[Al-Azhar International Medical Journal](https://aimj.researchcommons.org/journal)

Volume 4 | Issue 11 Article 7

2023
Section: Radiology & Radiodiagnosis

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How to Cite This Article
Rady, Ahmed F.; Maklad, Salah M.; and Yousef, Hazem A. (2023) "Role of CT in Assessment of Spinal Injuries in Trauma Patients," *Al-Azhar International Medical Journal*: Vol. 4: Iss. 11, Article 7.
DOI: https://doi.org/10.58675/2682-339X.2085

ORIGINAL ARTICLE

Role of Computed Tomography in the Assessment of Spinal Injuries in Patients with Trauma

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Abstract

Background: **Trauma of the spine weighs heavily on the social and economic development of our society. Multidetector computed tomography (MDCT) scan clearance of the spine does not result in greater radiation exposure. Accurate evaluation of the thoracolumbar spine is possible with targeted image reconstruction with a sensitivity and specificity of spinal fracture detection of 98 and 97 %, respectively.**

Purpose: **The aim of the study was: (a) to evaluate the diagnostic validity of MDCT in the assessment of spinal injuries in trauma patients and (b) to determine the type and degree of spinal fractures.**

Patients and methods: **A prospective study included 70 patients with traumatic spinal injuries examined with an MDCT scan.**

Results: **The part of the spine affected in 21 (30 %) was lumbar, 20 (28.6 %) cervical, 12 (17.1 %) dorsal, in eight (11.4 %) was no spine fractures, two (2.9 %) was dorsal and sacral, two (2.9 %) was cervical−dorsal, two (2.9 %) was lumbosacral, two (2.9 %) was lumbar-dorsal, and one (1.4 %) was coccygeal. Regarding the number of vertebrae affected, there were 60 (85.7) spine fractures and 10 (14.3 %) had no spine fractures. The most affected vertebrae were L1 12 (17.1 %), L2 five (7.1 %), and C5 four (5.7 %). Regarding the complementary MRI study, 20 (28.6 %) had complementary MRI, 12 (17.1 %) were cervical, six (8.6 %) were lumbar, and two (2.9 %) were dorsal.**

Conclusion: **As CT technology has evolved, the bone anatomy is better visualized in CT, and whole-body MDCT scan has become an integral part of the initial assessment of many injured posttraumatic patients. Considering the severity of trauma, CT shows accurate and faster ways to evaluate spinal trauma and its type and grading, which has an impact on appropriate management. It is also the most cost-effective; complementary MRI is useful in detecting spinal cord and ligamentous injuries.**

Keywords: Complementary MRI, Fracture types, Multidetector computed tomography, Spinal trauma, Spine fractures

1. Introduction

Injury of the spine weighs intensely on the financial plan of social and monetary improvement of our general public. It is estimated that there are 15−40 cases of paraplegia per million people in the United States each year, with 12 000 cases of paraplegia, 4000 deaths before admission, and 1000 deaths during hospitalization.[1]

The majority of spinal injuries are caused by sports injuries and road traffic accidents. Wounds in this locale might deliver neurological deformities, some of the time serious and lethal. When it comes to detecting spinal fractures, computed tomography (CT) has excellent sensitivity, specificity, and diagnostic accuracy. The use of multidetector computed tomography (MDCT) has taken on particular significance in recent years. It helps diagnose injuries to hollow or solid organs and quickly delineates a patient's anatomy.[2]

A spinal cord injury typically occurs when a sudden, traumatic impact fractures or dislocates vertebrae in the spine. The essential injury of the spinal line happens when dislodged bone sections,

Accepted 24 June 2023.
Available online 22 January 2024

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https://doi.org/10.58675/2682-339X.2085

plate materials, as well as tendons injury or attack the spinal string tissue. Cracks of the thoracolumbar spine address 90 % of every spinal break, trailed by cervical and lumbar spine fractures.[3]

CT is the investigation of a decision when injury of the cervical spine is thought. Multiplanar reformatted sagittal and coronal reproductions give great pictures that improve interpretation.[4]

EAST (eastern relationship for the medical procedure of injury) proposes with level 2 proposals that patients with back torment, thoracolumbar spine delicacy, adjusted mental status, inebriation, diverting wounds, or thought high-energy injury ought to be evaluated for thoracolumbar spine delicacy injury with a CT scan.[5]

Vertebral breaks can be characterized by wedge, (bi) sunken, or pulverized cracks or by the instrument of injury (flexion pressure, pivotal pressure, flexion interruption, or rotational break disengagement lesions).[6]

2. Patients and methods

2.1. Study design and setting

This study was done in the department of Diagnostic Radiology, Aswan University Hospital, The research ethics committee was accepted the start of the research.

In this cross-sectional study, 70 patients with a history of road traffic accidents or falling from heights were enrolled for ~6–9 months. With suspected posttraumatic spinal injuries, a Toshiba 160 MD-CT scanner was used in the Radiology Department at Aswan University Hospitals.

