


Review of Subaxial Cervical Spine Injuries Presenting to a Tertiary-Level Hospital in Nepal: Challenges in Surgical Management in a Third World Scenario

Global Spine Journal
2019, Vol. 9(7) 713-716
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DOI: 10.1177/2192568219833049
journals.sagepub.com/home/gsj



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Abstract

Study Design: Epidemiological retrospective study.

Objective: To describe the demographics, timing to surgery, delay, short-term neurological recovery, and complications in surgically treated subaxial cervical trauma in a resource-constrained country.

Methods: Thirty consecutive subaxial cervical trauma patients presenting to a trauma hospital in Nepal between December 2015 and August 2017 were analyzed as a retrospective cohort. Patients were segregated into 4 groups based on the timing to surgery: within 2 days, 3 to 7 days, 8 to 30 days, and >31 days.

Results: There were 27 male and 3 female patients with mean age 40 years. Twenty-four sustained fall injury, and 27 patients were from outside Kathmandu. No patients were treated within the first 48 hours; only 9 were treated between 3 and 7 days, 16 between 8 and 30 days, and 5 a month later. Major delay was finance and operating room availability. Thirteen patients had a C6C7 involvement followed by C5C6 in 6 patients. Seven patients had complete neurological deficit while 18 patients had incomplete deficit. A total of 46.7% improved their neurology in 6 months. No neurological recovery was observed in complete deficit patients.

Conclusion: Seventy percent of our patients were treated longer than 1 week after injury, which would likely be considered unacceptable in most first world countries. As expected, the outcomes for many of these patients were far worse than reported in North American centers with early access to medical care and insurance. Despite this, nearly half of our patients improved neurologically following treatment; hence, surgery holds hope of some restoration of neurologic deficits.

Keywords

cervical, injury, management, challenges

Introduction

With an annual incidence of 12.1 to 57.8 cases per million, spinal cord injuries (SCIs) are a major drain on the resources of the state and society.¹ Cervical spine injuries occur in 2% to 3% of all blunt trauma.² The permanent disability and lack of societal and vocational integration associated with SCI makes it a burden on the patient and the family. Since quadriplegia or quadriparesis resulting from cervical spine injuries cause major disability, it becomes more important to promptly manage these injuries in the hope of a better functional recovery.

While 80% of the world's population reside in developing and underdeveloped countries, the management of SCI in these resource-constrained regions may have a huge impact on the

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Table 1. Patient Demographics.

Characteristics	Percentage (Number)
Number of patients	30
Male	90% (27)
Female	10% (03)
Mean age	40 years
Address	
Outside Kathmandu	90% (27)
Kathmandu	10% (03)
Mode of injury	
Fall injury	80% (24)
Road traffic accidents	16.7% (5)
Physical assault	03.3% (1)
Surgical approach	
Anterior	60% (18)
Posterior	33.3% (10)
Combined	6.7% (2)

outcome of these patients.³ From extraction of the trauma victim, mode and delay in transportation or referral, delay in surgery to inadequate finances for surgery pose a challenge in cervical trauma treatment. Because of the lack of recent data reflecting the epidemiological, demographic, and surgical management and clinical outcome of subaxial cervical spine injury patients in Nepal, we performed this study.

The aim of this study was to describe the epidemiology of subaxial cervical spine injury patients undergoing surgery, the reason for surgical delay, the surgical procedure, short-term neurological outcome, and complications.

Materials and Methods

After approval from the institutional review board, a retrospective study was performed at National Trauma Center, Kathmandu, Nepal, from December 2015 to August 2017. All subaxial cervical spine injury patients undergoing surgery were included in the study. According to the time of presentation to the hospital and surgery, patients were divided into the following groups: within 2 days, 3 to 7 days, 8 to 30 days, and more than 31 days. Patients with osteoporosis, pathological fractures, nontraumatic cervical spine fractures, and conservatively managed patients were excluded from this study. Data was retrieved from the emergency charts, admission sheets, surgery notes, and discharge forms. The collected data was then stored in an Excel sheet format and analyzed.

