

S100B protein in diagnosing intracranial hemorrhage in some patients with mild head injury

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Researchers conducted a prospective observational study in elderly patients and adult patients receiving antiplatelet therapy who presented with mild head injury at two trauma hospitals in Vienna: the Trauma Hospital Meidling and the Donauespital. The focus of the study was to see if blood serum levels of S100B protein in these patients could help identify whether their injuries included intracranial bleeding. If there was no indication of intracranial hemorrhage, these patients would not need additional testing or hospitalization. The researchers found that patients whose serum S100B levels were lower than 0.105 micrograms per liter (0.105 µg/L) were very unlikely to have intracranial hemorrhage.

Detailed findings of this study are reported and discussed in "Evaluation of S100B in the diagnosis of suspected intracranial [hemorrhage](#) after minor head injury in [patients](#) who are receiving platelet aggregation inhibitors and in patients 65 years and older," by Heinrich Wolfgang Thaler, MD, Jochen Schmidsfeld, MD, and colleagues, published today online, ahead of print, in the *Journal of Neurosurgery*.

As mentioned in the paper, mild head injuries (MHIs) often occur in patients 65 years and older, frequently as a result of falls caused by balance problems. Although intracranial hemorrhage does not occur often in cases of MHI, when it does occur it can be of particular concern if the patient is receiving antiplatelet therapy. To rule out the possibility of intracranial hemorrhage, cranial computed tomography (CCT) and hospital observation are increasingly prescribed when patients are older or take anticoagulant medications. CCT examinations and hospital stays are expensive, and CCT subjects the patient to a substantial dose of radiation, which can potentially pose problems if used repeatedly. In the interests

of keeping costs down and protecting patients from unnecessary and possibly damaging diagnostic testing, the authors examined a simple blood test for S100B as a diagnostic tool to rule out the presence of intracranial hemorrhage.

S100B is released into the blood stream by astrocytes in the brain when brain injury occurs. The authors investigated whether a specific threshold level of S100B would indicate the absence of intracranial hemorrhage. They found that a serum level lower than 0.105 µg/L was an accurate predictor that no intracranial hemorrhage was present.

The authors discovered this by examining patients who presented to their hospitals with a diagnosis of MHI (defined as a Glasgow Coma Scale score of 13-15) who were 65 years or older, or were 18 years of age or older and receiving antiplatelet therapy (consisting of low-dose aspirin or clopidogrel). Because the SB100 molecule has a half-life of approximately 90 minutes, only patients in whom blood samples were drawn within three hours after injury were included in the study. Serum levels of SB100 were recorded and a cutoff of 0.105 µg/L was set for a comparison of patients.

CCT studies were performed in all 782 patients included in the study analysis. Findings of trauma-related intracranial hemorrhage (epidural, subdural, intracerebral, and subarachnoid bleeding) and the lack of such findings were compared with serum SB100 levels in each patient. CCT findings of intracranial hemorrhage were found in 50 patients (6.4%); in all but one of these patients, the serum SB100 level was 0.105 µg/L or greater. In that one patient, the SB100 level was 0.094 µg/L, very close to the threshold, and there was no need for neurosurgical intervention.

Older age and antiplatelet therapy are two factors cited as increasing the risk of intracranial hemorrhage in patients with MHI. For this reason CCT scans are regularly obtained and hospital observation is often recommended in these patients. Nevertheless, the percentage of patients with MHI who have intracranial hemorrhage is quite small (6.4% in this study population). In the present study the authors found that the negative predictive value of SB100 is 99.6%, and they "conclude that S100B levels below 0.105 µg/L can accurately predict a normal CCT scan after MHI in older patients and those on antiplatelet medication." In addition, the authors found no clear increased risk for intracranial hemorrhage either in patients 65 years of age and older or in patients receiving [antiplatelet therapy](#).

The authors hope that their findings will reduce the number of CCT studies and hospitalizations in these two patient groups. They believe that together with clinical decision making, an assessment of serum S100 levels will point to which patients with MHI should be further evaluated and which patients may return home to recuperate.

When asked about the study, Dr. Thaler said, "We undertook the study with the aim to reduce the workload of medical staff and costs as well as the radiation burden in the management of patients with mild head injuries. We are confident that this study will prove to be useful in achieving these aims."

More information: Thaler HW, Schmidsfeld J, Pusch M, Pienaar S, Wunderer J, Pittermann P, Valenta R, Gleiss A, Fialka C, Mousavi M. Evaluation of S100B in the diagnosis of suspected intracranial hemorrhage after minor head injury in patients who are receiving platelet aggregation inhibitors and in patients 65 years and older *Journal of Neurosurgery*, published online, ahead of print, July 7, 2015; [DOI: 10.3171/2014.12.JNS142276](https://doi.org/10.3171/2014.12.JNS142276)

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