



Comparison of propofol-ketamine combination with propofol- butorphanol combination for total intravenous anaesthesia in short surgical procedures

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Abstract

Objectives: The objective of this study was to compare propofol-ketamine combination with propofol-butorphanol combination for short surgical procedures in terms of hemodynamic and respiratory stability, postoperative sedation, postoperative nausea and vomiting and effect of abolishing pain on injection with propofol. **Methods:** This was a randomized double blinded study conducted in 60 patients belonging to ASA I & II, aged between 16 - 60 years. Patients were divided into two groups: Group-B: Propofol-Butorphanol combination (n=30) and Group-K: Propofol-Ketamine combination (n=30). The baseline values for the heart rate, mean arterial pressure and SPO recorded and every 5 minutes after induction of anesthesia. **Results:** In Butorphanol group MAP at 5, 10, 15, 20, 25 and 30 minutes after induction was significantly lesser but heart rate at 10, 15, 20, 25 and 30 minutes after induction was significantly greater than in the Ketamine group with the p value of < 0.05. From 20-30 minutes post induction,

SPO in Butorphanol 2 group was significantly less than in the Ketamine group with the p value of < 0.05. Pain after injection of propofol was significantly greater in Ketamine group with the p value of 0.008. There was no statistically significant sedation and post operative nausea and vomiting among the groups. **Conclusion:** Propofol-Ketamine combination provided better hemodynamic and respiratory stability than Propofol-Butorphanol combination however pain on injection with propofol was greater in Propofol-ketamine combination.

Keywords: Hemodynamic stability, propofol-butorphanol, propofol-ketamine, respiratory stability, sedation, total Intravenous anaesthesia.

Introduction

Total intravenous anaesthesia (TIVA) is a technique in which induction and maintenance of anaesthesia is achieved with intravenous drug alone; avoiding volatile agents. In this process the patient either breaths spontaneously or are artificially ventilated with oxygen. Total intravenous anaesthesia overcomes some of the

disadvantages of traditional inhalation anesthesia. Speedy and complete recovery with decreased post operative nausea and vomiting occurs with TIVA thus is suitable for day care surgeries and early ambulation and also reduces the cost of hospital stay. It avoids risk of malignant hyperthermia syndrome and environmental hazards unlike inhalational agents.

TIVA has been attempted since 1934 but its use was hampered by cumulative effect of longer acting drugs, inadequate methods of administration like with intermittent bolus administration, leading to peaks and unstable anaesthetic conditions and fear of intraoperative awareness. But with invention of newer induction agents, opioids and amnestic agents having shorter half-life and advents of infusion pumps, syringe pumps and target controlled infusions these problems have been declined. Thus, TIVA is gaining popularity day by day.

Propofol a GABA modulator is a newer intravenous anaesthetic agent, having favourable pharmacokinetic profile. It has a high clearance rate and rapid decline in blood concentration, making it eminently suitable for infusion. When propofol infusion is discontinued there is rapid recovery from anaesthetic state. Propofol has emerged as a gold-standard for TIVA for short surgical interventions and day care surgery but its main shortcoming is lack of analgesia, therefore it has to be combined with an analgesic.

Pain relief forms an important constituent of balanced anaesthesia. Ketamine and opioids like butorphanol are the popular analgesics in this context. Ketamine a phencyclidine derivative is N-methyl-D-aspartate receptor antagonist. It produces "dissociative anesthesia". Of the nonvolatile agents, ketamine may be the closest to being a "complete" anesthetic as it induces analgesia, amnesia, and unconsciousness. Butorphanol is a agonist-

antagonist opioid that resemble pentazocine. The chief advantages of this agent are its potent analgesia, low toxicity and very low potential for abuse.

In this study we will compare two drug regimens, i.e., propofol-ketamine and propofol-butorphanol for TIVA technique in patients undergoing short surgical procedures.

Material and Methods

This was a comparative prospective study conducted from January 2019 to December 2021 in the Department of Anesthesiology, Muzaffarnagar Medical College in 60 patient undergoing elective short surgical procedure (less than 1 hr.) under total intravenous anaesthesia. Inclusion criteria were patient of either sex, Patient belonging to ASA grade I and grade II, Age between 16-60 years, Patient planned for elective surgery undergoing various short surgical procedures. Exclusion criteria were patient belonging to ASA III and ASA IV, patient with anticipated difficult intubation and difficult mask ventilation, Patient with comorbid medical conditions, history of drug hypersensitivity and unwilling patients.

