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Prevalence of Traumatic Brain Hemorrhages in Brain Death Patients

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Abstract

Background: Given the severity of the brain death burden and its main cause in emergency clinical settings, intracerebral hemorrhage due to concussion, determining the most common type of hemorrhage among these patients, helps us to predict the likelihood of progression of the vegetative outcome.

Purpose: This study aimed to assess the prevalence of different types of intracranial hemorrhage in patients with brain death.

Material and methods: 70 head traumatic brain dead patients who were referred to Masih Daneshvari hospital undergone assessment by CT scan to determine the prevalence of major intracranial hemorrhage types and their complications.

Results: Subarachnoid hemorrhage (SAH) and subarachnoid hemorrhage (SDH) are the most common types of intracranial hemorrhage among patients with brain death. Overall, 45.7% and 40%, respectively, were associated with bleeding events with a change in the midline at 14.3% and edema at 12.9%. The middle shift was more common in SAH patients, while edema was more common in SDH patients. Each relative to the other.

Conclusion: This study showed that SAH and SDH are the most common types of intracranial hemorrhage in patients with traumatic brain injury.

Keywords: Brain death • Trauma • Intracranial hemorrhage • SAH • SDH

Introduction

Traumatic brain injury is common in emergencies and is a concern for intracranial hemorrhage and its aftermath. Meanwhile, brain death is the end of the clinical scenario. However, 70%-80% of head injuries are benign and do not damage the brain or its function, resolving spontaneously with conservative interventions [1,2].

Although head trauma is more common in patients aged 20-30 years, it has become a concern due to the higher incidence reported in recent years [3]. Intracranial hemorrhage consists of several types, including epidural hemorrhage (EDH), subdural hemorrhage (SDH), subarachnoid hemorrhage (SAH), and intraventricular hemorrhage (IVH). Hemorrhagic lesions due to concussion of the head can also be accompanied by bruising or middle shift. Worsening clinical prognosis. Patient evaluations include GCS evaluation and CT scan of the brain to diagnose the type of bleeding [4-9].

Brain death is clinically defined according to UDDA guidelines. This guideline states that Diagnosis of brain death due to complete brain damage involves irreversible brain function that affects the entire brain. Clinical examinations to confirm brain death include loss of response, movements, and reflexes of the brainstem in which the patient goes into a coma. It should be noted that before diagnosing brain death, consumption of drugs including sedatives, hypothermia, hypotension, or metabolic disorders must first be omitted or corrected. The apnea test assesses the brainstem function by detecting the absence of a respiratory drive [10].

Insufficient blood supply to the brain is approved as critical paraclinical evidence approving the brain death event [11]. CT angiography of the brain (with a sensitivity of 85.7%) is superior to CT scan (with a sensitivity of 76%) in the diagnosis of brain death, however, CT scan is a reliable tool in diagnosis [12,13].

According to health data on the global burden of disease, subarachnoid hemorrhage (common type ICH) accounts for 0.47% of the leading causes of death in Iran and 0.8% of the leading causes of death around the world. In 2019, DALYs Subarachnoid hemorrhage was reported with a rate of 23,522.21 years in Iran and 32,801.70 in the world. These results Indicate a large burden of intracranial hemorrhage due to brain damage economically as well as the emotional impact on their families [14].

Considering the heavy burden of complications from brain injuries on patients, early detection of cranial hemorrhage and brain injury, performing the necessary interventions while predicting the clinical outcome and final prognosis according to the type of cranial hemorrhage caused by head trauma, will be effective in reducing the rate of brain death as an end to injury. Unfortunately, there are few reports on the different roles of cranial hemorrhage in subsequent brain death events in head trauma patients. In this study, we evaluated the prevalence of intracranial hemorrhage that has led to brain death in head trauma patients.

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Materials and Methods

This cross sectional study included 70 patients with cerebral palsy who were referred to Masih Daneshvari Hospital in 2019 according to the admission and discharge criteria. Inclusion criteria included patients aged 18-80 years and the existence of both recent stroke and brain death was confirmed by two neurologists. Exclusion criteria were a history of remote concussion and other known causes of brain death other than traumatic intracranial hemorrhage. Patients were evaluated using CT scans to determine the major rates of intracranial hemorrhage in those patients including epidural hemorrhage (EDH), subdural hemorrhage (SDH), subarachnoid hemorrhage (SAH), and intracerebral hemorrhage (ICH). Be also, the prevalence of two major complications of intracranial hemorrhage, including cerebral edema and midline change, was measured.

