

Outcome of Cervical Spine Trauma Patients Admitted to the Intensive Care Unit at a Tertiary Government Referral Trauma Center in Nepal

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Abstract

Study Design: Retrospective study.

Objectives: Cervical spinal cord injury (SCI) is a devastating event for patient and family. It has a huge impact on society because of intensive resources required to manage the patient in both acute and rehabilitation phases. With the limited resource setting in underdeveloped countries like Nepal, questions are often raised regarding whether the outcome justifies the expenses of their care. The objective was to assess the outcomes of cervical SCI patients admitted to intensive care unit (ICU).

Methods: All cervical SCI admitted in ICU during May 2017 to August 2018 were included in this study. Demographic details, mode, morphology, and neurological level of injury, intervention performed and outcomes of ICU stay were analyzed.

Results: Out of 48 patients, 36 (75%) were male and 12 female with mean age 43.9 ± 15.9 years. Fall injury was the commonest mode of injury (83.3%). Most patients presented within 1 to 3 days of injury and C5-C6 (33.3%) was the most common involved level and 75% presented with ASIA A neurology. Mechanical ventilation was required in 95.8% of the patients and 22 patients were operated upon. The average stay in ICU was 15 days and 13 patients died in the ICU.

Conclusions: Majority of cervical SCI with complete motor paraplegia required ICU care. In spite of the intensive care, a subset of these patients succumbed to the complications of the injury. Therefore, it is essential to establish trauma ICU care with specific protocols on managing cervical spine injuries.

Keywords

cervical spinal cord injury, complications, intensive care unit, outcome, Nepal

Introduction

Traumatic spinal cord injury (SCI) is a leading cause of morbidity and mortality¹ and cervical spine is the commonest anatomical level of injury.²⁻⁴ The impact of SCI on society and resources is huge both in the acute and rehabilitation settings.^{2,3,5}

With the limited resource setting in underdeveloped countries like Nepal, questions are often raised whether the outcome of this group of patients justifies the expenses of their care.^{1,3-5} Few studies describe the outcome of cervical SCI patients admitted to the intensive care unit (ICU) in underdeveloped countries with limited ICU services.^{1,5-8} The major challenge

toward optimal care of cervical SCI patients in our setting is near absence of health insurance coverage.^{3,9} This necessitates out of pocket payment for healthcare which puts a huge financial burden on the population with minimal per capita income especially with one quarter population below poverty line.⁹

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Table 1. Socio-Demographic Profile.

Variables	No of patients
Gender	
Male	36
Female	12
Age	Mean \pm SD : (years) 43.9 \pm 15.9
Occupation	
Farmer	20
Student	8
Housewife	8
Teacher	7
Businessman	5
Mode of injury	
Fall	40 (83.3)
RTA	4 (8.3)
Electrocution	2 (4.2)
Blunt trauma	2 (4.2)
Address	
Kathmandu	4
Outside Kathmandu	44

There is scant epidemiological literature for patients with cervical SCI in Nepal. The primary objective was to assess the outcomes of cervical SCI patients admitted to the ICU in a tertiary referral trauma center in Kathmandu, Nepal. Whereas the secondary objectives included description of their demography, clinical characteristics such as mode of injury, level of cervical injury, morphology and neurology, various ICU intervention procedures, associated complications, morbidity, mortality, and delay in presentation to the hospital.

Methods

After receiving the Institutional Review Board approval (Ref. No. 1075) a retrospective study was performed from 2017 May to 2018 August at a tertiary referral government trauma center in Kathmandu, Nepal. Since this study was a retrospective study and required no further follow up intervention and diagnostic procedures, consent exemption was availed. Convenience (nonprobability) sampling technique was utilized for data collection. All cervical trauma patients admitted to the ICU were included except non-cervical trauma, pathological fractures, spondylodiscitis, inflammatory tumors and history of previous spine surgery. Data regarding demography, mode of injury, morphology of injury, neurological level and intervention procedures were obtained from ICU records and analyzed.

