

# Early Mobilisation Improves Conscious Levels, Cognitive Levels and Reduction in Number of Days in Intensive Care Unit Stay in Moderate to Severe Traumatic Brain Injury Patients- A Hospital Based Study

Dr. Annie Thomas<sup>1</sup>, Belle Shravani<sup>2</sup>, Lini Poulose<sup>3</sup>

<sup>1</sup>Assistant Professor, <sup>2</sup>Lecturer, <sup>3</sup>Clinical Therapist,  
JSS College of Physiotherapy, Mysuru, India

Corresponding Author: Dr. Annie Thomas

## ABSTRACT

Traumatic brain injury (TBI) is one of the major causes that lead to neurological impairments and physical disability in individuals. It includes both sensory and motor functions which affect the quality of life. The optimal management is a great importance for the early recovery and reduction in mortality. The role of physiotherapist ranges from neurosurgery ICU to the community, in reducing the mortality as well as maximum degree of return to their previous level of functions. There is strong evidence that intensive rehabilitation in early stages has positive effects on patients with TBI.

**Methods:** All the patients admitted in Neurosurgical ICU (NSICU) of the tertiary care teaching hospital in Mysuru, Karnataka with traumatic brain injury (moderate to severe brain injury) whose GCS score (E & M components) ranging between 1 and 4 were selected for the study for a period of two months. The treatment protocols were considered on the basis of RLA scale (for cognitive rehabilitation) and GCS scoring

**Results:** The results shows that the length of stay in ICU is of median 10 and Conscious levels are improved at the significance of  $P=.000$  and cognitive levels  $P=.001$

**Conclusion:** Optimization of physiotherapy management, understanding of basic neurocritical care knowledge as well as incorporation of newer guidelines would certainly improve the outcome of the TBI patients.

**Key words-** Traumatic brain injury, Moderate to severe head injury, Rehabilitation, ICU, Cognition, Conscious.

## INTRODUCTION

Traumatic Brain injury (TBI) is the most challenging and having highest morbidity and morbidity rate in Intensive care units. TBI is defined as an alteration in brain function, or other evidence of brain pathology, caused by an external force. [1] According to the Mayo System there are three main classifications: Definite Moderate-Severe TBI, Probable Mild TBI (MTBI), and Possible TBI. A classification of a definite Moderate-Severe TBI would be made if one of the following was present, death due to this TBI, loss of consciousness of 30 minutes or more, post-traumatic

amnesia of 24 hours or more, worst Glasgow Coma Scale score in the first 24 hours. [2] It is become a growing epidemic throughout the world also global burden. Traumatic brain injury (TBI) is one of the major causes that lead to neurological impairments and physical disability in individuals. It includes both sensory and motor functions which affect the quality of life.

The conscious level assessment by Glasgow Coma Scale (GCS) helps to identify the severity of head injury which often followed with Rancho Los Amigos scale (RLA) assessment which helps in the

stage wise physiotherapy care from Intensive care unit (ICU) till discharge of patients with TBI. [2] As per the guidelines of TBI it has been shown that better outcome in functional recovery and reduction in mortality rate by implementing proper protocols of brain injury management. The optimal management is a great importance for the early recovery and reduction in mortality. [2] The role of physiotherapist ranges from neurosurgery ICU to the community, in reducing the mortality as well as maximum degree of return to their previous level of functions. There is strong evidence that intensive rehabilitation in early stages has positive effects on patients with TBI. [2,11,12]

The management includes respiratory care, Coma stimulation and passive /active mobility for patients by monitoring the vitals and other co-morbidities The intensive care unit is meant for generalised supportive care and this study is an outlook on reduction in number of days of patients stay in ICU, improvement in conscious and cognitive levels of moderate to severe brain injury patients in a tertiary hospital in Mysuru.

#### **Aim and objectives**

To reduce the number of days stay in ICU for moderate to severe brain injury patients  
To improve the conscious and cognitive levels

#### **MATERIALS AND METHODS**

The design used for this study is experimental design with a sample method of complete enumeration for two months. All the patients admitted in Neurosurgical ICU (NSICU) of the tertiary care teaching hospital in Mysuru, Karnataka with traumatic brain injury (moderate to severe brain injury) whose GCS score (E & M components) between 2 and 4 were selected for the study for a period of two months. The patients with moderate to severe brain injuries with or without craniotomy ranging the age from 18 to 75 years are taken for study. Patients with mild head injury, unstable vitals, brain tumours, brain abscess

were not included in the study. The treatment protocols were considered on the basis of RLA scale (for cognitive rehabilitation) and GCS scoring.

The rehabilitation carried out with the coordination of consultants and nursing care staffs. The ICU caters the need of all age group patients. The data acquired for two months of 36 patients. The date of incident, admission, GCS and RLA noted for all the patients with moderate to severe TBI admitted in NSICU for two months. Other demographic data's include patient's age, length of stay in ICU and days in ventilator support is noted down.

