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Original Research Article

Assessment of Preoperative Pain Induced by Peripheral Venous Cannulation and Propofol Infusion for Prediction of Postoperative Pain: A Cross Sectional Study

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Abstract

Introduction: Peripheral venous cannulation and propofol infusion can induce preoperative pain, impacting postoperative discomfort. Understanding this link aids in tailored pain management. This study assesses preoperative pain's predictive value for postoperative pain, aiming to enhance perioperative care guidelines and improve surgical patient outcomes.

Methods: Before surgery, patients underwent pre-anesthetic evaluation, including history-taking, vital signs assessment, and basic tests. They were instructed on using a VAS slide ruler to rate pain. Oral medications were administered, and a research investigator cannulated a vein, recording pain levels. Anesthesia comprised propofol, fentanyl, and vecuronium bromide for laparoscopic cholecystectomy. Postoperatively, pain severity was monitored, with fentanyl administered as needed.

Results: The study comprised 130 members, with a mean age of 36.15 ± 11.13 years and 28.5% males. ASA grade distribution was 46.9% grade I and 53.1% grade II. Mean intraoperative fentanyl dose was 114.08 ± 29.64 mg. Preoperative VAS scores varied between venous cannulation and propofol injection. Postoperative fentanyl dosing and timing varied, with significant differences observed in VAS scores.

Conclusion: Preoperative assessment of pain during venous cannulation and propofol infusion is vital. Tailored pain management is crucial, aiming to maintain postoperative pain below 4.0 VAS units. Reduced pain threshold during these procedures correlates with lower likelihood of postoperative discomfort. Preoperative pain assessment can be easily conducted at the bedside, potentially improving patient outcomes.

Keywords: Postoperative Pain, Preoperative Assessment, Venous Cannulation, Propofol Infusion, Tailored Management.

Introduction

Peripheral venous cannulation and propofol infusion are common procedures performed in preoperative settings to facilitate anesthesia induction and ensure patient comfort during surgery. [1] However, these interventions can sometimes induce pain and discomfort in patients, which may contribute to their overall experience of postoperative pain.

Preoperative pain assessment is crucial as it not only influences patient satisfaction but also has implications for postoperative pain management strategies. Peripheral venous cannulation involves the insertion of a needle into a superficial vein, which can cause varying degrees of discomfort depending on factors such as vein size, technique, and patient sensitivity. [2] Similarly, propofol infusion, a common intravenous anesthetic agent, can sometimes elicit pain upon injection due to its chemical properties and rapid onset of action.

Understanding the relationship between preoperative pain from these procedures and postoperative pain can help healthcare providers anticipate and address pain more effectively. By identifying patients who are more likely to experience postoperative pain based on their preoperative pain responses, tailored pain management approaches can be implemented,

potentially improving overall patient outcomes and satisfaction. [3, 4]

This study aims to contribute to the growing body of literature on perioperative pain management by providing insights into the predictive value of preoperative pain induced by peripheral venous cannulation and propofol infusion. Ultimately, the findings may inform clinical practice guidelines and enhance the quality of care for surgical patients.

Methods

It was a prospective, randomised, double-blind study, conducted in the department of Anaesthesia, GSL Medical College, Rajahmundry. Study was conducted between November 2020 to April 2022. Study protocol was approved by the Institutional Ethics Committee. Informed written consent was taken from the study members.

The study included patients meeting specific criteria: ASA grades 1 and 2, aged between 18 and 65 years, and scheduled for laparoscopic cholecystectomy. Patients who were unwilling to participate, had a history of chronic pain, demonstrated an inability to understand instructions, or had contraindications to the study drugs were excluded from the study. Additionally, individuals undergoing open cholecystectomy or with a history of opioid addiction were also excluded.

Before anesthesia administration, patients underwent pre-anesthetic evaluation including history-taking and vital signs assessment. Clinical signs and symptoms were noted, and basic tests such as full blood count, blood type, blood urea, and serum creatinine levels were conducted to ensure patient safety and readiness for anesthesia. Before surgery, patients received instructions on using a horizontal VAS slide ruler to rate their pain level. They were administered oral pantoprazole (40 mg) and ondansetron (8 mg) two hours prior. During preoperative preparation, a research investigator cannulated a vein on the hand dorsum with an 18-gauge cannula, recording pain levels using a VAS. [5] Similarly, propofol infusion pain was assessed via VAS after a 30mg dose. Anesthesia was induced consistently with propofol (2 mg/kg), fentanyl (1.5 µg/kg), and vecuronium bromide (0.1 mg/kg) before laparoscopic cholecystectomy. Postoperatively, pain severity was monitored every 10 minutes, with fentanyl administered for VAS ≥4.0. Parameters included pain scales, extubation-fentanyl interval, and total fentanyl within 90 minutes. Open cholecystectomy cases were excluded.

