

Anesthesiological aspects on acute ischemic stroke and traumatic brain injury

AKADEMISK AVHANDLING

som för avläggande av medicine doktorexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligens försvaras i Hjärtats Aula, Vita stråket 12, Sahlgrenska Universitetssjukhuset, Göteborg onsdagen den 24 maj 2017, kl 09:00

av

Pia Löwhagen Hendén

Leg.Läkare

Fakultetsopponent:

Professor Eddie Weitzberg

Avdelningen för Anestesiologi och Intensivvård,
Institutionen för fysiologi och farmakologi, Karolinska Institutet

Avhandlingen baseras på följande delarbeten:

- I. P Löwhagen Hendén, A Rentzos, J-E Karlsson, L Rosengren, H Sundeman, B Reinsfelt, S-E Ricksten. Hypotension during endovascular treatment of ischemic stroke is a risk factor for poor neurological outcome. *Stroke* 2015; 46:2678-2680
- II. P Löwhagen Hendén, A Rentzos, J-E Karlsson, L Rosengren, B Leiram, H Sundeman, D Dunker, K Schnabel†, G Wikholm, M Hellström, S-E Ricksten. General anesthesia vs. conscious sedation for endovascular treatment of acute ischemic stroke The AnStroke trial. *Accepted for publication in Stroke*
- III. P Löwhagen Hendén, A Rentzos, J-E Karlsson, L Rosengren, H Sundeman, S-E Ricksten. Does off-hour admission have an impact on lead times and neurological outcome in endovascular treatment for acute ischemic stroke? -the Gothenburg experience. *Manuscript*
- IV. P Löwhagen Hendén, S Söndergaard, B Rydenhag, B Reinsfelt, S-E Ricksten, A Åneman. Can Baroreflex Sensitivity and Heart Rate Variability Predict Late Neurological Outcome in Patients With Traumatic Brain Injury? *J Neurosurg Anesthesiol* 2014; 26(1):50-59



ABSTRACT

Background

Endovascular treatment (EVT) of acute ischemic stroke (AIS) requires that patients are immobilized during the procedure. Retrospective studies have shown worse neurological outcome for patients receiving general anesthesia (GA) compared with patients receiving conscious sedation (CS) during EVT. Some suggested explanations for worse outcome in the GA group have been peri-operative hypotension, hypocapnia and attenuated cerebral autoregulation. However, the retrospective studies experienced pronounced selection bias, with more severe stroke in the GA groups, which could also explain the worse outcome.

Regarding traumatic brain injury (TBI), studies have shown that autonomic nervous system (ANS) dysfunction is associated with neurological outcome. However, the most severely injured patients treated in an intensive care unit, were excluded in those studies.

Methods

Paper I was a retrospective study on neurological outcome in relation to peri-operative blood pressure in patients managed with GA during EVT. In Paper II, a prospective study, stroke patients were randomized to GA or CS before EVT and neurological outcome was analyzed. Paper III investigated the impact of off-hour stroke admission on in-hospital lead times for EVT, in a cohort merged from Paper I and II.

Patients with severe TBI, receiving standard treatment in a neuro intensive care unit (NICU), were retrospectively studied with the aim to analyze ANS dysfunction in relation to late neurological outcome (Paper IV).

Results

Profound blood pressure fall (MAP fall > 40% from baseline) during EVT was an independent predictor of poor (modified Rankin Scale (mRS) > 2) neurological outcome. Patients randomized to GA or CS had equal mRS at 3 months (primary end-point). Furthermore, there were no differences in short-term neurological outcome (National Institutes of Health Stroke Scale (NIHSS) 24 h), infarction volume, recanalization grade or complications between the groups. Patients admitted during off-hours, experienced a longer time interval from admission non-contrast computed tomography to recanalization. This time interval was an independent predictor of poor neurological outcome.

In patients with severe TBI treated in a NICU, analyzes of ANS were feasible with ongoing full scale NICU care. ANS dysfunction was associated with worse long-term neurological outcome.

Conclusion

The results of this thesis on EVT in AIS, does not support the theory that anesthesia technique per se influences neurological outcome, provided that severe hypotension is avoided. Stroke management must be organized so that recanalization in EVT can be achieved as fast as possible around-the-clock. ANS analyzes might be adjunct tools in multi-monitoring of TBI patients in the NICU.

Keywords: acute ischemic stroke, endovascular treatment, general anesthesia, conscious sedation, traumatic brain injury, autonomic nervous system, heart rate variability, baroreflex sensitivity