ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 7, Issue – 1, January – 2022 , Page No. : 128 - 131

Role of MRI in evaluation of spinal trauma

[1]Dr. Prem Chand, M.D.,Department of Radiodiagnosis, Bushahr Diagnostic and Imaging Centre.

[2]Dr. Rajan Singh, M.S., Department of Orthopaedics, MGMSC, Khaneri, Rampur.

[3]Dr. Suchita Palmo, MBBS CMO, Govt. MGMSC, Khaneri, Rampur.

[4]Dr. Nihal Chand, M.D., General Medicine, Department of Medicine, Govt. MGMSC, Khaneri, Rampur.

[5]Dr. Sathyan G, Professor, Govt. Stanley Medical College, Chennai.

[6]Dr. Subhasini B, Professor, Govt. Stanley Medical College, Chennai.

Corresponding Author: Dr. Prem Chand, M.D., Department of Radiodiagnosis, Bushahr Diagnostic and Imaging Centre.

Citation this Article: Dr. Prem Chand, Dr. Rajan Singh, Dr. Suchita Palmo, Dr. Nihal Chand, Dr. Sathyan G, Dr. Subhasini B, "Role of MRI in evaluation of spinal trauma", IJMSIR- January - 2022, Vol – 7, Issue - 1, P. No. 128 – 131.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract: Early detection often leads to prompt and accurate diagnosis, expeditious management, avoidance of unnecessary procedures. 65 patients of acute spinal trauma who underwent MRI of spine in the department of radiodiagnosis, Acharya Vinoba Bhave Rural Hospital, Sawangi, Wardha were included in the study. Detailed neurological examination of the patient was done during the scan. Detailed neurological examination of the patient was also done during his or her discharge from the Hospital. Clinical assessment was done at the time of admission and discharge using ASIA impairment scale. MRI findings were subsequently compared were clinical profile and neurological outcome. The strength of association between extent of spinal cord injury and outcome were described using Odd's ratio. Chi square test of significance ($p<0.005$) was used to assess the association between MR findings and clinical outcome.

Keywords: ASIA impairment scale, MRI, spinal trauma, cord injury.

Introduction

Most of the diagnostic information in spinal trauma is derived from the sagittal images. Axial images serve as a supplement[1]. Sagittal T1- Weighted images offer an excellent anatomic overview. Disc herniations, epidural fluid collections, subluxation, vertebral body fractures, cord swelling and cord compression are also visualised[2]. Sagittal T2- Weighted images depict most of the soft tissue abnormalities including spinal cord oedema and haemorrhage, ligamentous injury, disc herniations and epidural fluid collections[3]. Axial and sagittal GE images aid in the identification of the acute spinal cord haemorrhage, disc herniations and fractures.

The depiction of parenchymal SCI on MRI not only correlated well with the degree of neurologic deficit, but it also bears significant implications in regard to prognosis and potential for neurologic recovery[4-13].

As MRI is an excellent diagnostic modality for evaluation of spinal trauma, it is possible to suggest that the MRI findings correlated directly with the degree of

deficit according to ASIA impairment scale. The purpose of this study is to evaluate this correlation.

Materials and methods

Type of study: Hospital based prospective study.

Sample size: 65 patients with spinal trauma irrespective of age, sex referred to Acharya Vinoba Bhave Rural Hospital, Sawangi (Meghe) were included. After giving informed consent and ethical clearance, patients had MR imaging done

Equipment: GE MRI 1.5 tesla with phase array coil was used for acquisition of images in all patients.

Method of collection of data: MR imaging of spine was performed in the axial and saggital planes using a combination of pulse sequences. The study was performed with patient in supine position with quiet breathing obtaining saggital T2 and T1-weighted fast spin echo images, STIR, coronal STIR and axial T2 and T1-weighted fast spin echo images for proper evaluation of cord hemorrhage.

Saggital images were 5.0mm thick with a 0.5m slice gap. The field of view (FOV) of the area of interest is adequate at 24 cm in cervical spine and at 32 cm in lumbosacral spine. In the dorso-lumbar spine, a large FOV was needed (34/36 cm) for accurate labelling of the involved levels.

