

Acute cervical intervertebral disc herniation after traffic accident: the importance of rapid diagnosis with magnetic resonance imaging in the emergency department

Baycan Kuş¹, Gözde Yılmaz¹, Fatma Hançer Çelik¹, Necmi Baykan¹, Merve İrem Atıcı¹

¹Department of Emergency Medicine, Kayseri City Hospital, Kayseri, Türkiye

The study has been presented at The International Emergency Medicine Academic Congress in Konya in 2024.

Cite as: Kuş B, Yılmaz G, Hançer Çelik F, Baykan N, Atıcı Mİ. Acute cervical intervertebral disc herniation after traffic accident: the importance of rapid diagnosis with magnetic resonance imaging in the emergency department. Northwestern Med J. 2025;5(4):274-280.

ABSTRACT

The cervical vertebrae (C1-C7) are the most commonly injured region of the spine because they are the most flexible, mobile, and exposed part of the spinal column. Different studies have demonstrated that cervical spine injuries are more common in motor vehicle accidents. An acute intervertebral disc herniation may develop due to hyperextension of the cervical region in trauma-related conditions such as motor vehicle accidents. Rapid and definitive diagnosis is possible with magnetic resonance imaging (MRI). In acute cervical spine injury, MRI is the gold standard for the surgeon to decide on issues such as the need for surgery, the type of approach, the need for instrumentation, the level of decompression, and the need for re-surgery in case of insufficient decompression, as well as the presence of edema or hematoma.

In this case report, a patient with plegia is presented who had an acute intervertebral disc herniation without cervical spine fracture due to hyperextension of the cervical region during a motor vehicle accident and whose diagnosis was possible with early consultation and MRI. Computed tomography and X-ray imaging were normal. The patient's clinical status could not have been adequately elucidated without the performance of MRI. As a matter of fact, according to the spinal cord trauma guidelines, neurological recovery is faster and more favorable in cases operated on within 24 hours, as observed in our case.

This article was written to emphasize that relying solely on Computed tomography or X-ray may be insufficient, and that MRI should not be avoided when clinically indicated. To identify and monitor the presence and underlying causes of spinal cord hematoma, edema, and stenosis, MRI is required.

Keywords: Cervical spine injury, emergency department, intervertebral disc displacement, magnetic resonance imaging, traffic accident

Corresponding author: Baycan Kuş **E-mail:** drcan86@gmail.com

Received: 09.10.2024 **Accepted:** 01.09.2025 **Published:** 26.10.2025

Copyright © 2025 The Author(s). This is an open-access article published by Bolu İzzet Baysal Training and Research Hospital under the terms of the [Creative Commons Attribution License \(CC BY\)](#) which permits unrestricted use, distribution, and reproduction in any medium or format, provided the original work is properly cited.

INTRODUCTION

The intervertebral discs function as shock-absorbing structures that facilitate the distribution of axial loads across the spinal column. When the compression forces exceed the absorption capacity of the disc, the annulus fibrosus ruptures, the nucleus pulposus protrudes into the vertebral canal, and as a result, spinal nerve or spinal cord compression develops. Disc herniation occurs, resulting in the sudden onset of neck pain, paraspinal muscle spasm, and radicular arm pain and weakness (1). In a study, it was determined that 23% of the herniations secondary to trauma occurred in the cervical spine. Of these, 23% were in C3–C4, 21% in C4–C5, and 23% in C5–C6 (2).

In this case report, a patient with plegia is presented who had an acute intervertebral disc herniation without cervical spine fracture due to hyperextension of the cervical region during a motor vehicle accident and whose diagnosis was possible with early consultation and magnetic resonance imaging (MRI). Computed tomography (CT) and X-ray imaging were normal. The patient's clinical status could not have been adequately elucidated without the performance of magnetic resonance imaging. The aim of this case report is to highlight the importance, as emphasized in the literature, of rapid MRI diagnosis and surgical intervention within 24 hours in improving the prognosis of patients who develop acute neurological deficits following trauma.

