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Factors affecting acute pain perception and analgesics consumption in patients undergoing bariatric surgery

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HIGHLIGHTS

- Different psychological dimensions affect specific pain feature in bariatric patients.
- Anxiety and depression predicts both pain perception and analgesic requirement.
- Alexithymia predicts analgesics consumption but not pain perception.

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ABSTRACT

Background: Previous studies performed in non-obese patients undergoing elective surgery have revealed that psychological factors may affect postoperative analgesic requirements. The aim of this observational prospective study was to investigate the extent to which psychopathological dimensions, including anxiety, depression and alexithymia, may influence postoperative pain intensity and analgesics consumption using patient-controlled analgesia (PCA) in patients undergoing bariatric surgery.
Methods: 120 patients, aged 18–60 years, with an ASA physical status I–II, undergoing gastric bypass were enrolled. Anxiety and depression Hamilton scales, and Toronto Alexithymia scale, were administered to patients on the day before surgery. General anesthesia was standardized. After awakening, a PCA pump with intravenous tramadol was immediately made available for a 36-hour postoperative analgesia. Visual analog scale at rest (VASr) and after coughing (VASi), and effective PCA requests number were postoperatively recorded. Pearson's correlations, Anova analyses and multiple linear regression were used for statistical purpose.
Results: Positive correlations were found between anxiety, depression, alexithymia and all pain indicators ($p < 0.01$). Analyses of variance showed that anxious ($p < 0.001$), depressed ($p < 0.001$) and alexithymic ($p < 0.05$) patients had high pain indicators. VASr and VASi were predicted by anxiety and depression ($p < 0.05$), but not by alexithymia; effective PCA requests number was predicted by anxiety, depression and alexithymia ($p < 0.001$).
Conclusions: Obese patients with high depression, anxiety and alexithymia levels rated their pain as more intense and required a larger amount of tramadol. Pain perception intensity was predicted by anxiety and depression but not by alexithymia, whereas analgesics consumption was predicted by all the investigated psychopathological dimensions.

1. Introduction

Pharmacological strategies for postoperative pain treatment have greatly evolved [1]. However, many patients-related factors may affect postoperative analgesia. In the challenging field of bariatric surgery, clinicians have to deal with relevant obesity-related comorbidities [2,3] that may influence patient's response to pain. Also the role of psychopathological dimensions in affecting postoperative analgesia cannot be missed [4]. Preoperative anxiety and depression have been called into question as predictors of postoperative pain perception in non-obese patients undergoing abdominal surgery [5–7]. Incidence of anxiety and depression is quite high in obese population [8]. Likewise, alexithymia, a condition characterized by inability to identify and communicate emotions, may be frequently found in obese patients [9,10]. Its role in affecting pain perception and analgesics consumption has never

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been investigated. Moreover, up to date, no studies have investigated the influence of any psychopathologic characteristic on postoperative pain perception and analgesic requirements in obese patients after bariatric surgery.

The aim of this observational prospective study was to investigate the extent to which patients' psychopathological dimensions, including anxiety, depression and alexithymia, may affect postoperative pain perception and need for self-administered analgesic by using patients controlled analgesia (PCA) after laparoscopic bariatric surgery.

2. Methods

The study was carried out at "A. Gemelli" hospital in Rome, Italy. After Ethical Committee approval (reference number 10432/13; date of approval 23/May/2013) and informed consent, 120 patients, aged 18 to 60 years, each with an American Society of Anesthesiologists (ASA) physical status I–III, scheduled for gastric bypass from 03/June/2013 to 18/March/2014 were enrolled. Exclusion criteria were lack of patient consent; preexisting chronic pain disorder; use of analgesic or psychotropic medications; and inability to complete the required psychological assessment in Italian. Patients with allergic diathesis for drugs used in the study were also excluded.

On the day before surgery, the following questionnaires were administered to the patients by a trained psychologist in order to assess their psychological status:

1) Toronto Alexithymia scale (TAS-20) includes, in addition to a total score, three factors defined as "difficult to identify and discriminate emotions", "difficulty in communicating emotions", and "externally oriented thinking". It consists of 20 items with the score reported on a 5-point scale [11].
2) Hamilton Anxiety Scale (HAM-A) investigates 15 critical areas; each area comprises 3 to 8 items, scored on a range from 0 (absent) to 6 (very serious) [12].
3) Hamilton Depression Scale (HAM-D) consists of 21 items used in order to assess the severity of depression [13].

At the time of preoperative visit, patients were familiarized with a 10-cm visual analog scale (VAS) device for pain (0 = no pain at all, 10 = worst imaginable pain) and were instructed on how to use the PCA pump.