Criteria for study group inclusion: patients who have suffered a traumatic event and are concerned about having spinal injuries (such as from a road traffic accident or a fall from a height) for people of any age and sex. Group exclusion criteria: pregnancy, marked patient irritability, declining informed consent, and severe renal impairment are all CT contraindications. The eligible participants in this study will be subjected to the following. Pre-imaging: all patients were exposed to definite history taking including orientation, age, etiology, span of stay in the emergency clinic (hospitalization), and seriousness of injury. Airway, breathing/oxygenation, and circulation are the ABCs for trauma evaluation. Clinical assessments include imperative signs (temperature, beat, pulse) and frameworks assessments were finished for all members. Preparing the patient: eliminate all metal items that might cloud the field of view. Ensure that the patient remains still throughout the scan. CT strategy: 42 patients were exposed to CT in all spine tests. A cervical spine CT examination was performed on 11 patients. Four patients underwent a CT dorsal spine examination. A cervical spine CT examination was performed on 11 patients. The patient was positioned in a supine position during Toshiba 160 MDCT examinations. MDCT in pivotal cuts with posthandling renewal in coronal and sagittal planes with no difference organization. Procedure for the examination: 120 KVp, 110–220 mA, a 2 mm slice thickness, a 25 cm field of view, a matrix size of 512×512, and a supine position with a pitch factor of 1–1.5 are the parameters. Rendering of 3D volumes in the bone window. The pictures were sent to the Marco Pacs, California, USA, picture archiving and communication system (PACS). Contrast CT scans of the abdomen and pelvis were performed on four patients. MDCT (Toshiba, Otawara, Tochigi, Japan, 160-slice MDCT) in axial cuts with coronal and sagittal plane postprocessing reformation. Postcontrast organization arterial, venous, and deferred stages. Procedure for the examination: supine position with both arms raised, abdomen centered in the gantry, and tube voltage: less than or equal to 120 kVp, scout: over the stomach to the lesser trochanter, examine degree: vascular phase: iliac crest to the diaphragm. Venous stage: over the stomach to the symphysis, check course: field of view, craniocaudal: 350 mm, cut thickness: 0.75 mm, spacing: 0.5 mm, contrast volume: 70–100 ml (0.1 ml/kg) with a 30–40 ml saline chaser at 3–5 ml/s, bolus following aorta of the abdomen, arterial phase: negligible output delay, portal venous stage: 30–50 s after the blood vessel stage or 60–80 s after contrast infusion. At long last, the area of injury, vertebral morphology, and break type were accounted for as well as settling on a choice for potential further treatment methodology. Twenty patients underwent a complementary MRI spine examination. Assessments completed on 1.5 T shut radiograph machine (Toshiba Vantage Titan, Japan) at Aswan College emergency clinic body loop in the recumbent position. Geometry scan: space resolution inside the plane: field of view: 0.7×0.7 mm slice thickness: (300–380) (sagittal/coronal) 150–250 (axial) less than or equal to 4 mm. Planning: images sagittally: angulation: volume: parallel to the axis of the spine and the spinous processes incorporate the entire vertebral bodies and the feature joints, cut thickness: less than or equal to 3 mm. Coronal pictures: angulation: lined up with the spinal hub and cross-over processes; volume: includes the spinal canal and posterior laminae as well as the entire vertebral body. Slice thickness: less than or equal to 3 mm. Long-stacked axial images: angulation:

volume, perpendicular to the spine: slice thickness is a variable that depends on the clinical question and/or the visible pathology: less than or equal to 3 mm. Short stacks of axial images: angle: lined up with the intervertebral circles being referred to, cut thickness: less than or equal to 3 mm. Sequences: T1-weighted: technique: fast spin echo in T1. T2-weighted: technique: T2-weighted (fat-saturated) fast spin echo: technique: STIR. The classification of all members confessed to this review was safeguarded to the furthest reaches conceivable. Any reports or publications based on the study's data will include the full name of the study participants. Information gathered from the beginning of time, fundamental clinical assessment, laboratory examinations, and result estimates coded, entered, and dissected utilizing Microsoft Succeed programming. Information was then brought into the Factual Bundle for the Sociologies (SPSS rendition 20.0, USA) programming for investigation. The following tests were used to determine whether or not differences were significant: qualitative data were represented as numbers and percentages, and quantitative data were continued group representations by mean ± SD. Correlation using Spearman's or Pearson's correlation. Mean, SD, and reach for parametric mathematical information, while middle and between quartile range (interquartile range) for nonparametric mathematical information.

