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Severe Traumatic Brain Injury and Ventriculoperitoneal shunt challenges: Case report

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Introduction

Traumatic brain injury (TBI) is a challenging and complicated disease process to care for, despite the advance of technology used to monitor and guide treatment. 1

TBI is defined by an alteration in the brain function, or other evidence of brain pathology, caused by an external force. In this definition, the presence of confounding factors such as intoxication or medical illness does not preclude a diagnosis of TBI, although clinical judgment is used to decide whether the patient's symptoms are a consequence of the TBI. Additionally, this definition can include imaging or laboratory investigations. 2

As a silent epidemic, it is a critical public health and socio-economic issue across the world that contributes to death and disability more than any other traumatic insult. Globally, its annual incidence is variably estimated to be 27 to 69 million, with a prevalence rate of 759 per 100,000. 3, 4, 5

Symptoms of a TBI can be mild, moderate, or severe, depending on the extent of the damage to the brain. The Glasgow Coma Scale (GCS) uses exam findings to quantify level of consciousness following TBI, with 3 being the worst, defined as deep coma, and 15 being the best, a fully awake person. 6

Initial management of TBI is the most critical time period because it will have the greatest effect on mortality and degree of debility that surviving patients will experience. Little can be done to reverse the initial brain damage caused by trauma. 1 As so, the mainstay of treatment is aimed at stabilizing an individual with TBI and limiting secondary brain injury. Approximately half of severely head-injured patients will need surgery.

Prognosis after TBI is often even more challenging than the treatment itself. 1 Disabilities resulting from a TBI depend upon the severity of the injury, the location of the injury, and the age and general health of the individual. 6

Aim

The aim of this case report, as a research design, is to describe scientific observations that we encountered in a clinical setting and expand our knowledge.

Methodology

We present the case of a previously healthy 38-year-old male patient that was involved in a road accident (car against bicycle). The victim had no helmet and was found with an initial GCS of 14 (eyes: 4, verbal: 4, motor: 6) associated with agitation. Head computerized tomography (CT)-scan revealed sulcal subarachnoid hemorrhage and multiple cerebral contusions. After the documentation of intracerebral hypertension, a first decompressive craniectomy was performed. Despite medical measures, a persistent increased intracerebral pressure motivated a second surgery 48 hours later to enlarge borders of the

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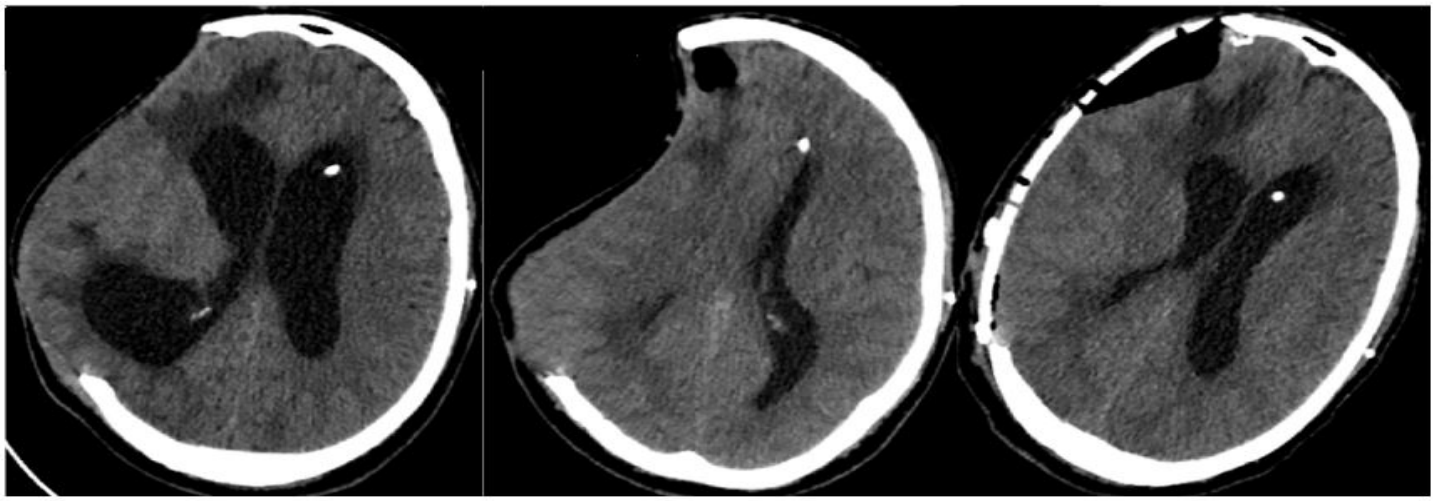

Figure 1: *Head CT scan showing from left to right Hydrocephalus; paradoxical brain Herniation; cranioplasty with no complications associated.*

previous craniectomy, and an external ventricular drain was placed. Then, the patient developed a cerebrospinal fluid leak through the surgical wound which led to a subdural Hygroma complicated with Staphylococcus epidermidis and Enterobacter aerogenes Meningitis. Surgical debridement, subdural drain, direct pressure and a prolonged course of antibiotic therapy was done with a favorable evolution.

Two months later, after a ventriculoperitoneal Polaris® adjustable valve was inserted, the valve position, and therefore pressure (confirmed by radiological image), was a challenge. Initially, the valve was set at position 3 (100mmH2O median pressure), but 24hours after the surgery, the patient developed unconsciousness (GCS of 9), sinking flap skin and vomiting. Head CT-scan showed paradoxical brain Herniation and midline shift to the left by 13,5mm. The strategy established was to maintain supine bed rest, fluid therapy and augment the valve position to 4 (150mmH2O median pressure). However, these measures were insufficient. To counterbalance this, the valve was adjusted to position 5 (200 mmH2O median pressure) and 24hours hours later the patient complained of headache, extremity weakness and the head CT-scan showed Hydrocephalus. In the next five days, the valve position was adjusted between position 4 and 5 four times. It was only normalized when a cranioplasty with customized PolyEther Ether Ketone implant was placed and the valve pressure was set at position 4 (150mmH2O median pressure) and tolerated.

Outcomes

The use of programmable shunt devices offers many advantages because of their adjustable-pressure valve systems.4 Still, the regulating pressure device used in this case had only five ranges available and this difficulted the patient's management, who developed either Hydrocephalus at position 5 or paradoxical brain Herniation at position 4.

Conclusion

Treatment of TBI is complex and requires multidisciplinary discussion.

The advantage of programmable valves is the ability to adjust cerebrospinal fluid pressure-related flow percutaneously in response to a patient's clinical response or development of subdural effusions.7,8 However, the clinician must be alert to the occurrence of possible complications.

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