The intraoperative monitoring included heart rate (HR), noninvasive blood pressure (NIBP), pulse oximetry, 5-lead electrocardiogram, end-tidal carbon dioxide, acceleromiography and Bispectral Index (BIS). The BIS was recorded during anesthesia using specific electrodes placed over the fronto-temporal patient after cleaning the skin of the forehead and reaching an impedance $<5\ k\Omega$.

General anesthesia was induced with propofol 2.5 mg/kg IBW (ideal body weight); fentanyl 3 mcg/kg IBW and rocuronium 1.2 mg/kg IBW. For the maintenance, sevoflurane concentration was titrated so as to maintain BIS < 60. Additional fentanyl boluses were administered up to a maximum dosage of 10 mcg/kg IBW until reaching the pneumoperitoneum working pressure of 12 mm Hg. Intraoperative analgesia was then assured by remifentanil, at infusion rates ranging from 0.1 to 0.3 mcg/kg(IBW)/min, in order to maintain NIBP and HR within a range of 20% more or less than the basal values. Paracetamol (1 g) was administered 30 min before the end of surgery.

Roux-en-Y gastric bypass procedure was the technique used in all the patients. The same surgical team performed all the surgical procedures.

In the recovery room, a PCA electronic device containing tramadol 5 mg/mL and programmed to deliver an intravenous bolus of 4 mL (lockout interval = 7 min; dose limit over 8 h = 150 mg) was immediately made available for a 36-hour postoperative analgesia. Number of effective and ineffective requests from the PCA pump was recorded at fixed intervals (at the start of PCA, 1, 2, 6, 12, 24, 36 h afterwards). Ineffective PCA requests are those made in the look-out time period during which the demand button is out of order. Rescue analgesia was performed by ketorolac 30 mg as needed (not exceeding 90 mg/day).

To obtain a report of analgesia effectiveness, both current pain at rest [visual analog scale at rest (VASr)] and after a voluntary cough [visual analog scale after coughing (VASi)] were assessed 20 at fixed intervals (at the start of PCA, 1, 2, 6, 12, 24, 36 h afterwards). At the same time intervals, need for rescue (yes/no), time to rescue, number of rescue doses, presence/absence of PONV (postoperative nausea and vomiting) and need for antiemetic medication (ondansetron 4 mg) were recorded. Vital parameters (noninvasive arterial blood pressure, heart rate, respiratory rate, and oxygen saturation) were also assessed throughout the study. The postoperative course of all the patients was reported including any adverse events and duration of postoperative hospital stay.

2.1. Statistical analysis

The number of patients included in the study was based on previous results [6] and a priori power analysis using G*Power 3.1.5. The lower squared multiple correlation ($R2 = 0.155$) from the multiple linear regression predicting VASr score with depression as predictor [6] was used to determine effect size (Cohen's f2). It was estimated that a minimum of 103 patients would be required to detect a prediction of VASr score for depression with a power of 95%, an effect size (Cohen's f2) of 0.18, a 0.01 level of significance and 3 as number of predictors. The study plan was to recruit 120 patients as the investigators expected approximately a 15% drop-out rate.

Assumption of data normality was confirmed through a Shapiro–Wilk test. Results were expressed as means ± SDs or as numbers. Three different pain indicators (outcome measures) were used: visual analog scale at rest (VASr) and after coughing (VASi) and total number of effective PCA requests during the postoperative 36 h.

A preliminary analysis of Pearson's correlations was used to analyze the relationship between psychopathological dimensions (TAS-20, HAM-D, HAM-A) and pain outcome measures (VASr and VASi mean values and total number of effective PCA requests).

Patients were classified on the basis of the cut-offs of each scale (TAS-20, HAM-A and HAM-D) for each single independent variable (alexithymia, anxiety and depression). Patient groups were divided into two categories (alexithymic and non-alexithymic or probably alexithymic patients) according to the clinical TAS-20 cut-off score of 60 [14]. The normative HAM-A score used in order to differentiate patients with mild-to-severe anxiety from patients without anxiety was 17 [12]. The cut-off used for classifying patients with moderate-to-severe depression versus those with mild depression or without depression was >17 [15]. These cut-offs were used in order to perform analysis of variance.

Three single analyses of variance (ANOVAs), were used in order to compare VASr and VASi mean values, and effective PCA requests number in alexithymic versus non-alexithymic or probably alexithymic patients, patients with mild-to-severe anxiety versus those without anxiety, patients with moderate-to-severe depression versus those with mild depression or without depression.

Anova comparisons between the categorized groups of patients were also performed for duration of surgery, remifentanil consumption, and rescue analgesia.

The relationship between operative factors (duration of surgery and intraoperative remifentanil dose) or patient/disease severity factors (age, gender, BMI and ASA) and analgesia usage (total effective PCA number) was tested by using Pearson' or point biserial correlation, as required.

Finally, three multiple linear regression analyses were used to determine which psychopathological dimension among TAS-20, HAM-D, HAM-A (data on a continuous scale) may predict each single pain