ROLE OF MRI IN EVALUATION OF COMPRESSIVE MYELOPATHY

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ABSTRACT

BACKGROUND

Aim of the study was to find out various causes of compressive myelopathy and to characterise them.

MATERIALS AND METHODS

Total of 48 cases were analysed over a period of January 2016 to January 2017 and were evaluated using MRI spine studies.

RESULTS

MRI, because of its exemplary tissue characterisation and high contrast resolution, excellently demonstrates the anatomical details and pathological process. Thus, is a superior modality in diagnosing Spinal cord lesions as well as associated soft tissue injuries, inter-vertebral discs and ligaments. In our study, traumatic injuries (43%) were found to be the most common cause of Compressive myelopathy, other were Infections (23%), primary malignancies (17%), and Metastasis (17%). Thoracic spine was found to be the most frequent site in cases of Traumatic injuries. 40 out of total 48 cases had extradural, and the rest 8 had intra-dural compressive lesions.

CONCLUSION

The study concludes that patients with suspected Compressive myelopathies benefit from evaluation with MRI, which is highly accurate for characterising and identifying the underlying aetiology, as well as associated features. Thus, explicitly helps in stating the long-term prognosis of the patient.

KEYWORDS

Spinal cord, Spinal cord compression, Myelopathy.

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BACKGROUND

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

The term myelopathy describes pathologic conditions that cause spinal cord, meningeal or perimeningeal space damage or dysfunction. Traumatic injuries, vascular diseases, infections and inflammatory or autoimmune processes may affect the spinal cord due to its confinement in a very small space. Spinal cord injuries usually have devastating consequences such as quadriplegia, paraplegia and severe sensory deficits.[1]

Symptoms suggestive of cord compression are back pain, a dermatome of increased sensation, paralysis of limbs below the level of compression, decreased sensation below the level of compression, urinary and faecal incontinence and/or urinary retention. Lhermitte's sign (intermittent shooting electrical sensation) and hyperreflexia may be present.[2]

The history, an adequate neurological examination and the study of the cerebrospinal fluid (CSF) guide the diagnosis of spinal cord injuries. However, imaging is of great importance in order to home in on the diagnosis and classify the aetiology appropriately.[2]

Compressive diseases of the spinal cord are divided into acute and chronic, including degenerative changes, trauma, tumor infiltration, vascular malformations, infections with abscess formation, and syringomyelia. Patients with clinical findings of compressive myelopathy that show extensive (more than three vertebral segments) fusiform spinal cord hyperintensity in T2 weighted sequences, are often mistakenly thought to have optic neuritis, or classified as idiopathic. This delays surgical treatment when other causes such as stenosis of the spinal canal are not taken into consideration.[3]

Compressive disease is the main cause of myelopathy in older patients. It has a chronic course and usually does not recur. High intensity signals in T2 images is explained by myelomalacia, gliosis, tethering damage, vascular or inflammatory oedema, demyelination and vacuolar changes. Gadolinium enhancement is limited to the region of

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maximum compression. Kelley et al. found that none of the patients with compressive myelopathy improved with intravenous corticosteroids, while patients with inflammatory myelopathies did improve, invalidating the hypothesis of traumatic inflammatory demyelination.[4]

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 MR for a more definitive evaluation of the spine.[5]

MRI is the definitive modality in assessing spinal soft tissue injuries, especially in evaluation of spinal cord, intervertebral discs and ligaments.[6,7]

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.[6]

In case of suspected cord compression due to neoplasm MRI serves as an excellent method for imaging tumor involving spinal column, canal and cord.[8]

Many spinal cord diseases are reversible if recognized and treated at an early stage; thus they are amongst the most critical of all Neurologic emergencies.

The role of MRI is to distinguish compressive from non-compressive myelopathy. Once compressive lesions have been excluded, non-compressive cause of acute Myelopathy that are intrinsic to the cord are considered primarily vascular, inflammatory and infectious etiologies.[9]

Surgery improved or stabilized all patients with compressive disease, consistent with the hypothesis of spinal cord edema or reversible ischemia in compression. These findings support the argument that the clinical and imaging findings may differentiate those patients who will benefit from surgical decompression.