Analysis

SPSS software version 22 was used for analysis. Quantitative variables are described using variance and variance, while qualitative data are defined by their frequencies. Chi-square tests were used to compare the proportion of complications among intracranial hemorrhages. A p=0.05 is statistically significant at 95% CI. Ethics: In this study, the ethical principles were maintained according to the Helsinki Declaration and approved by the Ethics Committee of the Free University of Medical Sciences (IAUTMU).

Results

The average age of 70 patients in this study was 32 ± 13.26 years, 84.3% were male and 15.7% were female. By measuring the prevalence of various types of hemorrhages using CT scan, the presence of SAH was observed in 45.7%, SDH in 40%, ICH in 21.4%, and EDH in 5.7% of cases. It should be noted that in some cases there is not just one type of intracranial hemorrhage but also in general, bleeding events were associated with a midline change in 14.3% and edema in 12.9% of cases (Table 1) (Figure 1). Brain edema was more common in patients with SAH than in SDH patients (P<0.001; Chi-square) while midline shift was more common in SDH patients than in SAH patients (P<0.001; Chi-square) (Table 2).

Table 2. Comparison of complications between SAH and SDH.

Complication/ Hemorrhage	Midline shift (ratio)	Edema (ratio)
SAH	0.16	0.11
SDH	0.07	0.21
P-value (Chi-square)	<0.001	<0.001

1. SAH and SDH are the most prevalent types of intracranial hemorrhagic events in subjects of brain death
2. SAH was accompanied by higher rates of midline shift compared to SDH.
3. SDH subjects demonstrated a higher incidence of brain edema compared to SAH patients.

Table 1. Descriptive statistics of quantitative data by percentages report.

Variable	Presence (%)	Absence (%)
Gender	Male : 84.3	Female: 15.7%
SAH	45.7%	54.3%
SDH	40%	60%
EDH	5.7%	94.3%
ICH	21.4	78.6%
Midline shift	14.3%	85.7%
Brain edema	12.9%	87.1%

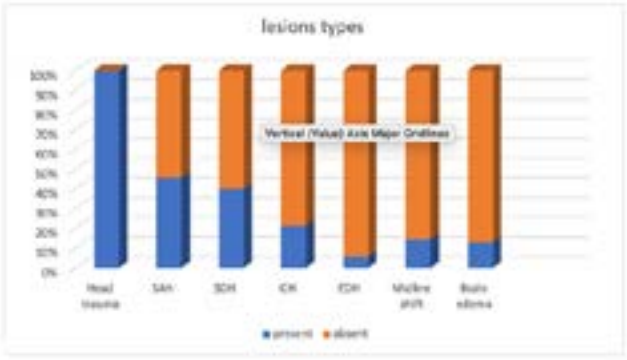

Figure 1. Prevalence of types of lesions.

Discussion

This study showed that respectively, SAH and SDH are the most common types of intracranial hemorrhagic events in brain dead individuals with different incidences of complications. Our results adapted to reports Yattoo et al., in 2008, on the prevalence of SAH, SDH, EDH, ICH, and cerebral edema equal to 0.74%, 10.39%, 7.92%, 0.74%, and 3.21% in head trauma patients [3]. Therefore, in this study, we showed the order of prevalence of hemorrhage events that lead to brain death. Shift midline is a life threatening risk that can be caused by increased intracranial pressure such as brain tumors and intracranial hemorrhage [15]. SAH was associated with higher middle shift rates compared to SDH. Edema is another complication that may be caused by hemorrhage events inside the skull. SDH subjects were more likely to develop cerebral edema than SAH patients. Epidemiological studies focusing on prevalence assessment help physicians to have a better view of the underlying causes and causes of death and disability in their communities.

Conclusion

In Conclusion, SAH and SDH are the most common types of intracranial hemorrhagic events in brain death individuals with the different incidence of complications.

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Conflict of Interest/Competing Interests

The authors approve that they have no conflict of interest associated with any organization or entity in the subject matter or materials discussed in this manuscript.

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Ethics Approval

In this research, ethical issues were conserved according to declaration of Helsinki and were approved by Azad University of Medical Sciences (IAUTMU) Ethics committee.

Consent to Participate

Not applicable.

Consent for Publication

Not applicable.

Availability of Data and Material

In this paper, we report the Spectral imaging has brought a new light insight to the field of radiology, based on its specific characteristics such as high resolution and, low dose of radiation.

Code Availability

Not applicable.

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