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Effect of multimodal coma stimulation therapy with parental participation in child with traumatic head injury: A Case Report

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ABSTRACT

The traumatic head injury leads to different arousal state, coma is one of them in which patient do not respond to any internal and external stimuli. Specific stimulation or arousal therapy is required to stimulate the arousal state of patient. The purpose of this case study is to improve the state of a comatose child by coma stimulation therapy along with parental participation.

Multimodal coma stimulation therapy was given to 3.7 years old child who is in comatose state after traumatic head injury, 3 session in a day was given for 3 weeks, one session given by therapist and other two by parents. Glasgow coma scale and coma rating scale is the outcome measure used to assess the improvement in the patient before and after 3 weeks of intervention.

The result of the study shows improvement in GCS score from 5 to 7 after one week of treatment and 10 after 3 weeks of treatment. There is also improvement in coma rating scale from 4 to 8 after 1 week of treatment and 14 after 3 weeks of treatment. Therefore by the results of this case report explains that Parental participation plays a significant role in improving the arousal state of comatose patient.

Keywords- *Glasgow coma scale, Coma rating scale, Traumatic brain injury, Coma stimulation therapy*

INTRODUCTION

Traumatic Brain Injury is defined as a brain injury caused by externally inflicted trauma to head, may result in significant impairment of individual functioning- physical, cognitive and psychosocial.[1, 2].TBI is one of the leading cause of morbidity, mortality and disability in India150/1,00,000. The most common cause of TBI, normally reported in our country, is road

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traffic accidents accounting for 60%, followed by falls and assaults contributing to 25% and 10% of traumatic brain injury[1].One of the main consequences of TBI is coma. Coma is a sleep like state in which patient does not makes any purposeful response and there is no confined duration of arousal from this state. Coma is the stage of persistent vegetative state it is a deep state of consciousness;in the comatose state the individual is alive but unable to move or respond to external environment or stimuli. The ability to respond to internal and external stimuli is absent or diminish in coma because of sensory deprivation. Coma stimulation therapy includes the stimulation of sensory system through external stimulus or environmental stimulation which initiate the arousal state because the cortical neuronal network require input from sense receptor to maintain functional efficiency. Sensory stimulation of significant intensity,frequency and duration can stimulate the brain.On the basis of evidence, specific frequency, intensity and duration has shown to arouse the brain by improving neural organization, increased dendritic branches, stimulating reticular activating system and increase the level of cognitive functioning[3].

With the implement of the current evidence, we found that to give therapy for more than one session was difficult due to time factor and setup difficulties. Patient socio-economic condition also hinders the recovery of the patient from the comatose state, so including parents or care giver as a rehabilitation member and educating them with the coma stimulation therapy so that this therapy can be carried out at home after the discharge of the patient. This case studyinclude parents as a rehabilitation team member and they are guided with the procedure of coma stimulation therapy. Parents of the patient are educated with the procedure of the therapyso that the number of sessions can be increase and better outcomecan be achieved in short duration.

The aim of this study is toobserve the effect of parental participation in improvement of arousal state of comatose child receiving multimodal coma stimulation therapy.

METHODOLOGY

This is the case of a 3 years and 7 months oldmale pre-school child, with the normal growth and development met with a road traffic accident and had a head injury that lead him to state of coma.

Before RTA status:All milestone has achieved till aged, he was able to walk, run and climb stairs, able to manipulate toys, draw and copy the simple image, able to sing songs, dance,

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and can able to answer the simple basic questions, and also achieved bowel and bladder control.

After RTA status: GCS: 3/15

CT scan suggestive of small extra axial collection at right temporal convexity suggestive of extra Dural haematoma, maximum of 2-3mm, and multiple small haemorrhagic contusion noted in right temporal and frontal lobe, and diffuse cerebral oedema.Also seems de-corticated rigidity posture.

Outcome measures

- Glasgow coma scale:Inter-rater reliability=71%Intra-rater reliability=90% (Fischer et at,2010)MCID: 8.6 (minimal clinically important difference)

- Coma recovery scale:Inter-rater reliability=84%, Intra-rater reliability=84% (Schnakers,2008)MCID:9.6

Intervention

- Pharmacological management started for controlling symptoms.
- When his vitals were stable the paediatrician refer him for the physiotherapy basically for coma arousal therapy on 7th post admission day.
- Coma stimulation therapy was given using easily affordable and locally available materials.
- Five senses that is visual, auditory, tactile, gustatory, kinaesthetic are stimulated three times a day, for 45-50 min per session (one time by the therapist followed by the parents for remaining session) from 7th day after admission for 3 weeks.

