Predictive Factors of Severe Postoperative Pain in the Postanesthesia Care Unit

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BACKGROUND: IV morphine titration (IMT) is widely used in the postanesthesia care unit to achieve pain relief. Numerous factors contribute to variability in postoperative pain or morphine consumption. We analyzed prospectively the pre- and intraoperative predictive factors of severe postoperative pain defined as a dose of IMT >0.15 mg/kg or a failure of IMT.

METHODS: We assessed the role of preoperative information about pain, medical treatments, and intraoperative events and their role on postoperative pain. After IMT, patients were divided into two groups: severe pain (SP) and nonsevere pain. Data are expressed as mean ± sd.

RESULTS: Three hundred forty-two patients were included in the study: 200 (58%) in the nonsevere pain group and 142 (42%) in the SP group. Using a univariate analysis, there was no significant difference between groups related to medical or surgical history except for more frequent preoperative treatments in the SP group (P < 0.05). Duration of the surgical procedure and anesthesia were longer in the SP group (P < 0.001). The dose of sufentanil and visual analog scale scores before and at the end of IMT were higher in the SP group (P < 0.001). Using a multivariate analysis, a high dose of intraoperative opioid (sufentanil dose >0.6 μg/kg) (Odds ratio 2.68, P < 0.001), a general anesthetic procedure (Odd ratio 3.96, P = 0.03), and the use of preoperative analgesic drugs (Odds ratio = 1.91, P < 0.01) were independent factors associated with severe postoperative pain.

CONCLUSION: A higher intraoperative dose of sufentanil, general anesthesia, and preoperative treatment with analgesics were significantly associated with severe postoperative pain.

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the incidence of moderate to severe pain (SP) with cardiac, abdominal, or orthopedic inpatient procedures has been reported to be as high as 25% to 76% and there is a strong relationship between patient dissatisfaction and moderate or severe postoperative pain.

IV administration of morphine is usually recommended for acute pain relief in the immediate postoperative period. The use of small IV boluses of morphine in the postanesthesia care unit (PACU) allows a rapid and efficient titration of the dose needed for adequate pain relief. In large databases of patients undergoing IV morphine titration (IMT) for moderate to SP in the immediate postoperative period, more than 90% of patients had pain relief using a strict protocol of morphine titration and the mean dose required to obtain pain relief was 12 ± 7 mg, after a median of 4 boluses. However, half of the patients needed a morphine dose larger than 0.15 mg/kg and almost 5% needed at least 10 boluses for pain relief. Moreover, some patients still had pain or complained of morphine-related adverse effects despite a strict protocol of morphine titration.

The type of surgical procedure and many pre- and intraoperative factors (medical and surgical history, level of anxiety and information, type of anesthesia, opioid consumption) may contribute to determining the immediate postoperative pain strategy. We analyzed, in a prospective study, the pre- and intraoperative predictive factors of severe postoperative pain, defined as a dose of IV morphine larger than 0.15 mg/kg to obtain pain relief or a failure of morphine titration. The purpose of this study was to identify perioperative variables associated with severe postoperative pain.

METHODS

This study was conducted between May 2002 and April 2003. Because data were recorded without any specific intervention and according to a protocol already used routinely in our PACU, authorization...
was given by our ethical committee (CPP Pitié-Salpêtrière, Paris, France) to waive informed consent.

**Patients**

Patients’ medical and surgical history was collected by an anesthesiologist during the preanesthetic consultation. Patients were asked about their own acute or chronic painful experience in the past, preoperative use of patient-controlled analgesia (PCA) device, past number of surgical procedures, postoperative pain scores after previous surgeries, history of polytrauma, multiple fractures or cancer and their medical treatment including minor (paracetamol, nonsteroidal anti-inflammatory drugs [NSAIDs], nefopam) or major analgesics (opioids).

**Pre- and Intraoperative Events**

Preoperative information about pain management was collected by a nurse specialized in anesthesia in the operating room before the induction of anesthesia. The patients were asked about information given to them during the anesthesia consultation, especially the information about pain, pain scale, and pain score. They were also asked if an anesthesiologist had come to visit them the day before the operation.

