Early Physiotherapy in the Neurointensive Care Unit

Passive Physiotherapy Interventions

Akademisk avhandling

som för avläggande av medicine doktorsexamen vid
Sahlgrenska akademin, Göteborgs universitet,
kommer att offentligen försvaras i
hörsal Arvid Carlsson, Academicum, Medicinaregatan 3,
fredagen den 8 april 2016 kl. 9:00

av
Anneli Thelandersson
Legitimerad fysioterapeut

Fakultetsopponent:
Professor Jonas Åkesson
Institutionen för kliniska vetenskaper Malmö, Lunds Universitet

Avhandlingen baseras på följande arbeten:

I. Thelandersson A, Cider Å, Nellgård B. Prone position in mechanically ventilated patients with reduced intracranial compliance. Acta Anaesthesiol Scand. 2006;50:937-41.

II. Thelandersson A, Cider Å, Volkmann, R. Cerebrovascular and systemic haemodynamic parameters during passive exercise. Adv Physiother. 2010;12:58-63.

III. Thelandersson A, Volkmann R, Cider Å. Blood flow velocity and vascular resistance during passive leg exercise in the critically ill patient. Clin Physiol Funct Imaging. 2012;32:338-42

IV. Thelandersson A, Nellgård B, Ricksten S-E, Cider Å. Effects of early bedside cycle exercise on intracranial pressure and systemic haemodynamics in critically ill patients in a neurointensive care unit. Submitted

UNIVERSITY OF GOTHENBURG

Early Physiotherapy in the Neurointensive Care Unit

Passive Physiotherapy Interventions

Anneli Thelandersson

Department of Anaesthesiology and Intensive Care, Institute of Clinical Sciences
Sahlgrenska Academy at University of Gothenburg

ABSTRACT

Background: In critically ill patients, treated in the neurointensive care unit (NICU) because of severe brain injury or stroke, physical activities have been restricted to a minimum due to the potential risks of complications and adverse events. Nevertheless, passive physiotherapy treatments are widely used without conclusive evidence for their safety.

Aim: The overall aim of this thesis was to investigate if three different passive physiotherapy interventions i.e. prone position (PP), passive range of motion (passive-ROM) and continuous passive motion (CPM), were safe to use in patients that are critically ill due to severe brain injury or stroke when admitted to a NICU and to investigate the respiratory and circulatory effects of these interventions.

Methods: This thesis consists of four different quantitative research papers. Paper **I** investigated the effect of PP on lung oxygenation as well as the intracranial and systemic haemodynamic variables before, during and after PP. Paper **II** investigated the intracranial, cerebrovascular and systemic haemodynamics before, during and after a session of passive-ROM as performed in clinical practice. Paper **III** studied peripheral blood flow velocity (PBFV) and resistance index (RI) before, directly after and after a passive-ROM intervention. In paper II and III a healthy control group matched for age and sex was also included. Paper **IV** studied intracranial and systemic haemodynamics before, during and after a session of 20 minutes of CPM with a bedcycle ergometer.

Main results: I. PP enhanced oxygenation without any significant changes in intracranial pressure (ICP), cerebral perfusion pressure (CPP) or blood pressure (BP) while heart rate (HR) increased. **II.** During passive-ROM CPP, BP and HR did not change significantly, while ICP decreased after passive-ROM. Furthermore, no significant changes in cerebral blood flow velocity (CBFV) or pulsatility index (PI) were noted. In the healthy control group a significantly higher BP was found before the intervention, but no other significant results were noted. **III.** Passive-ROM interventions did not significantly affect PBFV or RI. When comparing the patient group with the control group in paper II and III, a significantly higher PI and PBFV and a lower RI were noted in the patient group. **IV.** CPM did not affect ICP but significantly increased BP and stroke volume (SV) during the exercise. Furthermore, cardiac output, SV, BP and CPP were increased during versus after the intervention.

Conclusion: Prone position, passive-ROM and CPM are safe to use in critically ill patients, suffering from brain injuries or stroke treated in the NICU, since the intracranial and systemic haemodynamic responses are small. PP increased the oxygenation in this patient group.

Keywords: physiotherapy, brain injury, stroke, intensive care unit, prone position, range of motion, continuous passive motion, intracranial pressure, cerebral perfusion pressure, haemodynamics

ISBN: 978-91-628-9708-6 (PRINT)
ISBN: 978-91-628-9709-3 (PDF)
http://hdl.handle.net/2077/41549