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Original Research Article

To Study the Clinic-Epidemiological Profile and Early Outcome of Patients with Traumatic Spine Injury

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Abstract

Aim: To study the clinic-epidemiological profile and early outcome of patients with traumatic spine injury.

Material and Methods: This was a retrospective study conducted in the Department of Orthopedics, SKMCH, Muzaffarpur, Bihar, India for one year. 200 patients were included in the study. All patients with traumatic spine injuries attending OPD or admitted in emergency, willing to participate in study were included in this study. Radiological imaging (X-rays, CT scan, and MRI) were done. After clinical and radiological examination patients' further treatment options (operative/non operative) were planned.

Results: Follow up ASIA score after 2 weeks in patients was A in 14% patients, B in 8%, C in 16%, D in 12%, E in 50%. Follow up ASIA score after 3 months in patients was A in 8% patients, B in 5%, C in 6%, D in 15%, E in 68%. Follow up ASIA score after 6 months in patients was A in 9% patients, B in 5%, C in 4%, D in 16%, E in 66%. Follow up ASIA score after 9 months in patients was A in 8% patients, B in 6%, C in 4%, D in 20, E in 60%. Follow up ASIA score after 12 months in patients was A in 12%, D in 28, E in 60%.

Conclusion: Leading causes in deaths at cervical level were due to respiratory failure and leading causes of deaths in thoracic and lumbar vertebral level were due to secondary complications of long-standing bed sores. Despite limited sources, outcomes of SCI patients in India appear favorable with evidence of clinical improvement and low mortality.

Keywords: Traumatic spine injuries, ASIA score, Radiological imaging,

Introduction

Traumatic spine injuries (TSIs) represent a significant public health challenge, affecting individuals of all ages and often leading to substantial morbidity and mortality. These injuries are primarily caused by high-energy trauma, such as motor vehicle accidents, falls, sports injuries, and acts of violence. The incidence of TSIs varies globally, with rates influenced by factors such as traffic regulations, occupational safety measures, and the prevalence of violent activities. [1,2] In the United States alone, approximately 17,000 new cases of spinal cord injuries (SCIs) are reported annually, contributing to an estimated 291,000 individuals living with SCI-related disabilities. [3] The spine's intricate structure and critical role in protecting the spinal cord make injuries to this region particularly devastating. TSIs can range from minor ligamentous injuries and vertebral fractures to severe spinal cord damage, leading to partial or complete paralysis. [4] The consequences of these injuries are profound, often resulting in long-term disability, chronic pain, and a diminished quality of life. Additionally, the economic burden associated with TSIs is substantial, encompassing direct medical costs and indirect costs related to loss of productivity and long-term care. Advancements in imaging techniques, such as computed tomography (CT) and magnetic resonance imaging (MRI), have significantly improved the diagnosis and management of TSIs. These modalities provide detailed insights into the extent of bony and soft tissue damage, guiding therapeutic interventions. Early and accurate diagnosis is crucial for optimal outcomes, as delayed or missed diagnoses can exacerbate neurological deficits and complicate recovery. [5,6] Management of TSIs involves a multidisciplinary approach, encompassing pre-hospital care, acute medical and surgical interventions, and comprehensive rehabilitation. Initial stabilization and transport to a specialized trauma center are critical to prevent further injury and manage acute complications. Surgical interventions, when indicated, aim to decompress neural elements, stabilize the spinal column, and

restore alignment. Innovations in spinal surgery, such as minimally invasive techniques and advanced instrumentation, have enhanced the safety and efficacy of these procedures. [7,8] Rehabilitation plays a pivotal role in the recovery process, focusing on maximizing functional independence and improving the quality of life. Early and intensive rehabilitation programs, tailored to the individual's specific needs, can lead to significant improvements in mobility, self-care, and psychological well-being. Moreover, ongoing research into neuro regenerative therapies, such as stem cell therapy and neuro prosthetics, holds promise for future advancements in the treatment of SCI. Despite these advancements, TSIs remain a major challenge in trauma care, with ongoing efforts needed to improve prevention, early diagnosis, and treatment outcomes. Public health initiatives aimed at reducing the incidence of high-energy trauma, alongside advancements in medical and surgical care, are essential to mitigate the impact of TSIs. Continued research and innovation in this field are imperative to enhance the understanding and management of these complex injuries, ultimately improving the lives of affected individuals. [9-11]