3. Results

Table 1 shows that regarding the CT study, there were 42 (60 %) all spine, 11 (15.7 %) cervical, nine (12.9 %) lumbar, four (5.7 %) abdomen and pelvis with contrast, and four (5.7 %) dorsal. Table 2 shows that 20 (28.6 %) had complementary MRI; 12 (17.1 %) were cervical, six (8.6 %) were lumbar, and two (2.9 %) were dorsal. Table 3 shows that there were six (8.6 %) who had peri-vertebral hematoma and 64 (91.4 %) did not have. Table 4 shows that there were 18 (25.7 %) who had a chest injury. Regarding abdominal injury, there were 61 (87.1 %) who were free, six (8.6 %) had query (minimal collection), two (2.9 %) had kidney laceration grade 1, and one (1.4 %) had a retroperitoneal hematoma. Table 5 shows that there were seven (10 %) who had pelvic fractures and 16 (22.9 %) had decreased bone density. Table 6 shows that there were 16 (22.9 %) who had cord injury, 46 (65.7 %) were free, and eight (11.4 %) had query. There were nine (12.9 %)

Table 1. Distribution of the studied cases according to computed tomography study (N = 70).

	n (%)
CT study	
Abdomen and pelvis with contrast	4 (5.7)
Cervical	11 (15.7)
All spine	42 (60.0)
Lumbar	9 (12.9)
Dorsal	4 (5.7)

Table 2. Distribution of the studied cases according to complementary MRI (N = 70).

	n (%)
Complementary MRI	
No	50 (71.4)
Yes	20 (28.6)
Cervical	12 (17.1)
Lumbar	6 (8.6)
Dorsal	2 (2.9)

Table 3. Distribution of the studied cases according to peri-vertebral hematoma (N = 70).

	n (%)
Peri-vertebral hematoma	
No	64 (91.4)
Yes	6 (8.6)

Table 4. Distribution of the studied cases according to chest injury and abdominal injury (N = 70).

	n (%)
Chest injury	
No	52 (74.3)
Yes	18 (25.7)
Lung laceration	5 (7.1)
Lung contusion	2 (2.9)
Lung laceration–pneumothorax	2 (2.9)
Bilateral lung contusion	1 (1.4)
Bilateral mild hemothorax	2 (2.9)
Bilateral minimal hemothorax	1 (1.4)
Bilateral moderate pneumothorax/ lung contusion	1 (1.4)
Lung contusion–pneumothorax–surgical emphysema	2 (2.9)
Right mild pneumothorax	2 (2.9)
Abdominal injury	
No	61 (87.1)
Kidney laceration grade 1	2 (2.9)
Query (minimal collection)	6 (8.6)
Retroperitoneal hematoma	1 (1.4)

Table 5. Distribution of the studied cases according to pelvic fracture and bone density (N = 70).

	n (%)
Pelvic fracture	
No	63 (90.0)
Yes	7 (10.0)
Bone density	
Decreased	16 (22.9)
Normal	54 (77.1)

Table 6. Distribution of the studied cases according to cord injury (N = 70).

	n (%)
Cord injury	
No	46 (65.7)
Yes	16 (22.9)
Query	8 (11.4)
Abnormal high T2 signal edema/contusion	9 (12.9)
Abnormal high T2 signal, edema/contusion/spinal canal stenosis	6 (8.6)
Cord cut	1 (1.4)

Table 7. Distribution of the studied cases according to mode of trauma and spine degenerative changes (N = 70).

	n (%)
Mode of trauma	
RTA	50 (71.4)
FFH	20 (28.6)
Spine degenerative changes	
No	44 (62.9)
Yes	26 (37.1)

FFH, fall from a height; RTA, road traffic accident.

abnormally high T2 signal edema/contusion, six (8.6 %) were abnormally high T2 signal edema/contusion/spinal canal stenosis, and one (1.4 %) were cord cut. Table 7 shows that regarding the mode of trauma, there were 50 (71.4 %) with road traffic accident and 20 (18.6 %) with fall from a height. There were 26 (37.1 %) who had spine degenerative changes and 44 (62.9 %) were free (Tables 8–12).

4. Case presentation

4.1. Case 1

A male patient 50 years old presented from a road traffic accident 7 h ago and pain in moving neck. He was clinically stable and after an orthopedic examination he was suspected of spinal injury and was referred to the Radiology Department for a CT scan (Fig. 1).

4.2. Case 2

A female patient of 67 years old presented by a fall from height 17 h ago and difficulty walking; she was

Table 8. Relation between the type of fracture and different parameters (N = 70).

