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Original Research Article

A Comparison of Propofol-Ketamine and Propofol-Fentanyl Combinations for Hemodynamic Stability and Analgesia in Adult Patients Undergoing Elective Short Surgical Procedures

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Conflict of interest: Nil

Abstract

Background and Aims: The present study was done to evaluate the efficacy of the two drug combinations for Total Intravenous Anaesthesia (TIVA) that is propofol-ketamine and propofol-fentanyl not only for their induction, maintenance and recovery characteristics but also to compare their hemodynamic stability and postoperative analgesic effect.

Materials and Methods: Comparative study, 60 patients, American Society of Anesthesiologists (ASA) class I or II aged between 18 and 60 years, for elective surgeries under total intravenous anaesthesia (TIVA) randomly divided in 2 groups of 30 each. Group K patients received propofol- ketamine IV while group F received propofol- fentanyl IV for both for induction and maintenance of anaesthesia.

Results: Post induction, SBP, DBP, MAP and HR were significantly high in group K from 5-25 mins as compared to group F (p value< 0.05). Recovery time (time to achieve Modified Aldrete Score of 9-10) was significantly shorter in Group F (4.38 ± 1.77 mins) compared to Group K (6.62±1.92 mins), with a p-value of 0.001. Postoperatively higher pain scores were observed in group K at 6 and 12 hrs with p- values of 0.014 and 0.002 respectively. More patients in group K required rescue analgesia at 6 hrs, 12 and 24 hrs with (p-value of 0.417),(p- value of 0.119) and (p- value of 0.836) respectively but the differences were not statistically significant. Difference in occurrence of adverse events was significant in both groups (p-value of 0.037).

Conclusion: Propofol fentanyl combination provides more stable intraoperative hemodynamic parameters, early recovery, and lower pain scores postoperatively with minor side effects than propofol- ketamine combination.

Keywords: Total intravenous anaesthesia, Propofol-ketamine, Propofol-fentanyl.

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Introduction

General anaesthesia may be administered using inhalational agents, intravenous agents, or a combination of both. Total intravenous anaesthesia (TIVA) is a method where general anaesthesia is provided by giving various drug combinations exclusively through intravenous route with or without airway device but without using any inhalational agents for both induction and maintenance of anaesthesia. [1]

Volatile anaesthetics because of their rapid and predictable dose adjustments are preferred by many but it comes with many drawbacks such as high costs of procurement, apparatus required for dispensing and scavenging it and tendency to cause environment pollution. Upto 63% of operating room greenhouse gas emissions and 3% of the carbon footprint of the world are ascribed to anaesthetic gases. [2] TIVA too has certain limitations which includes the requirement of infusion pumps, equipment cost, need for trained personnel, risk of infusion related errors and possibility of awareness if there is inadequate delivery. Nevertheless , TIVA still remains an attractive anaesthetic technique because of lack of emission of any harmful gases, no risk of malignant hyperthermia, better operating conditions by avoiding distension of air filled spaces, predictable recovery profile, less incidence of emergence phenomena and post-operative nausea and vomiting.[3] Various modes to administer TIVA include intermittent boluses or continuous infusion through saline bags, syringe infusion pumps or target controlled infusions (TCI). [4]

Various drugs have been evaluated as an ideal TIVA agent which can provide balanced anaesthesia i.e. hypnosis, amnesia and analgesia along with sympatholysis, hemodynamic stability and immobilisation. But till now no single drug has

been able to show all the characteristics of an ideal TIVA agent.

Recently both ketamine and fentanyl have been explored in combination with propofol in quest for ideal tiva drug combination. Ketamine is a phencyclidine derivative with rapid onset, short duration of action and half-life of 2hrs. Together with propofol it provides cardiovascular stability by stimulating the sympathetic system. [5] Fentanyl is a synthetic opioid belonging to the phenylpiperidine group that has a fast onset and brief duration of action which depresses cardiovascular system and thus provides hemodynamic stability by blunting somatic and autonomic responses to airway manipulation .[6]

Although propofol-ketamine and propofol – fentanyl combinations have been evaluated previously for TIVA, available studies have mainly focused on intraoperative haemodynamic variables and immediate recovery characteristics.

Data regarding postoperative analgesia and haemodynamic outcomes extending upto 24 hours after surgery remain limited. Therefore we did a comparative study on two drug combination of propofol- ketamine and propofol-fentanyl for their hemodynamic stability, analgesia, recovery characteristics and adverse effects in adult patients undergoing elective short surgical procedures.

Materials and Methods

The present comparative study was conducted in department of anesthesiology, Guru Gobind Singh Medical College & Hospital, Faridkot over 18 months after approval by the Hospital Ethical Committee (30/IEC/026 date- 22/7/23) and registration with clinical trial registry India (CTRI/2024/01/077726).

After obtaining informed written consent , 60 patients aged 18-60 years of either gender belonging to ASA grade I and II with BMI <30 kg/m2 scheduled for elective surgeries of up to 90 mins under general anaesthesia were enrolled in study.

Exclusion Criteria: Patients who were hemodynamically unstable, had history of anaphylaxis or allergy to study drugs, had history of head injury, seizure disorder, psychiatric illness, or substance abuse or sedatives, or pregnant were excluded from the study.