T2-weighted information was obtained using a single FSE acquisition using a split echo train, resulting in an intermediate T2-weighted sequences. For the short TE image, an echo train of three with two excitations was used, whereas for the long TE image an echo train of 15-30 with single excitation was used. For each sequence, 256-448 steps were followed in both the frequency and phase axes. Fat suppression was employed on the long TR sequences to improve visualisation of edema in the posterior ligamentous complexes (STIR- Short Tau Inversion Recovery). Axial images were obtained using FSE or gradient echo (GRE) pulse sequences. Technical parameters included 16-degree flip angle, minimum TR/TE, 224 x 320 matrix and two excitations in T1WI and one excitation in T2WI. The TE used was less than 15 ms in T1WI and upto 100 ms in T2WI in order to minimize unwanted susceptibility effects that might exaggerate bony stenosis.

Inclusion criteria: All the patients of acute spinal trauma undergoing MR imaging formed the study group.

Exclusion criteria

1. Post operative patients of spinal trauma undergoing MRI scan of spine.
2. Uncooperative patients.
3. Patients with metallic implants, Patients with pacemaker / cochlear implant in-situ, Patients with claustrophobia/ any other psychiatric abnormality.

Results

Table 1: Cord findings in MRI in spinal trauma

Cord Findings	No. of patients	Percent	95% confidence limit
Hemorrhage	5	7.69	2.54%- 7.05%
Cord edema (<3cm)	20	30.76	19.91%-43.45%
Cord edema (>3cm)	11	16.92	12.31%-33.49%
No abnormality	29	44.61	28.04%-52.90%
Total	65	100	

MRI examination revealed the cord abnormalities in 36 out of 65 patients, i.e. in 55.38% of patients. Rest 29 patients (44.61%) had no findings in MRI. Cord edema more than 3 cm was there in 11 out of 65 patients (16.92%). Cord edema less than 3 cm was there in 20 out

of 65 patients (30.76%) while 5 patients (7.69%) showed hemorrhagic focus within the cord in MRI.

Discussion

This prospective study was performed in 65 patients of spinal trauma referred for an MRI examination.

The results of the study have shown that the MRI is an excellent diagnostic modality for the evaluation of patients of spinal trauma. It accurately defines the extent of spinal cord injury and the imaging findings correlate with the clinical neurological examination findings according to the ASIA impairment scale.

Out of 65 patients, 48 were males and 17 were females. The age group most commonly affected was those in the age group of 21-40 years (55.38%). This was in concordance with Shih P. et al[14] which showed that the spinal trauma was more common in men and the age group of 25-40 years.

The most common cause of injury was fall from height which was the cause in 29 patients (44.61%), followed by road traffic accidents in 20 patients (30.76%). Other causes such as assault and blunt trauma were present in 8 patients each (12.30%). This was in accordance to a study by Gupta N et al, where in fall from heights was observed in 25% of the cases[15]. In another study by Rao MUM et al, 50% of the patients suffered spinal injuries due to fall from heights and 17.4% was due to road traffic accidents, which corroborated this study[16]. In a study by Nagvekar RA et al, 62% was due to fall from heights and 37% due to road accidents[17].

Most commonly affected region by the spinal trauma was cervical spine, comprising of 26 patients (40%). Dorsolumbar and dorsal spine were also commonly affected, comprising of 14 (21.53%) and 12 (18.46%) patients respectively. Lumbar spine involvement was seen in 11 patients (16.92%) and sacral spine was involved in only 2 patients (3.07%). Similar results were observed by Rahman et al[18], Nagvekar RA et al[17] and Lenehan B[19] in their studies.

MRI showed cord abnormalities were present in 36 out of 65 patients, i.e., in 55.38%. No abnormalities were found in 29 patients, i.e., in 44.61%. This was in concordance with Umesh C. Parashari et al[20] which showed spinal cord abnormalities in 55%.

Focus of cord hemorrhage was present in 5 out of 65 patients, i.e., 7.69% of patients with 95% confidence limit of 2.54%-17.05%. Cord edema/non-hemorrhagic contusion involving more than 3 cm was present in 11 out of 65 patients, i.e., 16.92% of patients with 95% confidence limit of 12.31%-33.49%. Cord edema/non-hemorrhagic contusion involving less than 3 cm was present in 20 out of 65 patients, i.e., 30.76% of patients with 95% confidence limit of 19.91%-43.45%. So cord edema/contusion involving less than 3 cm of the cord was most common finding in our study.

Conclusion

MRI is the imaging modality of choice in the evaluation of cord abnormality in spinal trauma cases.

