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EVALUATION OF THE HEMODYNAMIC EFFECT OF INTRAVENOUS LIDOCAINE ON PROPOFOL

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ABSTRACT Consciousness is a complex state that can be divided into two components, namely, arousal and awareness, with both individually blocked by anesthetic Awareness is the ability to process and store information that can be used to interact with internal or external environment. Aim is to evaluate hemodynamic changes of intravenous lidocaine in reducing requirements of propofol during general anesthesia as monitored by the Bi Spectral Index (BIS). 40 ASA I and II patients posted for elective laparoscopic cholecystectomy were enrolled in the study. study concluded that intravenous lidocaine in the form of bolus followed by infusion reduces the propofol requirements to maintain BIS between 40 and 60, which is required to prevent intraoperative awareness and recall. It also significantly maintains the hemodynamic stability throughout the procedure and reduces the intraoperative analgesic requirements in patients undergoing laparoscopic surgeries.

KEYWORDS : lidocaine, profopol, spectral index, hemodynamic effects

1.INTRODUCTION

General anesthesia can be defined as a drug-mediated reversible depression of the central nervous system resulting in the absence of response to and lack of perception of all external stimuli. The various components of anesthesia include unconsciousness, analgesia, amnesia, immobility, and suppression of autonomic responses to noxious stimulation.Consciousness is a complex state that can be divided into two components, namely, arousal and awareness, with both individually blocked by anesthetics. Awareness is the ability to process and store information that can be used to interact with internal or external environment. In contrast, arousal or wakefulness is the state of receptivity to the external environment and is likely mediated through subcortical structures such as the reticular activating system (RAS). An inadequate general anesthesia results in intraoperative awareness with or without recall and the consequent postoperative morbidity. Intraoperative electrophysiological monitoring using Bi Spectral Index (BIS) allows a reproducible, objective and continuous measurement of depth of anesthesia, even during the period when the patient is paralyzed and all reflexes are abolished.[1] BIS monitor consists of a sensing electrode placed on the patient's forehead which reads out the patient's EEG in the form of a non-attributable number in the range of 0 to 100, by means of an integrated custom software. This value helps the anesthesiologist in assessing the conscious state of the patient and in modifying the dose of anesthetic drugs to maintain an adequate depth of anesthesia.[2] Systemic lidocaine infusion has been used in several studies to assess its benefits on the outcome of anesthesia. Having inflammation-modulatory properties, it significantly reduced pain. Similarly, studies have shown that intravenous lidocaine infusion causes a decrease in the minimum alveolar concentration (MAC) of volatile anesthetic agents, thereby decreasing their requirement. There have been some studies postulating the reduction in intravenous anesthetic requirements by using lidocaine infusion.This study aims at evaluating hemodynamic changes of intravenous lidocaine in reducing requirements of propofol during general anesthesia as monitored by the Bi Spectral Index (BIS). The BIS index is maintained between 40 and 60 to maintain an adequate depth of anesthesia, and the anesthetic agents are titrated accordingly.

2. AIMS

Evaluation hemodynamic changes of intravenous lidocaine in reducing requirements of propofol during general anesthesia as monitored by the Bi Spectral Index (BIS).

3. METHODS AND MATERIALS

After obtaining institutional ethical committee approval, an informed written consent was obtained from all the patients participating in the study. 40 ASA I and II patients posted for elective laparoscopic cholecystectomy were enrolled in the study.

INCLUSION CRITERIA

- ASA I and II status
- Age 18-60 years
- Both sex
- Undergoing elective laparoscopic cholecystectomy

EXCLUSION CRITERIA

- Age <18 and >60 years
- Unwillingness to participate in the study
- Patients with BMI >35
- Patients with history of allergic reaction to lidocaine
- Patients with history of seizures, drug or alcohol abuse

METHODOLOGY

The patients were randomly allocated into two groups – Group L and Group C.

