

16 - Title: "Does Traumatic Brain Injury Adversely Affect Cardiac Function?"

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Introduction: Blunt traumatic brain injury (TBI) remains a major cause of morbidity and mortality following trauma. Neurologic outcomes following TBI may worsen in the setting of hypotension due to decreased blood flow to the brain. One possible cause may be cardiac dysfunction. However, the few studies that have examined cardiac function in TBI offer conflicting results. We examined cardiac function in patients with TBI.

Methods: We retrospectively analyzed the trauma registry and medical records of adult blunt patients admitted to an ACS verified Level 1 Trauma Center in 2023 with intracranial hemorrhage and an echocardiography (ECHO) filed within about 2 days of hospitalization. Exclusion criteria included pre-existing cardiac conditions, including arrhythmias, on medical record review or deaths in the emergency department. ECHO results including ejection fraction (EF) and left ventricular fractional shortening, i.e. the percentage change in left ventricular diameter during systole at a specific location on the parasternal long axis, were recorded.

Results: Of 382 blunt TBI patients with intracranial hemorrhage, 77 patients met inclusion criteria. They displayed the full spectrum TBI. Most often it was subarachnoid hemorrhage (55.4%), followed by subdural hemorrhage (42.9%), followed by others. The median age was 74 [IQR 62-81] years, 53.2% male, and most often were hospitalized after a fall (81.8%). Further 75.3% had head/neck abbreviated injury score (AIS) $\geq$ 3, 18.2% had chest AIS $\geq$ 3, with median ISS of 16 [IQR 9-25]. With regards to outcomes, 20.8% had complications, and 89.6% were admitted to the ICU with median ICU LOS of 4 [IQR 3-9] days. The in-hospital mortality was 6.5% and 3.9% being placed on hospice status. Additional demographics are provided in Table 1.

Overall, the ejection fraction (EF) for the group was preserved, with a median of 66% [IQR 60%-71%]. However, there were differences in left ventricular fractional shortening (FS): 13 patients had decreased FS, 61 had normal FS, 1 had increased FS, and data were not available for 2. The decreased FS and normal FS groups had a similar median EF of 65% [IQR 59%-73%] and 67% [IQR 61%-71%] ($p=0.58$). Regional wall motion abnormalities with hypokinesis were noted in only 2 patients with normal FS. The decreased FS group had multiple intracranial findings (53.8% vs 23.0%, $p=0.025$) more often had higher injury severity with a median Injury Severity Score (ISS) of 26 (IQR 10-29) as compared to 14 (IQR 9-22) in the normal FS group. The decreased FS group was more frequently on vasopressors (30.8% vs 8.2%, $p=0.02$) and had higher in-hospital mortality (23.1% vs 3.3%, $p=0.01$).

Conclusions: While the overall EF was not depressed in this group of older blunt TBI patients, a subset exhibited reduced fractional shortening (FS). Those with depressed FS were more severely injured, more frequently had multiple intracranial findings, more often required vasopressors, and had higher mortality rates. These preliminary findings suggest the need for further research to determine whether decreased FS and concomitant adverse outcomes reflect an artifact, incidental, or an association with a specific type of TBI-related cardiac dysfunction.