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A Comparative Study of Ketamine with Propofol Versus Fentanyl With Propofol For Total Intravenous Anaesthesia In Short Surgical Procedures.

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ABSTRACT
BACKGROUND
Total intravenous anesthesia can be an effective alternative to inhalational anesthesia .Propofol has been considered as a gold-standard for total intravenous anaesthesia (TIVA) for short surgical procedures with its main shortcoming being lack of analgesia, therefore it is always combined with an analgesic. Ketamine and fentanyl are the popular analgesic in this context. This study was carried out to compare hemodynamic variables and the post-operative recovery characteristics of the two combinations of Propofol- Ketamine and Propofol-Fentanyl used in total intravenous anaesthesia in short surgical procedures.
Objective- To evaluate and compare hemodynamic variability,clinical efficacy of induction and maintenance of anaesthesia and side effects following TIVA in ketamine-propofol and fentanyl-propofol groups among the patients posted for short surgical procedures
MATERIALS AND METHODS
In this study, 92 consenting patients undergoing short elective surgeries were divided into two groups of 46 each. Group B received propofol 2mg/kg + fentanyl 2µg/kg for induction and propofol 2mg/kg/hr. + fentanyl 1µg/kg/hr for maintenance of anaesthesia and group A received propofol 2 mg/kg + ketamine 2 mg/kg for induction and propofol 2mg/kg/hr. + ketamine 1mg/kg/hr for maintenance of anaesthesia. Haemodynamic variables were recorded pre, intra and postoperatively at regular intervals. At the end of drug infusion(s), time to spontaneous eye opening and response to postoperative questionnaire was noted to assess recovery. All the data presented as mean + standard deviation.
RESULTS
Patients in both groups did not differ significantly in demographic profile and haemodynamic parameters. In group B there was significant fall in pulse rate and blood pressure at 1st minute of induction as compared to propofol-ketamine group but post operatively returned to baseline values in both the groups. There was fall in SpO2 in group B but the recovery was better. Incidence of postoperative nausea and vomiting was also statistically insignificant between both the groups. ($p>0.05$).
CONCLUSION
Ketamine and fentanyl with propofol infusion for short surgical procedures are equally safe and efficacious. In both groups stable haemodynamics and good recovery profile were noted.

KEYWORDS: Total Intravenous Anaesthesia, Ketamine, Propofol, Fentanyl.

I. INTRODUCTION :

"Amnesia is an indication, not a chaos. It's like ache. You're not going to provide a patient ache medicine without figuring out what's reasoning the pain"-Judith Owen

One of the main aims of general anaesthesia was to provide quick and smooth induction with predictable loss of consciousness, stable hemodynamics and minimal post-operative adverse effects and a smooth recovery [4]. One of the historic milestones in the development of anaesthesia was the development of the total

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intravenous anaesthesia (TIVA) which is a technique of general anaesthesia using a combination of agents given solely through intravenous route forbidding the inhalational agents and the operating room pollution[3].

This technique provides a very good alternative for the day care surgeries or on the other hand ambulatory surgeries requiring short duration of anaesthesia where in it ensures there is amnesia but not to a extent causing hemodynamic instability, good analgesia and a profound muscle relaxation to ensure a good surgical field [3]. The drugs mainly used for TIVA should have a quick onset of action with smooth induction, easy maintenance throughout the procedure with quick recovery and minimal post-operative complications or adverse effects [1]. Owing to these objectives various studies have been studied comparing two drug combinations, which are Propofol- Ketamine versus Propofol- Fentanyl regarding the intraoperative hemodynamic fluctuations and the post-operative recovery characteristics [1,2,3,4,5,6,7]. In this study I am comparing the hemodynamic variables and the post-operative recovery characteristics of the two combinations of Propofol- Ketamine and Propofol-Fentanyl used in total intravenous anaesthesia in short surgical procedures.

