

## Management of Cervical Spine Trauma in the Surgical Emergency Intensive Care Unit

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### ABSTRACT

**Background:** Cervical spine trauma represents a major public health issue because of its frequency, severity, and potentially devastating neurological consequences. Early diagnosis and appropriate prehospital and in-hospital management are essential to improve survival and functional outcomes.

**Methods:** We conducted a retrospective study including 35 patients admitted for cervical spine trauma to the Surgical Emergency Intensive Care Unit of Ibn Rochd University Hospital between January 2023 and November 2025. Epidemiological, clinical, radiological, therapeutic, and outcome data were analyzed.

**Results:** Road traffic accidents were the leading cause of injury, accounting for 52% of cases, followed by falls (31%). On admission, 74.3% of patients presented with life-threatening conditions. Hemodynamic instability and respiratory failure were observed in 62.86% and 57.14% of cases, respectively. Cervical computed tomography identified spinal lesions in 97.14% of patients, whereas magnetic resonance imaging was performed in 22.85% of cases and demonstrated spinal cord injury in all examined patients. The lower cervical spine was the most frequently affected region (57%). Surgical management was performed in 42.85% of patients, while 28.57% received conservative treatment. Adequate prehospital immobilization and medical transport were documented in only 5.71% of cases. Overall mortality reached 22.85%.

**Conclusion:** Cervical spine trauma remains associated with high morbidity and mortality. Early diagnosis, adequate prehospital immobilization, rapid transfer to specialized centers, and multidisciplinary management are essential to improve neurological and functional outcomes.

**KEYWORDS:** cervical spine trauma; spinal cord injury; intensive care unit; cervical fracture; trauma management; Morocco

### INTRODUCTION

Cervical spine trauma includes injuries affecting the osteoligamentous and disco-ligamentous structures of the cervical spine. These injuries are particularly severe because of their neurological consequences, which may compromise both vital and functional prognosis. Cervical spinal trauma remains a major public health concern worldwide due to its high incidence, especially among young adults, and the significant morbidity and mortality associated with spinal cord injury.

Road traffic accidents and falls are the most frequently reported causes of cervical spine trauma. The severity of neurological impairment depends on several factors, including the mechanism of injury, the level of spinal involvement, and the rapidity and quality of management. Delayed diagnosis or inadequate immobilization may worsen neurological damage and increase mortality. Advances in imaging modalities, particularly computed tomography (CT) and magnetic resonance imaging (MRI), have considerably improved diagnostic accuracy and therapeutic decision-making. Likewise, improvements in prehospital care, immobilization techniques, intensive care management, and surgical stabilization have contributed to better outcomes in specialized centers.

The objectives of this study were to analyze the epidemiological, clinical, radiological, therapeutic, and prognostic characteristics of cervical spine trauma managed in the Surgical Emergency Intensive Care Unit of Ibn Rochd University Hospital and to highlight the importance of early and appropriate management in improving patient outcomes.

### MATERIALS AND METHODS

#### Study Design and Setting

We conducted a retrospective descriptive study in the Surgical Emergency Intensive Care Unit of Ibn Rochd University Hospital.

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### Study Population

The study included 35 patients admitted for cervical spine trauma between January 2023 and November 2025.

Eligible patients were adults and adolescents older than 15 years presenting with traumatic cervical spine injuries confirmed clinically and/or radiologically. Both surgically treated patients and those managed conservatively were included. Patients admitted with severe neurological or hemodynamic impairment who died before surgery were also included in the analysis.

### Data Collection

Data were collected from medical records and standardized data extraction forms. The following variables were analyzed:

- Demographic characteristics
- Mechanism of injury
- Clinical presentation
- Neurological status
- Radiological findings
- Therapeutic management
- Postoperative complications
- Clinical outcomes and mortality

### Clinical Assessment

Neurological impairment was assessed according to the Frankel classification. Hemodynamic instability, respiratory failure, and associated injuries were systematically recorded.