All patients were admitted to the hospital at least a day before surgery and went a thorough pre-anaesthetic checkup. Once shifted to operation theatre routine monitoring was done in all patients and were premedicated with midazolam 2 mg. and glycopyrolate 0.2 mg intravenously. These patients were randomly assigned to one of the two groups in a double-blind manner for induction viz; Group B: Inj. Butorphanol 20µgm/kg + Inj. Propofol 1.5mg/kg Group K: Inj. ketamine 1 mg/kg + Inj. Propofol 1.5mg/kg.

Pain on injection with propofol was noted after injecting the propofol in the form of vocal response, facial grimace, arm withdrawal or tears on eye suggesting pain.

All the hemodynamics parameter BP, PR, SPO were noted again and 2 then after each 5 minutes of interval till 30 minutes. Anaesthesia was maintained with propofol in the dose of 9mg/kg/hr via syringe pump infusion till the end of surgical procedure and spontaneous respiration was maintained with 100% oxygen via facemask and brain circuit assistance when needed. Incidence of hypotension / hypertension, changes in electrocardiogram and other complications during operation were noted and appropriate action was taken. Sedation was assessed in postoperative period using Modified Ramsay sedation Table 1: intergroup comparison of changes in mean arterial pressure (map).

score. Incidence of postoperative nausea and vomiting (PONV) was noted and treated with ondansetron 4-8 mg when needed.

Statistical Analysis

Paired sample t- test was used to compare the means between the two groups and p-value less than 0.05 was considered significant.

Results

Demographic profiles and ASA grading of the patients scheduled for study were comparable.

Mean BP	Propofol Butorphanol		Propofol Ketamine		p value	Inference
	Mean	SD	Mean	SD		
Baseline	90.03	6.52	87.83	8.51	0.268	NS
Premedication	89.36	7.78	89.53	9.43	0.947	NS
Induction	85.63	7.17	91.10	5.95	0.008	S
5 min	83.63	7.97	89.90	6.14	0.002	S
10 min	82.86	8.21	88.30	6.77	0.017	S
15 min	81.36	7.69	86.60	6.42	0.018	S
20 min	80.03	7.18	85.33	6.13	0.011	S
25 min	78.70	6.70	84.30	5.83	0.004	S
30 min	78.03	7.22	83.53	5.61	0.005	S

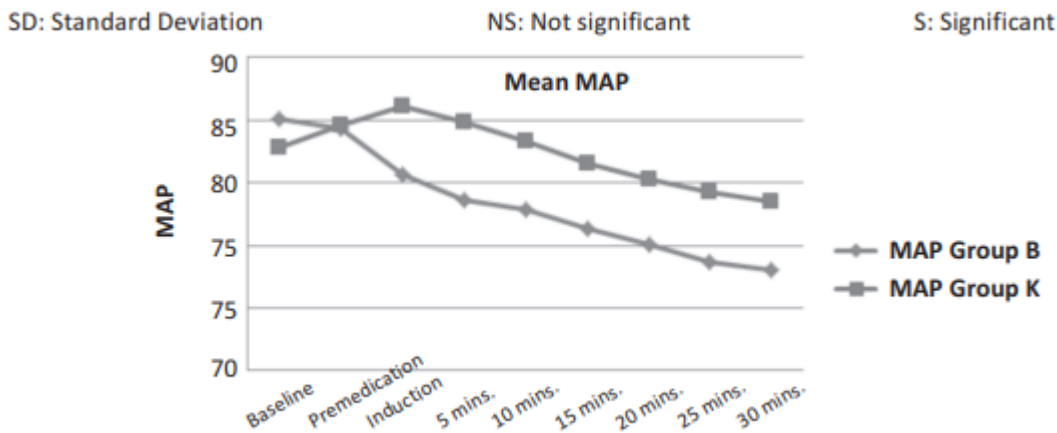


Figure 1: Intergroup comparison of changes in Mean Arterial Pressure

Comparison of Propofol-Ketamine Combination with Propofol-Butorphanol Combination for Total Intravenous Anaesthesia on Short Surgical Procedures.

