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Rural spine surgery practice: Challenges in optimal management of traumatic spinal cord injury

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Abstract

Study design: Prospective observational study.

Objectives: To highlight the challenges in the management of traumatic Spinal Cord Injury in rural spine surgery practice.

Setting: Agartala Government Medical College, Agartala Tripura India.

Methodology: Consecutive spinal cord injury cases were admitted from September 2018 to September 2019 in the department of orthopaedics and surgical stabilization with pedicular screws system with or without decompression was carried out.

Results: 44 patients with SCI were treated with 34 males (77.27%) and 10 females (22.72%) majority of the patients were between the age group of 31-40 years (40.9%). Fall from height being the common cause of SCI the patient were brought to the hospital emergency at 1 day to 7 day in 61.36% and in 45.5% of the cases SCI patients were transported to the hospital on relative arrangement in 45.45% of cases CT evaluation was carried out at 1day to 7 days and MRI evaluation at one week to one month in 59.09% of the cases. Time to surgery was between one week to one month in 61.6% of our cases and 40.45% of our patients belonged to low economic families.

Conclusion: Comprehensive management of SCI is a big challenge in a resource-challenged rural area needs a collaborative effort by the government for improving the practice of spine surgery in rural settings. Imbalance still exists in the availability of the specialized spine care between urban and rural areas. Families with low socio-economic status had a major financial, social and psychological impact as majority of the patients were the primary bread earning members of the family and hence emphasis should be on proper utilization of the available Government health schemes for addressing the financial constrain families in rural set ups.

Keywords: Spinal cord injury (SCI), American spinal injury association (ASIA), rural areas

1. Introduction

Spinal problems pose a great challenge to humanity and hence there has been a rapid development in the prevention, diagnosis and comprehensive management of various spinal ailments worldwide. Spine fractures and spinal cord injury were described over 5,000 years ago in the Edwin surgical papyrus as an ailment that should not be treated because of its grave prognosis with unremitting bedsores, infection, renal failure and death was a rule ^[1].

Today, improved operative techniques has led to major advances in spinal stabilization and the development of dedicated spinal cord injury centers with improved postoperative rehabilitation have led to significant improvement in the functional outcome.

However, the problem of actually availability of specialized spinal care poses a great challenge especially in rural and low-resource societies owing to the lack of infrastructure, healthcare investment and training programs for the health care practitioners and hence a vast imbalance exists between urban and rural areas ^[2].

The present study is an attempt to highlight the challenges in the management of traumatic Spinal Cord Injury (SCI) in a state-run hospital in the North eastern State of Tripura (rural area) India, the initial first one year of rural spine surgery practice.

2. Patients and Methods

A prospective observational study of 44 patients with spinal fracture with indicated surgical intervention were treated from September 2018 to September 2019 in the Department of Orthopaedics Agartala Government medical college Tripura. Patients admitted were evaluated for neurological status as per the American Spinal Injury Association Impairment Scale (ASIA). Data obtained included: demographic parameters such as age, gender, marital status, locality, educational status, income, type of family, profession. In the epidemiological variables, mechanism of injury, time of arrival in our unit after injury, mode of transport used during transfer of patient, adequate transportation knowledge of primary responder. Patient who consented for surgery underwent spine stabilization procedure with or without decompression. All patient Data obtained were analysed using a simple descriptive statistic tool.

3. Results

3.1. Statistical summary

A total of 44 patients were treated over the period of one year, of which were 34 males (77.27%) and 10 females (22.72%). Majority of these patients were between 31-40 years (40.9%). Fall from height was the most common cause of spinal cord injury (Table 1) accounting for 70.45% of the etiology of which fall from tree was commonest cause followed by road traffic accident (27.27%) as the second next cause. Regarding the region of spine injury majority were the thoracolumbar

injuries (72.72%). SCI patient were brought to the hospital emergency (Table 3) at 1 day to 7 day of the injury in 61.36% with neurological impairment of 40.90% as complete and 52.27% as incomplete. 45.5% of the cases SCI patients were transported to the hospital on relative arrangement. In term of radiological evaluation (Table 2) in 45.45% of cases CT evaluation was carried out at 1day to 7 days and for the MRI evaluation it could be possible at one week to one month in 59.09% of the cases. Time to surgery was between one week to one month in 61.6% at an average on 17.7 day Post SCI of our cases and 40.45% belonging to low economic families. The mean follows up in our case series was six months, 12 cases in the case series were excluded in operative outcome result (3 patient resulted in death and 9 were lost in follow up) and 32 patients were regularly followed up and a grade higher the above at presentation neurological recovery was noted.