The patients' baseline pulse rate, blood pressure and SpO2 were noted preoperatively outside the operating theatre. No preoperative anxiolytics were given to the patient. Inside the OT, the following monitors were attached:

- BIS monitor
- Pulseoximetry
- NIBP
- Capnography (intraoperatively)
- ECG

Separate infusion pumps for either lidocaine or saline prepared by separate staff blinded to the study, were kept ready. After checking the anesthesia machine (Drager workstation), and with all emergency drugs at hand, the procedure was commenced.

All patients were premedicated with Inj. Glycopyrrolate sodium 0.2 mg i.v. 15 minutes prior to surgery. All patients were preoxygenated with 100% oxygen and induced with Inj. Fentanyl citrate 2 µg/kg i.v. and Inj. Thiopentone sodium 5 mg/kg i.v. or till BIS drops to 40, and intubation facilitated with Inj. Succinylcholine 1.5-2 mg/kg i.v. and endotracheal tube of size 8.0-8.5 ID for men and 7.0-7.5 ID for women was used. Intubation stress was attenuated with Inj. Lidocaine 1.5 mg/kg i.v. in Group L. Saline was used in Group C.

Following intubation, anesthesia was maintained with N2O:O2 at 2:1 and propofol infusion at 50-150 µg/kg/min, which was titrated to maintain the BIS value between 40 and 60. Infusion of lignocaine was started at 2 mg/kg/hr in Group L and in Group C, saline infusion was started.

The patients were put on ventilator – controlled mode with tidal volume of 7-10 ml/kg, Respiratory rate of 12-16/minute according to

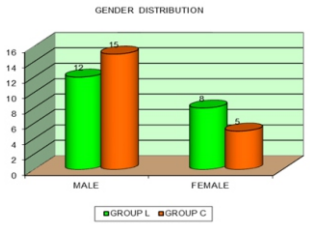
EtCO2, PEEP of 3-5 cmH2O.

Parameters monitored:

- Pulse rate
- Blood pressure
- SpO2
- BIS
- EtCO2

4. RESULTS AND DISCUSSION

FIGURE1 : SEX DISTRIBUTION



HEART RATE	GROUP L		GROUP C		P
	MEAN	SD	MEAN	SD	
Pre Op	90.9	8.614	91.6	8.714	0.913
5 MIN	88.2	8.08	92.86	9.25	0.042
15 MIN	84.2	5.822	88.1	5.693	0.011
30 MIN	76.6	4.784	76.95	4.43	0.812
1 HR	76.7	6.342	77.15	6.235	0.94
1.5 HR	81.15	7.058	81.45	7.073	0.87
END	76.15	5.344	76.45	5.365	0.86

TABLE 1: HEART RATE COMPARISION

FIGURE 2 : COMPARISION OF SYSTOLIC BP

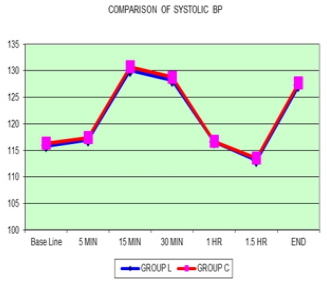


FIGURE 3: COMPARISION DIASTOLIC BP

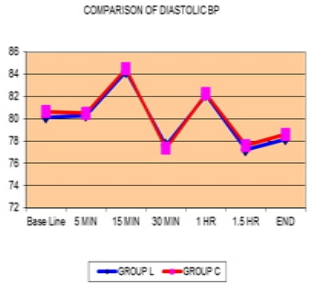
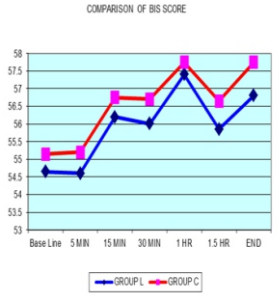


FIGURE 4 COMPARISION OF BIS SCORE



The two groups, Group L (lignocaine) and Group C (control) were comparable with respect to the demographic data like age, sex, weight. Duration of surgery was also comparable between the two groups. The flow rates were also same throughout the procedure and intraoperatively, the BIS value was maintained between 40 and 60, with average BIS value showing no significance.

