



## Comparison of Rehabilitative Outcome of Posttraumatic Paraplegic Patients with Posterior Stabiliation and Non Operative Methods

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### Abstract

**Introduction:** Paraplegia is one of the most important morbidity faced by people in the age group of 25-50 years due to trauma to spine. To make them live a near normal life must be the aim of rehabilitation. Considering the nature of injury and its operative outcome and its rehabilitation, many factors plays role in rehabilitation .In that posterior stabilization is also one. But due to few factors like age, family background etc all paraplegia patients can't go for posterior stabilization.

**Aim:** To compare the rehabilitative outcome of posttraumatic paraplegic patients with posterior stabilization and non operative methods

**Materials and Methods:** The study was retrospective study done at RMMC&H from June 2015 to September 2017. All cases of paraplegia due to spinal trauma presented to our hospital were considered. Their rehabilitative outcome was analysed and outcome was compared between posterior stabilization and non operative methods

**Results:** 20 Post traumatic paraplegia patients who were rehabilitated in our setup were studied .Out of which 15 were stabilized with posterior fixation 5 were treated with non operative methods. The average gain in FIM score of patients with posterior stabilization was 35.38, where as in non operative group was 23.50. Major complications faced by paraplegic patients are Pressure ulcers, UTI which contribute 50% and 40% respectively early ambulation of group with posterior stabilization was seen.

**Conclusion:** Patients for whom posterior stabilization was done for spinal injuries were rehabilitated comfortably when compared to non operative patients, their rehabilitative outcome was exceptionally good comparing to non operative patients.

**Keywords:** Paraplegia, Posterior stabilization, Rehabilitation.

### Introduction

Paraplegia is one of the most important morbidity faced by people in the age group of 25-50yrs due to spinal trauma. Most common mode of injury is fall from height followed by RTA. To rehabilitate them is the challenging task. To make them lead a near normal life must be the aim of rehabilitation

programs all over the world. In order to overcome activity limitations, prevent secondary complications and early death and to achieve community integration, comprehensive rehabilitation of post spinal cord injury (SCI), is essential. There is increasing need to make patients to early rehabilitation so that complications can be minimised.

Several components play a role in rehabilitation of SCI. Initially, acute management includes medical agents administered with the goal of reducing secondary injury cascade, and an initial surgical treatment that usually includes either all or a combination of reduction, decompression, and stabilization. Physical therapy and rehabilitation, which can lead to a significant impact on overall recovery is an additional component. Finally, late onset SCI problems, such as bowel and bladder dysfunction, pain, spasticity, and problems with automatic breathing, play a role.

This paper focuses on outcome of rehabilitation with surgery and without surgery. Later interventions for other sequelae of SCI, for example, spasticity management, and chronic pain management are not discussed. Early intervention has been a focus of treatment for enhancing neurological recovery. Research using animal models has provided evidence that early decompressive surgery can lead to improved neurological recovery after SCI, which highlights the importance of early intervention. Unfortunately, the number of human spinal surgical studies using prospective, randomized, or controlled methodologies is limited.

### Aims

To compare the rehabilitative outcome of posttraumatic paraplegic patients with posterior stabilization and non operative methods

### Objectives of Study

1. To identify post traumatic paraplegic patients
2. To find the factors affecting rehabilitation undertaken by them.
3. To find the factors that lead the patients for non operative management
4. To identify the ambulatory outcome of both groups

### Materials and Methods

The study conducted between from June 2015 to September 2017. 20 patients with traumatic spinal

cord injury admitted for rehabilitation were included in the study. Patients were included irrespective of completeness of their spinal cord injury. Out of 20 patients of dorsal and dorsolumbar spine injuries, 12 (60%) were neurologically complete (ASIA Grade A), 8(40%) patients were incomplete (ASIA Grades B, C and D). Out of which 15 were posteriorly stabilized, 5 were treated non operatively and rehabilitated. Their physical condition, neurological status, socio economic status and rehabilitation measures are studied. The results are analysed and the factors affecting the rehabilitation were assessed.