Statistical Analysis: Statistical analysis was performed by using SPSS software version 20.0 and MS excel-2007. Descriptive data were tabulated as mean ± standard deviation and percentages. Data were also tabulated and graphically represented. The Chi-square test was used to assess the association among various categorical variables. For all statistical analyses $P<0.05$ was considered statistically significant.

Results

Total 130 members were included, mean age was 36.15± 11.13 yrs, 37 (28.5%) were male, 46.9% of patients belong to ASA grade I and 53.1% of patients belong to ASA grade II. The mean intra-operative fentanyl dose was 114.08 ± 29.64 mg. The average pre-surgical VAS score for venous cannulation was 2.13 ±0.79, ranging from 1 to 3. For propofol injection, the mean preoperative VAS score was 2.91 ±0.8, ranging from 2 to 4.Mean post-operative fentanyl dose in patients was 65.91 ± 32.96. The average time for the first dose of fentanyl postoperatively was 35.06 ± 26.49 minutes, ranging from 2 to 90 minutes. The mean heart rates ranged from 79.49 to 84.96 beats per minute. There was a significant difference between preoperative VAS scores during peripheral cannulation and postoperative VAS scores at 0, 10, 20, and 90 minutes ($p < 0.05$). However, average VAS ratings were similar at 30 and 60 minutes ($p > 0.05$). In the study, 45% of patients with preoperative VAS ≤ 2 had postoperative VAS < 4, while 55% had VAS ≥ 4. Conversely, 8% with preoperative VAS > 2 had VAS < 4 postoperatively, while 92% had VAS ≥ 4. The frequency of patients with preoperative VAS > 2 and postoperative VAS ≥ 4 significantly increased ($p < 0.0001$).

Discussion

Uncontrolled postoperative pain poses a significant challenge for surgical patients, impacting rehabilitation, quality of life, and potentially leading to chronic pain. Failure to manage it effectively can impede recovery and diminish overall well-being, emphasizing the crucial need for comprehensive pain management strategies to mitigate its adverse effects and promote better patient outcomes. [6] Patients undergoing peripheral venous cannulation before surgery commonly report pain, influenced by factors such as cannula site, size, failed venipuncture attempts, and procedure duration. These variables contribute to the intensity of pain experienced during the process, highlighting the importance of optimizing techniques to minimize discomfort and enhance patient experience. [7, 8]

In this study, the mean preoperative VAS score for venous cannulation was 2.13 ± 0.79, ranging from 1 to 3, while propofol injection resulted in a mean preoperative VAS score of 2.9 ± 0.8, ranging from 2 to 4. In a study by Peng et al. [9] the median VAS score during peripheral venous cannulation was 1.8, ranging from 1.4 to 2.6. Another study by Yung et al. [10] reported a preoperative mean pain threshold of 141.0 ± 65.0 kPa and mean pain tolerance of 223.0 ± 62.0 kPa. These findings provide insights into the varying degrees of pain experienced during

different preoperative procedures, highlighting the need for tailored pain management approaches. Whereas the mean postoperative fentanyl dose was 65.91 ± 32.96 mcg, ranging from 25 to 100 mcg. In research by Wang et al. [9] the median additional dose of sulfentanil was 3.18 mcg, with doses ranging from 0 to 12.56 mcg. According to Yung et al. [10] patients consumed an average of 21.0 ± 6.0 mg of morphine in the first 24 hours, with the lowest dosage administered.

Patients with a preoperative VAS score below 2 were more inclined to have a postoperative VAS score below 4, while those with a preoperative VAS score below 2 were also more likely to have a postoperative VAS score above 4. Conversely, 22.8% of patients with a preoperative VAS score above 2 had a postoperative VAS score below 4, while 77.2% had a VAS score above 4. The likelihood of postoperative VAS scores below 4 significantly increased for patients with preoperative VAS scores above 2 ($p < 0.0001$). Persson et al. [11] discovered that patients reporting discomfort above 2.0 VAS units after venous cannulation experienced more severe postoperative pain and required earlier and increased opioid administration. Maintaining postoperative pain at manageable levels, typically below 4.0 VAS units, is widely recognized as a crucial objective of clinical anesthesia therapy. Peng et al. [12] also presented similar findings.

Thomas et al. [13] discovered that McGill Pain Questionnaire's VAS and Present Pain Intensity (PPI) effectively measured pain levels. Postoperative pain ranged from mild to moderate, decreasing over days, then increasing one month post-surgery. Hip replacement patients reported significantly less total pain. Nurses' assessments of pain were significantly lower than patients' self-reports. Female sex, high preoperative pain intensity, and other factors were predictors of worse pain experience and low satisfaction.

Uncontrolled postoperative pain hampers recovery and quality of life. Preoperative assessment of pain during venous cannulation and propofol infusion is vital. Tailored pain management is crucial, aiming to maintain postoperative pain below 4.0 VAS units. Reduced pain threshold during these procedures correlates with lower likelihood of postoperative discomfort. Preoperative pain assessment can be easily conducted at the bedside, potentially improving patient outcomes.

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