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Discipline: Anesthesiology and Perioperative Medicine

Title: Integration of Dynamic Arterial Elastance into Daily Haemodynamic Monitoring

Abstract: Traditional haemodynamic monitoring is still built upon pressure measurement and only indirect flow assessment. The last two decades, however, an important evolution developed towards less invasive and more flow-based haemodynamic monitoring. An important issue in this respect is the description of pulse pressure variation (PPV) and its flow equivalent stroke volume variation (SVV). Both include a dynamic approach of preload assessment, namely fluid responsiveness, allowing safe fluid administration if other variables such as oliguria, lactate, hypotension are present. Fluid responsiveness can be diagnosed with increase of perfusion pressure or stroke volume by passive leg raising, infusion of small boluses of colloids or mechanically ventilated induced alterations of intrathoracic pressures.

The ratio of PPV over SVV has been described as the dynamic arterial elastance (Eadyn)(Cecconi et al., 2014). Eadyn has been used as an indicator to predict decrease of arterial blood pressure when altering vasopressor doses. Cardiac ultrasound allows not only flow measurements (Poelaert et al., 2005), but permits also calculation of load independent indices of systolic function (contractility - Ees)(Lee et al., 2002), combining arterial pressure and volume assessments by means of three-dimensional echocardiography, taking into account arterial load (Borlaug et al., 2007). A side-project utilizes the calculation of Ees, using model flow based noninvasive pressure estimations (Bogert et al., 2010) and three-dimensional cardiac ultrasound based left ventricular volume estimations.

The most vulnerable patients are those with increased risk, related to age, morbidity, type of surgery (e.g. total abdominal hysterectomy, mastectomy, endoscopic resection of prostate, lumbar discectomy, thyroidectomy, total joint replacement, colonic resection, radical neck dissection, nephrectomy and neurosurgery)(KCE 2017)

The present project focuses on a more complete study of Eadyn in critically ill patients with increased cardiac morbidity, scheduled for major abdominal or vascular surgery, including:

-Impact of altering loading conditions and test the sensitivity and specificity of this variable in a clinical setting of hypovolemic critically ill patients

-Impact of vasopressors on Eadyn in septic patients

-Impact of inotropic drugs (dobutamine, phospho-diesterase inhibitor milrinone) in cardiac failure patients

-Impact of levosimendan in Eadyn

Eadyn is obtained from noninvasive measurements (model flow based technology) in conjunction with transaortic valvular flow measurements. All cardiac ultrasound measurements could be performed either with transthoracic or transoesophageal echocardiography.

Supervisors: Jan Poelaert, Jan.Poelaert@vub.ac.be

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