ORIGINAL RESEARCH PAPER

Volume-7 | Issue-3 | March-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

TO STUDY THE DIFFERENCES BETWEEN HAEMODYNAMIC CHANGES SEEN IN TOTAL INTRAVENOUS ANAESTHESIA AMONGST : PROPOFOL-KETAMINE AND PROPOFOL-FENTANYL

Anesthesiology

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ABSTRACT

INTRODUCTION This study was conducted to evaluate and compare two drug combinations for TIVA (Total Intravenous Anesthesia) using propofol--ketamine and propofol-fentanyl and to study the induction, maintenance and recovery characteristics of anaesthesia with these techniques.

AIMS AND OBJECTIVES To find a proper combination of agents for safe total intravenous anesthetic technique, to prevent atmospheric pollution. For this my present objective is to compare Propofol- ketamine combination Vs. Propofol-Fentanyl combination.

MATERIAL AND METHODS After obtaining approval from institutional ethical committee and written informed consent from the patients this study was carried out of 100 patients of either sex of ASA grade I & II, aged 20-45 years selected elective abdominal surgeries under general anesthesia. Patients were randomly allocated into two group (n = 50 each) depending upon the use of study drugs.

Exclusion criteria:

Patient with suspected difficult airways
History of allergy to study drugs
Patient taking antihypertensive systematic diseases drugs
Patient having significant systematic diseases
Patient in whom laryngoscopy and intubation require>1attempts and or lasted >30 seconds

Plans of study-

Grop K : ketamine as study drugs
Grup F: fentanyl as study drugs

METHOD – Preoperative explanations will be given to the fit patients. Monitoring gadget (ECG, SPO_2 and non invasive BP cuff) were attached to the patient before anesthetic administration. Pre oxygenation with 100% oxygen was done for 3 mints before induction. Induction of anesthesia was done by propofol 1.5 mg / kg immediately followed by ketamine 0.5 mg/kg in group k or fentanyl (0.2 ug)/kg in group f.

All patients were received inj. succinylcoline 1.5mg/kg and ventilated. Laryngoscopy followed by endotracheal intubation and ventilated. Anesthesia was maintained by propofol (100 ug/kg at 10 mint interval in group k / fentanyl (1ug/kg /hour) in group f, vecuronium (0.80 mg/kg) as bolus followed by 0.03 mg/kg as top ups if required and IPPV.

CONCLUSION

propofol-ketamine and propofol-fentanyl can be used as an excellent combination in TIVA for various elective surgeries where minimal side effects and early recovery are desired. However, due to wider availability and lower cost, we prefer & recommend propofol-ketamine combination

KEYWORDS

Propofol , Ketamine ,Fentanyl , TIVA.

INTRODUCTION

General anaesthetic agents should provide quick and pleasant induction, predictable loss of consciousness, stable operating conditions, minimal adverse effects, rapid and smooth recovery of protective reflexes and psychomotor functions.

This study was conducted to evaluate and compare two drug combinations for TIVA (Total Intravenous Anaesthesia) using propofol--ketamine and propofol-fentanyl and to study the induction, maintenance and recovery characteristics of anaesthesia with these techniques.

Till recently, inhalational agents have remained the routine choice for maintenance of anesthesia. One of the principal reason is the availability of sophisticated delivery systems for volatile anesthetics, which allows the anesthetics to have a fine degree of control on the concentration administered to the patient. Moreover, monitoring systems that permit nearly accurate measurement of end tidal concentration of the volatile anesthetics as well as the introduction of new potent volatile agents provide a wider choice of drugs.

In spite of all these advantages, inhalational agents have their own drawbacks and shortcomings that are as follows:

- cost factor

different specific vaporizers require repeated maintenance, **scavenging system is necessary:** otherwise pollution of operation room environment in a big hazard.

TIVA has many advantages over inhalatational anesthesia such as:

- No operating room pollutions
- Minimal cardiac depression
- Lesser neurohumoral response
- Decreased oxygen consumption
- Avoids distension of air-filled spaces within the patient's body, thus producing optimum operating conditions for the surgeon
- Avoids postoperative diffusion hypoxemia
- Decreases the incidence of postoperative nausea and vomiting (PONV)
- In day-care surgery, etc.

Moreover, TIVA can be used not only in well-equipped hospital setting but at remote location also with only oxygen and ventilation facilities.

Various drugs have been tried from time to time in TIVA. Since no single drug can provide all the characteristics of an ideal intravenous agent, several drugs are used in different combinations to provide balanced anesthesia in TIVA, that is, amnesia, hypnosis and analgesia.

