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COMPARATIVE EVALUATION OF PROPOFOL VS KETAMINE ON INTRAOPERATIVE HEMODYNAMIC STABILITY IN PATIENTS UNDERGOING PERFORATED LAPAROTOMY

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Abstract

Background: Intraoperative hemodynamic stability is of great importance in emergency patients like perforated laparotomy. Type of anesthetic induction is of critical importance in the shaping of responses of the heart. Propofol has been widely adopted and is linked to hypotension, but ketamine ensures cardiovascular stability by its sympathomimetic action.

Objective: The aim of the study was to evaluate the impact of propofol and ketamine on intraoperative hemodynamic stability in perforated laparotomy patients.

Methodology: Cross-sectional research was carried out in two tertiary care hospitals in Lahore involving 80 patients who were divided into two groups: ketamine (Group A) and propofol (Group B). The information about the demographic features, intraoperative hemodynamic variables, challenges, postoperative hypotension, adverse effects, and patient satisfaction was gathered and examined on the basis of SPSS.

Results: Ketamine was found to be more hemodynamically stable, there was less postoperative hypotension (22.5% vs

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27.5) and reduced postoperative side effects. Propofol on the contrary had fewer intraoperative complications (17.5% vs 27.5) and more easily induced and a better intraoperative stability. The satisfaction of the patients and recommendations were better in the ketamine group.

Conclusion: They are both effective nonetheless, ketamine is effective in hemodynamically unstable conditions which are better than propofol in healthy conditions, since it induces more smoothly.

Introduction

Patient safety and hemodynamic stability are key considerations for patient safety in general anesthesia, especially in high-risk surgical procedures. The induction agents have a profound effect on cardiovascular parameters such as heart rate, blood pressure and mean arterial pressure. Common IV anesthetic agents with different cardiovascular effects include propofol and ketamine. Propofol is a very fast and smooth induction agent, but can cause hypotension because of systemic vasodilation and myocardial depression. In contrast, ketamine, in general, is stable on the cardiovascular system by stimulating the sympathetic nervous system. The differences emphasize the need to choose an induction agent based on the patient's hemodynamic status (1).

In patients with poor circulatory function maintaining cardiovascular stability during abdominal surgery is especially difficult. Gastrointestinal perforation can be accompanied by hypovolemia, sepsis and by significant hemodynamic disturbances, which may require an emergency laparotomy. Hypotension that occurs during propofol administration may further impair tissue perfusion, particularly in patients with decreased blood volume. Ketamine may be a viable alternative as it has sympathomimetic effects that maintain cardiac output, blood pressure and heart rate. Additionally, high doses of the drug ketamine can stimulate the cardiovascular system and cause rapid pulse and high blood pressure. For this reason, it is all the more vital to compare the hemodynamic effects of such agents to enhance anesthetic management in high-risk abdominal surgery (2).

Patients who have undergone emergency laparotomy with a perforation are at risk of hemodynamic instability as a result of sepsis and hypovolemia. Propofol can lead to hypotension and ketamine can prevent cardiovascular instability due to its sympathomimetic activity. But little direct comparison of these agents has been carried out in patients undergoing perforated laparotomy. The goal of this study is to compare their effects on HR, MAP and vasopressor requirement. Both the findings could help to identify a better anesthetic induction agent, reduce complications and increase patient safety.

LITERATUIRE REVIEW

Smith et al., (2016) performed a randomized controlled trial of 114 adult surgical patients who were scheduled for elective surgery to investigate the hemodynamic effects of induction with propofol versus ketamine. According to the study, propofol induced a significant decrease in mean arterial pressure (MAP), while the MAP remained relatively stable in the group receiving ketamine. The sympathomimetic properties of ketamine resulted in a better preservation of blood pressure and heart rate in patients receiving ketamine. The results indicated that ketamine could have a positive effect on patients who are at risk of perioperative hypotension. It, however, was

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confined to elective surgical patients and thus did not apply to the emergency laparotomy patients with hemodynamic instability (1).

