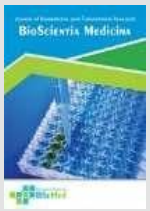
eISSN (Online): 2598-0580



Bioscientia Medicina: Journal of Biomedicine & Translational Research

Journal Homepage: www.bioscmed.com

Critical Care Management of Fracture Dislocation of Cervical Spine: A Case Report

Liliriawati Ananta Kahar[1*], Wiwi Monika Sari[2], Aldhimas Marthsyal Pratikna[3], Arif Gunawan[3]

[1]Department of Anesthesiology and Intensive Care, Faculty of Medicine, Universitas Andalas, Padang, Indonesia

[2]Department of Intensive Care, Dr. M. Djamil General Hospital, Padang, Indonesia

[3]Department of General Surgery, Faculty of Medicine, Universitas Andalas, Padang, Indonesia

ARTICLE INFO

Keywords:
Cervical spine
Critical care
Spinal injury

***Corresponding author:**
Liliriawati Ananta Kahar

E-mail address:
lili_ananta@ymail.com

All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/bsm.v7i9.865

A B S T R A C T

Background: Spinal cord injuries affect nearly 1 million people every year, more than 90% of all cervical injuries require intubation, most cases also require tracheostomy, and nearly 40% are ventilator dependent. This study aimed to describe critical care management of fracture dislocation of spine. **Case Presentation:** A 27-year-old male patient complained patient came with complaints of weakness in both limbs 13 hours before admission. Initially, the patient was driving a motorbike then the patient was involved in an accident with a car after the incident, the patient also felt a bit short of breath, could not move both his leg and hand, and could not feel defecation or urination. Patient was diagnosed with Fracture dislocation of C4-C5. The patient underwent elective decompression stabilization. Patient admitted to ICU with the majority requiring assisted ventilation. After five days in the ICU, the patient was challenged to be released from the ventilator, so the patient was performed early tracheostomy **Conclusion:** Patients with cervical injuries require comprehensive care in the intensive care unit, especially in airway management and respiratory support, in addition to addressing the potentially catastrophic multisystem sequelae of nerve damage.

1. Introduction

Spinal cord injuries affect nearly 1 million people every year. The incidence of spinal cord injury in the United States is approximately 55 new cases per million population annually.[1,2]

The incidence of spinal cord injury is increasing yearly, with annual rates estimated at 10.4-130.6 cases per million despite preventive measures. The incidence of spinal cord injury in the general population in the Southeast Norway health region is 14.9 in 100,000 inhabitants per year.[3,4]

Spinal cord injury (SCI) is one of the problems that can increase morbidity and decrease the quality of life. More than 75% of these traumatic injuries occur in the population under 45 years of age, and most are in the productive age between 16 and 30 years.[5]

The mortality rate in cervical injuries is also higher, mainly due to traffic accidents. Spinal cord injury will cause impaired mobility, pain, and severe neurological damage, resulting in total or partial paralysis.[3]

It is estimated that more than 90% of all cervical injuries require intubation, most cases also require tracheostomy, and nearly 40% are ventilator dependent. Although the management of cervical injuries is already advanced, the mortality rate of patients with cervical injuries and ventilator dependents is still relatively high.[5,6] Cervical spine injuries can lead to long-term disability. Prompt and appropriate management, as well as suitable

treatment evaluation and rehabilitation, are needed in treatment to reduce the morbidity of patients.[7] This study aimed to describe critical care management of fracture dislocation of spine.

2. Case Presentation

A 27-year-old male patient complained patient came with complaints of weakness in both limbs 13 hours before admission. Initially, the patient was driving a motorbike then the patient was involved in an accident with a car after the incident, the patient also felt a bit short of breath, could not move both his leg and hand, and could not feel defecation or urination.

Physical examination found the general condition of moderate illness, GCS E4M6V5, blood pressure 108/70 mmhag, pulse 65x per minute, respiratory rate 22x per minute. Pupil isochor 3mm/3mm, light reflex +/+. Laboratory examination before operation revealed leukocytosis and increased blood urea. Blood gas analysis obtained PH 7.47. PO_2 76, PCO_2 28, SO_2 98.9, HCO_3 -20.4, Beecf -2.6, cervical CT scan examination showed fracture dislocation of C4-C5. Patient was diagnosed with fracture doslocation of C4-C5. The patient underwent elective decompression stabilization. The patient underwent decompression stabilization. Patients were admitted to the ICU, with the majority requiring assisted ventilation.

After decompression stabilization, the patient was admitted to the ICU. Hemodynamics while in the ICU, blood pressure 92/65, heart rate 60, SaO_2 100% on ventilator. The patient's blood pressure was supported by vasopressor. After five days in the ICU, the patient was challenged to be released from the ventilator, so the patient was performed early tracheostomy to help weaning the ventilator in the patient.

