelopathy is a broad term that refers to spinal cord involvement of multiple etiologies. Compressive myelopathy is the term used to describe the spinal cord compression either from outside or within the cord itself. Compressive diseases of spinal cord are divided into acute and chronic degenerative changes, trauma, tumor infiltration, vascular malformations, infections with abscess formation and syringomyelia. Spinal cord diseases often have devastating consequences, ranging from quadriplegia and paraplegia to severe sensory deficits due to its confinement in a very small area. Many of these diseases are potentially reversible if they are recognized on time, hence the importance of recognizing the significance of magnetic resonance imaging when approaching a multi factorial disease considered as one of the most critical neurological emergencies, where prognosis depends on an early and accurate diagnosis Spinal cord injury is the major cause of quadriplegia and disability. Plain radiographs/CT scan have a low sensitivity for identifying traumatic spinal lesions. MRI is the definitive modality in assessing spinal soft tissue injuries, especially in evaluation of spinal cord, intervertebral discs and ligaments. It also allows differentiation of spinal cord hemorrhage and edema which may have a prognostic value.

METHODOLOGY:

A total of 50 patients of whom 34 were males and 16 were females studied. Age group varied from 3 to 70 years. Data for the study were collected for one year of duration from January 2015 to December 2016 from patients attended/referred to the Department of Radio-Diagnosis, PBM Hospital, Bikaner for Magnetic resonance imaging for evaluation of signs and symptoms of compressive myelopathy. All the MR scans were performed at our institute using 1.5 TESLA PHILIPS ACHIEVA MAGNETIC RESONANCE IMAGING MACHINE. Cases with non compressive myelopathy, degenerative spine changes and having contraindication for MRI like prosthetic heart valve, cochlear implant or any other orthopedic metallic implant were excluded from the study.

SCANNING PARAMETERS: Patient Position:
Supine, **Coil used**: Phased-Array surface coil. MR imaging will be performed on a 1.5-T MR imaging unit (Achieva; Philips Healthcare). The following sequences will obtained: : conventional spin echosequencesT1WI, T2WI, FLAIR sagittal, STIR sagittal, T1WI, T2WI axial and GRE axial, and post contrast T1WI axial, sagittal and coronal. Unenhanced images and if required, enhanced fat-suppressed spoiled gradient-echo T1-weighted imaging will be performed in the best plane for visualizing the particular lesion. **FOV:** Sagittal: 30cm, **Axial:** 18cm,**Matrix size:**256x 256**, Slice thickness :** 4.5mm x 5mm,**Contrast used:** Dimegluminegadopentetate (469 mg/ml), **Dose of contrast :** 0.1 ml/Kg body weight. No contrast reactions were encountered**. Scan time:** Varied from 15mins to 45 minutes.

RESULTS: In our study males were 34 and females were 16 out of total 50 patients(17:8).

TABLE 01: DISTRIBUTION AMONGST COMPRESSIVE MYELOPATHY LESIONS.

MR DIAGNOSIS	NO. OF PATIENTS	Percentage
Infections	20	40%
Trauma	14	28%
Primary tumor	10	20%
Metastasis	6	12%
Total	50	100%

Chart 1 : AGE WISE DISTRIBUTION OF COMPRESSIVE LESIONS

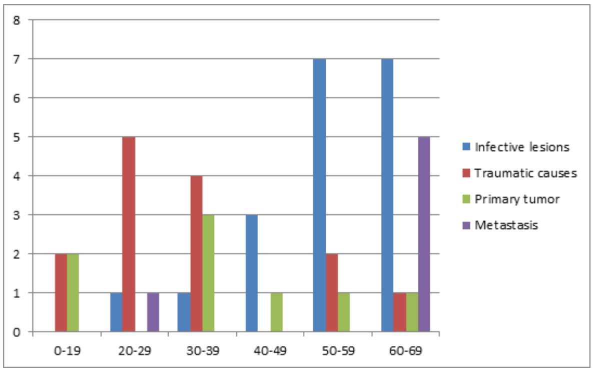


TABLE 02: LOCATION OF THE PATHOLOGY

Compartment	No. of the patients	Percentage
Intramedullary	3	6%
Intradural	7	14%
Extradural	40	80%

TABLE 03: CHARACTERISATION OF INFECTIONS OF SPINE BY MRI

MRI FINDINGS	NO. OF PATIENTS	PERCENTAGE
Disc and end plate changes	15	75%
Collapse of vertebrae	4	20%
Posterior elements changes	1	5%
Cord changes	8	40%
Epidural collection	20	100%
Pre and Paravertebral Collection	18	90%
Psoas & Para spinal abscess	2	10%

