Association Between Mean Arterial Pressure and Delirium in Postoperative Critically Ill Patients

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Introduction

Postoperative delirium is common, with a reported incidence of 11-43%¹, and is associated with significant morbidity and cost^{2,3}. The extent to which perioperative hypotension contributes to delirium in critically ill patients remains poorly understood. The relationship is of considerable interest because hypotension is one of the very few potential correlates of critical care delirium that is modifiable and thus amenable to intervention.

Methods

We included 908 postoperative patients admitted directly to the intensive care unit from the operating room(Fig 1). A Cox proportional hazard survival model was used to assess the association between the amount of intraoperative hypotension, which was measured as the time-weighted average of MAP lower than 65mmHg, and delirium in ICU, adjusting for potential confounding variables. As for blood pressure during ICU stay, we used Cox model with the lowest MAP on each intensive care day as a time varying covariate to assess its association to delirium, adjusted for confounders and intraoperative amount of hypotension. (Table 1)

Figure 1. Flow chart

Results

316 (34.8%) patients had delirium within 5 postoperative days in ICU. Intraoperative hypotension was moderately associated with higher odds of postoperative delirium (Figure 2). The adjusted hazard ratio associated with one unit increase in TWA of MAP<65mmHg was 1.10 (95% CI: 1.01, 1.20; P=0.029). For postoperative blood pressures, a 10-mmHg reduction in the lowest MAP on each day during ICU stay was significantly associated with a higher hazard of delirium, with an adjusted hazard ratio 1.16 (95% CI: 1.07, 1.26; P<0.001).

Conclusion

Both intraoperative and postoperative hypotension were associated with delirium in postoperative critical care patients. Whether the relationship is causal remains to be determined.

Figure 2. Associations of intraoperative TWA of MAP < 65 mmHg and lowest MAP on each day during ICU stay to delirium in ICU.

Table 1. Patient characteristics and surgery information

Factor	Without delirium (N=592)	With delirium (N=316)
Age - year	60±14	64±13
Gender - female %	261(44)	146(46)
Race - white%	487(82)	258(82)
ASA status		
2	22(4)	8(3)
3	270(46)	138(44)
4	296(50)	168(53)
5	3(0.5)	2(0.6)
Charlson comorbidity index	3[1,6]	4[2,5]
History of -%		
Depression	87(15)	59(19)
Alcohol abuse	30(5)	29(9)
Vision impairment	10(2)	8(3)
Hearing impairment	11(2)	9(3)
Use of benzodiazepines	156(26)	112(35)
Surgery duration - minute	511[321,678]	458[247,654]
Emergency surgery - %	119(20)	98(31)
Surgery type -%		
Organ transplant	136(23)	79(25)
On digestive system	181(31)	112(35)
On musculoskeletal system	79(13)	44(14)
Other	195(33)	81(26)
Blood loss - mL	700[250,2350]	500[100,3250]
Transfusion - mL	660[0.0,1946]	667[0.0,2697]
Intraoperative opioid as iv morphine equivalent - mg	37[20,70]	25[15,50]

Values presented as Mean ± SD, Median [P25, P75], Median (min, max) or N (column %).