

A Missed Subtle Sign on Cervical Computed Tomography Scan - A Case Report on Our Aching Experience

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Abstract

Stringent criteria have traditionally guided cervical clearance in trauma patients, particularly those who exhibit mid-line cervical pain or cannot undergo a reliable examination. This can sometimes result in extended periods of cervical immobilisation or necessitate the use of further imaging scans. In the absence of fractures, dislocation, or pathological subluxation on cervical computed tomography (CT) scan, cervical collar can be safely removed. We report a polytrauma case with altered consciousness, where bilateral facet fracture dislocation at the C5/C6 level was initially overlooked. CT scan of the spine revealed traumatic brain injury and lumbar vertebral fracture, and the collar was removed and proceeded with surgical stabilisation. The progress was complicated a pulmonary embolism and CT scan also identified the overlooked cervical injuries. A retrospective review of the initial scan revealed the presence of subtle signs of a small unilateral facet avulsion fragment. Our patient succumbed to his injuries. This discovery underscores the potential for pathologies to be missed with dire consequences. Our case illustrates the severe outcomes that can arise from overlooking a cervical spine injury, underscoring the importance of keeping cervical collars in place for high-risk patients until comprehensive imaging can be performed.

Keywords: Cervical spine; Cervical collar; C-spine clearance; Trauma; Missed Injury

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INTRODUCTION

Cervical spine injuries can have devastating consequences if overlooked in trauma patients. Multiple publications propose that in cases of negative computed tomography (CT) scans, cervical collars can be safely discontinued for both awake and alert patients, as well as for those who cannot undergo a dependable examination, without the requirement for additional imaging.^{2,3}

We present a case of an obtunded patient with concomitant traumatic brain injury (TBI) and subtle cervical spine injuries initially missed on CT scans. This case highlights the importance of careful evaluation, considering the mechanism of injury, and the role of experienced radiologists in cervical spine clearance.

CASE REPORT

A 41-year-old man with underlying history of schizophrenia and scar epilepsy who tragically attempted suicide by jumping from the second floor, resulting in a head-first impact on the ground. The patient was intubated and sedated due to a poor Glasgow Coma Scale (GCS) score. Initial assessment revealed multiple left rib fractures, lung contusion, and hemopneumothorax, which required a chest tube.

The patient exhibited movement in all four limbs, but an accurate neurological assessment could not be conducted due to a low GCS. We revealed no step deformity, wounds, or bruises on the cervical spine examination. Anal tone and bulbocavernosus reflex were intact. A CT scan of the brain and the entire spine was performed, showing severe TBI and an L1 vertebral fracture. The cervical CT scan appeared normal (**Figure 1**) without any obvious fracture or misalignment, leading to the removal of the cervical collar.

Posterior minimal invasive spine surgery for the L1 fracture was done, however, the patient's post-operative respiratory requirements raised concerns. A CT pulmonary angiogram (CTPA) was conducted, revealing pulmonary embolism and incidentally detecting cervical spine injuries, including C5/C6 anterolisthesis, left superior articular facet avulsion fracture, and bilateral facet dislocation (**Figure 2**). Subsequent magnetic resonance imaging (MRI) of the cervical spine confirmed spinal cord edema, disc tear, and posterior ligamentous complex tear (**Figure 3**). The patient succumbed to death before second surgery due to multiple severe lung insults that required prolonged high ventilator settings.

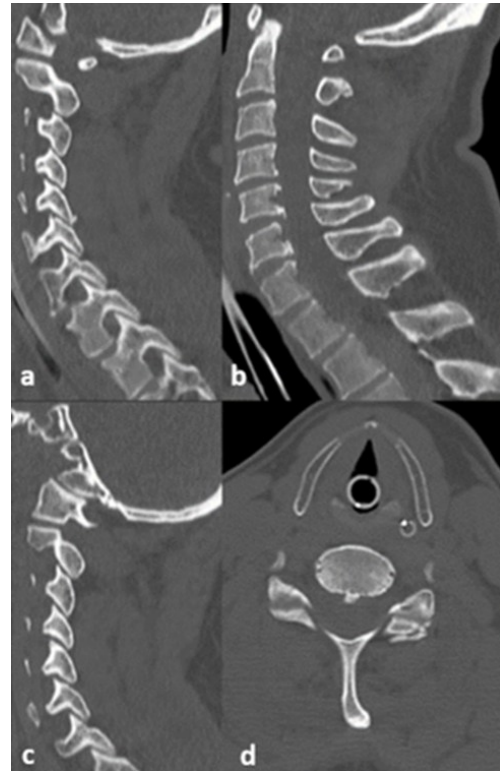


Figure 1 (a-d) findings: a) In the left parasagittal bone window, a small avulsion fragment of the C5 inferior facet was observed, with no other signs of facet subluxation. b) The midsagittal bone window displayed no widening of the interspinous space. c) The right parasagittal bone window revealed a typical facet joint appearance. d) In the axial bone window at the C5/C6 level, avulsion fracture fragment of the left inferior facet joint was noted.



Figure 2 (a-d): a) The left parasagittal bone window revealed C5/C6 facet dislocation with a small accompanying avulsion fracture piece. b) Within the midsagittal bone window, there was evident C5/C6 anterolisthesis. c) The right parasagittal bone window exhibited a characteristic facet joint dislocation. d) In the axial bone window at the C5/C6 level, the reversed hamburger sign was discernible.

