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Radio-Diagnosis

EVALUATION OF COMPRESSIVE MYELOPATHY BY MAGNETIC RESONANCE IMAGING AT TERTIARY REFERRAL CENTRE IN SOUTH INDIA

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ABSTRACT **Background:** Spinalcord compression is the major cause ofdisability, such as quadriplegia. Plain radiographs and CT have low sensitivity for identifying spinallesions. So, the role of MRI cametodistinguish compressive from non-compressive causes of myelopathy. The objectives ofpresent studyare to accurately localise spinal tumours and to assess integrity of the spinal cord, intervertebral discs and ligaments after immediate spinal trauma. **Methodology:** A cross-sectional study with 30 cases carried out in the Department of Radiodiagnosis at Katuri Medical College and Hospital, Guntur district. The patients with a suspected clinical history of compressive myelopathy were subjected to MRI scan. The images were evaluated. **Results:** The most common cause for spinal cord compression was spinal trauma(44%) and spinal infection or TB (26%). 26 out of 30 cases were all extradural compressive lesions and 4 were intradural extramedullary lesions. Out of the 26 extradural compressive pathologies, 15 were spinal injury, 7cases of infective spondy litiswi the pidural component and 4metastases.MRIdetected11cases of cord oedema or contusion and 4 intradural tumours. **Conclusion:** In this study we could successfully characterise spinal tumours, assess integrity of spinal cord, intervertebraldiscs and ligaments after sudden spinal trauma with MRI. So, we conclude that MRI is very definitive, sensitive, accurate, though costly but specific, non-invasive, radiation-free mo- dality for evaluation of compressive myelopathy.

KEYWORDS : Compressive myelopathy, MRI, Spinalcord.

INTRODUCTION

Compressive myelopathy is the term used to describe spinal cord compression in various condi- tions; either from outside or within the cord itself. Cord compression is due to reasons such as herniated disc, post-traumatic compression by fracture/displaced vertebra, epidural haemor- rhage/abscess or epidural/intradural neoplasm i.e., intramedullary and extramedullary.

Spinalcord injuryis the main cause of quadriplegia and disability. Plain radiographs have a very low sensitivity for identifying traumatic spinal lesions. So, trauma victims withplain films nega- tive for spinal injury but with high clinical suspicion ofspinal cord injury must undergo MRI for more specific and definitive evaluation of spine. MRI is the definitive modality in assessing spinal soft tissue injuries, especially in evaluation of spinal cord, intervertebral discs and ligaments. In case of suspected compression due to neoplasm, MRI is excellent tool for imaging tumours in- volving spinal column, canal and cord.Spinal cancers are classified as extradural, intradural extramedullary or intramedullary. Secondary tumours/metastases remain significantly more common in extradural space. Many primary bone cancers can also arise. In intradural and extramedullary space, primary cancers like neurofibroma as well as meningioma are common. Lastlyin intramedullary space, primary cancers are increasingly common than secondary cancers or metastases.

Complaints of spinalcord itself normally are infrequent and problematic to manage successfully. Consequently, radiological assessment of myelopathy is principally attentive on extrinsic compression of spinalcord. MR imaging is the backbone in assessment of myelopathy[1]. Imaging of the spinalcord has strengthened to the fact that dependable analysis of non-expansible spinalcord lesions is regularly no table.

In view of trauma, neoplastic, congenital and degenerative disorders[2] MR imaging of the spine and spinalcord shows greater sensitivity and specificity than myelography and CT. MRI has developed the means of best to image spine and spinalcord pathologies because of its ability to depict cross-sectional anatomy in multiple planes without ionising radiation, superior soft tissue delineation and non-invasiveness.

