

Evaluation of Prognostic Value of Magnetic Resonance Imaging in Acute and Chronic Spinal TraumaP.V. S. Abhishek¹, Mudunuri Lakshmi Deepthi², Sai Charitha. G³¹Assistant Professor, Department of Radiology, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar, Telangana, India²Postgraduate, Department of Radiology, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar, Telangana, India³Postgraduate, Department of Radiology, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar, Telangana, India

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Conflict of interest: Nil

Abstract:**Introduction:** Spinal trauma is commonly seen in RTA cases, sport injuries, assaults etc. MRI is an excellent diagnostic modality for evaluation of spinal trauma.**Aims and Objectives:** To evaluate role of MRI as a patient's non-invasive diagnostic tool in acute and chronic spinal trauma and comparison of these findings with patient's neurological status and clinical outcome.**Materials and Methods:** This was descriptive study with 85 cases carried out over a period of 10 months in the Department of Radiodiagnosis, CAIMS, and Karimnagar.**Results:** In present study, the total number of patients was 85 and the male to female ratio was 3:1, age ranged between 11 to 80. Cervical spine is the most commonly involved. RTA and fall from height are the most common causes of spinal injury. Cord compression and hemorrhage are most common type seen whereas cord edema has better prognosis. Cord transection and hemorrhage had worst neurological outcome.**Conclusion:** MRI is the modality of choice for evaluation of spinal trauma. MRI is the only tool available for depicting the changes within the cord, ligaments and paraspinal soft tissues which helps in the management of the patients and in predicting the prognosis of recovery.**Keywords:** Spinal trauma, cord injuries, ligamentous injuries.

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Introduction

Spinal trauma is a common cause of disability. It is commonly seen in RTA cases, sport injuries, assaults or gunshot injury, falls etc. It can manifest as a wide variety of clinical syndromes resulting from damage to the spinal cord or its surrounding structures. It is an emergency which can require urgent surgical intervention to prevent long term neurological complications of spinal cord injury [1,2,3]. MRI is an excellent diagnostic modality for evaluation and detection of spinal trauma.

On MRI, it is simple to spot subtle abnormalities in the spinal cord, soft tissues, and bone marrow that may not be visible on other imaging modalities. Early detection frequently results in a quick, precise diagnosis, early treatment, and the avoidance of needless treatments.

Materials and Methods: This was prospective study conducted, after getting informed consent, from 85 individuals with a history of spinal injury who had had spine MR imaging between October 2022 to July 2023 were examined in the

Department of Radiodiagnosis, CAIMS. 65 male patients and 20 female patients made up the study group. The age range of those covered was from 11 years to 80 years.

Inclusion criteria: All individuals with catastrophic spinal injuries

Exclusion criteria:

- Patients with hemodynamic instability,
- Patients with metallic implants or pacemakers,
- Claustrophobic patients.

Method: On a 1.5 Tesla GE, MRI was carried out without the use of contrast. The patient's neurological condition at discharge was assessed using MR imaging results in situations where it was practical to do so, and the patient's prognosis was determined using the ASIA score at the time of hospitalization. With informed consent and Ethics committee approval, Descriptive study was conducted in the Department of Radiodiagnosis, CAIMS, Karimnagar.

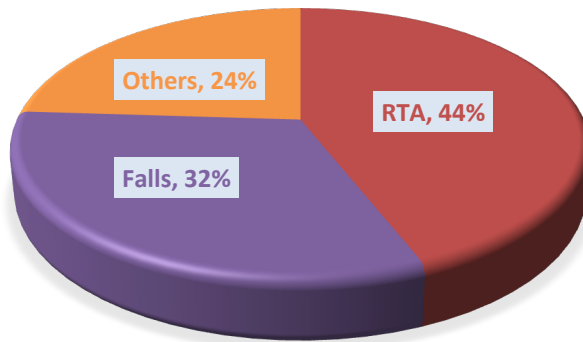
Observations and Results:

