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Original Research Article

Low tesla MRI in acute spinal injuries: a study in a teaching hospital

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ABSTRACT

Background: Early detection of spinal cord lesions in patients of suspected acute spinal injury leads to better prognosis. MRI has become a standard technique for evaluating spinal injuries and especially helpful for diagnosing acute compression of the spinal cord and cord oedema. This study was conducted to evaluate the low tesla MRI findings in cases of suspected acute spinal injuries.
Methods: 120 patients with a suspected history of spinal injury who came into the emergency ward of our hospital were included into the study. MRI was done for all the patients within 2 days of admission.
Results: The most common age group to be affected was 21-40 years with 48%followed by 41-60 years with 34% being affected. 46% of the patients had cervical injuries, 24% had dorsolumbar and lumbar injuries were seen in 17% of the patients. Spinal cord injuries was seen in 73 of the patients, out of which 64 patients had cord edema,7 with cord haemorrhage and 2 had cord transection.
Conclusions: 0.3T MRI was able to identify cord compression and swelling, traumatic disc herniation's, epidural hematoma, soft tissue injuries, and prevertebral/paravertebral hematoma, while MR imaging was unsatisfactory in identifying small fractures especially of posterior elements.

Keywords: Low tesla MRI, Spinal cord injury, Trauma

INTRODUCTION

An acute injury is an injury that occurred recently. Injury to the bony spine can be considered acute if it has occurred within 3 weeks, as during this period most fractures behave like fresh fractures.[1] These injuries are important because they cause damage to the spinal cord even on more than one site. The most frequent cause of acute injury is trauma such as motor vehicle accidents, sports, accidents at work and falls at home.[2] In most countries, acute spinal cord injury occurs at an annual rate of 20-40 persons per million causing neural deficit and physical impairment.[3]

Early detection of spinal cord lesions in patients of suspected acute spinal injury leads to better prognosis. The imaging technique routinely used includes computed tomography and myelography along with conventional radiology, but these however cannot directly demonstrate changes in spinal cord.

CT scan is done for detailed evaluation, it helps in clear visualization of bone injuries and undetected non - displaced fractures of neural arch, clear information of free bony fragments in spinal canal which need surgical intervention, however evaluation spinal cord is not possible with CT and that of ligamentous injuries is suboptimal. Magnetic resonance has been able to demonstrate a variety of spinal cord abnormalities including hemorrhage, edema, cyst and myelomalacia in traumatized patient.[4]

There are two distinct group of patients populations for which MR imaging is indicated for defining spinal pathologies responsible for neural compromise, analyzing epidural, intradural extra medullary and intra medullary space, clear visualization of soft tissue (ligamentous and muscular) injuries, visualizing bone marrow abnormalities. One consists with patients with negative radiograph and negative CT who have neurological symptoms or persistent neck pain. The other population consists of patients with fracture or unstable injury on radiograph or CT.[4]

MR Imaging is significantly better than CT in assessment of damage to Anterior, Posterior and Interspinous ligaments5. It is also superior to CT in depicting chronic changes like end plate marrow changes, disc spondylosis, canal stenosis and focal disc herniation.[6]

Now a days, MRI has become a standard technique for evaluating spinal injuries and especially helpful for diagnosing acute compression of the spinal cord and cord oedema.

This study was conducted to evaluate the Low Tesla MRI findings in cases of suspected acute spinal injuries.

METHODS

This prospective study was conducted in the Department of Radiodiagnosis, Krishna Institute of Medical Sciences; Karad, Maharashtra, India. 120 patients with a suspected history of spinal injury who came into the emergency ward of our hospital were included into the study. The procedure and the nature of the study were carefully explained to the patients and their relatives and informed consent was taken.

Patients with cardiac pacemaker, prosthetic heart valves, cochlear implants on any metallic orthopedic implants, pregnant ladies and patients with previous history of surgery in the injured spine, infections and neoplasms were excluded from the study.

General demographics were taken for all the patients and all of them were subjected to total physical and clinical examination. A brief clinical history with importance to mode of trauma, neurological deficit, and any other associated chest and abdominal injuries were noted. Correlation with the general examination, local examination findings, and relevant investigation (radiographs) was done. MRI was done for all the patients within 2 days of admission.

In cases where suspicion of listhesis, radiographs were done following MRI to see for superior and articular processes. In cases where marrow oedema was noted without fracture line on MRI or suspicion of unstable fracture, CT was done.

Axial T1W and T2W; Sagittal T1W, T2W and STIR; Coronal T2W with STIR where necessary were the MRI sequences used.

RESULTS

Of 120 patients included in the study, the most common mode of injury was a fall from height in 63% of the cases followed by road traffic accidents in 37% of the cases (Figure 1).

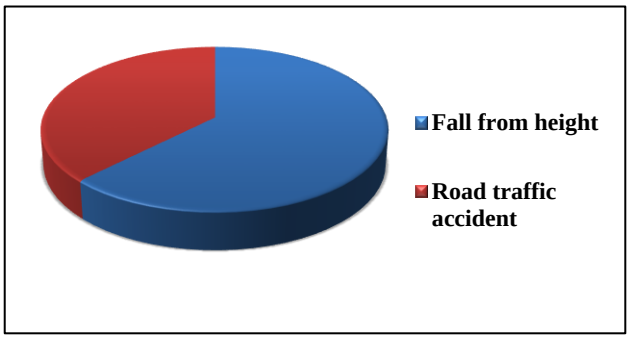

Figure 1: Mode of injury.