Material and Methods

This was an intervention retrospective randomized control trial study was conducted in the Department Of orthopedics, SKMCH, Muzaffarpur, Bihar, India for one year. 200 patients were included in the study. All patients with traumatic spine injuries attending OPD or admitted in emergency, willing to participate in study were included in this study. Patient with Non traumatic patients with spine ailments were excluded from the study. Study was explained to patients/relatives and written informed consent was taken for participation and follow-up. All the patients received in emergency room were managed according to ATLS protocol (general examination, primary and secondary surveys to identify associated injuries). Patient was log rolled for examination of the back. Note was made for any bruises, swellings and palpated for kyphotic angulations, step-off and point tenderness which was present in injuries to osteo-ligamentous complex. Radiological imaging (X-rays, CT scan, and MRI) were done. After clinical and radiological examination patients' further treatment options (operative/non operative) were planned. All patients admitted for surgical intervention would be assessed pre operatively with complete hemogram, renal function tests/liver function tests, blood sugar levels (FBS and PP), PT/PTI/INR, blood grouping, neurological status as per American spinal injury association (ASIA impairment scale), pain –back pain using visual analogue scale (VAS), imaging such as radiographs- cervical and thoracolumbar spine (AP/Lat view)- Vertebral body height, NCCT of affected spine, MRI of affected spine. After fitness, patients underwent surgery at our center. Standard post-operative care was provided to all patients. Patients were discharged appropriately as per surgery protocol. All patients who reported were followed up in OPD/telephonically after every 4 weeks till 1 year. Patients were studied for: Survivorship, Neurological status, Nutritional status, Complications like bed sores, urinary tract infections, upper respiratory tract infections and Sexual functions. Radiologically patient was reviewed for the deformity.

Statistical Analysis

Data was collected and compiled using Microsoft Excel. The presentation of the Categorical variables was done in the form of number and percentage (%). On the other hand, the presentation of the continuous variables was done as mean ± SD and median values. The comparison of the variables which were qualitative in nature were analyzed using Fisher's Exact test. The data entry was done in the Microsoft EXCEL spreadsheet and the final analysis was done with the use of Statistical Package for Social Sciences (SPSS)software version 24.0. For statistical significance, p value of less than 0.05 was considered as significant.

Results

Out of 200 patients, most of the patients were in the age group 51-60 (32%) and 41-50 (30%). Mean age was 51.59 years. Majority of the patients were male 70% while 30% patients were female. In present study, majority of traumatic spine injuries were due to road traffic accidents (52%), followed by fall from height (45%) and assault (3%). Majority of spine fractures occurred at cervical (40%) followed by Lumbar (30%) followed by thoracic (20%) vertebral level. Out of 100 patients, 55 patients (55%) had no associated injuries. Common associated injuries were hemoperitoneum (12%), head injury (11%), fracture humerus (9%) and fracture clavicle (6%). Out of 200 patients, 54% patients had no Neuro deficit and 46% patients had Neuro deficit. On pre -operative assessment 50% patients had ASIA score of E, 11% had ASIA score of D, 17% had ASIA score of C, 7% had ASIA score of B and 15% had ASIA score of A.

Follow up ASIA score after 2 weeks in patients was A in 14% patients, B in 8%, C in 16%, D in 12%, E in 50%. Follow up ASIA score after 3 months in patients was A in 8% patients, B in 5%, C in 6%, D in 15%, E in 68%. Follow up ASIA score after 6 months in patients was A in 9% patients, B in 5%, C in 4%, D in 16%, E in 66%. Follow up ASIA score after 9 months in patients was A in 8% patients, B in 6%, C in 4%, D in 20, E in 60%. Follow up ASIA score after 12 months in patients was A in 12%, D in 28, E in 60%.

Table 1: Distribution of age (years) in males and females

Age in years	Male (n=140)	Female (n=60)	Total
≤20	2	0	2 (1)
21-30	8	4	12 (6)
31-40	8	6	14 (7)
41-50	44	16	60 (30)
51-60	48	16	64 (32)
61-70	28	12	40 (20)
>70	2	6	8 (4)
Mean±SD	55.05±11.59	53.27±13.97	51.59±12.38

Table 2: Distribution of mode of injury, injury level and associated injuries of study subjects

Mode of injury	N	%
RTA	104	52
Fall from height	90	45
Assault	6	3
Injury level		
Cervical	80	40
Cervical and Lumbar	2	1
Cervical and sacra Lala	2	1
Cervical and thoracic	10	5
Lumbar	60	30
Lumbar and sacra Lala	4	2
Thoracic	40	20
Thoracic and Lumbar	6	3
Associated injuries		
No associated injuries	110	55
Hemoperitoneum	24	12
Head injury	22	11
Fracture humerus	18	9
Fracture clavicle	12	6
Others	14	7

Table 3: Distribution of pre -operative assessment of study subjects

Pre-operative assessment	Frequency	Percentage
Neurological status		
With neuro deficit	92	46
Without neuro deficit	108	54
ASIA score		
A	30	15
B	14	7
C	34	17
D	22	11
E	100	50%

Table 4: Distribution of follow up ASIA score of study subjects

Follow up ASIA score	After 2 weeks	After 3 months	After 6 months	After 9 months	After 12 months
A	28 (14%)	16 (8%)	18 (9%)	16 (8%)	24 (12%)
B	16 (8%)	10 (5%)	10 (5%)	12 (6%)	-
C	32 (16%)	12 (6%)	8 (4%)	8 (4%)	56 (28%)
D	24 (12%)	30 (15%)	32 (16%)	40 (20%)	-
E	100 (50%)	136 (68%)	132 (66%)	120 (60%)	120 (60%)

