



## ROLE OF WALKING INDEX FOR SPINAL CORD INJURY IN REHABILITATION OF PARAPLEGICS WITH TRAUMATIC CORD LESION AT T12 – L1 WITH ASIA GRADE A

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### ABSTRACT

**Aim of the Study:** To determine the usefulness of WISCI in the objective assessment of rehabilitation of paraplegics with spinal cord injury at T12 or L1 and compare the degree of rehabilitation and mobility from the time of injury, up to 3 months after rehabilitation using WISCI. **Material & Methods:** A total of 12 patients with traumatic fracture (T12-L1) with neurological deficit graded ASIA grade A treated at the department of physiotherapy in our Tertiary Care Hospital, Telangana State were enrolled in this study. **Results:** A prospective study was performed in the physiotherapy department of NIMS, on paraplegics with spinal cord injury at T12 L1 who had undertaken surgical stabilization of the spine and had pre operative ASIA grade A. To assess the role of the WISCI scale during Ambulation Rehabilitation of these patients, 12 patients were enrolled for this study from May 2018 till January 2021. The duration of observation was 3 months for each patient. **Conclusion:** In our study the management of time and a schedule of treatment protocol was on the basis of client centered measure along with the Physical therapist or rehabilitation team centered measure. This had a great advantage thus to involve the patient in every step of treatment and to achieve a combined result towards better ambulation.

**KEYWORDS :** Walking index for spinal cord injury (WISCI) ; Traumatic cord lesion (TOL)

### INTRODUCTION

Among the many forms of disability, which can beset mankind, a severe injury or disease of the spinal cord undoubtedly constitutes one of the most devastating calamities.

Rehabilitating the paraplegics is a major challenge encountered by physiotherapist and the rehabilitation team. Based on the concept of sir Ludwick Guttman, with the aim to provide a comprehensive service from the start of their injury or disease and throughout all stages for spinal paraplegics to rescue these men and women from the human scrap heap and to return most of them, in spite of their profound disability, to the community as useful and respected citizens, comprehensive rehabilitation programme have been revised<sup>1</sup>.

Ambulatory rehabilitation in paraplegics is like providing a second chance to live life, near normal way. Studies have found both physical and psychological benefits from exercises in persons with spinal cord injury and that training program's for persons with disability can increase maximum oxygen consumption, decrease heart rate at a given work load, increases grip-strength, increase general well being<sup>2</sup>.

A scale was developed to grade the Ambulatory ability of Spinal cord injured by a modified Delphi technique by Department of Rehabilitation Medicine, Jefferson Medical college of Thomas Jefferson University, Philadelphia. A Walking scale was introduced, which mentioned that physical limitation for walking secondary to impairment is defined at the person level and indicates the ability of a person to walk after Spinal cord injury the development of this assessment index required a rank ordering along a dimension of impairment, from the level of most severe impairment (1) to least impairment (19) based on use of devices Braces, and physical assistance of one or more persons the order of the levels suggests each successive level is a less impaired level than the former. The ranking of severity is based on the severity of the impairment and not on functional independence in the environment<sup>3</sup>.

This Scale was further developed into a more precise Scale for use in clinical trials of subjects with Spinal cord injury and determined the Scales validity and reliability by conducting trials at eight Spinal Cord Injury (SCI) centers around the world and gained international recognition as Walking Index for Spinal Cord Injury (WISCI)<sup>4</sup>.

Our institute is a tertiary referral center for spinal cord injuries, which provided a comprehensive care for these patients. Though we provide for preoperative and postoperative rehabilitation for these patients in the physiotherapy department of our institute there was no objective method of assessment of these patients until the introduction of the WISCI.

The present study was undertaken to assess the rehabilitation programme for using the WISCI and to study the predictive value of level of WISCI in rehabilitation after one month of training for the rehabilitation level achieved after 3 months.

### Aim Of The Study

- To determine the usefulness of WISCI in the objective assessment of rehabilitation of paraplegics with spinal cord injury at T12 or L1 and compare the degree of rehabilitation and mobility from the time of injury, up to 3 months after rehabilitation using WISCI.
- To determine the role of WISCI level at the time of discharge after the stage I, rehabilitation training as a predictor of final level of rehabilitation attained at the end of 3 months and to determine the factors contributing to the level of rehabilitation achieved.
- To determine whether younger patients attained higher level in WISCI than the older age group.
- To assess the incidence of complication during the period of rehabilitation.

### MATERIAL & METHODS

A prospective observation study was performed on paraplegics with traumatic injury of T12-L1 segments, with ASIA grading A, to assess their functional mobility at the end of three months from the day of injury using walking index for spinal cord injury (WISCI).