Randomization and Intervention: A computer generated randomization was done to allocate 60 patients in 2 groups - K and F of 30 each. 60 sealed envelopes were prepared by a designated consultant (not included in study), who opened it just before the start of the study and prepared all the drugs in identical syringes as per the code on the envelops. The attending anesthesiologist kept a record of the patients which were divulged on completion of the study. The groups were:

Group K: Propofol and ketamine

Group F: Propofol and fentanyl

Methodology

Sample size calculation: The sample size was calculated based on the comparison of systolic blood pressure (SBP) at induction time between two groups in a previous study done by Bajwa et al .[7] The mean SBP values and corresponding standard deviations observed in two groups in reference study was used for sample size estimation. Assuming 90% power and a 95% confidence interval the minimum required sample size was calculated to be 25 patients per group. To account for a potential dropout rate of 20%, a total of 60 patients were enrolled in the study.

Pre-operatively, a complete anaesthetic evaluation and relevant investigations were performed in all the patients. Patient was made aware of purpose of study and explained about the use of VNRS.[8] A written informed consent was obtained from all patients. Premedication with tab. alprazolam 0.25 mg was given orally on the night before surgery. Adequate fasting was ensured prior to surgery.

Anaesthesia Technique (General Anaesthesia): In the operating room, the standard monitors for electrocardiogram, non-invasive arterial blood pressure and oxygen saturation were attached and baseline parameters were recorded. An intravenous infusion of crystalloids by peripheral venous cannula was initiated.

After 3 mins of preoxygenation with 100% oxygen, patients received premedication with 0.005mg/kg of glycopyrrolate and 0.15mg/kg of dexamethasone intravenously as per institutional protocol. Dexamethsone was administered for prophylaxis against nausea and vomiting. For induction of anaesthesia both groups were given 1.5 mg/kg of propofol intravenously.

Patients in group K were given 1.0mg/kg of ketamine and in group F 2.0mcg/kg of fentanyl intravenously as co induction agent. In both groups, injection succinylcholine 1.5mg/kg was given and patients were intubated and ventilated with 100% oxygen. Ventilation was adjusted to maintain end-tidal CO2 of 35-40 mmHg. Each patient was given 1g of paracetamol intravenously after half an hour of induction.

Maintenance of anaesthesia was achieved using infusion pumps. Propofol was administered as an undiluted preparation containing 10mg/ml. For group K, ketamine (50mg/ml) was prepared by diluting 4ml (200mg) of ketamine with normal saline upto 50 ml and starting the infusion of

2.0mg/kg/hr of ketamine and 2.0mg/kg/hr of propofol. In group F, fentanyl was prepared by diluting 4ml (50mcg/ml) in saline upto 50 ml and infusion started at 2.0mcg/kg/hr of fentanyl and 2.0mg/kg/hr of propofol intravenously. Muscle relaxation was maintained by atracurium. Injection ondansetron 4mg was used as antiemetic 15 mins before surgical closure.

All anaesthetic drugs were stopped 5-7 mins before the anticipated end of surgery and reversal was done by 0.05mg/kg of neostigmine along with 0.01mg/kg of glycopyrrolate given intravenously over 2-3 mins. Patient was extubated and monitoring parameters were recorded at extubation.

Parameters to Be Assessed

Intra-operative Assessment: The vital parameters like systolic blood pressure (SBP), diastolic blood Pressure (DBP), mean arterial blood pressure (MAP), oxygen saturation, respiratory rate (RR) and heart rate (HR) were monitored every 5 minutes for 30 minutes, then every 10 minutes till the end of the surgery.

Depth of anaesthesia was assessed clinically using above mentioned standard parameters and response to surgical stimulation.

Hypotension and bradycardia events (HBE) was defined as Heart rate less than 60 beats/min and hypotension was considered when Mean Arterial Pressure (MAP) drops by more than 20% of baseline (MAP). HBE was managed by IV injection of atropine (0.6 mg boluses) or mephentermine (6 mg boluses).

Post-operative Assessment: All patients were shifted to the post anaesthesia care unit (PACU). All hemodynamic parameters were monitored every 15 mins till 1 hr in PACU followed by 6hr, 12hr and 24hr post-operatively. The recovery characterstics were assessed using Modified Aldrete Score (MAS) and the patients were discharged after attaining MAS of 9-10.[9] The time taken to achieve this score was noted. Pain intensity was assessed at the end of operation, then every 15 mins for 1 hour, then at 6 hours, 12 hours and 24 hours using Verbal Numerical Rating of Pain (VNRS). Rescue analgesia was given with Inj. Fentanyl 1mcg/kg IV and the number of patients requiring rescue analgesia were noted. Side effects like nausea, vomiting, secretions, laryngospasm/ bronchospasm, respiratory depression (respiratory rate <10) post ketamine sequelae (emergence phenomenon) like excitation, hallucination, euphoria etc were noted. The patients experiencing emergence phenomenon were given inj. midazolam 0.1mg/kg IV.

Data was collected using a pre designed structured proforma and was then compiled and analyzed using (Statistical Package for the Social Science) SPSS 21.0 version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows. Data has been described in terms of range; mean ±standard deviation (± SD), frequencies (number of cases) and relative frequencies (percentages) as appropriate.