One of the most important vitals to be noticed in brain patients are Hypoxemia and hypotension. During the physiotherapy session, continuous monitoring of the vitals like systolic pressure, respiratory rate, arterial oxygen saturation (Spo2), heart rate was made it mandatory to find out any fluctuations. The chest care for all the patients does for three times in a day with a gap of five hours. The chest care includes percussion, positional drainage and suctioning. Suctioning was done only when it was absolute necessary. During suctioning the suction pressure kept minimal and duration also was short of about 15 seconds. [3,4] During the positional drainage head down position and prone position are avoided due to ventilator and unstable vitals. Head up position minimizes ventilator supported pneumonia as well as it increases the venous drainage. [6,7] The head up position that is semi-recumbent position of 30 degrees reduces increase in intracranial pressure. [5] The patients who are unable to keep the head upright was stabilized by hard cervical collar (ambulance collar) but also see to that it is not causing venous obstruction. Deep vein thrombosis (DVT) stockings, cock up splint, elbow immobiliser and ankle foot orthosis are given to avoid secondary complications only on need basis. Arm support given for the complete flaccid upper limbs to avoid shoulder subluxation.

The exercises like passive movements to prevent contractures, deformities and to maintain muscle properties, active assisted exercises and facilitation techniques to improve the muscle tone, positional changes from supine to sit, sitting in chair and standing with support/tilt table given to improve the arousal mechanism. Joint approximation by weight bearing on hands, leg support on high stools, positioning changes, slow rocking in high sitting position, tactile stimulation by tapping on muscle bellies to facilitate movements, quick stretches to initiate muscle contractions all are added to improve the brain stem arousal. The treatment carried out three times in a day. Other than the usual therapy, those patients who are maintaining the vitals are given one hour of chair mobilisation in a day (sitting in chair with ventilator). We avoided sitting upright and the chair mobilisation for the patients who are not maintained the systolic pressure of more than or equal to 110 and SPO<sub>2</sub> below 90%. All these exercises are given to patients even when they are on ventilator support of around 20-30 minutes. The coma stimulation incorporated with cognition training such as calling out their names, using patient's relatives help for transferring etc were used for improving the cognition and conscious levels.

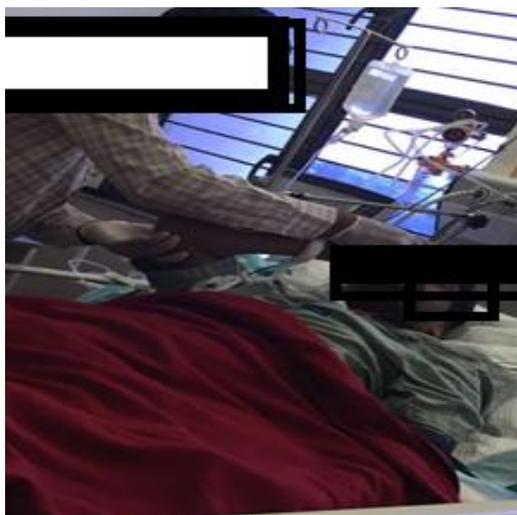


Fig.1 Coma stimulation with tactile stimulation-joint approxiamtions and distractions.



Fig.2 Mobilised to sitting position and patient is on ventilator support



Fig.3 Patient able to sit by himself with very minimal support

### Statistical Analysis

The conscious and cognitive levels are assessed by taking the scores of GCS and RLA. The analysis done by T test followed with Wilcoxon test.

The length of days patient stay in ICU was assessed by median average and the range

Table 1: The length of stay in ICU of 32 TBI patients (moderate to severe brain injury)

Median	10.00
Standard deviation	5.147
Minimum	5
Maximum	23
Interquartile range	8

The length of stay is of median 8 and ranges from 5 to 23

**Table 2: GCS of the TBI patient at the time of admission and discharge from NSICU**

	Mean	N	Std. Deviation	Std. Error mean	Correlation	Sig
GCS (at the time of admission in ICU)	5.92	32	2.581	.516	.915	.000
GCS (at the time of discharge from ICU)	8.56	32	1.660	.332		

There is correlation of significance difference of GCS at the time of admission and shifting from NSICU to step down ICU, *P* value is .000

**Table 3: Differences between GCS scores at the time of admission and discharge from NSICU**

GCS	Paired Differences				
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	
				Lower	Upper
At the time of admission-At the time of discharge from ICU	-2.640	1.254	.251	-3.158	-2.122

**Table 4: T test for GCS at the time of admission and at the time of discharge from NSICU**

GCS	t	df	Sig. (2-tailed)
At the time of admission-At the time of discharge from ICU	-10.524	24	.000

There is a significance difference between GCS scores *P* value is .000

**Table 5: RLA scoring at the time of admission and at the of discharge of ICU**

RLA	Mean	N	Std. Deviation	Std. Error Mean	Correlation	Sig.
RLA at the time of admission	1.63	32	.576	.118	.624	.001
RLA at the time of discharge from ICU	4.38	32	1.135	.232		

There is a significant difference in the correlation between RLA at the time of admission and at the time of discharge, *P* value is .001