In 2007, Yukawa et al. found that the signal intensity in the pre-operative T2 image correlates with patient age, chronicity of the disease, and post-operative recovery. Patients with greater signal intensity in T2 weighted images recover poorly. Consequently, this parameter may be used as a predictor of surgical prognosis.[10]

Objectives of the Study

- To evaluate various causes of compressive myelopathy.
- MR characterization of spinal cord compressive lesions.
- To classify the lesions based on location into extradural /intradural compartments and according to their most commonly involved level of spinal cord.

The data was collected from patients referred to the Department of Radiodiagnosis, C. U. Shah Medical College and Hospital, Surendranagar, Gujarat.

The patients who were clinically suspected of compressive myelopathy were investigated with MRI spine studies. The study group included a sample size of 48 patients from January 2016 to January 2017.

Inclusion Criteria

- All age groups
- Both sexes
- All symptomatic cases of compressive myelopathy

Exclusion Criteria

- Cases of non – compressive myelopathy.
- Degenerative disc herniation.

Equipment

- Siemens 1.5 tesla MRI machine- Magnetom Essenza.

Observations

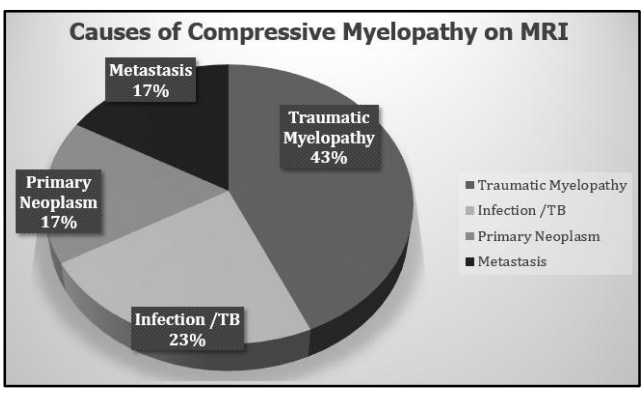

Table I

The most common cause of compressive myelopathy found was trauma. The most common cause of trauma was Road traffic accident followed by Fall from height.

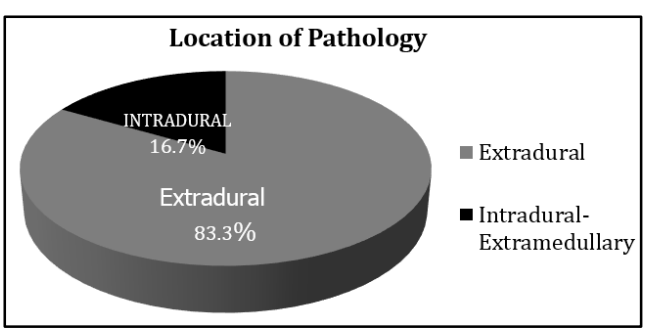

Table II

Most of the lesions were found to be in the extradural compartment.

Causes According to Various Compartments

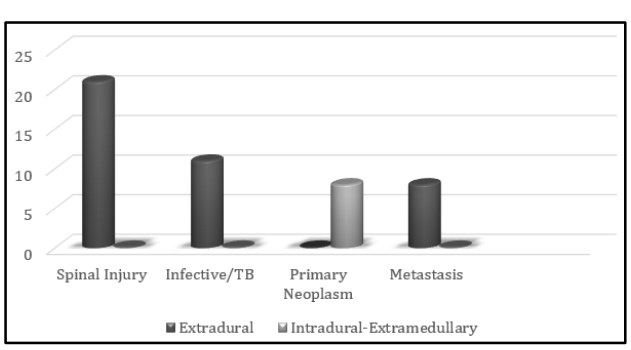

Table III

Primary neoplasms were found to be predominantly involving the intradural-extramedullary compartment whereas all other causes like trauma, infective lesions and metastasis were predominantly found in the extradural compartment.