CASE REPORT

The patient was a 54-year-old male with no known disease. He was admitted to the emergency department by ambulance because he had rear-ended a truck at a slow speed while driving under the influence of alcohol. At the time of admission, his blood pressure was 122/81 mmHg, pulse rate was 86/min, SO₂: 99%, and temperature was 36.5°C. The total score of the Glasgow Coma Scale (GCS) was 15. He was conscious,

cooperative, and oriented. Pupils were isochoric, and the pupillary light reflex was intact bilaterally. Eye movements were exact in all directions. He had no speech disorder. Strength was 4/5 in the right upper limb, 0/5 in the left upper limb, and 5/5 in the lower extremities. There was a sensory deficit in the left upper extremity. There were no other pathological examination findings. The patient persistently stated that he was fine before the accident, but after the accident, he could not move his left arm in particular. CT and X-ray imaging were performed for the pathological findings. Cranial CT, thorax CT, cervical spine CT, and X-ray were normal (Figure 1, Figure 2). There were no pathological findings in the clavicle, scapula, shoulder joints, or upper extremity bones to explain the loss of strength. Diffusion MRI was performed on the assumption that the patient may have had a traffic accident after a cerebrovascular accident. There was no diffusion-restricted area in the brain. The possibility of an acute intervertebral disc herniation occurring due to trauma was considered, and approximately twelve hours after admission to the emergency department, a consultation was requested from the neurosurgery department. A cervical MRI was performed at the suggestion of the consultant and urgently interpreted by the radiology department.

MRI interpretation: Diffuse bulging obliterating the anterior subarachnoid space and causing significant compression of the spinal cord and central broad-based protrusion are observed in the C3-4 disc. The neural foramen is narrowed. At this level, a segment of approximately 25 mm in length in the spinal cord shows a T2 slightly hyperintense faint limited area that may be compatible with myelopathy (Figure 3).

After the diagnosis of the patient was established by MRI, he was quickly re-consulted with the neurosurgery department and underwent emergency surgery. After one month, the motor examination of the patient was 5/5 in the right upper extremity and 4/5 in the left upper extremity; there was no sensory deficit or pathological reflex.

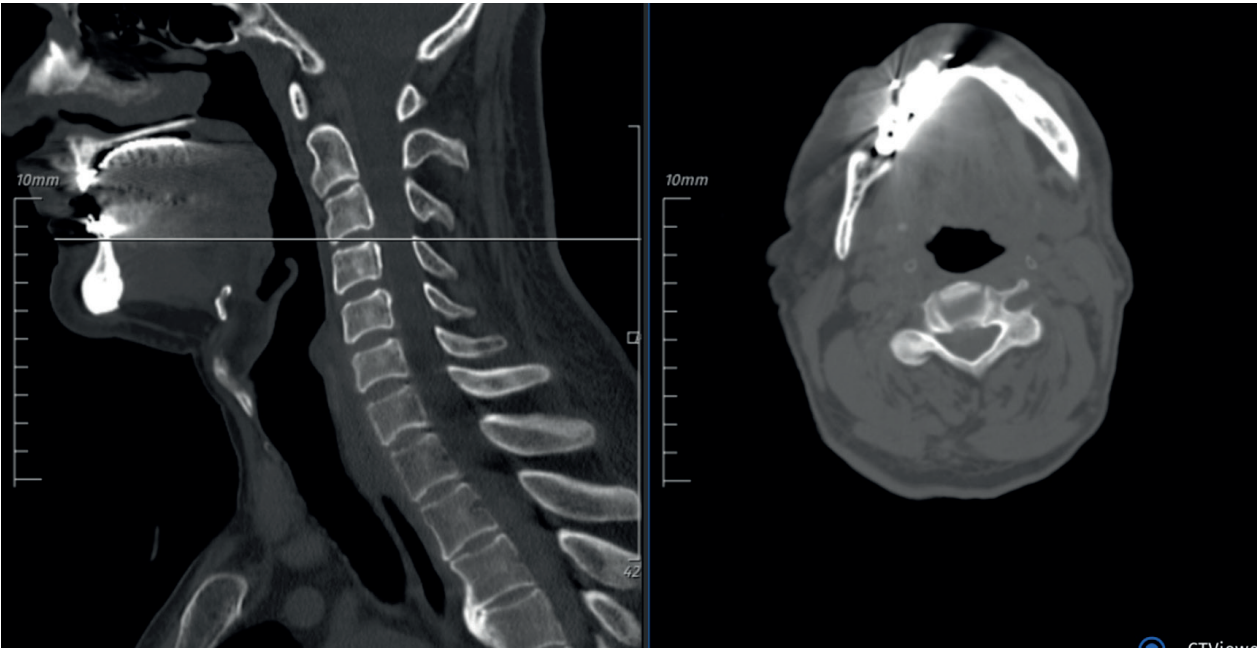


Figure 1. Cervical CT image (Normal).