	Type of fracture [n (%)]		χ^2	P
	No spine fractures (N = 10)	Spine fractures (N = 60)		
CT study				
Abdomen and pelvis with contrast	0	4 (6.7)	5.588	$^{MC}P = 0.158$
Cervical	2 (20.0)	9 (15.0)		
All spine	4 (40.0)	38 (63.3)		
Lumbar	2 (20.0)	7 (11.7)		
Dorsal	2 (20.0)	2 (3.3)		
Part of the spine affected				
No spine fractures	8 (80.0)	0	35.687*	<0.001*
Dorsal and sacral	0	2 (3.3)		
Dorsal	0	12 (20.0)		
Cervical	0	20 (33.3)		
Lumbar	2 (20.0)	19 (31.7)		
Cervical–dorsal	0	2 (3.3)		
Lumbosacral	0	2 (3.3)		
Lumbar–dorsal	0	2 (3.3)		
Coccygeal	0	1 (1.7)		
Number of vertebrae affected				
No spine fractures	10 (100.0)	0	70.0*	$^{FE}P<0.001$*
Spine fractures	0	60 (100.0)		
Complementary MRI				
No	10 (100.0)	40 (66.7)	4.667	$^{FE}P = 0.053$
Yes	0	20 (33.3)		
Clinical status				
Unstable	0	7 (11.7)	1.296	$^{FE}P = 0.582$
Stable	10 (100.0)	53 (88.3)		
Sensory affection				
No	10 (100.0)	42 (70.0)	4.038	$^{FE}P = 0.054$
Yes	0	18 (30.0)		

Table 9. Relation between the type of fracture and different parameters (N = 70).

	Type of fracture [n (%)]		χ^2	P
	No spine fractures ($N = 10$)	Spine fractures ($N = 60$)		
Peri-vertebral hematoma				
No	10 (100.0)	54 (90.0)	1.094	$^{FE}P = 0.583$
Yes	0	6 (10.0)		
Chest injury				
No	8 (80.0)	44 (73.3)	0.199	$^{FE}P = 1.000$
Yes	2 (20.0)	16 (26.7)		
Abdominal injury				
No	10 (100.0)	51 (85.0)	1.402	$^{MC}P = 0.737$
Kidney laceration grade 1	0	2 (3.3)		
Query (minimal collection)	0	6 (10.0)		
Retroperitoneal hematoma	0	1 (1.7)		
Pelvic fracture				
No	10 (100.0)	53 (88.3)	1.296	$^{FE}P = 0.582$
Yes	0	7 (11.7)		
Bone density				
Decreased	2 (20.0)	14 (23.3)	0.054	$^{FE}P = 1.000$
Normal	8 (80.0)	46 (76.7)		
Cord injury				
No	10 (100.0)	36 (60.0)	5.248	$^{MC}P = 0.044$
Yes	0	16 (26.7)		
Query	0	8 (13.3)		
Mode of trauma				
RTA	5 (50.0)	45 (75.0)	2.625	$^{FE}P = 0.135$
FFH	5 (50.0)	15 (25.0)		
Spine degenerative changes				
No	8 (80.0)	36 (60.0)	1.469	$^{FE}P = 0.303$
Yes	2 (20.0)	24 (40.0)		

FFH, fall from a height; RTA, road traffic accident.

clinically stable and after an orthopedic examination, she was suspected as spinal injury and was referred to the Radiology Department for a CT scan (Fig. 2).

5. Discussion

Trauma patients frequently present with spinal injuries, which can be fatal if not detected quickly.[7] Sports injuries and road traffic accidents account for the majority of spinal injuries. CT plays an essential role in the rapid assessment of trauma patients because injuries in this region may result in neurologic defects that can be severe or fatal.[7] Injuries to the spinal cord are a leading cause of disability. Besides, patients with TSCI have a higher lethality than the ordinary populace.[8]

New-age MDCT scanners permit quick filtering time, work on transient and spatial goals, diminished picture commotion, more effective X-beam tube use, and isotopic recreation. The symptomatic exactness of the assessment expanded; however, it is balanced by an expansion in radiation dosage.[8]

The purpose of this study was to exhibit the job of figured tomography (CT) as a demonstrative methodology in the location of post-horrible spinal wounds and deciding the sort and level of spinal cracks.

In the current study, 59 (84.3 %) of the participants were male and 11.7 % were female. Their mean age was 38.20 ± 16.35 with a range of 4.0–85.0. There were 42 (60 %) CT scans of the entire spine, 11 (15.7 %) of the cervical, 12 (12.9 %) of the lumbar, four (5.7 %) of the abdomen and pelvis with contrast, and four (5.7) of the dorsal. Age and sex were not significantly different between the spinal ligamentous injury categories. These results were consistent with those of Aly et al.,[9] whose findings indicated that 83 % were male. In terms of age, there was a statistically significant difference between the studied groups but a sex difference that was statistically insignificant. Khurana et al.[10] found that 60 % (63/105) of the men (median age 42, range 17–93) and 40 % (42/105) of the women (median age 62, range 17–93) were male, which is consistent with our findings.

Table 10. Relation between the part of the spine affected and demographic data (N = 70).

