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Titolo

Serum biomarkers in mild trauma brain injury: our experience.

Identificativo

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Introduction: The incidence rate for trauma brain injury (TBI) is very high and mild traumatic brain injury (mTBI) accounts for the vast majority of TBI defined by a Glasgow Coma Scale Score (GCS) of 13 to 15. In TBI the gold standard for diagnosis of traumatic intracranial hemorrhage is computerized tomography scan (CTs) of the head. In 2018 the FDA approved the use of Brain Trauma Indicator, a ubiquitin-C-terminal-hydrolase-L1 (UCH-L1) and glial fibrillary acidic protein (GFAP) assay, for determining the clinical necessity of obtaining a head CTs in patient with mTBI. Our study's main objective was to verify the predictive accuracy of a test combining both GFAP and UCH-L1 serum measurements by means of comparison of the results obteined with standard head CTs in mTBI. A secondary endpoint was to determine accuracy of these biomarkers among the mTBI subsets with risk factors (antiplatelet/anticoagulant therapy, e.g.), those undergoing 12 hours in hospital observation.

Materials and Methods: This retrospective observational study was carried from October 2023 to April 2024 at the Emergency Department of public hospital in Sondrio (Italy). The study was performed on patients with mTBI and GCS 14 to 15. All subjects underwent head CTs and measurement of plasmatic concentrations of GFAP and UCH-L1 at the time of admission (T0); in patients with known risk factors for hemorrhage, the measurement of plasma markers was repeated at 4 (T4) e 12 (T12) hours from admission, and CTs of the brain was repeated after 12 hours from injury and hospital observation. The GFAP and UCH-L1 concentrations were measured by Alinity® mTBI test. The results of the plasma marker measurements were interpreted based on the cut-offs and were compared with the CTs reports and with the clinical evolution of patients. We performed statistical analysis in order to assess sensitivity, specificity and predictive value of the blood test for determining brain injury as hemorrhage in mTBI, in concordance with CTs results.

Results: Of the 235 subjects observed, we obtained valid CTs and plasma specimens for testing both GFAP and UCH-L1. 28 patients (12%) had TBI on head CT. 66 of 235 subjects had risk factors for hemorrhage, they were left in ED for observation and CTs was repeated at T12, as actual internal protocol. Among all subjects, the test had a sensitivity of 100%, specificity of 19%, 11 % and 10% at T0, T4 and T12, with positive predictive value of 13.4% and negative predictive value of 100% for acute TBI. None subjects had false-negative test results. For both GFAP and UCH-L1, median values were higher among CTs-positive subjects than from CTs-negative subjects.

Combined GFAP and UCH-L1 test Sensitivity and Specificy at T0-T4-T12 in according to CT scan results at T0 and T12

	mTBI Test T0	mTBI Test T4	mTBI Test T12
Positive n(%)	195 (82.7)	100 (90.9)	61 (92.4)
Negative n(%)	40 (17.3)	10 (9.1)	5 (7.6)
Sensitivity %(95% CI)	**100 (86-100)**	**100 (85-100)**	**100 (79.6-100)**
Specificity %(95% CI)	19 (14-25)	11 (6-19)	10 (4.3-21)
NPV	**100%**	**100%**	**100%**
PPV	14%	13.2%	13%

Discussion: For patients seeking care for mTBI in the ED, head CTs continues to be the imaging modality of choice. There is general agreement, however, that CTs for mTBI are overutilized and many are avoidable. In 2022 the Societè Francaise de Medicine d'Urgence presented new guidelines for mTBI including GFAP and UCH-L1 biomarkers in the recommendations. Our results suggest the potential for CTs rule-out in patients with mTBI and plasma GFAP or UCH-L1 concentrations below the cutoffs. In according to French guidelines, the results of our study suggest that, when applied to mTBI patients in whom a head CTs is not felt to be clinically indicated, a test combining GFAP and UCH-L1 concentrations can exclude acute TBI with a high sensitivity (100%) and NPV (100%). This test was also highly sensitive when applied to the subgroup of patients with risk factors for hemorrhage after 12 h of injury (NPV= 100%).

Conclusions: These findings suggest that this test could eliminate the need for some head CTs in patients with mTBI. Moreover, high rule-out accuracy combined with test speed might reasonably be expected to facilitate clinical adoption of this test as an aid to head CTs decision making in busy EDs where waits for imaging contribute to overcrowding and reduced patient throughput.

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Affiliazioni

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RESEARCH ABSTRACT - AREA CLINICA
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