To determine whether the data is normally distributed, a Kolmogorov-Smirnov test has been used. Comparison of quantitative variables was done using Student t-test and Mann Whitney U test for independent samples for parametric and non-parametric data respectively. For comparing categorical data, Chi square ($\chi 2$) test was performed and fisher exact test was used when the expected frequency was less than 5.A probability value (p value) less than 0.05 was considered statistically significant.

Results

All the 60 participants completed the study protocol (Figure 1). Demographic parameters, including age, height, weight, BMI, gender and American Society of Anesthesiologists physical status and duration of surgery were comparable without any statistically significant difference in both the groups (Table1).The distribution of surgical categories was comparable between two groups. (p=0.389) (Table2).

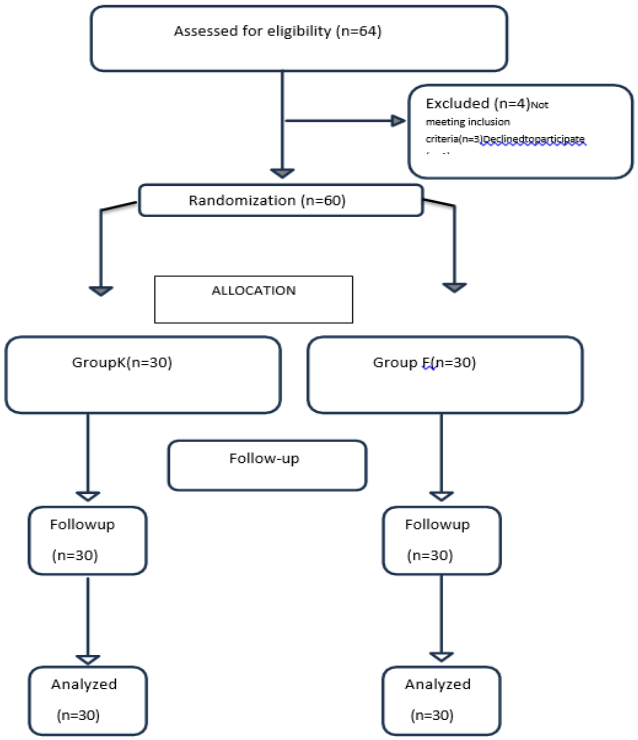

Figure 1: Consort Diagram

Table 1: Comparison of Demographic and Surgical Characteristics between Group K and Group F

	Group K(n=30)		Group F(n=30)		Z	Chi Square Value	p-value
	Mean± SD	%	Mean± SD	%			
Age(years)	36.63±12.07	-	35.10±11.57		-0.281	-	0.778
Height(cm)	164.13±5.63	-	165.77±5.12		-1.586	-	0.113
Weight(kg)	66.50±5.91	-	67.20±5.68		-0.396	-	0.692
BMI(Kg/m2)	25.80±2.57	-	24.52±2.62		-1.849	-	0.065
Duration of Surgery (mins)	63.50± 8.52	-	61.00±8.75		-1.339	-	0.180
Gender (%)	- -	F/M 46.7/53.3	- -	F/M 40/60	-	0.271	0.602
ASA	- -	I/II 66.7/33.3	- -	I/II 50/50	-	1.714	0.295

(n=sample size, SD=standard deviation, BMI=body mass index, ASA= American Society of Anesthesiologists)

Table 2: Comparison of types of surgeries between Group K and Group F

	Group K (n=30)		Group F (n=30)		Total	Chi-square value	p-value
	No. of cases	% age	No. of cases	%age			
Laparoscopic procedures(lap cholecystectomy+lap hysterectomy+lap tubal ligation)	16	53.3%	25	83.3%	41	13.792	0.389
Open abdominal /gynaecological procedures(open cholecystectomy+hysterectomy+ Total Abdominal Hysterectomy+ Suction evacuation and B/Ltubal ligation	8	26.7%	4	13.3%	12		
Breast procedures(Fibroadenoma+ gynaecomastia)	3	10.0%	1	3.3%	4		
Miscellaneous procedures(Umbilical hernia+ Tendon repair)	3	10.0%	0	0.0%	3		
	30		30		60		

Perioperative hemodynamic variables: At baseline, there was no statistically significant difference observed in SBP, DBP, MAP and HR between the two groups indicating comparable preoperative conditions. However from 5 to 25 minutes, Group K demonstrated significantly higher SBP,DBP,MAP and HR values than Group F($p<0.05$). For SBP, mean values ranged from 136.03± 9.89 to 144.50± 15.41 mm Hg in group K compared with 120.50± 8.27 to 122.40 ±7.99 mmHg in group F ($p<0.001$). From 30 minutes onward haemodynamic variables gradually returned towards baseline and there were no statistically significant differences in SBP, DBP, MAP and HR between the groups indicating stabilization of cardiovascular parameters over time (figure 2,3 ,4 and 5) . At all times SpO_2 values were similar between both the groups, with no statistically significant differences observed (all p-values > 0.05). The respiratory rate (RR) was controlled throughout the intraoperative operative period.

