Predicting Preoperative Hemodynamic Changes Using the Visual Analog Scale

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Purpose: *This study aimed to investigate how both visual analog scale cut-off scores and State-Trait Anxiety Inventory scores relate to hemodynamic changes in patients entering the operating theater.*
Design: *A prospective observational study.*
Methods: *The study subjects included 130 prospectively enrolled patients who were scheduled for abdominal surgery under combined epidural-general anesthesia and who underwent preoperative anxiety level measurements using both scales.*
Findings: *The heart rate and systolic blood pressure on entering the operating theater were significantly higher than those at baseline in the high and low/moderate anxiety groups. Variations in heart rate and systolic blood pressure were significantly higher, whereas peripheral blood flow was significantly lower in the high anxiety group compared with the low/moderate anxiety group.*
Conclusions: *Using the visual analog scale to measure anxiety can improve our understanding of the hemodynamic changes that occur when patients enter the operating theater.*

Keywords: *hemodynamics, preoperative anxiety, visual analog scale, research.*

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Conflicts of interest: None to report.

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ANXIETY IS COMMON in patients anticipating surgery.[1] Preoperative anxiety can increase both heart rate (HR) and blood pressure (BP), stimulate arrhythmias, magnify pain, and negatively impact treatment and outcomes.[2] On entering the operating theater, peripheral vasoconstriction, hypertension, and tachycardia because of anxiety can occasionally be severe enough to require immediate treatment. Furthermore, anxiety can adversely influence postoperative recovery[3] and wound healing.[4]

Anxiety is widely accepted to be a major factor contributing to hemodynamic changes in patients entering the operating theater. The widely used State-Trait Anxiety Inventory (STAI),[5] developed by Spielberger, is considered a valid and reliable instrument for the assessment of anxiety. A correlation has been established between the STAI and the more simplistic visual analog scale (VAS).[6]

However, VAS cutoff scores have not been adequately determined in relation to STAI scores.

This study aimed to establish the corresponding VAS cutoff scores to the established STAI preoperative anxiety scores and to determine the relationship between these values and hemodynamic changes.

Methods

Subjects

One hundred thirty patients scheduled for abdominal surgery lasting at least 2 hours under combined epidural-general anesthesia were prospectively enrolled from April 1, 2011 to January 31, 2012. Patients undergoing either upper or lower abdominal surgery via laparotomy were included. The inclusion criteria were as follows: age, 20 to 80 years; American Society of Anesthesiologists physical status 1 to 3; and surgery scheduled in the supine or dorsosacral position. Exclusion criteria included a history of any psychiatric disorder, use of vasoactive medication, thyroid disease, and autonomic dysfunction. No anesthetic premedications were administered, and preoperative warming was not conducted.

The study was conducted with the approval of the clinical research review committee of our institution. Written and verbal informed consent was obtained from all subjects before enrollment.

Anxiety Measurements

Patient anxiety level was assessed the evening before surgery using two self-reported psychological instruments: the STAI and VAS. The STAI is a validated and widely used instrument for measuring patient anxiety.[5] In total, 816 research articles were identified as having used the STAI in the period from 1990 to 2000. Internal consistency has been demonstrated with reliability coefficients of 0.91 and 0.89 for state anxiety and trait anxiety, respectively; the test-retest reliabilities were 0.70 and 0.88, respectively.[7] The STAI-state (STAI-S) form is comprised of 20 statements, the patient's responses to which are used to determine their current anxiety level. The STAI-trait (STAI-T) form is comprised of 20 different statements measuring the underlying (ongoing/personality) anxiety level. Each statement in the STAI-S is rated on a four-point Likert scale based on the extent of patient agreement with the statement (not at all, somewhat, moderately so, or very much so). Statements in the STAI-T are also rated on a four-point Likert scale (almost never, sometimes, often, and almost always). The overall (total) STAI score ranges from 20 to 80 points. STAI scores are commonly classified as "no or low anxiety and moderate anxiety" (20 to 44 points) and "high anxiety" (45 to 80 points). An STAI-S score of greater than or equal to 45 defines an individual as highly anxious.[8]

The VAS is recognized as a reliable instrument to measure preoperative patient anxiety.[9] In this study, we used a 0- to 100-mm straight line, with the left and right ends representing "no anxiety" and "extreme anxiety," respectively. We asked patients to indicate where, on the line, their current level of anxiety pertaining to surgery and anesthesia fell. Their score was then recorded.

Hemodynamic Measurements

After admission, HR, systolic blood pressure (SBP), and diastolic blood pressure (DBP) were measured with the patient in a supine position and recorded as the hemodynamic baseline. When the patient entered the operating theater, routine monitoring equipment was connected (eg, noninvasive arterial BP monitor and electrocardiogram). The temperature of the operating theater was set at 22 to 24°C,[10] with 40% humidity. HR and BP values were recorded 5 minutes after entering the operating theater. A laser Doppler flow meter probe (CDF-2000; CyberMed, Inc., Tokyo, Japan) was attached to the index finger (on the arm without a peripheral vein catheter) to assess peripheral blood flow; recordings were taken 2 minutes after measuring BP. The following formula was used to calculate changes in hemodynamics: hemodynamic change rate = ([operating theater measurement − baseline measurement]/baseline measurement) × 100.

Statistical Analysis

The relationship between STAI and VAS scores for anxiety related to surgery and anesthesia was examined using Spearman rank correlation coefficient. Considering that high anxiety corresponded to an STAI-S score of greater than or equal to 45,