Predicting Fluid Responsiveness in Mechanically Ventilated Children under General Anaesthesia using Dynamic Parameters and Transthoracic Echocardiography.

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Background

Dynamic variables are accurate predictors of fluid responsiveness in adults undergoing mechanical ventilation. They can be determined using respiratory variation in aortic flow peak velocity (▵Vpeak), arterial pulse pressure [▵PP and pulse pressure variation (PPV)], or plethysmographic waveform amplitude [▵POP and pleth variability index (PVI)]. These indices have not been validated in children. We studied the ability of these variables to predict fluid responsiveness in mechanically ventilated children.

Methods

All results are expressed as median [median absolute deviation (MAD)]. Thirty mechanically ventilated children were studied after undergoing general anaesthesia. Mechanical ventilation was maintained with a tidal volume of 10 ml kg(-1) of body weight. ▵PP, PPV, ▵POP, PVI, ▵Vpeak, and aortic velocity-time integral were recorded before and after volume expansion (VE). Patients were considered to be responders to VE when the aortic velocity-time integral increased more than 15% after VE.

Results

VE induced significant changes in ▵PP [13 (MAD 4) to 9 (5)%], PPV [15 (5) to 9 (5)%], ▵POP [15 (10) to 10 (6)%], PVI [13 (6) to 8 (5)%], and ▵Vpeak [16 (9) to 8 (3)%] ($P<0.05$ for all). Differences in ▵PP, ▵POP, PPV, and PVI did not reach statistical significance. Only ▵Vpeak was significantly different between responders (R) and non-responders (NR) to VE [22 (3) vs 7 (1)%, respectively; $P<0.001$]. The threshold ▵Vpeak value of 10% allowed discrimination between R and NR.

Conclusions

In this study, ▵Vpeak was the most appropriate variable to predict fluid responsiveness.