References

1. Mcardle CB, Crofford MJ, Mirfakhraee M, Amparo EG, Calhoun JS. Surface coil MRI of spinal trauma: Preliminary experience. Am J Neuroradiol 1986;7:885-93.
2. Kalfas I, Wilberger J, Goldberg A, Prostko ER. Magnetic resonance imaging in acute spinal cord trauma. Neurosurgery 1988;23:295-9.
3. Goldberg AL, Daffner RH, Schapiro RL. Imaging of acute spinal trauma: An evolving multi-modality approach. Clin Imag 1990;14:11-6.
4. Wittenberg RH, Boetel U, Beyer HK. Magnetic resonance imaging and computed tomography of

acute spinal cord trauma. Clin Orthop 1990;260:176-85.

5. Flanders AE, Schaefer DM, Doan HT, Mishkin MM, Gonzalez CF, Northrup BE. Acute cervical spine trauma: Correlation of MRI imaging findings with degree of neurologic deficit. Radiology 1990;177:25-33.
6. Kulkarni MV, McArdle CB, Kopanicky D, Miner M, Cotler HB, Lee KF, et al. Acute spinal cord injury: MRI imaging at 1.5T. Radiology 1987;164:837-43.
7. Schouman-Claeys E, Frija G, Cuenod CA, Begon D, Paraire F, Martin V. MRI imaging of acute spinal cord injury: Results of an experimental study in dogs. Am J Neuroradiol 1990;11:959-65.
8. Schaefer DM, Flanders A, Northrup BE, Doan HT, Osterholm JL. Magnetic resonance imaging of acute cervical spine trauma: Correlation with severity of neurologic injury. Spine 1989;14:1090-5.
9. Silberstein M, Tress BM, Hennessy O. Prediction of neurologic outcome in acute spinal cord injury: The role of CT and MRI. Am J Neuroradiology 1992;13:1597-608.
10. Marciello M, Flanders AE, Herbison GJ, Schaefer DM, Friedman DP, Lane JI. Magnetic resonance imaging related to neurologic outcome in cervical spinal cord injury. Arch Phys Med Rehabil 1993;74:940-6.
11. Flanders AE, Schaefer DM, Friedman DP, Lane JI, Herbison GR. Predictive value of MRI imaging in the determination neurologic recovery in acute cervical spinal cord injury. Radiology 1991;181:172.
12. Schaefer DM, Flanders AE, Osterholm JL, Northrup BE. Prognostic significance of magnetic resonance imaging in the acute phase of cervical spine injury. J Neurosurg 1992;76:218-23.
13. Silberstein M, Tress BM, Hennessy O. Delayed neurologic deterioration in the patient with spinal trauma: Role of MRI imaging. Am J Neuroradiol 1992;13:1373-81.
14. Shih p, Fessler RG, Trauma of the Nervous System and spinal cord Trauma, Bradley's Neurology in Clinical practice, 6th edition, Philadelphia, Elsevier, 2012:1212-1250.
15. Gupta N, Solomon MJ, Raja K. Demographic characteristics of individuals with paraplegia in India-a survey. Ind J Physiotherapy Occupational Therapy Inter J. 2008;2(3):24-7.
16. Rao MUM, Tirumalaraju A, BujjiBabu P, Reddy S. Spinal Trauma evaluation by MRI-research article. IOSR J Dental Med Sci. 2015;14(10):74-83.
17. Nagvekar RA, Nagvekar P. Low tesla MRI in acute spinal injuries: a study in a teaching hospital. Inter J Advances Med. 2017;4(1):108-11.
18. Rahman ML, Haque ME, Zaman MS, Arafat MY, Alam MI. Management of spinal injury: experience in Rajshahi Medical College Hospital. TAJ: J Teachers Assoc. 2002;15(1):25-7.
19. Lenehan B, Boran S, Street J, Higgins T, McCormack D, Poynton AR. Demographics of acute admissions to a national spinal injury's unit. Euro Spine J. 2009;18(7):938.
20. Parashari U. C, Khanduri s, Bhadury S, Kohli N, Parihar A, Singh R, Srivastava RN, Upadhyay D. Diagnostic and Prognostic Role of MRI in Spinal Trauma, its Comparison and Correlation with Clinical Profile and Neurological outcome, According to ASIA Impairment Scale. Journal of Craniovertebral junction 2011; 2:17-26.