II. MATERIALS AND METHODS :

After the approval of institutional ethical committee and written informed consent by patients, a randomized controlled study was conducted. The study was conducted on ninty two one patients of ASA status I and II aged 18-60 years undergoing elective short surgical procedures lasting a minimum duration of 30 minutes. The patients with comorbidities such as congestive heart failure, bronchial asthma, COPD, renal failure were excluded from study. Patients were shifted to OT, monitors attached and were premedicated with inj glycopyrolate 0.2 mg, inj midaz 1mg. Induction of anesthesia in patients of group A will be done with propofol 2.0 mg/kg body wt. and ketamine 1.0 mg/kg body wt. given as IV bolus doses. In group B, induction of anaesthesia will be done with propofol 2 mg/kg body wt. and fentanyl 2.0 µg/kg body wt. given as IV bolus doses.In both the groups, injection succinylcholine will be given as a muscle relaxant before intubation in doses of 2 mg/kg body wt. with maximum doses not exceeding 100 mg. Patients will be ventilated with 100% oxygen via a facemask for 60–90 seconds with the help of Bain's circuit, and intubation will be done with an appropriate size of cuffed endotracheal tube. Hemodynamic and other monitoring parameters will be observed continuously and recorded at an interval of 1 minute each for the first 5 minutes.

In group A, maintenance of anesthesia will be achieved with infusion of propofol 2.0 mg/kg/h and ketamine 1.0 mg/kg/h, while in group B, maintenance of anesthesia will be achieved with infusion of propofol 2.0 mg/kg/h and fentanyl 2.0 µg/kg/h. Vecuronium bromide will be used as a muscle relaxant in doses of 0.05–0.06 mg/kg body wt. as an initial bolus dose and supplemented with top-ups of 1 mg in both the groups. Hemodynamic and other monitoring parameters will be observed continuously and noted at an interval of 5 minutes during the operation. Patients will be ventilated with 100% oxygen with close circuit attached to circle absorber system.

Heart rate, systolic blood pressure, diastolic blood pressure ,mean arterial pressure , respiratory rate and ETCO2 will be measured for obtaining baseline values and after every 5 minutes till the end of surgery.All the anesthetic drugs will be stopped 5–7 minutes before the anticipated end of surgery. At the end of surgery, neuromuscular blockade will be reversed with injection neostigmine 0.05 mg/kg body wt. and injection glycopyrrolate 0.008/kg body wt. which will be given over 2–3 minutes. Extubation will be done when the patients are able to maintain rhythmic respiration and adequate tidal volume. The monitoring parameters will be observed continuously and recorded at the time of extubation and 5 minutes after that.

III. RESULTS:

DEMOGRAPHIC CHARACTERISTICS

The study was conducted on 92 patients belonging to ASA class I and II undergoing elective short surgical procedures under total intravenous anaesthesia.

Hemodynamic parameters were compared among both the groups before and after induction at an interval of 5 minutes till the end of the procedure.

Postoperative side effects were also analysed among both the groups.

STATISTICAL ANALYSIS

The data entered was entered in Excel spread sheet and analysed using SPSS (Version 2.0) software.Variables are tested for normality using Kologove Smirnov test.

Median and Interquartile range was computed for the non- normal data and mean and standard deviation was computed for normal data. Categorical data was presented with frequencies and percentages. Pre and post induction values of the

parameters like heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure(DBP), mean arterial pressure (MAP), EtCO2 (end tidal carbon dioxide),SpO2(oxygen saturation), were compared using paired sample t-test.Repeated measure ANOVA was applied to test the difference in parameters like heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure(DBP), mean arterial pressure (MAP), EtCO2 (end tidal carbon dioxide),SpO2(oxygen saturation) at different points of time. p- value less than 0.05 was considered statistically significant.