In the lookout for an ideal intravenous anesthetic agent in clinical practice, **Kay and Roily**[1] introduced propofol in 1977. Its advantage

in short surgical procedures relates to Its rapid elimination from the blood (halflife 1-3 h due to high hepatic clearance) leading to rapid recovery of cognitive and psychomotor functions with very low incidence of PONV. Lack of analgesic properties of propofol has necessitated the need for supplementary analgesic agents during TIVA.

Ketamine in subanesthetic doses has gained more attention as an analgesic for TIVA.

Fentanyl is used extensively in TIVA now-a-days. It belongs to opioid group of drugs. It is hundred times more potent analgesic than morphine, and as a part of balanced anesthesia it relieves pain, reduces somatic and autonomic response to airway manipulation, provides hemodynamic stability and lesser respiratory depression.

The combination of these drugs provides complete and balanced anesthesia and has advantages such as high potency, lower dosages and fewer side effects. In the quest for complete anesthesia, various combinations of these new drugs have been tried which, include midazolam-ketamine, propofol--ketamine, propofol-fentanyl and many more each with varying results.

AIMS AND OBJECTIVES

To find a proper combination of agents for safe total intravenous anesthetic technique, to prevent atmospheric pollution. For this my present objective is to compare Propofol- ketamine combination Vs. Propofol-Fentanyl combination.

MATERIAL AND METHODS

After obtaining approval from institutional ethical committee and written informed consent from the patients this study was carried out of 100 patients of either sex of ASA grade I & II, aged 20-45 years selected elective abdominal surgeries under general anesthesia. Patients were randomly allocated into two group (n = 50 each) depending upon the use of study drugs.

Exclusion criteria:

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Plans of study-

Grop K : ketamine as study drugs
Grup F: fentanyl as study drugs
METHOD – Preoperative explanations and guidelines will be given to the fit patients. Monitoring gadget (ECG, SPO_2 and non invasive BP cuff) were attached to the patient before anesthetic administration. Base line parameters were observe and recorded after securing intravenous line. Injection midazolam (0.08mg /kg) was given iv over 2 minuts. Before the induction of anesthesia in both groups. Pre oxygenation with 100% oxygen was done for 3 mints before induction. Induction of anesthesia was done by propofol 1.5 mg / kg (bw) immediately followed by ketamine 0.5 mg/kg(bw) in group k or fentanyl (0.2 ug)/kg (bw) in group f.

All patients were received inj. succinylcoline 1.5mg/kg and ventilated with 100% oxygen via a facemask for 1 to 1.5 mint after succinylcholine injection. Laryngoscopy followed by endotracheal intubation and ventilated. Anesthesia was maintained by propofol (100 ug/kg at 10 mint interval in group k / fentanyl (1ug/kg bw/hour) in group f, vecuronium (0.80 mg/kg (bw) as bolus followed by 0.03 mg/kg (bw) as top ups if required and IPPV.

At the conclusion of operation propofol drip will be stopped. Neuromuscular block was reversed by using neostigmine glycopyrolate combination. Adequacy of reversal was assessed, if adequate extubation was performed and oxygen supplemented for 20 mints and patient transferred from the OT.

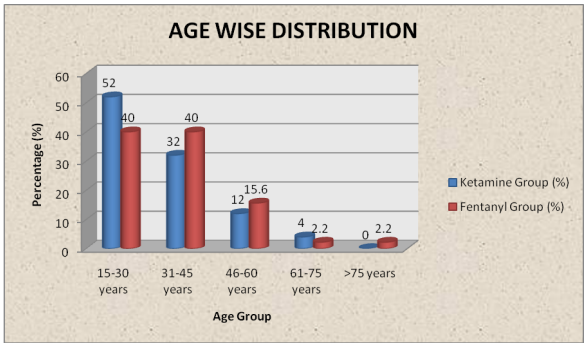
OBSERVATIONS AND RESULTS

Table No. 1
Age wise distribution of cases in each group

Age in years	Ketamine Group		Fentanyl Group	
	No.	%	No.	%
15-30 years	26	52.0	18	40.0
31-45 years	16	32.0	18	40.0
46-60 years	6	12.0	7	15.6
61-75 years	2	4.0	1	2.2
>75 years	0	0.0	1	2.2
Total	50	100.0	45	100.0

The above table shows the distribution of patients according to age group.

Majority of the patients were in the age group 15-45 years of age in both the ketamine and fentanyl group.



Graph : Showing age wise distribution

Table No. 2
Sex wise distribution of cases in each group

Gender	Ketamine Group		Fentanyl Group	
	No.	%	No.	%
Female	25	50.0	30	60.0
Male	25	50.0	20	40.0
Total	50	100.0	50	100.0

The above table shows the distribution of patients according to gender.

There were 25 (50%) each female and male in ketamine group and 30 (60%) females and 20 (40%) males in the fentanyl group.