Total number of 12 patients with traumatic fracture (T12-L1) with neurological deficit graded ASIA grade a treated at the department of physiotherapy in our institution with complete physiotherapy rehabilitation, were enrolled for the study after institutional approval and informed consent from the patient.

Patients with traumatic injury to the spine at T12 and L1 level, belonging to either gender aged between 19-60 years with a ASIA grade A. who underwent surgical stabilization of the spine were included in the study.

### Inclusion Criteria

1. Age group between 18 and 60
2. ASIA score grade A.
3. Traumatic fracture T12 and L1.

### Exclusion Criteria

1. The patient with the following which could hinder the process of rehabilitation or assessment were excluded from the study.
2. Fractures of either upper or lower limbs and the pelvis.
3. Head injuries
4. Any associated cardiac or vascular problems.
5. Hypertension.

**PHOTO**



**RESULTS**

**Table 1 : Age Sex Wise Distribution of Patients**

Age (in years)	Total (%)	Male (%)	Female (%)
18 – 27	33	25	8
28 – 37	33	33	0
38 – 47	25	25	0
48 – 60	8	0	8

**Table 2 : Complication Of Various Stages Of Rehabilitation**

Complication	Number Of Patients With Complication In Various Stage Of Rehabilitation				
	Initial Evaluation stage	Evaluation at discharge Stage I	Initial evaluation on Stage II	Evaluation at discharge stage II	Final evaluation on Stage III
Bed Score	17	25	33	33	0
Cardio pulmonary	0	8	0	0	0
Urinary tract infection	0	17	8	0	0
Others	0	0	0	0	0
Patients without complications	83	50	58	67	100

**Table 3: A.S.I.A. Grading At The Time Of Initial Evaluation And**

**Discharge Stage I**

S.No	Age & sex of patients (in years)	ASIA initial evaluation	Asia evaluation discharge stage I	ASIA evaluation initial stage 2	ASIA evaluation discharge stage 2	ASIA evaluation stage III	ASIA level final attained at end 3 months
1	19 / F	Grade A	Grade B	Grade C	Grade C	Grade C	Grade C
2	19 / M	Grade A	Grade B	Grade C	Grade C	Grade C	Grade C
3	21 / M	Grade A	Grade A	Grade A	Grade A	Grade A	Grade A
4	26 / M	Grade A	Grade A	Grade A	Grade A	Grade A	Grade A
5	28 / M	Grade A	Grade A	Grade A	Grade A	Grade A	Grade A
6	30 / M	Grade A	Grade A	Grade A	Grade A	Grade A	Grade A
7	32 / M	Grade A	Grade A	Grade A	Grade A	Grade A	Grade A
8	35 / M	Grade A	Grade A	Grade A	Grade A	Grade A	Grade A
9	38 / M	Grade A	Grade A	Grade A	Grade A	Grade A	Grade A
10	39 / M	Grade A	Grade A	Grade A	Grade A	Grade A	Grade A
11	44 / M	Grade A	Grade A	Grade A	Grade A	Grade A	Grade A
12	59 / F	Grade A	Grade B	Grade B	Grade C	Grade C	Grade C

  

ASIA Grade	EISI	EDSI	EIS2	EDS2	EFS3
A	12	9	9	9	9
B	0	3	1	0	0
C	0	0	2	3	3
D	0	0	0	0	0
E	0	0	0	0	0

1. Eis 1 : Evaluation during initial stage 1
2. Eds 1 : Evaluation during discharge stage 1
3. Eis2 : Evaluation during initial stage 2
4. Eds2 : Evaluation during discharge stage 2
5. Efs3 : Evaluation final stage 3

**Table 4: Level's Achieved By Patients In Walking Index For Spinal Cord Injury (WISCI) During Various Stages Of Rehabilitation**

S. No	Age & sex of patients (in years)	WISCI initial evaluation	WISCI evaluation discharge stage I	WISCI evaluation initial stage 2	WISCI evaluation discharge stage 2	WISCI evaluation stage 3	WISCI level final attained at end 3 months
1	19 / F	Level 0	Level 6	Level 9	Level 10	Level 12	Level 12
2	19 / M	Level 0	Level 9	Level 9	Level 10	Level 12	Level 12
3	21 / M	Level 0	Level 9	Level 9	Level 10	Level 12	Level 12
4	26 / M	Level 0	Level 9	Level 9	Level 10	Level 12	Level 12
5	28 / M	Level 0	Level 6	Level 9	Level 10	Level 12	Level 12
6	30 / M	Level 0	Level 6	Level 6	Level 9	Level 9	Level 9
7	32 / M	Level 0	Level 9	Level 9	Level 10	Level 12	Level 12
8	35 / M	Level 0	Level 9	Level 9	Level 10	Level 12	Level 12
9	38 / M	Level 0	Level 9	Level 9	Level 10	Level 12	Level 12
10	39 / M	Level 0	Level 9	Level 9	Level 10	Level 12	Level 12
11	44 / M	Level 0	Level 9	Level 9	Level 10	Level 12	Level 12
12	59 / F	Level 0	Level 6	Level 6	Level 9	Level 9	Level 9

