Original Article

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Comparison of Hemodynamic Effect of Propofol and Ketofol During Induction of Anaesthesia in General Surgery Patients

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Author`s Contribution

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ABSTRACT

Objective: To determine the comparison of homodynamic effect of propofol and ketofol during induction in general surgery patients.

Methods: This randomized control trial study was conducted at Department of Anesthesia, Surgical ICU and Pain management, Civil Hospital Karachi from June 2019 to January 2020. Patients scheduled for elective general surgery procedures, aged 20 to 60 years, both male and female patients were included. Patients were randomly allocated into two groups. Group A received a combination of ketofol while Group B received propofol as the induction agent. After recording of the base line values of mean arterial pressure patient was induced using propofol or ketofol. Mean arterial pressure readings were noted at 30 seconds after drug injection, as well as at 1 minute, 5 minutes, and 10 minutes after intubation, to capture the immediate hemodynamic effects of the drugs and to observe any potential changes over time following intubation.

Results: The average age of the patients was 37.38±13.78 years. Out of 64 patients, 30(46.9%) were male and 34(53.1%) were female. Homodynamic effect was significantly high in those patients who received ketofol than those who received propofol (100% vs. 59.4% p=0.0005). The findings observed also with significant differences in hemodynamic effects between the two groups, even after controlling for age, gender, and ASA classification (p-<0.05).

Conclusion: Combination of Ketofol with ketofol was observed to be the better hemodynamically as compared to Propofol. Additionally, the use of ketofol reduces the cost of induction and decreasing the economic burden on the patient.

Key words: Ketamine, Propofol, Ketofol, Homodynamic effect.

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Introduction

Patients undergoing surgical procedures necessitating prolonged deep relaxation are most effectively managed with general anesthesia, provided there are no contraindications.[1] Surgical interventions that cannot be sufficiently anesthetized through local or regional techniques necessitate the use of general anesthesia.[1] In surgical scenarios where general anesthesia is necessary, various effective anesthetic choices exist, including inhaled volatile agents and intravenous agents like propofol.[2] Nonetheless, the determination regarding the type of anesthesia to be administered is usually made by the clinical team without involving the patient.[2] Overall, it is generally safe for individuals with significant health conditions to undergo procedures under general anesthesia, although there can be numerous minor and major complications.[3] The occurrence of postoperative complications is influenced by various factors, some of which are associated with the surgical procedures themselves. The risk factors and complications are more dependent on the specific type of procedure and the individual's overall physical health rather than the type of anesthesia used.[3] Untangling the relationship between extended surgical procedures and morbidity presents a challenge because the duration of the operation often correlates with the complexity of the procedure. Cardiovascular complications following major abdominal surgery are quite frequent and tend to manifest early in the postoperative period.[4]

However, the Hemodynamic instability poses a significant challenge during anesthesia and surgery, often arising from the stresses of intubation, surgical incisions, and the administration of anesthetic drugs.[5] This issue is especially common among patients with heart conditions and older adults.[5,6] Hemodynamic disturbances are frequently seen during the start and end of anesthesia. Low blood pressure is a common occurrence when propofol is used for anesthesia induction, leading to a notable drop in blood pressure, particularly in patients with high blood pressure.[7]

This drop in blood pressure is linked to a decrease in both the resistance of blood vessels throughout the body and the strength of the heart's contractions. This impact becomes more pronounced with higher doses, quick delivery, and in older people.[7,8] Propofol, the usual anesthesia choice for starting the process, has disadvantages like widening blood vessels, reduced heart output, and an increased likelihood of low blood pressure in older patients above 50 who are at high risk.[9,10] On the other hand, ketamine triggers dissociative anesthesia and sympathetic activation, resulting in a more consistent hemodynamic state.[11] Despite these advantages, ketamine isn't commonly employed as a standard sedative agent.[11]

However, according to studies, the combination of propofol and ketamine not only extends the duration of anesthesia but also offers a more stable hemodynamic profile compared to propofol alone.[12] This makes ketofol particularly beneficial in cases where maintaining stable blood pressure and heart function is crucial, such as in patients with compromised cardiovascular status or those undergoing lengthy surgical procedures. Although ketofol has gained recent usage for procedural sedation in various settings such as the operating theater, emergency department, and for critically ill patients in the ICU, there exists a scarcity of reports directly comparing its effectiveness with propofol for anesthesia induction in elective surgeries.[5] Furthermore, given the existing literature's indication of the necessity for additional research to develop the more conclusive evidence,[13-15] and the lack of sufficient national data, this study aims to investigate the comparative hemodynamic effects of propofol and ketofol during induction in patients undergoing general surgery.

Methodology

This Randomized control trial was conducted in the department of Anesthesia, Surgical ICU and Pain management, Civil Hospital Karachi. Duration of study was six months from June 2019 to January 2020. Non probability purposive sampling. Patients aged 20 to 60 years, American Society of Anesthesiologist criteria (ASA) I and II undergoing elective general surgery of either gender were included. Patients with history of known allergy to propofol / egg protein, hypovolemic patients as it is a relative contra indication to propofol use, known cases of hypertension, known cases of ischemic heart disease and known cases of pheochromocytoma were excluded. Study was done following approval from the Hospital Ethical Committee.

