

ORIGINAL RESEARCH

Study of Analysis of Intraoperative Depth of Anesthesia on Postoperative Pain and Analgesics Usage

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ABSTRACT

Background: A universally acknowledged consequence of surgical procedures is the experience of pain, which is inherently subjective and varies in intensity among individuals. The present study was conducted for assessing pattern of utilization of analgesics in perioperative cases. **Materials & Methods:** 100 patients undergoing laparoscopic cholecystectomy were randomly assigned to either a Standard Practice group or a BIS Titrated group, where anesthetic depth was adjusted to achieve a specific Bispectral Index (BIS) value. Postoperative pain levels were evaluated using the Visual Analogue Scale (VAS) and compared pain management outcomes between the two groups. **Results:** Mean age of the patients of group 1 and group 2 was 33.6 years and 35.9 years respectively. Mean duration of surgery among patients of group 1 and group 2 was 62.3 mins and 58.1 mins respectively. Mean BIS value among patients of group 1 and group 2 was 65.7 and 46.7 respectively. Mean rescue analgesic requirement among patients of group 1 and group 2 was 2.39 mg and 1.08 mg respectively. Mean VAS among patients of group 1 and group 2 was 61.3 and 77.9 mg respectively. **Conclusion:** Sustaining a BIS value between 40 and 45 during surgical procedures is associated with a reduction in postoperative pain intensity and a diminished need for rescue analgesics, all while avoiding any adverse effects.

Key words: Postoperative Pain, Analgesia, Intraoperative.

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INTRODUCTION

A universally acknowledged consequence of surgical procedures is the experience of pain, which is inherently subjective and varies in intensity among individuals. Concerns regarding postoperative pain are prevalent among both patients and healthcare providers, as inadequate management of this pain can trigger the release of catecholamines and metabolic hormones. Such physiological responses may lead to stress-related complications, including fluid retention and hemodynamic disturbances, characterized by significant increases in blood pressure and heart rate.¹⁻³ In older patients, these factors can exacerbate risks such as excessive bleeding and myocardial infarctions. Furthermore, insufficient pain

management during the postoperative phase can hinder patient mobility, prolong hospital stays, and disrupt rehabilitation efforts. Implementing effective anesthesia and analgesia techniques for surgical patients can significantly mitigate healthcare costs and reduce patient morbidity.⁴⁻⁶ In 2005, a groundbreaking investigation conducted by Monk et al. sought to explore novel variables, specifically the duration of deep hypnosis characterized by low Bispectral Index values and the duration of intraoperative hypotension, as potential risk factors for long-term postoperative mortality occurring one-year post-surgery. The researchers indicated that the relative risk of mortality associated with deep hypnotic time (DHT, defined as the total duration of

Bispectral Index values below 45) and intraoperative systolic hypotension was calculated to be 1.244 per hour and 1.036 per minute, respectively. Additionally, another study corroborated the relative risk of 1.244 per hour in relation to BIS values falling below 45; however, the authors were unable to determine whether this association was causal or merely coincidental. As anticipated, these results sparked considerable debate and critique within the scientific community, given that numerous other factors could influence mortality rates over extended study durations.⁷⁻⁹ Hence; the present study was conducted for assessing pattern of utilization of analgesics in perioperative cases.

MATERIALS & METHODS

A cohort of 100 participants aged between 30 and 50 years were recruited for the study. Only those individuals scheduled for laparoscopic cholecystectomy were included in the enrollment. A pre-anesthetic evaluation was conducted to determine the suitability of each patient for the planned surgical intervention under general anesthesia. The Visual Analogue Scale (VAS), ranging from 0 to 100, was introduced to the patients, where 0 indicated no pain and 100 denoted the most severe pain imaginable. Participants were randomly assigned to either the Standard Practice group (Group 1), in which anesthetic depth was managed according to established protocols and Bispectral Index (BIS) values were recorded, or the BIS Titrated group