Discussion

Spinal cord injury is an insult spinal cord resulting in a change either temporary or permanent, in its normal motor, sensory, or autonomic function. Traumatic Spinal Cord Injury (TSCI) is a devastating neurological injury, causing paralysis, sensory loss and sphincter disorder in different

degrees and indirectly imposes a significant burden on the health care system. [12] Internationally incident rates for traumatic spinal cord injuries range from 10.4-83 cases per million of population with significant differences between different countries or regions. [13] The incidence of traumatic spinal cord injury (TSCI) in the developing countries is 25.5/million/year. [14] People with Spinal cord injury are 2 to 5 times to die prematurely than people without Spinal cord injuries depending on the health-care system capacity. [15] Etiologically, more than 90% of spinal cord injuries cases are traumatic and caused by incidences such as road traffic accidents, violence, sports or falls. 14 Spinal cord injury is a two-step process that involves Primary (combination of the initial impact as well as the subsequent persisting compression) and Secondary injury (series of physiological and biochemical changes after which are primary mechanical injury). [16] Out of 200 patients, most of the patients were in the age groups 51-60 (32%) and 41-50 (30%). Mean age was 51.59 years. Majority of the patients were male 70% while 30% patients were female. In the series of Chamberlain JD et al [17] out of 932 patients, male to female ratio was 1.88:1. The mean age in tetraplegics was 53.5 years and in paraplegics was 43.8 years. Over all mean age was 48 years. In present study, majority of traumatic spine injuries were due to road traffic accidents (52%), followed by fall from height (45%) and assault (3%). Majority of spine fractures occurred at cervical (40%) followed by Lumbar (30%) followed by thoracic (20%) vertebral level. Out of 100 patients, 55 patients (55%) had no associated injuries. Common associated injuries were hemoperitoneum (12%), head injury (11%), fracture humerus (9%) and fracture clavicle (6%). Sommer et al [18] reported epidemiology, treatment, clinical and radiological results of 283 patients with spine fractures in a five-year period. The operation rate ranged from 42% of cervical to 9% of thoracic and 24% of the lumbar spine. He found good radiological results concerning the correction of the wedge compression and the collapse of the lumbar vertebral body by fixation with an internal fixator. After a follow-up of 2-5 years, nearly 80% of conservatively, as well as surgically, treated patients had residual back pain. Shamim MS et al [19] in series of 54 patients with complete SCI, in which 50% received surgical treatment, they found the operated group spent a longer period in rehabilitation. They also had a longer hospital stay, were associated with more complications, especially those related to infections and also had a significantly higher cost of treatment when compared with the group treated conservatively. Pandey Vket al [20] concluded in his study with 23-month average follow-up revealed that 17% of patients who underwent surgery for spine fractures died, all after discharge. Out of 200 patients, 54% patients had no Neuro deficit and 46% patients had Neuro deficit. On pre -operative assessment 50% patients had ASIA score of E, 11% had ASIA score of D, 17% had ASIA score of C, 7% had ASIA score of B and 15% had ASIA score of A. Follow up ASIA score after 2 weeks in patients was A in 14% patients, B in 8%, C in 16%, D in 12, E in 50%. Follow up ASIA score after 3 months in patients was A in 8% patients, B in 5%, C in 6%, D in 15%, E in 68%. Follow up ASIA score after 6 months in patients was A in 9% patients, B in 5%, C in 4%, D in 16%, E in 66%. Follow up ASIA score after 9 months in patients was A in 8% patients, B in 6%, C in 4%, D in 20, E in 60%. Follow up ASIA score after 12 months in patients was A in 12%, D in 28, E in 60%. In a study, 70% of patients initially diagnosed as ASIA A didn't convert, as did 90% with ASIA D. On the whole 68% of total patients didn't convert, while 30% of patients improved and 2% deteriorated. [21] Midden drop et al [22] in his series of 273 patients observed that ASIA A were 161, ASIA B were 37, ASIA C were 43, and ASIA D were 32. 42(26%) converted from ASIA A, 27(73%) from ASIA B, 32(75%) from ASIA C, 5(16%) from ASIA D.

Conclusion

Complication rates were higher in patients treated non-operatively. Leading causes in deaths at cervical level were due to respiratory failure and leading causes of deaths in thoracic and lumbar vertebral level were due to secondary complications of long-standing bed sores. Despite limited sources, outcomes of SCI patients in India appear favorable with evidence of clinical improvement and low mortality. In-country like India Road traffic accident in young population is the most common cause of SCI. Adequate traffic education and public awareness, in implementing traffic rules and road safety measures may reduce RTAs. Establishment of physical rehabilitation programs is needed to maximize functional outcomes and minimize secondary complications, and efforts should be made to improve the follow-up of SCI patients.

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