The study group was blinded to the investigator, and the hemodynamic parameters like heart rate, blood pressure and SpO2 were monitored. Only the mean heart rate showed a significant fall in the lidocaine group at 5 and 15 minutes after intubation, suggesting the pressor attenuation action of lidocaine. Otherwise, all other hemodynamic variables did not show any statistical difference between the two groups, suggesting that lidocaine does not produce great hemodynamic stability. Bi Spectral monitoring system was first introduced for clinical use in October, 1996, to monitor the outcome of anesthetic agents. In 2003, the Food and Drug Administration (FDA) allowed for another clinical indication which states: "Use of BIS monitoring to help guide anesthetic administration may be associated with the reduction of the incidence of awareness with recall in adults during general anesthesia and sedation.[3]" The BIS Index is derived from a complex EEG parameter combining several variables from the frequency domain and the time domain, analyzed in real time. The BIS Index is a dimensionless number between 0 and 100 arranged in a scale that gives important clinical end points and status of EEG during general anesthesia.Non anesthetized awake patients have a BIS of 90 and 100, and 0 represents total cortical silence. Readings over 70 is suggestive of patients most likely to be conscious and probably able to obey oral commands and recall events. The optimal BIS for general anesthesia with lesser propensity of explicit recall and non-responsiveness to oral commands is between 40 and 60. A BIS value below 40 corresponds to deep sedation with increased probability of burst suppression. The values represented by the BIS Index are mainly markers of decreased cerebral metabolic rate caused by most anesthetic agents. There is a significant cause and effect relationship between BIS values and fall in cerebral metabolic activity occurring during general anesthesia. However, physiological factors like thermoregulation can also influence cerebra metabolism resulting in subtle changes in the BIS value.[4] In a study done by Hans et al.,[5] titled, "Intravenous lidocaine infusion reduces BIS guided requirements of propofol only during surgical stimulation," 40 patients were tested for the effect of intravenous lignocaine given as 1.5 mg/kg bolus followed by 2 mg/kg/hour, on the requirements of propofol. The results of this randomized controlled study showed that lidocaine decreased propofol requirements only during surgery. There was no effect on the BIS values in the absence of surgical stimulation. There was also a stable hemodynamic picture during surgery suggesting that the sparing effect of lidocaine on anesthetic requirements was mediated by an anti-nociceptive action. A study was conducted by Nakayama et al.[6], titled "The effects of intravenous lidocaine infusion on hospital stay after major abdominal pediatric surgery," which investigated the effect of perioperative lidocaine infusion on hormonal responses, bowel function and hospital stay after major abdominal surgeries in pediatrics. 80 children were randomly allocated into two groups of 40 each. Those in the placebo group were given normal saline and those in the study group were given continuous lidocaine infusion at 1.5 mg/kg/hour continued until 6 hours postoperatively. The study showed that there was a significant reduction in the pressor response to intubation, and also decreased the duration of hospital stay. It was also found that return of bowel function was earlier in the lidocaine group and postoperative opioid requirements were significantly lesser in the lidocaine group

5. CONCLUSION

The parameters monitored the hemodynamic variables, namely heart rate, blood pressure. The intraoperative BIS values were recorded throughout the procedure. the hemodynamic variables did not show significant variation between the two groups, except during the first few minutes after intubation when the heart rate increase to pressor response was significantly reduced in the lidocaine group.Thus, our study concluded that intravenous lidocaine in the form of bolus followed by infusion reduces the propofol requirements to maintain BIS between 40 and 60, which is required to prevent intraoperative awareness and recall. It also significantly maintains the hemodynamic stability throughout the procedure and reduces the intraoperative analgesic requirements in patients undergoing laparoscopic surgeries.

6. REFERENCES

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