Table 2:

Heart Rate	Group B		Group K		p value	Inference
	Mean	SD	Mean	SD		
Baseline	69.26	8.83	67.70	6.12	0.380	NS
Premedication	75.63	9.66	73.33	7.61	0.282	NS
Induction	78.86	12.62	76.50	9.21	0.363	NS
5 min	80.63	13.71	75.83	9.12	0.062	NS
10 min	82.16	12.50	74.73	8.77	0.003	S
15 min	80.26	11.37	73.26	8.68	0.001	S
20 min	80.93	11.01	72.50	8.58	0.001	S
25 min	79.13	11.56	71.96	7.21	0.002	S
30 min	78.46	10.52	70.73	6.83	0.001	S

Table II: Intergroup comparison of Heart Rate
 SD: Standard Deviation NS: Not significant S: Significant

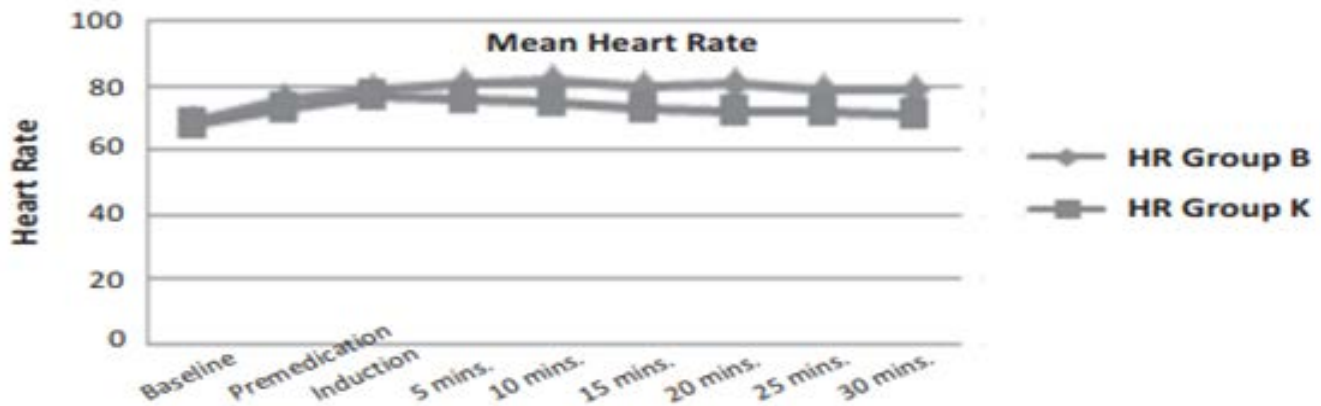


Figure 2: Intergroup comparison of changes in Heart Rate

SPO2	Group B		Group K		p value	Inference
	Mean	SD	Mean	SD		
Baseline	99.76	0.51	99.56	0.56	0.161	NS
Premedication	99.93	0.36	99.86	0.34	0.489	NS
Induction	99.50	0.86	99.86	0.34	0.032	S
5 min	99.56	0.85	99.86	0.34	0.071	NS
10 min	99.56	0.72	99.83	0.37	0.088	NS
15 min	99.56	0.73	99.83	0.37	0.034	S
20 min	99.53	0.81	99.90	0.30	0.032	S
25 min	99.43	0.97	99.90	0.30	0.020	S
30 min	99.53	0.81	99.93	0.25	0.012	S

Table III: Inter group comparison of SPO2
 SD: Standard Deviation NS: Not significant S: Significant

Comparison of Propofol-Ketamine Combination with Propofol-Butorphanol Combination for Total Intravenous Anaesthesia on Short Surgical Procedures