Results

From December 2015 to August 2017, 121 patients with spine injuries underwent stabilization surgery. Out of the 121 patients, 30 patients with cervical spine injury were operated upon. There were 27 male and 3 female patients with a mean age of 40 years (see Table 1).

Eight percent suffered fall injuries with majority being fall from a cliff or a tree and 16.67% sustained road traffic

Table 2. Percentage Neurological Recovery According to the Delay.

Surgical Timing	Total Patients	Number of Recovery	Subgroup	Total Cohort
0-2 days	0	0	0%	0%
3-7 days	9	7	77.8%	23.3%
8-30 days	16	7	43.8%	23.3%
≥31 days	5	0	0%	0%
3-30 days	25	14	56%	46.7%

Table 3. Time to Admission and Surgery.

	0-2 Days	3-7 Days	8-30 Days	≥31 Days
Trauma to admission, % (n)	40% (12)	50% (15)	3% (1)	7% (2)
Admission to surgery, % (n)	0%	30% (9)	53.3% (16)	16.7% (5)

accidents. A total of 16.67% were motorcycle injuries, and only 1 patient sustained cervical spine injury due to physical assault.

Ninety percent of patients presented to the hospital from outside the Kathmandu valley. All the cervical spine injuries patients from outside were referrals and had undergone primary management in local hospitals and brought in ambulances in a hard collar. Ten percent of the patients from within the valley were transported directly from the accident site in ordinary vehicles without any hard collar.

Ninety percent had more than one-level injury, with 43.3% at C6C7. All 90% with more than one-level injury had a translational type of injury (AO C). A total of 93.3% had a Subaxial Spine Injury Classification Score of 6 and higher, while 6.7% had a score between 4 and 5.

Sixty percent (n = 18) of the patients had an incomplete neurological deficit (ASIA B to D), 23.3% presented with complete neurological deficit (ASIA A), and the remaining had a normal neurology. Seven patients (23.3%) with AO C injury had complete neurological deficit, 16 patients (53.3%) with AO C injury had incomplete deficit (ASIA B to D), 2 patients (6.67%) with AO B2 injury had incomplete deficit, and 5 patients (16.67%) with AO C injury had normal neurology (Table 2).

Fourth percent (n = 12) presented to the hospital emergency within 2 days of the injury, 50% (n = 15) between 3 and 7 days of the injury, 3% (n = 1) between 8 and 30 days, and 7% (n = 2) was brought to the hospital 31 days after the injury (Table 3).

All patients with translational injuries underwent preoperative skull traction till the time of surgery. The skull traction were placed after magnetic resonance imaging (MRI) scans of the cervical spine to rule out any extruded cervical disc fragment. However, none of the MRI scans revealed any extruded disc.

A total of 53.3% (n = 16) of the patients had their surgery between 8 and 30 days, 30% (n = 9) underwent surgery

between 3 and 7 days, and 16.7% (n = 5) were operated upon 31 days later. Majority of the patients (83.3%, n = 25) had their surgery between 3 and 30 days. None of the patients were operated within 2 days of the injury. Thirty-five percent of the delay was due to unavailability of the operating room, 27% of the delay was because of the inability of the patient's relatives to arrange finances for the spine instrumentation, comorbidities resulted in 20% of the delay, while the remaining was due to late presentation.

Sixty percent underwent an anterior surgery with cage or bone graft and plate stabilization. A total of 33.3% were stabilized posteriorly with lateral mass screws while 6.7% had a combined anterior and posterior surgery.

None of the complete deficit patients recovered postoperatively. Fourteen patients (46.6%) improved their neurology post operatively by at least one grade. When operated between 3 and 7 days, 7 of the 9 patients (77.8%) had one grade of neurological improvement. Of the 25 patients operated between 3 and 30 days, 56% had at least one grade neurological improvement. In patients operated after 31 days, the neurological status remained the same.