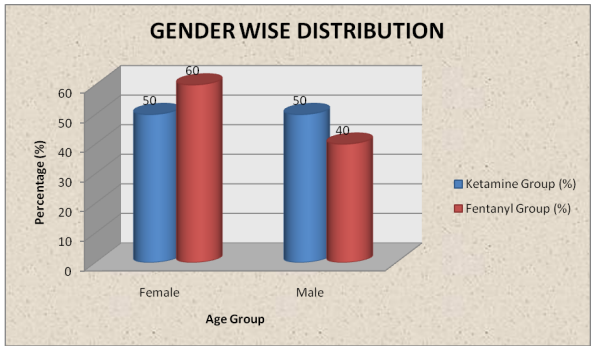


Table No. 3

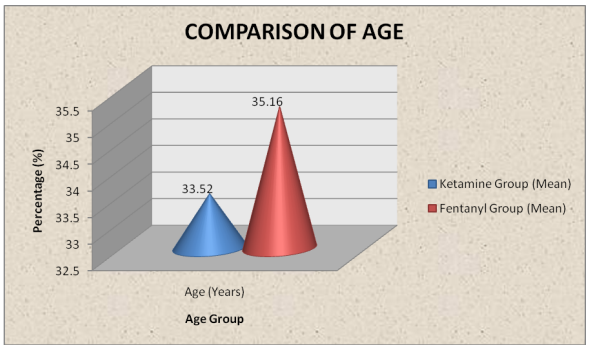
Demographic Data

Statistical Parameter	Ketamine Group [Mean±SD]	Fentanyl Group [Mean±SD]	't' Value	P Value
Age (Years)	33.52 ± 11.72	35.16 ± 14.76	-0.601, df=93	0.549, NS
Weight (kg)	57.12 ± 8.27	65.88 ± 10.19	-4.722, df=98	0.000*

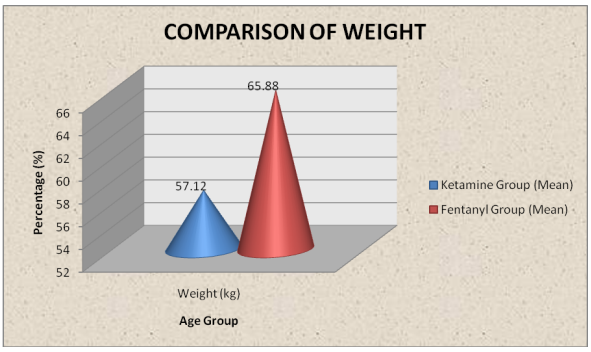
Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

Age was found to be comparable between the two groups (P > 0.05),

while statistically significant difference in weight was seen (P < 0.05), between the two groups with a higher weight in Fentanyl group in comparison to the ketamine group.



Graph : Cone diagram Showing comparison of age



Graph : Cone diagram showing comparison of weight

Table No. 4

Comparison of mean heart rate between the two groups at different time intervals

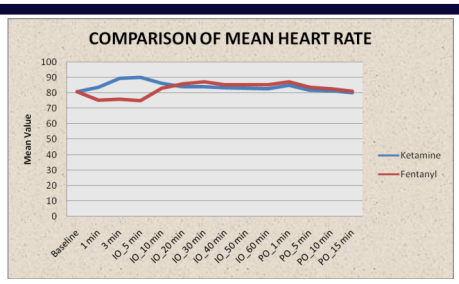
Time Interval	Ketamine Group [Mean±SD]	Fentanyl Group [Mean±SD]	't' Value	P Value
Baseline	80.66 ± 9.10	80.78 ± 4.92	-0.082, df-98	0.935, NS
1 min	83.56 ± 6.19	75.14 ± 1.19	9.452, df=98	0.000*
3 min	89.18 ± 5.21	75.84 ± 2.15	16.749, df=98	0.000*
IO_5 min	89.94 ± 4.97	74.86 ± 1.74	20.264, df=98	0.000*
IO_10 min	86.30 ± 3.97	83.14 ± 3.55	4.201, df=98	0.000*
IO_20 min	84.10 ± 4.07	86.00 ± 4.00	-2.354, df=98	0.021*
IO_30 min	83.88 ± 3.71	87.18 ± 8.27	-2.574, df=98	0.012*
IO_40 min	83.44 ± 3.57	85.16 ± 3.51	-2.430, df=98	0.017*
IO_50 min	82.94 ± 3.67	85.18 ± 3.47	-3.136, df=98	0.002*
IO_60 min	82.64 ± 4.53	85.24 ± 3.27	-3.292, df=98	0.001*
PO_1 min	84.90 ± 4.81	87.24 ± 3.20	-2.862, df=98	0.005*
PO_5 min	81.86 ± 5.19	83.60 ± 2.25	-2.176, df=98	0.032*
PO_10 min	81.50 ± 5.69	82.72 ± 2.16	-1.418, df=98	0.159, NS
PO_15 min	80.16 ± 6.81	81.02 ± 4.72	-0.734, df=98	0.465, NS

Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

In the ketamine group, there is an increase in heart rate from baseline to intraoperative 5 min, then a fall till postoperative 15 min.

