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Impact of intraoperative goal-directed fluid therapy in patients undergoing transthoracic oesophagectomy. Comment on *Br J Anaesth* 2020; 125: 953–61

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Keywords: enhanced recovery after surgery; fluid therapy; goal-directed therapy; oesophagectomy; strike volume variation

Editor—We read the article by Mukai and colleagues[1] regarding the impact of intraoperative goal-directed therapy (GDT) on the outcome of patients undergoing oesophagectomy in a recent issue of the *British Journal of Anaesthesia* with much interest. In this large multicentre randomised trial, the use of GDT was associated with a reduction in morbidity, mortality, and length of hospital stay.

Oesophageal cancer is the seventh most common cancer worldwide and the sixth most common cause of cancer death.[2] As described by the authors, despite important improvements in anaesthesiology and surgery, oesophagectomy remains a challenging surgery for all professionals involved, with significant complications occurring in up to 70% of patients.[3] Recent Enhanced Recovery After Surgery Society recommendations on oesophageal surgery suggested focusing on adjustment of perioperative fluid therapy, rather than preferring a restrictive or a liberal fluid regimen.[4]

A recent randomised trial by Bahlmann and colleagues[5] with a smaller sample size showed no clinical advantage related to the use of GDT in a similar clinical setting. The reliability of stroke volume variation (SVV) in thoracic surgery remains a matter of debate, as underlined by the authors in the discussion. Because of significant GDT protocol heterogeneity and to the small sample size of previous studies analysing the role of SVV during thoracic surgery, it is difficult to define the role of this dynamic preload indicator in this specific setting.[6] Another possible confounding element in the study is the pressure of artificial pneumothorax, which is not reported by the authors. Moreover, it is not specified whether it was the same in all the centres involved. As indicated in the discussion, a more reliable, dynamic index may be represented by stroke volume (SV), as stated by Veelo and colleagues.[7] The optimal value of SV can be determined under baseline conditions before starting surgery, and subsequent fluid administration is managed according to changes of this value. Mukai and colleagues[1] present a GDT protocol based on modification of SVV and SV (a bolus of colloid was administered if the SVV was >12% or SVV was 8–12% with a decrease of SV of >10% for more than 2 min). Considering the debate about the use of SV rather than SVV in the context of thoracic surgery, it would be interesting to know if the authors observed whether these values changed in a similar direction during the thoracic portion of a procedure, or if the changes in SVV were not associated with SV changes when an alteration in thoracic pressure was introduced.

In addition, the use of vasoactive drugs in the study is unclear: did the authors use a standardised protocol for dosage (infusional rate/bolus amount) and type (according to cardiac index)? Although the authors present an excellent RCT with a large sample size, more detailed information could help inform design of future trials in oesophageal surgery according to homogenous and shared haemodynamic protocols.

Declarations of interest

The authors declare that they have no conflicts of interest.

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Increasing intraoperative hydromorphone does not decrease postoperative pain: a retrospective observational study

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Keywords: acute hyperalgesia; acute tolerance; hip surgery; hydromorphone; knee surgery; opioid-induced hyperalgesia; orthopaedic surgery; postoperative pain

Editor—Recent evidence suggests that intraoperative opioids have inconsistent effects on nociception and pain in the immediate postoperative period.[1–6] Potent shorter acting opioids, most consistently remifentanil but also sufentanil and fentanyl,[1,2] have been shown to produce dose-related increases in pain scores and opioid consumption in the immediate postoperative recovery period. This may represent either acute opioid tolerance, opioid-induced hyperalgesia, or both.[3] Conversely intraoperative doses of longer acting opiates such as morphine[4,5] and methadone[6] have been shown to reduce pain scores and opioid requirements in the immediate postoperative period.

Hydromorphone is being used increasingly in perioperative settings.[7] It has a greater potency and shorter onset time than morphine but a similar duration of effect, and may decrease pain in the immediate postoperative period when given intraoperatively. The goal of this retrospective cohort study was to test the hypothesis that intraoperative hydromorphone reduces pain scores and opioid consumption in the immediate postoperative period in a dose-dependent manner. Our primary outcome was immediate postoperative pain scores and our secondary outcome was opioid consumption in the PACU.

All patients who underwent a first total hip (THA) or knee arthroplasty (TKA) under general anaesthesia at our institution between December 3, 2012 and May 1, 2017 and who received both intraoperative fentanyl and hydromorphone were eligible for inclusion. We excluded patients with preoperative opioid use, those with missing key demographic or outcome data, and data from any subsequent arthroplasties within the study's time period. Pain scores were assessed in the PACU using a 0–10 numeric rating score (NRS); PACU opioid doses were converted to morphine equivalents. Patients were grouped by quartiles of intraoperative hydromorphone dose (mg kg^{-1}). We examined the relationships of maximum PACU NRS and PACU opioid consumption with intraoperative hydromorphone quartile, using ordinal regression (with a logit linking function) and analysis of covariance, respectively. In both cases, we adjusted for covariates that were associated with the independent variable ($P<0.1$) in bivariate analyses. For maximum pain scores, odds ratios represent the odds of having NRS=10 *vs* the odds of NRS=0–9. Morphine equivalent data were log transformed before analysis and adjusted geometric mean values were calculated as the base 10 exponent of the estimated marginal mean. All