Information about the pre- and intraoperative period and events that may influence postoperative pain was also recorded: premedication including hydroxyzine or a benzodiazepine, anesthetic procedure including propofol, sufentanil (0.2–0.3 μg/kg at induction and then boluses of 0.1–0.15 μg/kg during surgery), atracurium, end-tidal isoflurane and nitrous oxide combination, and intraoperative analgesics including nonopioid drugs. Type of surgery is the most important factor influencing intensity and duration of postoperative pain. Therefore, patients were classified according to the predictive postoperative pain severity: minor, moderate, and severe postoperative pain surgery in accordance with the results of the French Consensus conference about postoperative pain management in adults and children. Age, body weight, American Society of Anesthesiologists (ASA) status, preoperative anxiety level (using an anxiety numerical rating scale [NRSa]): 0 = no anxiety, 10 = the worst imaginable anxiety) were also noted.

**Nurse Training in PACU**

All nurses in the PACU had been trained to assess pain using unidimensional scales and to perform morphine titration. They used the visual analog scale (VAS) (0 to 100, hand-held slide-rule type) and a special form for data collection. When patients had difficulties in manipulating the VAS, nurses were allowed to use a NRS (from 0 to 100), since these two methods are equivalent.

**Regimen of IMT**

A strict protocol was implemented in the PACU after a preliminary study determined the optimal regimen of morphine titration. This protocol defined the dose of IV boluses of morphine, the interval between boluses, the absence of limitation on the total dose, the VAS (or NRS) threshold required to administer morphine and the criteria to stop titration. After arrival of patients in the PACU, they were questioned, after tracheal extubation and the return of full consciousness, about the presence of pain (at least every 15 min before the onset of morphine titration) and asked to rate pain intensity on a scale (VAS or NRS). When the scale was more than 30, IV morphine was titrated every 5 min by 3 mg increments (2 mg in patients weighing ≤60 kg) and pain was assessed every 5 min until pain relief, defined as a VAS or NRS ≤30. If the patients were unable to answer, the nurses used a simple behavioral scale (complaint behavior: pain treatment, relief behavior: no treatment). When the patient was asleep, no arousal was attempted. In this situation, the patient was considered as having adequate pain relief and was assigned a score of 0. When pain was too severe to obtain a VAS or NRS (patient refusal), it was scored 100. Clinical monitoring included respiratory rate (RR) measurements, pulse oximetry (SpO₂), sedation according to the Ramsay score, arterial blood pressure, and heart rate. Morphine titration was stopped if the patient had a RR <12 breaths/min and/or a SpO₂ <95%, and/or experienced a serious adverse event related to morphine administration (allergy with cutaneous rash and/or hypotension, vomiting, severe itching). In case of severe ventilatory depression (RR <10 breaths/min), naloxone (IV bolus of 0.04 mg) was administered until RR was more than 12/min. As previously reported, severe postoperative pain was defined as an initial VAS ≥70.

Temperature level on arrival in the PACU, pain scores, morphine consumption, postoperative anxiety level, duration of stay in the PACU were recorded.

**Study Protocol**

During the data collection period, consecutive patients who fulfilled the following criteria were included: (1) VAS, or NRS >30; (2) compliant behavior in case of lack of communication. Patients with minor pain (defined as a VAS or NRS ≤30), with delirium or dementia, or who were non-French speaking were not included in the study. Criteria for exclusion were interruption of morphine titration because of severe morphine-related adverse effects: allergy, severe vomiting or pruritus, ventilatory depression. Sedation was not considered a severe morphine adverse effect, as previously reported.

Patients who received other analgesics (including regional anesthesia) as a rescue procedure because of lack of pain relief with morphine were considered a failure of morphine titration. This decision was taken by the anesthesiologist, usually for patients requiring more than 10 boluses of morphine.

In the PACU, patients were divided into two groups according to the severity of their postoperative pain.
intensity: SP group and nonsevere pain (NSP) group. SP was defined as a dose of morphine in the PACU >0.15 mg/kg to obtain pain relief and/or a lack of pain relief at the end of the morphine titration.\textsuperscript{11}

**Statistical Analysis**

Data are expressed as mean ± SD or median and 95% confidence interval (CI) (time delay, duration, morphine doses), unless specified otherwise. Comparison of two means was performed using the unpaired Student’s t-test and comparison of two medians using the Mann–Whitney U test. Comparison of several means was performed using repeated measures two way (groups, time) analysis of variance. The Greenhouse–Geisser correction was applied when more than two levels were present in a “within” factor and the interaction was used to test differences between the two groups. The Fisher’s exact method was used for categorical variables.