Demographic data	Part of the spine affected [n (%)]									Test of significance	P
	No spine fractures (N = 8)	Dorsal and sacral (N = 2)	Dorsal (N = 12)	Cervical (N = 20)	Lumbar (N = 21)	Cervical–dorsal (N = 2)	Lumbo-sacral (N = 2)	Lumbar-dorsal (N = 2)	Coccygeal (N = 1)		
Sex											
Male	6 (75.0)	2 (100)	12 (100)	20 (100)	15 (71.4)	2 (100)	0	1 (50.0)	1 (100)	$\chi^2 = 19.293$	$^{MC}P = 0.003$
Female	2 (25.0)	0	0	0	6 (28.6)	0	2 (100)	1 (50.0)	0		
Age											
Minimum–maximum	4.0–52.0	24.0–24.0	25.0–62.0	18.0–50.0	18.0–67.0	40.0–40.0	32.0–32.0	30.0–85.0		$F = 1.590$	0.147
Mean ± SD	29.6 ± 18.9	24.0 ± 0.0	41.2 ± 12.3	35.7 ± 11.3	43.3 ± 18.9	40.0 ± 0.0	32.0 ± 0.0	57.5 ± 38.9	14.0		
Median	34.0	24.0	40.0	40.0	46.0	40.0	32.0	57.50			

According to the findings of this study, the affected portion of the spine consisted of 21 (30 %) of the lumbar region, 20 (28.6 %) of the cervical region, 12 (17.1 %) of the dorsal region, eight (11.4 %) of the no spine fracture region, two (2.9 %) of the dorsal and sacral region, two (2.9 %) of the cervical–dorsal region, two (2.9 %) of the lumbosacral region, and two (2.9 %) of Aly et al.[9] reported that thoracolumbar (67.3 %), thoracic (T1–T9), and lumbar (L3–L5) fractures were the most common levels. According to Fatehi et al.,[11] the most common injury site for males was the thoracic vertebra, followed by the lumbar vertebra, while the most common injury site for females was the lumbar vertebra, followed by the thoracic vertebra. The impairment ASIA scale of E (normal) was used by 26.2 % of the patients, followed by the impairment ASIA scale of B (23.3 %). The extended length of hospitalization for the two guys and females was short of a multi-week followed by over about a month.

In terms of the number of affected vertebrae, our current findings showed that there were 60 (85.7 %) spine fractures and 10 (14.3 %) none. The most impacted vertebrae were L1 12 (17.1 %), L2 five (7.1 %), and C5 four (5.7 %). Aly et al.[9] outlined that in regard to the number of cracks, there were 176 (67 %) single-level, 44 (16.7) of staggered bordering, and 43 (16.3) of staggered noncontiguous.

We found that 20 (28.6 %) had complementary MRI in the current study; 12 (or 17.1 %) were cervical, six (or 8.6 %) were lumbar, and two (or 2.9 %) were dorsal. According to Khurana et al.,[10] the median time between the CT and MRI was one day (mean 0.8, range 0–3 days), and 85 % of MRIs were carried out within the first 48 h of the CT.

In the current investigation, we discovered that there were 63 (90 %) who had stable clinical status and seven (10 %) were shaky. Eighteen (25.7 %) had sensory affection, while 74.3 % (52) did not. In keeping with Aly et al.,[9] this was the case who stated that 85 % of patients had neurologically intact conditions, while 15 % had neurological deficits.

Our ongoing findings concerning the kind of crack uncovered that there were 60 (85.7). Spine breaks and 10 (14.3 %) had no spine cracks. Burst 16 (22.9 %), compression fracture six (8.6 %), compression five (7.1 %), and flexion distraction four were the most common types. According to Bush et al.,[12] the majority of injuries involved fractures of the vertebral body and the spinous/transverse process.

Six patients, or 8.6 %, had peri-vertebral hematoma, while 64 people (91.4 %) did not. Seven (10 %) people broke their pelvis, and 16 (22.9 %) people had less bone density. According to Lau et al.,[13] bilateral facet dislocation was associated with disk

Table 11. *Relation between part of the spine affected and different parameters (N = 70).*