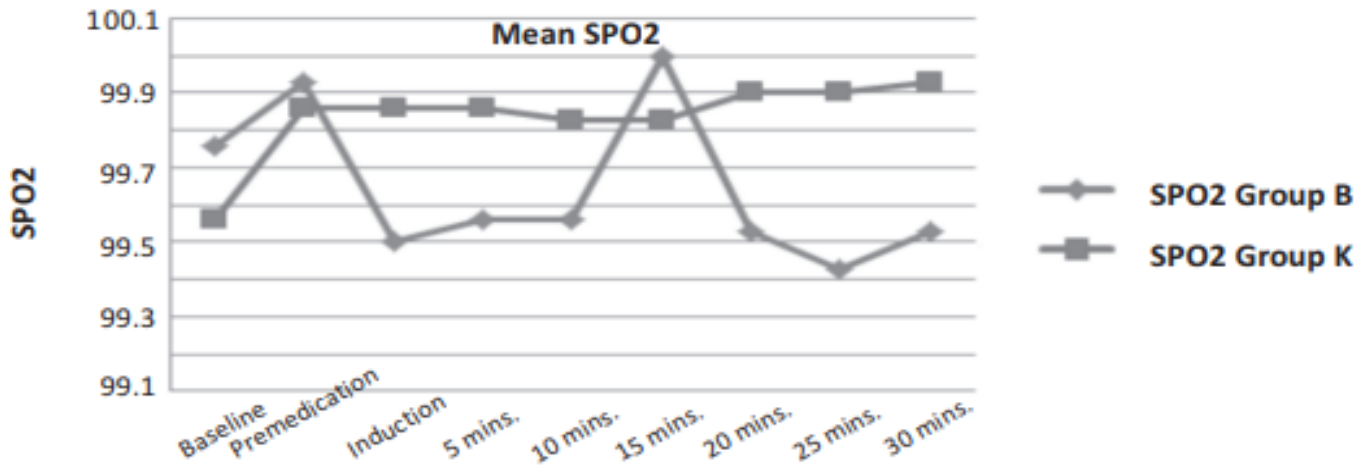


Figure 3: Intergroup comparison of changes in SPO2

POI	Group B		Group K		Total		p value	Inference
	N	%	N	%	N	%		
Absent	23	76.7%	13	43.3%	36	60%	0.008	Significant
Present	7	23.3%	17	56.7%	24	40%		
Total	30	100%	30	100	60	100%		

Table IV: Intergroup comparison of pain on injection with Propofol

POI - Pain On Injection

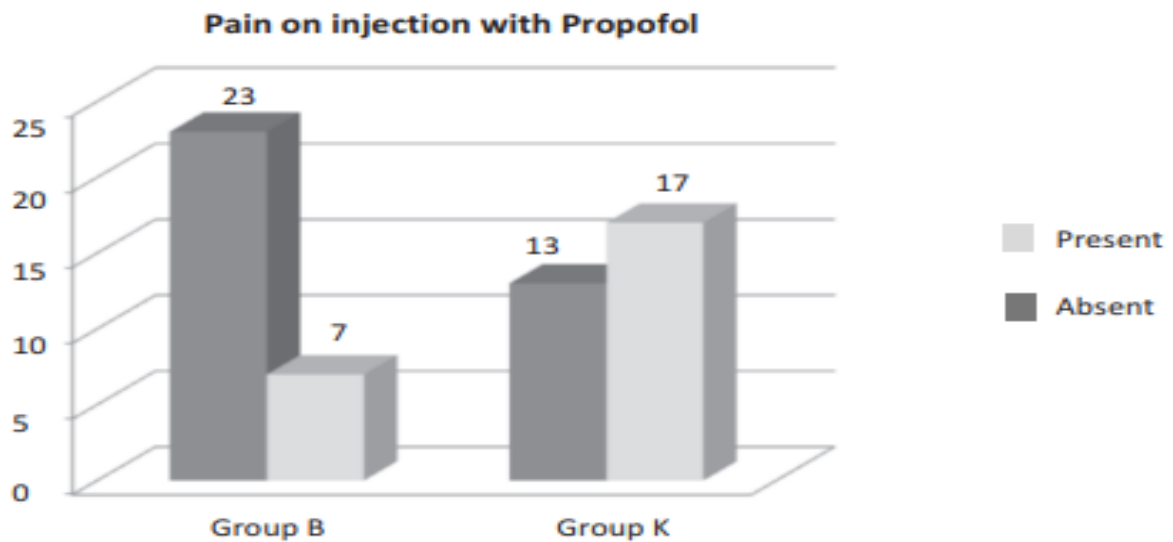


Fig 4: Intergroup comparison of pain on injection with Propofol

Comparison of Propofol-Ketamine Combination with Propofol-Butorphanol Combination for Total Intravenous Anaesthesia on Short Surgical Procedures.