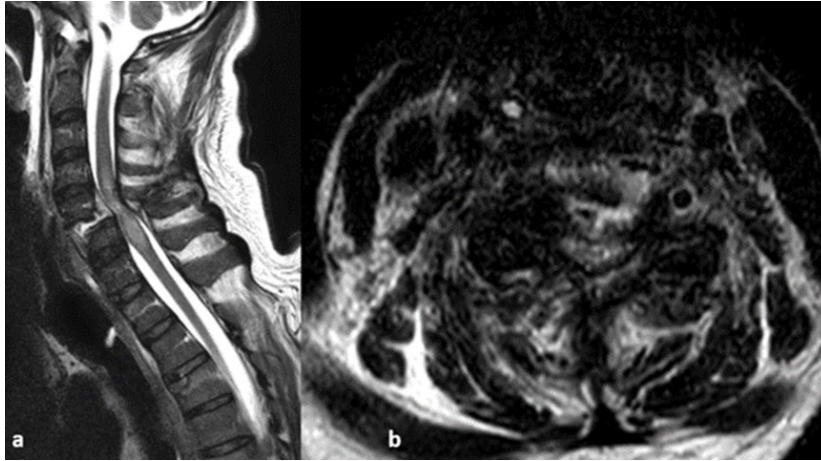


Figure 3: In the sagittal view of the cervical MRI (T2 weighted), there is evident anterolisthesis at the C5/C6 level, along with an injury to the posterior ligamentous complex (PLC) and the presence of spinal cord oedema.

DISCUSSION

Our case underscores the significance of considering concomitant cranial and cervical spinal injuries, which occur frequently following trauma.¹ A missed cervical injury can have severe consequences, as observed in our patient. Recent guidelines suggest different approaches for cervical clearance based on patient consciousness and symptoms.² In alert patients with neck pain and negative CT findings, options include collar maintenance until pain resolves, MRI imaging for confirmation, or flexion/extension radiographs. A study by Alexander *et al.* through routine single out of collar lateral cervical radiograph following normal CT cervical scan documented a near miss cervical dislocation in a patient.³ However, emerging evidence supports cervical collar removal after high-quality cervical CT scans interpreted by experienced radiologists, while MRI is reserved for those with neurological deficits.⁴

Numerous studies have supported the idea that a negative CT scan alone is adequate for removing cervical collar in obtunded patients or those who are unable to offer a dependable clinical examination.² While MRI diagnosed more cases of cervical injuries not detected by CT scans, the authors emphasised that none of these cases necessitated surgery or a modification in clinical management, and none progressed to develop late instability. Delay in C-spine clearance due to awaiting an MRI resulted in prolonged intubation, consequently extending stays in the intensive care unit, increasing overall length of hospital stays, and raising the risk of complications associated with immobilisation. However, a study by Menaker *et al.*, 203 patients with unreliable clinical examinations underwent MRI after negative CT scans, and found 18 patients (8.9%) exhibited

injuries on MRI.⁵ Among these cases, two required surgical intervention. Furthermore, a study Lin *et al.* concluded that relying solely on CT scans may be insufficient for effectively identifying occult discoligamentous injuries in the subaxial cervical spine following trauma.⁶ In this study, a total of 316 patients with cervical spinal admissions underwent both CT and MRI scans. Among CT-negative cases, 11 patients (3.5%) were later discovered to have occult discoligamentous injuries on MRI. Four of these patients were categorised as unstable injuries, with three of them undergoing surgical management. Subtle CT findings suggestive of discoligamentous injury were retrospectively identified in all four of these patients.

In our case, the patient proceeded to L1 surgery after a negative CT cervical scan, and the intraoperative respiratory requirement raised concern. A subsequent CTPA revealed significant cervical injuries that were missed, emphasising the need for vigilance. The only subtle sign observed during a retrospective review was the avulsion fragment of the left C5 inferior facet (**Figure 1**). In a similar vein, Gebauer *et al.* documented a case where a patient suffered a cervical spinal cord injury after the removal of a collar due to the initial misinterpretation of a CT scan as being normal.² Upon retrospective review of the CT scan, subtle signs of a minor widening of the interspinous space were detected, a finding that could be easily overlooked without the incorporation of additional imaging studies.² Presently, the guidelines from EAST (Eastern Association for the Surgery of Trauma) express uncertainty regarding the role of MRI in the clearance of the C-spine.⁷

CONCLUSION

As such, decisions regarding cervical clearance should consider the reliability of CT findings, mechanism of injury, concomitant brain injury and the patient's neurological status. The context of intensive care unit patients should also be evaluated, weighing the risks of missed cervical injury against potential complications associated with prolonged collar immobilisation, such as pressure sore, hinder nursing care and airway access, raised intravenous and intracranial pressure.

Take Home Message

- Aa
- Bb
- Bb
- bb

Abbreviations

CT	Computed tomography
TBI	Traumatic brain injury
IV	Intravenous
GCS	Glasgow coma score
CTPA	Computed tomography pulmonary angiography
MRI	Magnetic resonance imaging

Declarations

Patient Consent

Patient consent has been obtained.

Disclosure and Conflict of Interest

The authors declare that they have no conflicts of interest and no financial disclosures relevant to this case report.

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None.

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