In the fentanyl group, there is a fall in heart rate from baseline to intraoperative 5 min and the rise till intraoperative 30 min and then again a fall.

There was statistically no significant difference in the mean heart rate at baseline and postoperative 10 min and 15 min (P > 0.05).While for all other time intervals there was a statistically significant difference (P < 0.05).



Graph : Line diagram showing comparison of mean heart rate

Table No. 5

Comparison of mean systolic blood pressure between the two groups at different time intervals

Time Interval	Ketamine Group [Mean±SD]	Fentanyl Group [Mean±SD]	't' Value	P Value
Baseline	127.92 ± 5.24	126.00 ± 5.78	1.740, df=98	0.085, NS
1 min	129.78 ± 5.99	127.50 ± 3.76	2.280, df=98	0.025*
3 min	135.38 ± 3.66	123.08 ± 1.83	21.242, df=98	0.000*
IO_5 min	133.10 ± 5.63	119.34 ± 2.13	16.181, df=98	0.000*
IO_10 min	130.22 ± 3.55	123.38 ± 3.81	9.289, df=98	0.000*
IO_20 min	129.22 ± 3.92	130.90 ± 2.69	-2.497, df=98	0.014*
IO_30 min	129.14 ± 3.75	134.04 ± 3.02	-7.196, df=98	0.000*
IO_40 min	129.02 ± 3.58	131.48 ± 2.68	-3.887, df=98	0.000*
IO_50 min	128.12 ± 3.87	130.96 ± 4.74	-3.281, df=98	0.001*
IO_60 min	128.18 ± 3.99	130.44 ± 4.34	-2.709, df=98	0.008*
PO_1 min	132.18 ± 2.84	129.72 ± 5.01	3.018, df=98	0.003*
PO_5 min	129.20 ± 3.93	130.00 ± 2.34	-1.237, df=98	0.219, NS
PO_10 min	128.38 ± 3.41	129.02 ± 2.68	-1.043, df=98	0.300, NS
PO_15 min	127.70 ± 2.46	127.34 ± 1.83	0.831, df=98	0.408, NS

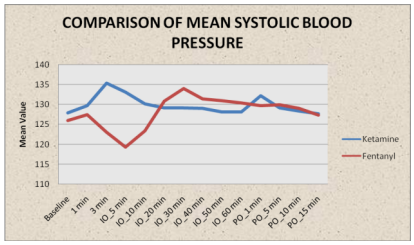
Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

In the ketamine group, there is an increase in systolic blood pressure from baseline to intraoperative 3 min, then a fall till postoperative 15 min.

In the fentanyl group, there is a fall in systolic blood pressure from 1 min and the fall from 3 min to postoperative 15 min.

There was statistically no significant difference in the mean systolic blood pressure at baseline, postoperative 5 min, 10 min and 15 min (P > 0.05).

While for all other time intervals there was a statistically significant difference (P < 0.05).



Graph : Line diagram showing comparison of mean systolic blood pressure

Table No. 6
Comparison of mean diastolic blood pressure between the two groups at different time intervals

Time Interval	Ketamine Group [Mean±SD]	Fentanyl Group [Mean±SD]	't' Value	P Value
Baseline	81.00 ± 4.09	81.50 ± 3.96	-0.621, df=98	0.536, NS
1 min	80.90 ± 3.21	78.86 ± 4.40	2.648, df=98	0.009*
3 min	86.06 ± 0.74	76.82 ± 2.02	30.409, df=98	0.000*
IO_5 min	86.06 ± 0.74	75.00 ± 1.40	49.397, df=98	0.000*
IO_10 min	81.06 ± 0.74	79.12 ± 0.82	12.386, df=98	0.000*
IO_20 min	81.06 ± 0.74	82.44 ± 1.39	-6.206, df=98	0.000*
IO_30 min	81.06 ± 0.74	84.06 ± 0.96	-17.544, df=98	0.000*
IO_40 min	81.06 ± 0.74	82.92 ± 1.03	-10.391, df=98	0.000*
IO_50 min	81.06 ± 0.74	84.44 ± 0.79	-22.132, df=98	0.000*
IO_60 min	81.06 ± 0.74	85.34 ± 0.75	-28.818, df=98	0.000*
PO_1 min	82.06 ± 0.74	86.36 ± 1.03	-24.047, df=98	0.000*
PO_5 min	79.06 ± 0.74	80.54 ± 0.68	-10.440, df=98	0.000*
PO_10 min	80.02 ± 3.59	80.52 ± 0.89	-0.955, df=98	0.342, NS
PO_15 min	80.16 ± 3.61	80.08 ± 1.14	0.150, df=98	0.881, NS