### Inclusion Criteria

- All patients with a traumatic spinal cord lesion below the level of T1 with paraplegia, admitted in our hospital
- All patients who consented to participate in the study

### Exclusion Criteria

- All patients with a traumatic spinal cord lesion above the level of T1
- Pre-existing cardiac or other systemic conditions that will influence endurance
- Associated Head injury Patients
- Associated congenital anomalies or PPRP

### Rehabilitation Outcome Evaluation

Functional independent measure (FIM) is used for evaluating the rehabilitation outcome

### Results

15 (75%) of the spinal cord injured patients were males and 5(25%) were females. The mean age of study group was 32.6 years (range 17-70 years).Level of lesion were maximum in lower thoracic level (D7- D12) contributing 45% of our study and upper thoracic region (D1-D6) had least incidence of injury. Highest incidences were among the age groups of 20-40 and age groups of <20 years were having least incidence. Ideal transportation in an ambulance was carried out in 10 patients, while 10 patients were carried manually in other modes of transportation like car, bike etc.16 patients had fall in rural setup like fall

from tree, fall from boat, RTA etc. 4 patients had fall in suburban areas. 15 patients had posterior stabilization done, 5 were treated without surgery. Out of 20 patients included in our study, 4 patients who were injured had completed/pursuing their under Graduation, 4 patients completed primary education, 12 patients were Illiterate At time of injury, 70% of patient's average monthly income were around less than Rs 5000 and at follow up, 80% of patients were unable to support themselves or their family financially. Fall from height

contributed to most injuries and were the most common cause followed by road traffic accidents. Patients with lower thoracic spine injury accounted for most associated injuries and calcaneum fractures accounted for most common associated injuries. ASIA A category comprised majority of patients 12 patients and most cases (10 of them) were in patients with lower thoracic spine injury patients. Average duration of rehabilitation was 32. Patients with thoracic spine injury were having maximum duration of rehabilitation.

**Table 1:** Complications of our study Population

Complication	No Of Patients
Pressure Ulcers	10
UTI	8
CKD	1
DVT	1
Hypertropic Ossification	2
Ankle Equinus	6
Joint Stiffness	6
Post Of Infection	1
Implant Failure	0

In our study, main complications we encountered were pressure ulceration and urinary tract infections accounting for 50% and 40% respectively. Other Complications include joint stiffness, spasticity, equinus deformity, heterotopic ossification, deep vein thrombosis. 10 patients out of 20 patients had no complications. Majority of patients has significant improvement in bladder rehabilitation and patients with intact wrist and hand function developed significant functional independence in form of intermittent catheterisation.

Only 31% of patients who were rehabilitated and integrated into society had income and they were able to do house hold and less demanding works. 69% of patients had no income post injury and were supported by their spouse or care givers. Only 5 out of 20 patients were able to modify their residence for ease of ambulation and rest of patients were unable to do the modifications. These patients were able to ambulate only with help of their care givers.

**Table 2.** Average gain in FIM score according to ASIA scale, posterior stablization (N=15)

Level of lesion	ASIA scale (No. of subjects)	Average gain in FIM score	Standard Deviation	F value	P value
Lower Thoracic spine	A (6)	39.8333	4.75044	0.623	0.556
	B(2)	36.5000	12.02082		
	C(0)	-	-		
	D(0)	-	-		
Lumbar spine	A(1)	35.0000	-	.253	0.855
	B(2)	31.0000	1.41421		
	C(2)	36.0000	5.65685		
	D(2)	34.0000	8.48528		

**Table 3.** Average gain in FIM score according to ASIA scale, NON Operative (N=5)

Level of lesion	ASIA scale (No. of subjects)	Average gain in FIM score	Standard Error	F value	P value
Thoracic spine	A(2)	22.17	0.95000	20.043	0.046
	B(2)	30.18	1.50000		
	C(0)	-	-		
	D(0)	-	-		
Lumbar spine	A(1)	18.16	-	-	-
	B(0)				
	C(0)				
	D(0)				

**Table 4:** Statistical significance of both the group

	N	Mean	Std. Deviation	T value	P value
Non surgery	5	24.8520	5.60103	3.842	0.001
Surgery	15	36.6000	6.00952		

Average gain in FIM score was higher among thoracic spine injury patient compare to other groups which was found to be statistically significant

FIM score during follow up is significantly higher than admission score in lower thoracic and lumbar spine injury patients. It was statistically significant

**Table 5:** Distribution of study subjects according to level of lesion and mobility outcome (n=20).

Mobility outcome	Thoracic spine	Lumbar spine
Bed mobility	2	0
Wheel chair mobility	3	3
Limited indoor mobility	1	2
Limited outdoor mobility	4	1
Community ambulatory	2	2
Total	12	8