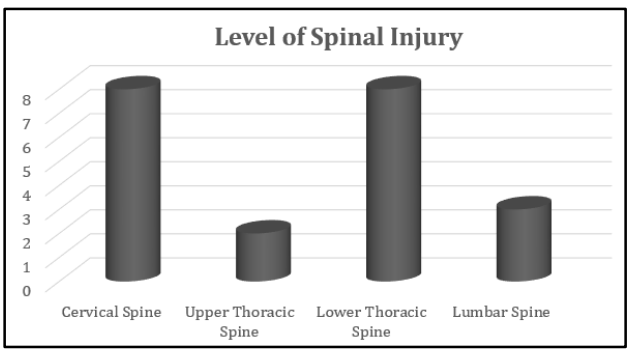

Table IV

The cervical and lower thoracic spine were the most common locations of involvement in cases of compressive myelopathy.

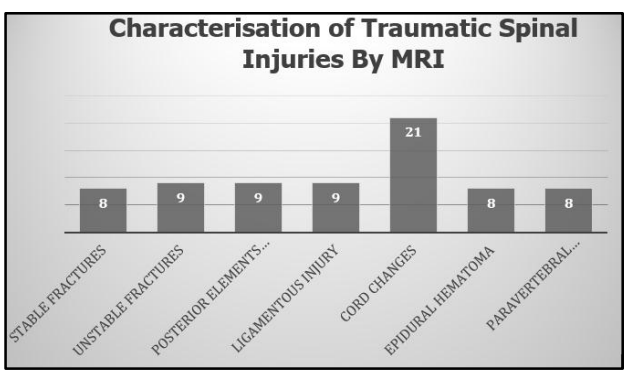

Table V

The most common associated finding seen in cases of traumatic compressive myelopathy was cord oedema.

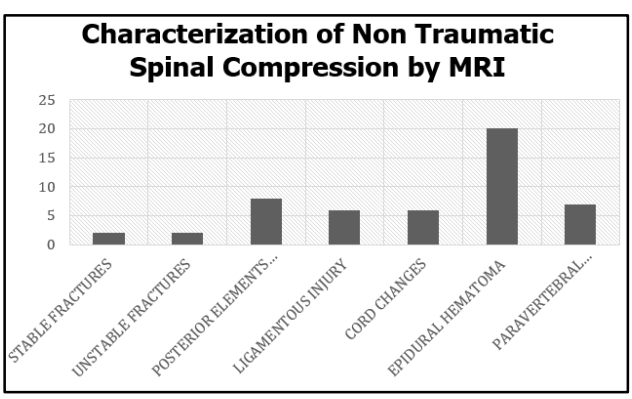

Table VI

The most common associated finding seen with non-traumatic compressive myelopathy was epidural hematoma.

Intradural Extramedullary Neurofibroma with Extension into Neural Foramina

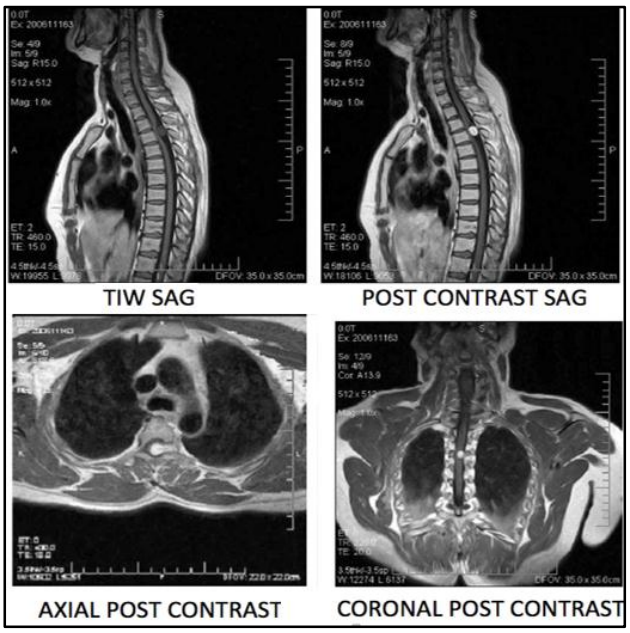

Image 1

MRI spine shows e/o a well defined round oval shaped lesion which is isointense on T1W images and is situated in intradural extramedullary compartment along with extension into the neural foramina. The lesion shows intense contrast enhancement on post contrast scans.