Table 1: Distribution of age as per groups

Age (in years)	Group A	Group B	Total	Chi-Square, P-value
<=25	9 (19.6%)	14 (30.4%)	23 (25.0%)	3.988, 0.408
26-35	12 (26.1%)	11 (23.9%)	23 (25.0%)	
36-45	9 (19.6%)	9 (19.6%)	18 (19.6%)	
46-55	10 (21.7%)	4 (8.7%)	14 (15.2%)	
>55	6 (13.0%)	8 (17.4%)	14 (15.2%)	
Total	46 (100.0%)	46 (100.0%)	92 (100.0%)	

Table 2: Distribution of sex as per groups

Sex	Group A	Group B	Total	Chi-Square, P-value
Male	19 (41.3%)	25 (54.3%)	44 (47.8%)	1.569, 0.210
Female	27 (58.7%)	21 (45.7%)	48 (52.2%)	
Total	46 (100.0%)	46 (100.0%)	92 (100.0%)	

Table 3: Comparison of duration of procedure between groups

	Group A	Group B	P-value
Duration of illness (in mins)	28.26±13.34	23.70±9.74	0.064

Table 4 : Distribution by BMI

BMI	Group		Total	Chi-Square, P-value
	Group A	Group B		
Under Weight	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.453, 0.501
Normal Weight	30 (65.2%)	33 (71.7%)	63 (68.5%)	
Over Weight	16 (34.8%)	13 (28.3%)	29 (31.5%)	
Obesity Class I	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Obesity Class II	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Obesity Class III	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Total	46 (100.0%)	46 (100.0%)	92 (100.0%)	

Table5: Heart Rate

Heart Rate	Group A		Group B		P-value¶
	N	Mean±SD	N	Mean±SD	
BASELINE	21	80.10±9.28	14	83.64±7.50	0.98
INDUCTION	21	81.71±9.19	14	83.00±6.91	0.83
1Min	21	82.52±8.76	14	82.14±6.42	0.39
2Min	21	84.05±8.62	14	81.14±6.42	0.08

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3Min	21	85.05±8.95	14	82.36±5.90	0.12
5Min	21	83.90±8.12	14	81.57±7.80	0.15
10Min	21	83.81±7.90	14	82.64±6.99	0.35
15Min	21	83.52±8.63	14	82.79±6.80	0.33
20Min	21	84.10±8.71	14	83.71±8.40	0.49
25Min	21	84.14±9.12	14	84.00±7.21	0.39
30Min	21	83.24±8.10	14	83.14±4.99	0.97
P-value$^{\epsilon}$	0.001		0.480		

¶ *Independent sample t-test,* $^{\epsilon}$ *Repeated measure ANOVA*

Table 6: Systolic Blood Pressure

Systolic Blood Pressure	Group A		Group B		P-value¶
	N	Mean±SD	N	Mean±SD	
BASELINE	21	125.14±9.43	14	129.14±10.80	0.15
INDUCTION	21	124.71±8.42	14	128.52±8.20	0.61
1Min	21	123.79±6.59	14	127.43±8.05	0.09
2Min	21	121.93±9.55	14	127.95±8.21	0.02
3Min	21	124.21±6.33	14	125.33±7.91	0.15
5Min	21	126.57±10.30	14	126.67±6.98	0.61
10Min	21	125.50±7.34	14	127.05±6.54	0.26
15Min	21	129.29±7.53	14	127.52±7.19	0.78
20Min	21	125.71±6.40	14	127.19±7.97	0.86
25Min	21	126.43±7.06	14	126.48±7.45	0.85
30Min	21	125.71±10.51	14	126.52±7.33	0.79
P-value$^{\epsilon}$	0.001		0.020		

¶ *Independent sample t-test,* $^{\epsilon}$ *Repeated measure ANOVA*

Table 7: Diastolic Blood Pressure

Diastolic Blood Pressure	Group A		Group B		P-value¶
	N	Mean±SD	N	Mean±SD	
BASELINE	21	75.90±8.87	14	75.07±6.37	0.63
INDUCTION	21	77.90±7.24	14	74.36±7.07	0.42
1Min	21	78.90±9.06	14	74.07±6.63	0.71
2Min	21	78.86±7.19	14	75.14±6.44	0.50
3Min	21	78.10±9.91	14	74.50±6.91	0.62
5Min	21	77.19±5.94	14	76.64±4.92	0.08
10Min	21	80.14±8.32	14	80.86±7.18	0.39
15Min	21	76.10±8.35	14	72.00±7.47	0.21
20Min	21	77.52±7.28	14	77.93±6.03	0.16
25Min	21	78.62±5.68	14	78.29±5.24	0.39
30Min	21	78.43±5.76	14	77.93±6.03	0.16
P-value$^{\epsilon}$	0.011		0.644		