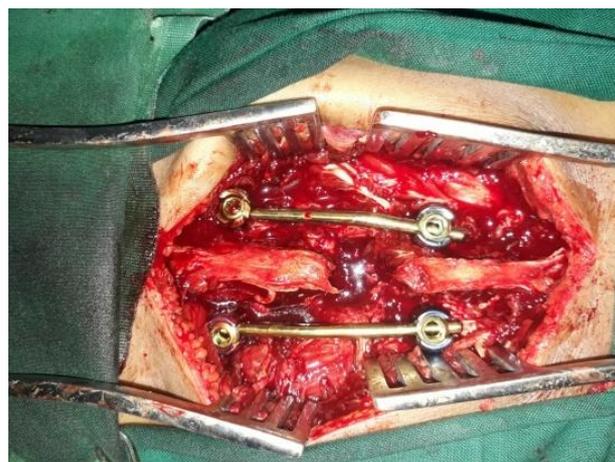
Only two out of twenty patients showed no improvement in mobility after rehabilitation. Significant numbers of patients lumbar level of injuries were rehabilitated as community ambulators. Majority of patients showed improvement in ambulation.

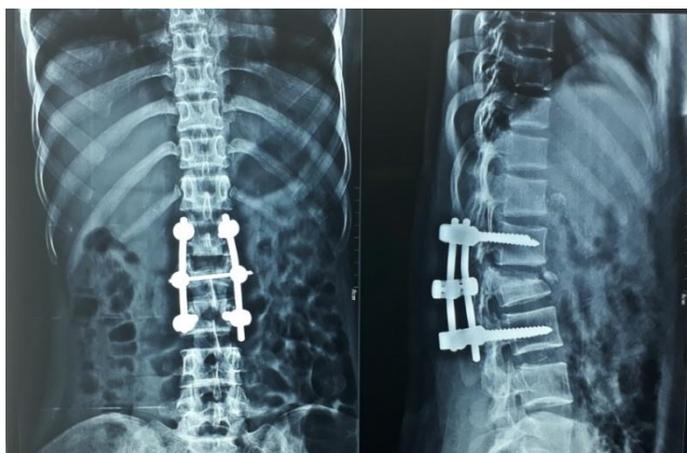
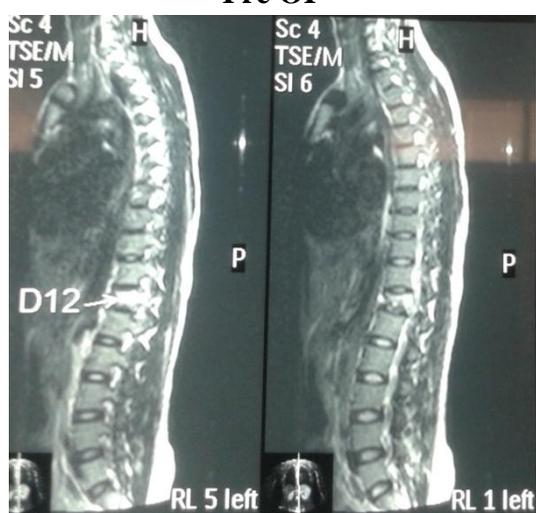
**Case 1**

**Pre OP**



**Intra OP**



**Post OP****Case 2****Pre OP****Post OP****Discussion**

20 patients were included in our study who got admitted with paraplegia below the level of T1, in the period of June 2015 to September 2017. The mean age of the patient in the study is 32.6 years,

comparable to a study from similar developing country like Brazil<sup>[2]</sup> where it is 34 years with fall injury contributing to major cause of injury.

Irrespective of the age of the patient, all patients have shown significant functional independence when comparing FIM scores of admission, discharge and follow-up in our study.

There is male preponderance in this study with 75 % of the patients are male comparable with the previous studies in developing countries like Brazil, China, Pakistan.

In our study, mode of injuries were road traffic accidents and fall from height, of which fall from height forms the major group constituting 57% of the total study population.

Rehabilitation protocol was aimed at improving functional outcome and preventing complications. Patients functional outcome were assessed with functional independent measure [FIM] score which included 18 items organized into six categories, patients were assessed by 7 point ranging from complete independence value 7, to complete dependence value-1 (self care, sphincter control, transfer, locomotion, communication, social cognition) at the time of admission, discharge and follow-up.

The bladder rehabilitation in our rehabilitation centre was aimed at resumption of balanced bladder by providing clean intermittent bladder catheterisation (ICC), either by self or by care givers. Two essentials for a trial of intermittent catheterisation are a large volume of residual urine and a motivated patient or carer. Excessive residual urine implies adequate bladder capacity and sphincter activity. Timely voiding 4-5 times a day with low residual volume of <50 ml was the goal of ICC. Patients with absent bladder sensation, dribbling bladder and unable to perform intermittent catheterization were managed with indwelling Foley's catheter which was changed for every 15 days. Patients with non operative group had delayed control of bladder. They were in Foleys catheter for longer duration of time than surgically managed group. Patients who were able to initiate voiding reflex were managed with

reflex or induced voiding. Suprapubic catheterisation was performed in patients with compromised urethral passage. Bladder wash was provided with betadine and normal saline in ratio 1:5 for patients with turbid urine and catheter block.