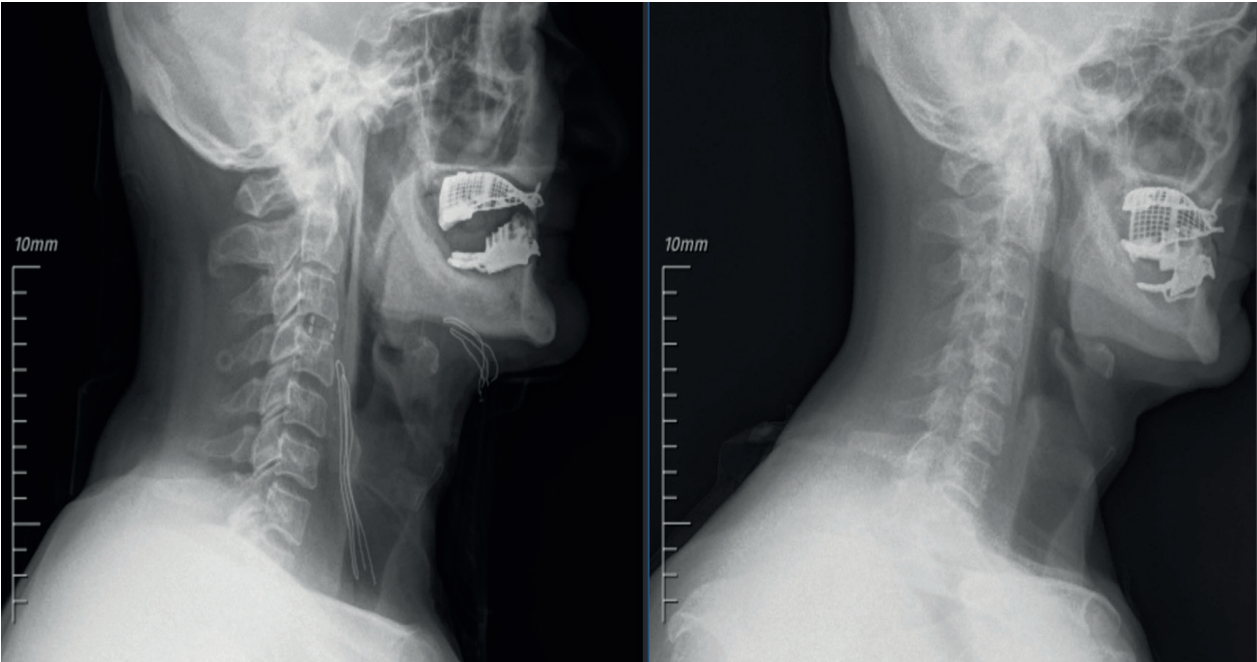


Figure 2. Cervical X-ray images postoperatively (left) and one month later (right) (Normal).

