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MAGNETIC RESONACE IMAGING IN SPINAL LESIONS

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ABSTRACT

Objectives: The purpose of the study is to describe the radiological features of spinal lesions on MRI (magnetic resonance imaging) and the role of MRI in assessing the extent of disease, to assess the degree of cord/ thecal sac compression and to correlate with neurological deficit.

Methods: This study was done on prospective basis in 50 patients with clinical suspicion of disease of spine and spinal cord. MRI of spine were done. Various features were observed on non-contrast T1W, T2W and STIR sequences followed by post-contrast T1W sequences and degree of cord compression was correlated with neurological deficit.

Results: We categorized the findings according to the spinal compartment involved. There were 29 patients with extradural, 11 with intradural-extramedullary and 9 with intramedullary disease. In 6 patients more than one compartment was involved simultaneously. The most common causes of extradural disease were bone lesions, Lumbar vertebrae were most commonly involved.

Conclusions: MRI is the best diagnostic modality for spinal lesions and is more sensitive. It provides the diagnosis of spinal lesions earlier than conventional methods, offering the benefits of earlier detection and treatment.

KEYWORDS

Introduction

A wide spectrum of diseases affects the spine and spinal cord including infections, neoplasms and inflammatory disorder which subsequently causes compression of spinal cord and constitutes a neurological emergency, and if left untreated, can result impermanent irreversible neurological dysfunction. Disabilities can range from mild weakness to complete quadriplegia with the inherent associated mental, physical and emotional suffering .The burden of cost to the individual and community is enormous

Also Vertebrae are the most common sites of infection and metastasis to bone. It is important to differentiate spondylitis from vertebral metastasis as there are significant differences in the subsequent management. In addition, establishment of an accurate early diagnosis can reduce the wide range of investigations performed for the diagnosis with the result that hospitalization and treatment costs can be reduced.

Magnetic resonance imaging (MRI) is used for assessing spinal abnormalities in detecting small changes in the fat and water components of the medullary bone, intervertebral discs, spinal cord, and soft tissues around the vertebrae .

So this study was conducted to assess the radiological features of spinal lesions on MRI.And to evaluate the types and incidence of spinal lesions by MRI and to determine its diagnostic accuracy of MRI in differentiation of lesions.

Materials and Methods

This prospective study was done in the Department of Radio diagnosis & KRSNAA diagnostic centre of Mahatma Gandhi Memorial Medical College & M. Y. Hospital, Indore, Madhya Pradesh, India,. Imaging was done with SIGNA 97 CHANNELS, 3 TESLA MAGNETIC RESONANCE IMAGING equipment from March 2015 to August 2016**.**Patients with neurologicalsdeficit or Clinically Known or suspected lesions of spine were included .Patient with contraindications to MRI and with congenital spinal anamolies, trauma and degenerative disease were excluded.Informedconsent weretaken .Initially noncontrast T1 weighted (T1W), T2 weighted (T2W) and short tau inversion recovery (STIR) sequences in axial, sagittal and coronal planes were taken. Then post-contrast sequences T1W were obtained by using intravenous administration of gadodiamide (GdDTPA-BMA).The characteristic radiological features on MRI noted Degree of cord compression assessed and was correlated with neurological deficit.

Results

The MRI findings were categorized according to the site of the abnormality, into extradural, intradural-extramedullary, and intramedullary disease . They were further divided according to the pathology into infections and neoplasms . Extradural lesions included lesions of the extradural space, as well as isolated or combined bone disorders.

TABLE 01: THE AGE-WISE DISTRIBUTION OF CASES.

AGE GROUP	TOTAL	Percentage
0-9	1	2
10-19	4	8
20-29	14	28
30-39	4	8
40-49	11	22
50-59	8	16
60-69	7	14
70-79	1	2
TOTAL	50	100

TABLE 02: THE SPINAL PATHOLOGY WERE CATEGORISED ACCORDING LOCATION

LOCATION	No. of Patients	Percentage
INTRADURAL(INTRAMEDULLARY)	2	4
INTRADURAL(EXTRAMEDULLARY)	7	14
EXTRADURAL	41	82
TOTAL	50	100

TABLE 03 : NO. OF CASES ACCORDING TO MRI DIAGNOSIS.

