Original Article

A Descriptive Study on Patterns of Traumatic Spinal Injuries in a Tertiary Care Hospital Rawalpindi

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Abstract

Introduction: Spinal injuries are one of the most debilitating injuries if not fatal and affect every dimension of patients' lives i.e. early mortality and late complications. Lifelong disability due to spinal cord injury is very common even if the patient survives early death. The current study was aimed to investigate the frequency, management, mortality, the pattern of spinal injuries and to recommend plans for better patient management based on assessment.

Materials and Methods: The study was descriptive, cross-sectional, and was conducted at the Neurosurgery Department of Rawalpindi Medical University and Allied Hospitals for the duration of October 2018 to January 2019. All cases of traumatic spinal injuries were included and variables noted were gender, age, mode of Injury, presenting motor power in limbs, ASIA score, diagnosis, management, outcome, and deaths.

Results: In the sample size of 84 patients, the mean age was 37.1 years, the mechanism of injury due to falls was most common at 73%, and the lumbar region was found to be the most common area involved. Male patients outnumbered females in the study. 14% of the patients could not survive due to the injury, 15% received cervical traction, 4% received cervical traction and anterior cervical plating, and 43% of patients underwent Transpedicular Screw Fixation, the total number of patients who expired was 25%.

Conclusion: Patterns of traumatic spinal injuries are changing, shifting from road traffic accidents to falls being the primary cause nowadays, with prolonged hospital stay periods, disability for life, and high-cost treatments putting a huge burden on our already exhausted health resources. Efforts should be made to make a national registry for traumatic spinal injuries presented to the emergency department and guidelines should be established regarding occupational hazards. Awareness should be given to the general population regarding hazards at home regarding falls.

Keywords: SCI (Spinal Cord Injury), TSI (Traumatic Spinal Injuries), ASIA score (American Spinal Injury Association score), TPSF (Trans pedicle screw fixation), LMIC (Lower middle-income countries).

Introduction

Traumatic spinal injuries are one of the most common modes of trauma and paradoxically most prone to be overlooked and underestimated in our healthcare settings. According to a systemic review, the Global incidence of TSI is 10.5 per 100,000.[1] and 13.7 per 100,000 in South-East ASIA Region (SEAR), resulting in an estimated 768,473 [95% confidence interval, 597,213-939,732] new cases of TSI annually worldwide(1), whereas the mortality rate in the injured reaches up to 60% globally.[1]

Spinal and spine-related injuries, which are common in trauma, have the poorest functional outcomes and the lowest rates of return to work among all major organ injuries[2], The clinical effects of TSI vary from primary injuries (mechanical instability, complete/incomplete paralysis) to secondary injuries which include ischemia, axonal degeneration, vascular dysfunction, oxidative stress, demyelination, and inflammatory cell death.[3] The prevalence of TSI injuries in blunt trauma patients presenting to emergency facilities undergoing Thoracolumbar radiographs is 6.9%[4] and spinal fractures represent 3% to 6% of all skeletal injuries.[5] The effect of TSI on survivors ranging from the length of hospital stay, lifetime cost, and decreased life expectancy and quality of life of the victims and families involved makes it a serious issue to address. In Canada, The estimated lifetime economic burden per individual with traumatic Spinal injuries ranges from $1.5 million for incomplete paraplegia to $3.0 million for complete tetraplegia. The annual economic burden associated with 1389 new persons with traumatic spinal injuries surviving their initial hospitalization is estimated at $2.67 billion[6], in the USA Estimated lifetime cost varies from 2.5 million dollars to 4.6 million dollars.[7] Annual costs associated with spinal cord injury (SCI) exceed $4 billion in the USA[8], the cost in these developed countries is borne by state and insurance agencies whereas Pakistan having limited resources and no health insurance support for the general population, makes TSI a massive burden on our already choked health resources.

The magnitude of effect TSI has as a global health issue remains obscure. The scarcity of available data and lack of a national SCI registry remain obstacles to the assessment of the burden of TSI (9) and a major hindrance to the development of national guidelines and agendas, focused on injury prevention and management.

