



Severe Traumatic Brain Injury: A Case Report

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Abstract:

Objective: Unusual clinical course of a right side Hemiplegia, Right Facial Palsy . **Background:** Traumatic brain injuries are one of the most challenging scenarios to deal with in the medical field. Not only because intervention could be life-saving but also because circumstances that evolve from brain injury affect the quality of life. The more severe is the injury the poorer is the prognosis. So, building a well structured treatment plan is critical to this type of cases to improve the quality of life and maintain independent functional level. **Case presentation:** This case report demonstrates the recovery of a 10-year-old male child who presented with a severe traumatic brain injury after a train accident. Clinical examinations and several investigatory procedures demonstrated an increased possibility for mortality and morbidity. **Conclusions:** A well established treatment plan delivered by a multidisciplinary team from the early beginning after the condition becomes stable is the main factor in controlling the circumstances of traumatic brain injuries and plays an important role in the prognosis of the condition.

Keywords: Brain Injuries • Glasgow Coma Scale • Trunk Control • Balance • Pelvic Control • Facial Expressions • Hand Function.

Background:

Traumatic brain injury (TBI) is one of the most prevalent causes of disability and possible death in the general population. TBI may typically result by an external assault that causes damages to the brain. The extent of the cerebral injury can be focal which is merely related to one specific region of the cerebrum or diffuse that happens in more than one area of the brain. The potential severity of a brain injury can scale from a mild concussion to severe damage that lead to a coma or even imminent death. (1)(2)

Possible signs of moderate to severe traumatic brain injuries could be severely disabling. Somatic symptoms typically involve

potential loss in consciousness that could remain steadfastly for typical days or even months. A headache, vomiting or nausea correctly is also typical cues to TBI. Convulsions, seizures, dilation of one or both pupils of the eyes and clear fluids draining from the nose or ears are also all alarming signs caused by TBI. Impairment of the upper and the lower limbs and losing of correctly are additional signs. Cognitive or mental symptoms equally may be associated with TBI as possible confusion, agitation, combativeness. Other unusual behavior like loss of verbal communication, speech disorders or even sad or depressed mood and dropping of interest in favorite toys or activities all may be associated with TBI. (3)

Initial treatment of TBI start with a establishing a reliable airway, and insure adequate ventilation and normal blood pressure. Surgical interventions to carefully remove intracranial hematomas are typically performed in severe cases. Proper placement of an ICP monitor in the brain and proper positioning of oxygen sensor into the jugular vein can accurately monitor the oxygen consumed by the brain. Additional catheters may be optionally added to evaluate brain temperature and oxygenation to reliably detect any possible changes in the condition. The most significant goal at this stage is to properly preserve adequate cerebral blood perfusion and oxygenation, and to precisely control and prohibit complications result from altered function of the brain. (4), (5)

It is crucial to accurately detect the degree of consciousness in TBI cases. The Glasgow Coma Scale (GCS) is widely used classification system to asses and accurately assesses the accurate level of consciousness and specific grade of severity of TBI, with 3 being the worst, defined as deep coma or confirmed death, and 15 being the best, a fully awake. (5)(6)



The golden standard radiological investigation used in early TBI assessment is computed tomography scan (CT or CAT scan), as it accurately detect the possible presence of hematomas, hemorrhage and potential fractures. As soon as the patient is stabilized, MRI is performed that may adequately show specific details that did not demonstrate on the CT scan. Data are employed to merely determine the prognosis than influencing treatment. (5)

Intracranial pressure is significant to look at. A review of 753 CT studies that may reveal all or some of the following findings abnormal mesencephalic cisterns, midline shift, and subarachnoid hemorrhage were associated with an increased risk of elevated ICP and death.(7)

This case report describes a patient who had most of the symptoms of severe TBI after train accident. The patient presented with ventricular fibrillation and cardiac arrest which restored twice in the emergency room and a GCS of 4 and bilaterally dilated and fixed pupils.