Table 1: Distribution of Mode of injury

Mechanism of Injury	No.pt	%cent
1.Fall from height		
I. Tree	11	25
II. Roof	8	18.1
III. Stair	5	11.4
IV. On Ground	3	6.8
V. With Object Over Head	3	6.8
VI. Pole (Electric Shock)	1	2.27
2. fall of object overhead / back	1	2.27
3. Road traffic accident	12	27.27

Table 2: Distribution of Mode of Transportation

Transportation		
Mode of Transport	Frequency	%cent
Ambulance service	9	20.5
Fire service personal	15	34.1
own arrangement [family]	20	45.5
knowledge of appropriate mobilization and Transport of the pt. [primary responder]		
	awareness	trained
108 ambulance service	suboptimal	partially
Fire service personal	NO	NO
Family member	NO	NO

Table 3: Distribution of cases, Evaluation and intervention

Time to presentation at hospital	No. of pt	% cent
within 24 hr of injury	10	22.72
2 nd day to 1weeks	27	61.36
1 week to 1month	5	11.36
1 month to 3month	2	45.54
Time of CT evaluation	No. of pt	% cent
within 24 hr of injury	12	27.27
2 nd day to 1weeks	20	45.45
1 week to 1month	10	22.72
1 month to 3month	2	45.54
Time of MRI evaluation	No. of pt	% cent
within 24 hr of injury	1	2.27
2 nd day to 1weeks	15	34.09
1 week to 1month	26	59.09
1 month to 3month	2	45.54
Time to surgery	No. of pt	% cent
within 24 hr of injury	0	
2day to 1weeks	4	9.09
1 week to 1month	27	61.36
1 month to 3month	13	29.54

Table 4: Distribution of follow up of the cases

	Frequency	%cent
Death	4	
hospital	3	
Home	1	
follow up		
rarely following	15	37.5
partially following (3 visit)	12	30
continuously following (8 visits)	13	32

4. Discussion

Spinal cord injury (SCI) causes a very serious after mate. The trauma per se, type of transportation, time taken to reach hospital, resource level at the place of treatment and rehabilitation determine SCI outcome. The concept of “time is spine” emphasizes the importance of early transfer to a specialized centers and early decompressive surgery for long-term outcomes^[3].

Starting spinal surgery service in a rural setting post a great challenge and the encountered challenges in every stages of management starting from pre hospital care, hospital care (comprehensive evaluation, operation theatre, material for surgical intervention critical care) post-operative rehabilitation thus compromises the outcome.

4.1. Pre-hospital care of spinal cord injury

The knowledge of appropriate mobilization and proper transportation immensely affect the outcome, inappropriate mobilization contributes in the decline in the neurologic status of persons with SCI therefore proper evacuation to the nearest major accident and emergency centre should be given by trained personnel^[4].

In our study 68.8% the patient presented to the hospital late (1 day to 1 week) and 45.5% of the patient were transported to the hospital by arrangement made by patient family on their own not availing the special ambulance services with trained paramedic, 34.1% of the them were transported by fire service personal specially the road traffic accidents and there was lack of appropriate knowledge of mobilization of this SCI patient from the accident scene to the general public as well as the fire service personals.

Pre hospital mobilization and transportation has not been given due emphasis in our cases, therefore increasing awareness through social media to the primary responders, adequate training of the fire service personal and paramedic in spinal stabilization and airway maintenance (trauma evacuation) about the type of transportation and importance of time between injury and hospital arrival are important determinants for better neurological outcome. Trauma care models [Ambulance Access for All (AAA) and Centralized Accident & Trauma Services (CATS)] and Highway Road Traffic Patrol is available government efforts and should be properly implemented in rural setting as well^[5].