Pakistan is among the lower-middle-income countries (LMICs) with approx. 7.5 crore population involved in labor work and the 10th country in terms of the labor workforce.[10] The labor workforce is prone to occupational hazards, and accidents such as falls (major causes of spinal injuries), are accentuated by disasters such as the earthquake of 2005, and the lack of safety measures in building infrastructure for the prevention of falls.

Until now CT scan with sagittal and coronal reconstruction remains the modality of choice for imaging TSI.[11] DHQ Rawalpindi serves as a specialized referral center for TSI from adjoining areas Kashmir, Chakwal, Jehlum, Mianwali, Attock, Sargodha, and even central Punjab and KPK.

Materials and Methods

This study was descriptive cross-sectional to assess the pattern of Traumatic Spinal Injuries.

The total number of patients was 84 who were selected based on consecutive, non-random sampling. All cases of TSI presenting to District Headquarters Hospital Rawalpindi from October 2018 to January 2019 were included. In all patients, initial routine stabilization was done according to ATLS protocol, followed by a complete neurological examination. All patients were graded according to the ASIA scale into A, B, C, D, and E accordingly.

A specifically designed proforma was used as a study tool to gather relevant data about the patients after informed consent. Variables included in the proforma were age, gender, mode of trauma, ASIA score, diagnosis, the region of the spinal cord involved, treatment and management performed, and outcome.

Operative intervention was decided on SLICS (Sub-Axial Cervical Spine Injury Classification System) score for patients with a cervical spine injury and TLICS (Thoracolumbar Injury Classification and Severity Scale) score for patients have a thoracic spine or lumbar spine injury, with patients having a score greater than 4 or patients with worsening neurological deficit.

Characteristic	Points
Morphology	
No abnormality	0
Compression	1
Burst	2
Distraction (*e.g.*, facet perch, hyperextension)	3
Rotation/Translation (*e.g.*, facet dislocation, unstable teardrop or advance-staged flexion compression injury)	4
Discoligamentous complex	
Intact	0
Indeterminate (*e.g.*, isolated interspinous widening, MRI signal changes only)	1
Disrupted (*e.g.*, widening of the disk space, facet perch or dislocation, kyphotic deformity)	2
Neurological status	
Intact	0
Root injury	1
Complete cord injury	2
Incomplete cord injury	3
Continuous cord compression in setting of neuro deficit (Neuro Modifier)	1

Figure 1: SLICS (Sub-Axial Cervical Spine Injury Classification System) score

Category	Parameter	Points
Morphology	Compression fracture, height loss <50%	1
	Compression fracture, height loss ≥50%	2
	Burst fracture, height loss <50% and spinal stenosis <50%	2
	Burst fracture, height loss ≥50% or spinal stenosis ≥50%	3
	Translation/rotational injury	3
	Distraction	4
Neurologic status	Intact	0
	Nerve root injury	2
	Cord, conus medullaris Incomplete injury	3
	Cord, conus medullaris Complete injury	2
	Cauda equina injury	3
Posterior ligamentous complex (PLC)	Intact	0
	Focal edema or enhancement in the soft tissue of PLC on MRI	1
	Focal edema or enhancement in the bony structure of the facet joint or spinous process	2
	Definite discontinuation of the PLC	3

Posterior ligamentous complex = supraspinous ligament, the interspinous ligament, the ligamentum flavum and the facet joint.

Figure 2: TLICS (Thoracolumbar Injury Classification and Severity Scale) score

Patients were followed up for a minimum of 6 months to evaluate and record their results.

Statistical analysis of data was carried out through the statistical software IBM SPSS version 23. Descriptive statistics i.e frequency, percentage and mean ±standard-deviation were used to describe continuous variables, and categorical variables were analyzed using Pearson's chi-square for measuring the association between variables with the level of significance P-value less than 0.05.

Results

The total number of patients presenting throughout the study was 84, with males (n=66, 79%) outnumbering females (n=18, 21%).

The age range was 13-70 with the mean age 37.6 ± 15. Patients most commonly affected belonged to the age group 20-30 with the frequency of n=18 (21%). The relationship between Age and outcome of the patient was found to be statistically insignificant (p=.420), and the relationship between Age and ASIA score was also found to be statistically insignificant (p=.189).

