Traumatic Brain Injury (TBI) caused by Motor Vehicle Accident (MVA)

Coursera: Understanding the Brain: The Neurobiology of Everyday Life

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1. Brain injury - Frontal and Temporal Lobes

- Patient:: Male 45
- Cause of Injury: Motor Vehicle Accident (MVA)
- Final Diagnosis: Closed head injury
- Symptoms: Bilateral mydriasis, coma
- Clinical Procedure: Ventriculostomy and hemicraniectomy
- Specialty: Neurology
- Rehabilitation: physiotherapy, psychotherapy, occupational therapy, cognitive training, Speech and language therapy, Community Re-integration

Background of the Case

Patient was driver of a passenger car T-boned by a lorry running red light. Direct impact was on the driver side of the patient's vehicle

Patient was brought to Emergency Department via ambulance, intubated

Physical examination revealed a GCS of 3T, bilateral fixed pupils, negative corneal response

CT of head showed subarachnoid hemorrhage with left frontal and temporal subdural hemorrhage, in addition, MRI studies showed a left frontal/temporal hematoma with mass effect and cerebral edema

Patient received two neurosurgical interventions on the same day of the accident. One was to drain the blood/CSF, and the other to relief the pressure built up due to swollen masses

Chronology of recovery

Patient regained consciousness on Hospital Day 8

Patient was kept in ICU for 2 weeks and was moved to the general wards where patient was bed bound for 10 weeks. He was then transferred to the rehabilitation centre and he stayed till end of the 7th month.

7 months after the accident, the patient could walk for 15- 20 feet using a walker, but right side of the body was very weak

Starting from the 8th month onwards, patient was discharged to his family doctor and private rehab clinics, but have to return to hospital for follow up, and frequency of visit depended on the patent's condition

Observations

Patient has no memory about how the accident occurred

Patient could not recognize his wife and children until the 3rd week after the accident

Patient could not speak or communicate for 6 weeks after accident, then he started communicating non-verbally through touches and hand movement. A couple of weeks later, patient started to mumble in broken sentences but often lost his words

Patient suffered from tension-type headaches, dizziness, and sometimes seizures in the first 8 weeks

Patient continued to be weak on the right side of his body

Observations (continued … part 2)

Patient did not know how to use his cell phone and his notebook computer, despite of being an experienced computer programmer before the accident

Patient suffered from short memory loss and could not retain/recall information

Patient has difficulty recognising faces

Patient was often lost in the middle of conversations

Patient has problem with decision making

Patient did not want to go outside

Patient was extremely nervous when he was in vehicle, especially when it came near to road intersections. He always covered his face with his hands when the car approached traffic lights

He never wanted to come close to where his accident happened before

Observations (continued…part 3)

- Patient demonstrated temperament and affective attitude change:

  Patient became very easily annoyed with sounds made by his children and did not want them around him talking, playing and making noise

  Patient became more and more disagreeable with people around him, including nurses, therapists and doctors, and not to mention, his spouse.

Parts of the nerves system under study: Frontal and Temporal Lobes

Injuries the patient sustained:

Subarachnoid hemorrhage with left frontal and temporal subdural hemorrhage resulting to blood-brain barrier (BBB) and/or cerebrospinal fluid (CSF) barrier break down, allowing fluid to accumulate in the patient's extracellular space. It would caused pressure to build up and damage the brain cells in left frontal and temporal lobes.

2 Functions of the Frontal and Temporal Lobes (Part 1)

- Frontal lobe is the part of the brain responsible for the ability to decide between good and bad choices, as well as recognize the consequences of different actions.
- Though not part of the memory system, it is believed that the part of the functions of the frontal lobe is to facilitate working memory[2] which is closely involved with the ability to hold attention.

[2] Kim J.S.; Kim O.L.; Seo W.S.; Koo B.H.; Joo Y.; Bai D.S. (2009). "Memory Dysfunctions after Mild and Moderate Traumatic Brain Injury : Comparison between Patients with and without Frontal Lobe Injury"

Frontal Lobes:

Functions [1]

- How we know what we are doing within our environment (Consciousness)
- How we initiate activity in response to our environment
- Judgments we make about what occurs in our daily activities
- Controls our emotional response
- Controls our expressive language
- Assigns meaning to the words we choose (Left Lobe)
- Involves word associations (Left Lobe)
- Memory for habits and motor activities

[1] http://www.neuroskills.com/brain-injury/brain-function.php

Frontal Lobe:

Observed Problems [1]

- Inability to attend to more than one object at a time
- Inability to name an object (Anomia)
- Left lobe damage can cause difficulty in forming complete sentences, poor repetition. (Broca's aphasia)
- Inability to locate the words (Agraphia), Problems with reading (Alexia)
- Difficulty with drawing objects
- Difficulty in making decisions
- Difficulty with doing mathematics (Dyscalculia)
- Lack of awareness of certain body parts and/or surrounding space (Apraxia) that leads to difficulties in self-care. Inability to focus visual attention
- Difficulties with eye and hand coordination