Johnson et al., (2017) investigated the cardiovascular effects of intravenous anesthetic agents in 120 patients who were undergoing abdominal surgery. The study found that giving propofol caused a large drop in both systolic and diastolic blood pressure, especially in the first five minutes after induction. Those with hypovolemia had more hypotensive reactions and needed more fluid and vasopressor therapy. The results underscored the cardiovascular depressing effects of propofol and the need for prudent selection of anesthetic agents for high-risk patients. This study had not analyzed the outcomes of the surgery, however, thus the analysis of the outcomes of surgery in emergency abdominal surgery needs to be done further in order to assess it properly (2).

Lee et al., (2018) studied the effects of propofol and ketamine on heart rate variability during the induction of anesthesia in 90 patients undergoing laparoscopic abdominal surgery. In the study, it was reported that the HRV was decreased after propofol administration, due to the suppression of sympathetic activity, while HRV was preserved after ketamine. Ketamine was also known to have reduced the amount of opioids needed due to its pain-relieving effects. Based on these findings, ketamine could be useful for maintaining hemodynamic stability during surgical stress. The study was not randomized, however, and it did not include patients with significant comorbidities, so it is not generalizable to high-risk emergency surgical patients (3).

Patel et al., (2019) PERFORMED a randomized controlled trial that included 100 adult patients receiving emergency abdominal surgery and compared the hemodynamic effects of propofol and ketamine in these patients. The frequency of hypotension was more common in the propofol group with 38% of patients requiring vasopressor support compared with 10% of patients in the ketamine group. Because ketamine has sympathomimetic properties, it was more effective in maintaining MAP. Transient tachycardia, however, occurred more often in patients who received ketamine. The results indicated that there was a greater cardiovascular stability in high-risk surgical patients undergoing emergency surgery, which may continue to be explored with the use of ketamine (4).

MATERIAL AND METHODS

A cross-sectional study was conducted at Fatima Memorial Hospital, Lahore, over a period of 6–8 months. A total of 80 patients were selected using a convenience sampling technique and divided into two groups: Group A (Ketamine) and Group B (Propofol). Data were collected using a structured clinical proforma containing demographic information, anesthetic induction agents, heart rate, systolic and diastolic blood pressure, mean arterial pressure, intraoperative complications, and vasopressor requirements. The collected data were analyzed using SPSS version 28. Independent t-tests, Mann–Whitney U tests, Chi-square tests, and repeated-measures ANOVA were used as appropriate. A p-value of less than 0.05 was considered statistically significant.

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RESULTS

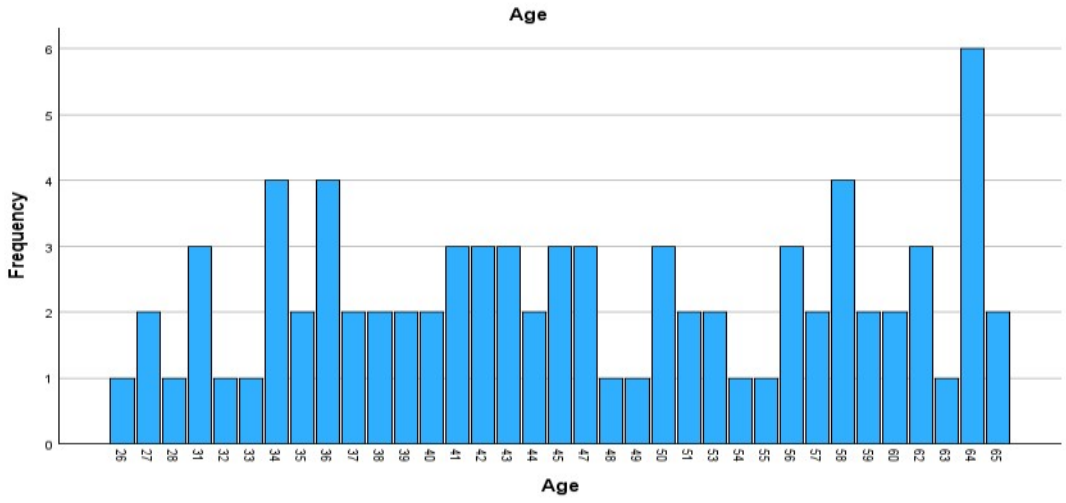
Table: The demographic profile of patients

	Group A(Ketamine patients)	Group B(Propofol patients)
Weight(kg) Mean±(SD)	77.09±11.06	72.77±12.88
Height(feets) Mean±(SD)	5.82±0.40	5.73±0.41

The average patient weight of patients in Group A (Ketamine patients) was 77.09 kg with a standard deviation of 11.06 and shows that the body weight of the patients did not have a high variability. The average height was 5.82 feet and the standard deviation was 0.40 which indicated a fairly homogeneous distribution of height amongst group. Group B (Propofol patients) had a standard deviation of 12.88 and a mean, which is 72.77 kg, as there was a greater range of weight values among patients in this group. The average height of this group was 5.73 feet with a standard deviation of 0.41 giving the group the same measure of variation in height as the Group A.