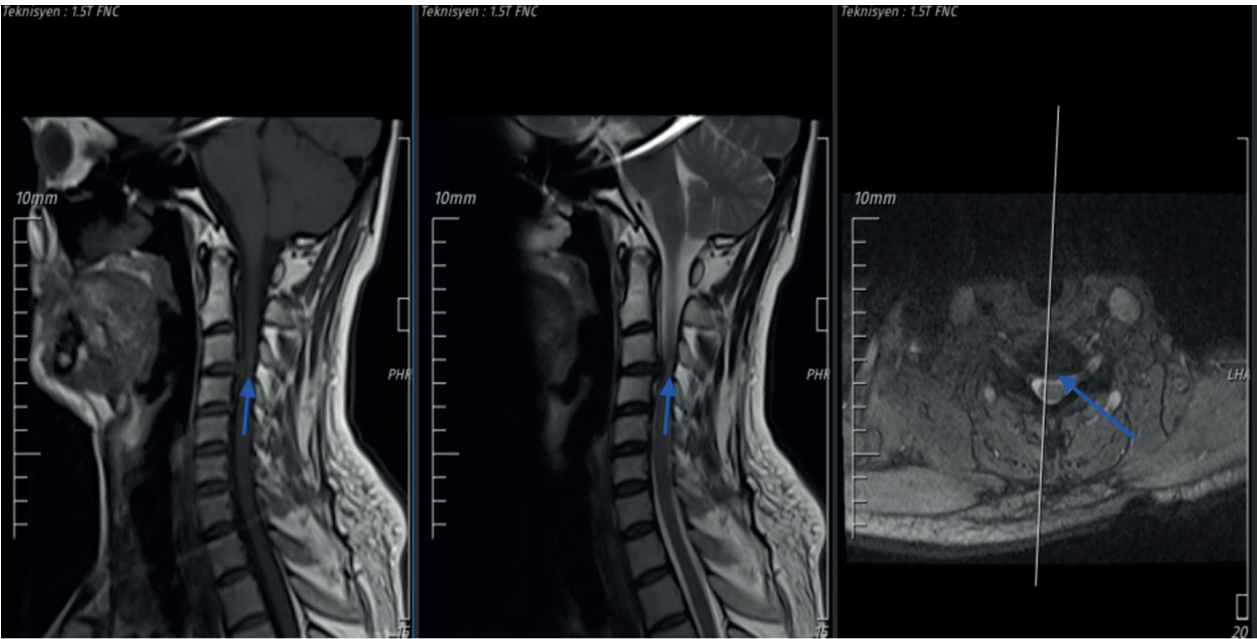


Figure 3. Cervical MRI Image (Diffuse bulging obliterating the anterior subarachnoid space and causing significant compression of the spinal cord and central broad-based protrusion are observed in the C3-4 disc).

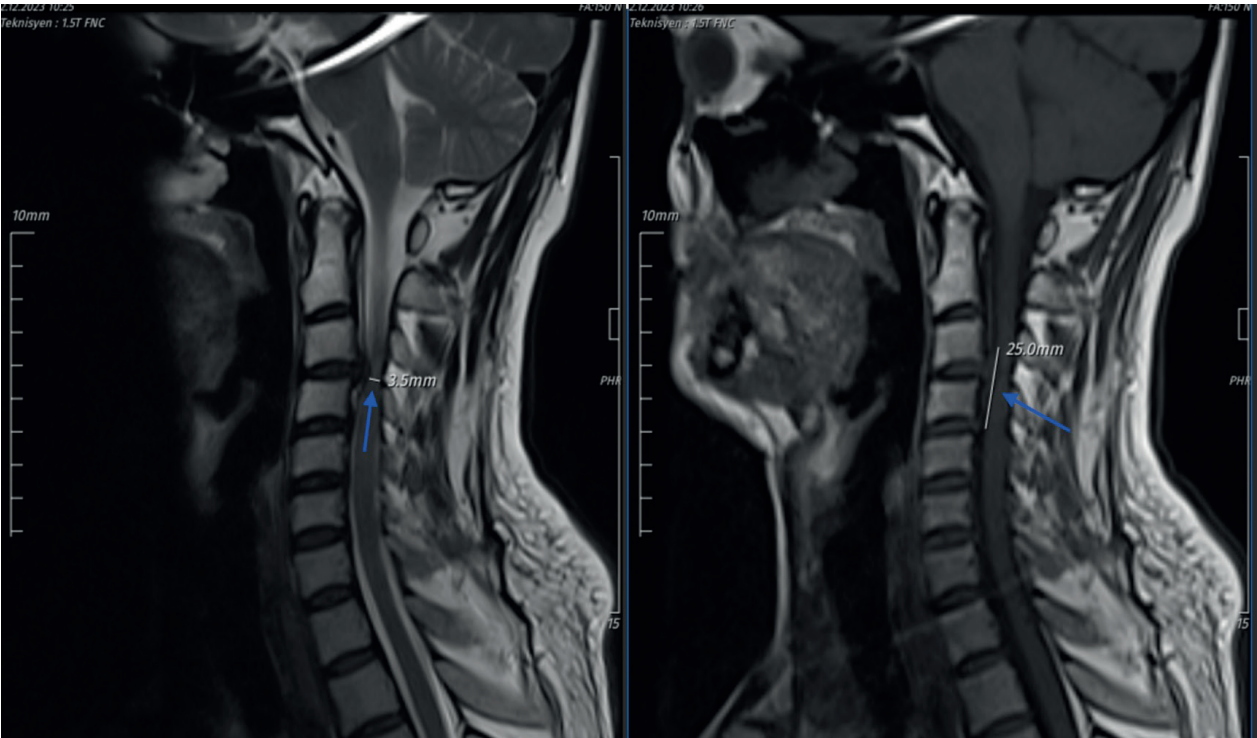


Figure 4. Cervical MRI image (IMLL:25 mm, channel diameter at MSCC level:3.5 mm).