Minor dysphagia was seen in anterior cervical surgery patients, which subsided in a week. Two patients had hoarseness of voice, which resolved in 3 weeks. One patient had an anterior wound infection for which debridement and intravenous antibiotics for 3 weeks were administered after culture sensitivity report. One patient with anterior cervical surgery had postoperative pneumonitis, which was managed by the pulmonologist. And a patient with deep vein thrombosis 7 days after surgery was managed with subcutaneous heparin and was discharged after Doppler resolution. Another patient with culture-positive urinary tract infection was also managed conservatively with intravenous antibiotics.

Discussion

Fifty-five percent of all SCIs involve the cervical spine with serious consequences.⁴ The only study describing cervical spine injuries in Nepal is by Shrestha et al in 2007.⁵ Much has changed in the demographics of the country since the time of the study and it may not be reflective of the current scenario.

In our study, the mean age of injury is 40 years with male predominance. This is similar to other studies wherein the age of injury is in the fourth and fifth decades.⁶ The male predominance is also in accordance with other published studies.⁷

Majority of the Western literature and publications from the developed nations have revealed motor vehicle accidents to be the most frequent cause of the injury.⁸ However, our study and the study by Shrestha et al have established fall injuries to be the major cause of cervical spine injuries. This cause reflects the geography of the country and the occupation of the victims. The fall injuries are either from a cliff or from a tree while grazing cattle or gathering wood from the branches of trees. With precautions taken, this mode of injury is preventable.

Ninety percent of our patients were from outside the valley, and 60% of the patients presented 2 days after the injury. All the patients from outside were referred patients. This clearly shows the delay in referrals or transportation. Unlike the study by Shrestha et al, where majority of their patients were transported without neck immobilization, all the patients referred to us were immobilized in neck collars. This is a clear indicator that proper primary spine evaluation and immobilization have been performed in the peripheral hospitals.

While 40% of the patients were brought within 48 hours, none of them were operated within 48 hours. More than half (53.3%) had their surgery between 8 and 30 days, and only 30% were operated between 3 and 7 days. The major delay was the unavailability of the operating room followed by the inability of the victims' families to mobilize resources to fund for the spine instrumentation.

Increasing the operating rooms for spine surgery will help in expediting surgery and reducing the waiting list. Also, if the Government of Nepal's spine injury policy incorporated the cost of the spine instrumentation, then most of the surgeries can be performed early.

Despite the delay in surgery, 46.57% of our patients improved their neurology by at least one grade. There is limited evidence to suggest that early decompression within 24 hours may improve neurology.⁹ However, early surgery is still recommended in the presence of deteriorating neurology or incomplete neurological deficit.¹⁰

Besides neurological recovery, early surgery is recommended to reduce in-hospital complications and morbidities.¹¹ Three of the 30 patients had postoperative complications that necessitated them to remain in hospital for more than a month. Deep vein thrombosis was observed in an ASIA A neurology patient, which ultimately resolved by conservative management. A patient with pneumonitis was managed in the intensive care unit, while another patient with anterior wound infection was successfully treated with debridement and antibiotics. All these 3 patients had their surgery between 8 and 30 days. No mortality occurred in the surgically treated patients during their hospital stay.

The major challenges in managing cervical spine injuries in Nepal, which may also be reflective of the situation of other underdeveloped countries or countries with resource constraints, are delay in referral, delay in transport, provision of surgical theater, and mobilization of finance and resources for surgery. All these causes can be mitigated by designing a quick referral system or provision of trained spine surgeons in the peripheral hospitals, obtaining access to more operating rooms, and inclusion of the cost of spine instrumentation in the spine injury policy of the government.