¶ *Independent sample t-test,* $^{\epsilon}$ *Repeated measure ANOVA*

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Table 8: MAP

MAP	Group A		Group B		P-value¶
	N	Mean±SD	N	Mean±SD	
BASELINE	21	93.52±7.26	14	93.79±5.91	0.59
INDUCTION	21	95.81±9.15	14	96.64±8.24	0.93
1Min	21	96.43±8.48	14	93.29±7.39	0.42
2Min	21	96.95±6.98	14	91.86±6.85	0.14
3Min	21	95.86±9.93	14	88.86±5.27	0.10
5Min	21	96.10±5.09	14	92.57±7.39	0.23
10Min	21	97.24±7.96	14	96.14±6.75	0.39
15Min	21	94.52±9.30	14	97.43±8.08	0.23
20Min	21	95.14±7.04	14	91.43±7.65	0.55
25Min	21	95.43±7.12	14	93.00±6.24	0.65
30Min	21	94.38±7.20	14	95.86±5.45	0.52
P-value$^{\epsilon}$	0.006		0.645		

¶ *Independent sample t-test,* $^{\epsilon}$ *Repeated measure ANOVA*

Table 9: ETCO2

ETCO2	Group A		Group B		P-value¶
	N	Mean±SD	N	Mean±SD	
BASELINE	20	34.10±1.71	14	32.29±1.33	0.00
INDUCTION	20	33.25±2.02	14	31.57±1.40	0.09
1Min	20	32.90±2.61	14	30.07±1.38	0.00
2Min	20	33.75±3.09	14	29.64±1.78	0.01
3Min	20	34.40±3.35	14	29.86±2.41	0.00
5Min	20	33.90±3.08	14	29.86±2.44	0.00
10Min	20	34.35±3.45	14	31.57±2.74	0.01
15Min	20	34.60±3.41	14	31.79±2.78	0.00
20Min	20	33.65±3.07	14	32.14±1.29	0.02
25Min	20	33.30±3.50	14	31.00±1.18	0.02
30Min	20	33.55±2.95	14	31.71±1.44	0.04
P-value$^{\epsilon}$	0.251		<0.001		

¶ *Independent sample t-test,* $^{\epsilon}$ *Repeated measure ANOVA*

Table 10: SPO2

SPO2	Group A		Group B		P-value¶
	N	Mean±SD	N	Mean±SD	
BASELINE	21	98.57±0.68	14	98.29±0.73	0.00
INDUCTION	21	99.05±0.38	14	97.93±1.14	0.00
1Min	21	98.76±0.83	14	97.14±0.95	0.00
2Min	21	98.90±0.62	14	97.14±0.95	0.84
3Min	21	98.43±0.93	14	97.93±0.92	0.00
5Min	21	98.81±1.03	14	97.36±0.74	0.00

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10Min	21	98.29±1.15	14	97.29±0.91	0.00
15Min	21	98.52±0.87	14	98.14±1.23	0.00
20Min	21	98.95±0.97	14	98.29±1.07	0.00
25Min	21	98.76±0.70	14	98.07±1.38	0.03
30Min	21	98.48±0.81	14	98.29±0.61	0.46
P-value$^{\epsilon}$	0.047		<0.001		

¶ *Independent sample t-test,* $^{\epsilon}$ *Repeated measure ANOVA*

Table 11: SS

SS	Group A		Group B		P-value¶
	N	Mean±SD	N	Mean±SD	
INDUCTION	21	4.05±0.22	14	4.07±0.27	0.31
1Min	21	4.86±0.36	14	4.86±0.36	0.53
2Min	21	5.81±0.40	14	5.86±0.36	1.00
3Min	21	6.00±0.00	14	5.86±0.36	1.00
5Min	21	6.00±0.00	14	6.00±0.00	0.09
10Min	21	6.00±0.00	14	6.00±0.00	0.01
15Min	21	6.00±0.00	14	6.00±0.00	0.45
20Min	21	5.76±0.44	14	5.86±0.36	0.85
25Min	21	5.38±0.50	14	5.43±0.51	0.58
30Min	21	4.76±0.94	14	4.93±0.83	0.60
P-value$^{\epsilon}$	<0.001		0.542		

