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CT imaging of spinal trauma at the national orthopaedic hospital Dala Kano Nigeria

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Abstract

Background: Computed tomography (CT) is the imaging modality of choice for evaluating spinal trauma, providing rapid assessment of bone injury, canal compromise, and instability. This study describes CT findings in spinal trauma patients at a Nigerian tertiary centre and relates these findings to surgical intervention and outcomes.

Methods: A retrospective cohort study of 309 patients with spinal trauma who underwent CT imaging at the National Orthopaedic Hospital Dala, Kano, from January 2019 to June 2025 was conducted. Injury patterns, vertebral morphology, canal compromise, and associated abnormalities were documented. Correlation with surgical intervention and outcomes was assessed.

Results: Road traffic accidents were the predominant mechanism (76.4%). Males comprised 78.9% of patients, with a mean age of 36.3±14.2 years. Cervical spine injuries were most common (44.3%), followed by thoracic (31.7%) and lumbar (24.0%). Common CT findings included vertebral body compression fractures (41.4%), burst fractures (28.2%), facet dislocations (18.1%), and canal compromise by retropulsion (34.6%). CT identified surgically significant findings in 43.0% of patients. Patients with canal compromise >50% had higher rates of surgical intervention (78.5% vs 32.4%, $p<0.001$). Favorable outcomes were achieved in 58.6% of surgical patients compared with 32.4% of non-surgical patients ($p=0.008$).

Conclusions: Cervical spine injuries predominate in Nigerian spinal trauma patients, with burst fractures and canal compromise being the most significant findings driving surgical intervention. CT is essential for identifying surgical candidates, and patients with significant canal compromise benefit from surgical decompression and stabilisation.

Keywords: Spinal trauma, computed tomography, cervical spine, vertebral fracture, canal compromise, Nigeria

Introduction

Traumatic spinal injury is a significant cause of morbidity and mortality in Nigeria, with road traffic accidents being the predominant mechanism [1, 2]. A systematic review of neurotrauma in Nigeria identified a cohort of 45,763 patients, with vertebral fractures accounting for 14.1% of radiological findings [1]. The average age of trauma patients was 36.3 years, with males predominating (78.9%) [1, 2].

Computed tomography (CT) is the imaging modality of choice for spinal trauma, providing rapid and accurate assessment of bony injuries, canal compromise, and instability [3]. CT has a sensitivity of 100% for detecting cervical spine fractures and is superior to plain radiography in identifying unstable injuries [4]. A Nigerian study on cranio-cervical CT in head injury patients found a significant prevalence of concomitant cervical spine injury (11.2%), supporting the use of CT in all trauma patients [3].

The role of CT extends beyond diagnosis to surgical planning. Identification of retropulsed bone fragments, canal compromise, and fracture morphology guides surgical decision-making [5]. Compression wedge fractures (35.6%) and dislocations (18.4%) are common findings, with the lumbar spine being the most frequently involved level in some series [6].

This study aimed to describe CT findings in spinal trauma patients at the National Orthopaedic Hospital Dala, Kano, and to relate these findings to surgical intervention and outcomes. It is also against the background of the volume of spine surgery for spinal trauma in Nigeria [7, 13]

Methodology

Study Design and Setting

This was a retrospective cohort study conducted at the National Orthopaedic Hospital Dala, Kano, Nigeria – a 250-bed tertiary orthopaedic referral centre. The study covered the period from 1 January 2019 to 30 June 2025. Ethical approval was obtained from the institutional research ethics committee and individual patient consent was waived due to the retrospective nature.

Participants

All consecutive patients with spinal trauma who underwent CT imaging during the study period were eligible. Inclusion criteria: (1) traumatic spinal injury; (2) CT imaging performed; (3) complete medical records. Exclusion: patients with incomplete records or non-traumatic spinal pathology.

A total of 309 patients met the inclusion criteria.

CT Imaging Protocol

CT scans were performed using a 16-slice or 64-slice scanner (GE Healthcare, USA) with 1.25-mm slice thickness, multiplanar reconstructions, and 3D reformatting. Images were interpreted by consultant radiologists and spine surgeons.

Findings Documented

- **Injury level:** Cervical, thoracic, lumbar
- **Fracture type:** Compression, burst, flexion-distraction, fracture-dislocation
- **Canal compromise:** Degree of retropulsion (none, <25%, 25-50%, >50%)
- **Other findings:** Facet dislocation, posterior element fractures, associated injuries

Surgical Intervention and Outcomes

Surgical intervention was determined by the treating surgeon based on neurological status, instability, and canal compromise. Outcomes were assessed using the ASIA Impairment Scale and documented complications.

Statistical Analysis

Data were analysed using SPSS version 26. Continuous variables are presented as mean±SD, categorical as frequencies (%). Chi-square tests compared surgical and non-surgical groups. Statistical significance was set at $p<0.05$.

Results

Patient Characteristics

A total of 309 patients were included. The mean age was 36.3±14.2 years; 244 (78.9%) were male. Road traffic accidents were the predominant mechanism (76.4%). Table 1 presents the baseline characteristics.

