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Research Article

# Nicotine smoking: Influences on perioperative pain management

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**KEYWORDS**

Perioperative pain;
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**Abstract** *Background:* The complex relationship between smoking and pain has clinical relevance in the practice of anesthesiology and pain medicine. The present study investigated the effect of heavy nicotine smoking on perioperative pain management.

*Methods:* This prospective controlled study was carried out in Alexandria Main University hospital on 80 adult ASA I and II patients scheduled for lower limb fractures fixation under general anesthesia after an informed written consent and approval of the Medical Ethics Committee. Patients were divided into 2 groups: group N included nonsmokers and group S included the heavy smokers. Intraoperative heart rate (HR), mean arterial blood pressure (MAP) and intraoperative analgesia were recorded. Postoperatively; HR, MAP, pain visual analog scale (VAS) and total postoperative analgesic requirements were recorded.

*Results:* Intraoperative and postoperative HR and MAP showed significantly higher values in group S patients than group N patients. VAS values were significantly lower in group N than group S at recovery, 8 and 24 h postoperatively. Total intraoperative and postoperative analgesic requirements of meperidine were significantly lower in group N than group S.

*Conclusions:* Chronic nicotine smoking increases the incidence of perioperative pain. Heavy smokers need more perioperative analgesia than nonsmokers.



## 1. Introduction

Cigarette smoke, which serves as a nicotine delivery vehicle produces profound physiological changes [1]. Chronic exposure to nicotine and other tobacco constituents is associated with an increased prevalence of painful conditions in many studies [2,3]. Among those with chronic pain, smokers report greater pain intensity and functional impairment [4]. On the other hand, nicotine itself can produce analgesia when administered acutely [5]. The complex relationship between smoking and pain has clinical relevance in the practice of anesthesiology and pain medicine [1].

Nicotine exhibits its pharmacological effects by interacting with ion channels of the peripheral and central nicotine acetylcholine receptors (nAChR) family [6]. When nAChR are exposed chronically to low agonist concentrations, of nicotine typically seen in chronic heavy smokers results in

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an up to 2-fold up-regulation of nAChR expression in the brain [7]. Reduction in channel opening rates results in a closed, desensitized state and tolerance to nicotine-induced antinociception [8–10]. Chronic nicotine exposure results in interaction between nAChRs and opioid receptor pathways may contribute to the increased use of opioid analgesics by smokers than nonsmokers that may be explained by an up-regulation of mu opioid receptors in the striatum and decreasing striatal met-enkephalin levels which had observed in some animal studies [11,12].

The aim of the present study was to investigate the effect of chronic heavy smoking on perioperative pain and perioperative analgesia in patients undergoing lower limb fractures fixation surgery under general anesthesia.

## 2. Methods

This prospective controlled study was carried out in Alexandria Main University hospital on 80 adult ASA I and II patients scheduled for lower limb fractures fixation under general anesthesia (GA) after taking an informed written consent and approval of the Medical Ethics Committee. Patients were divided into two equal groups (40 each): group N included the nonsmokers patients and group S included the heavy smokers (smoking more than 20 cigarettes per day) [13]. Patients with history of allergy to meperidine, use of psychotropic medications, alcohol or substance abuse, morbid obesity and patients with chronic pain were excluded from the study.

The day before surgery, patients were familiarized with visual analog scale (VAS) for pain (0 = no pain, 10 = worst pain imaginable) [14]. All patients were subjected to the same anesthetic protocol for GA; using intravenous (IV) midazolam 0.05 μg/kg as premedication, IV fentanyl 1.5 μg/kg, IV propofol 2–3 mg/kg and IV cis-atracurium 0.15 mg/kg to facilitate endotracheal intubation. Patients were monitored by using Hewlett Packard Viridian 24 multichannel monitor. Anesthesia was maintained by sevoflurane (2–3%) in oxygen and cis-atracurium increments guided by nerve stimulator. HR and MAP were recorded intraoperatively every 15 min. IV meperidine 0.5 mg/kg was given when HR and/or BP were increased 20% above the patient's preoperative reference level. At the end of operation, residual neuromuscular blockade was reversed with IV neostigmine 0.04 mg/kg and atropine 0.01 mg/kg and duration of anesthesia was recorded.