[1] http://www.neuroskills.com/brain-injury/brain-function.php

Temporal Lobes:

Functions [1]

- Hearing ability
- Memory acquisition
- Some visual perceptions
- Categorization of objects

[1] http://www.neuroskills.com/brain-injury/brain-function.php

Temporal Lobes:

Observed Problems [1]

- Difficulty in recognizing faces (Prosopagnosia)
- Left lobe damage can cause difficulty in understanding spoken words (Wernicke's Aphasia)
- Disturbance with selective attention to what we see and hear
- Difficulty with identification of, and verbalization about objects
- Short-term memory loss. Interference with long-term memory Increased or decreased interest in sexual behavior
- Inability to categorize objects (Categorization)
- Right lobe damage can cause persistent talking
- Increased aggressive behavior

[1] http://www.neuroskills.com/brain-injury/brain-function.php

Post Traumatic Stress Disorder (PTSD)

Patient could not recall how the accident occurred. It may due to lesion to the memory function of the temporal lobe or the patient's psychological avoidance to the the accident.

Symptoms observed on travel anxiety and avoidance to come near to the scene of accident are symptoms of PTSD due more to sensory organs inputs affecting emotions after realizing the damage to his life than from emotions of recalling the scene of how the accident occurred – since he could not remember.

Hemiparesis - Weakness on one side of the Body

An interruption in the blood supply to the one side of brain caused by trauma or concussion hence depriving brain cells of oxygen and blood supply (and the cells died) may affect the motor function of the body and create the symptom of one-sided weakness to the patient.

Lesions to the left side of the brain have caused weakness to the right side of the patient’s body.

Symptoms (Part 1)	Lesion Location/Cause
Patient has no memory about how the accident occurred	Temporal Lobe
Patient could not recognize his wife and children until the 3rd week after the accident	Temporal Lobe
Patient could not speak or communicate for 6 weeks after accident, then he started communicating non-verbally through touches and hand movement. A couple of weeks later, patient started to mumble in broken sentences but often lost his words	Left Front Lobe (Broca's Aphasia)
Patient suffered from tension-type headaches, dizziness, and sometimes seizures in the first 8 weeks	Subarachnoid Hemorrhage
Patient continued to be weak on the right side of his body	Left hemisphere, (Hemiparesis)

Symptoms (part 2)	Lesion Location/Cause
Patient did not know how to use his cell phone and his notebook computer,	Frontal Lobe
Patient suffered from short memory loss and could not retain/recall information	Left Temporal Lobe
Patient has difficulty recognising faces	Temporal Lobe
Patient was often lost in the middle of conversations	Temporal Lobe
Patient has problem with decision making	Front Lobe
Patient did not want to go outside	PTSD
Patient was extremely nervous when he was in vehicle, He always covered his face with his hands when the car approached traffic lights. He never wanted to come close to where the accident happened before	PTSD

Symptoms (part 3) Lesion Location/Cause

Patient demonstrated temperament and affective attitude change: Temporal Lobe

Patient became very easily annoyed with sounds made by his children and did not want them around him talking, playing and making noise

Patient became more and more disagreeable with people around him, including nurses, therapists and doctors, and not to mention, his spouse.

3. Analysing events and phenomena

- The discussion forum is particular helpful. Fellow learners have asked questions or provides ideas on issues that they encounter and it helps save a lot of time digging around for solutions or answers.
- The quiz after each session is particular challenging. Setting a high passing mark (80%) as compared to most of the other courses is not an arbitrary decision but a planned step to make learners retake the test, thus going over the entire presentation at least one more time, do a lot more thinking, read more on the topic, and more research.
- I start to notice and can relate to more illnesses and deceases (e.g. Parkinson, Alzheimer's , BPPV, etc.) due to neurological or brain issue with the people around me, including elderlies that I have known and passed away.
- The MVA presented in this case happened on January 8, 2015 in Toronto, Canada. The patient is still receiving therapeutic treatment from occupation therapist (cognitive impairment), speech and language therapist, psychiatrist, and physiatrist. It is estimated that his legal claim may take 3-4 more years to settle. This course helps me understand more about the physiological and neurological conditions of the patient, and can handle his case with higher confidence.

Reference:
Links to Brain Lobe Injuries

- Frontal Lobe Brain Injuries: http://www.brainandspinalcord.org/frontal-lobe-brain-injury/
- Temporal Brain Lobe Injuries: http://www.brainandspinalcord.org/temporal-lobe-brain-injury/
- Parietal Brain Lobe Injuries: http://www.brainandspinalcord.org/parietal-lobe-brain-injury/
- Occipital Lobe Brain Injuries: http://www.brainandspinalcord.org/occipital-lobe-brain-injury/