WISCI levels	EIS1	EDS1	EIS2	EDS2	EFS3
0	12	0	0	0	0
6	0	4	2	0	0
9	0	7	10	2	2
10	0	0	0	10	0
12	0	0	0	0	10

1. EIS 1 : Evaluation during initial stage 1
2. EDS 1 : Evaluation during discharge stage 1
3. EIS2 : Evaluation during initial stage 2
4. EDS2 : Evaluation during discharge stage 2
5. EFS3 : Evaluation final stage 3

**Table 5 : A Comparison Between Nature Of Injury And The Level Attained In WISCI At The Time Of Discharge In Stage I**

Nature of Injury	Level 6	Level 9	Grand Total
Fall from height	33%	33%	67%
Road traffic injury	0	17	17
Fall of object	0	17	17
Grand Total	33	67	100

**Table 6 : Comparison Between Occurrence Of Complication And The Levels Attained In WISCI At The Time Of Discharge In Stage I**

Complication	Level 6	Level 9	Grand Total
Bed sore	1	2	3
Respiratory infection	2	0	2
Urinary tract infection	0	1	1
No complication	1	5	6
Grand Total	4	8	12

**Table 7 : A.S.I.A Grade Compared With WISCI Level And Their Deviation, Chi Square And Value Of P At Various Stages Of Rehabilitation**

A.S.I.A	Vs	WISCI	St-df	Chi-square	P
EIS1	Vs	EIS2	2	5.6	NS
EIS1	Vs	EIS1	-	-	0.15
EIS2	Vs	EIS2	1	0.8	NS
EFS3	Vs	EFS3	1	0.8	NS

## DISCUSSION

Ambulation for a spinal cord injury patient does not merely mean functional movements but does mean much more, as said by a professor of disability studies (who also has a spinal cord injury).

The thoraco-lumbar junction (T11, T12, L1) is the most common site for non osteoporosis-related spinal column fractures. Whereas large motions are possible in the cervical and lumbar spine, the thoracic spine is restricted by the rib cage. Because the lower cervical spine and the thoraco-lumbar junction represent transition zones between mobile and restricted segments, injuries are concentrated in these areas. Although the thoraco-lumbar junction has a higher risk for fracture, it has important anatomic characteristics that allow for a greater recovery from neurological injury than more cephalad cord level injuries.

An international walking scale by a modified Delphi technique, and the purpose was to Develop a more precise walking scale for use in clinical trials of subjects with spinal cord injury (SCI) and to determine its validity and reliability. A videotape comprised of 40 clips of patients walking was forwarded to all eight centers and inter-rater reliability data collected. The following results were attained, Kendall coefficient of concordance for the pilot data was significant (W=0.834, P<0.001) indicating agreement among the expert in rank ordering of original items FIM comparison (Spearman's rank correlation coefficient=0.765, P<0.001) showed a theoretical relationship, however a practical difference in what is measured by each scale.

Kendall coefficient of concordance for the international blind hierarchical ranking showed significance (W=0.860, P<0.001) indicating agreement in rank ordering across all eight centers. Group consensus meeting resulted in a 19 item hierarchical rank ordering "Walking Index for Spinal Cord Injury (WISCI)". Inter rated reliability scoring of the 40 video clips showed 100% agreement<sup>5</sup>.

Though the functional electrical stimulation and cyberorthosis 25 are available the cost and availability is the factor prevailing for the minimal usage in developing countries. Also the procedure of implant of electrodes needs expertise and the high maintenance forms a major reason for less usage. Thus keeping in view the affordability of the patients for rehabilitation, in our study usage of affordable orthosis

which have been fabricated at our institutions orthotic department<sup>6</sup>.

