

six cases of spontaneous respiration, although its incidence did not differ between the groups. The above study concluded that if NMB is used during MEP monitoring, a target T2/Tc of 0.5 is recommended. However, as the MEP amplitude was largest and least variable in the group with no NMB compared with any level of partial NMB used and as incidences of spontaneous movement or increased vasopressor requirements did not increase with no NMB, no muscle relaxation is strongly recommended over partial NMB during MEP monitoring in neurosurgery.

Previously Yamamoto *et al.*^[3] devised a new technique of post-tetanic MEP (p-MEP) and found p-MEPs could be recorded at a T1 of 1 mV or %T1 of 10% with no or mild patient movement in response to transcranial stimulation. These strategies can be used as alternatives for improved surgery and patient monitoring.

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Byon HJ, Lim CW, Lee JH, Park YH, Kim HS, Kim CS, Kim JT. Prediction of fluid responsiveness in mechanically ventilated children undergoing neurosurgery. *Br J Anaesth* 2013;110:586-91.

The dynamic indicators of fluid responsiveness that are based on cardiopulmonary interactions in patients ventilated mechanically, such as respiratory variations in aortic blood flow peak velocity (ΔV_{peak}), respiratory variations in inferior vena cava diameter (ΔIVC), systolic pressure variation (SPV), pulse pressure variation (PPV), difference between SPref and SPmin ($\Delta down$), difference between SPmax and SPref (Δup) and pleth variability index (PVI), have been shown to be predictive for fluid responsiveness. There are insufficient data on the efficacy of these dynamic variables for the prediction of fluid responsiveness in children. Children differ from adults in terms of arterial compliance, chest wall rigidity and lung compliance, and therefore, indicators based on pressure, such as PPV and SPV may not be as reliable in children.

The purpose of this study was to evaluate the predictive values of central venous pressure CVP, SPV, PPV, Δup , $\Delta down$, ΔV_{peak} , ΔIVC and PVI for the determination of fluid responsiveness in paediatric patients during general anaesthesia.^[1] This study was approved by the appropriate institutional review boards and written informed consent obtained from parents of the children. Children aged 6 months to 9 year of age undergoing elective neurosurgery under general anaesthesia were enrolled in this study.

Patients were excluded if they had congenital heart disease, cardiac arrhythmia, ventricular dysfunction, unstable perfusion index (PI) (defined as a variation exceeding 30% over a 1 min period), pneumonia, atelectasis, upper respiratory infection symptoms or vasoactive and/or inotropic support. Anaesthesia was induced with thiopental (5-6 mg/kg), remifentanyl (0.3-1.0 mcg/kg and inhaled sevoflurane. Rocuronium (0.6 mg/kg) was administered to facilitate tracheal intubation. Mechanical ventilation was instituted in a pressure-controlled mode adjusted to obtain a PaCO₂ of 4.7-5.3 kPa during surgery. PEEP was not applied. Central venous catheter was inserted in right subclavian vein and catheter tip confirmed with ultrasound. An arterial catheter was placed in right radial artery and oxygen saturation measured continuously using Masimo rainbow SET monitoring system. Peak inspiratory pressure (PIP) was recorded. In addition, heart rate (HR), arterial pressure, CVP and end-tidal carbon dioxide (PECO₂) were recorded.

Maximal pulse pressure (PPmax), minimal pulse pressure (PPmin), maximal systolic pressure (SPmax), minimal systolic pressure (SPmin) and reference systolic pressure at the end expiratory pause (SPref) at the end-expiratory pause were manually measured. SPV, PPV, $\Delta down$ and Δup were calculated as follows: $SPV(\%) = 100 \times (SP_{max} - SP_{min}) / [(SP_{max} + SP_{min}) / 2]$, $PPV(\%) = 100 \times (PP_{max} - PP_{min}) / [(PP_{max} + PP_{min}) / 2]$, $\Delta down = SP_{ref} - SP_{min}$, and $\Delta up = SP_{max} - SP_{ref}$. PVI was calculated using formula $PVI = 100 \times (PI_{max} - PI_{min}) / PI_{max}$. Stroke volume index, ΔV_{MAX} and ΔIVC were measured using transthoracic echocardiography TTE.

After obtaining an expiratory tidal volume of 10 ml/kg, all variables were measured before volume loading and re-measured after fluid loading. A total number of 33 patients were included in the cohort study. There were no differences between the responders and non-responders in terms of clinical characteristics, PIP, PECO₂, end-tidal sevoflurane concentration, temperature and haemodynamic variables. Fluid loading changed CVP, SPV, PPV and Δup in both responders and non-responders. However, ΔV_{peak} , PVI, and SVI were changed by volume expansion in the responders only. Only ΔV_{peak} ($r = 0.516$, $P = 0.004$) and

PVI ($r = 0.49$, $P = 0.004$) before volume expansion were significantly correlated with SVI change. In particular, a ΔV_{peak} of 11% was able to predict fluid responsiveness with a sensitivity of 86.7% and a specificity of 72.2%, and a PVI value of 11% predicted fluid responsiveness with a sensitivity of 73.3% and a specificity of 86.7%.

Recently in another study by Lee *et al.*,^[2] with the help of a non-invasive cardiac output monitor found that SVV and ΔV_{peak} correlated best with fluid responsiveness in mechanically ventilated children as compared with CVP. These studies conclude that as compared with other dynamic variables ΔV_{peak} and PVI are the best predictors of fluid responsiveness. Further studies are still needed to compare non-invasive cardiac output

monitor to echocardiography as the best means to measure dynamic indicators in paediatric age group.

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