The end point of bowel rehabilitation in our institute was timely bowel evacuation with no constipation for more than 48hours. Patients were encouraged to take timely dinner and evacuation was initiated next morning by utilising intact gastrocolic reflex. In patients with UMN lesions, evacuation was done by reflex evacuation while in LMN lesions, digital evacuation was done. We found difficulty with non operative group as their bowel control was difficult to get because of difficulty in performing activities

Functional rehabilitation was aimed at restoration of locomotor ability. Locomotor ability in these patients are categorised into limited indoor ambulation, limited outdoor ambulation and community ambulation, with self propulsion of wheel chair or by care givers. Patients with incomplete neurological deficit were ambulated based on Ambulation Motor Index (AMI) which included assessment of sum of five lower extremity muscle grades. Maximum score of 3 is provided to each muscle group with total score of 30. Postural stability exercises were taught to these patients.

In our study, 10 patients were transported in ideal mode of transportation from site of injury in an ambulance in supine position while rest of 10 were transported with other modes of transportation. The lack of awareness in initial care of SCI patients, delay in obtaining expert care in tertiary centre, inappropriate mode of transportation and severity of injury in initial impact contributes to the complete neurological deficit in majority of patients. In our study the degree of initial impact leading to primary injury plays main role of deciding the degree of neurological injury in our case study and the degree of injury can be reduced to an extent if above factors are considered in management. T12 - L1 junction comprises the majority of site of

injury covering more than 50% of the study group and is comparable to study by Bhajracharya et al where they found out T11- L4 comprises the major site of injury.<sup>[3]</sup> Patients with incomplete injuries and minimal vertebral displacement in initial radiographs demonstrated improved outcome, similar results were given by Bravo et al in 1996<sup>[4]</sup> and Pollard et al, 2003<sup>[5]</sup>.

Females had higher rehabilitation FIM score when compared to the males on discharge from rehabilitation centre, however males exhibited more functional independence when compared to females and this result is comparable to studies by Sipski et al, AMPR, 2004 - study involving 14,433 injuries.<sup>[9]</sup>

Younger age group of patients demonstrated more functional independence when compared to older individuals and more mobility outcomes and is supported by studies by Cifu et al, APMR, 1999 - study with 375 spine injury cases<sup>[6]</sup>, Furlan et al 2009<sup>[20]</sup>, Kay et al 2007<sup>[8]</sup> - Older age has negative influence on outcome.

Recovery in SCI patients depend on initial severity of injury supported by Pollard et al, 2003<sup>[5]</sup>. Regarding mobility, patients with younger age and incomplete ASIA scale demonstrated improved outcome and similar results were demonstrated by Burns et al, 1997<sup>[10]</sup>.

Main objective of rehabilitation is measured in terms of ambulation of SCI patients. More severe the neurological injury, less is the functional independence in mobility. The degree of neurological impairment and level of lesion determines the ambulatory outcomes of the patient. In our study, as the level of lesion at initial impact is below L1, there is independence in mobility in these patients and these patients were reintegrated into society as community ambulators. While lesions involving thoracic level and complete lesions at presentation demonstrated less functional independence in ambulation as use of orthosis and splints were required. And patients with non operative group irrespective of level of lesion, ambulatory outcome were delayed and independence in ambulation were obtained later

with average delay of ambulation of about 4 weeks

If wheel chair mobility is considered as functional independence, then majority of patients demonstrated wheel chair mobility after community rehabilitation. Regarding surgical procedure for stabilisation, 15 patients were operated with posterior stabilisation with decompression which corresponds to 75% of study population. In spite of adequate decompression at time of stabilisation, there was no improvement in neurological outcome if patients presents with complete deficit at initial impact.

Patients presented with incomplete deficit benefitted with decompression at time of stabilisation. Study by Miyashita et al, 2012 in 31 patients also concluded that effects of decompression remain unclear.<sup>[11]</sup>

### Complications

Major complications in our study were urinary tract infections and pressure sores were 40% and 50% respectively, comparable to studies of Haisma et al, J Rehabil Med, 2007 (47% and 36% respectively)<sup>[12]</sup> and Chen et al, APMR, 1999<sup>[13]</sup> also accounted for urinary tract infections and pressure ulceration as major complications.

