Effectiveness of Task Oriented Training in Improving Level Surface Walking in Patient with Incomplete Spinal Cord Injury (SCI)

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Abstract: ***Damage to the spinal cord may result from direct injury to the cord itself or indirectly from damage to surrounding bones, tissues, or blood vessels. Musculoskeletal and neurological problems of patient with SCI at the level of T11-T12 are, Paralysis of both lower limbs, sensory loss in lower limbs, bowel and bladder dysfunction. Functional and locomotor problems of SCI are inability to stand independently, inadequate balance, inability to walk, inability to squat, inability to sit to stand, inability to transfer, sexual problems. Four weeks treatment was given for the rehabilitation. Outcome measure was on based on Berg balance scale and Barthel index and on Functional Ambulation Classification Scale. The considerable upgrading in patient's transferring activities and functional status. Risk of fall category is not recounting beneficial changing and the task oriented training is beneficial in treatment for patient with SCI***

Keywords: Spinal, SCI, Rehabilitation, Neuro, physiotherapy

1. Introduction

Spinal cord injury (SCI) is take place by the damage to the spinal cord. It may results from direct injury to the cord itself or indirectly from damage to surrounding bones, tissues, or blood vessels. Depending on where the spinal cord and nerve roots are damaged, the symptoms can vary widely, from pain to paralysis to incontinence [8]. Musculoskeletal and neurological Problems of SCI patient at the level of T11 - T12 are, Paralysis of both lower limbs, sensory loss in both lower limbs, bowel and bladder dysfunction. Functional and locomotor problems of SCI are inability to stand independently, inadequate balance, inability to walk, inability to squat, inability to sit to stand, inability to transfer, sexual problems [4], [8].

1.1 Complications

Complications are common after Spinal Cord Injury [8]. Most of complications develop due to immobility and wrong posture adaptation. Common complications are,

- Contractures
- Bed sores
- Urinary Tract Infections
- Deep Vein Thrombosis
- Orthostatic Hypotension
- Deformities

1.2 Prognosis of SCI

Prognosis of SCI depends on various factors. The severity of the original injury determines whether or not recoveries will occur. Incomplete injuries have a better chance of further recovery than complete injuries. So, prognosis for incomplete SCI is better than complete SCI.

The timing for starting of rehabilitation programme also determines prognosis of SCI. If the rehabilitation programme starts later, recovery chances are very poor. It also affects by patients' age and status of complications like spasticity, contracture etc. which influence the recovery. Young age patient have better prognosis compare to old age patient [7].

1.3 Physiotherapy treatment

Physiotherapy treatment focuses on prevention of complications and to achieve the highest degree of functional independence and balance and control. Common treatments are passive movements, stretching, transferring and MAT activities, balance training and gait training. Passive movements are given to avoid contractures and to maintain muscle properties. The aim of stretching is to avoid contractures and to maintain muscle flexibility. Transferring and MAT activities prevent bed sores and help the patient to achieve functional independence. Sitting and standing balance training improves patient's static balance. Gait training is given with help of parallel bar and assistive devices which improves patient's functional abilities.

2. Case Description

An 18 years old male, diagnosed with Spinal Cord Injury (SCI) at the level of T11 - T12, was referred to Neuro Rehabilitation Unit, Department of Physiotherapy, Navodaya Medical College Hospital and Research Centre (NMCHRC), Raichur, Karnataka. His main complaint was inability to walk independently. He fell down on his back from a tree

before six months and after that he developed paralysis of his both lower limbs.

He also had bowel and bladder incontinence at that time. Immediately after his accident, he was admitted in NMCHRC and he was operated within 2 days. He took bed side physiotherapy after operation for a week and then he was discharged. He again came back with following Goal and Expectation:

- To walk independently or with minimal support
- To transfer independently
- To carry out ADLs with minimum assistance

2.1 Examination

2.1.1 American Spinal Cord Injury Association (ASIA) scale [5] was used to determine level and extent of injury. It has two components, sensory and motor. Sensory includes light touch and pin prick examination.