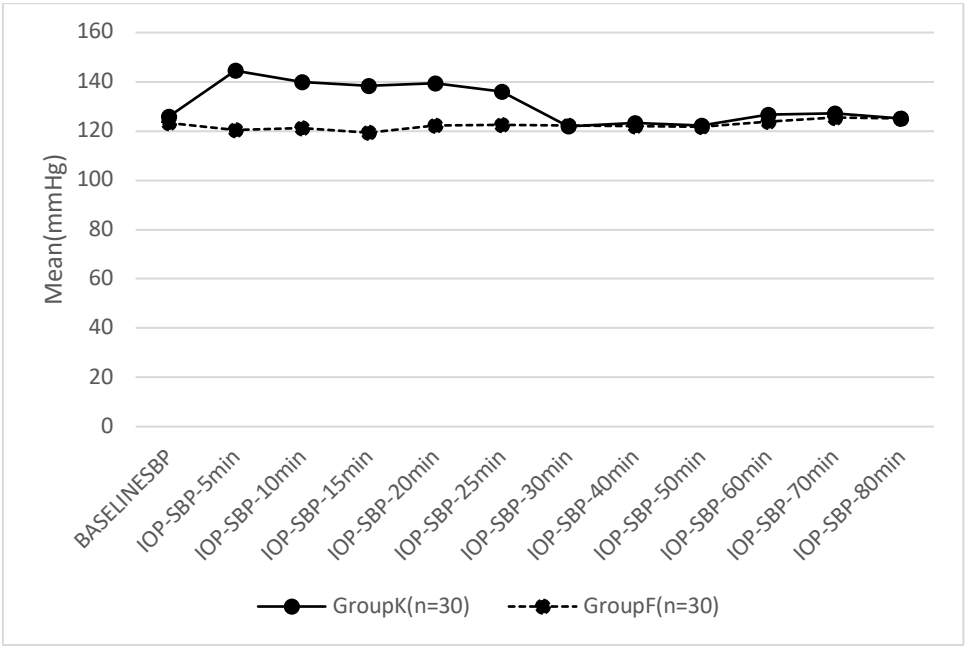

Figure 2: Comparison of intraoperative Systolic Blood Pressure (SBP) between Group K and Group F

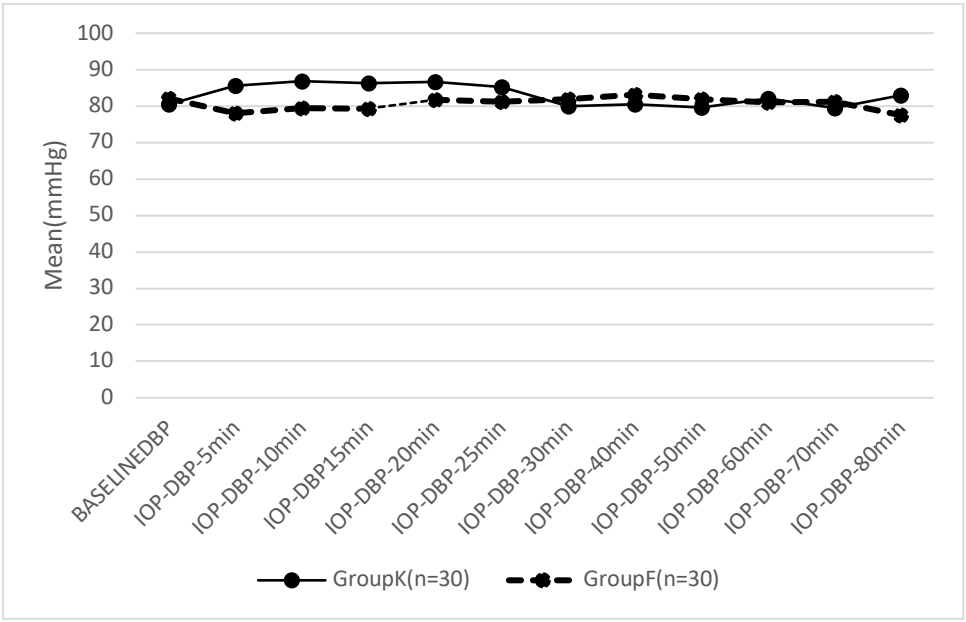

Figure 3: Comparison of intraoperative Diastolic Blood Pressure (DBP) between Group K and Group F