Figure: Frequency of patient age.

The age structure is varied and it was in the mid 20s to late 60s. The majority of patients lie in the range between 3560 years, which means that mostly they are middle-aged people.



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Figure: Visualizing frequency of recommendation in ketamine patients group.

Among the ketamine patients (n = 40), a colossal proportion of the respondents expressed that they would recommend the treatment, with 37 patients (92.5%) giving Yes(s), and just 3 patients (7.5%) giving No(s).

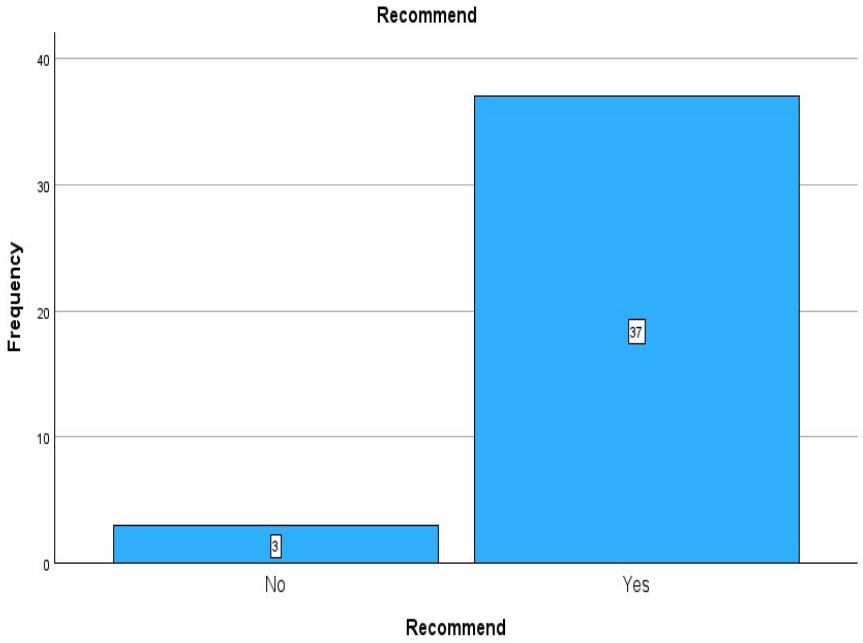
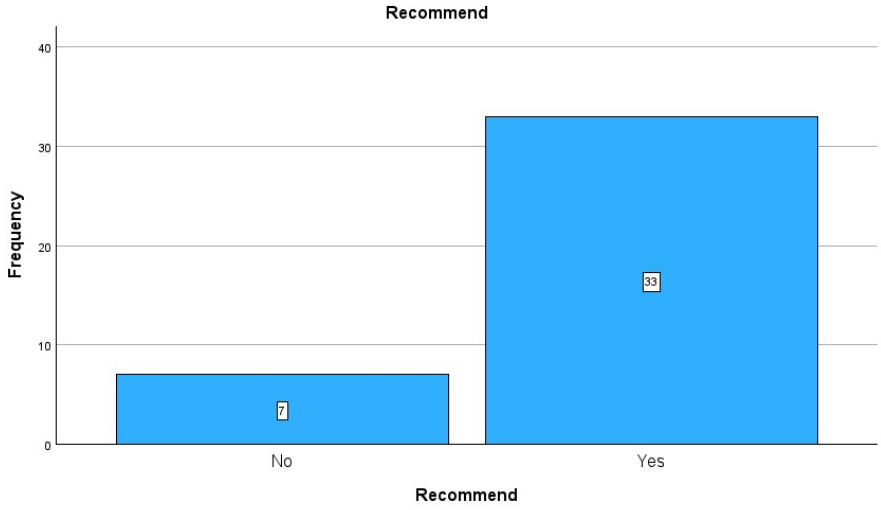


Figure: Displaying the frequency of recommendation among propofol patients group.