We tried to assess variables significantly associated with severe postoperative pain as defined above. In the univariate analysis, all possible variables were considered to compare SP and NSP groups. A stepwise backward logistic regression was then performed. To avoid overfitting, we used a conservative approach and included only the significant preoperative variables in the univariate analysis ($P$ value of entry ≤0.10). Odds ratios and their 95% CI were calculated. Interactions were not specified. The Spearman coefficient matrix correlation was used to identify significant collinearity (>0.70) among variables. The calibration of the model was assessed with the Hosmer–Lemeshow test and the discrimination of the model was assessed with the area curve under the receiver operating characteristic curve.

All comparisons were two-tailed and a $P$ value of <0.05 was required to exclude the null hypothesis. Statistical analysis was performed using NCSS 2004 software (Statistical Solutions Ltd, Cork, Ireland).

**RESULTS**

Data from 342 patients were analyzed in the study. Mean age was 48 ± 18 yr, with 27 patients ≥75 years old (8%). Mean weight was 69 ± 13 kg, 160 (47%) patients were male and 182 (54%) were female.

Two hundred ninety-three (86%) patients had a painful experience in the past (polytrauma: $n = 27$ [8%], multiple fractures: $n = 33$ [10%], cancer: 25 [7%, others: 289 [84%]). The intensity of the painful experience was: mild ($n = 58$, 17%), moderate ($n = 62$, 18%), severe ($n = 63$, 18%), and unbearable ($n = 58$, 17%). Twenty-four patients (7%) used PCA in the past. The chronic medical treatment administered before surgery included NSAIDs in 50 (15%) patients, minor analgesics in 25 (7%) patients, combination of paracetamol and codeine in 19 (7%) patients, opioids in 12 (3%) patients, benzodiazepines in 40 (12%) patients, antidepressant drugs in 24 (7%) patients, $\beta$-blockers in 29 patients (8%), and converting enzyme inhibitors in 33 (10%).

The mean preoperative NRS\textsubscript{a} was 4.4 ± 3.0. Information about pain management was dispensed to 219 patients (64%). Median VAS at the consultation was 20 [95% CI: 10–30 mm]. PCA was proposed to 40 patients (12%). Sixty-five patients were admitted to the PACU after minor surgery (19%), 128 who had surgery with postoperative moderate pain (37%), and 149 patients who had surgery with postoperative SP (44%) (Table 1). The duration of the surgical procedure was 101 ± 60 min (median: 90, 95% CI: 80–90 min). The type of anesthesia was mainly general anesthesia ($n = 314$, 92%). Regional anesthesia was performed in 28 patients (8%). The mean duration of the anesthesia was 154 ± 74 (median: 140 min [95% CI: 130–150 min]).

The time to morphine titration in the PACU was 40 ± 50 min. The mean value of initial VAS was 52 ± 32. The mean morphine dose required to obtain pain relief was 9.6 ± 8.3 mg or 0.143 ± 0.130 mg/kg. The mean duration of morphine titration to obtain pain relief was 18 ± 17 min (extremes: 5–70 min).

Using an univariate analysis, there was no significant difference in the two groups related to medical or surgical history except for preoperative therapeutics, which appeared to be more common in the severe postoperative pain group (Table 2). Patients in the SP group were significantly more anxious in the preoperative period. The duration of the surgical procedure and anesthesia was longer in the SP group. The dose of sufentanil administered during surgery was higher, but there was no significant difference between the two groups for the administration of minor analgesics (Table 3). All pain scales (on arrival in the PACU, at the end of the titration) were higher in the SP group in comparison with the NSP group. The time between the last administration of sufentanil and the start of the titration or between the arrival at the PACU and the titration was longer in the SP group (Table 4). Similarly, the duration of stay in the PACU was significantly longer in the SP group (Table 4).