86 (72%) patients were makes and 34 (28%) were females.

The most common age group to be affected was 21- 40 years with 57 (48%) followed by 41-60 years with 41 (34%) being affected.

Table 1: Distribution of patients according to age.

Age Group	No of Patients
1-20	3 (2%)
21-40	57 (48%)
41-60	41 (34%)
61-80	19 (16%)

55 patients (46%) had cervical injuries, 29 (24%) had dorsolumbar and lumbar injuries were seen in 20 (17%) of the patients (Figure 2).

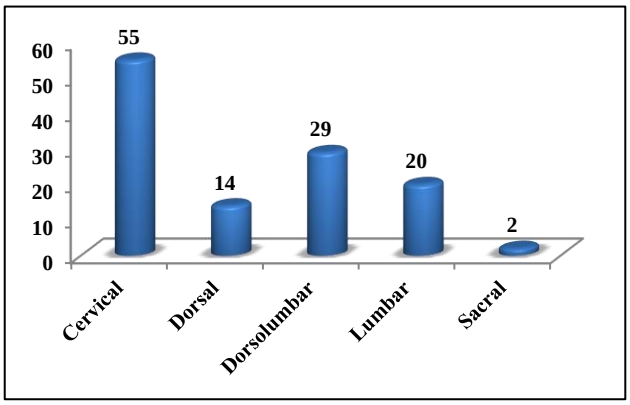

Figure 2: Site of injuries.

Spinal cord injuries was seen in 73 (60%) of the patients, out of which 64 patients had cord edema, 7 (12%) with cord hemorrhage and 2 (2%) had cord transection. Canal Compromise was seen in 57 (48%) patients, out of which 12 (21%) were due to disc herniation and 45 (79%) were due to retro pulsed fracture fragment. Of 55 patients of cervical injury in our study 15 (29%) had injury to upper cervical spine. Hematoma and soft tissue injury was seen in 60 patients (Table 2).

Table 2: Type of injuries.

Type of injuries	Number	Percentage
Spinal cord	73	60%
Cord edema	64	86%
Cord hemorrhage	7	12%
Cord Transection	2	2%
Canal compromise	57	48%
Disc herniation	12	21%
Retropulsion	45	79%
Hematoma and soft tissue	60	50%
Epidural	13	26%
Prevertebral	15	30%
Paravertebral	5	10%
Posterior spinal muscle injury	27	54%

DISCUSSION

High-field strength imaging is generally considered to produce high quality images that are preferred by readers in image quality assessment; however production of high quality image does not generally translate into greater diagnostic accuracy.[7]

In our study, the most common age group affected was between 21 to 60yrs of age (81%). Males were the most affected sex (71%). These characteristics were similar to other previously published studies. In a study of 465 spine trauma patients, Rahman et al observed that most (56%) patients were young, in the age range of 21 to 40 years with a male to female ratio of 5:18. In yet another study by Lenehan et al, traumatic injury was the leading cause of morbidity and mortality among the younger adult population, with 60% of injuries occurring inpatietns under 40 years of age. Most common gender affected in this study was also males.

Similarly in a study of 942 Irish patients with spinal fractures and/or cord injury, Lenehan et al. reported that traumatic injury is the leading cause of death and long term morbidity in the young adult population; spinal column and cord injury being an important cause of morbidity among them, with 60% of injuries occurring in those under 40 years of age. Males are consistently at a higher risk across all etiologies of spinal injury.[9] Similar was the case in another study by Wyndaele et al.[10]

The most common mode of trauma in our study population was fall from height (62%), followed by road traffic accident (RTA) (37%). This finding was also consistent with other similar studies on Indian population. Gupta N et al observed that fall from height was the leading cause (25%), followed by road traffic accidents (17.4%). This can be explained, as the majority of the patients in the study were manual workers as compared to western countries where manual work is less.[11]

In our study, the stratification of spinal injury by level of injury revealed that, the cervical spine was the most commonly affected (45%), followed by the dorsolumbar (24%), lumbar (16%), and the dorsal (11%) spine. Similar results were seen in the case in the studies by Lenehan et al and Rahman et al.

The spinal cord injury, caudaequina or root injury was seen in 73 (60%) patients in the present study, amongst which cord oedema in 64 (86%), haemorrhage in 7 (12%), epidural hematomas 13 (11%), and posterior ligamentous disruption, which corresponded with the study by Khandelwal et al, who done 60 consecutive patients of cervical spine injuries on 0.3 T2. In another study by Flanders et al on 78 patients, 91% cord injuries was reported.[12] The most common injury pattern in this case was simple cord edema seen in 63% of the cases, while in our study it was 85%. Cord oedema was highest in patients with fractures of the cervical spine, independent of accident mechanism, and lowest in thoracolumbar junction fractures.[13]

CONCLUSION

MRI is non-invasive modality having high sensitivity, specificity and accuracy in the diagnosis of spinal injuries. We found that 0.3T MRI was able to identify cord compression and swelling, traumatic disc herniations, epidural hematoma, soft tissue injuries, and prevertebral/paravertebral hematoma, while MR imaging was unsatisfactory in identifying small fractures especially of posterior elements, as many of the times only marrow oedema was seen and fracture line could not be demonstrated.

Hence, we suggest that the low field imaging is an alternative to high field imaging in diagnosing acute spinal injuries, especially in cord injuries.

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Ethical approval: The study was approved by the institutional ethics committee

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