External Pressure Applied on the Caval Vein and its Effects on Difference in Pulse Pressure (Dpp) and Pleth Variability Index (PVI).

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Background and Goal of Study

Fluid therapy optimization in the perioperative period has been considered as major contributor to improve oxygen delivery. Intraoperative fluid management by difference in pulse pressure (dPP) is a goal-directed fluid management approach to avoid both hypervolemia and hypovolemia (1). However, several clinical factors may impede dPP measurements, e.g. surgical manipulations.

Materials and Methods

Following IRB approval and written informed consent, 20 patients, ASA 2-3, undergoing elective hepatic surgery were enrolled. Anesthesia was standardized. Hemodynamic monitoring for cardiac index (CI), stroke volume (SV), and corrected flow time (fTc) was obtained by esophageal doppler. Pleth variability index (PVI) was monitored by Radical-7 (Masimo Corp., Irvine, CA.), dPP was assessed continuously at the bedside as described previously (2). Fluid management consisted of a crystalloid solution for baseline fluid maintenance and additional boluses of HES 6% 130/0.4 in case of fTc< 330 msec. After hepatic resection, baseline measurements of CI, SV, fTc, dPP, and PVI were taken. Thereafter, the attending surgeon applied three different pressure levels (2 N, 5 N, 10 N) at random with a pressure application device (Fa. ATP Messtechnik, Ettenheim, Germany). Two minutes after starting pressure application, CI, SV, fTc, dPP and PVI was measured by a blinded investigator. After each pressure application a stabilization period of at least 5 minutes was given for hemodynamic recovery. Comparisons were made using a paired t-test. $P< 0.05$ was considered statistically significant.

Conclusion

Surgical manipulation, as modeled by external pressure application, may impede dPP measurements. A pressure application of 10 N might have led to therapeutic consequences. Therefore, a vigilant anesthesiologist is mandatory to interpret displayed dPP numbers correctly.

References

[1] Marik PE et al: Crit Care Med 2009: 37(9); 2642-2647.
[2] Pestel G Fukui K Hartwich V et al: Anesth Analg 2009: 108; 1823-1829.

Results and Discussion: Data are shown in Table 1:

Hemodynamic parameters	baseline	2 N	baseline	5 N	baseline	10 N
CI	3,5±0,86	3,22±0,91 p<0,0122	3,36±0,91	3,09±1,12	3,65±1,62	2,63±1,05 p<0,024
SV	87,65±22,96	82,15±23,49 p<0,018	85,45±24,95	77,70±25,10 p<0,006	86,95±21,81	66,55±25,53 p<0,0004
fTc	370,85±36,74	357±56,29 p<0,112	370,9±29,05	347,05±54,62 p<0,042	373,8±34,52	328,5±60,69 p<0,009
dPP	6,82±3,49	9,21±5,05 p<0,013	7,31±2,51	10,8±8,16 p<0,049	8,09±3,45	14,32±9,22 p<0,008
PVI	10,85±7,37	9,35±5,53	10,7±5,18	10,4±5,5	9,9±6,97	12,85±8,38 p<0,034

[Table 1]