Tuberculosis of Spine with Cold Abscess

Image 2

MRI dorsal spine shows e/o wedging and decreased height of D9 vertebral body along with altered signal intensity seen in D8, D9 and D10 vertebral bodies. This also leads to posterior displacement and compression of the spinal cord. The lesion also seems to be extending in the

prevertebral and paravertebral spaces which is typically seen in cases of tuberculosis involving the spine.

Multiple Metastasis

Image 3

MRI dorsal spine shows e/o altered signal intensity lesions involving the dorsal spine with typical skip lesions with compression over the spinal cord posteriorly.

Spinal Hydatid

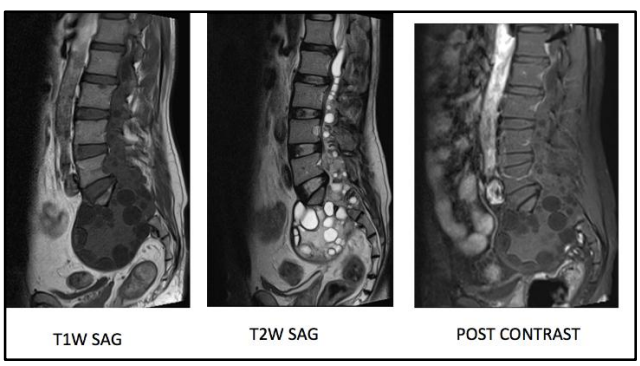

Image 4

MRI lumbar spine shoes e/o multiloculated lesions seen involving the pelvis and extending into the lumbar spinal column which is predominantly hypointense on T1W images and predominantly hyperintense on T2W images. On post contrast scans the lesion shows no significant contrast enhancement.

Traumatic Myelopathy

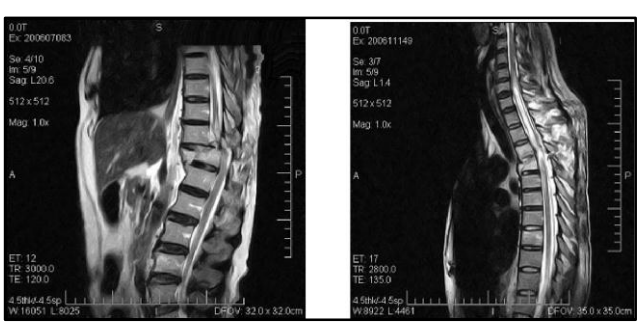

Image 5

MRI dorsal spine shows e/o compressive fracture seen along the vertebral body with the fracture segment causing compression over the spinal cord. There is also extensive cord oedema noticed.

Calcified spinal Meningioma

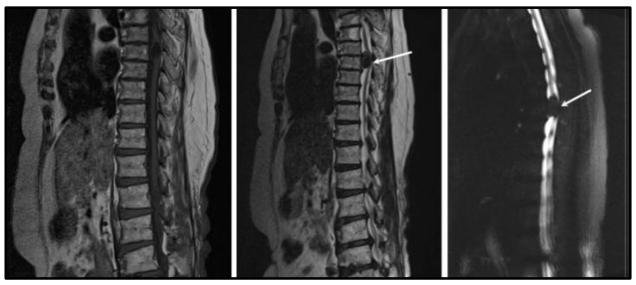

Image 6

MRI demonstrates well defined hypointense lesion in the extra-medullary, intra-dural space as seen on both T1 & T2W images (arrow), which is compressing the cord.