Table 1: Gender distribution

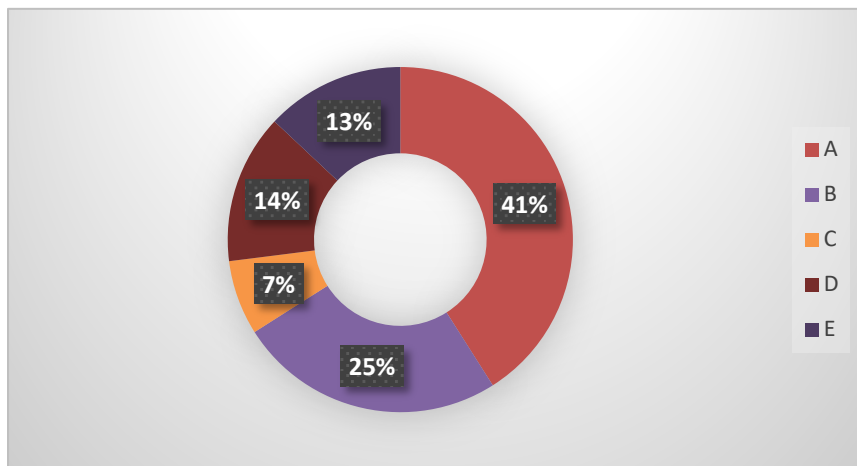
Gender	Cervical	Dorsal	Lumbar	Total
Males	36	14	15	65(76.4%)
Females	9	6	5	20(23.6%)
Total	45	20	20	85(100%)

Table 2: Distribution of Region

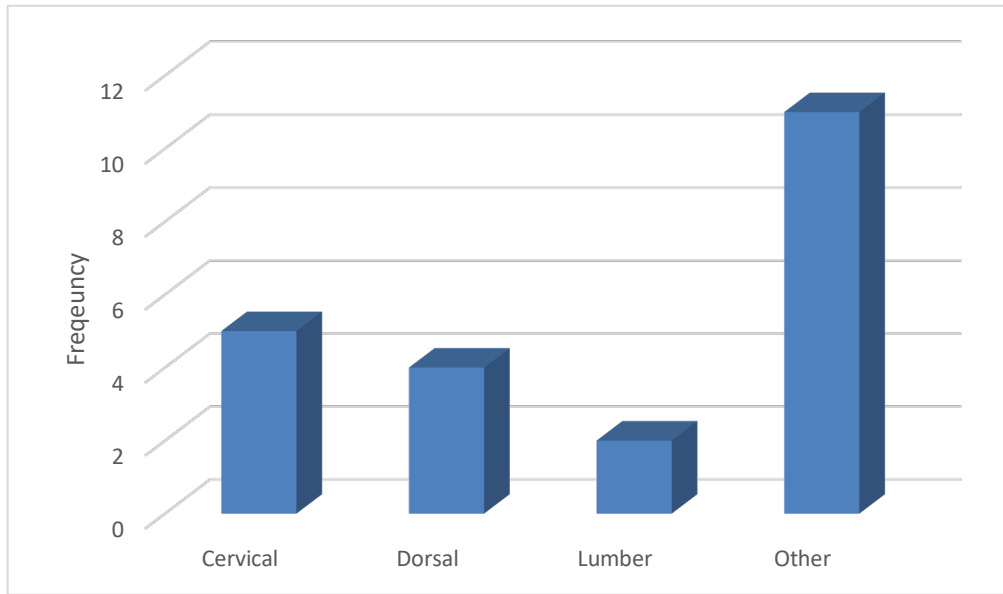
Region	No of cases
Cervical	45(52.9%)
Dorsal	20(23.5%)
Lumbar	20(23.5%)