### Radiological Assessment

All patients underwent standard cervical spine radiographs and cervical computed tomography with sagittal reconstruction. Magnetic resonance imaging was performed when spinal cord injury was suspected or when additional neurological assessment was required.

### Therapeutic Management

Medical treatment included analgesia, anti-inflammatory therapy, respiratory support, and hemodynamic stabilization when necessary.

Conservative treatment consisted of cervical immobilization using a cervical collar, with or without skull traction. Surgical treatment was indicated according to spinal instability, neurological deficits, and radiological findings.

### Statistical Analysis

Data were analyzed descriptively. Quantitative variables were expressed as means and ranges, whereas qualitative variables were presented as frequencies and percentages.

## RESULTS

### Epidemiological Characteristics

Road traffic accidents were the leading cause of cervical spine trauma, accounting for 18 cases (52%). Falls represented 31% of cases (11 patients), followed by assaults (11%) and sports-related injuries (6%).

### Clinical Presentation

On admission, 74.3% of patients presented with life-threatening conditions. Hemodynamic instability was observed in 62.86% of cases, whereas respiratory failure occurred in 57.14%.

Neurological assessment according to the Frankel classification showed that among tetraplegic patients:

- 30% were classified as Frankel A
- 7% as Frankel B
- 17% as Frankel C
- 3% as Frankel D
- 43% as Frankel E

Hemiplegia was observed in 11.43% of patients, and neurovegetative disorders were present in 22.85%. Associated injuries were identified in 57.14% of cases.

### Radiological Findings

All patients underwent cervical CT scanning with sagittal reconstruction. Spinal lesions were identified in 97.14% of patients.

MRI was performed in 22.85% of patients and demonstrated spinal cord injury in all examined cases. The lower cervical spine was the most commonly affected region, accounting for 57% of injuries, whereas upper cervical spine injuries represented 31%. Combined upper and lower cervical injuries were observed in 9% of cases. No osseous lesions were identified in 3% of patients.

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The C5–C6 and C6–C7 levels were the most frequently involved segments, representing 52.94% of lesions.

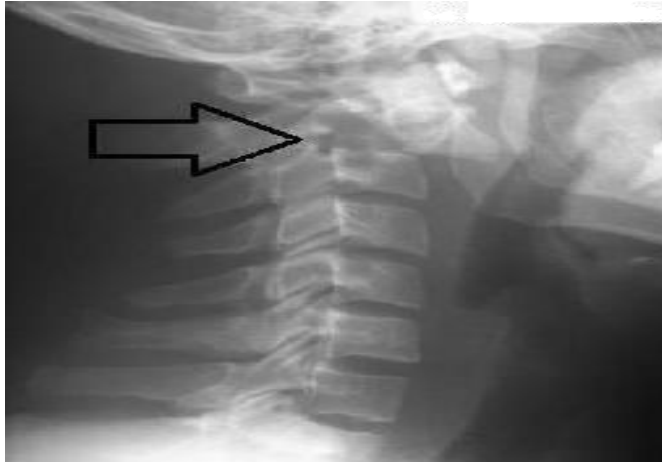


Figure 1: Lateral cervical spine radiograph showing a biarticular fracture of C1–C2 associated with a C2–C3 dislocation



Figure 2: Cervical spine MRI showing a C6–C7 dislocation associated with spinal cord compression