Table 1. Extent of Injury

Motor	54/100
Pin Prick	90/112
Light touch	85/112

Table 2. Level of Injury

	Right	*Left*
Sensory	L1	L1
Motor	T12	T12

2.1.2 ASIA Impairment scale – C
Incomplete Motor function is preserved below the neurological level. And more than half of key muscles below the neurological level have a muscle grade less than 3.

2.1.3 Gait
The scale taken for gait examination was, functional Ambulation Classification Scale [6].

2.1.4 Functional Ambulation Classification Scale
This scale describes the dependency level of the patient and functional status of the patient [6]. Patient was fallen in 0 categories (non functional ambulation).

2.1.5 Balance
The Berg Balance Scale was taken for balance examination. The Berg Balance scale is a performance based assessment tool that is used to evaluate sitting and standing balance during functional activities [9]. It is a widely used assessment to identify balance impairment. Functional activities such as a reaching, bending, transferring and standing are evaluated. Total score is 56 points. Interpretation is based on score which he achieved during examination.

It has 3 categories which are (1) 41-56 low fall risk (2) 21-40 medium fall risk and (3) 0-20 high fall risk. Patient got 04 points which put him in high risk of fall.

2.1.6 Examination of Functional activities
The Barthel scale used to measure performance in basic activities of daily living [3]. Each performance item is rated on this scale which given number of point assigned to each level or ranking. It uses ten variables describing ADL and mobility. Total score is 100 BI. Patient has achieved 40 BI.

2.1.7 Bladder and Bowel Examination
As patient was having incontinence, a catheter was inserted to him. He was not aware of passing of his urine. He also lost the micturation reflex. He was having bowel incontinence at the time of the injury. But, slowly he achieved control on his bowel function.

2.1.8 Skin Examination
The skin was rough and dry. There were no any sign of pressure sores. However, patient was prone to get bed sores as his skin was thinned and dry.

2.1.9 Contracture
In Spinal Cord Injury, hip flexors, knee flexors and ankle plantar flexors groups are more prone to get contractures. Though, this patient was not having any contracture.

3. Intervention

Task oriented training was used as rehabilitation program. The recent studies in this field strongly support the task oriented training in improving patient's functional ability after Spinal Cord Injury and the research evidence is suggesting that treatment should be patients centred and task oriented [1], [2]. So on the basis of research evidence, we selected task oriented training.

- Walking
- Sit to Stand
- Stepping Exercise

3.1 Walking
We started with parallel bar walking. Patient was asked to hold the both bars with his upper limb and to walk. We made him walk over parallel bar. When patients achieved more confidence, we started him walking with walker in which trunk was supported maximally by therapist [2]. As patient achieved more strength and confidence, we progressively reduced support.

Dosage: 15 minutes/session like 2 sessions/day for 4 weeks

3.2 Sit to Stand
Sit to stand training was given to make patient in dependent in standing up from the chair or bed. We used a stool. Initially he was not able to stand up. We gave assistance to stand up. We also made him to take support of walker while STS. Progressively, we increased number of STS activity.

Dosage: 15 repetitions/set like 2 sets/session like that 2 sessions/day for 4 weeks

3.3 Stepping Exercise
Stepping was given with support of walker. The exercise was given in both extremities alternatively. A line was made in front of his leg and patient was asked to touch it with his foot. At starting, small steps were given. Progressively, patient was encouraged to do large steps.

Dosage: 50 steps/session like 2 sessions/day for 4 weeks

4. Results

Table 3. Outcome by classification Scale

Scales	*Before Treatment*	*After Treatment*
Berg balance scale	04/56	11/56
Barthel index	40/100	65/100

Table 4. Functional Ambulation Classification Scale

	Before treatment	*After treatment*
Category	Zero	First
Description	Non functional ambulation	Ambulatory - dependent for physical assistance level 2

The rehabilitation programme was given for 4 weeks. Outcome measure was on based on Berg balance scale and Barthel index and on Functional Ambulation Classification Scale described in Table: 03 and Table: 04 respectively..

5. Conclusion

The results showed the significant improvement in patient's transferring activities like moving from bed to wheelchair and return to bed, and functional status like waking on level surface with walker. However, risk of fall category was not showing any significant changes.

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