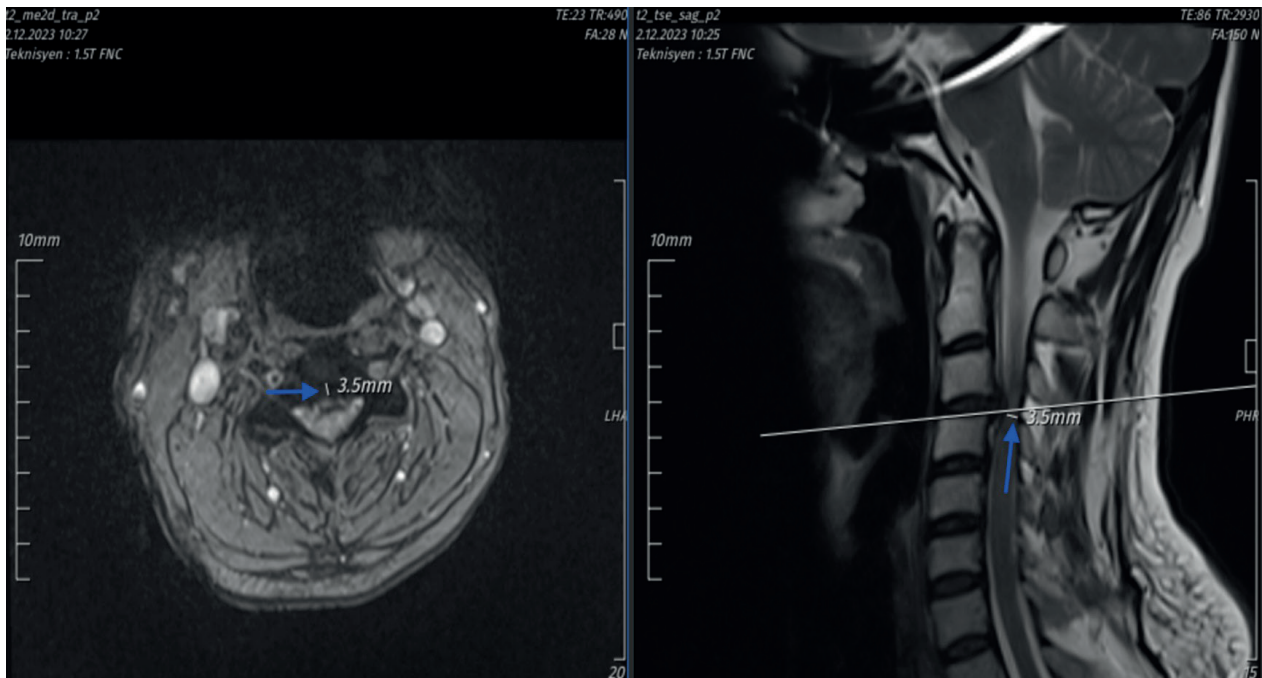


Figure 5. Cervical MRI image (channel diameter at MSCC level:3.5 mm).

DISCUSSION

Considering the multiple axes of motion, vertebrae can be injured by various mechanisms, and a number of different injury patterns can be identified (3,4). The cervical vertebrae (C1-C7) are the most commonly injured region of the spine because they are the most flexible, mobile, and exposed part of the spinal column. Most injuries occur at the C2 level and from C5 to C7 (5). Different studies have demonstrated that cervical spine injuries (CSI) are more common in motor vehicle accidents. Cervical spine injuries represent a significant proportion of spinal traumas, frequently observed in emergency departments. Globally, they account for approximately 60% of all spinal injuries, with road traffic accidents being the leading cause, responsible for over half of the cases (>50%) (6,7).

CT is the first imaging method preferred to evaluate the cervical spine in trauma. CT is more sensitive and specific than other radiological imaging modalities for assessing the cervical spine in trauma patients and can be performed promptly (8). However, MRI for soft tissue and spinal cord injuries have a higher sensitivity rate than CT. The sensitivity of CT is 88.6%, and its

specificity is 99%. MRI has a sensitivity of 89,8%, and specificity of 99,2%. Although CT is highly sensitive in identifying cervical spine trauma, MRI plays a crucial role in detecting clinically relevant lesions that may be missed on CT, particularly in patients with persistent symptoms (9-11).

