**Supplemental Digital Content 6**

**Main findings, results and conclusions of seven studies discussing one type of hemodynamic monitoring**

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| **TITLE** | **RESULTS** | | | | **CONCLUSION** |
| MAIN FINDINGS | DCI INCIDENCE | CARDIOPULMONARY COMPLICATIONS | FLUID BALANCE |
| Impact of transpulmonary thermodiluition-based cardiac contractility and extravascular lung water measurements on clinical outcome of patients with Takotsubo cardiomyopathy after subarachnoid hemorrhage: a retrospective observational study | There was a correlation between patients who developed cardiac dysfunction (LVEF <40%) and both WFNS poor grade and PE onset. | 5 patients in LVEF≥40% group; 11 patients for LVEF <40% | LVEF≥40% = 26 patients; LVEF<40% = 20 patients. PE in 6 patients for LVEF ≥40% group; PE in 14 patients for LVEF<40% group | 282 ± 163 ml for LVEF ≥40% group; 166 ±108 ml for LVEF<40% | Serial measurements of CFI and ELWI by TPT may provide an easy bedside method of detecting early changes in cardiopulmonary function to direct proper post-SAH treatment. |
| Multicenter prospective cohort study of volume management after SAH. Hemodynamic Changes According to Severity of Subarachnoid Hemorrhage and Cerebral Vasospasm | The medians of GEDVI (*p*=0.023), CI (*p*=0.013), and SVRI (*p*=0.003) at an early stage of SAH (days 3–6) were independent factors related to DCI onset. Before DCI onset, PiCCO paramenters showed: lower CI- GEDVI and greater SVRI. | 18 patients in WFNS I-III group; 34 patients in WFNS IV-V group | 5 (PE) + 8 (heart failure) patients in WFNS I-III group; 35 (PE)+ 26 (heart failure) patients in WFNS IV-V group. Secondary PE was greater in poor grade group |  | DCI and poor grade SAH are major factors in an unfavorable outcome. The introduction of PiCCO at the early stage of SAH may allow establishment of tailor-made fluid management to inhibit DCI and improve the prognosis of patients with SAH. |
| A Multicenter prospective cohort study of volume management after subarachnoid hemorrhage: circulatory characteristics of pulmonary edema after subarachnoid hemorrhage. | PE has biphasic onset. Patients were divided in PE group (patients who developed PE) and no PE group. No difference in term of mortality(*p*=0.73) between the 2 groups. Age, WFNS grade and PVPI on Day 6 were independent risk factors for the occurrence of pulmonary edema (*p*=0.002, *p=*0.009, and *p=*0.024, respectively) | 44 patients(10 in PE group; 34 in no PE group; *p*=0.63) | 52 patients developed PE (11 good grade, 41 poor grade) | more positive in PE group on Day 1 (*p* = 0.017), Day 2 (*p* = 0.013) and day 6 (*p*=0.025) | PE has biphasic onset: early caused by cardiac dysfunction (lower CI); delayed caused by inflammatory process. GEDI is a good predictor of PE and DCI. ELWI>10 ml/kg is more accurate in PE diagnosis and is independently predictive factor of prognosis. |
| Fluid balance and Blood volume measurement after aneurysmal SAH | There was no correlation between daily fluid balance and CBV (regression coefficient b= -0.32; 95% Confidence Interval: -1.81 to 1.17) or between the cumulative adjusted fluid balance and CBV (b= 0.20; 95% Confidence Interval: -0.31 to 0.72) | 24 patients (78% with severe hypovolemia and 42% without hypovolemia, during first week) |  | A negative cumulative adjusted fluid balance on any day after SAH was not associated with DCI (- 2l RR was 0.91; -3l RR was 0.68) | PDD provides adequate information on actual CBV in patients with SAH, better than fluid balance. |
| Optimal range of global end-diastolic volume for fluid management after aSAH: a multicenter prospective cohort study | GEDVI is correlated with boths DCI onset (threshold< 822 mL/m2) and severe PE (threshold> 921 mL/m2). | 35 patients (WFNS I-III: 17; WFNS IV-V: 17). DCI onset was higher in high-GEDVI group than in low-GEDVI group(p<0.001) | 47 patients. PE prevalence was higher in the high-GEDVI group than in low-GEDVI group(p<0.001) | No significant difference in the net total fluid balance between DCI and non-DCI patients (p=0.22) and between PE and no-PE group(p=0.13) | Appropriate fluid management with GEDVI and ELWI may prevent severe PE and DCI and subsequently influence patient outcomes. |
| Goal directed fluid management by bedside transpulmonary hemodynamic monitoring after SAH | High CI values detected on day 1, fell to a minimum on day 5 (*p=*0.05). The GEDVI was low on day 1, normalized on day 3(*p=*0.05). EVLWI remained slightly raised (10.42.3 mL/kg). Higher CI, lower GEDVI in patients with poor clinical grade (p<0.05 for each) | 17 with vasospasm (8 with delayed ischemic neurologic defect) | neurogenic PE in 4 patients (no heart failure during fluid therapy) | greater fluid administration on day 5 in poor clinical grade patients (*p=* 0.05). Net daily fluid balance and CVP were not significantly different between clinical grades (*p=* 0.05) | Bedside monitoring with TPT may be a powerful tool for systemic management; it allows to minimize pulmonary edema and/or congestive heart failure by directing adequate volume status. |
| Bedside Monitoring of Circulating Blood Volume After Subarachnoid Hemorrhage | The mean value of CBV on day 2 to 3 was 64 mL/kg, which increased to 69 mL/kg on day 4 to 5, 71 mL/kg on day 7 to 8, and 70 mL/kg on day 14.Group of patients with CBV < 60 ml/kg had more WFNS poor grade (*p* <0.05). | 2 |  |  | CBV decreased postoperatively to approximately four fifths of its preoperative value and gradually increased and returned to its preoperative value on day 7. ICG pulse spectrophotometry may be a powerful tool for the management of patients with SAH. |

**LEGEND**

IG= intervention group (more advanced monitoring); CG= control group (basal invasive monitoring); TPT= transpulmonary thermodilution; PE= pulmonary edema; DCI= delayed cerebral ischemia; SAH= subarachnoid hemorrhage; WFNS= world federation of neurosurgical societies; EGDT= early goal directed therapy; TPCO= transpulmonary cardiac output; PDD= pulse dye densitometry; PCCI= pulse contour cardiac index; PACI=pulmonary artery cardiac index; APCO= arterial pressure cardiac output; CO= cardiac output; NA= noradrenaline; ELWI=extra lung water index; GEDVI= global end diastolic volume index; LVEF= left ventricular ejection fraction; CVP= central venous pressure; CBV= circulating blood volume; PCWP= pulmonary capillary wedge pressure; PVPI= pulmonary vascular permeability index; TCM= Takotsubo cardiomyopathy; ICG= indocyanine green; CI= cardiac index; PiCCO= pulse contour continuous cardiac output.