MATERIALS AND METHODS

It is a hospital based cross-sectional observational study carried out on 30 patients with a clinical history of compressive myelopathy referred to the Department of Radiodiagnosis in Katuri Medical College and Hospital. Patients were examined with an MRI scan insupine position with proper positioning and immobilisation of body. Standard surface coils were used for acquisition of im- ages. Pre-contrast scanning was done using T1WI, T2WI, FLAIR Sagittal, STIR Sagittal with slice thickness of 4.5mmx5mm. Omniscan (Gadodiamide) or Magnevist (dimegluminegadopentetate) were used as contrast agents in dose of 0.1mmol/kg body weight in cases of neoplasms and infections. For spinal trauma contrast was not done. Post contrast T1WI sagittal, axialandcoronalim- ages were obtained. Whenever required, thinner sections were obtained in the region of interest. Special MRI sequences like FLAIR and STIR were routinely obtained. The MRI images were analysed based on location (cervical, thoracis, lumbar) segment of the spinal cord involvement, severity of injury. In cases of trauma, site and level of injury, vertebral fracture, ligamentous injury, presence/absence of hematoma to classify into spinal subdural/extradural hematoma were noted. Neoplasms were classified based on appearance into benign/malignant, based on location into ex-tradural, intradural (intramedullary/extramedullary).

RESULTS

In the present study, total 30 patients presented with compressive myelopathy of spine.

Tables

Table1: Causesof Compressive myelopathy

MRdiagnosis	*Numberof patients(n=30)*	*Percentage(%)*
Traumaticmyelopathy	15	50
Infection/TB	7	23.3
Primary neoplasm	4	13.3
Secondaryneoplasm/ Metastasis	4	13.3

In the current study it was showed that 15 patients suffered from traumatic myelopathy (50%), 7 patients had infective pathology (23.3%), 4 patients with primary neoplasm (13.3%) and 4 patients with secondary neoplasm(13.3%). From the above information the most common cause of compressive myelopathy in the present study was trauma.

Table2: Location of the Pathology

Compartment	*Numberofpatients*	*Percentage(%)*
Extradural	26	87
Intradural-Extramedullary	4	13
Total	30	100

In our study, we observed that the location of pathology was extradural

in 26cases (87%), where as intradural-extramedullary in 4 cases (13%).

Table3:Causes According to Various Compartments

Causes	Number of patients (n=30)	Extradural (n=26)	Intradural-Extrame- dullary (n=4)
Spinalinjury	15(50%)	15(58%)	0(0%)
Infective/TB	7(23%)	7(27%)	0(0%)
Primary neoplasm	4(13.3%)	0(0%)	4(100%)
Secondaryneo-plasm/Metastasis	4(13.3%)	4(15%)	0(0%)

Spine injuries and infection are the frequent reasons for extradural compression while primary neoplasms were further frequent in intradural part in current study.

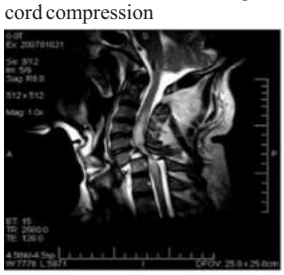
Table4: Age, Gender and Compartmental Distribution in Various Diagnoses.

Variables	*MRIDiagnosis*			
	Traumatic (n=15)	*Infection (n=7)*	*Primaryneo-plasm (n=4)*	*Secondaryneo- plasm/ Metasta- sis (n=4)*
Ageinyears				
12-30	6(40%)	2(28.6%)	0(0%)	0(0%)
31-50	5(33%)	2(28.6%)	3(75%)	1(25%)
>50	4(27%)	3(42.9%)	1(25%)	3(75%)
Gender				
Male	11(73%)	4(57%)	1(25%)	1(25%)
Female	4(27%)	3(43%)	3(75%)	3(75%)
Compartme				
Extradural	15(100%)	7(100%)	0(0%)	4(100%)
Intradural	0(0%)	0(0%)	4(100%)	0(0%)

Majority of patients of spinal injury (40%) and primary neoplasm(75%) are young adults/middle age group(20-49 years). While majority of patients of spinal infection(42%) and secondary neo- plasm (75%) are older age group (>50 years).