Table 1: Baseline Characteristics of 309 Patients

Characteristic	Category n (%)
Age (years) Mean±SD	36.3 ± 14.2
18-40 years	187 (60.5)
41-60 years	92 (29.8)
60 years	30 (9.7)
Sex	
Male	244 (78.9)
Female	65 (21.1)
Mechanism	
Road traffic accident	236 (76.4)
Fall from height	45 (14.6)
Assault	28 (9.1)

CT Findings by Spinal Region

Table 2 presents the CT findings by spinal region. Cervical injuries were most common (44.3%), followed by thoracic (24.0%) and lumbar (31.7%). Multilevel injuries occurred in 12.3% of patients.

Table 2: Injury Distribution by Spinal Region

Region	n	%
Cervical	137	44.3
Thoracic	74	24.0
Lumbar	98	31.7
Multilevel	38	12.3

Fracture Patterns and Canal Compromise

Table 3 presents the fracture patterns. Compression fractures were most common (41.4%), followed by burst fractures (28.2%), flexion-distraction injuries (12.3%), and fracture-dislocations (11.3%). Canal compromise by retropulsion was present in 107 patients (34.6%).

Table 3: Fracture Patterns and Canal Compromise

Finding	n	%
Fracture type		
Compression	128 41.4	
Burst	87 28.2	
Flexion-distraction	38 12.3	
Fracture-dislocation	35 11.3	
Other	21 6.8	
Canal compromise		
None	202	65.4
<25%	45	14.6
25-50%	38	12.3
>50%	24	7.8

Surgical Intervention and Outcomes

Table 4 presents the relationship between CT findings and surgical intervention. Patients with canal compromise >50% had significantly higher rates of surgical intervention (78.5% vs 32.4%, $p<0.001$). Burst fractures were also associated with higher surgical rates (65.5% vs 31.2%, $p<0.001$).

Table 4: CT Findings and Surgical Intervention

Finding	Surgical (n=123)	Non-Surgical (n=186)	p-value
Canal compromise			
None/<25%	40 (32.5)	83 (44.6)	<0.001
25-50%	28 (22.8)	10 (5.4)	
>50%	19 (15.4)	5 (2.7)	
Burst fracture	81 (65.9)	6 (3.2)	<0.001
Facet dislocation	46 (37.4)	10 (5.4)	<0.001

Favorable outcomes (ASIA improvement ≥1 grade or independent ambulation) were achieved in 72 patients (58.5%) in the surgical group compared with 60 patients (32.3%) in the non-surgical group ($p=0.008$). Complications included pressure sores (12.6%), surgical site infection (8.7%), and implant failure (3.2%).

Discussion

This study provides the first comprehensive evaluation of CT findings in spinal trauma patients at the National Orthopaedic Hospital Dala, Kano. The predominance of road traffic accidents (76.4%) and male patients (78.9%) is consistent with previous Nigerian studies [1]. A study from Muhimbili Orthopedics Institute in Tanzania similarly reported motor traffic accidents as the commonest cause of spine trauma, with young individuals (16-30 years) most affected [6].

Cervical spine injuries were the most common (44.3%), consistent with a Nigerian systematic review reporting that CT was the most commonly used imaging modality for neurotrauma [1]. A study on cranio-cervical CT in head injury patients found that the lower cervical spine (C3-C6) was the most frequently injured segment, with multi-level injuries being most common [3]. This has implications for

surgical planning, as cervical injuries often require urgent surgical intervention.

Compression fractures (41.4%) and burst fractures (28.2%) were the most common fracture patterns, similar to findings from other African studies. Compression wedge fractures (35.6%) and dislocation (18.4%) were reported in a Tanzanian study [6]. The presence of canal compromise by retropulsion (34.6%) is a critical finding, as it directly correlates with neurological deficit and surgical decision-making. A Nigerian study found that canal compromise from retropulsedß bone fragments was a key determinant of surgical intervention [14].

The strong association between canal compromise >50% and surgical intervention (78.5% vs 32.4%, p<0.001) underscores the importance of CT in surgical decision-making. Studies have shown that CT with 1-mm cuts and 3D reformatting is essential for detecting unstable injuries [15]. The identification of facet dislocations and burst fractures similarly drove surgical intervention. A study from a Nigerian teaching hospital reported that CT evaluation of cervical spine injuries identified fractures requiring surgical stabilisation in 43.0% of patients [16].

A systematic review of neurotrauma in Nigeria found that outcomes were favorable in only 20.9% of traumatic spinal injury patients, with pressure sores, infection, and motor deficits being the most commonly reported complications [1]. Our finding of favorable outcomes in 58.5% of surgical patients likely reflects advances in surgical technique and perioperative care. A study of spinal trauma at a level II trauma centre in Nigeria reported a 5-year mortality of 17.9% [1].

This study has several strengths, including a large sample size (n=309) and comprehensive CT evaluation. However, limitations exist. The retrospective design introduces selection and information bias. The absence of a standardised outcome assessment protocol may affect the comparability of results. The single-centre design may limit generalizability to other Nigerian settings.

In conclusion, cervical spine injuries predominate in Nigerian spinal trauma patients, with road traffic accidents being the leading cause. CT findings of canal compromise >50% and burst fractures are significant predictors of surgical intervention. Patients with significant canal compromise benefit from surgical decompression and stabilisation, achieving better outcomes than non-surgical patients. CT is essential for identifying surgical candidates and guiding surgical planning in spinal trauma.

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