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Specific Role of Transcranial Doppler Ultrasound for Patients with Wartime Traumatic Brain Injury

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Introduction

Traumatic brain injury (TBI) is associated with the severest casualties from Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF). From Oct. 1, 2008 AMEDD TBI program initiated transcranial Doppler (TCD) ultrasound service for TBI patients who were presented for care at the National Naval Medical Center and at the Walter Reed Army Medical Center.

Methods

Seventy-seven patients (3 females) aged 18 to 40 years (mean 25.9 years) who had suffered wartime TBI injuries (with Glasgow Coma Scale scores ranging from 3 to 15) were investigated with daily TCD studies. A total of 483 TCD recordings (mean 6.5 tests per patient, ranged from 1 to 30) were made after admission. There were 28 (36.4%) patients after explosive blast injury, 18 patients (23.4%) after GSW and 31 (40.2%) after other causes of TBI (closed, penetrating, MVA, falls, etc). Comprehensive TCD protocol and well published diagnostic criteria for vasospasm and abnormally high intracranial pressure (ICP) applied in all cases.

Results

The TCD signs of mild, moderate and severe vasospasm were observed in 28 (36.4%), 16 (20.7%) and 9 (11.6%) of patients, respectively. The TCD signs of intracranial hypertension were recorded in 51 (66.2%) patients. Abnormally high CBFV's without TCD signs of vasospasm and abnormally low CBFV's were recorded in 7 (9%) and 12 (15.5%) of all patients, respectively. Four patients (5.1%) underwent transluminal angioplasty for post-traumatic vasospasm treatment.

Conclusions

These findings demonstrate that delayed cerebral arterial spasm is a frequent complication of combat TBI and that the severity of spasm is comparable to that seen in aneurysmal SAH. In addition, TCD provided valuable information about the presence of abnormally high ICP. Because vasospasm and intracranial hypertension represent significant events in a high proportion of patients after wartime TBI, close daily TCD monitoring is recommended for the management of such patients.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Describe the importance of the specific TCD utilization for the detection of posttraumatic vasospasm and intracranial hypertension, 2) Discuss, in small groups, clinical value of TCD for wartime TBI patients, 3) Identify an effective management strategy based on TCD data in combination with other clinical variables

References

Armonda RA. et al. Wartime Traumatic Cerebral Vasospasm: Recent Review of Combat Casualties. Neurosurgery 59:1215–1225, 2006