TABLE 04: LEVEL OF SPINAL INJURY

LEVEL OF LESION		NUMBER OF PATIENTS n = 14	Percentage
CERVICAL(C)	Upper cervical(C1-C2)	1	7.14%
	Lower Cervical(C3-C7)	6	42.85%
THORACIC(T)	Upper Thoracic T6 and above	1	7.14%
	Lower Thoracic below T6	4	28.56%
LUMBAR(L)		2	14.28%
TOTAL		14	100%

TABLE 05: CORD CHANGES IN SPINAL INJURY

Patients	No. of cases	Percentage
With cord change (Contusion/Edema)	12	85.71%
Without cord change	2	14.28%

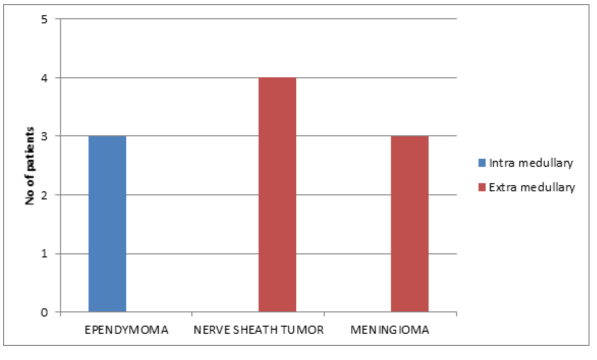
TABLE 06: CHARACTERIZATION OF SPINAL INJURIES BY MRI

MRI findings	No. of patients	Percentage
Post. Elements injury	6	42.85%
Cord changes	12	85.71%
Ligamentous changes	2	14.28%
Epidural hemorrhage	8	57.14%
Pre and Paravertebral Collection	8	57.14%