**Table 6: Differences of RLA scoring at the time of admission and at the of discharge of ICU**

RLA	Paired Differences				
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	
				Lower	Upper
At the time of admission-At the time of discharge from ICU	-2.750	.897	.183	-3.129	-2.371

**Table 7: T test for RLA at the time of admission and at the time of discharge from NSICU**

RLA	T	df	Sig. (2-tailed)
At the time of admission-At the time of discharge from ICU	-15.022	23	.000

There is a significant difference between RLA at the time of admission and at the time of discharge from NSICU, *P* value is .000

## RESULTS

The total patients were 88 in neurosurgical intensive care unit for the month of October and November 2017. Among 88 patients 36 patients were moderate to severe brain injury. Two patients died and another two gone for discharge against medical advice (DAMA) and 32 patients remained in NSICU. The mean age was 50.75 with standard deviation of 50.75±13.26. The results analysed for the TBI patients' length of stay or number of days in ICU, comparison of GCS and RLA at the time of admission and discharge from NSICU or shifted from NSICU to Step down ICU. The length of stay in ICU of 32 TBI patients (moderate to severe brain injury). The length of stay is of median 8 and ranges from 5 to 23. GCS of the TBI patient at the time of admission and discharge from NSICU is assessed and there is correlation of significance difference of GCS at the time of admission and shifting from NSICU to step down ICU, *P* value is

0.000. RLA scoring at the time of admission and at the discharge of ICU is assessed and there is a significant difference in the correlation between RLA at the time of admission and at the time of discharge, *P* value is 0.001.

## DISCUSSION

General supportive measures of physiotherapy and nursing care are equally important to prevent and minimize the effects of secondary complications and therefore, have a substantial impact on the outcome in patients with TBI. In this study the average stay is of 10 days. Most of the guidelines say about prevention of deformities, contractures, pneumonia and pressure sores in Intensive care unit, there is very less evidence says about length of stay in ICU and its relation with functional recovery. But there are studies about tracheostomy, which shows that early tracheostomy reduces the length of stay in ICUs and reduction in mortality. But most

of the cases below GCS 5 indicate for tracheostomy, and the other cases which is above GCS 5 goes for tracheostomy after prolonged intubation. [5,10,11] So the early tracheostomy also part in reducing the length of stay in ICU. The hygiene was maintained throughout during the session of individual patients. Among the thirty six patients only one patient ended up with lower limb DVT on the paralyzed leg. The other complications like Rib fractures, Pneumothorax and septicaemia has prolonged the stay in ICU for few patients.

Early mobilisation is a controversial word. In some studies it shows that the general movement and positioning as mobilisation. But here we gave emphasis on mobilising the patient to sitting upright in bed or transferring the patient to chair. There are less evidences regarding the mobilisation of traumatic brain injury patients, where as in the case of stroke there are studies which indicate early mobilisation indicates early functional recovery. [3,4] National guidelines of acquired head injury indicates that prolong bed rest may result in osteopenia, reduction in muscle bulk, reduction in normal cardiovascular and autonomic responses. [12] Early sitting prevents the complications as well as it improves the normal postural tone, proprioception; maintain the normal range of motion. [11,12] The patient's tolerance level increases in supported sitting and standing even they are in unconscious state. Luther et.al says that the syncope mechanism has improved with the patient's tolerance level of standing. So we used tilt table to improve this sort of function and got better improvement in patients. [8-10]

There are few evidence based studies shows the length of the stay and improvement in TBI patients. Shiel et.al., 2001 in his study emphasis that increase in rehabilitation reduces the length of stay in hospital (Level 1b evidence). There is Level 4 evidence that patients with a long length of stay who receive high-intensity rehabilitation fair better on the Rancho Los

Amigos Scale at discharge than those who receive low-intensity rehabilitation. [13,14]

The conscious levels have improved significantly of P value .000. Here the importance is given for E components and M components as the patient is on Tracheostomy. Assessment and treatment of critically ill patients concentrate on deconditioning and related problems (muscle weakness, joint stiffness, impaired functional exercise capacity, physical inactivity), and respiratory conditions (retained airway secretions, atelectasis and respiratory muscle weakness) to identify targets for physiotherapy. Positioning and movement of limbs to keep full range of movement prevents the contractures and also helps in controlling the abnormal movement patterns. Challenging by retraining balance and tilt table - strengthens bones and muscles in patients who're unable to stand. Chang et.al study says that tilt table used by physiotherapists improves musculoskeletal functions and promote consciousness. Positive effects of early verticalisation (making the patient stand upright in tilt table) in ICUs were demonstrated for various clinical symptoms and conditions. [9,12-14]

The cognitive levels has improved significantly and the P value is .001 indicates that optimum physiotherapy management improves cognition as well as conscious levels.

## CONCLUSION

There is also a need to develop some evidence based protocols for the physiotherapy, in which there is still lack of specific management related to treatment techniques. Optimization of physiotherapy management, understanding of basic neurocritical care knowledge as well as incorporation of newer guidelines would certainly improve the outcome of the TBI patients.

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