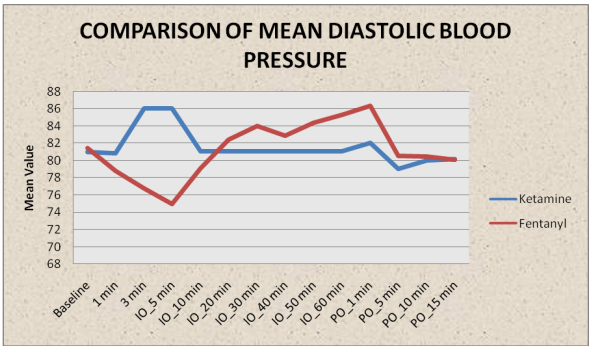
Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

In the ketamine group, there is an increase in diastolic blood pressure from baseline to intraoperative 5 min, then a fall till postoperative 15 min.

In the fentanyl group, there is a fall in diastolic blood pressure from baseline to intraoperative 5 min and the rise till postoperative 1 min and then fall till postoperative 15 min.

There was statistically no significant difference in the mean diastolic blood pressure at baseline and postoperative 10 min and 15 min (P > 0.05).

While for all other time intervals there was a statistically significant difference (P < 0.05).



Graph : Line diagram showing comparison of mean diastolic blood pressure

Table No. 7
Comparison of mean MAP pressure between the two groups at different time intervals

Time Interval	Ketamine Group [Mean±SD]	Fentanyl Group [Mean±SD]	't' Value	P Value
Baseline	85.64 ± 6.37	80.54 ± 2.79	5.185, df=98	0.000*
1 min	89.34 ± 4.57	88.96 ± 3.13	0.485, df=98	0.629, NS
3 min	97.98 ± 8.56	103.02 ± 3.25	-3.892, df=98	0.000*
IO_5 min	110.0 ± 10.01	106.44 ± 3.09	7.740, df=98	0.000*
IO_10 min	105.00 ± 1.01	105.18 ± 1.41	-0.734, df=98	0.465, NS
IO_20 min	105.06 ± 1.04	105.04 ± 1.43	0.080, df=98	0.936, NS
IO_30 min	103.60 ± 1.88	104.58 ± 1.51	-2.867, df=98	0.005*
IO_40 min	108.00 ± 1.01	107.28 ± 1.72	2.558, df=98	0.012*
IO_50 min	108.00 ± 1.01	108.02 ± 0.61	-0.074, df=98	0.941, NS
IO_60 min	104.94 ± 1.15	105.54 ± 1.29	-2.447, df=98	0.016*
PO_1 min	104.06 ± 1.09	103.74 ± 1.21	1.387, df=98	0.169, NS
PO_5 min	101.84 ± 0.99	102.02 ± 0.98	-0.911, df=98	0.365, NS
PO_10 min	89.32 ± 4.75	88.30 ± 3.19	1.261, df=98	0.210, NS
PO_15 min	89.32 ± 4.75	89.60 ± 3.12	-0.348, df=98	0.728, NS

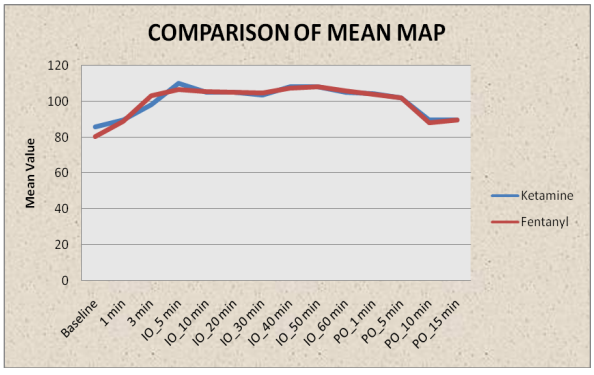
Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

In the ketamine group, there is an increase in mean MAP from baseline to postoperative 5 min, then a fall till postoperative 15 min.

In the fentanyl group, there is a fall in mean MAP from baseline to intraoperative 50 min and fall till postoperative 15 min.

There was statistically no significant difference in the mean MAP at 1 min, intraoperative 10 min, 20 min, 50 min, postoperatively 1 min, 5 min, 10 min and 15 min (P > 0.05).