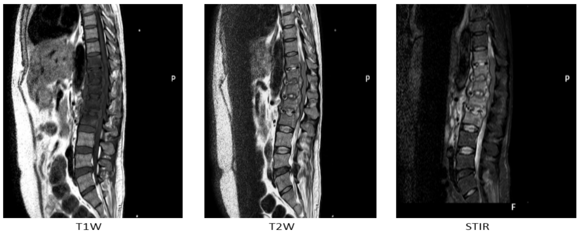
TABLE 07: SITE OF CORD COMPRESSION WITH METASTASIS

SITE OF LESION	NO. OF PATIENTS	PERCENTAGE
CERVICAL	0	0
THORACIC	4	66.66%
LUMBAR	2	33.33%

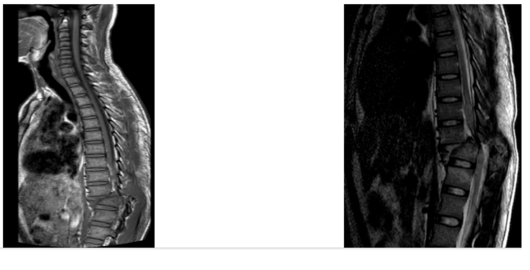
Chart 2: TUMORS AND THEIR LOCATION



CASE (1) POTT'S SPINE

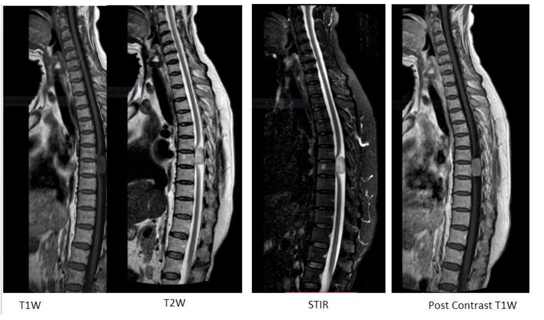


CASE (2) FRACTURE WITH CORD CONTUSION

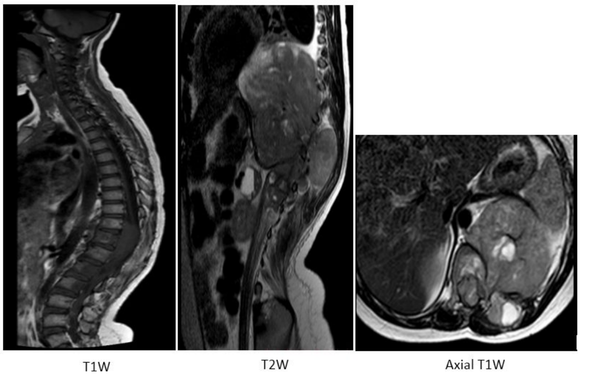


T2W

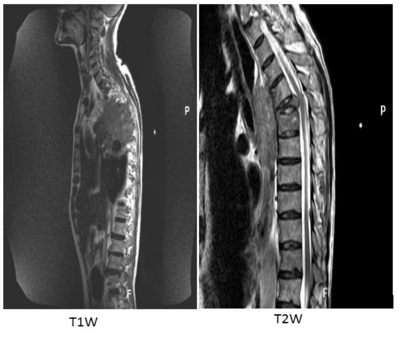
CASE (3) MENINGIOMA

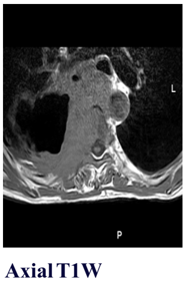


CASE (4) PERIPHERAL NERVE SHEATH TUMOR

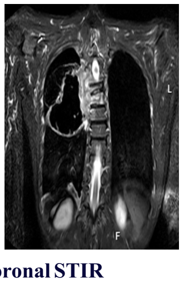


CASE (5) LUNG CARCINOMA WITH SPINE METASTASIS





Axial T1W



Coronal STIR

DISCUSSION: MRI is the modality of choice to image spine and spinal cord pathologies because of its ability to depict cross sectional anatomy in multiple planes without ionizing radiation, exquisite soft tissue delineation and noninvasiveness.

In our study of 50 cases of compressive myelopathy we found various causes for compression. Infection (20), trauma (14) primary neoplasms (10) and secondary neoplasm (Metastasis) (06) were main etiologies. Out of 20 cases of infective spondylitis 8 cases were in the thoracic region, 5 in the lumbar region, 4 in thoracolumbar region, 2 in cervical region & 1 in cervicothoracic region. MRI showed vertebral end plate changes & pre and paravertebral collection in almost all cases while x ray findings were inconclusive. Epidural soft tissue component compressing the cord was seen in all 20 cases which was hypo intense on T1WI, hyper intense on T2WI and STIR images suggestive of cord edema. Cord edema was associated with 3 cases. Study by Roos DEA et al[1] showed thoraco lumbar junction as the most common affected site as in our cases. They showed rim enhancement around the intraosseous and paraspinal soft tissues abscess. Follow up MRI after course of proper prescribed treatment (either ATT/Antibiotics) showed complete resolution of epidural component confirming the infectious etiology of lesion. We had one case of psoas abscess presented with difficulty in hip flexion in both lower limbs. MRI showed soft tissue with internal necrotic changes. It was isointense on T1WI and hyper intense on T2WI and showed peripheral minimal enhancement. One case of extensive paraspinal abscess with extension into neck and right scapular region. Among 14 patients of trauma, the mode of injury was RTA (70%) and fall from height (30%). In a study conducted by Sekhon et al[2], also described motor vehicle accident as most common mode of spinal cord injury in trauma. The similar finding of the mode of injury was found in our study also. The age of the patient in our study ranged from 12-70years with mean age 42 years. In our study accidents were more common among young people. This is in comparison to the study conducted by Yamashita et al[3]. In our study the level of injuries among the 14 patients 7 cervical (50 %), 5 thoracic (35.71%) and 2 were lumbar (14.28%). This is comparable to study conducted by Kerslakeet al[4]. 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 14 cases of spinal injury. The causes of spinal cord compression included retropulsion of fractured vertebral fragments in 8 patients and epidural hematoma in 6 patients.

Abnormal signal intensities from the spinal cord were observed in 10 of 14 patients and 2 patients had no cord changes. 14 patients showed hypointensity on T1WI and hyperintensity on T2WI and STIR images suggestive of cord edema. These signal changes are in consistent with studies done previously by Hackney et al[5].The cord signal intensity has the prognostic implication where patient with cord edema recovered completely / partially. This has also been shown by studies done by Hackney et al and Flanders et al. MRI depicted not only the spinal cord changes in our patients but also the relationship of retropulsed fractured fragments of vertebral bodies to the cord, posterior elements fracture (6 patients),Ligamentous disruption (2), soft tissues injuries (8) and epidural hematomas (8). The advantage of MRI in demonstrating all these changes is shown by many studies done by Qureshi IA et al[6], Kulkarni et al[7] etc.

We had 10 cases of tumors (3intramedullary ependymoma and 4 were nerve sheath tumors (NST) and 3 were meningiomas) As ependymoma are the most common intramedullary tumors, we also had similar finding in our study. These showed cystic components and heterogeneous enhancement with hemorrhagic component with myxopapillary variant at conus medullary location.

