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Role of Magnetic Resonance Imaging in the Evaluation of Compressive Myelopathy

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Abstract

Background: The spinal anatomy is very complex, being composed of multiple tissues. Mechanical support is provided by vertebral bodies & interposed intervertebral discs between the vertebral bodies for cushion motion, serving as shock-absorbing system of spine. The spinal cord lies within the protective environment of the spinal colum which is surrounded by CSF. At each segment of spinal cord, two spinal nerves exit through the neural foramen. An extensive vascular network is present for supplying blood to spinal cord. There are 33 vertebrae in spine, consisting of seven cervical, twelve thoracic, five lumbar, five sacral, and four coccygeal segments

Aims and objectives: To assess the role of magnetic resonance imaging in evaluation of various causes of the compressive myelopathy

Materials and methods: This study is a descriptive study conducted on 50 patients using 1.5 Tesla SEIMENS MRI machine in department of radio-diagnosis in Alluri Sitarama Raju Academy of Medical Sciences referred in all patients with clinical suspicion of

compressive myelopathy (1st October 2020 to 30th September 2021).

Results: Out of 50 cases studied,myelopathy is more common in older age, males are more affected than females, Degenerative compressive myelopathy (36%), Traumatic myelopathy (22%), Infectious spondylitis/spondylodiscitis (18%) were the commonest causes detected in this study.

Conclusion: Magnetic Resonance Imaging is the excellent non-invasive investigation for determining the cord oedema / contusion, intervertebral discs & ligaments integrity.

MRI is very sensitive and is the imaging modality of choice for detecting &characterizing the spinal tumour and spinal infections

Keywords: Degenerative compressive myelopathy, traumatic myelopathy, infectious compressivemyelopathy, neoplasms, cervical flexion induced myelopathy, syringomyelia.

Introduction

Compressive Myelopathy is the term used to describe the spinal cord compression either from outside or within the cord itself[1].

Spinal cord compression may result from trauma, congenital stenosis, infections, neoplasms, epidural hemorrhage/abscess, degenerative disease or disc herniation. Plain radiographs have a low sensitivity for identifying traumatic spinal lesions.

Therefore, trauma victims with plain films negative for spine injury, but with a high clinical suspicion of injury should undergo MRI for a more definitive evaluation of the spine.

MRI is the definitive modality in assessing spinal soft tissue injuries, especially in evaluation of spinal cord, intervertebral discs and ligaments[2].

In case of spinal trauma, MRI demonstrates the relationship of fractured / subluxated vertebral bodies to the cord and highlights a significant stenosis.

The signal abnormalities within this cord can be identified, helping to localize and define the degree of trauma.

In case of suspected cord compression due to neoplasm MRI serves as an excellent method for imaging tumor involving spinal column, canal and cord[3].

Aims and objectives

To assess the role of magnetic resonance imaging in evaluation of various causes of the compressive myelopathy

Materials & Methods

A total number of 50 patients referred with clinical suspicion of compressive myelopathy were imaged with 1.5 Tesla MRI scanner, Siemens magnetom avento Syngo (MR D-13) 16 channel machine in the department of radio-diagnosis over a period of 12 months (1st October 2020 to 30th September 2021).

It was descriptive study and a total of 50 patients fulfilling the selection criteria were studied.

Source of data

All patients with clinical suspicion of compressive myelopathy and were investigated with the help of MRI

Selection criteria

Inclusion criteria

- All age groups
- All sexes
- All cases of compressive myelopathy investigated with MRI
- With the informed consent of the patient.

Exclusion criteria

- All patients who did not give consent to be a part of the study.

- Patients with ferromagnetic implants, pacemakers, cochlear implants and aneurysmal clips.
- Medically unstable patients.
- Patients with claustrophobia

Results

A total of 50 patients with clinical suspicion for compressive myelopathy referred for MRI scan were studied.

Majority of the patients were male i.e.; 82% and 18% patients were female. The commonest age group was between 41 to 60 years (46%).