Using a multivariate analysis, the following variables were significantly associated with severe postoperative pain: a higher dose of sufentanil (≥0.6 μg/kg), general anesthesia, and preoperative treatment with analgesics (Table 5). The percentage of patients appropriately classified by the model was

<table>
<thead>
<tr>
<th>Type of Operation Classified as Minor, Moderate, and Major Surgeries</th>
<th>SP</th>
<th>NSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor,</td>
<td>Moderate,</td>
<td>Major,</td>
</tr>
<tr>
<td>$n = 64$ (19%)</td>
<td>$n = 128$ (37%)</td>
<td>$n = 149$ (44%)</td>
</tr>
<tr>
<td>Minor urological or gynecological procedures</td>
<td>Intervertebral disc surgery</td>
<td>Spinal surgery (spinal fusion)</td>
</tr>
<tr>
<td>Transurethral prostatectomy</td>
<td>Inguinal repair</td>
<td>Knee arthroplasty</td>
</tr>
<tr>
<td>Osteosynthesis</td>
<td>Thyroidectomy</td>
<td>Shoulder surgery</td>
</tr>
<tr>
<td>material remove</td>
<td>Hip surgery</td>
<td>Renal surgery</td>
</tr>
<tr>
<td>Appendicectomy</td>
<td>Laparotomy/ bowel surgery</td>
<td></td>
</tr>
</tbody>
</table>

**Table 1. Type of Operation Classified as Minor, Moderate, and Major Surgeries According to Expected Level of Postoperative Pain Intensity**

65% (95% CI: 60%–70%) and the area under the receiver operating characteristic curve was 0.690 (95% CI: 0.632–0.740). The calibration of the model was not very good, as shown by a significant Hosmer-Lemeshow test (51.9, \( P < 0.05 \)). There was no significant collinearity between selected variables except for regional anesthesia and sufentanil dose but the coefficient of correlation (\( r = 0.26 \)) was lower than the predetermined threshold (0.70). When considering only patients with general anesthesia (\( n = 185 \)), 2 variables remained in the final logistic regression model: a high dose of sufentanil (odds ratio 2.59 [95%CI: 1.61–4.15], \( P < 0.001 \)) and preoperative treatment with analgesics (odds ratio 1.78 [95% CI: 1.07–2.98], \( P < 0.03 \)).

**DISCUSSION**

The main findings of our study are that patients with severe postoperative pain, defined as a titrated dose of morphine larger than 0.15 mg/kg or a lack of pain relief despite morphine titration, received a higher dose of intraoperative opioid, experienced a general anesthetic procedure, and used preoperative analgesic drugs more often.

Most studies defined moderate or severe postoperative pain as a simple and empirical value of a pain scale.\(^{17–21}\) Other studies evaluated the postoperative morphine consumption but without separating patients who needed a high dose from those who did not experience pain relief at the end of morphine titration.\(^{19,22}\) In our study, we defined severe postoperative pain as a function of the total dose of IV morphine titrated in the immediate postoperative period, or as a failure of IMT, and not as a simple level of pain. This morphine dose corresponds to the pharmacological effort to achieve pain relief and represents another way to define severe postoperative pain, as previously described.\(^{11}\)

Several arguments justify the choice of the threshold of 0.15 mg/kg, as a surrogate end-point for severe postoperative pain. First, this dose corresponds to that administered in many randomized studies comparing morphine to other analgesics\(^{23}\) or studying acute postoperative analgesia after anesthesia with remifentanil,\(^{24,25}\) and it approximately corresponds to 10 mg in an adult weighing 65 kg.\(^{26}\) Second, this dose corresponds to the median dose of morphine required to obtain pain relief in studies on postoperative morphine titration.\(^{11}\) The failure of morphine titration to produce adequate pain relief was defined as a lack of pain relief despite the strict practice of the protocol of titration. The decision was made by the anesthesiologist, usually for patients requiring more than 10 boluses of morphine or for patients experiencing adverse morphine effects.

Several studies attempted to predict moderate, intense, or severe postoperative pain but our work is the

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**Table 2. Main Characteristics and Medical History of the Patients in the Study Groups**