	Part of the spine affected [*n* (%)]									χ^2	^{MC}p
	No spine fractures (*N* = 8)	Dorsal and sacral (*N* = 2)	Dorsal (*N* = 12)	Cervical (*N* = 20)	Lumbar (*N* = 21)	Cervical−dorsal (*N* = 2)	Lumbo-sacral (*N* = 2)	Lumbar-dorsal (*N* = 2)	Coccygeal (*N* = 1)		
CT study											
Abdomen and pelvis with contrast	0	2 (100)	0	0	2 (9.5)	0	0	0	0	58.064	<0.001
Cervical	2 (25.0)	0	2 (16.7)	5 (25.0)	0	2 (100)	0	0	0		
All spine	4 (50.0)	0	8 (66.7)	15 (75.0)	12 (57.1)	0	0	2 (100)	1 (100)		
Lumbar	0	0	0	0	7 (33.3)	0	2 (100)	0	0		
Dorsal	2 (25.0)	0	2 (16.7)	0	0	0	0	0	0		
Number of vertebrae affected											
No spine feractures	8 (100)	0	0	0	2 (9.5)	0	0	0	0	35.687	<0.001
Spine feractures	0	2 (100)	12 (100)	20 (100)	19 (90.5)	2 (100)	2 (100)	2 (100)	1 (100)		
Complementary MRI											
No	8 (100)	2 (100)	10 (83.3)	8 (40.0)	15 (71.4)	2 (100)	2 (100)	2 (100)	1 (100)	14.463	0.027
Yes	0	0	2 (16.7)	12 (60.0)	6 (28.6)	0	0	0	0		
Clinical status											
Unstable	0	0	2 (16.7)	4 (20.0)	0	0	0	0	1 (100)	11.890	0.103
Stable	8 (100)	2 (100)	10 (83.3)	16 (80.0)	21 (100)	2 (100)	2 (100)	2 (100)	0		
Sensory affection											
No	8 (100)	2 (100)	9 (75.0)	12 (60.0)	17 (81.0)	0	2 (100)	1 (50.0)	1 (100)	11.722	0.095
Yes	0	0	3 (25.0)	8 (40.0)	4 (19.0)	2 (100)	0	1 (50.0)	0		
Peri-vertebral hematoma											
No	8 (100)	2 (100)	12 (100)	18 (90.0)	19 (90.5)	0	2 (100)	2 (100)	1 (100)	12.734	0.069
Yes	0	0	0	2 (10.0)	2 (9.5)	2 (100)	0	0	0		
Chest injury											
No	6 (75.0)	0	7 (58.3)	15 (75.0)	19 (90.5)	2 (100)	2 (100)	1 (50.0)	0	13.385	0.045
Yes	2 (25.0)	2 (100)	5 (41.7)	5 (25.0)	2 (9.5)	0	0	1 (50.0)	1 (100)		
Abdominal injury											
No	8 (100)	0	10 (83.3)	18 (90.0)	19 (90.5)	2 (100)	2 (100)	2 (100)	0	42.978	0.010
Kidney laceration grade 1	0	2 (100)	0	0	0	0	0	0	0		
Query (minimal collection)	0	0	2 (16.7)	2 (10.0)	2 (9.5)	0	0	0	0		
Retroperitoneal hematoma	0	0	0	0	0	0	0	0	1 (100)		

Table 12. Relation between part of the spine affected and different parameters (N = 70).

	Part of the spine affected [n (%)]									χ^2	^{MC}p
	No spine fractures (N = 8)	Dorsal and sacral (N = 2)	Dorsal (N = 12)	Cervical (N = 20)	Lumbar (N = 21)	Cervical–dorsal (N = 2)	Lumbo-sacral (N = 2)	Lumbar-dorsal (N = 2)	Coccygeal (N = 1)		
Pelvic fracture										29.766	<0.001
No	8 (100)	0	12 (100)	20 (100)	20 (95.2)	2 (100)	0	1 (50.0)	0		
Yes	0	2 (100)	0	0	1 (4.8)	0	2 (100)	1 (50.0)	1 (100)		
Bone density										3.333	0.975
Decreased	2 (25.0)	0	3 (25.0)	4 (20.0)	6 (28.6)	0	0	1 (50.0)	0		
Normal	6 (75.0)	2 (100)	9 (75.0)	16 (80.0)	15 (71.4)	2 (100)	2 (100)	1 (50.0)	1 (100)		
Cord injury										28.674	0.003
No	8 (100)	2 (100)	7 (58.3)	8 (40.0)	17 (81.0)	0	2 (100)	1 (50.0)	1 (100)		
Yes	0	0	2 (16.7)	10 (50.0)	4 (19.0)	0	0	0	0		
Query	0	0	3 (25.0)	2 (10.0)	0	2 (100)	0	1 (50.0)	0		
Mode of trauma										16.178	0.011
RTA	3 (37.5)	2 (100)	12 (100)	16 (80.0)	11 (52.4)	2 (100)	2 (100)	1 (50.0)	1 (100)		
FFH	5 (62.5)	0	0	4 (20.0)	10 (47.6)	0	0	1 (50.0)	0		
Spine degenerative changes										6.888	0.557
No	6 (75.0)	2 (100)	9 (75.0)	10 (50.0)	11 (52.4)	2 (100)	2 (100)	1 (50.0)	1 (100)		
Yes	2 (25.0)	0	3 (25.0)	10 (50.0)	10 (47.6)	0	0	1 (50.0)	0		

FFH, fall from a height; RTA, road traffic accident.

rupture/herniation and epidural hematoma ($P = 0.020$, odds ratio 16.13, $P = 0.017$, and odds ratio 10.62, respectively), while unilateral facet dislocation was associated with bone edema without a fracture ($P = 0.019$, odds ratio 5.25).