Cases of falls from height were the most common mode of injury (n=64, 78%) followed by road traffic accidents (n=20, 22%). In the study population, the most commonly affected region was the Lumbar Region (n=37, 44%) followed by the Cervical Region (n=24, 28%). The L1 fracture was most common and found to occur in 29% of patients n=25, followed by L3 segment fracture (n=8, 9%). The relationship of the injury region involved was found to be statistically significant with the type of treatment performed (p=.000) and the outcome of the patient (p= .000).

Table 1: Region of the Spine involved

	Frequency	*Percent*
Cervical	23	27.4
Cervicothoracic	4	4.8
Coccygeal	3	3.6
Lumbar	37	44.0
Thoracic	15	17.9
Thoracolumbar	2	2.4
Total	84	100.0

ASIA A was the most common presentation of TSI n=28 (33%). In our study, the relationship between the ASIA score and the outcome was found statistically significant with a p-value of (p= .000), the relationship between the ASIA score was also found to be statistically significant with the region involved (p= .009), and treatment performed (.004).

ASIA score was also found to be strongly associated with the level of injury i.e cervical injuries 18 out of 23 patients (78%) had the poorest scores A = 8, C =10 similarly in lumbar injuries out of 37 patients 23 had poor ASIA score A=09, B=10, C=4 (62%) at presentation. This ASIA score at presentation and region involved significantly predicted the outcome as patients with poor ASIA scores had no improvement even after surgery in our 6 monthly follow-ups.

Table 2: ASIA score in TSI patients along with regional classification

*Region * ASIA Crosstabulation*							
		ASIA					Total
		A	B	C	D	E	
Region	Cervical	8	0	10	3	2	23
	Cervicothoracic	1	0	2	1	0	4
	Coccygeal	0	0	0	2	1	3
	Lumber	9	10	4	4	10	37
	Thoracic	8	1	2	2	2	15
	Thoracolumber	2	0	0	0	0	2
Total		28	11	18	12	15	84

Out of the total sample of n=84, 44 patients (48%) were operated on (TPSF=37, Anterior cervical plating n=4, coccygectomy n=3), 17 (20%) patients were given cervical traction, and 27 (32%) patients were managed conservatively. 26 patients showed improvement during the study out of which 19(73%) were postoperative, 1 patient showed improvement from ASIA B to C, 3 patients showed improvement from ASIA C to D and 8 patients showed improvement from D to E. 14 patients had ASIA E after TSI but were discharged after no signs of worsening or clinical distress were observed. Overall 37 patients showed no improvement on follow-ups.

Twenty-one patients could not survive (25%) out of which 1 was post-operative death, 7 patients were being managed conservatively and 13 were being managed conservatively by applying cervical traction for cervical vertebrae fracture. A statistically significant relationship was found between Treatment performed and the outcome (p=.000).

Table 3: Outcome of the patients with TSI

Outcome	*Frequency*	*Percent*
Expired	21	25.0
improvement	26	31.0
No improvement	37	44.0
Total	84	100.0

Cervical injuries had the highest number of mortality n=21 (cervical 19, cervicothoracic segment =2)(25%), out of these 1 was post-operative.

Surgical Site infections developed in 3 patients which were managed with antibiotics, debridements, and wound dressings.

Discussion

In our study, patients with TSI presented with two mechanisms of injury i.e RTA or Fall from height. RTA was considered to be the leading cause of TSI globally but due to recent advancements and stringent regulations, the incidence of RTA has decreased largely, making falls the leading source of TSI according to recent study findings.[12,13,14] M Oliver et al reported that due to better motor vehicle safety and adherence there has been a marked reduction in TSI due to RTA.[15] and according to the Pakistan Bureau of Statistics total number of accidents across Punjab has decreased by 5344 (2009-10) to 4294 (2019-20)[16], which can be attributed to better road safety regulations and awareness. Whereas falls from height remain an enigma in Pakistan, due to the lack of a national registry for Spinal cord injuries, which puts a major hindrance to the development of policies regarding spinal trauma management protocols and rehabilitation.

