

# Studies of biochemical brain damage markers in patients at a neurointensive care unit

Akademisk avhandling

som för avläggande av medicine doktorexamen vid Göteborgs Universitet kommer att offentligen försvaras i Arvid Carlsson salen, Academicum, Medicinaregatan 3, torsdagen den 10 maj kl 09.00

av  
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Fakultetsopponent:  
Professor Tor Ingebrigtsen  
Universitet i Tromsø

Avhandlingen baseras på följande delarbeten:

- I Nylén K, Csajbok LZ, Öst M, Rashid A, Blennow K, Nellgård B, Rosengren L. Serum GFAP is related to focal brain injury and outcome after aneurysmal subarachnoid haemorrhage. In press in *Stroke*. Accepted for publication 070102.
- II Nylén K, Csajbok LZ, Öst M, Rashid A, Karlsson J-E, Blennow K, Nellgård B, Rosengren L. CSF-Neurofilament correlates with outcome after aneurysmal subarachnoid haemorrhage. *Neurosci Lett*. 2006; 404:132-136.
- III Nylén K, Öst M, Csajbok LZ, Nilsson I, Blennow K, Nellgård B, Rosengren L. Increased serum-GFAP in patients with severe traumatic brain injury is related to outcome. *J Neurolog Sci*. 2006; 240: 85-91.
- IV Nylén K, Öst M, Csajbok LZ, Nilsson I, Hall C, Blennow K, Nellgård B, Rosengren L. Serum levels of S100A1B and S100 BB are related to outcome after severe traumatic brain injury. *Submitted for publication*.

Handledare:  
Docent Lars Rosengren

# **Studies of biochemical brain damage markers in patients at a neurointensive care unit**

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Physical examination is the basic and most important tool in medical practice. However, at a neurointensive care unit, neurological status can sometimes be difficult to evaluate due to sedation or impaired consciousness. Repeated radiology may not always be feasible. The aims of the present study were to investigate whether Glial Fibrillary Acidic Protein (GFAP) measured in serum could be used as a biochemical brain damage marker. To investigate whether concentrations of CSF-NFL were associated with brain injury severity and long-term outcome after aneurysmal subarachnoid haemorrhage (aSAH). Finally, to compare the two dimers S100A1B and S100BB with S100B, when it came to outcome after severe traumatic brain injury (TBI).

Serum samples were obtained on a regular basis from 116 patients with aSAH and 59 patients with TBI during a two-week period. LP was performed in a subgroup of patients (n=48) with aSAH. The concentrations of the markers were analysed using ELISA methods. Clinical and radiological findings were estimated in the acute phase and outcome was assessed after one year using the Glasgow Outcome Scale.

After aSAH maximum s-GFAP was increased in 81 of the patients and was normal in 35. A normal concentration predicted a favourable outcome. Increased s-GFAP levels were related to focal brain lesions, neurological complications and poor outcome. The concentrations of CSF-NFL were related to focal brain injury and outcome after aSAH.

After severe TBI maximum s-GFAP was increased in all but one of the patients. The five patients with the most pronounced increase died. The serum concentrations of GFAP, S100B, S100A1B and S100BB were all related to outcome.

We conclude that s-GFAP can be used as a biochemical brain damage marker after aSAH and severe TBI. The high npv (32/35) after aSAH is the main finding, which may provide information to complement clinical data. CSF-NFL is a sensitive brain damage marker after aSAH, but for better utility, an analysis method for serum is needed. In the clinical setting in this study the investigated serum markers (GFAP, S100B, S100A1B, S100BB) appeared to predict outcome after severe TBI equally well.

Key words: subarachnoid haemorrhage, traumatic brain injury, outcome, NFL, S100, GFAP, biochemical brain damage markers

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