Also, public awareness programs on prevention of spine injuries, method of extrication of injury victims from the site of accident or fall, and proper immobilization during transport can help in reducing spine injury and neurological deterioration.

Limitations of the Study

This is a retrospective study with limited number of patients conducted in a single institution. Also, this study does not include upper cervical injuries and conservatively managed subaxial cervical spine injuries. Patients with concomitant life-threatening injuries and who died during the course of treatment were also not included. This study does not follow the patients after discharge from the hospital, and as a result, short-term and long-term functional and radiological outcomes have not been included. The rehabilitation and societal and vocational integration of the patients have not been studied.

Conclusion

Seventy percent of our patients were operated a week after hospital admission, which may not be the acceptable norm in developed countries with modern health care facilities. Despite the delay, nearly half had an improvement in their neurology, which suggests that surgery still holds the key to a better functional and rehabilitation outcome. With quicker referral, early and frequent access to operating rooms, an inclusive spine injury policy, and trained cervical spine surgeons in the periphery, majority of the delay can be mitigated.


Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: K. Daniel Riew: Biomet, Medtronic—Royalties. Osprey, Expanding Orthopedics, Spineology, Spinal Kinetics, Nexgen Spine, Amedica, Vertiflex, Benvenue, Paradigm Spine, PSD—Stock. *Spine*, *GSJ*, *ESJ*, *Neurosurgery*, *Clinics in Orthopedics*, *Spine Surgery Today*—Editorial/Board. AO Spine—Board. The remaining authors have no conflicts of interest to disclose.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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References

1. van den Berg ME, Castellote JM, MahilloFernandez I, de Pedro-Cuesta J. Incidence of spinal cord injury worldwide: a systematic review. *Neuroepidemiology*. 2010;34:184-192.
2. Lowery DW, Wald MM, Browne BJ, Tigges S, Hoffman JR, Mower WR; NEXUS Group. Epidemiology of cervical spine injury victims. *Ann Emerg Med*. 2001;38:12-16.
3. Rahimi-Movaghar V, Sayyah MK, Akbari H, et al. Epidemiology of traumatic spinal cord injury in developing countries: a systematic review. *Neuroepidemiology*. 2013;41:65-85.
4. Sekhon LH, Fehlings MG. Epidemiology, demographics and pathophysiology of acute spinal cord injury. *Spine (Phila Pa 1976)*. 2001;26(24 suppl):S2-S12.
5. Shrestha D, Garg M, Singh GK, Singh MP, Sharma UK. Cervical spine injuries in a teaching hospital of eastern region of Nepal: a clinico-epidemiological study. *JNMA J Nepal Med Assoc*. 2007;46(167):107-111.
6. Fredø HL, Rizvi SA, Lied B, Rønning P, Helseth E. The epidemiology of traumatic cervical spine fractures: a prospective population study from Norway. *Scand J Trauma Resusc Emerg Med*. 2012;20:85.
7. Thompson WL, Stiell IG, Clement CM, Brison RJ; Canadian C-Spine Rule Study Group. Association of injury mechanism with the risk of cervical spine fractures. *CJEM*. 2009;11:14-22.
8. Clayton JL, Harris MB, Weintraub SL, et al. Risk factors for cervical spine injury. *Injury*. 2012;43:431-435.
9. Furlan JC, Noonan V, Cadotte DW, Fehlings MG. Timing of decompressive surgery of spinal cord after traumatic spinal cord injury: an evidence-based examination of pre-clinical and clinical studies. *J Neurotrauma*. 2011;28:1371-1399.
10. Consortium for Spinal Cord Medicine. Early acute management in adults with spinal cord injury: a clinical practice guideline for health-care professionals. *J Spinal Cord Med*. 2008;31:403-479.
11. Kerwin AJ, Frykber ER, Schino MA, Griffen MM, Murphy T, Tepas JJ. The effect of early spine fixation on non-neurologic outcome. *J Trauma*. 2005;58:15-21.