BENIGN	NERVE SHEATH TUMOUR	2
	MENINGIOMA	2
	EPENDYMOMA	1
	GIANT CELL TUMOUR	1
	HEMANGIOMA	5
	OSTEOBLASTOMA	1
	EOSINOPHILIC GRANULOMA	1
MALIGNANT	MULTIPLE MYELOMA	1
	CHORDOMA	1

	LYMPHOMA	1
	METASTASIS	6
INFECTIONS/INFLAMMATORY	TRANVERSE MYELITIS	1
	TUBERCULAR	15
	Pyogenic	8
	HYDATID	1
	PERINUERAL CYST	1
TUMOR MIMICS	ARACHNOID CYST	2
	TOTAL	50

We evaluated the magnetic resonance imaging features of various spinal lesions with characterization and extent of each lesionsin total 50 cases. On basis of T1w, T2w &STIR images, a diagnosis was made and noted.

Maximum 14 patients (28%) were in the age group 20-30yrs more common in males, 28 males (55%) in comparison to 22females (45%) were diagnosed. Back pain or neck pain present in majority of patients 32 (80%) [1,2]

Lumbar region was the most common involved site in the spine (38%) followed by Thoracic (24%) and cervical region (18%) [3]
Extradural lesions were the commonest spinal lesion representing about 41 (82%) cases, followed by intradural extramedullary lesions representing 7(14%) cases, then intradural intramedullary lesions representing 2(4%) of cases.[3]

Various abnormalities include infection and inflammatory lesions(50%),Benign lesions (32%)and malignant lesions (18%) were studied.

Infection/Inflammatory lesions constituted the most common cause in our study accounting 25 cases (50%). This included 15 cases of tubercular spondylitis (60%) ,8 case of pyogenic spondylitis (32%) ,1 case of hydatid cyst (4%) and 1 case of transverse myelitis (4%)

Tuberculosis spondylitis were contributed majority 60% cases all showed low signal intensity on T1-WI and high signal intensity on T2-WI sequenceswith heterogenous contrast enhancement in post Gadolinium T1-WI with associated paraspinal and intraosseous abscesses.[4]

There were 8 cases(16%) of pyogenic spondylitis was seen, the lesions shows low signal intensity on T1-weighted images with loss of definition of the end plate and the adjacent vertebral bodies.

Differentiation between the two main categories of spine infections (tuberculous and pyogenic spondylitis) was made. Vertebral collapse and/or loss of vertebral contour were seen in 11 case (73%) of tuberculous and 2 case (25%) of pyogenic infections. Moderate to severe epidural extension was demonstrated in 7 cases (50%) of tuberculous lesions and in 3 case (37%) of other infections. Skip lesions seen in 3cases (20%) and involvement of the posterior elements 2 cases (13%) of tuberculous spondylitis. Paraspinalabscesses were seen in 10 (66%)cases of tuberculous spondylitis. Vertebral intraosseous abscesses were seen in 10 (66%) of cases of tuberculous spondylitis and were demonstrated only after contrast.[5]

In our study Total 25 lesions (50%) were diagnosed as neoplastic lesion out of these 16of the lesions were diagnosed benign (64%), 9case were diagnosed malignant (36%). Among 16(64%) cases of benign lesion 13 (81%) cases were diagnosed benign tumour and 3 (18%) were tumour mimic.

In benign tumour (13 cases) majority of the cases found were vertebral hemangioma 5 cases (38.4%).were the most common.
All cases of hemangioma were seen in vertebral region and was the most common benign tumour in our study. All cases show high signal intensity on T1 and T2 images showing intense post contrast enhancement.1 case is associated with severe compressive myelopathic changes.[6]

Nerve sheath tumour were diagnosed in 2 cases and all were located Intradural extramedullary wereiso to hypointense on T1WI and hyperintense on T2WI with intense heterogenous enhancement on post contrast with extension into the neural foramina and 1 case was associated with hemorrhage, cyst formation, and fatty degeneration.[7]