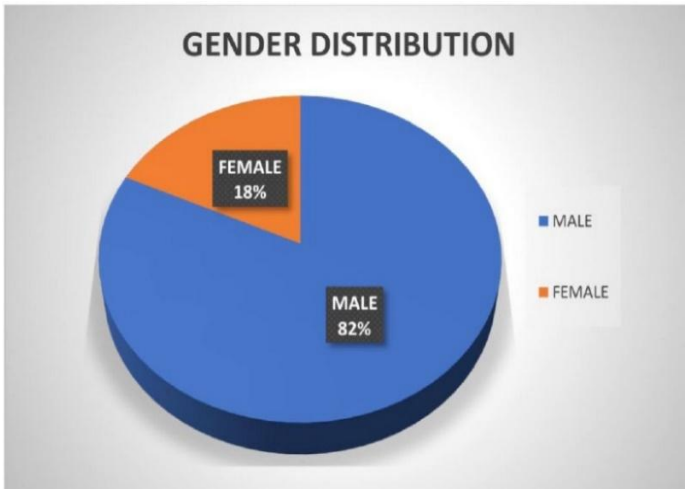

Figure 1: Gender distribution

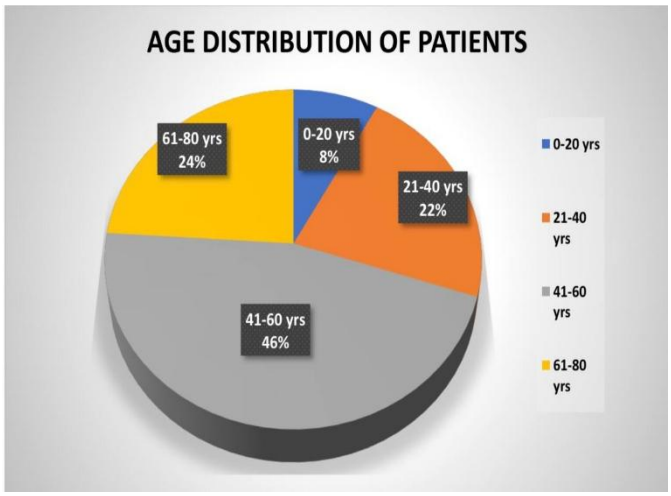

Figure 2: Distribution of patients according to the ages and sexes

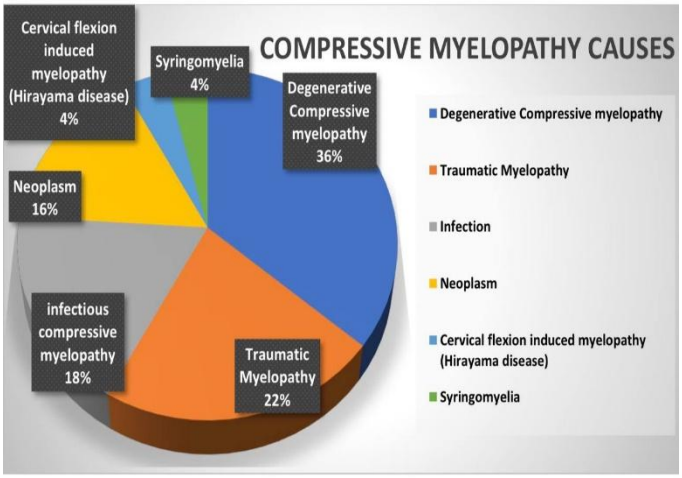

Figure 3: Causes of Compressive Myelopathy.

The present study was carried out on 50 cases of compressive myelopathy and we found various a etiologies for compression. Among these 18 cases were of Degenerative compressive myelopathy (36%), 11 cases were of Traumatic myelopathy (22%), 9 cases were of Infectious spondylitis/spondylodiscitis (18%), 8 cases were of neoplasms includingmetastasis (16%), 2 cases comprised of cervical flexion induced myelopathy-Hirayama disease (4%) and 2 cases of syringomyelia (4%).

In the present study, age of patients with degenerative compressive myelopathy ranged between 36-80 years with mean age of 55.6 years. Out of 18 cases of degenerative compressive myelopathy, 15 patients had cervical spondylosis, among them all the 15 cases showed cord changes, that is high intramedullary T2 signal intensity Of the 15 cases of cervical spondylosis MRI delineated the disc bulge, osteophytes, canal narrowing and myelomalacia. Only MRI consistently showed the changes within the cord that result from compression.

In our study, out of 11 cases of traumatic myelopathy, 8 were due to Road traffic accident (72.7%) & 3 were due to fall from a height (27.3%). Age of patients with

traumatic myelopathy in our study ranged from 20 to 79 years old with a mean age of 45.2 years. The level of traumatic spinal cord injuries, among 11 trauma patients in our study were 7 cervical (63.6%), 2 thoracic (18.2%) and 2 lumbar (18.2%).

In our study, 9 cases were due to infective spondylitis/ spondylodiscitis and the age group ranged between 11 to 74 years with mean age of 46.8 years with male to female ratio of 7:2. Out of 9 cases, 2 were in cervical region (22.2%) and thoracic region (22.2%) each and 5 cases were in lumbar region (55.5%). MRI showed Disc end plate changes with prevertebral and paravertebral collections in 8 cases (88.9%) and epidural collections are seen in 8 cases causing compression of cord with signal changes within the cord, which is hyperintense on T2 weighted images denoting cord oedema.

In our study out of 8 cases of spinal neoplasms, 7 were primary neoplasms and one case is due to metastasis and the age group was ranging between 31-70 years with mean age of 50.6 years. Among them 5 cases (62.5%) were in extradural compartment and 3 (37.5%) were in the intradural-extramedullary compartment. Among the 3 intradural tumour, schwannoma was most common (66.7%) in our study.

In our study out of 50 cases, 2 were due to Hirayama disease accounting for 4% of cases. Both the cases were young males in 19-20 age group with weakness and wasting of forearm and hand muscles of upper limb.