A total of sixty-four patients, who met the specified inclusion criteria, were recruited for study. All individuals included in the study were chosen from the list of elective general surgery patients. Before participating, each patient received detailed information about the study's objectives, methods, possible risks, and expected benefits. Written consent was obtained from all participants after confirming their understanding of the provided information. The study utilized a randomized allocation approach to divide patients into two separate groups, labeled as Group A and Group B. Through a random ballot process, participants were assigned to receive either ketofol or propofol during their surgical procedure. Group A received a combination of ketofol as the induction agent, while Group B received propofol.

Before induction, baseline measurements of mean arterial pressure (MAP) were taken for each patient. Then, patients were induced using either propofol or ketofol, based on their assigned group. Succinylcholine, at a dose of 1mg per kg of body weight, was used as the muscle relaxant for intubation. All medications were administered by the research anesthetist. Data collection commenced 30 seconds after the administration of the drugs. Subsequent MAP readings were recorded at 1 minute, 5 minutes, and 10 minutes post-intubation. This standardized procedure ensured consistent data collection across all participants and allowed for the evaluation of MAP variations over time following intubation. SPSS version 26 was used for data analysis.

Results

A total of 64 patients underwent electric general surgery were Included in this study. Patients were equally divided into two groups. Average age of the patients was higher in group B than group A (34.06±11.95 vs. 41.72±16.38; p= 0.037). Out of 64 patients, 30(46.9%) were male and 34(53.1%) were female. Regarding ASA status, ASA-I was observed in 81.3% cases while ASA-II was observed in 18.7% patients. For Group A, the baseline MAP was 88.53±10.33 mmHg which was slightly lower compared to Group B at 95.69±12.67 mmHg. After induction, Group A's MAP increased to 90.16 mmHg with a standard deviation of 12.44, while Group B's decreased to 81.09±14.53 mmHg. At subsequent time points, Group A generally maintained higher MAP values compared to Group B, although there were fluctuations observed over the 10-minute period. At 10 minutes post-intubation, Group A's MAP was 87.78±13.24 mmHg, while Group B's MAP was 84.31±9.54 mmHg. These findings suggest potential differences in MAP responses between the two groups throughout the surgical procedure. (Table I)

Table I: Mean arterial pressure with respect to groups. (n=64)

Mean arterial pressure	Group A (n=32)	Group B (n=32)
Base line	88.53±10.33	95.69±12.67
After induction	90.16±12.44	81.09±14.53
1 minute	92.72±12.17	77.94±9.13
5 minutes	95.69±17.74	84.50±19.50
10 minutes	87.78±13.24	84.31±9.54

Homodynamic effect (No hypotension) was significantly high in those patients who received ketofol than those who received propofol (100% vs. 59.4% p=0.0005). (Table II)

Table II: Comparison Homodynamic effect between groups. (n=64)

Homodynamic Effect	Group A (n=32)	Group B (n=32)	Total	p-value
Yes	32 (100%)	19 (59.4%)	51 (79.7%)	0.0005
No	0 (00%)	13 (40.6%)	13 (20.3%)	

For participants aged >35 years, in patients of Group A and 45% in Group B showed the hemodynamic effect, (p- 0.002), while for aged <35 years, 21 (100%) in Group A and 10 (83.3%) in Group B exhibited the hemodynamic effect (p- 0.125). For males, 18 (100%) in Group A and 8 (66.7%) in Group B exhibited the effect, and for females, 14 (100%) in Group A and 11 (55%) in Group B showed the effect, (p- <0.05). In terms to the hemodynamic effect concerning ASA classification. For participants classified as ASA-I, 27 (100%) in Group A and 16 (64%) in Group B exhibited the no hypotension, with a significant p-value of 0.001, while for ASA-II, 5 (100%) in Group A and 3 (42.9%) in Group B showed the no hypotension, p- 0.034. The findings suggest potential differences in hemodynamic effects between the two groups, even after controlling for age, gender, and ASA classification. (Table III)

Table III: Comparison Homodynamic effect between groups after controlling of age. (n=64)

Variables		Homodynamic Effect	Group A (n=32)	Group B (n=32)	P value
Age groups	≤ 35 years	Yes	21 (100%)	10 (83.3%)	0.125
		No	0 (0%)	2 (16.7%)	
	≥ 35 years	Yes	11 (100%)	9 (45%)	0.002
		No	0 (0%)	11 (55%)	
Gender	Male	Yes	18 (100%)	8 (66.7%)	0.018
		No	0 (0%)	4 (33.3%)	
	Female	Yes	14 (100%)	11 (55%)	0.004
		No	0 (0%)	9 (45%)	
ASA	ASA-I	Yes	27 (100%)	16 (64%)	0.001
		No	0 (0%)	9 (36%)	
	ASA-II	Yes	5 (100%)	3 (42.9%)	0.034
		No	0 (0%)	4 (57.1%)	

Discussion

Anesthesia plays a critical role in ensuring patient comfort and safety during surgical procedures. However, it is not without risks, as complications can arise, particularly in relation to hemodynamic effects. Propofol, a widely employed anesthetic agent, is known for its rapid onset of action and sedative properties. However, it is also associated with vasodilation and a propensity to cause hypotension, especially in certain patient populations. Ketofol, a combination of propofol and ketamine, has emerged as an alternative induction agent. This study was conducted to compare the hemodynamic effects of propofol and ketofol during induction in general surgery patients. The study included two groups, with the average age of participants being 34.06±11.95 years for group A and 41.72±16.38 years for group B and overall, 30(46.9%) patients were male and 34(53.1%) were female.