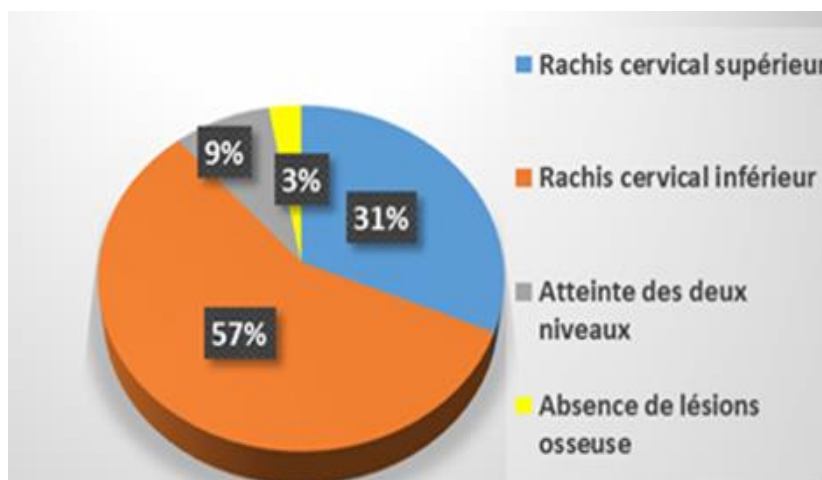


Figure 3: Distribution of lesions according to spinal level

### Therapeutic Management

Only two patients (5.71%) received adequate prehospital management consisting of cervical immobilization and medically supervised transport.

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All patients received medical treatment including analgesics and anti-inflammatory agents.

Conservative treatment was performed in 28.57% of cases:

- 70% received immediate cervical collar immobilization without skull traction
- 30% underwent skull traction followed by immobilization with a rigid cervical collar

Surgical treatment was performed in 42.85% of patients, with a mean delay of 8 days after trauma (range: 24 hours to 29 days). An anterior surgical approach was used in most cases.

### Outcomes

Among surgically treated patients, postoperative wound infection occurred in 13.33% of cases. Postoperative mortality reached 13.33%, occurring within 5 to 20 days after surgery.

Patients managed conservatively showed favorable clinical evolution. Surgical management resulted in improvement of cervical pain and radicular symptoms after reduction and stabilization.

Patients with incomplete spinal cord injury demonstrated better neurological recovery, whereas complete spinal cord injuries remained neurologically unchanged.

The overall mortality rate was 22.85%.

## DISCUSSION

Cervical spine trauma remains a frequent and severe condition associated with substantial morbidity and mortality. Spinal cord injury complicates approximately 15–30% of spinal trauma cases and represents a major cause of disability worldwide.

In our series, road traffic accidents were the predominant mechanism of injury, consistent with findings reported in the international literature. Young adults represented the most affected population, reflecting the high exposure of this age group to high-energy trauma.

The lower cervical spine was the most frequently involved anatomical region, particularly the C5–C6 and C6–C7 levels. These findings are consistent with previously published studies, which demonstrated the increased biomechanical vulnerability of the lower cervical segments.

CT scanning remains the cornerstone of initial radiological assessment because of its high sensitivity in detecting cervical fractures and dislocations. MRI provides valuable information regarding spinal cord injury, ligamentous damage, and soft tissue lesions, although its use may remain limited in emergency settings because of availability constraints.

Prehospital management is a critical determinant of neurological prognosis. Appropriate cervical immobilization and rapid medical transport reduce the risk of secondary neurological deterioration. In our study, only a minority of patients benefited from adequate prehospital care, reflecting limitations in emergency medical systems and trauma organization.

Therapeutic management depends on neurological status, spinal stability, and associated injuries. Conservative treatment may be appropriate for stable lesions without neurological compromise, whereas surgical stabilization is indicated in unstable fractures, spinal dislocations, and progressive neurological deficits.

Mortality in our series remained high, reflecting the severity of neurological and systemic injuries. Poor prognostic factors included complete spinal cord injury, lesions located above C3, delayed management, and severe associated trauma.

Multidisciplinary management involving emergency physicians, intensivists, radiologists, spine surgeons, physiotherapists, and rehabilitation specialists is essential to optimize outcomes and improve functional recovery.

## CONCLUSION

Cervical spine trauma remains a severe condition associated with high morbidity and mortality. Early diagnosis, adequate immobilization, rapid transfer to specialized centers, and multidisciplinary management are essential to improve survival and neurological outcomes.

Strengthening prehospital emergency systems, promoting medicalized transport, and improving access to specialized trauma care may significantly reduce secondary neurological complications and mortality.

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