In this study, we found that 25.7 % of the 18 had a chest injury. Five (7.1 %) had lung cut, two (2.9 %) had lung injury, two (2.9 %) had lung gash pneumothorax, two (2.9 %) had respective gentle hemothorax, two (2.9 %) had lung wound–pneumothorax, careful emphysema, two (2.9 %) had right gentle pneumothorax, one (1.4 %) had two-sided lung injury, one (1.4 %) had reciprocal negligible hemothorax, and one (1.4 %) had reciprocal moderate pneumothorax/lung injury. Six (8.6 %) had query (minimal collection), two (2.9 %) had a kidney laceration of grade 1, and one (1.4 %) had a retroperitoneal hematoma, all of which were abdominal injuries. Aly et al.[9] demonstrated that 128 (49) individuals did not have polytrauma and 135 (51 %) had polytrauma.

Sixteen people (22.9 %), had a cord injury, 46 (65.7 %) people, were free, and eight people, or 11.4 %, had a question. There were nine (12.9 %) unusually high T2 signal edema/wound, six (8.6 %) were usually high T2 signal edema/injury/spinal trench stenosis, and one (1.4 %) were line cut. According to Bush et al.,[12] the rate of associated spinal cord injury ranged from 1 % in sober individuals to 3.8 % in drug-intoxicated individuals. The sober and intoxicated groups had similar rates of CSI and types of CSI.

Our outcomes concerning the method of injury uncovered that there were 50 (71.4 %) with road traffic accident and 20 (18.6 %) with fall from a height. Twenty-six (37.1 %) had degenerative changes in the spine, while 64.9 % were healthy. Aly et al.[9] reported similar outcomes and expressed that the most well-known injury system was street car crash (70 %), tumble from a level (21 %), and self-destructive leap (4 %). According to Su et al.,[8] 113 (68.48 %) were fall from a height, while 52 (31.52 %) were involved in a traffic accident. Fatehi et al.[11] concur with our findings in that they expressed that there was a genuinely tremendous distinction between sexes in etiology ($P = 0.001$). Auto collision (44.6 %) and tumbling from level (29.8 %) were the most well-known etiology.

In the ongoing investigation, we discovered that there was an exceptionally genuinely tremendous distinction between spinal ligamentous injury classifications concerning corresponding radiograph, clinical status, and tactile warmth. Aly et al.,[9] in agreement with our findings, demonstrated a significant ($P = 0.001$) difference in the degree of injury between the studied groups. In terms of the number

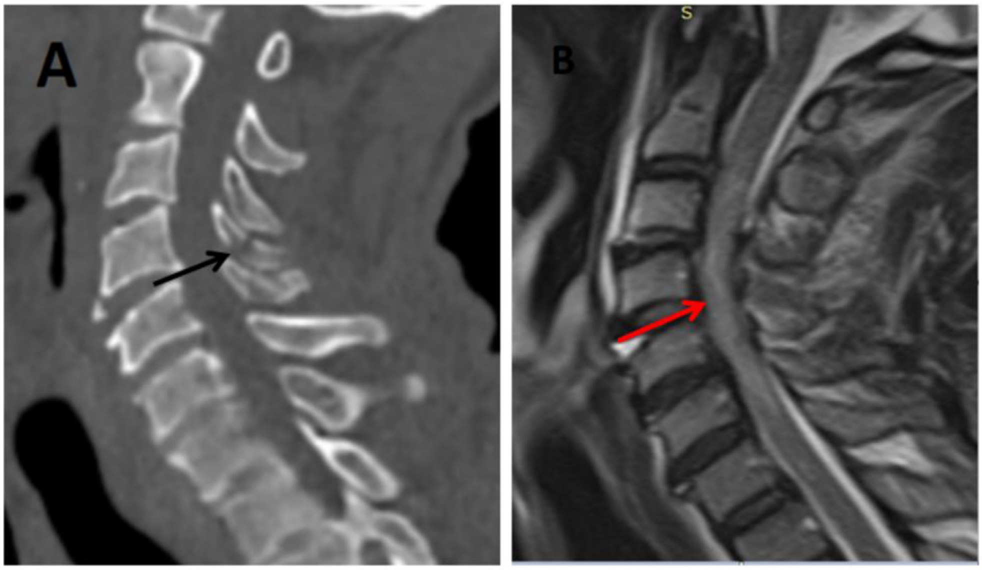

Fig. 1. (a) CT scan of cervical spine, sagittal view, bone window: shows nondisplaced fracture of C4 spinous process (black arrow). (b) MRI scan of cervical spine, sagittal view, T2 sequence: shows abnormally high T2 signal of the spinal cord (red arrow) (suggesting cord edema or contusion) with obliteration of the subarachnoid space around the spinal cord denoting secondary canal stenosis. CT, computed tomography.

of fractures, there was a statistically significant difference between the studied groups ($P = 0.031$).