CSI is a devastating condition and a common cause of disability and death, especially in young people (disability ratio 20%, mortality ratio 5.1%) (12,13). An acute intervertebral disc herniation may develop due to hyperextension of the cervical region in trauma-related conditions such as motor vehicle accidents. Rapid and definitive diagnosis is possible with MRI (14). In acute CSI, MRI is the gold standard for the surgeon to decide on issues such as the need for surgery, the type of approach, the need for instrumentation, the level of decompression, and the need for re-surgery in case of insufficient decompression, as well as the presence of edema or hematoma (11,15,16). A recent study investigated the relationship between the length of the spinal cord intramedullary lesion (IMLL), the diameter of the canal at the maximum spinal cord compression level (MSCC), and the presence of intramedullary hemorrhage on MRI and prognosis. Shorter spinal

cord lesion (<6.5 mm), larger diameter of the canal at the MSCC level (>5.5 mm), and the absence of intramedullary hemorrhage were associated with better prognosis (17). In this case, although the canal diameter was narrow (3.5 mm) and the length of the IMLL lesion (25 mm) was longer, a good prognosis was observed due to the rapid diagnosis and the operation within 24 hours (Figure 4, Figure 5).

As a matter of fact, according to spinal cord trauma guidelines, neurological recovery is faster and more favorable in cases operated within 24 hours, as observed in our case (18- 21). In Türkiye, MRI scanners are available in nearly every province and in most large districts; in fact, some provinces are equipped with multiple MRI units. Performing MRI in patients with a clear indication, as in our case, has a favorable impact on prognosis. Therefore, this article was written to emphasize that relying solely on CT or X-ray may be insufficient, and that MRI should not be avoided when clinically indicated. To identify and monitor the presence and underlying causes of spinal cord hematoma, edema, and stenosis, MRI is required.

CONCLUSION

In motor vehicle accidents and even other traumas that cause hyperextension in the cervical region, cervical MRI should be performed in the presence of neurological deficit findings, even if CT and X-ray imaging are normal. When spinal cord injury is detected, early surgical intervention should be ensured by consulting with the neurosurgery department immediately. Thus, the patient's paralysis can be prevented by acting on-site and, when necessary, selected advanced imaging techniques.

Ethical approval

This study is not experimental or clinical research. Because it was a case report, ethical approval was not needed. Written informed consent was obtained from the patient for the publication of the case report.

Author contribution

Surgical and Medical Practices: BK, GY, FHÇ, NB, MİA; Concept: BK, GY, FHÇ, NB, MİA; Design: BK, GY, FHÇ, NB, MİA; Data Collection or Processing: BK, GY, FHÇ, NB, MİA; Analysis or Interpretation: BK, GY, FHÇ, NB, MİA; Literature Search: BK, GY, FHÇ, NB, MİA; Writing: BK, GY, FHÇ, NB, MİA. All authors reviewed the results and approved the final version of the article.

Source of funding

The authors declare the study received no funding.

Conflict of interest

The authors declare that there is no conflict of interest.

REFERENCES

1. Yamaguchi JT, Hsu WK. Intervertebral disc herniation in elite athletes. *Int Orthop*. 2019; 43(4): 833-40. [\[Crossref\]](#)
2. Gray BL, Buchowski JM, Bumpass DB, Lehman RA, Mall NA, Matava MJ. Disc herniations in the national football league. *Spine (Phila Pa 1976)*. 2013; 38(38): 1934-8. [\[Crossref\]](#)
3. Amorosa LF, Vaccaro AR. Current concepts in cervical spine trauma. *Instr Course Lect*. 2014; 63: 255-62.
4. Syre P, Petrov D, Malhotra NR. Management of upper cervical spine injuries: a review. *J Neurosurg Sci*. 2013; 57(3): 219-40.
5. Greenbaum J, Walters N, Levy PD. An evidenced-based approach to radiographic assessment of cervical spine injuries in the emergency department. *J Emerg Med*. 2009; 36(1): 64-71. [\[Crossref\]](#)
6. Wang H, Zhang Y, Xiang Q, et al. Epidemiology of traumatic spinal fractures: experience from medical university-affiliated hospitals in Chongqing, China, 2001-2010. *J Neurosurg Spine*. 2012; 17(5): 459-68. [\[Crossref\]](#)
7. Beeharry MW, Moqem K, Rohilla MU. Management of Cervical Spine Fractures: A Literature Review. *Cureus*. 2021; 13(4): e14418. [\[Crossref\]](#)
8. Bailitz J, Starr F, Beecroft M, et al. CT should replace three-view radiographs as the initial screening test in patients at high, moderate, and low risk for blunt cervical spine injury: a prospective comparison. *J Trauma*. 2009; 66(6): 1605-9. [\[Crossref\]](#)
9. Rutsch N, Amrein P, Exadaktylos AK, et al. Cervical spine trauma - Evaluating the diagnostic power of CT, MRI, X-Ray and LODOX. *Injury*. 2023; 54(7): 110771. [\[Crossref\]](#)