¶ *Independent sample t-test,* $^{\epsilon}$ *Repeated measure ANOVA*

Table 12: Reversal

REVERSAL	Group A	Group B	P-value¶
HR	84.04±8.82	82.91±9.45	0.554
SBP	127.91±6.81	128.52±7.15	0.677
DBP	78.37±5.12	78.59±5.75	0.849
MAP	95.20±5.55	96.65±5.53	0.211
ETCO2	34.54±10.04	31.98±2.13	0.094
SPO2	97.63±9.01	97.65±1.18	0.987
SS	4.07±0.25	4.28±0.46	0.006

¶ *Independent sample t-test*

Table 13: POST OPERATIVE COMPLICATIONS

POST OPERATIVE COMPLICATIONS	Group A	Group B	Total	Chi-Square, P-value
Nil	28 (60.9%)	38 (82.6%)	66 (71.7%)	7.315, 0.120
DELIRIUM	4 (8.7%)	1 (2.2%)	5 (5.4%)	
HALLUCINATION	1 (2.2%)	0 (0.0%)	1 (1.1%)	
NAUSEA	3 (6.5%)	9 (19.6%)	12 (13.0%)	
VOMITTING	4 (8.7%)	4 (8.7%)	8 (8.7%)	
PRURITIS	0(0.0%)	0(0%)	0(0%)	

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Total	46 (100.0%)	46 (100.0%)	92 (100.0%)	

Table 14: Comparison of parameters between groups

Parameters	Group A	Group B	P-value¶
SEDATION SCORE	1.78±0.47	1.52±0.51	0.012
RECOVERY TIME (in Mins)	6.78±1.74	4.43±0.93	<0.001
VAS	0.80±1.02	1.02±1.04	0.316

IV. DISCUSSION :

The analysis of data obtained from the study conducted on 92 patients(46 patients in each group) of ASA grade I and II undergoing short surgical procedures. Group A was induced with Propofol- Ketamine whereas Group B was induced with Propofol - Fentanyl.

Majority of patients that is 23 (25.0%) belonged to the age group of 26-35 years and 63 (68.5%)patients were having BMI between 18.5-24.9 kg/m2. Out of 92 patients 44 (47.8%) were male and 48 (52.2%) were female even though age and sex had no significance with the selection of the induction agents as comparable to Sandhya Pandey et al (2017), Babita Ramdev et al (2015)and Aditya Pradeep et al (2019).

In this study the induction in group A that is propofol- ketamine group was found to be quicker rather than group B that is propofol- fentanyl with a mean induction time of 2 minutes in group A and 5 minutes in group B. This rapid induction with ketamine is due to its additive hypnotic effect with propofol as observed in Madhavi S Mavani et al (2016) ,Sukwinder Jit Singh Bajwa et al(2006) and R Mahajan et al (2009).

Based on the induction criteria the dose of each of the drugs were fixed so as to attain the loss of consciousness, loss of eyelid reflex. Propofol was used at a dose of 2 mg/kg, whereas ketamine and fentanyl were used at an induction dose of 2mg/kg and 2 microgram/kg respectively similar to the studies conducted by R Mahajan et al (2009),Sandhya Pandey et al (2017) and Babita Ramdev et al (2015).

The infusion rate of propofol for the maintenance of anaesthesia was 2mg/kg in both the groups. Hence in the study conducted the total dose of propofol required was less in the Propofol-ketamine(Group A) group as compared to propofol-fentanyl group (Group B), also the number of top up doses given for the maintenance of anesthesia was less in number with group- A as compared with group-B. This is relatively due to additional hypnotic property possessed by the ketamine.