(Group 2), where anesthetic depth was adjusted to achieve a BIS value between 40 and 45, with additional propofol administered as necessary. Continuous monitoring was performed, including electrocardiogram, heart rate (HR), non-invasive mean arterial pressure (MAP), minimum alveolar concentration (MAC), and BIS. Approximately 15 minutes prior to the cessation of anesthesia, each patient received an intravenous dose of 1 mg/kg of tramadol and ondansetron to mitigate pain and nausea, respectively. Following the surgical procedure, the administration of isoflurane and propofol was halted, the residual neuromuscular blockade was reversed, and extubation was performed once the patients were alert and demonstrated adequate respiratory function. Postoperative pain levels were evaluated by a blinded observer using the VAS scoring system. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

RESULTS

Mean age of the patients of group 1 and group 2 was 33.6 years and 35.9 years respectively. Mean duration of surgery among patients of group 1 and group 2 was 62.3 mins and 58.1 mins respectively. mean BIS value among patients of group 1 and group 2 was 65.7 and 46.7 respectively. Mean rescue analgesic requirement among patients of group 1 and group 2 was 2.39 mg and 1.08 mg respectively. Mean VAS among patients of group 1 and group 2 was 61.3 and 77.9 mg respectively.

Table 1: Intraoperative data

Variable	Group 1	Group 2	p-value
Duration of surgery (mins)	62.3	58.1	0.72
MAC of isoflurane	0.91	0.93	0.16
BIS value	65.7	46.9	0.00*
Mean heart rate (bpm)	82.3	80.7	0.59

*: Significant

Table 2: Postoperative variables

Postoperative variables	Group 1	Group 2	p-value
Time to eye opening (mins)	8.12	11.35	0.00*
Nausea/ vomiting	56 %	18%	0.00*
Rescue morphine (mg)	2.39	1.08	0.01*
VAS	61.3	77.9	0.03*

*: Significant

DISCUSSION

Effective postoperative pain management has been associated with enhanced recovery times, the prevention of long-term post-surgical pain, and a reduction in hospital stay. Acute pain stimulates an endocrine-metabolic response. Recent studies have suggested that deeper anaesthesia could attenuate this response and decrease postoperative pain.^{10,11} Hence; the present study was conducted for assessing pattern of utilization of analgesics in perioperative cases. Mean age of the patients of group 1 and group 2 was 33.6 years and 35.9 years respectively. Mean duration

of surgery among patients of group 1 and group 2 was 62.3 mins and 58.1 mins respectively. mean BIS value among patients of group 1 and group 2 was 65.7 and 46.7 respectively. Mean rescue analgesic requirement among patients of group 1 and group 2 was 2.39 mg and 1.08 mg respectively. Mean VAS among patients of group 1 and group 2 was 61.3 and 77.9 mg respectively. Similarly, Sahni N et al studied the impact of intraoperative anesthesia depth on postoperative pain in 80 patients undergoing laparoscopic cholecystectomy. Patients were divided into two groups: Group S (standard anesthesia) and

Group B (BIS-guided anesthesia, targeting a BIS value of 40-45). Results showed that Group B had lower mean arterial pressure, reduced postoperative pain scores, and decreased need for rescue analgesics, highlighting the benefits of BIS-guided anesthesia in improving pain management.¹⁰ Faiz SHR et al studied the impact of anesthesia depth on postoperative pain in 60 patients undergoing laparoscopic cholecystectomy. Patients were divided into two groups based on bispectral index (BIS): L-BIS (35-44) and H-BIS (45-55). Results showed that the L-BIS group had significantly lower pain scores, reduced need for supplementary sedatives, and decreased nausea and vomiting compared to the H-BIS group, suggesting that a lower BIS during anesthesia is associated with improved pain management and reduced postoperative symptoms.¹¹

CONCLUSION

Sustaining a BIS value between 40 and 45 during surgical procedures is associated with a reduction in postoperative pain intensity and a diminished need for rescue analgesics, all while avoiding any adverse effects.

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