Computed tomography scans were performed in all cervical spine injury patients irrespective of their neurological deficit. Magnetic resonance imaging was done in all incomplete and neurologically intact patients and patients with head injury. Patients with associated head injury, chest injury, cardiac complications and respiratory distress with haemodynamic instability were admitted to ICU. Preoperative closed supervised Gardner-Wells Tongs was applied in all dislocations. Data collected was entered in Microsoft Excel and descriptive statistical analysis was performed as frequency and percentage (%).

Table 2. Characteristics of Injury in the ICU Admitted Patients.

Parameters	Level	n (%)
Involved level of vertebra	C1–C2	4 (8.3)
	C3–C4	2 (4.2)
	C4–C5	8 (16.7)
	C5–C6	16 (33.3)
	C6–C7	11 (22.9)
	C7–T1	5 (10.0)
	Multiple level	2 (4.2)
Total		48 (100)
AO Spine classification	A	12 (25)
	B	24 (50)
	C	9 (18.8)
	Others	3 (6.2)
Total		48 (100)
ASIA impairment scale for neurology status	A	36 (75)
	B	4 (8.3)
	C	3 (6.2)
	D	2 (4.2)
	E	3 (6.3)
Total		48 (100)
Associated injuries	Present	14 (29.2)
	Absent	34 (70.8)
Case management	Conservative	26 (54.2)
	Operative	22 (45.8)
Case outcome	Patients discharged on request	13 (27.1)
	Mortality	13 (27.1)
	Transferred to ward	22 (45.8)
Assisted Ventilation	Ventilator	46 (95.8)
	Tracheostomy	30 (62.5)
	Chest tube	5 (10.4)

Results

Out of 48 patients admitted in ICU during the study duration, 36 (75%) were male and 12 (25%) female with male to female ratio 3:1. The age of the patients ranged from 8 to 82 years with mean \pm SD: 43.9 \pm 15.9 years. Most of the patients were farmer (20, 41.7%) by occupation (Table 1) and resided in other locations despite the study site being in Kathmandu.

Fall injury was the most frequent mode of injury representing 83.3%, followed by road traffic accidents (RTA, Table 1). Patients presented to the hospital within 1 to 3 days of injury. Upper cervical spine injuries were seen in 8.3% and lower cervical spine injury in 91.7% (Table 2). The most common involved level was C5–C6 (16, 33.3%) followed by C6–C7 (11, 22.9%).

50% of the patients were classified as having AO type C¹⁰ injury while the extent of SCI as defined by American Spinal Injury Association (ASIA) Impairment Scale¹¹ was 75% as ASIA A. Other associated injuries were seen in 14 (29.2%) patients. Cardiac complications (16, 33.3%) were encountered more often than pulmonary, renal, or psychiatric (Table 2). Overall 26 (54.2%) were managed conservatively and 22 (45.9%) operated upon. Among the operated patients, 15

Table 3. Mortality and ASIA Grading.

ASIA	No of patients	Mortality
A	36 (75%)	10
B	4 (8.34%)	2
C	3 (6.25%)	1
D	2 (4.16%)	-
E	3 (6.25%)	-
Total	48	13

underwent surgery during their ICU stay. Posterior surgical approach (10, 45.5%) was the commonly utilized technique (Table 2). 62% patients required tracheostomy, 5 (10.4%) patients required chest tube for associated chest injury and 46 (95.9%) patients required ventilator support (Table 2).

Of the 48 cases, 22 (45.9%) were stepped down to the ward, 13 (27.1%) were discharged on the request of the family members while 13 (27.1%) expired in ICU due to cardiopulmonary complications (Table 3). All patients expired in the ICU had ASIA A and B neurology and 5 had undergone surgery. The 5 cases operated upon expired 2 weeks post-surgery while remaining 8 with non-surgical care died within a week of ICU admission. The duration of stay ICU ranged from 1 to 47 days with an average of 15 days.

Discussion

Spinal cord injury is a devastating, life changing condition, and poses a major challenge for clinicians to manage in resource constrained regions. With a need for more consistent reliable data, the International Standards for the Neurological Classification of Spinal Cord Injury (ISNCSCI) was developed as the ASIA Standards for grading the neurological status.^{11,12}

Previously, SCI patients died within few years of trauma.¹³ Though status of morbidity and mortality have gradually improved in developed countries, it is still lacking in developing nations.^{4,13}

Even after treatment and rehabilitation, the life expectancy after spinal cord injury has been observed to be less than the general population.¹⁴ Because of the cardio-pulmonary complications associated with cervical spine trauma, ICU admission becomes necessary and a large subset of these patients eventually require respiratory support in the form of assisted ventilation. However, there is limited study on the outcome of these patients with ICU admissions in a government hospital setup in an underdeveloped country.