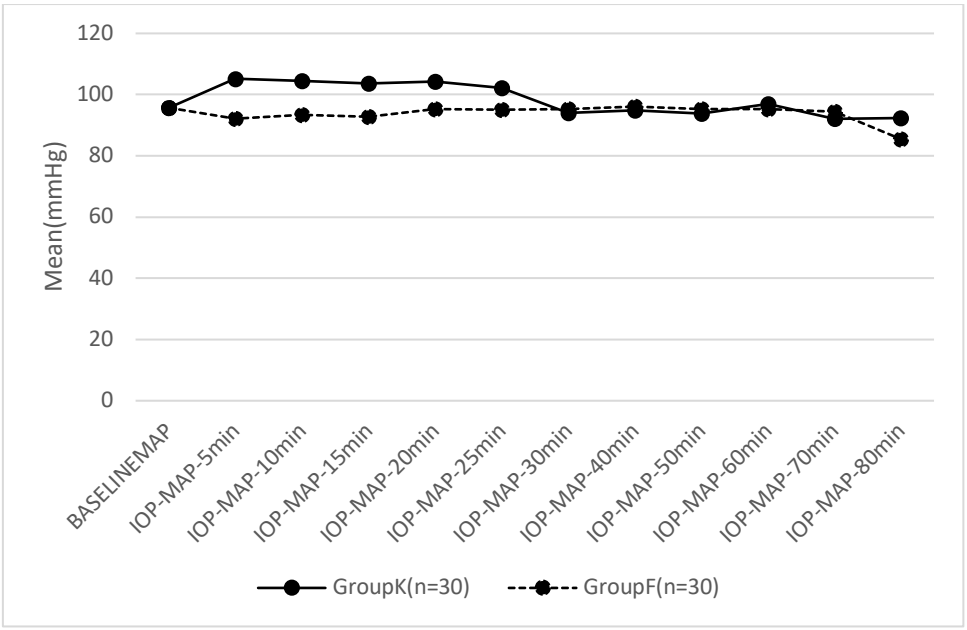

Figure 4: Comparison of intraoperative Mean Arterial Pressure (MAP) between Group K and Group F

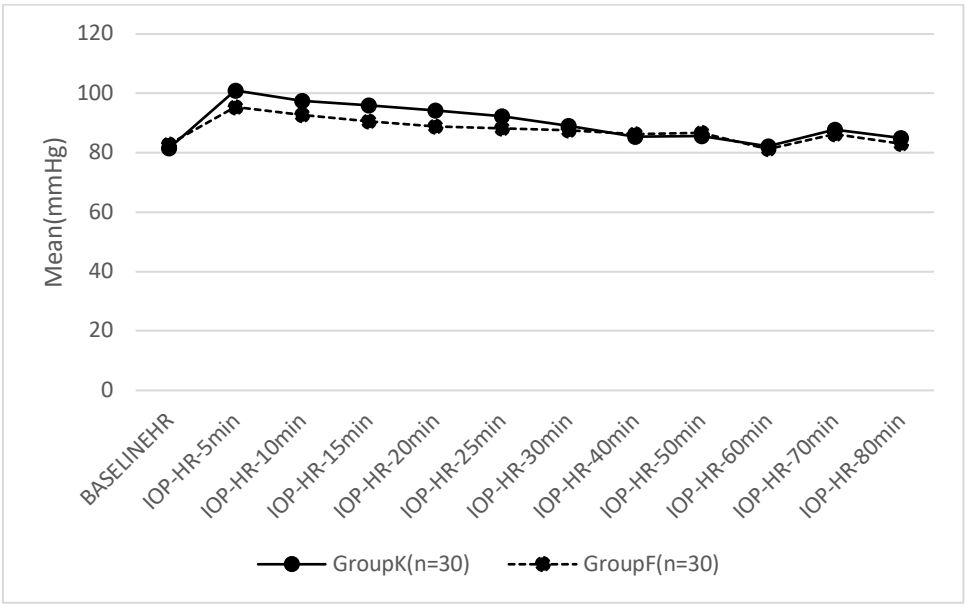

Figure5: Comparison of intraoperative Heart Rate (HR) between Group K and Group F

Postoperative hemodynamic variables: No significant differences were observed in SBP, DBP, MAP, HR, SPO2 and RR on arrival in PACU and then at15, 30, 45, and 60 minutes.

(All p values > 0.05)Across all time points post discharge from PACU (6hr, 12hr,24hr), no statistically significant differences were found in SBP,DBP,MAP,HR, SPO2 and RR between Group K and Group F (all p-values > 0.05).

The time required to obtain Modified Aldrete: Score of 9-10 was significantly shorter in Group F (mean = 4.38 ± 1.77 mins) as compared to Group K (mean = 6.62 ± 1.92 mins), with a p value of 0.001, indicating a statistically significant difference (table 3).

Table 3: Comparison of Time To Achieve Modified Aldrete Score (MAS) OF 9-10 between Group K and Group F.

	Group K (n=30)		Group F (n=30)			p-value
	Mean	SD	Mean	SD	Z	
Time to Achieve Mas of 9-10(in mins)	6.62	1.92	4.38	1.77	-4.326	0.001

Postoperative visual numeric rating scale (VNRS) and rescue analgesia: No significant differences were observed in pain scores on arrival in PACU, then at 15, 30, 45 and 60 minutes post-operatively. Also no patient in group K and group F required rescue analgesia in PACU. At 6 and 12 hours group K reported significantly higher pain scores than group F with p- value of 0.014 and 0.002 respectively. By 24 hours, both groups had comparable pain scores with no statistical difference between them (p value= 0.249) (table 4).

Although a greater number of patients in group K required rescue analgesia at 6 hours (12 versus 9 patients),12 hours (17 versus 10 patients),and 24 hours (12 versus 8 patients),the differences were not statistically significant (p=0.417,p=0.119 and p=0.836 respectively) (table 5).

