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CORRESPONDENCE

Effects of opioid-based *versus* opioid-free anaesthesia on blinded nociception level index values during laparoscopic gastric bypass surgery: a secondary analysis of a randomised double-blind trial

Sean Coeckelenbergh[1,2], Teodora Oltean[3], Anne-Catherine Dandrifosse[4], Matthieu Clanet[5] and Alexandre Joosten[6,*]

[1]Department of Anaesthesiology and Intensive Care, Paris-Saclay University, Paul Brousse Hospital, Assistance Publique Hôpitaux de Paris, Villejuif, France, [2]Outcomes Research Consortium, Cleveland, OH, USA, [3]Cell Death and Inflammation Unit, VIB-UGent Center for Inflammation Research (IRC), Ghent, Belgium, [4]Department of Anaesthesiology, Chirec Delta Hospital, Brussels, Belgium, [5]Department of General Surgery, Chirec Delta Hospital, Brussels, Belgium and [6]Department of Anesthesiology & Perioperative Medicine, David Geffen School of Medicine, University of California Los Angeles, Los Angeles, CA, USA

*Corresponding author. E-mails: joosten-alexandre@hotmail.com, ajoosten@mednet.ucla.edu

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Editor—We recently reported the impact of an opioid-free anaesthesia (OFA) strategy, when compared with an opioid-based anaesthesia (OBA) strategy on postoperative morphine consumption and patient comfort during laparoscopic gastric bypass surgery in class III obese patients.[1] This study included 172 patients in total and a subgroup was monitored with the Nociception Level Index (NOL) monitor (Medasense, Ramat Gan, Israel). The NOL index monitor measures autonomic nervous system response to nociceptive events. The main input variables include heart rate, heart rate variability, skin conductance, and temperature. Values above 25 indicate excessive sympathetic response, which often corresponds to inadequate antinociception. Values below 10 indicate a strong inhibition of the sympathetic nervous system, which occurs during excessive antinociception. Studies have previously demonstrated that this tool can guide antinociception[2] and that implementing it into patient care can decrease intraoperative anaesthesia/analgesia requirements[3] and improve postoperative comfort.[3,4] Although the NOL index does measure the opioid-sparing effects of dexmedetomidine during remifentanil and propofol anaesthesia,[5] there is little evidence of its capacity to measure nociception–antinociception balance during OFA.

Patients in the original trial[1] were all monitored with the PMD-200 (Medasense) which displays the NOL index. Sevoflurane was titrated to the same target range in both groups using the SedLine processed EEG monitor (Masimo, Irvine, CA, USA). The NOL index was blinded and used to determine if NOL index values would differ when OFA or OBA was titrated using classical variables (i.e. heart rate and blood pressure changes). To date, it is unclear if administering dexmedetomidine instead of remifentanil will lead to different NOL index values intraoperatively. In other words, there are no data comparing an OFA *vs* OBA strategy on a nociception monitoring device. The recommended target for the NOL index during remifentanil antinociception is 10 to 25 while there are no recommendations for NOL index targets during OFA, as evidence during this type of anaesthesia is scarce. We therefore aimed to investigate how often the intraoperative NOL index values were within the target range in each group with remifentanil as the reference (i.e. 10–25) to determine if these anaesthetic strategies affect the NOL index differently. We performed a descriptive analysis to characterise NOL index values and reported continuous variables as median with [inter-quartile range] and values were compared between

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Table 1 Median [inter-quartile range] nociception level index values during opioid-based or opioid-free anaesthesia. NOL, nociception level; OBA, opioid-based anaesthesia; OFA, opioid-free anaesthesia.

NOL variable	OBA	OFA	P-value
Mean preincision values	14 [9–21]	16 [11–25]	0.124
Mean value during the entire surgery	9 [6–11]	9 [7–13]	0.301
Mean value during the last 10 min of the surgery	8 [5–14]	9 [5–13]	0.894
Percentage of surgery time with NOL <10%	66 [54–76]	60 [52–75]	0.402
Percentage of surgery time with NOL between 10% and 25%	24 [18–31]	27 [19–33]	0.496
Percentage of surgery time with NOL >25%	7 [3–12]	10 [5–16]	0.251

groups using a Mann–Whitney *U*-test. A *P*-value <0.05 was considered as statistically significant.

Of the 172 patients in the original study, 106 patients had the blinded NOL technology that provided reliable values during surgery (50 in the control [OBA] group and 56 in the OFA group). During surgery, NOL index values in the OBA and OFA groups were between 10 and 25 with a median [inter-quartile range] of 24% [18–31%] *vs* 27% [19–33%] of case time (P=0.496). Almost two-thirds of case time for OBA and OFA patients had NOL index values <10 (66% [54–76%] *vs* 60% [52–75%], P=0.402). In both groups, patients spent 10% of case time with the NOL index above 25. No differences were found between groups for NOL index values before surgery, during surgery, or during the last 10 min of surgery (Table 1). As a reminder, there was no difference between patients for postoperative morphine consumption or pain scores.

Our *post hoc* analysis indicates three important findings regarding NOL index use during bariatric surgery. First, the NOL index provides values that may correspond to nociception-antinociception balance during OFA. Second, when applying both OBA and OFA, blood pressure and heart rate poorly guide clinicians for antinociception titration and will lead to periods of excessive antinociception for the majority of surgery. Third, inadequate antinociception also occurs during a clinically significant period of time (i.e. 10% of case time). Patients only spent a quarter of case time with the NOL index in the appropriate target range. As the NOL index has been shown to correspond to nociception-antinociception balance and that a proposed target, especially for remifentanil, is to maintain the NOL index between 10 and 25, it is possible that guiding antinociception with this monitor will improve balance and potentially optimise patient comfort for obese patients undergoing surgery.

In summary, our results indicate that guiding antinociception with an adapted monitor (e.g. the NOL index) in obese patients has potential, even during OFA. As 75% of surgical case time was spent outside the 10–25 target, there may be room to individualise nociception–antinociception balance. Future protocols should investigate the capacity of this monitor to improve patient comfort after surgery when using either OFA or OBA.

Declarations of interest

Sean Coeckelenbergh has received speaker fees from Medtronic, Medasense, and Medstorm. All other authors declare that they have no conflicts of interest.

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