Sensory Stimulation after Traumatic Brain Injuries

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BACKGROUND

A Traumatic Brain Injury (TBI) is defined as an injury to the head that disrupts normal function of the brain. Around 1.7 million people in America sustain a TBI each year (Padilla & Domina, 2016). A TBI can cause many complications including both physical and emotional, such as changes in thinking, language, and sensation. These individuals often begin in a coma stage with complete unconsciousness of their surroundings. The focus of this case study is on the vegetative state which is the phase of consciousness progressing from a coma. In the vegetative state, individuals have lower brain functions (sleep cycles, heart rate regulation, etc.) and some upper brain function (eye opening, sound production, etc.). Through the brain's recovery process, plasticity allows the brain to modify its function (DeFina et al., 2009). Enhancement of plasticity can occur through internal and external factors such as sensory stimulation. A growing body of evidence suggests regulated sensory stimulation may improve alertness and progression after a TBI. Evidence supports that the recovery process begins immediately after an injury indicating the importance of rehabilitation immediately following the brain injury (Padilla & Domina, 2016), Occupational therapy practitioners in the intensive care unit (ICU) are knowledgeable in controlled sensory stimulation to increase cortical activity.

CLIENT HISTORY

The patient which the case study was completed on was a 46-year-old who was initially admitted to the hospital for shortness of breath. She has a past medical history of Diabetes and Hypertension. She was taken to the operating room for AV Fistula and Permacath insertion where she went into cardiac arrest resulting in nearly 10 minutes of chest compressions to achieve return of spontaneous circulation. She was intubated on a ventilator and the MRI showed small infarcts in the corpus callosum and thalamus and diffuse encephalopathy indicating signs towards an anoxic brain injury. The patient was transferred to the medical surgical ICU where she was not following commands and not opening her eyes to any stimulus.

RESEARCH QUESTION

What is the role of OT practitioners regarding sensory stimulation in the vegetative state after a traumatic brain injury in the ICU?

METHODS

Data was collected from the time of the patient's admission until the patient discharged to the next line of care. At CHI Creighton University Medical Center-Bergan Mercy Hospital, patient information and data is stored in a secure system entitled EPIC. Each member of the interprofessional team can document various notes to communicate about the patient's hospital stay. After each therapy session, detailed documentation occurs on the documentation system allowing the interprofessional team to view the patient's progression with therapy. To measure the patient's response to occupational therapy with emphasis on regulated sensory stimulation, the JFK Coma Recovery Scale-Revised (CRS-R) was used. The CRS-R is used to assess patients with an altercation of consciousness most commonly between a coma and is often used to differentiate between a vegetative state and minimally conscious state. The assessment has 23 items within six subscales that measure various aspects of sensation. The six subscales include: Auditory, Visual, Motor, Oromotor, Communication, and Arousal Functions. It is composed of hierarchical items that are associated with brain stem, subcortical and cortical processes. The lowest score being 0 indicates only reflexive activity while the highest score 23 representing higher cortical and cognitive functioning.

JFK COMA RECOVERY SCALE - REVISED ©2004
Record Form

This form should only be used in association with the "CRS-R ADMINISTRATION AND SCORING GUIDELINES" which provide instructions for standardized administration of the scale.

Patient:	Diagnosis:	Etiology:
Date of Onset:	Date of Admission:	

Date / Week	ADM	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
AUDITORY FUNCTION SCALE																
4 - Consistent Movement to Command *																
3 - Reproducible Movement to Command *																
2 - Localization to Sound																
1 - Auditory Startle																
0 - None																
VISUAL FUNCTION SCALE																
5 - Object Recognition *																
4 - Object Localization: Reaching *																
3 - Visual Pursuit *																
2 - Fixation *																
1 - Visual Startle																
0 - None																
MOTOR FUNCTION SCALE																
6 - Functional Object Use †																
5 - Automatic Motor Response *																
4 - Object Manipulation *																
3 - Localization to Noxious Stimulation *																
2 - Flexion Withdrawal																
1 - Abnormal Posturing																
0 - None/Flaccid																
OROMOTOR/VERBAL FUNCTION SCALE																
3 - Intelligible Verbalization *																
2 - Vocalization/Oral Movement																
1 - Oral Reflexive Movement																
0 - None																
COMMUNICATION SCALE																
2 - Functional: Accurate †																
1 - Non-Functional: Intentional *																
0 - None																
AROUSAL SCALE																
3 - Attention																
2 - Eye Opening w/o Stimulation																
1 - Eye Opening with Stimulation																
0 - Unarousable																
TOTAL SCORE																

Denotes emergence from MCS†
Denotes MCS *

https://www.sciencedirect.com/science/article/abs/pii/S0003999314004754

RESULTS

Therapy

- OT treatment sessions consisted of early mobility, therapeutic activity, neuromuscular re-education, and therapeutic exercise with emphasis on sensory stimulation within activities of daily living.
- At the beginning of the OT treatment plan, the patient initially scored a 9/23 on the CRS-R with only minimal reflexive movements present. Her main responses were noted when noxious stimuli was presented to her lower extremities, brief eye opening to loud startles, and blinking to threats to her eyes.

Progression

- Therapy continued to progressed as the patient was able to regain strength and activity tolerance enabling her to tolerate a separate occupational therapy and physical therapy session in one day rather than one co-treatment session.
- The patient's parents were able to be present and involved in majority of the OT treatment sessions. They were able to provide insight into special qualities about the patient that allowed individualization for each therapy session. Education was provided to her parent's on using the patient's name, bringing autobiographical information, and providing light touch to the patient's hands and face to further enhance sensory stimulation and arousal.
- Therapy sessions would consist of the patient sitting at the edge of the bed to further enhance neuromuscular re-education with the goal of increasing proprioceptive input and arousal

Outcomes

- Towards the end of the patient's hospital stay, the patient scored 15/23 with significant increases in command following, eye opening, and action-oriented movement. The patient was also able to share a special moment with her mother when she was able to reach out for her mom's hand and hold onto it, something she has not been able to do since her brain injury.
- The patient discharged to a long-term acute care hospital to further address her rehabilitative and medical needs.

BOTTOM LINE FOR OT

- Occupational therapy practitioners are knowledgeable in providing regulated sensory stimulation to improve cortical activity and arousal
- Evidence has found that multimodal sensory stimulation enhances arousal and alertness.
- Activities of daily living can work in conjunction increasing alertness by providing further sensory stimulation and return to previous roles
- Occupational therapists are encouraged to incorporate family members to learn individualized traits about each patient and involve them in each treatment session.
- Significant changes in attention and cognition were observed in frequent, repetitive, and simple sensory stimulation sessions that ranged from 3-5 times a week for 20 minutes.
- Rehabilitation has been proven to be effective immediately following a brain injury to improve functional outcomes.

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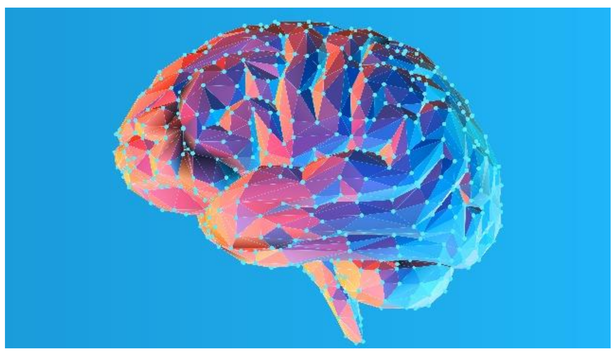

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