Traumatic Myelopathy

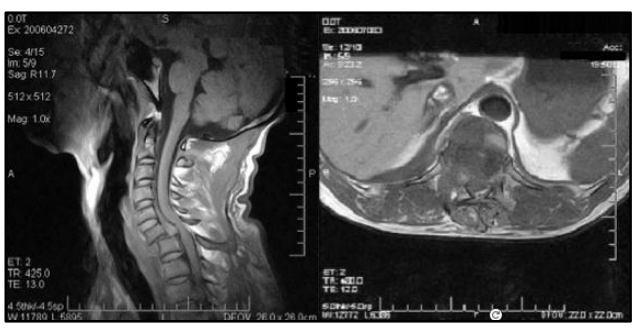

Image 7

MRI cervical spine shows, spondylolisthesis at the level of C6-C7 vertebra, causing compression over the spinal cord, along with epidural and pre/para-vertebral hematoma formation.

DISCUSSION

Spinal cord pathologies can have devastating repercussions, which can range 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 multifactorial disease considered as one of the most critical neurological emergencies, where prognosis depends on an early and accurate diagnosis.

Compressive diseases of the spinal cord can be divided into acute and chronic, including degenerative changes, trauma, tumor infiltration, vascular malformations, infections with abscess formation, and syringomyelia. Patients with clinical findings of compressive myelopathy that show extensive (more than three vertebral segments) fusiform spinal cord hyperintensity in T2 weighted sequences, are often mistakenly thought to have optic neuritis, or classified as idiopathic. This delays surgical

treatment when other causes such as stenosis of the spinal canal are not taken into consideration.

The ability of MRI to show the spine and spinal cord with greater sensitivity and specificity than myelography and CT is well established for trauma, neoplastic, congenital, & degenerative disorder. 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 non-invasiveness.

In our study of 48 cases of Compressive myelopathy, we found various different causes for compression and amongst these Trauma (21) was the most common, followed by Infectious causes (11), Primary neoplasms (08) and Secondary neoplasm (08).

Most common causes for Spinal Trauma was found to be Road traffic accidents (RTA) and fall from height.

Extradural compressive lesions (83.3%) was seen as the most common cause for Compressive myelopathy.

Spinal injuries and infections were the common causes for Extradural compression, while Primary neoplasms were more common in Intradural compartment, in our study.

In Spinal injury, the common site involved was found to be the Thoracic spine followed by cervical spine.

Majority of the patients of spinal injury and primary neoplasms were among Middle age group or Young adults (20-49 years). While, majority of patients of Spinal infection and metastasis were seen in the older age groups (>50 years).

Most cases of Spinal injury were found to occur in the Male population, whereas Spinal infection, Primary neoplasms as well as Metastasis was more commonly seen in female population.

There are other causes of myelopathy such as, Demyelinating disorders, like ITM which tends to occupy more than 50% of the cross-sectional area of the spinal cord on MRI and tends to be central, uniform, and symmetric. Early recognition of such syndromes is crucial for applying the appropriate therapy that can be quite different from that of multiple sclerosis.[11] However, increased signal intensity cannot be related to a poor outcome or severity of myelopathy in the patients with mild myelopathy.[12] Kelley et al[10] found that none of the patients with compressive myelopathy improved with intravenous corticosteroids, while patients with inflammatory myelopathies did improve, invalidating the hypothesis of traumatic inflammatory demyelination. Matsumoto et al[12] found no relationship between hyperintense signals and prognosis.

CONCLUSION

MRI is the definitive modality in assessing soft tissues of the spine and spinal cord abnormalities.

It is the best modality to evaluate associated cord oedema or contusion and also the integrity & early changes in intervertebral discs and ligaments which can be crucial in long term prognosis of the patient.

MRI is very sensitive and considered the imaging modality of choice to detect, characterize, determine the extent of various Spinal tumours and infections.

So, we can conclude that MRI is definitive, accurate, though costly but non-invasive, radiation free modality for evaluation of Compressive myelopathy.

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