From the examination of the patient's neurological status, the patient's consciousness was composmentis, he has tetraplegia, and he has difficulty breathing independently. The patient needed ventilator assistance to be able to develop his diaphragm. The patient was ventilator dependent and had CO_2 retention with pCO_2 values from blood gases ranging from 60 to 70. However, the patient could still not be released from the ventilator.

After 28 days on the ventilator, the patient began to show symptoms of ventilator-associated pneumonia. There were increased infiltrates in both lung fields and increased leukocyte and procalcitonin values.

3. Discussion

This case discusses a 27-year-old male with a diagnosis of tetraparese due to fracture dislocation of C4-C5. The patient underwent elective decompression stabilization. Cervical 3-7 are cervical vertebrae that are often injured due to trauma. The most common mechanisms of injury are axial compression leading to Jefferson-type fractures of the C1 vertebrae, hyperflexion, hyperextension, rotation injuries, occipital-condylar fractures or rupture fractures of the vertebrae.[7]

Neurogenic shock is a condition of concern in spinal cord injuries, and the triad includes hypotension, hypotension, and peripheral vasodilatation. Proper and appropriate fluid administration can restore intravascular volume and cardiac preload, stimulating atrial stretch receptors, which respond to reduced parasympathetic tone, increasing heart rate. In shock patients, vasopressors and inotropes are administered to stabilize blood pressure and reduce ischemia in the nerves.[11]

Injury to the cervical and resulting dysfunction of the sympathetic nerves, characterized by bradycardia and neurogenic shock, hypotension that occurs can also cause hypoperfusion injury to the cord. This patient was also found to have hemodynamic instability and received vasopressor titration (norepinephrine). Treatment of persistent or intermittent bradycardia in spinal cord injury may include administration of beta-2 adrenergic agonists (albuterol), chronotropic agents (atropine, epinephrine, dopamine, norepinephrine), or phosphodiesterase inhibitors (aminophylline, theophylline).[2]

The degree of sympathetic cardiovascular disturbance is related to the severity and location of the injury. Spinal cord injury will cause vasoconstriction of blood vessels, leading to impaired venous return, decreasing cardiac output, and resulting in hypotension. Sinus bradycardia is the most common rhythm disturbance in the acute stage after spinal cord injury.[2,8]

Spinal injuries at the cervical or thoracic level will cause dysfunction in the innervation of the respiratory muscles. The third - fifth segment of the cervical nerve is the nerve that controls the muscles. Injury to the nerve will cause paralysis of the diaphragm intercostal muscles. Patients with injuries at this level should require intubation and respiratory support.[9]

Due to the loss of intercostal muscle function, rib movement will fail so that when the diaphragm contracts, it will cause paradoxical movement of the chest wall. The intercostal and abdominal muscles are paralyzed, so the patient cannot expectorate entirely passively. Sputum retention is also a future problem if not treated properly.[10]

The study of Schreiber et al. showed that in patients with spinal cord injury, the average duration of mechanical ventilation was 27 days, and the length of hospital stay was 44 days. 81% of patients underwent tracheostomy, and 30% decannulated. The incidence of pneumonia was 40%, and the incidence of death was 8%.[5]

Respiratory complications are one of the leading causes of long-term mortality in spinal cord injury. High dependency on respiratory support and good critical care support should be required.[10]

High-lying spinal cord injury will cause physiological disturbances in the body, namely, loss of normal respiratory function, low lung volume, impaired function of the respiratory muscles (including the diaphragm), weak or absent cough reflex, and chest wall rigidity. In addition, immobility of the patient can also lead to static and risk of pulmonary embolism. These problems make weaning from the ventilator very difficult. Autonomic dysfunction also aggravates the patient's condition, and autonomic dysfunction will result in increased mucus secretion, bronchospasm and respiratory distress. Early tracheostomy is recommended to assist breathing when treating spinal cord injury patients.[2]

The main goals of spinal cord injury management include restoring and maintaining lung volumes. Several things that can be done are continuous positive airway pressure (CPAP), intermittent positive pressure breathing, generally done later, or specific ventilator modes such as airway pressure relief ventilation (APRV) in cases of severe atelectasis. Giving mucolytics to increase mucus production and beta-agonists to reduce bronchoconstriction can help patients when weaning from ventilators.[9] Early tracheostomy (less than seven days after injury) may help wean patients who tend to require prolonged mechanical ventilation, decreasing the length of stay and reducing laryngotracheal complications.[11]

The intercostal muscles are initially flaccid if the spinal cord injury is treated correctly. After a few weeks, flexibility slowly develops, and the chest wall becomes stiffer with less tendency to collapse during inspiration. However, patients with cervical impairment will continue to have impaired expiratory muscle function. However, the work of the clavicular muscles and pectoralis major muscle, by compressing the ribs, will cause an increase in intrathoracic pressure and can contribute to a better cough. Tracheostomy has a better effect, especially when weaning can take a long time. The patient is comfortable, and there is less damage to the larynx from prolonged intubation. The tracheostomy cannula also has less dead space compared to the tracheal tube, so it can also reduce respiratory infections.[10]