There were 2 cases of meningioma diagnosed Both cases in female suggesting female preponderance located intradurally. All were broad based. 1tumors were hypo intense on T1WI and 1 was iso to hypo intense .1meningiomas were T2W Isointense. 1 was hyper intense on T2WI. None of the tumor was T2 hypo intense.[8]

Total one cases of Ependymoma was diagnosed located intramedullary in the lumbar region. It was of classic low-grade ependymoma and associated with syrinx. Isointenseon T1-weighted and Hyperintense. on T2-weighted and STIR with enhance homogeneously on contrast enhanced sequence.[9]
Three cases (18.5%) cases of tumourmimics were diagnosed Arachnoid cysts 2 cases (12.5%) and 1 case of perinueral cyst (6.2%) these were considered as developmental tumor mimics and not true tumour.

The two cases (4%) of arachnoid cyst were seen. 1 in the thoracic and 1 in the lumbosacral region. The lesions were low signal intensity on T1-weighted images and high signal intensity on T2-weighted images, with sacral bone erosion at the S1 canal in 1 case. Gd-DTPA enhancement was not performed.[10]

In 9 cases (12%) of Malignant lesion 6 were metastasis (66.6%) and 1 multiple myeloma (11.2%) ,1 lymphoma (11.2%) and 1 chordoma (11.2%) were diagnosed

The majority of cases in malignant lesions was of Metastatic lesions 6 (66%)and age group ranged from 40 to 65 years and 4were seen in female. This reflected in the most common primary being carcinoma breast in this study. Lesions were multiple. Intraspinal extradural extension that caused cord compression seen in 5 patients.[11]

Most common site of involvement was the thoracic spine (62.5 %). Lesions were iso to hypo intense on T1WI and T2WI and hyper intense on STIR images. Contrast was used in 6 out of 6 patients which showed heterogeneous enhancement.[11]

In this study the abnormal signal obtained from the affected spines was useful for detecting the site and delineating the extent of the lesions. It did not provide reliable information for differentiating infection from neoplasm nor for distinguishing among spinal infections. In almost all cases, areas of spinal involvement irrespective of aetiology demonstrated low signal on Tl-weighted and high signal on T2-weighted images. In this study, infection and metastatic disease had several common characteristics. Both demonstrated skip lesions, posterior element involvement, and eccentric paraspinal and epidural extension. Differentiating tuberculous spondylitis from neoplastic disease was best achieved on post-contrast studies. While tumours and tumour extensions enhanced fairly diffusely, abscesses (paraspinal, epidural and/or vertebral) demonstrated rim enhancement. In our study the most sensitive sequence for detecting intradural-extramedullary infectious disease was the contrast-enhanced T1-weighted acquisition. Evidence of infiltration of the marrow of two consecutive vertebrae and the intervening disc is virtually diagnostic of infective spondylitis. Pitfalls in the differentiation between the infection and neoplastic lesion can be encountered in neoplasms which affect consecutive vertebrae and discs, pyogenic infections and neoplasms which affect the spine by direct spread, infections complicating neoplasms, and rare infections which have no recognised patterns such as fungus and hydatid disease.

IMAGES

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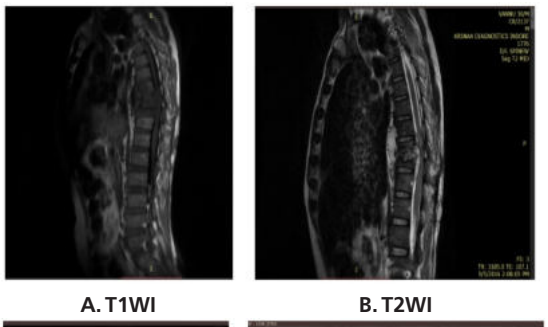
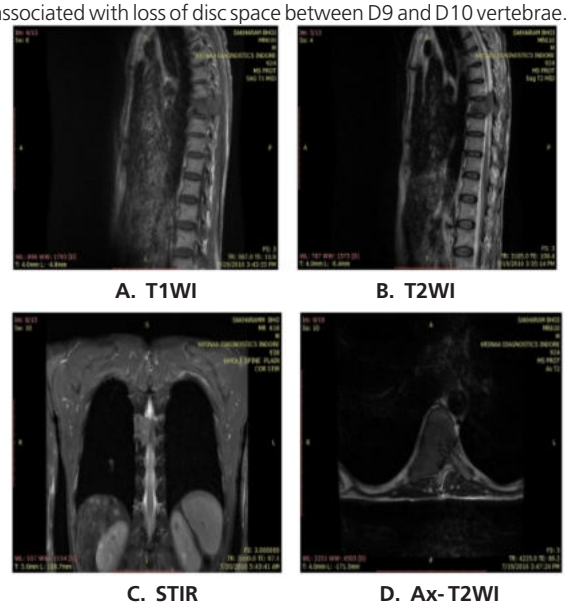