In the current investigation, we discovered that there was a genuinely tremendous distinction between spinal ligamentous injury classes with respect to chest injury, stomach injury, and method of injury. Aly et al.[9] demonstrated that there was a statistically significant ($P = 0.03$) distinction between the studied groups regarding polytrauma, but that there was a statistically insignificant distinction

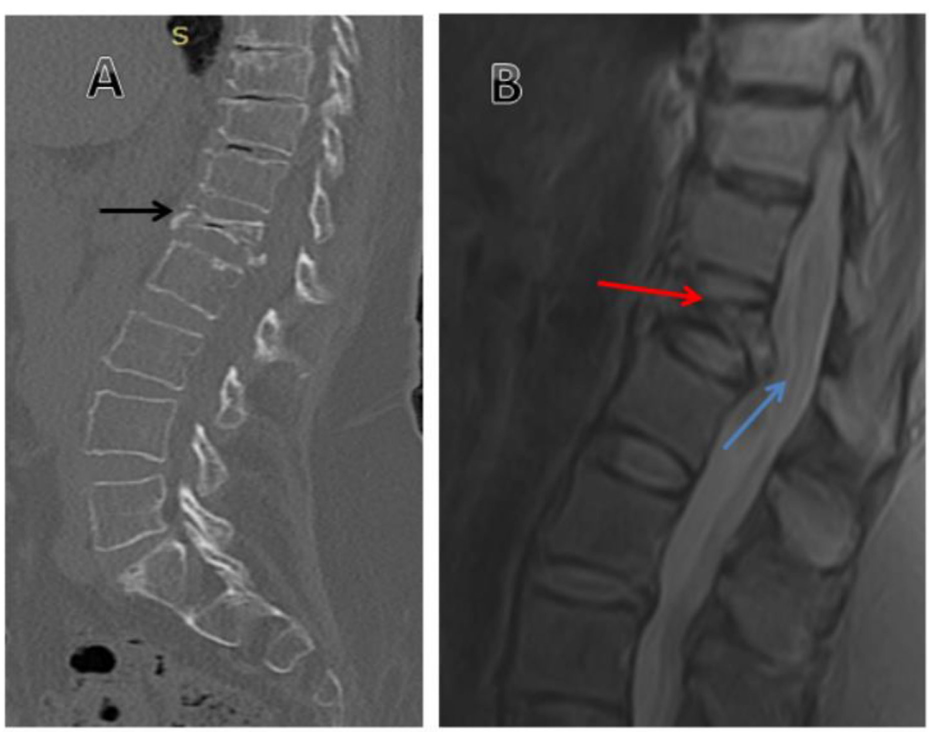

Fig. 2. (a) CT scan of lumbar spine, sagittal view, bone window: shows insufficiency fracture of L1 vertebral body that is completely collapsed (black arrow), with diffuse decreased bone density. (b) MRI scan of the lumbar spine, sagittal view, STIR sequence: shows the previously mentioned collapsed vertebra (red arrow) and compression on the thecal sac with abnormally high signal (suggesting edema or contusion) (blue arrow). CT, computed tomography.

between the studied groups regarding the mechanism of injury. This was in line with the findings of Widder et al.,[14] people who said that plain films were 39 % more sensitive, 98 % more specific, and 88 % more accurate than CT scans. Cervical spine injury was detected by CT scanning with 100 % accuracy. This series did not include any delayed diagnoses of injury to the cervical spine or the cord, nor did it include any subsequent diagnoses or readmissions for ligamentous injury with subluxation. Khurana et al.[10] studies concur with Hiyama et al.[15] and concentrate on showing the unfortunate unwavering quality of any singular CT tracking down in foreseeing PLC injury. In any case, the Khurana et al.[10] results do suggest that CT may be useful in deciding whether or not additional imaging is needed. Aly et al.,[9] concluded that PLC injury was independently associated with facet joint malalignment, spinous process fracture, horizontal laminar fracture, and interspinous widening (adjusted odds ratio range, 4.4–17.4). PLC injury had a positive predictive value of 31 % and negative predictive value of 66 % for a single positive CT finding. PLC injury had a positive predictive value of 91 % for two or more CT findings. The negative predictive value for PLC injury was 94 % if all four CT scans came back negative.

5.1. Conclusion

This study found that the majority of spinal injuries in trauma patients are caused by traffic accidents followed by falls from height. The bone anatomy can now be more clearly seen on a CT scan, and a whole-body MDCT scan has become an essential part of the initial evaluation of many injured posttraumatic patients as the CT technology has improved. Taking into account the seriousness of the injury, CT shows exact and quicker ways of assessing spinal injury and its sort and evaluation, which affects proper administration. Moreover, complementary MRI is the most cost-effective method for detecting injuries to the ligaments and spinal cord.

Conflicts of interest

There is no any conflict of interest.

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