Nerve sheath tumors were iso to hypo intense on T1WI and hyper intense on T2WI and showed intense heterogeneous enhancement on post contrast. Studies done by Dorsi et al [8]and Matsumo et al[9] showed that on T1WI the signal varied from hypo to isointense to the cord and on T2WI they are hyperintense in signal and also may show decreased signal in the central portion consistent with necrosis. Some of the neurinoma showed ring like enhancement hence target sign as described by Duffus et al[10].

Those lesions which showed intense homogenous enhancement on post contrast images were given meningioma as primary differential and in those which showed areas of T2 hyperintensities and heterogeneous contrast enhancement on post contrast images were given as nerve sheath tumors as primary differential. Above findings coincided with the pathological diagnosis of intradural-extramedullary neoplasms which was proven in some of the patients. Several studies by Matsumoto et al, Gezenetal[11] and Saweidane et al[12]showed signal characteristic of meningioma as iso intense to the cord on T1WI and T2WI with intense homogenous enhancement on post contrast.

6cases were metastatic lesions 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 correlated by a study conducted by Lien et al[13] in which 90% showed extradural masses extended from an abnormal part of a vertebra. All lesions show multiplicity. This is in comparison to study done by Lien et al in which 78% had more than one lesions which include vertebral metastases in addition to those compressing the cord. In our study most common site of involvement was the thoracic spine (66.6%). This is in comparison to the study done by Livingston et al[14] where 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 (15%), breast carcinoma (14%) and lymphoma (11%). In our study we had 2 patients with primary carcinoma bronchus, 2 patients had breast carcinoma, 1carcinoma prostate, and 1patients lymphoma. We used T1WI, T2WI and STIR sequence to image spinal metastases. T1WI was useful in the detection of bone marrow metastases and STIR helped in picking up more marrow lesions.

REFERENCES

1) Roos DEA, Persijn V, Meerten EL, Bloem JI. MRI of Tubercular spondylitis: AJR. 1986; 146:79-82.
2) Sekhon LH, Fehlings MG. Epidemiology, demographics, and pathophysiology of acute spinal cord injury. Spine. 2001; 26(24 Suppl):S2-12.
3) Yamashita Y, Takahashi M, Matsuno Y, Kojima R, Sakamoto Y, Oguni T, et al. Acute Spinal cord Injury. Magnetic resonance Imaging correlated with myelopathy: The British Journal of Radiology. 1991; 64:201-209.
4) Kerslake RW, Jaspan T, Worthington BS. Magnetic resonance Imaging of Spinal trauma: The British Journal of Radiology. 1991; 64:386-402.
5) Hackney DB, Asata R, Sci DM, Joseph PM, Carvlin MJ, McGrath JT, Grossman RI, et al. Hemorrhage and edema in Acute spinal cord compression. Demonstration by MR Imaging: Radiology. 1986; 161:387-390.
6) Ahmed N, Akram H, Qureshi IA. Role of MRI in differentiating various causes of non-traumatic paraparesis and tetraparesis. J Coll Physicians Surg Pak. 2004, Oct; 14(10):596-600.
7) Kulkarni MV, McArdle CB, Kapanicky D, Miner M, Cotler HB, Lee KF, et al. Acute Spinal Cord Injury. MR Imaging at 1.5 T: Radiology. 1987; 164: 837-843.
8) Dorsi MJ, Belzberg AJ. Paraspinal nerve Shealth tumors: NeurosurgClin N Am. 2004; 15: 217-222.
9) Matsumoto S, Hasuo K, Uchino A, Mizushima A, Kawa TF, Matsuura Y, et al. MRI of Intradural-Extramedullary Spinal neurinomas and meningiomas: Clinical Imaging. 1993; 17:46-52.
10) Duffau H, Gazzaz M, Kujas M, Fahanno D. Primary Intradural Extramedu llaryEpend ymoma: Spine. 2000; 25:1993-1995.
11) Gezen F, Kahraman S, Canakci Z, Beduk A. Review of 36 cases of Spinal cord Meningioma: Spine. 2000; 25: 727-731.
12) Souweidane MM, Benjamin V. Spinal Cord Meningiomas: Neurosurgery Clinics of North America. 1994; 5: 283-291
13) Lien HH, Blomlie V, Heimdal K. Magnetic Resource Imaging of malignant extradural tumors with acute spinal cord compression: ActaRadiologica. 1990; 31:187-190
14) Livingston KE, Perrin RG. The Neurosurgical management of spinal metastases causing cord and cauda equine compression: J. Neurosurg. 1978; 49: 590- 594.