A. T1WI B. T2WI

C. Ax-T2WI D. COR T2WI

Fig.1 : There is evidence of destruction of end plates of D9& D10 vertebrae ; it is associated with B/L para spinal collection ,it is also associated with anterior epidural collection extending from D8-D11 vertebrae which is causing compression of spinal cord resulting into T2 (B) , (C) hyperintensity within the cord; it is associated with loss of disc space between D9 and D10 vertebrae.



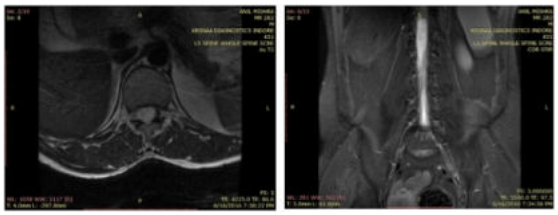
A. T1WI B. T2WI

C. STIR D. Ax- T2WI

Fig. 2: An ill-defined lesion noted involving the anterior aspect, right transverse process and pedicle of D8 vertebral body. It is extending into the extra-dural space at this level on right side and causing displacement of thecal sac towards left side. Involvement of right posterior paraspinal muscle noted at this level. It is hypointense on T1(A) & T2 WI(B), (D) and hyperintense on STIR(C)

Diagnosis :METASTASES

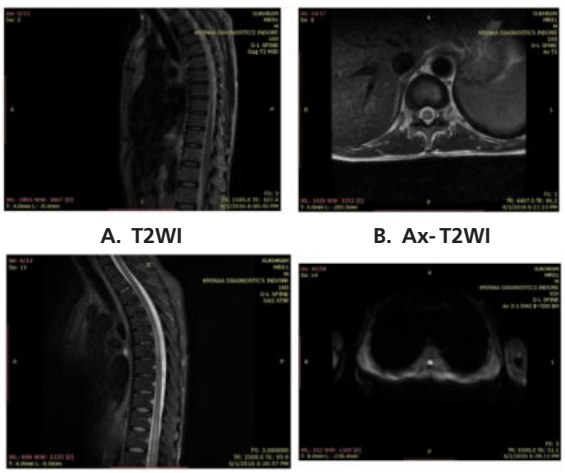
A B



C D

Fig 3: A well defined lesion seen at D12-L1 level which is hyperintense on T2WI (A), (C) and STIR (D) images, hypointense on T1WI(B). which doesn't suppress on fatsat sequences . Peripheral enhancement seen on post contrast images.

Diagnosis: EPENDYMOMA



A. T2WI B. Ax- T2WI

C. STIR D. DWI

Fig.4 : Long segment cord hyperintensity involving mid thoracic and lower thoracic cord which is extending upto conus medullaris. In upper thoracic cord it is extending from D5 to D8 vertebral body in lower part it is extending from D11 to L1 level. Involved cord is bulky and showing T2 (A), (B), & STIR (c).hyperintensity within and show restricted diffusion (D). T2 hyperintense area appears to be involving more than 60 % of cross sectional area of cord.

Diagnosis: TRANSVERSE MYELITIS

CONCLUSION

MRI is the best diagnostic modality for spinal lesions.Itprovides the diagnosis earlier than conventional methods, offering the benefits of earlier detection and treatment. It allows for the rapid determination of the mechanism for neurologic compression and can distinguish between bone and soft tissue lesion and provide the clinician with important information for the diagnosis, staging, and monitoring of management in patients with spinal lesions and contrast enhanced MRI is a useful evaluation tool in addition to conventional MRI for patient undergoing imaging for the evaluation of spinal lesions..

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