<table>
<thead>
<tr>
<th></th>
<th>Nonsevere pain (NSP group)</th>
<th>Severe pain (SP group)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 200)</td>
<td>(n = 142)</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>47 ± 18</td>
<td>49 ± 18</td>
</tr>
<tr>
<td>Age &gt;75 (yr)</td>
<td>16 (8)</td>
<td>11 (8)</td>
</tr>
<tr>
<td>Man (%)</td>
<td>95 (47)</td>
<td>65 (46)</td>
</tr>
<tr>
<td>Women (%)</td>
<td>105 (53)</td>
<td>77 (54)</td>
</tr>
<tr>
<td>ASA status (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>110 (55)</td>
<td>69 (49)</td>
</tr>
<tr>
<td>2</td>
<td>76 (38)</td>
<td>59 (41)</td>
</tr>
<tr>
<td>3</td>
<td>13 (6)</td>
<td>14 (10)</td>
</tr>
<tr>
<td>4</td>
<td>1 (1)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Preoperative pain experience, n (%)</td>
<td>167 (83)</td>
<td>126 (89)</td>
</tr>
<tr>
<td>Preoperative use of PCA, n (%)</td>
<td>11 (5)</td>
<td>13 (9)</td>
</tr>
<tr>
<td>Number of surgical procedures in the past</td>
<td>2 [2–2]</td>
<td>3 [2–3]</td>
</tr>
<tr>
<td>Postoperative pain scores after previous surgeries</td>
<td>2 [2–3]</td>
<td>2 [2–3]</td>
</tr>
<tr>
<td>History of polytrauma, n (%)</td>
<td>12 (5)</td>
<td>15 (11)</td>
</tr>
<tr>
<td>History of multiple fractures, n (%)</td>
<td>18 (9)</td>
<td>15 (11)</td>
</tr>
<tr>
<td>History of cancer, n (%)</td>
<td>14 (7)</td>
<td>11 (8)</td>
</tr>
<tr>
<td>Preoperative treatment, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEI</td>
<td>19 (9)</td>
<td>14 (10)</td>
</tr>
<tr>
<td>Beta-blockers</td>
<td>13 (6)</td>
<td>16 (11)</td>
</tr>
<tr>
<td>Antidepressant drugs</td>
<td>11 (5)</td>
<td>13 (9)</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>15 (7)</td>
<td>25 (18)</td>
</tr>
<tr>
<td>NSAIDs</td>
<td>21 (10)</td>
<td>29 (20)</td>
</tr>
<tr>
<td>Minor analgesics(^a)</td>
<td>42 (21)</td>
<td>53 (37)</td>
</tr>
<tr>
<td>Opioids</td>
<td>6 (3)</td>
<td>6 (4)</td>
</tr>
</tbody>
</table>

Data are mean ± SD, median [95% confidence interval], or number (percentage).

ASA = American Society of Anesthesiologists status; VAS = visual analog pain score; PCA = patient-controlled analgesia; NSAID = nonsteroidal antiinflammatory drugs; CEI = converting enzyme inhibitors.

\(^a\) Minor analgesics: paracetamol, nefopam. NSAIDs are considered separately in Table 2.
sole prospective study to assess the pre-, peri-, and immediate postoperative factors. Caumo et al. performed a study to determine presurgical factors, psychological and demographic characteristics as predictors to report moderate to intense postoperative pain. The authors demonstrated that the severity of pain was notably associated with status ASA III, age, preoperative moderate to intense pain, and chronic pain. On the other hand, patients undergoing surgery to treat cancer and those who received epidural and multimodal analgesia with systemic opioid presented lower risk for reporting moderate to intense pain. Kalkman et al. studied independent predictors of severe postoperative pain in 1416 inpatients. These factors were notably younger age, level of preoperative pain, incision size, and type of surgery. Dahmani et al.
performed a study to identify the patient characteristics, surgical, anesthetic, and postoperative factors that contribute to variability in early postoperative morphine requirements. Using a multiple regression analysis, the authors showed that emergency surgery, surgical duration of longer than 100 min, a pain score of 2 or 3 of 5 on arrival in the PACU, Caucasian patients and major surgery were independent predictive factors of morphine requirements in the PACU. Slappendel et al.19 showed that severity of preoperative pain intensity relates to postoperative pain levels and morphine consumption after total hip surgery. In our study, preoperative benzodiazepines, preoperative analgesics, and general anesthesia were predictive factors of postoperative pain severity, but there was no significant association between preoperative pain experience, sex, age or ASA status, and severe postoperative pain. Even if we did not accurately assess a correct level of anxiety (using the State Trait Anxiety Inventory or the Beck Depression Inventory), the NRSa in the operating room, immediately before surgery, was higher in the SP group \( (P = 0.03) \). Preoperative analgesics (NSAIDs and other minor analgesics) mean a high level of preoperative pain. Knowing these data during the preoperative anesthetic consultation may help care providers to improve periodic and postoperative pain management. In patients under general anesthesia, pain scores after major surgery are often higher in the immediate postoperative period and these patients need rapid morphine IV titration until pain relief.11 Pain management protocols should be improved to include nonopioid drugs during the surgical procedure. Moreover, after regional anesthesia, there is a delay between the end of the surgical procedure and the occurrence of pain. This situation often occurs in the wards and not in the PACU. In previous studies, we demonstrated that the VAS score (before, during, and at the end of morphine titration) and the total dose of morphine were not significantly different in young and elderly patients (older than 70 years old).10,27 We observed the same results in our study: old age was not a predictor of severe (or NSP) postoperative pain.