Case presentation:

M.W ten-year-old male child admitted to the hospital in 11th of March 2022. He was playing alongside the train lines when the metal part in the front of the train strikes his head directly. He lost consciousness and directly admitted to the emergency room. The patient was comatose. The physical examination revealed a GCS of 4T, 4 mm bilaterally fixed pupils, negative corneal response, right occipital cephalohematoma, cerebral spinal fluid (CSF) otorrhea on the right side, and generalized tonic clonic seizure. In addition, CT findings showed skull base fracture, brain edema. (figure1)

The patient presented to the physical therapy institute with Ryle feeding tube, partially right eye blindness, right facial palsy, right side hemiplegia, and lost hand function.

In the first 4 weeks, we focused on improving the following: trunk control, sitting

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Discharge Summary

Patient name: Osama Age: 10 years
Date of admission: 11/3/2022 Date of discharge: 20/3/2022

Provisional diagnosis on admission: Head Trauma → Skull base fracture
Final diagnosis on discharge: Skull base fracture → Post-traumatic sequelae
Clinical data: (Delayed motor & mental)

The condition started at day of admission by head trauma followed by GTC convulsions, bloody vomit.
→ MRI → CT brain: Skull base fracture, mild midline shift.
Examination: GCS 4/15
Investigation: CT brain: Fr. Skull base, edema.
→ brain edema, midline shift → CT brain: improved.
→ CT brain: Skull base fracture. Fracture: base of skull.
Medications: As ordered. Fracture: base of skull.
Medications: Aspirin, Ibuprofen, Chlorzoxazone, T. intram. Comp.
Follow up plan: Low Physiotherapy Neurology Psychiatry
Condition on discharge: Improved - Referred - Against medical advice - Died
Fr (Physiotherapy & Neurology) Clinic supervisor
Resident: [Signature]

Figure 1: patient physical therapy report

ability, and weight bearing abilities, upper limb strength, hand function, and facilitation of facial expressions. These goals were delivered in the form of isolated and functional exercises that target the core components of each goal. For the trunk control we focused on gaining muscle power in back muscles by active assisted trunk extension exercises from the wedge, and with the abdominal muscles mainly the rectus abdominus, internal and external obliques muscles by active assisted sit ups exercises and active assisted trunk side flexion exercises from

the high-level of the wedge. The strength of these muscles would enable the patient to move his trunk in a more controlled manner and get to sit and maintaining sitting position independently.

Increasing the endurance in these muscles also was targeted. The child was put in cross sitting position with external support (therapist hand). Different weight bearing positions were used to enhance the proprioception, muscle power and endurance. One of these positions used was quadruped positioning to bear weight on upper



limbs and on knees enhancing proprioception in knees, hips and joints of the upper limbs, challenging trunk and pelvic control as the child try to maintain the position. Pelvic rocking also enhanced in this position. Weight bearing in the lower limb was focused on by standing with knee immobilizer holding the stand bar to enhance antigravity muscles power of the lower limbs. Upper limb strength and hand function were improved by active assisted isolated Shoulder flexion, abduction exercises with elbow immobilizer, minimally resisted elbow flexion and extension exercises, and facilitation of wrist extension and radioulnar supination. Facilitation of facial expressions was done by facial massage and facial expressional muscles exercises in front of the mirror. On the other hand, home program was established and delivered by the patient relatives and neurologist consultation for proper medications and follow ups was conducted. From the early beginning the patient started his sessions with the speech therapist and occupational therapist for speech disorders and specific hand function respectively. At the end of the 4th week, the patient could abandon the Ryle tube and started to see and hear clearly with his right eye and ear as the brain edema completely recovered.

After one month of intensive physical therapy and standing with knee immobilizers holding the stand bar for long periods of time at home. The patient condition progressed as he could sit alone without any external support and stand holding the stand bar without immobilizers.

So in the second month (4-8 weeks) we continued in the same treatment plan leveling up in the abdominal exercises and repetitions of back muscles exercise and adding some challenges to the patient's sitting abilities aiming to increase the time of sitting unsupported and improve his balance during sitting. So balanced sitting exercises on the balance board were started. Improving standing abilities achieved by standing against the wall, assisted single right limb stance with therapist support and holding the stand bar (figure 2). Kneel-sitting to kneeling position holding the stand bar and maintaining kneeling position were targeted mainly focusing on pelvic



control in addition to trunk control by enhancing coordination between abdominals and gluteus maximus on one side with back and iliopsoas muscles on the other side and coordination between hamstring and quadriceps muscles to maintain the femur on neutral position. Neurologist follow-ups, speech and OT sessions were continued.