While for all other time intervals there was a statistically significant difference (P < 0.05).



Graph : Line diagram showing comparison of mean MAP

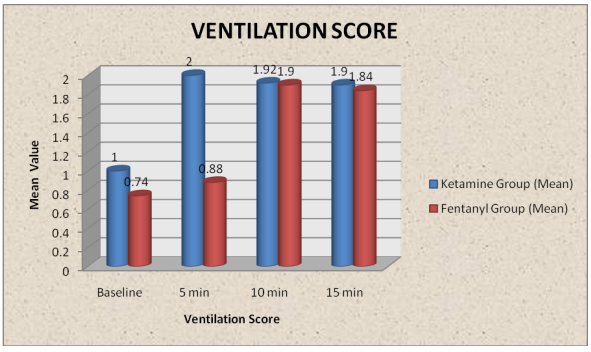
Table No. 8 Recovery (Ventilation Score) of both the groups at different time intervals

Time Interval	Ketamine Group [Mean±SD]	Fentanyl Group [Mean±SD]	't' Value	P Value
Baseline	1.00 ± 0.00	0.74 ± 0.44	4.149, df=98	0.000*
5 min	2.00 ± 0.00	0.88 ± 0.33	24.126, df=98	0.000*
10 min	1.92 ± 0.27	1.90 ± 0.30	0.346, df=98	0.730, NS
15 min	1.90 ± 0.30	1.84 ± 0.37	0.887, df=98	0.377, NS

Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

The above table shows the comparison of ventilation score between the two groups at different time intervals.

It was found to be statistically significant at baseline and 5 min (P < 0.05), with a higher ventilation score in ketamine group in comparison to the fentanyl group, while it was not significant for 10 min and 15 min (P>0.05).



Graph : Showing mean ventilation score

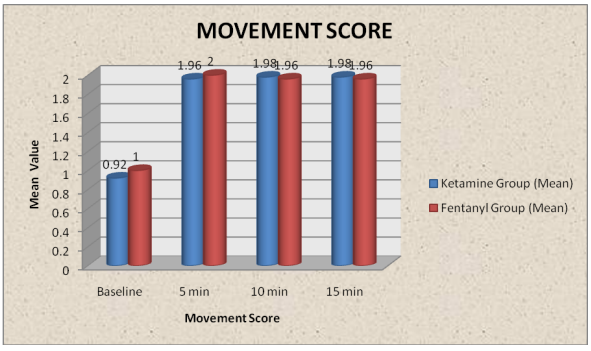
Table No. 9
Recovery (Movement Score) of both the groups at different time intervals

Time Interval	Ketamine Group [Mean±SD]	Fentanyl Group [Mean±SD]	't' Value	P Value
Baseline	0.92 ± 0.27	1.00 ± 0.00	-2.064, df=98	0.042*
5 min	1.96 ± 0.19	2.00 ± 0.00	-1.429, df=98	0.156, NS
10 min	1.98 ± 0.14	1.96 ± 0.19	0.581, df=98	0.562, NS
15 min	1.98 ± 0.14	1.96 ± 0.19	0.581, df=98	0.562, NS

Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

The above table shows the comparison of movement score between the two groups at different time intervals.

It was found to be statistically significant at baseline (P < 0.05), with a higher movement score in fentanyl group in comparison to the ketamine group, while it was not significant for 5 min, 10 min and 15 min (P>0.05).



Graph : Showing mean movement score

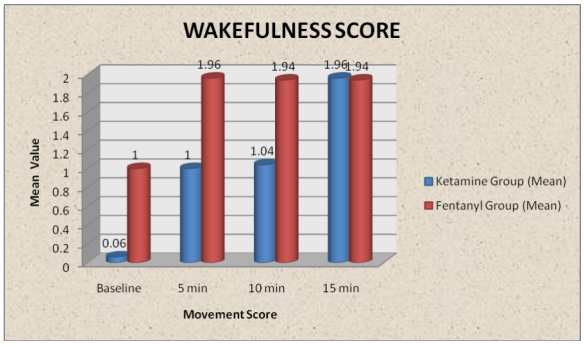
Table No. 10
Recovery (Wakefulness Score) of both the groups at different time intervals

Time Interval	Ketamine Group [Mean±SD]	Fentanyl Group [Mean±SD]	't' Value	P Value
Baseline	0.06 ± 0.24	1.00 ± 0.29	-17.816, df=98	0.000*
5 min	1.00 ± 0.00	1.96 ± 0.19	-34.293, df=98	0.000*
10 min	1.04 ± 0.19	1.94 ± 0.24	-20.461, df=98	0.000*
15 min	1.96 ± 0.19	1.94 ± 0.24	0.455, df=98	0.650, NS

Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

The above table shows the comparison of wakefulness score between the two groups at different time intervals.