As shown in the figure, most of the patients who were on the propofol group recommended the intervention. A high degree of satisfaction or acceptance was observed as 33 out of the total sample (82.5) responded Yes. Conversely, there were 7 patients (17.5%) who answered No.

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DISCUSSION

The aim of the study was to compare propofol and ketamine in terms of maintaining an intraoperative hemodynamic stability in 80 patients subjected to perforated laparotomy. The results showed that rate of postoperative hypotension was lower in the ketamine group (22.5%) than in the propofol group (27.5%). The results are similar to the study reported by Smith et al (2016), in which 114 elective surgical patients were studied, who found that propofol resulted in a substantial decrease in mean arterial pressure, while ketamine caused relatively stable cardiovascular parameters. A sympathomimetic activity is proposed to offer greater cardiovascular support, which is why both studies indicated that ketamine may be superior. The subject of the present study, however, was patients with perforated laparotomy in emergency as compared to Smith et al., who studied elective surgical patients.

In this study, it was found that ketamine has less association with postoperative hypotension than propofol, suggesting that it may be useful in maintaining the stability of cardiovascular systems. The results are in line with Johnson et al. (2017) who observed a significant decrease in SBP and DBP during propofol induction among 120 patients who received induction of abdominal surgeries. The investigators also noted that the hypovolemic patients had larger hypotensive responses, and were more likely to need more fluid and vasopressor doses. The same is true of the present study, which emphasizes the possible cardiac benefits of ketamine in emergency perforated laparotomy. The present study, however, specifically compared both induction agents in “emergency” surgical patients, while Johnson et al. studied a larger population of patients undergoing abdominal surgery.

Our study showed that there were differences between hemo-dynamic outcome of propofol versus ketamine, such as fewer cases of postoperative hypotension in the ketamine group. The results are similar to Lee et al. (2018), who studied 90 patients undergoing laparoscopic abdominal surgery, and found that propofol caused a decrease in HRV as it suppressed sympathetic activity while ketamine had a more favorable effect on autonomic cardiovascular regulation. Both studies demonstrate the significance of using the correct anesthetic to keep the heart functioning during surgery. The present study, however, was applied to the patients who underwent an emergency perforated laparotomy, while Lee et al. were applied to laparotomy abdominal surgery. Moreover, the present study found hypotension as a postoperative complication, but did not directly measure HRV.

CONCLUSION

The result of this study has shown that Ketamine was superior in hemodynamic stability, as there was a lower rate of hypotension in postoperative (22.5 vs 27.5) probably because of its sympathomimetic effect in ensuring blood pressure. Propofol on the other hand had a lower incidence of intraoperative complications (17.5% vs 27.5%) and induced smoother conversion with better intraoperative stability. This is an indication that propofol is more appropriate in the controlled and stable conditions. Comprehensively, ketamine should be used when patients are at risk of hemodynamic unsteadiness, particularly in emergency surgeries whereas propofol can be used in stable patients because of its less convulsing induction nature.

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RECOMMENDATIONS

To have a consistent and safe anesthetic practice, hospitals must develop clear guidelines on the choice of the induction agents to use during emergency surgeries. The pharmacological effects and clinical implications of propofol and ketamine should be provided to the anesthesia professionals on a regular basis. High-risk patients need to be identified with the help of preoperative assessment tools, and the most suitable induction agent must be selected. Emergency laparotomy patients are supposed to be followed closely during the postoperative phase to prevent detection and adverse management of complications in time. Proper documentations and regular audits should be maintained in hospitals to assess the outcomes with regard to various anesthetic agents and enhance the clinical practice.

LIMITATIONS

The small sample size of only 80 participants may limit the generalizability of the findings. The study focused only on intraoperative and immediate postoperative outcomes, without evaluating long-term patient outcomes. The research was conducted in specific hospitals, its applicability to other healthcare settings may be restricted. Variability in surgical procedures, anesthetic techniques, and comorbidities could have influenced the results. Delayed recovery was assessed based on clinical parameters, lacking objective biochemical markers

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