Generalizability of nociception level across various types of anesthesia: A retrospective analysis

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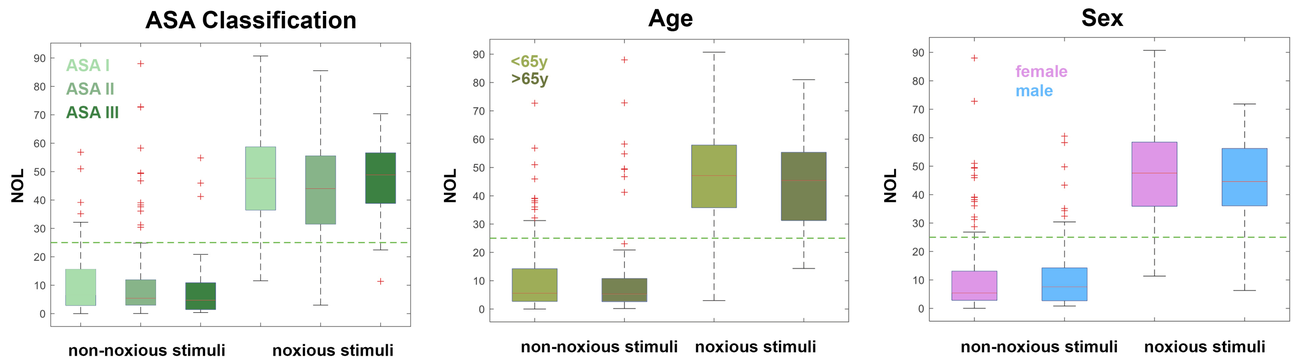
INTRODUCTION

Analgesia is one of the classic pillars of anesthesia. However, estimating analgesic adequacy is challenging and is usually based on indirect signs and provider experience. The PMD-200 system is a monitoring device that quantifies nociception as an index ranging from 0 to 100. We tested the hypothesis that NOL responses are similar in men and women given remifentanil and fentanyl across various types of anesthesia as a function of the American Society of Anesthesiologists physical status designations and over a range of ages and body morphologies.

DEVICE

The PMD-200 system (Medasense, Ramat Gan, Israel) integrates photoplethys-mography, galvanic skin response, peripheral temperature, and accelerometry to generate an index that reflects the balance between nociceptive stimuli and analgesia during general anesthesia. This nociceptive index (NOL) ranges between 0 and 100, with values exceeding 25 indicating excessive nociception.

RESULTS



Among 676 analyzed events, 315 were noxious and 361 non-noxious. The average NOL index in response to noxious stimuli was 47 ± 15 (95%CI = 45, 49) compared to an average NOL in response to non-noxious stimuli of 10 ± 12 (95% CI = 9, 11). Thus, NOL values during non-noxious stimuli were largely below 25, whereas noxious stimuli provoked NOL values above 25. Nociception level values were similar across various populations. There were no clinically meaningful or statistically significant differences across age, BMI, ASA physical status, analgesia, or anesthetic group for either noxious or non-noxious stimuli (Figure). The area under the curve across the populations exceeded 0.9 in all groups. Only 5% of non-noxious stimuli provoked a NOL value of more than 25.

METHODS

We conducted a retrospective cohort analysis of trial data from eight prospective NOL validation studies performed between August 2016 and December 2020. NOL recordings from 522 adults with elective surgical procedures (general, gynecological, and urological) were enrolled. Patients whose recordings were missing annotations, including demographic characteristics, or were otherwise incomplete were excluded, resulting in 447 patients included in our analysis. Subgroups were classified as a function of age (18–65 years old, over 65 years old), sex (female, male), body mass index (BMI) (normal, overweight, obese), ASA physical status (ASA I, II, III), anesthesia drugs (propofol, sevoflurane, desflurane), and opioid (fentanyl, remifentanil). NOL responses to various noxious and non-noxious stimuli were assessed.

CONCLUSION

The NOL index appears to provide accurate estimates of intraoperative nociception over a broad range of patients and anesthetic conditions.

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