A study in Northern Finland[17] reported that, regarding traumatic spinal injuries, falls were more common in the elderly whereas RTA affected the younger population more. This was not the case with our study, according to which the mode of injury had no significant relationship with age (p= .337). This can be further explained by the difference in lifestyles and economic status, a majority of our population doesn't have access to motor vehicles. Occupational injuries add more to the risk as insufficient safety measures exist to prevent injuries from falls, making TSI a risk factor for all age groups

Like other LMIC countries, a major part of the Pakistani population i.e. 7.5 crore people rely on labor wages.[18] According to the economic survey of Pakistan 2013-2014, our country is the 10th largest in terms of the labor force. The situation of occupational health and safety (OHS) is also miserable in Pakistan due to many factors, such as inadequate medical facilities, lack of specific laws for OHS, and non-adherence to labor laws unbeknownst to the labor workforce, and lack of awareness. All of this has contributed to the increase in the injured employed person ratio over the past years.[19] These factors collectively have an additive effect in our cases of falls from height.

In the current study, falls from height were the major presenting cause of TSI and the Lumbar spine was the most commonly affected region due to increased cases of falls. According to some studies, fracture of the lumbar spine was one of the most common and frequent results of fall injuries.[12,13,14] Tafida et al[14] also reported that traumatic spinal fractures are largely due to falls, especially at the lumbosacral level. The lumbar region is the weight-bearing area of the spine, where the observation of recovery after cord compression and cord swelling is unclear and the likelihood of severe neurological deficits (complete injury) followed by thoracolumbar spinal cord injury, increases in case of greater cord compression.[20] Therefore making it vital to promptly stabilize the spine and relieve the compression effect by ongoing hematoma and displaced bony fragments as early as possible, Qadir et al.[21] concluded that early decompression done under 72 hours had a neuroprotective effect hence better recovery rates, Hogan JA et al. concluded that early transfer of the patient to specialized Spinal Cord Injury centers decreases the overall length of stay and mortality[22], also Maharaj et al concluded that early transfer to specialized centers decreased the prevalence of medical complications (particularly pressure areas) and shortening of total hospital Length of stay.[23] Early decompression of traumatic cervical spine injury leads to improved neurological outcomes[24,25,26] if the surgical procedure is performed within 24 hours.

There are certain barriers to this which include the delayed presentation of the patient to the hospital, transport logistics, delayed or missed diagnosis, unavailability of a spine surgeon or operating room, and intensive care resources.[27] Pakistan in addition to these factors, the lack of Dedicated SCI centers for a large number of patients[28] adversely affects the time from onset of injury to the presentation of patients in our setup making early surgical intervention a challenge.

In this study out of the 21 (25%) patients who had expired, 19 had a cervical spine injury and 2 had cervicothoracic spine injury, whereas neurological recovery of the patients who had survived, was dependent on presenting ASIA score and the region involved i.e. poor ASIA score in cervical injuries had higher mortality and no improvement and moderate ASIA score in lumbar injuries had better prognosis than cervical.

The lumbar region had a better recovery rate than the cervical region this coincides with Khorasanizadeh et al.[29] In other studies mortality was high in older and female populations due to falls because of decreased bone mineral density and increased fragility of vertebrae bone[30] but in our study, Traumatic spinal injuries were more or less uniformly distributed in all age groups and most of the victims belonged to working groups. Scivoletto et al[31] reported that ASIA score at presentation had the most important prognosis in the outcome which coincides with our study i.e. p-value = 0.00, Prognosis in our study is related to ASIA score at presentation and consequent management plan, as patients with ASIA A score showed no improvements on 6 months follow-up.

Conclusion

With the passage of time pattern of presentation, treatment, and management of TSI are changing, trends of presentation are shifting from falls being the most common cause rather than RTA due to better rules and regulations for the prevention of RTA and awareness of the general population regarding RTA, TSI in the modern age is a silent pandemic affecting every region of the globe with poorest outcomes and quality of life. Pakistan being part of lower-middle-income countries needs to focus on making a national registry and dedicated rehabilitation setups for TSI. More dedicated Specialized Spinal Treatment centers and early referral systems so that time for presentation and surgical intervention is reduced, laws should be established and strict compliance with checks and balances is required for occupational hazards and workplace safety. Steps should be taken for health insurance for workers at risk of occupational hazards. Special campaigns need to be undertaken for public awareness about the prevention of falls in the home and workplace.

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