4.2. The place of treatment [Hospital]

Surgical stabilisation of mechanically unstable fracture spine decreases pain, enables mobilization and has a positive impact on pulmonary function^[6]. Evidence suggest that decompressive surgery of the spinal cord after spinal cord injury attenuates secondary injury mechanisms and improves neurological outcomes. Cengiz SL *et al.* Found that patients who underwent decompression and stabilization procedures for thoracolumbar fractures within 8 hours of injury had a significantly higher rate of neurologic recovery compared with those who had surgery after 8 hours^[7]. Delay in

initiating treatment leads to adverse consequences with compromised outcome with increased severity of complications longer hospital stay and higher costs of hospitalization.

4.3. Hurdles in Early management: comprehensive evaluation, Materials for surgical intervention, Operating theatre

45.45% of CT evaluation were being carried out within 1 week but were as in 59% cases MRI evaluation took a longer day of about 1month and hence there by operative spinal stabilization were delayed and the surgical intervention could be carried out late at 1week to about 1 month in 61.3% of our cases patient (Table 5).In our center we could do the CT evaluation at an average of 3.1 day routinely and MRI was advised for patient with neurological deficit however routine MRI evaluation couldn't be carried out because of lack in prioritize trauma protocol.

The implant for spinal stabilization (pedicular screws) are not readily available in our rural setting and has to be procured from other cities and this eventually cause delay in intervention there by predisposing to increased frequency of morbidity and also this non availability further increases the cost of the implant putting strain on our local inhabitant who are mostly of low socioeconomic background.

With busy elective routine orthopaedics cases, non-availability of dedicated Spine operation theatre and surgical instruments in our center which is another factor which delays the early surgical intervention hence treating traumatic SCI as emergency (early intervention) was never possible in our setting and hence resulted in increased morbidity.

4.4. Critical care

The need for intensive care unit [ICU] and mechanical ventilator in the post-operative management of spine patients cannot be over look, with inadequate ICU set up and few functional ventilators makes optimal emergency care unattainable, and increases the chances of morbidity and mortality. In our case series we had 3 patients (cervical injuries) who needed mechanical ventilator support but due to inadequate ICU set up eventually resulted to the mortality.

4.5. Post-operative Rehabilitation

The treatment and rehabilitation process of SCI is long, expensive and requires a multidisciplinary approach and the goal of rehabilitation is to make the individual independent able to do activities of daily living to the best possibility. Early rehabilitation is important to prevent disability and complications and the rehabilitation should begin as early as possible because delay may affect the functional recovery^[8].

4.6. Institutional rehabilitation

In our set up with no rehabilitation unit there was lack of adequate rehabilitation post SCI, with overburdened orthopaedics units bed we found it difficult to accommodate spinal injured patients for a long duration the SCI patient were provided acute management and then sent back home teaching basic skills such as bed mobility, transfers, wheel-chair mobility prior to discharge without comprehensive rehabilitation which is vital in their management.

There is a felt need for a spinal injury rehabilitation center where comprehensive rehabilitation can be carried out for early rehabilitation and chronic rehabilitation upgrading the present existing Physical Medicine and rehabilitation unit in the institution to address the unmet problem in our set up.

4.7. Follow up, Home Rehabilitation outcome

Of the 44 patients there were 4 death in our case series, 15 patients rarely followed up with 12 patiently partially followed and 13 patients with regular following up. Patients were taught basic skill before discharge (home rehabilitation)

5. Conclusion

Spinal cord injury, once considered as the ailment not to be treated but with revolutionized spinal care today it has resulted in a significant improvement in the outcomes ^[9] however there exists a problem of actually availability of this specialized spine service to the common man especially in the rural areas thereby a vast imbalance exists in the availability of the specialized spine services between urban and rural areas. The study is to understanding the state of spine care in our set up, the gaps and bridging them to overcome the challenges

1. The need for improvement of the existing trauma-care system and to function effectively and efficiently with better healthcare planning.
2. Greater understanding the urgency of SCI and to prioritize this spectrum of trauma will significantly improve the outcome
3. Identifying and implementing cost-effective health care strategies that would benefit all with proper implementation and utilization of various government health schemes like Ayushman Bharat Program for addressing the financial constrain population in a low-income society ^[10].
4. Comprehensive rehabilitation the felt need for a dedicated spinal injury rehabilitation center where comprehensive rehabilitation be carried out for early rehabilitation and chronic rehabilitation hence call for upgrading the rehabilitation unit in our set up.

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