Fracture dislocation causing cord compression

Extensive cordoedema



Pre And Paravertebral Collection With All And Pll Disruption.

Severe Cord Compression With Oedema

Figure1:Traumaticmyelopathy

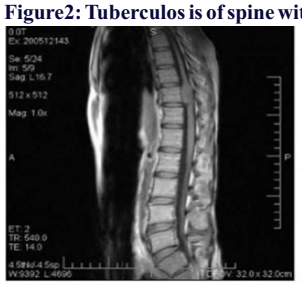
T2WCoronal

T2WSagittal

T1WSagittal

T2Wsagittal

Figure2: Tuberculos is of spine with Coldabscess



T1WSagittal

T2Wsagittal

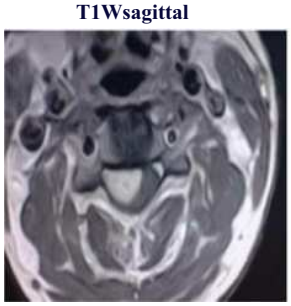
Postcontrastaxial

Postcontrastsagittal

Figure3: Meningioma

T1Wsagittal

T2Wsagittal



Postcontrastaxial

Postcontrastsagittal

Figure4: Intradural extramedullary Neurofibroma

DISCUSSION

In our study of 30 cases of compressive myelopathy we found various causes for compression. Among those, trauma (15), infectious causes (07), primary neoplasms (04) and secondary neo- plasms (04). The most common cause was trauma in our present study. This is also comparable with other studies. Out of 30 patients, 15 patients had a history of trauma. Among 15 patients the mode of injury was RTA (70%) and people injured were 11; fall from height (30%) and people suffered were around 4. Ina study conducted by Kulkarniet al[3], most

common mode of injury to the spinal cord was vehicular accident and least common was the fall. The similar finding of the mode of injury is found in our study conducted. The age of patients in our study ranged from12- 70 years, mean 41 years and 11 were males, 4 were females (M: F = 11:4) i.e., 2.75:1 This is in comparison to the study conducted by Yamashita et al [4].

In our study the level of injuries among 15 patients, 7 suffered from thoracic injury (47%), 6 suffered from cervical injury (40%) and 2 suffered from lumbar injury(13%). This is comparable to the study conducted by Ker slake et al [5].

Spinal cord abnormalities noticed by MRI were cord compression and abnormal signal intensities within the spinal cord. In the present study spinal cord compression was observed in all the 15 cases of spinal injury. The causes of spinal cord compression included subluxation of vertebral body in 8 patients which is around 53% and epidural hematomain 7 patients which accounts 47%.

Abnormal signal intensities from spinal cord were observed in 14 of 15 which was almost 93% and 1 patient had no cord changes. 14 patients showed hypointensity on T1W and hyperintensity on T2W and FLAIR images suggestive of cord oedema or contusion. These signal changes are in consistent with studies done previously by Hackney et al [6].

The cord signal intensity has prognostic implication, where the patients with spinalcord oedema were 8, which recovered completely or partially. This was related close to the studies done by Hackney et al [6] and Flanders et al [7,8]. Of the 8 cervical injury patients, 6 patients who were admitted inthe hospital expired. This is due to severity of cord compression and multisegmented involvement of the cord.

MRI shows not only spinalcord changes but also relationship of subluxedord is located vertebral bodies to the cord in 8 patients, posteri or elements fracture in 6 patients, ligamentous disruption in 6 patients, soft tissue injuries in 5 patients and epidural hematomas in 5 patients. The advantage of MRI in demonstrating all these changes is shown by many studies done by Yamashitaet al[9], Kulkarni et al [3].