Postoperatively; HR, MAP and pain VAS were recorded at recovery, then hourly for four hours, and 4 hourly till 24 hours postoperative. Patients received IV analgesia according to VAS (0–3 score: nothing was given, 4–6 score: diclofenac sodium 75 mg was given, with a maximum dose of 150 mg/day, score >6: meperidine 0.5 mg/kg was given). Total intraoperative and postoperative analgesic requirements in the first 24 h after surgery were recorded.

### 2.1. Statistical analysis

Data were statistically analyzed by SPSS$^R$ software (Statistical package for social science for personal computers) using "*t*" and chi-square ($X^2$) testes, and data were expressed as mean ± SD and $P \leqslant 0.05$ considered significant.

## 3. Results

The present study showed no significant differences between the two studied groups regarding demographic data; age, sex, body weight, ASA physical status and duration of anesthesia (Table 1).

Preoperative hemodynamic parameter; HR and MAP showed no significant statistical differences. Intraoperative HR and MAP showed significantly higher values in group S patients than group N patients at 60, 75, 120, 135 and 165 min. postoperatively HR and MAP showed significantly higher values in group S patients than group N patients at 3, 8, 20 and 24 h (Figs. 1 and 2).

VAS values were significantly lower in group N than group S at recovery, 8 and at 24 h postoperatively (Fig. 3). Total intraoperative and postoperative analgesic requirements of meperidine were significantly lower in group N than group S, while analgesic requirements of diclofenac sodium showed no significant differences (Table 2).

## 4. Discussion

The present study investigated the influence of heavy nicotine smoking on perioperative pain and analgesic requirements. Intraoperative and postoperative HR and MAP showed significantly higher values in group S patients than group N patients. VAS values were significantly lower in group N than group S at recovery, 8 and 24 h postoperatively. Total intraoperative and postoperative analgesic requirements of meperidine were significantly lower in group N than group S.

Volkan et al. [15], study on 220 patients divided into two equal groups (smokers and nonsmokers) to determine whether or not smoking has an effect on pain perception of venous can-

**Table 1** Comparison between the two studied groups regarding demographic data.

| | GN | GS | P |
|---|---|---|---|
| Age (yr) | 35.2 ± 7.4 | 38.1 ± 7.33 | 0.32 |
| Sex (M/F) | 33/7 | 35/5 | 0.33 |
| Weight (kg) | 78.32 ± 11.7 | 76.44 ± 10.51 | 0.298 |
| ASA I/II | 25/15 | 28/12 | 0.107 |
| Duration of anesthesia (min) | 161.50 ± 10.15 | 160.30 ± 12.15 | 0.788 |

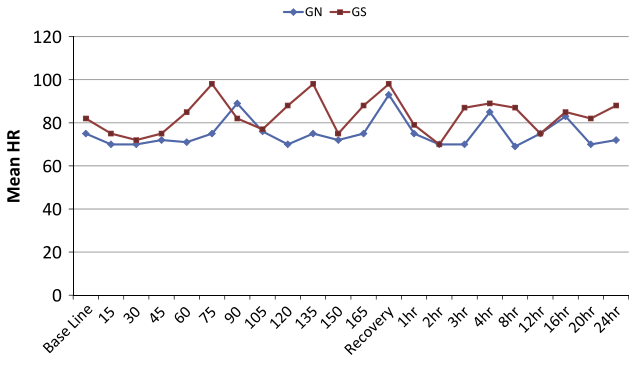


**Figure 1** Comparison between the two studied groups regarding HR.