It was found to be statistically significant at baseline, 5 min and 10 min (P<0.05), with a higher wakefulness score in fentanyl group in comparison to the ketamine group, while it was not significant 15 min (P>0.05).



Graph : Showing mean wakefulness score

DISCUSSION

TIVA by definition is a technique involving induction and maintenance of anaesthetic state with intravenous drugs alone avoiding both volatile agents and nitrous oxide. To produce anaesthetic state, each component of anaesthesia, namely unconsciousness/amnesia, analgesia, muscle relaxation (anaesthetic triad) and control of sympathetic activities are achieved by selecting specific anaesthetic agents. In modem clinical practice, a specific component of anaesthesia is achieved by the use of a single agent or more than one agent simultaneously to minimise the unwanted effects of toxic doses.

Ideal TIVA agent should be water soluble, stable in solution and on exposure to light over a long period of time, produce sleep in one arm brain circulation time, have a short duration of action due to rapid metabolism with no cumulative properties, should not cause venous damage or hepatoxicity when used in large doses and should have analgesic properties. In our present study all the results were tabulated and analysed statistically with student's unpaired t-test and chi-square test.

Pulse Rate:(As shown in table no.4 and fig no.1.4)
There was a statistically significant rise in mean pulse rate in group K, while fall in group F patients after induction of anesthesia which returned gradually toward baseline during the maintenance phase of anesthesia in both the groups, but the difference in both the groups was statistically significant (P< 0.05). Mean pulse rate increased in both the groups at 1 and 5 minutes after extubation.

Blood Pressure:(systolic and diastolic as in shown table no.5 and 6 and fig no.1.5 and 1.6)
There was a statistically significant fall in BP(systolic and diastolic) during the induction of anesthesia in group F, while there was a rise in group K after induction and intubation which was statistically significant (P < 0.05).

During maintenance there was gradual recovery toward baseline. During recovery period in both the groups, the BP increased again (1 minute after extubation), which was statistically significant (P < 0.05) but returned toward baseline in the next 15 minutes.

Mean areterial pressure (MAP) as shown in table no.7 and fig no.1.7: There is decrease in MAP in the fentanyl group from baseline to intraoperative 50 min and fall till post operative 50 min. There was statistically no significant fall in the MAP at 1 min, 5 min, 10min, 50 min, postoperatively 1 min, 5 min,10 min, and 15 min(P>0.05). While rest of time interval there was a statistically significant difference

(P<0.05).

- **Ventilation score (as shown in table no.8 and fig no.1.8):** was better in group K during the first 5 minutes of recovery phase as compared to group F.
- **Recovery(movement score) as shown in table no.9 and fig no.1.9**: was found to be statistically significant at baseline(P<0.5), with a higher movement score in fentanyl group in compare to ketamine group.And at 5 min,10min and 15 min it was not significant(P>0.05).

- **Recovery (Wakefulness score)as shown in table no.10 and fig no.2.0**: was better in group F at 5 and 10 minutes as compared to group K which gradually moves towards base line at the end of 15 minutes.

Various doses of ketamine and fentanyl have been reported in literature. Kaushik Saha et al[9] (2001), found excellent analgesia with ketamine 0.5mg/ kg. As our study involved procedures of longer duration, we chose 0.5 mg/kg of ketamine at induction and 0.5 mg/kg at interval of every 30 min till the completion of operation.

In view of the vasodialator property and apnoeic potential that propofol possesses, the reduction in the induction dosage of propofol has obvious advantages. The advantages of ketamine in terms of better haemodynamics intraoperatively, when combined with propofol have been studied by numerous investigators (Guit et al[4], 1991; Ravindra Prasad et al[8],T.W. Hui et al[5], 1995; Kaushik Saha et al[9], Hernandez et al[6] compared three techniques for intravenous anaesthesia (midazolam-ketamine, propofol-ketamine and propofol-fentanyl). They found that propofol-ketamine had most stable haemodynamics.

In our study, Propofol-fentanyl combination produced a significantly greater fall in mean pulse rate (PR; 5.42% versus 1.68%) and in both systolic (14.24% versus 2.72%) and diastolic blood pressures (BP; 8.20% versus 2.10%) as compared to propofol-ketamine during induction of anaesthesia.

Singh Bajwa et al[10], also found a significant fall in mean pulse rate (9.28% versus 0.23%) and in both SBP (7.94% versus 0.12%) and DBP (8.10 versus 0.35%) in propofol-fentanyl combination as compared to Propofol-ketamine combination during induction of anaesthesia.