Table 4: Post-Operative VNRS Pain Scores at 6, 12, and 24 Hours (n=sample size, SD=standard deviation)

	Group K (n=30)		Group F (n=30)		Z	p-value
	Mean	SD	Mean	SD		
VNRS-6hr	3.73	1.87	2.73	1.08	2.532	0.014
VNRS-12hr	3.53	1.28	2.50	1.22	3.196	0.002
VNRS-24hr	2.46	0.80	2.34	0.90	0.675	0.249

Table 5: Number of patients requiring rescue analgesia (RA) at 6hrs, 12hrs, 24hrs postoperatively

	Group K		Group F		Total	Chi-square value	p-value
	No. of cases	% age	No. of cases	% age			
RA-6hr	12	40.0%	9	30.0%	21	0.659	0.417
RA-12hr	17	56.7%	10	33.3%	27	3.300	0.119
RA-24hr	12	40.0%	8	26.7%	20	0.361	0.836

Postoperative Incidence of Adverse Events: Nausea occurred more frequently in group K (8 patients) than group F (2 patients), while emergence phenomenon was observed only in group K (4 patients) (table 6).No adverse events noted during 6, 12, 24 hrs post operatively.

Table 6: Postoperative incidence of adverse events

	Group K		Group F		Total
	No. of cases	%age	No. of cases	% age	
EP (Emergence phenomena)	4	13.3%	0	0.0%	4
N(Nausea)	8	26.7%	2	6.7%	10

Discussion

The present study has been done to compare propofol ketamine and propofol fentanyl with respect to haemodynamic stability, recovery characteristics and analgesia not only during intraoperative but also 24 hours postoperatively in which no study is available till now to best of our knowledge. Propofol with fentanyl is commonly used for brief procedures due to their ability to deliver effective analgesia while maintaining hemodynamic stability. This combination has minimal impact on psychomotor function. [10] In contrast, ketamine in conjunction with propofol balances propofol's cardio depressant impact and maintains stable hemodynamics while retaining respiratory drive. [11] At baseline, there was no statistically significant difference observed in SBP, DBP, MAP and HR between the two groups indicating comparable preoperative conditions. However from 5 to 25 minutes, group K demonstrated significantly higher SBP, DBP, MAP and HR values than group PF. From 30 minutes onward, there were no statistically significant differences in SBP, DBP, MAP and HR between the groups (figure 2,3 ,4 and 5). The hemodynamic response in SBP, DBP, MAP and HR in the first 25 mins during intraoperative period in group K can be explained by the central sympathetic stimulation caused by ketamine which was also compounded by the effects of CO2 stimulation as many laparoscopic surgeries were taken up in our study. The stabilisation of hemodynamics after 30 mins of induction in group K indicates the effective neutralisation of ketamine's actions by the cardio depressant action of propofol.

On the other hand in group F, the pressor response of laryngoscopy and surgical stimulation were very well balanced by the synergistic action of propofol-fentanyl combination. Thus, Group F provide a smoother intraoperative haemodynamic profile with avoidance of marked changes in haemodynamic parameters. Our results correlate well with the study done by Singh Bajwa SJ et al. where similar drug combinations were studied and they found that SBP in group I that is propofol and ketamine was consistently high in starting from 1 min post induction to 1 min in postoperative period as compared to group II which is propofol and fentanyl with p-values <0.05 at all times of observation. [7] Similarly Ramdev et al. did a study

in which propofol-ketamine and propofol-fentanyl combinations were given in 100 patients undergoing minor surgeries to compare their hemodynamic variables and recovery characteristics. They saw that there was a significant rise in SBP starting from 1 min after induction to 10 mins post induction in the propofol-ketamine group (with p- values of <0.05 at 1 min, 5mins and 10 mins post induction) .Thereafter the SBP values in both groups converged to the baseline and remained non-significant till the immediate postoperative period. These findings resonate with our results pertaining to SBP at induction, maintenance and immediate postoperative period. [12]

For DBP, our results align with study done by Sabertanha A et al. who evaluated the intra and post-operative hemodynamic effects of ketamine-propofol mixture (Ketofol) infusion in comparison with propofol infusion. They reported that DBP was consistently higher in ketofol group from 10 mins to 60 mins post induction. Unlike our study the patients weren't followed during the recovery period to note any hemodynamic differences.[13]

For MAP, Khutia SK et al. conducted a study on 100 children aged 3-14 years undergoing various short surgical procedures. Two equal groups PK and PF received combination of propofol-ketamine and propofol-fentanyl respectively from the premixed solutions of the drug combinations after calculating their required dose. They found MAP was significantly higher in group PK than in group PF when compared with baseline starting from 5 mins post induction till end of surgery. Their study lacks comparison of hemodynamics during the postoperative period which shows a higher MAP in the ketamine group in our study. [14]

In context to HR, the results were consistent to study done by Arya et al. in which 34 patients undergoing short surgical procedures were given TIVA using propofol-ketamine and propofol-fentanyl combinations. The study revealed that heart rate remained significantly higher in the ketamine group starting from 1 min post induction till 1min post extubation (p-value<0.05).[15] Both groups demonstrated stable oxygen levels during surgery, with a similar range of SpO_2 values similar to study done by Singh Bajwa SJ et al.[7]

In this study we followed up the patients up to 24 hour post operatively and it showed no significant differences in SBP,DBP, MAP, HR, SpO2 and RR between Group K and Group F at 6, 12, or 24 hours, indicating no delayed effects of the drug infusions on the hemodynamic variables over time. We haven't come across any literature in which patients have been followed up till 24 hrs post-surgery so as to support or refute our findings on comparison.