There are two strategies in ventilator weaning patients: gradually reducing support pressure until the patient can be converted to high-flow breathing or CPAP, and T-piece weaning (progressive ventilator-free breathing) or 'sprint weaning'. Once the support pressure level reaches 12-15 cm H_2O, rather than reducing the support further, the patient can be tried without support pressure for a predetermined time every hour. The duration free from support is

gradually increased (sometimes just a few minutes per hour) until they can achieve complete or partial independence from mechanical assistance. Weaning strategies where tracheostomy plays an important role.[9]

Patients with cervical spine injuries tend to require prolonged and long-term mechanical ventilation. The American Conference of Conventions on Artificial Airways states that "tracheostomy is preferred if mechanical ventilation is required for more than 21 days)". Tracheostomy has several benefits over endotracheal intubation. Tracheostomy reduces the length of the airway and thus reduces the effort to breathe, thus facilitating weaning from the mechanical ventilator.[13]

Gastric stress ulceration is common in patients with cervical injuries, possibly due to secondary causes or impaired innervation. H_2-antagonist prophylaxis can be given to the patient. Proton pump inhibitors may be more effective in patients. Enteral feeding may also reduce the incidence of ulcers in patients on ventilators.[10]

The patient also received gabapentin, a neuropathic pain therapy recommended for spinal cord injury and its mechanism of action. Gabapentin is a G-protein-coupled receptor antagonist that causes inhibition of glutamate release. After definitive spinal cord injury treatment, patients must undergo rehabilitation for continued neurological recovery. Patients must learn mobilization and self-care techniques to help improve functional abilities. Rehabilitation can usually start early in the ICU and requires a multidisciplinary team.[12]

4. Conclusion

Patients with cervical injuries require comprehensive care in the intensive care unit, especially in airway management and respiratory support, in addition to addressing the potentially catastrophic multisystem sequelae of nerve damage.

5. References

1. Wiles MD. Airway management in patients with suspected or confirmed traumatic spinal cord injury: A narrative review of current evidence. Anaesthesia. 2022; 77(10): 1120–8.
2. American Colege of Surgeon. Best practices guideline spinal cord injury. 2022.
3. Zileli M, Osorio-Fonseca E, Konovalov N, Cardenas-Jalabe C, Kaprovoy S, Mlyavykh S, et al. Early management of cervical spine trauma: WFNS spine committee recommendations. Neurospine. 2020; 17(4): 710–22.
4. Utheim NC, Helseth E, Stroem M, Rydning P, Mejlænder-Evjensvold M, Glott T, et al. Epidemiology of traumatic cervical spinal fractures in a general Norwegian population. Inj Epidemiol. 2022; 9(1): 1–13.
5. Schreiber AF, Garlasco J, Vieira F, Lau YH, Stavi D, Lightfoot D, et al. Separation from mechanical ventilation and survival after spinal cord injury: A systematic review and meta-analysis. Ann Intensive Care. 2021; 11(1).
6. Beeharry MW, Moqeem K, Rohilla MU. Management of cervical spine fractures: A literature review. Cureus. 2021; 13(4).
7. Okereke I, Mmerem K, Balasubramanian D. The management of cervical spine injuries – A literature review. Orthop Res Rev. 2021; 13: 151–62.
8. Hadley MN, Walters BC. The case for the future role of evidence-based medicine in the management of cervical spine injuries, with or without fractures. J Neurosurg Spine. 2019; 31(4): 457–63.
9. De SS, Marqués AM, Velasco MEF, Vázquez RG. Series in intensive care medicine : Traumatic acute spinal cord injury Update on traumatic acute spinal cord injury. Part 2 ଌ. 2017; 41(5): 306–15.
10. Denton M, Frca M, Mckinlay J, Oxon MA, Bch BM. Cervical cord injury and critical care. 2009; 9(3): 82–6.

11. Sacino A, Rosenblatt K. Critical care management of acute spinal cord injury-part II: Intensive care to rehabilitation. J Neuroanaesth Crit Care. 2019; 6(3): 222–35.
12. Shah G, Dhakal GR, Gupta A. Outcome of cervical spine trauma patients admitted to the intensive care unit at a Tertiary Government Referral Trauma Center in Nepal. Global Spine J. 2022; 12(7): 1388–91.
13. Choi HJ, Paeng SH, Ph D, Kim ST, Lee KS, Kim MS, et al. The effectiveness of early tracheostomy (within at least 10 Days) in cervical spinal cord injury patients. J Korean Neurosurg Soc. 2013; 220–4.