In our study most patients healed to the most productive years of life, 8 (66%) where males from rural background and the most frequent cause of injury was fall from height all patients had a severe spinal injury following trauma and had a ASIA grade A at the time of injury. ASIA grade is frequently used to assess the severity of injury. It was noted in this study that though there was no significant change in the ASIA grade, the rehabilitation training was affective to cause a chance in the ambulation of the patient 3(25%) of patients had mild improvement in the ASIA grade from A to C but there was no difference in the WISCI between those who have improved and those with no change in ASIA grade<sup>7</sup>.

Ditunno et al<sup>3</sup> have performed a retrospective analysis of 103 SCI patients with ASIA A-14, B-18, C-52, D-19 and found a correlation between ASIA grade and WISCI levels at initial ambulation and at maximum recovery. In our study all patients graded to ASIA grade A at the beginning of the study and 3 patients improved to ASIA -C, but there was no correlation between WISCI level and ASIA grade.

At the end of one month of training 8(66%) attained a WISCI of 9 and 4(33%) attained a WISCI of 6. As a level 9 of WISCI indicates ambulation without assistance, patient were categorized into 2 groups those with level of less than 9 (group 1) and those with level of 9 or more (group 2). There was a significant improvement in the WISCI with the training. The patient had an improvement in the level of ambulation at the time of discharge from the department and the level further improved when they returned for the second stage of rehabilitation 10 (83%) had a WISCI level 9 and 2 (17%) had a level 6. After the stage 2 of rehabilitation the WISCI level improved to 10 in 10 (83%) and 9 in 2(17%). At evaluation stage 3 of rehabilitation the WISCI level improved to 12 in 10(83%) and remained at 9 in 2(17%) of them. There was a statistically significant improvement in the WISCI from time of discharge at the end of stage 1 to the beginning of stage 2, End of stage 2 and the final stage 3.

Patients were able to ambulate with a pair of Knee Ankle Foot Orthosis and a pair of elbow crutches at the end of the stage 3. There was a statistically significant difference in the WISCI level at the end of rehabilitation programme between patients in Group 1(level 6) and Group 2 (level 9) .50% of patients in group did not achieve a level 12, they achieved only level 10 at the end of stage 3 of rehabilitation where as all the patients in group 2 achieved a final level of 12 at the end of stage 3 of rehabilitation.

The factors associated with a given level of ambulation achieved were assessed so as to facilitate optimization of that factor, as the level achieved at the end of stage I of rehabilitation correlating well with the level achieved at the end of stage 3. Achieving a higher WISCI level of ambulation at the end of stage1, could lead to a better WISCI level at the end of stage 3. There was no correlation between Age and the WISCI level achieved (Older individuals with spinal cord injury and disease do well, but have a less favourable outcome in regard to walking, bladder and bowel independence than younger subjects and have more associated medical problems)".

All our patients received a good psychological assessment and counseling at all the stages of their rehabilitation which could be responsible for the significant improvement in the WISCI level in a short duration and the motivation for the training. There was no statistically significant difference in the WISCI level achieved between those with complication such as bed sore, urinary tract infection and respiratory complications. And those without complications. The complication rates in our patients were lower than the described incidence of complication and the complication reduced with the time as the rehabilitation progressed.

The most frequent reason for readmissions were urinary tract complications (40.5% of all readmissions) and the highest bed occupancy was for skin problems (32.2% of all bed-days). Urinary and skin complications are the two main reasons for hospital readmissions in people with chronic SCI. Risk of readmissions increases with time since injury and with disability and handicap severity<sup>8</sup>

The incidence of bed sore reduced to 0% by stage and respiratory complications to 0% by stage and urinary complication to 0% by stage. Early mobilization and ambulation could be responsible for the lower incidence of complication and early healing of bed sore.

At the end of 3 months all our patients were able to ambulate with a pair of Orthosis and two of them with walker and the rest with a pair of elbow crutches (The clinical outcome of traumatic spinal cord injury (SCI) mainly depends upon the severity of the lesion, the recovery processes and neurerehabilitation programs. The percentage of SCI subjects who recover ambulation can range between 15-45% while the rest will remain wheelchair-bound.

WISCI was useful to objectively assess the rehabilitation of the paraplegics and also to compare the ambulatory level attained by patients.

### CONCLUSION

1. In our study patients with T12-L1 Traumatic fracture with A.S.LA Grade A, out of 12 patients 10 have achieved a Level 12 and 2 have achieved Level 9 in WISCI at the end of 3 months.
2. WISCI is an useful tool for assessment of patients during the course of rehabilitation. It is simple, reliable and reproducible.
3. WISCI of level of less than 9 predicts lower levels of ambulation at the end of rehabilitation WISCI can be used as a predictor of outcome of rehabilitation programme.

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