The recovery time was significantly shorter in Group F (4.38 ± 1.77 mins) as compared to Group K (6.62±1.92 mins), with a p-value of 0.001, indicating a statistically significant difference between the two groups (Table no 3) .The prolonged recovery profile in group K may be explained by psychomimetic and sedative effects of ketamine. Fentanyl when used in appropriate doses with propofol results in smoother emergence and earlier attainment of recovery endpoints. Our results are consistent with the study done by Pawar et al. to compare hemodynamic stability, recovery profile and side effects in 120 patients receiving propofol-ketamine and propofol-fentanyl for minor surgical procedures. They found that recovery time, as judged by spontaneous eye opening and orientation to time place and person was significantly longer (12.61± 2.83 mins and 20.60 ±4 .20 mins respectively) in ketamine group as compared to fentanyl group (10.42± 1.90 mins and 18.73± 2.62 mins respectively) with p value< 0.001 which is similar to our study but their higher mean time for recovery can be justified by the differences in type and duration of procedures.[16]

On arrival in PACU, patients were assessed every 15 mins till 1hr. Pain scores remained less than 3 in both groups and no significant difference in pain score was noted during that time (p-value=1.000). At 6 hours, Group K reported significantly higher pain scores than Group F (p = 0.014) and 12 patients in group K and 9 patients in group F had required rescue analgesia at this time. Pain scores remained significantly different between both groups at 12 hours (p = 0.002), with Group F experiencing lower pain where only 10 patients required rescue analgesia as compared to 17 patients in group K with p- value of 0.119. Although ketamine possesses intrinsic analgesic properties, the superior analgesia observed in group F may be related to the potent mu opioid receptor agonist action of fentanyl. Differences in surgical stimulation and postoperative pain perception may also be contributed to these results. By 24 hours, both groups had comparable pain scores with mean of (2.46± 0.80)and (2.34±0.90) in group K and F respectively which were comparable(p-value = 0.249) and 12 patients in group K and 8 patients in group F required rescue analgesia with p- value of 0.836 (table 4 and 5). Bahrami Gorgi et al. did a study in which 72 patients undergoing Endoscopic Retrograde Cholangiopancreatography (ERCP) were taken. Group (PK) received ketamine 0.5 mg/kg, and the control group (PF) received fentanyl 50-100 micrograms IV. All patients received propofol 0.5 mg/kg in a loading dose IV followed by 75 mcg/kg/minute through an intravenous infusion. They found that post procedure Visual analogue scale (VAS) was higher in PK group with mean value of (1.97 ± 1.742) than in PF group with mean value of (1.26 ± 0.921) (p-

value = 0.037) which was similar to our study.[17]We didn't come across any literature regarding duration of analgesia beyond 6hrs using TIVA. Jakobsson et al. did a study in which 200 patients were divided in four groups such that group 1 received injection propofol 20 mg plus ketamine 20 mg IV, group 2 received 20 mg propofol + 0.1 mg fentanyl, Group 3 received injection thiopentone 50 mg + fentanyl 0.1 mg IV and Group 4 received methohexitone 20 mg + 0.1 mg fentanyl IV. All patients were compared using a self-assessment questionnaire concerning quality of anaesthesia and postoperative course which included pain as one of the criteria. It was seen that out of 47 patients the highest number of patients who had postoperative pain and required rescue analgesia were in ketamine propofol group that is 24 patients with p- value< 0.05 as compared to propofol fentanyl group which had only 4 patients experiencing postoperative pain. This observation supports our finding that the propofol-ketamine group required more number of rescue analgesia.[18]

On arrival in PACU, in group K 4 patients had Emergence phenomena, 8 patients had nausea while in group F only 2 patients complained of nausea. (Table no. 6) Dexamethasone was given uniformly to all study participants to minimize the influence of PONV on recovery outcomes. The higher incidence of emergence phenomenon observed in Group K is consistent with the known psychomimetic effects of ketamine. Similarly, the increased frequency of postoperative nausea in group K may be related to ketamine associated central nervous system effects and delayed recovery characteristics. Singh R et al. did a study to compare fentanyl and propofol, and ketamine and propofol combination in 100 female patients undergoing laproscopic tubal ligation. They found that post-operatively, 14 patients in group PK had nausea as compared to 5 patients in group PF (p value- 0.04) which demonstrates that incidence of nausea was more in propofol- ketamine group just like in our study.[19]

Limitations: The present study was limited by its relatively small sample size and single- centre design. Patients undergoing different elective short surgical procedures were included, which may influence perioperative outcomes. Objective depth-of–anaesthesia monitoring was not performed due to resource and cost constraints. Future studies with large sample sizes may benefit from more advanced longitudinal statistical methods.