Mi et al observed greater hemodynamic and electroencephalograph responses 10 intubation in patients who received propofol than in those who received both Propofol and fentanyl (P< 0.05). Hernandez et al[6], carried out a study with propofol-ketamine, midazolam-ketamine and propofol-fentanyl combinations and observed stable hemodynamics in patients who received propofol and ketamine, whereas patients who had received propofol- fentanyl had significantly higher number of hypertensive peaks. In this study, the increase in mean systolic and diastolic BP in group K patients at 2 minutes may be due to the cardiac stimulant effect of ketamine and mild stress response to intubation. In group F patients both the mean systolic and diastolic BP decreased during induction because of the additive action of propofol and fentanyl whereas at 2 minutes (just after laryngoscopy and intubation), stress response was prevented mainly by the action of fentanyl.

Guit JBM et al[4] of the dept. of anaesthesia , medical canter Leeuworden Netherlands compared propofol and ketamine (in infusion) with propofol-fentanyl for elective surgeries. They found better hemodynamic stability in PK group during maintenance phase in comparison to PF group. Our study also found similar result.

In our study, mean recovery (ventilation) score in ketamine group found better at baseline and at 5 minute as was 1.0+/-0.00 and 2.00+/-0.00 respectively where as in fentanyl group it was 0.74+/-0.44 and 0.88+/-0.33 respectively, which are statistically significant. While it was not significant for 10 and 15 min in both the groups.

Mortero et al[7] in 2001 found that subanaesthetic doses of ketamine produced a "high" feeling on recovery in volunteers. They attributed this to the NMDA receptor blockade by this drug. In a study conducted in St. John medical college Bangalore by Dr. Smita Lisa found similar result. The slight lower ventilation score with propofol-fentanyl combination was due to central respiratory depressant effect of fentanyl The maintenance of respiratory drive and ketamine induced sympathoadrenal activation may have accounted for the improved ventilation in the ketamine group.

In our study, mean recovery (wakefulness) score in ketamine group found at baseline and at 5 minute was 0.06+/-0.24 and 1+/-0.00 respectively where as in fentanyl group it was 1.00+/-0.29 and 1.96+/-0.19 respectively, which are statistically significant. while at at 15 min it was not significant in both the groups.

Guit JBM et al[4], too found a slower recovery (17 min) in the propofol-ketamine group and 13 min in the propofol fentanyl group. The longer durations of recovery in their study can be attributed to the infusions of ketamine and fentanyl that were used by them. Hernandez et al[6] too found longer awakening times in the propofol-ketamine (in comparison to propofol fentanyl and midazolam-ketamine) group (20.2+/-12.5 min. versus 11.8+/-5mm.) They advised that the infusion that was used had to be stoped early for early awakening.

Ravindra V. Prasad et al[8] in 1991 and Rosendo Mortero et al[7] in 2001 found a significant reduction in the incidence of emergence delirium when propofol and ketamine were used in combination to ketamine alone. They found that ketamine produces positive mood effects without changes in perception and may provide and early recovery of cognition. Guit et al[4] reported that no patients reported dreaming during or after the operation. Hernandez et al[6] found that though both the techniques did not completely prevent the psychotomimetic effects of ketamine, there was a higher incidence of emergence delirium in the midazolam-ketamine group compared to the propofol-ketamine group.This proves that propofol decreases the psychotomimetic effects of ketamine. The incidence of emergence reactions was 3 out of 29 in a study conducted by Escarmentetal published in 1995-99.

In our study none of the patients had emergence reactions. The low incidence of emergence delirium in the PK group adds to the advantages that this combination of drugs gives.

CONCLUSION

The results of this study suggest that both propofol-ketamine and propofol-fentanyl combinations produce rapid, pleasant and safe anesthesia with only a few untoward side effects and only minor hemodynamic fluctuations.

Propofol-fentanyl combination produced hypotension during induction of anaesthesia in comparison to propofol-ketamine. Propofol-ketamine combination produced stable hemodynamics during maintenance phase, while on the other hand propofol-fentanyl was associated with slight increase in both PR and BP during maintenance phase.

There was a slight respiratory depression during recovery in patients who received propofol-fentanyl as was evident from the ventilation score. But on the other hand recovery characteristics like awakening time and response to verbal commands were better in the propofol-fentanyl group. However, as far as recovery is concerned, one of the most important areas in evaluating elective surgical procedures, both propofol-ketamine and propofol-fentanyl are associated with smooth and swift recovery with minimal residual impairment of mental functioning which are due to their significant metabolism, short elimination half-life and extremely high total body clearance. So it may be recommended that both propofol-ketamine and propofol-fentanyl can be used as an excellent combination in TIVA for various elective surgeries where minimal side effects and early recovery are desired. However, due to wider availability and lower cost, we prefer & recommend propofol-ketamine combination.

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