From (8-12 weeks), a good trunk power and control were gained, some hand function and some facial expressions as elevation of eye brows, closing eyes tightly and blowing cheeks began to be restored. The child started to speak some words clearly. His mental health and psychological mode started to improve as he began to try to communicate with his surroundings, interested in playing and returned to studying adapting to write with his left hand.

So, in the third month we continued to exercises the core muscles and leveled up to challenge his sitting balance by balanced sitting exercises on the ball in four directions; antero-posterior and medio-lateral directions (figure 3). Transition from kneeling sitting to kneeling to half kneeling positions to standing holding the stand bar and maintained half-kneeling position holding the stand bar were added to the program to improve strength, endurance and coordination of muscles around the pelvis and the lower limbs as mentioned early for the kneeling position, half-kneeling position improve endurance and coordination of muscles like quadratus lumborum and gluteus medius on the weight bearing limb and coordination between abductors and adductors of the balancing limb (figure 4). Sit to stand from the chair holding the stand bar targeting improvement of the functional level of the patient. Assisted side walking was initiated.

At the end of 12 weeks, the patient became able to tolerate kneeling position alone trying to take steps on his knees and started to stand alone momentarily.

In the 4th month (12-16 weeks), we focused on improving the balance, muscle endurance, and progressing to ambulation. So repeated trails of

standing alone as much as possible and walking assisted were the focus of this stage and were added to the home program. Pull to stand from supine position to improve the patient functional level. Balancing exercises as standing on the balance board initiated (figure 5). Unassisted kneel walking and walking between parallel bars he started to flex his knee in the early swing and in loading response phases of gait cycle relieving the load from the posterior knee capsule and eliminating the risk of developing genu recurvatum. At the end of the 16th week the patient hand functions and upper limb strength and coordination improved. His speech and facial expressions improved also making

on the stepper using one hand support were successfully initiated too (figure 6). In the beginning of the ambulation stage, the patient was walking with hyperextended knee which was placing an extra load on the posterior capsule of the knee but after strengthening of the hamstrings and improving quadriceps control capacity, communication with his family and surroundings easier for him. The goal in the following phase is continuing strengthening muscles of the lower limb and increasing their endurance and coordination and improving balance to progress to walk with the minimal support possible



Figure 2: postural reactions in balanced sitting exercises on ball

Figure 6: unassisted kneel walking
Figure 5: standing on the balance board



Figure 3: transitions from supported half- kneeling to stand





Discussion:

Traumatic brain injuries vary in severity between mild, moderate and severe. However, a patient with severe condition could respond quickly and more better to the intervention more than a patient with moderate condition. This depends on various factors including the age, the pre-injury health condition of the patient, the type of intervention and how much early it is delivered. A critical factor in the improvement of this case was that it has been medically dealt with immediately as fast as possible after the onset of the injury and he started intensive physical therapy and rehabilitation course after 20 days of the day of hospital discharge. Another critical factor in dealing with this type of cases is that the treatment is conducted by a multidisciplinary team. The patient was introduced to the physical therapy institute with Ryle feeding tube and a non-functional level at all. Now he is capable to ambulate with assistance, to be dependent on most of the ADLs, and to return to school and communicate with his community.

Conclusion:

Conducting a well-structured patient-oriented treatment plan based on problem list of activity limitations and participation restrictions delivered by a multidisciplinary team, which was in this case forms of physical therapists, neurologists, speech therapists, and occupational therapists, is the core and the key in dealing with patients with traumatic brain injuries specially the severe conditions and the circumstances evolves from them that can definitely affect the quality of life. In this case, regarding to the rehabilitation program, it was enormously productive and beneficial to establish it based on the problems found in the functional assessment of the patient at each stage of

progression taking the muscle power, endurance, coordination and the functional abilities into considerations. Despite it was a severe “hopeless” TBI case to improve or even live as described by the neurologist after seeing the results of the patient’s early clinical examination, he lived and now can be independent and perform his ADLs successfully. Conducting a home program by a cooperative caring family is another important key in the improvement of TBI cases with disabilities and in the speed of recovery.

Declarations of interest:

The authors have no conflicts of interest to disclose regarding this report.

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