Conclusion

The results of the study show that both propofol-ketamine andpropofol-fentanyl combinations are efficacious to provide total intravenous anaesthesia in surgical procedures of up to 90 mins. Compared with propofol-ketamine, the propofol-fentanyl combination was associated with a smoother intraoperative haemodynamic profile, faster recovery, lower postoperative pain scores at selected time points, and fewer adverse effects.

References

1. Lone JA, Hajam AF, Dar MT, Malik MMUD. Recent advancements in total intravenous anaesthesia (TIVA) and anaesthetic pharmacology. Int J Health Sci Res. 2023; 13(11):365-76. doi:10.52403/ijhsr.20231145.
2. Kampman JM, Hermanides J, Hollmann MW, Gilhuis CN, Bloem WA, Schraag S, et al. Mortality and morbidity after total intravenous anaesthesia versus inhalational anaesthesia: a systematic review and meta-analysis. EClinicalMedicine. 2024 ;72:102636. doi: 10.1016/j.eclinm.2024.102636.
3. Al-Rifai Z, Mulvey D. Principles of total intravenous anaesthesia: practical aspects of using total intravenous anaesthesia. BJA Educ.2016;16(8):276-80.
4. Nimmo AF, Absalom AR, Bagshaw O, Biswas A, Cook TM, Costello A, et al. Guidelines for the safe practice of total intravenous anaesthesia (TIVA): Joint Guidelines from the Association of Anaesthetists and the Society for Intravenous Anaesthesia. Anaesthesia. 2019 ;74(2):211-24.
5. Kurdi MS, Theerth KA, Deva RS. Ketamine: Current applications in anesthesia, pain, and critical care. Anesth Essays Res. 2014;8(3): 283-90. doi: 10.4103/02591162.143110.
6. Comer SD, Cahill CM. Fentanyl: Receptor pharmacology, abuse potential, and implications for treatment. Neurosci Biobehav Rev. 2019; 106:49-57.
7. Bajwa SJ, Bajwa SK, Kaur J. Comparison of two drug combinations in total intravenous anesthesia: propofol–ketamine and propofol–fentanyl. Saudi J Anaesth. 2010;4(2):72-9.
8. Holdgate A, Asha S, Craig J, Thompson J. Comparison of a verbal numeric rating scale with the visual analogue scale for the measurement of acute pain. Emerg Med 2003;15:441-6.
9. Ding D, Ishag S. Aldrete Scoring System. In: StatPearls [Internet]. Treasure Island (FL): Stat Pearls Publishing; 2025 Available from: https://www.ncbi.nlm.nih.gov/books/NBK594237.
10. Kb N, Cherian A, Balachander H, Kumar C Y. Comparison of propofol and ketamine versus propofol and fentanyl for puerperal sterilization, A Randomized Clinical Trial. J Clin Diagn Res. 2014 ;8(5):GC01-4.
11. Furuya A, Matsukawa T, Ozaki M, Nishiyama T, Kume M, Kumazawa T. Intravenous ketamine attenuates arterial pressure changes

during the induction of anaesthesia with propofol. Eur J Anaesthesiol. 2001 ;18(2):88-92.
12. Ramdev B, Sharma DK, Sharma SR, Sodhi GS. A comparative evaluation of propofol-ketamine and propofol-fentanyl As T.I.V.A techniques in terms of haemodynamic variables and recovery characteristics in minor surgeries. IOSR J Dent Med Sci. 2015; 14(4):19-26.
13. Sabertanha A, Shakhsemampour B, Ekrami M, Allahyari E. Comparison of infusion of propofol and ketamine-propofol mixture (Ketofol) as anesthetic maintenance agents on blood pressure of patients undergoing orthopedic leg surgeries. Anesth Pain Med. 2019;9(6):e96998.
14. Khutia SK, Mandal MC, Das S, Basu SR. Intravenous infusion of ketamine-propofol can be an alternative to intravenous infusion of fentanyl-propofol for deep sedation and analgesia in paediatric patients undergoing emergency short surgical procedures. Indian J Anaesth. 2012 ;56(2):145-50.
15. Arya JR, Sojitra BH, Pandya MJ. Comparison of two drug combinations in total intravenous anaesthesia: propofol-ketamine and propofol-fentanyl. Natl J of Med Res.2022;12(4):77–82.
16. Pawar D, Bhople P, Pandey S, Khobragade S. Comparative evaluation of propofol-ketamine and propofol fentanyl for minor surgical procedures. Int J Res Med Sci.2017; 3(12):3795–3801.
17. Bahrami Gorji F, Amri P, Shokri J, Alereza H, Bijani A. Sedative and analgesic effects of propofol-fentanyl versus propofol- ketamine during endoscopic retrograde cholangiopancreatography: a double-blind randomized clinical trial. Anesth Pain Med. 2016;6(5):e39835.
18. Jakobsson J, Oddby E, Rane K. Patient evaluation of four different combinations of intravenous anaesthetics for short outpatient procedures. Anaesthesia.1993;48(11):1005-7.
19. Singh R, Ghazanwy M, Vajifdar H. A randomized controlled trial to compare fentanyl-propofol and ketamine-propofol combination for procedural sedation and analgesia in laparoscopic tubal ligation. Saudi J Anaesth. 2013 ;7(1):24-8.