Risk factors of development of UTI and pressure sores were included ASIA scale A injuries, older age, violent injury mechanism, thoracic level of injuries and concomitant illness and were substantiated by the studies of McKinley et al, APMR, 1999.<sup>[14]</sup>

Increased age was associated with increased incidence of cardio respiratory complications and was associated with reduced incidence of Autonomic dyslexia (AD), bladder infections and heterotopic ossification. Complete injuries was associated with increased incidences of decubitus ulcers, AD and bladder infection.

Patients with Frankel A and older ages were more susceptible to develop pressure ulcerations and supported by studies of Vidal et al, 1991<sup>[16]</sup>. AISA A group of patients had a greater risk of

respiratory complications, decubitus ulcers and heterotopic ossification in our study as comparable to studies of Aito et al, Spinal Cord, 1991.<sup>[17]</sup>

Patients with complete injuries developed more complications and were treated for the same when compared to incomplete injuries and similar results were given by Dryden et al in 2004<sup>[18]</sup> in a study involving 233 patients. Regarding bladder and bowel function, patients showed significant functional outcome. Patient with bladder sensation recovery and those able to control urge for micturition for more than 2 hours were managed with intermittent catheterization either by self or by caregivers. However functional independence attained in hospital setup decreased after discharge into the and community.

Main reason behind non operative management was lack of proper care by their family members, and 2 patients initially went to native treatment delayed their hospital reach by about 6 months, no medical reasons were there for non operative management.

Roland Thietje BG Trauma Hospital Hamburg<sup>[19]</sup> most common cause of death in traumatic paraplegia patients is septicemia, as compared to this study. Improvements in survival have been associated with improved acute hospital treatment and rehabilitation, as well as improved health maintenance after discharge

### Bed Sores in Septicemia Patients



### Community Rehabilitation

Community rehabilitation involving reintegrating patients into the community is hindered by

architectural barriers inside and around the residence of the patients such as uneven terrains, open defecation and steps in home which constituted 60 % of our study. House hold modifications like even terrain, toilet modifications and large doorway and ramps for wheel chair mobility caused additional burden on the patients and 60 % of patients were earning pre injury income of less than 5,000 per month and 69% had no income post injury. Only 5 patients out of 20 patients were able to do household modifications.

In our study, post injuries 69% of patients had no income and were depend on spouse or relatives while rest of patients changed their works and were confined to house hold and less demanding works.

The objective of the study i.e. Rehabilitation Outcome study reveals inpatient rehabilitation has got significant functional gains in terms of self-care & wheel chair mobility avoiding complications like pressure sores & UTI as evidenced by FIM scores. (FIM Graph) and improved functional dependence. The overall Rehabilitation outcome of SCI patients were affected by multiple factors like family, level of education, occupation, social environment, community support and efficient mobility rehabilitation.

District rehabilitation centres in each district, vocational rehabilitation centres in head quarter, vocational evaluators and social welfare officers of the tertiary care hospitals in association with non - governmental social welfare organisations were involved in the effective rehabilitation of spine injury patients and helping in reintegrating the patients to join the society.

The government should work towards strengthening the infrastructure of primary and secondary level government hospitals for diagnosis and initial management of spinal injury patients, educating the attendants of the patients regarding precautions to be taken while transporting and shifting spinal cord injured patients, creating awareness amongst rural people

for spinal trauma and providing tertiary level hospitals with specialized spinal trauma units with comprehensive care for spinal injury patients. And awareness about the need to proper rehabilitation must be created. Follow up and house visits are must for rehabilitation of traumatic paraplegic patients.

Medical and paramedical staff across the country are still quite unaware about the socioeconomic impact of spinal cord injuries. Training programs to give an opportunity to health workers to improve their knowledge in the comprehensive management of spinal cord injured patients should be carried out on a regular basis. Hospitals even in rural area, managing spinal cord injured patients must have a comprehensive spinal trauma patient rehabilitation team. Complications associated with spinal cord injuries must be addressed immediately with help of specialists of other specialities like gastroenterology, urology, plastic surgery, and general medicine. Every effort should be made to make spinal cord injured patients independent and put them back into mainstream

### **Conclusion**

Comparing the economically strong parts of India our rural society who are economically backward are really far behind in caring for the post traumatic paraplegia patients. There is a need to set up more specialized spinal trauma units across the country with good accessibility to poorer sections of society for comprehensive management of spinal cord injury and rehabilitation of those patients. There must be specialized centers for rehabilitation even in PHCs which should consist of team members like doctor, a nurse, physiotherapist, occupation therapist, social worker, remedial gymnast, Psychologist. In our study we conclude that rehabilitative outcome of patients with posterior fixation for traumatic paraplegic patients better than non surgical patients who undergo rehabilitation.

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