In a multicentric study, the authors co-related the complications and outcomes of trauma patients admitted in ICU with gender and age.⁷ Our study shows male predominance (Table 1) which is similar to studies conducted in resource constrained nations.^{2,8,15} However it differs from another study where SCI was seen to affect ages between 20 to 39 years.³ The difference could be due to inclusion of only cervical SCIs in our study.

Majority of our patients were farmers (20, 41.7%) residing outside Kathmandu despite the study location being in

Kathmandu. Fall injury was the most frequent mode of injury representing 83.3% followed by RTA. This is in contrast to RTA being the primary cause of trauma in developed countries which highlights the fact that the focus on preventive measures might be different depending upon country specific population and geography.^{2,3,14}

Patients arriving at the site of definitive care within 24 hours have significantly fewer secondary complications.¹⁶ Since majority of our patients presented 24 hours post injury, and developed cardio-pulmonary complications, which necessitated ICU care. The major reason for the delay was late referrals and transport.

The most common level was C5-C6 (16, 33.3%) followed by C6-C7 (11, 22.9%). 75% patients had complete neurological deficit (Table 2). Associated complications were cardiac (16.4%) followed by pulmonary, renal and psychiatric. This is in contrast with Prin and Li's study where pneumonia (10.9%), urinary tract infection (4.7%), acute respiratory distress syndrome (4.4%) were seen more commonly in ICU patients.¹ The difference could be that the current study included only cervical SCIs whereas Prin and Li's study included all forms of trauma. It is the associated systemic injuries or complications that decide whether an individual actually needs ICU facility or can be transferred to a ward.¹

Twenty two patients (45.8%) underwent cervical spine surgery. Posterior surgical approach (10, 45.5%) was the preferred approach. 62% patients required tracheostomy, 5 (10.4%) required chest tube for associated chest injury and 46 (95.8%) patients required assisted ventilation (Table 2). Thirteen patients (27.08%) died in ICU due to cardiac and pulmonary complications and 13 (27.08%) patients were discharged on family request. Our mortality rate is higher than in the study by Yusuf (7.5%) and this could be due to higher association of pulmonary and cardiac compromise in ASIA A and B deficit patients with cervical SCI (Table 3).

Complications and morbidities are one of the important clinical factors that help decide whether the patient actually needs to stay in ICU or can be transferred to the ward without adversely affecting outcomes.¹ It has been reported that in 8 to 11% of the cases, patients are admitted to the ICU for no sound indication.⁵ This may lead to denial of ICU beds to patients who actually require it. It has also been reported that ICU admission for patients with extremely high expected mortality can be considered futile.⁵ ICU admission of cervical spine injury patients should be on a need basis and by following recommended guidelines and protocols.⁵ Hence, studies on actual utilization of ICU level care should be considered in a similar context where trauma ICU care services are limited.

Though cervical spine injuries have major impact over patient and society, it is inadequately addressed by the health-care system of developing countries like Nepal.¹⁵ In Nepal, the lack of availability of SCI dedicated ICUs, delayed presentation and the financial burden attached to it when the patient actually gets to use the facility increases the patient and their family's financial as well as psychological stress.

This is a retrospective study with limited number of patients over a short duration of 1 year. Also, we have not performed a cost analysis during the ICU stay. However, the authors believe that in a trauma ICU setting, the duration of 1 year is sufficient to analyze the patterns of cervical SCI patients admitted and their complications. A follow up study will be performed regarding the cost analysis and its economic impact.

Conclusion

In resource constrained regions with limited critical care services, patients with cervical spinal cord injury have a high rate of ICU admission with majority requiring assisted ventilation. In spite of the intensive care, a subset of these patients succumbed to the complications of the injury. Therefore, it is essential to establish trauma ICU care with specific protocols on managing cervical spine injuries and reducing the morbidity and mortality associated with it.

Declaration of Conflicting Interests

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