POS	Group B		Group K		Total		p value	Inference
	N	%	N	%	N	%		
Absent	21	70.0%	26	86.7%	47	78.3%	0.209	Not Significant
Present	9	30.0%	4	13.3%	13	21.7%		
Total	30	100%	30	100	60	100%		

Table V: : Intergroup Comparison of Post operative sedation

POS - Post Operative Sedation

PONV	Group B		Group K		Total		p value	Inference
	N	%	N	%	N	%		
Absent	22	73.3%	26	86.7%	48	80.0%	0.333	Not Significant
Present	8	26.7%	4	13.3%	12	20.0%		
Total	30	100%	30	100	60	100%		

Table VI: : Intergroup Comparison of Post operative sedation

PONV - Postoperative Nausea and Vomiting

Discussion

Total intravenous anaesthesia has been a subject of interest for all anaesthesiologists. TIVA was initially attempted with a single drug (eg: thiopentone, propofol) but was associated with side 10 effects and no drug was found to give complete anesthesia. Therefore, various drugs have been used individually or in 5 combinations with the other drugs to produce desired results. There is a perceived wisdom that their plasma drug concentrations needed to produce anesthesia has to be reached quickly and maintained over the period of time that anesthesia. They should have rapid clearance rate and little delay between change in infusion rates, plasma levels and pharmacological actions. This allows rapid induction, good plane of surgical stage of anaesthesia and at the end of surgery, 3 smooth emergence and early recovery. Propofol is a commonly used induction agent in day care procedures. When used as a sole agent, require a larger dose of propofol and may be associated with haemodynamic and respiratory effects like hypotension, bradycardia, apnoea or hypoventilation. Ketamine, and opioids like butorphanol, may be combined to decrease

the above-mentioned adverse effects as they do increase blood pressure, heart rate, cardiac index and simultaneously decrease the amount of propofol needed. In this study, in Ketamine group, there was statistically significant change in mean arterial pressure, heart rate and SPO during post induction and maintenance of anaesthesia 2 throughout the procedure when compared to Butorphanol group.

Similar study conducted by Nalini K B, et al compares propofol and Ketamine versus Propofol and Fentanyl in terms of haemodynamic stability and analgesia has concluded that the combination of ketamine and propofol is a safe and possibly superior alternative to propofol – 11 fentanyl combination, in terms of haemodynamic stability. Likewise Turk HS and et al. study on ketamine propofol combination vs opioid-propofol combination showed the same result.

Furuya A, et al. investigated for arterial pressure changes during the anaesthesia with propofol by adding intravenous ketamine in 12 patients. Authors concluded that administration of ketamine before induction with propofol preserved hemodynamic stability in terms of

blood pressure and heart rate compared with induction with propofol alone.

In the present study in comparison to Propofol-ketamine group, Propofol-Butorphanol group had statistically significant decrease in SPO after induction and during 2 maintenance phase of anaesthesia but no any significant difference in PONV. Similar study conducted by Aasim SA, Syamasundara RB, Zubair SI on 50 patients, propofol-ketamine group had better haemodynamic stability without respiratory depression and no postoperative nausea and vomiting than propofol fentanyl group.

Pain on injection with propofol is attenuated by various methods like injection of propofol in carrier fluid, large vein, and use of xylocard, analgesics and anaesthetic drugs. Of the 2 groups studied, butorphanol group enabled to abolish the pain on injection with propofol. Incidence of pain was 23.3% in Butorphanol group, where as in ketamine group it was 56.7%.¹⁵ This is consistent with study done by Agarwal and coworkers, where they found that simple and effective method of attenuating propofol induced pain is with pretreatment by butorphanol.

There was no statistical significant difference in PONV and sedation among the two groups.

Conclusion

This study concluded that Propofol-ketamine (Group K) combination has the advantage of offering better hemodynamic and respiratory stability. Attenuation of pain on injection is the only added advantage of propofol-butorphanol (Group B) combination whereas postoperative recovery in terms of sedation and PONV is similar among them.

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