Comparatively Qureshi BQ et al[16] reported that a total of 179 patients underwent procedural sedation and analgesia (PSA) using a combination of Ketamine and Propofol and among them, males were 57.0% and females were 43.0%, with an overall mean age of 3.91 ± 2.80 years. According to another study Elsherbiny M et al[13] also reported that the mean age of the patients in Propofol group was 41+15 years and in Ketofol group was 44+16 years. The proportion of males was 76% in the propofol group and 66% in the ketofol group, while the proportion of females was 24% in the propofol group and 34% in the ketofol group.[13] In this study regarding ASA status, ASA-I was observed in 81.3% cases while ASA-II was observed in 18.7% patients. The findings from previous study by Hailu S et al[5] indicated that the mean age of participants in both the ketofol group 38.16 and the propofol group 36.23 years was comparable. Additionally, there were no significant differences reported between the two groups in terms of gender distribution, weight, or ASA classification.[5]

However, it is important that some discrepancies were noted in the mean age and gender distribution when compared to other studies. These variations could be attributed to differences in sample sizes, selection criteria, and the types of surgeries conducted across various studies. In this study for Group A, the baseline MAP was 88.53+10.33 mmHg which was slightly lower compared to Group B at 95.69+12.67 mmHg. After induction, Group A's MAP increased to 90.16 mmHg with a standard deviation of 12.44, while Group B's decreased to 81.09+14.53 mmHg. At subsequent time points, Group A generally maintained higher MAP values compared to Group B, although there were fluctuations observed over the 10-minute period. At 10 minutes post-intubation, Group A's MAP was 87.78+13.24 mmHg, while Group B's MAP was 84.31+9.54 mmHg. These findings suggest potential differences in MAP responses between the two groups throughout the surgical procedure. These findings were supported studies by Hailu S et al[5], Mohajerani SA et al[17], and Raman V et al[18].

In this study, the incidence of hypotension, indicating the hemodynamic effect, was significantly higher among patients who received ketofol compared to those who received propofol (100% vs. 59.4%, p=0.0005). Furthermore, significant differences in hemodynamic effects between the two groups were observed even after adjusting for age, gender, and ASA classification (p<0.05). Consistently, Kumar et al,[19] found that the average mean arterial pressure (MAP) in the propofol group exhibited a significant decrease compared to the ketofol group immediately after induction and at 3 minutes post-induction. However, at 1-minute post-intubation, the MAP was significantly higher in the propofol group and remained relatively stable at other time points.

Additionally, the incidence of hypotension was notably higher in the propofol group compared to the ketofol group.[19] In aligns to this study a review study by Nasir H et al[20] observed that the mixture of Propofol and Ketamine offers benefits such as stable hemodynamics, absence of respiratory depression, swift recovery, and potent postoperative pain relief. In the comparison to this study Hailu S et al[5] also reported that there was a notable rise in the average heart rate within the ketofol group right after induction and at the 5-minute mark post-induction compared to the initial baseline value (p <0.05). In contrast, another study conducted by Tezcan AH et al[21] found no statistically significant disparities in preoperative and postoperative MMT scores, hear rate, respiratory rate, mean blood pressure, or oxygen saturation between the groups (p>0.05). However, in Propofol group, four cases had profound hypotension, leading to the need for termination of sedation in two cases.[21]

This study demonstrates significant strengths by investigating the beneficial hemodynamic effects of the ketofol mixture using a randomized controlled trial design at the local level. However, it is important to acknowledge certain limitations like relatively small sample size utilized in the study, which may affect the ability to draw definitive conclusions. A larger sample size is essential to enhance the statistical power of the study and ensure the reliability of the results. By employing a multicenter approach and including a larger number of participants over an extended period, researchers can obtain more robust and conclusive evidence regarding the efficacy and safety of ketofol administration in clinical practice.

Conclusion

In conclusion, study revealed the superior hemodynamic performance of the Ketofol combination compared to Propofol alone. Moreover, the adoption of Ketofol for anesthesia induction offers the added benefit of cost reduction, lessening the economic burden on patients undergoing surgical procedures. These findings underscore the potential clinical advantages and economic benefits of utilizing Ketofol as an induction agent in anesthesia practice. Further research and larger-scale studies are warranted to validate these findings and explore additional benefits associated with Ketofol administration.

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