PROCEDURE

- Visual stimulation:

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  - Stimulus was presented for 10-20 s, twice with 3s break between each stimulus, in upper ,inner, front and lower visual field and allow 1-2 min for response.
  - Materials were used such as bright colour lights with the help of different colour paper put over light and familiar photo
- Auditory stimulation:
  - Stimulus was presented for 20-30s, twice with 3s break on both the sides and allow 1-2 min for response.
  - Materials were used like playing songs of his interest, familiar sounds and ringing bell.
- Tactile stimulation:
  - Stimulus was presented for 15-20s, twice with 3s break , repeated to right after left upper extremity after lower extremity.
  - Materials were used such as cotton, cloth textures and soft brush.
- Gustatory stimulation:
  - Stimulus was presented for 5-10s, twice with 3s break.
  - Material was used e.g. lemon juice.
- Kinaesthetic stimulation:
  - Performed either on a bed or chair, one extremity at a time, each movement was done 5-7 times, allow 1-2 min for respond
  - Movements of arms, movements of legs, movements of head and log rolling.

PARENTAL GUIDANCE

- Positional advices like keep head in elevation position, maintain the posture in supine.
- Do not frustrate if the child is not responding as per your expectations keep calm and wait for the response and encourage him for better participation.
- After some days, if the child is responding from any specific side or any specific stimulus, so emphasis that on treatment. For example, called him from that side and encourage that side movement first.
- When the eye opening was likely to be spontaneous, suggested the parents to change the position in every 2/3 hours.
- Introduce every stimulus accordingly as per therapist guidance.

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- Ask the parents for active participation, observation every movement and every response from child, encourage him on his each and every efforts, repeat the guided treatment during the rest of the time.

RESULT

The results of the study after the 3 weeks of intervention shows significant improvement in Glasgow coma scale and coma rating scale.

The total GCS Score on 7th day before starting the intervention is 5, total score after 1 week of treatment is 7 and after three weeks of treatment is 10. The GCS component such as eye response and motor response was more improved as compare to verbal response which was less improved.

There is also significant improvement in coma rating scale the total score on 7th day of admission before starting the treatment is 4, total score after 1 week of treatment is 8 and after 3 weeks of treatment is14. Higher improvement in visual and motor components whereas less improvement in oromotor and communication of coma rating scale component.

Table 1

	components	7th day after admission	1week after treatment	3 weeks after treatment
GCS (Glasgow coma scale)	Eye	2	3	4
	Verbal	1	2	2
	Motor	2	3	4
	Total score	**5**	**7**	**10**
CRS (coma rating scale)	Auditory	0	1	2
	Visual	2	3	4
	Motor	1	2	4
	Oromotor	0	1	1
	Communication	0	0	1
	Arousal	1	1	2
	Total score	**4**	**8**	**14**

DISCUSSION

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The result of the study suggested that implementation of coma arousal therapy for 3 weeks with the parental participation can enhance consciousness and recovery.

Results of the literatures shown that sensory stimulated implementation at early stage is beneficial for head injury patients.[2,3,4]

The rationale is that the coma arousal therapy for specific intensity, frequency and duration arise the brain by improving neuronal organization, maximum reorganization occurs within first few weeks of brain injury. Becausethe exposureto various sensory stimulations frequently facilitatesdendritic growth and improves synaptic connectivity in those with damage nervous system[3]

We also have to consider the pharmacological aspects. By adding parental participation, we are influencing the personal domain and by giving the home exercise protocol we modulated the environmental factor. Because the recovery is not just based on bio-medical aspect but also depend upon the psycho-social factor and environmental factor that also responsible for the recovery, so parental participation and home environment can be enhanced the possible result.

CONCLUSION

From results of this case study its concluded that multimodal coma stimulation therapy with parental participation can significantly improve GCS and CRS score in3 weeks.Parental participation is equally important in coma stimulation therapy, their education and active participation can enhance the arousal level in comatose child in short duration. Parental participation in the therapy can increase the number of the session given to the patient which helps in early improvement of arousal state

The coma stimulation therapy should be administered in the comatose patient with parental participation to achieve early recovery and improvement in the arousal state. This improvement in arousal level will also help in improvement of other function and system.

LIMITATIONS

The patient belongs to low socio-economic status, we could not find repeated investigations.

Moreover, he came from the rural area so, they could not continue the treatment on daily basis.Follow up cannot be done more than three weeks. Thus, we have to give the written home exercise protocol to parents, explain and demonstrate it well, and ask for video recordings if possible.

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