Cord compression extended from an abnormal part of the vertebral column was caused by intraspinal extradural masses seen in 5 patients. This was proven by the study conducted by lien et al [10] in which 90% of the cases showed extradural masses extended from an abnormal part of vertebra. Out of 5 patients, 4 (80%) showed more than one lesions. The study was comparable with the study done by Lien et al [10] in which 78% had more than one lesions which include vertebral metastases in addition to those compressing the cord. In our present study the most common site involved was thoracic spine(80%). This is in comparison to the study done by Livingston et al [11] where site of epidural tumour in thoracic spine was 68%.

In our study we noticed, 4 cases of primary intradural extramedullary neoplasms, out of which 3 were meningioma and 1 was neurofibroma. Neurofibromason MRI in general show hyperintense rim and central area of low signal due to dense collagenous stroma. They are iso to hypointense on T1W and hyperintenseon T2W and show intense enhancement on post contrast. In our present study, neurofibroma show edextension into neuralforamina. Various studies done by David et al, Dorsi et al [12] and Matsumo et al [13] showed that on T1W the signal varied from hypotoiso intense to the cord and on T2WI they are hyperintense and may show decreased signal in the centre consistent with necrosis. They showed marked enhancement which was heterogenous.

Of the 4 intradural extramedullary neoplasms, 3 were meningioma. It was isointense on both T1WI and T2WI and showed moderate homogenous enhancement on post contrast. Several studies by Matsumoto et al[13], Genzen et al[14] and Saweidane et al[15] showed signal characteristic ofMening iomaas isointense to the cordon T1 and T2WI with intense homogenous enhancementon post contrast.

In our study, 7 cases of infective spondylitis were associated with compressive myelopathy. Out of 7 cases, 6 were in the thoracic region and 1 in the lumbar region. MRI showed vertebral body destruction with pre and paravertebral collection in 2cases. Epidural component compressing the cord was seen in all 7cases, which was hypointense on T1WI, hyperintense onT2WI and FLAIR images. Spinal cord oedema was seen in 2 cases. Study by Roos DEA et al[16] showed thoracolumbar junction was the most common affected site as in our cases. They showed rimenhancement around in traosseous and para spinals of tissue abscess. Though provisional diagnosis of tubercular etiology was given, ideally contrast study should have been done to increase the specificity of MRI. The commonest finding in non-compressive myelopathy is hyperintense cord signal on T2WI.

In our study, 1case of epidural abscess which was compressing the spinalcord was recorded. The patient presented with sudden onset weakness in both lower limbs. MRI showed extradural soft tissue posterior to the cord extending from T4-T9 levels causing cord compression. It was iso- intense on T1WI and hypointense on T2WI and showed peripheral minimal enhancement. The study conducted by Namaguchi et al [17] showed thoracic region as the most common site of involvement and signal intensities of the abscess as comparable to our study.

Chronic hypertrophic pachymening it [18] is a rare condition that cause intracranial or spinal thickening of the dura mater. 1 such case was noticed inthepresent study are cause of compressive myelopathy. Plain radiograph was normal and MRI showed diffuse irregular, thickened leptomeninges from C7-T5 levels which was isointense to cord on T1WI, hypointense on T2WI and FLAIR. Post contrast showed homogenous intense enhancement. The findings in our study were matched with most of the authors. The unenhanced MR findings of this disease have been reported by several authors, who reported moderate to marked hypo intensity on T1 and T2WI, particularly on T2WI. Friedman D et al [19] observed a pattern of intense enhancement of the lesion which is comparable to the case in our study.

CONCLUSION

In the present study conducted in our institution with the help of MRI, I could successfully characterise the spinal tumours based on location into extraduralor intradural and assess the integrity of spinal cord, intervertebral discs and ligaments after sudden spinal trauma. However, the final diagnosis is based on biopsy and histopathological examination in case of spinal tumours and infections, MRI is the only modality for imaging study of spinal cord and its abnormalities. So, in the end conclude that MRI is very definitive, sensitive, accurate, though costly but very specific, non-invasive, radiation free modality for evaluation of compressive myelopathy.

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