10. Mathew M, Mezue WC, Chikani MC, Jimoh AO, Uche EO, Mathew MB. Correlation of Quantitative MRI Parameters with Neurological Outcome in Acute Cervical Spinal Cord Injury. *J West Afr Coll Surg*. 2021; 11(1): 5-10. [\[Crossref\]](#)
11. Rutges JPHJ, Kwon BK, Heran M, Ailon T, Street JT, Dvorak MF. A prospective serial MRI study following acute traumatic cervical spinal cord injury. *Eur Spine J*. 2017; 26(9): 2324-32. [\[Crossref\]](#)
12. Häske D, Lefering R, Stock JP, Kreinest M, TraumaRegister DGU. Epidemiology and predictors of traumatic spine injury in severely injured patients: implications for emergency procedures. *Eur J Trauma Emerg Surg*. 2022; 48(3): 1975-83. [\[Crossref\]](#)
13. Kreinest M, Ludes L, Türk A, Grützner PA, Biglari B, Matschke S. Analysis of prehospital care and emergency room treatment of patients with acute traumatic spinal cord injury: a retrospective cohort study on the implementation of current guidelines. *Spinal Cord*. 2017; 55(1): 16-9. [\[Crossref\]](#)
14. Henninger B, Kaser V, Ostermann S, et al. Cervical Disc and Ligamentous Injury in Hyperextension Trauma: MRI and Intraoperative Correlation. *J Neuroimaging*. 2020; 30(1): 104-9. [\[Crossref\]](#)
15. Freund P, Seif M, Weiskopf N, et al. MRI in traumatic spinal cord injury: from clinical assessment to neuroimaging biomarkers. *Lancet Neurol*. 2019; 18(12): 1123-35. [\[Crossref\]](#)
16. Ghaffari-Rafi A, Peterson C, Leon-Rojas JE, et al. The Role of Magnetic Resonance Imaging to Inform Clinical Decision-Making in Acute Spinal Cord Injury: A Systematic Review and Meta-Analysis. *J Clin Med*. 2021; 10(21): 4948. [\[Crossref\]](#)
17. Dobran M, Aiudi D, Liverotti V, et al. Prognostic MRI parameters in acute traumatic cervical spinal cord injury. *Eur Spine J*. 2023; 32(5): 1584-90. [\[Crossref\]](#)
18. Sánchez JAS, Sharif S, Costa F, Rangel JAIR, Anania CD, Zileli M. Early Management of Spinal Cord Injury: WFNS Spine Committee Recommendations. *Neurospine*. 2020; 17(4): 759-84. [\[Crossref\]](#)
19. Tarawneh AM, D'Aquino D, Hilis A, Eisa A, Quraishi NA. Can MRI findings predict the outcome of cervical spinal cord Injury? a systematic review. *Eur Spine J*. 2020; 29(10): 2457-64. [\[Crossref\]](#)
20. Seif M, Curt A, Thompson AJ, Grabher P, Weiskopf N, Freund P. Quantitative MRI of rostral spinal cord and brain regions is predictive of functional recovery in acute spinal cord injury. *Neuroimage Clin*. 2018; 20: 556-63. [\[Crossref\]](#)
21. Fehlings MG, Tetreault LA, Wilson JR, et al. A Clinical Practice Guideline for the Management of Patients With Acute Spinal Cord Injury and Central Cord Syndrome: Recommendations on the Timing (≤ 24 Hours Versus >24 Hours) of Decompressive Surgery. *Global Spine J*. 2017; 7(Suppl 3): 195S-202S. [\[Crossref\]](#)