Graph 1: Mode of injury



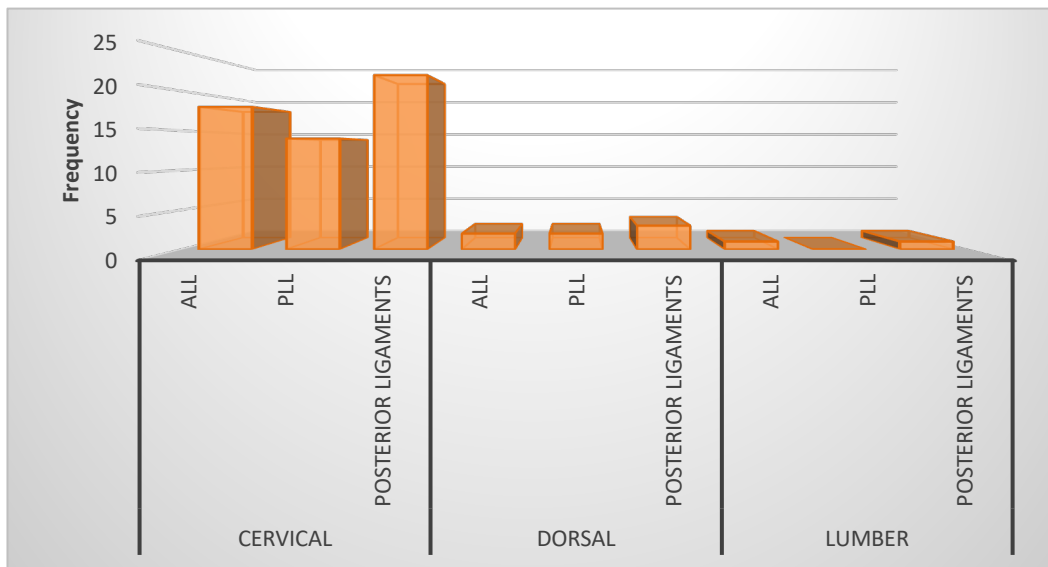
Graph 2: ASIA grade at admission



Graph 3: Intervertebral disc edema

Table 3: Cord injuries [11]

Type	Cervical	Dorsal	Lumbar	Total
SCIWORA	9	0	0	9(7.8%)
Edema	12	1	0	13(11.3%)
Hemorrhage	25	13	3	41(35.6%)
Transection	3	2	0	5(4.3%)
Compression	24	14	7	45(39.1%)
Syrinx	1	1	0	2(1.7%)



Graph 4: Ligamentous Injuries

Discussion

MR imaging is used in spinal trauma for the following reasons: (a) identifying vertebral injuries that compromise the spinal canal; (b) identifying ligamentous injuries; (c) determining the type and extent of cord injuries; (d) determining the

likelihood of surgical decompression; and (e) determining the prognosis for recovery.

85 patients who reported to our hospital with a history of spinal trauma and underwent MR imaging of the spine made up our study on the MRI evaluation of spinal trauma. 56 of the 85 patients

underwent surgery. In cases where it was practical, imaging findings and surgical findings were compared. Our study's findings demonstrated that MRI is a superior diagnostic tool for assessing spinal trauma patients. It precisely describes the degree of skeletal and soft tissue damage in the trauma zone. We were able to match objective imaging results in spinal trauma with clinical neurological evaluation results using the ASIA Impairment Scale. 65 of the 85 patients were men, making up 76.4% and 23.6% of the cases, respectively, out of the 85 patients. Mahmood et al [4] study also revealed that men suffer spinal injuries at higher rates. Despite the fact that the patients' ages ranged from 11 to 80, with a mean of 45. According to the ASIA classification [6], the patients' neurological condition was rated at the

time of admission and release. In the cervical, dorsal and the lumbar regions, respectively, the most frequent grade at presentation was A.

The cervical spine was most frequently affected (in 52.9% of cases), followed by the dorsal and lumbar spines (23.5%). The most frequently affected regions were D11/D12, C5/C6, and L1. Due to the shift in the dorsolumbar junction's centre of gravity and curvature, it is more vulnerable to injury.

18 patients had vertebral injury with normal cord, with 4 having it in the cervical, 5 having it in the dorsal, and 9 having it in the lumbar area. These patients had grade C (5.55%), grade D (44.4%), and grade E (50%) cases when they were admitted, but they had improved at discharge in terms of symptom alleviation or an increase in ASIA grade.

Table 4: common ASIA grade

Region	Commonest grade
Cervical	A
Dorsal	E

Cord Injuries: Cord compression (39.1%), cord hemorrhage (35.6%), cord edema (11.3%), SCIWORA (7.8%), cord transection (4.3%), and syrinx (1.73%) were the different forms of cord injuries observed in our study, in decreasing order of frequency. According to Mahmood et al [4,5]; cord edema (46%), cord bleeding (42%), and cord compression (10%) are the most prevalent cord injuries.