In our study we had 2 cases of syringomyelia, which constituted the spinal pathology in intramedullary compartment (4%), both of these cases were in middle age group (37-46 years) with one male and one female case. One of them developed syrinx post trauma & the other case was idiopathic. A syrinx is a fluid-filled cavity that anatomically lies in spinal cord parenchyma or the central canal.

Figure 4: MRI T2 sag image showing posterior disc osteophyte complexes at various level in cervical spine causing anterior thecal sac indentation and spinal canal narrowing with T2 hyperintensity noted in cord extending from C2 to C5 vertebral levels, suggestive of myelomalacia changes

Figure 5: MRI T2 sag image showing posterior subluxation of C5 vertebra (antero-listhesis of C4 over C5) causing cord compression, with T2 hyperintensity in

the cord extending from C3-C7 vertebral levels, suggestive of cord edema

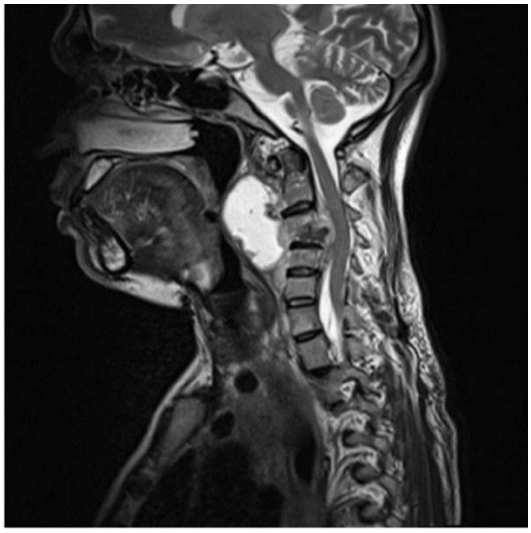

Figure 6: MRI T2 sag showing partial destruction of C3 &C4 vertebral bodies and C3-C4 intervertebral disc with well-defined collections in prevertebral, epidural and paravertebral regions causing spinal canal narrowing. Suggestive of spondylodiscits changes with cord compression at C4-C5 level.

Figure 7: MRI T2 sag, images showing a well-defined oval shaped intradural extramedullary lesion noted at T1-T2 vertebral level which is, hyperintense on T2 causing spinal canal narrowing to 2mm at this level – suggestive of a Intradural extramedullary spinal neoplasm at T1-T2 level (Schwannoma)

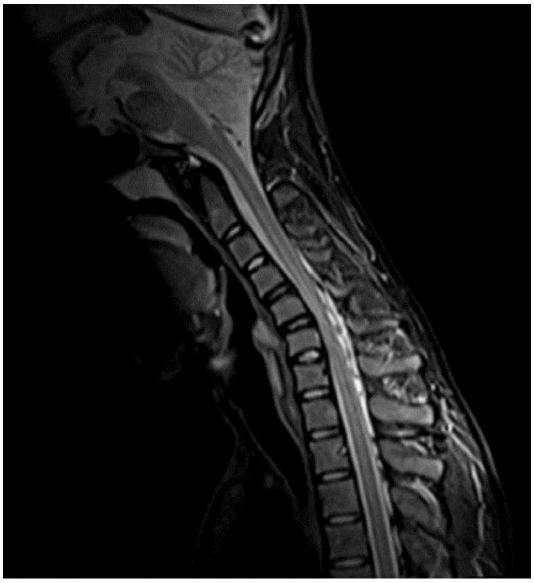

Figure 8: MRI T2 STIR sag showing crescent shaped altered signal intensity area which is hyperintense with few flow voids seen extending from C4 to C7 vertebral levels causing enlargement of posterior epidural space and narrowing of cervical spinal canal at C5-C6 vertebral level – suggestive of Hirayama Disease.

Figure 9: MRI T2 sag image showing a well-defined long segment T2 hyperintensity noted in spinal cord extending from lower cervical to thoracic region. Suggestive of syringomyelia

Discussion

- According to Vishal kasotiya et al[4] in year 2017 showed degenerative compressive myelopathy is the commonest cause for compressive myelopathy.
- According to study done by Chen Y et al[5] in 2016, showed cervical region is most commonly involved in acute spinal trauma.
- According to done by Maurya VK et al[6] in 2018, which concluded that lumbar vertebra is most commonly affected region in infective spondylitis with pre and paravertebral collections seen in almost 96.25% of cases. They also concluded that MRI is the choice for imaging spine not only in diagnosing infective spondylitis but also to guide the surgical management.
- According to study done by Jayashree Mohanty et al[7] in 2018, concluded that schwannoma was most common intradural extramedullary tumour.

Conclusion

MRI is the gold standard modality for detecting abnormalities in the soft tissues of spine and spinal cord. MRI is the best modality for determining the cord oedema / contusion, intervertebral discs & ligaments integrity. MRI is very sensitive and is the imaging modality of choice for detecting & characterising the spinal tumours and spinal infections. Biopsy and histological examination are still required for the definitive diagnosis of the suspected primary neoplastic lesions. MRI is still the most extensively utilised method for visualising the spinal cord and its associated pathologies.

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