Pulse Pressure Variation > 13% is a Predictive Risk Factor of Postoperative Nausea and Vomiting during Major Abdominal Surgery : a Retrospective Observational Study

Chien-Hung Lin[1], Chun-Yu Wu[2], Fu-Lan Chuang[2], Ya-Jung Cheng[2]
Department of Anesthesiology, National Taiwan University Hospital Yun-Lin Branch, Yun-Lin, Taiwan[1]
Department of Anesthesiology, National Taiwan University Hospital, Taipei, Taiwan [2]

Background and Goal of Study

Fluid management was thought to have influence on postoperative nausea and vomiting. Pulse pressure variation is a precise predictor of fluid responsiveness and a simple method on guiding fluid management. However, there is no study yet to examine the association between pulse pressure variation (PPV) and postoperative nausea and vomiting (PONV).

Material s and Methods

After reviewing medical records from September 1, 2014 to March 31, 2015, 229 adult patients (aged 20-79) who underwent schedule general abdominal surgery with arterial line setting were enrolled into this retrospective study.

- Exclusion criteria :
- (1) Patients with existing arrhythmic cardiac disease,
 - (2) New York Heart Association functional classification III-IV,
 - (3) ASA physical status classification IV-V,
 - (4) Morbid obesity (BMI>35 kg m⁻²),
 - (5) Marked anemia (Hb<9 g/dl),
 - (6) Intraoperative desaturation (SpO₂<92%),
 - (7) Gastroesophageal reflux disease,
 - (8) Preoperative use of opioids or antiemetics,
 - (9) Pregnancy,
 - (10) Postoperative intensive care unit admission.

- Intraoperative management :
- (1) No premedication,
 - (2) Standardized induction of general anesthesia, maintained with Sevoflurane or Desflurane in an air-oxygen mixture,
 - (3) The modal value of pulse pressure variation during operation was recorded every 15 minutes ,
 - (4) Fluid management would initiate according to each anesthesiologist's practice if pulse pressure variation above 10 to 13%,
 - (5) All patients applied Morphine I.V. patient-controlled analgesia ,
 - (6) All patients applied Ondansetron 4mg I.V. for PONV prophylaxis

Results and Discussion

*34.8% vs 12.1%, P<0.001

- * PPV>13% group : patients experiencing at least one event of pulse pressure variations > 13% during intraoperative period.
- * PPV≤13% group : patients keeping pulse pressure variations ≤ 13% during intraoperative period.
- * PONV(+) : Patients experiencing any degree of nausea or vomiting within the first 24h after surgery were classified as having PONV.
- * PONV(-) : patients without postoperative nausea nor vomiting.

Table 1 Patient characteristic data presented as mean(SD),mean (range), or numbers. PONV, postoperative nausea and vomiting; PPV, pulse pressure variation; ASA, American Society of Anesthesiologists; PCA, patient-controlled analgesia.

Parameters	Groups		P-value
	PONV(positive) (n=59)	PONV(negative) (n=170)	
Age (yr)	55.15 (27-76)	55.67 (25-77)	0.767
Body mass index (Kg m ⁻²)	23.33 (3.14)	23.59 (3.5)	0.609
ASA physical status	2.19 (0.51)	2.22 (0.51)	0.6291
ASA I	3 (5.1%)	7 (4.1%)	
ASA II	42 (71.2%)	118 (69.4%)	
ASA III	14 (23.7%)	45 (26.5%)	
Apfel score	2.9 (0.84)	2.5 (0.90)	0.0028
Duration of anesthesia (min)	224.5 (85.1)	227.0 (85.1)	0.845
24hr Morphine consumption (mg)	37.35 (17.44)	36.89 (19.90)	0.226
Fasting duration (hours)	10.53 (2.51)	11.15 (2.80)	0.1292
Laparoscopic surgery	29 (49.2%)	55 (32.4%)	0.0021
Average PPV value	10.76 (3.45)	9.27 (3.11)	0.0023
PPV>13%	48 (81.4%)	90 (52.9%)	0.0001

Table 2 Multiple logistic regression analysis with factors associated with PONV for all patients (n=229). CI, confidence interval.

Factor	Odds ratio (95% CI)	P-value
Apfel score	1.606 (1.118-2.307)	0.010
Laparoscopic surgery	1.480 (0.774-2.831)	0.236
Average PPV value	1.011 (0.902-1.134)	0.848
PPV>13% at least once	3.198 (1.332-7.681)	0.009
PPV≤13% during operation	0.313 (0.130-0.751)	0.009

Previous researches indicate intraoperative fluid administration may reduce the incidence of PONV. However, results are conflicting under some similar fluid administration protocol. How much fluid should be administrated intraoperatively to prevent PONV still remains controversial. The key point may be not how much fluid we give but how much fluid the patients actually need. PPV is a precise predictor of fluid responsiveness. Fluid deficit may exist perioperatively and we can use PPV to guide fluid management and to optimize fluid status. Our study indicates that transient PPV value exceeds 13% may have profound effect on PONV development. The anesthesiologists in our hospital are used to enhance fluid management if PPV above 10% during their daily practice to prevent episodes of PPV>13%. This may explain why the average PPV value does not exceed 13% in both groups and the influence of intraoperative average PPV value is not significant in this study. Our study also supports the idea that Apfel score is a predictive risk factor on PONV.

Conclusion

Our results demonstrate pulse pressure variation > 13% is a predictive risk factor of PONV even under routine PONV prophylaxis of Ondansetron 4mg I.V..