Table 5: Cord Injuries

	Present study	Mahmood(4)
Cord compression	39,1 %	10 %
Cord edema	35 %	42 %
Edema	11,3 %	46 %

SCIWORA: SCIWORA (Spinal Cord Injury without Radiographic Abnormality) was accounted for 9 cases, or 7.8% of the cases, where it was documented. Cord edema and cord hemorrhage were the most common injury types in these SCIWORA patients (66.6% and 33.3%, respectively).

Table 6: SCIWORA

	Present study	Sidharth Sharma et al (7)
SCIWORA	7,8 %	12,3 %

Cord Edema: 13 individuals in our study had cord edema, 12 in the cervical region and 1 in the dorsal area. Four of them had an ASIA grade of A, seven received a grade of B, and two received a grade of D. At discharge, the neurological state of every single one of them had significantly improved.

Cord Haemorrhage: In 41 cases, cord hemorrhage was seen. 25 of them are in the cervical region, 13 are dorsal, and 3 are in the lumbar area.

50% of them presented with grade A, another half with grade-B, only one case presented with grade-C.

Cord Compression: In our analysis, which included 45 instances, cord compression was the most frequent cord damage.

The majority of them received grades of A or B in the cervico-dorsal region and a D in the lumbar

region. At the time of discharge, 40% of the patients had improved neurological status.

Cord Transection: In our study, cord transection was noted in 5 cases - 3 in the cervical and 2 in the dorsal region accounting for 4.3% of the total cord injuries. All patients presented with grade-A ASIA score at admission.

Syrinx: Mean interval between the injury and onset of syrinx in his study was 38.8 months.

Epidural Hematoma: Epidural hematoma was noted in 18 cases. In 18 cases, 5 were associated with skeletal injuries with cord injury and 12 were associated with both cord and skeletal injuries.

Ligament Injuries: Among the ligaments involved, posterior ligamentous complex was commonly involved than anterior longitudinal ligament and posterior longitudinal ligaments. On MRI, anterior longitudinal ligament injury was

noted in 21 cases; posterior longitudinal ligament in 16 cases; posterior ligamentous complex in 26 cases.

Other Findings

In 27 cases, paraspinal soft tissue damage was identified. Soft tissue injury can be more easily detected with MRI, particularly the STIR sequence. 85 patients were treated; 56 (65.8%) underwent surgery, and 29 (34.11%) received conservative care. The operative cases included 28 cervical, 15 dorsal, and 13 lumbar instances. On MRI, intervertebral disc was involved in 6 cases whereas in surgery in 5 cases (sensitivity 100%, positive predictive value (83.3%).

In anterior approach, vertebral body injury was noted in 17 cases which were confirmed on surgery

[9] (100% sensitivity, 100% positive predictive value). Posterior element injury was noted in 8 cases on MRI whereas in surgery through posterior approach, posterior element fracture was noted in 11 cases (72.7% sensitivity, 100% positive predictive value).

Positive predictive value of MRI in detecting the skeletal injuries was 100%.

Positive predictive value of MRI in detecting the ligamentous injuries: Anterior longitudinal ligament: 68.75%, Posterior longitudinal ligament: 100%, Ligamentum flavum: 85.7%, Interspinous ligament: 81.8% Positive predictive value of MRI in diagnosing ligamentous injuries

Positive predictive value of MRI in detecting the disc injuries-83.3%.

Table 7: Positive predictive value in detecting ligamentous injuries

Sensitivity of MRI	Present study	Zhuge at al (8)
ALL injury	100 %	100 %
PLL injury	100 %	80 %
Ligamentum flavum	75 %	80 %
Interspinous ligament injury	100 %	100 %
Intervertebral disc	100 %	100 %

Conclusion

85 patients with spinal trauma had their MRI features examined, and in situations where it was possible, imaging results were associated with both the surgical results and the neurological outcome as measured by the ASIA score. The age range for the cohort was 11 to 80 years old, with a mean age of 45 years. There were more men than women (males - 65, females - 20). The cervical spine was most frequently injured (in 52.9% of cases); falls from heights and motor vehicle accidents were the most frequent causes of spinal damage. Cord edema had a better prognosis than cord compression and hemorrhage; cord transection and hemorrhage resulted in a worse neurological outcome. Cord compression and hemorrhage were the most frequent manifestations of cord injuries. The majority of skeletal injuries could be found by MRI, however posterior element fractures had a lower sensitivity (72.7% sensitivity).

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