Finally, we demonstrated that a high dose of intraoperative sufentanil was associated with severe postoperative pain in the PACU. This result is consistent with enhanced hyperalgesia and tolerance. Rapid development of acute opioid tolerance is well established in animals and humans after various opioids.28–30 Even if most studies about abnormal pain sensitivity concern remifentanil or short-acting synthetic narcotics like fentanyl or alfentanil, we can argue that morphine or sufentanil may induce hyperalgesia even after a single shot.31–34 Nevertheless, a high dose of sufentanil may also be linked with a longer duration or extent of surgery, indicating more severe tissue trauma. In the same way, end-tidal isoflurane was greater in the SP group, probably expressing more severe or longer duration of surgical procedures. Our study did not enable us to precisely determine the causative factors.

Some previous studies also analyzed the predictive factors of morphine requirements in the PACU but they failed to provide any information about the discrimination and calibration of their logistic model.22 It should be emphasized that, in our study, the logistic model that predicted severe postoperative pain (Table 4) was not very accurate as shown by its relatively low discriminant value and its poor calibration. This strongly suggests that other important variables have not been included in the model and/or that an accurate prediction of the severity of postoperative pain remains an elusive objective.

Some remarks must be included concerning the limitations of our study. First, our study shows association between variables but does not demonstrate a causality link between these variables. Second, the use of VAS or NRSa assumes that pain and anxiety level are unidimensional experiences.35 Although intensity is a very important dimension of pain or anxiety, it is clear that pain and anxiety refer to a variety of sensations that cannot be categorized under a single linguistic label which vary only in intensity.33 Nevertheless, VAS or NRSa have been widely accepted because of their ease of administration, their minimal intrusiveness, and their conceptual simplicity. Third, defining severe postoperative pain in the PACU as a titrated dose of morphine at a fixed value or a lack of pain relief despite morphine titration is an empirical method. Nevertheless, there is no validated definition of SP in the postoperative period except that provided by subjective pain scales (see above). Fourth, the study included only a restricted sample of 342 patients, which may have decreased its power, particularly for the negative findings, which were significant only in the univariate analysis. Fifth, our study strongly suggests that intraoperative high sufentanil dose is a predictor of severe postoperative pain in the PACU. The definition of a high dose of sufentanil \( (>0.6 \mu g/kg) \) we used is also empirical because there is no precise definition of a high dose of opioid during a surgical procedure. Moreover, it is highly possible that the dose of sufentanil was more related to the duration of surgery than to the severity of the surgery. Sixth, the type of surgery was heterogeneous and we cannot exclude the possible role of other variables that could have affected the outcome. Seventh, this study only included a small percentage of patients with chronic

### Table 5. Independent Predictive Factors of Severe Postoperative Pain in the Postanesthesia Care Unit

<table>
<thead>
<tr>
<th></th>
<th>Odds ratio</th>
<th>95% Confidence interval</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>High sufentanil dose*</td>
<td>2.68</td>
<td>[1.68–4.29]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>General anesthesia (vs regional)</td>
<td>3.96</td>
<td>[1.14–13.81]</td>
<td>0.03</td>
</tr>
<tr>
<td>Preoperative analgesics</td>
<td>1.91</td>
<td>[1.15–3.18]</td>
<td>0.01</td>
</tr>
</tbody>
</table>

*High dose sufentanil = dose \( >0.6 \mu g/kg \).
pain and patients receiving preoperative opioid analgesics. We did not focus our work on preoperative chronic pain and we did not assess pain level using specific tools of chronic pain evaluation (no psychological assessment, no neuropathic pain assessment). Lastly, our study was performed in the perioperative setting and after scheduled surgery and thus cannot be applied to other clinical conditions, such as emergency surgery.

In conclusion, a high dose of intraoperative opioid, a general anesthetic procedure and the use of preoperative analgesic drugs are predictors of severe postoperative pain, defined in our study as requiring a dose of IV morphine larger than 0.15 mg/kg or a failure of morphine titration in the PACU. These results may have important implications in improving pain protocols (including nonopioid drugs) during the operating period and in immediate postoperative pain management.

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