Patients in both the groups did not differ significantly with respect to the demographic data , type and the duration of the surgery consistent with the findings of Babita Ramdev et al (2015) who found no statistically significant difference in gender, age, weight and duration of surgery in both the groups.

The heart rate increased in group A with a maximum rise at 10 minutes which was statistically non significant compared to pre-induction state as shown in table 7. On the other hand the heart rate decreased in group B with a maximum decrease at 1 minute post induction. The difference in heart rate in both the groups was statistically significant ($p>0.05$) but post operatively it returned towards the pre induction values and the difference between them was statistically not significant which was similar to the studies done by Sandhya Pandey et al (2017), Babita Ramdev et al (2015)and Aditya Pradeep et al (2019). Heart rate does not change significantly after the induction with propofol whereas the ketamine stimulates the cardiovascular system and causes the increase in heart rate. Fentanyl because of its vagomimetic effect and depressed cardiac conduction due to direct membrane actions tends to decrease the heart rate following induction. Madhavi S Mavani et al (2016) in their study found a significant decrease in heart rate from the induction to minutes. R Mahajan et al in their study found a significant decrease in heart rate ($p<0.001$) at one minute after induction with propofol-fentanyl group(Group B). So our findings are co relating with findings of Madhavi S Mavani et al and R Mahajan et al.

The systolic blood pressure increased intraoperatively in group A whereas there was a decrease in systolic blood pressure in group B with the maximum decrease seen at 1 minute post induction. The difference in systolic blood pressures among both groups was significant upto 10 minutes post induction. Later they gradually returned towards baseline post operatively and this difference between them was statistically non significant. The changes of SBP observed in this study was comparable to the findings of the studies conducted by Aditya Pradeep Reddy et al (2019), Babita Ramdev et al (2015) ,Sandhya Pandey et al (2017) and Sukwinder Bajwa et al (2010).

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The diastolic blood pressure increased intra operatively in group A but was statistically not significant ($p<0.05$) compared to the baseline. On the other hand there was decrease in diastolic blood pressure till 10 minutes following induction maximum being 1 minute post induction in group B which was statistically significant ($p<0.05$).The difference between the two groups were statisticaslly significant ($p<0.05$) upto 15 minutes intraoperatively. Post operatively mean diastolic blood pressure gradually returned towards baseline value in both the groups which was observed in the studies conducted by R Mahajan et al(2009), Aditya Pradeep Reddy et al (2019), Ritu Goyal et al (2012).

Ketamine stimulates the cardiovascular system and is associated with increase in both systolic and diastolic blood pressures, heart rate and the cardiac output as well. These changes are not dose dependent on ketamine. Fentanyl decreases the blood pressure by decreasing the systemic vascular resistance. The combination of propofol with fentanyl hence was a potent stimulus for hypotension post induction in group B. Intraoperatively there as significant fall in systolic and diastolic blood pressure in group B when compared to group A post induction with a maximum decrease noted within 1 minute and lasted for 15 minutes later returned to baseline values. Post operatively the values returned to baseline among both the groups. The stable hemodynamics in propofol- ketamine group could have been because of ketamine causes sympathetic stimulation which counter balances the cardiovascular depressant effects of propofol. The decrease in the blood pressure and heart rate in group B can be attributed to the cumulative cardio-depressant effects of propofol and fentanyl. Babita Ramdev et al (2015) in their study found that stable arterial blood pressure was present in propofol-ketamine group and decrease in blood pressure and heart rate in propofol and fentalyl group. Singh Bajwa SJ, et al (2010) also found an decrease in systolic and diastolic blood pressure in propofol -fentanyl group during induction. The findings in our study are consistent with the finfings of Babita Ramdev et al (2015) and Singh Bajwa et al.

The EtCO2 decreased intraoperatively in group B and the difference was statistically significant till10 minutes post induction ($p<0.05$).The maximum decrease was at 5 minutes post induction and lasted for about 10 minutes post induction. The EtCO2 increased post induction in group A which was statistically insignificant ($p<0.05$) Post operatively the EtCO2 returned to baseline among both the groups.

Intraoperatively there was a fall in SpO2 in both the groups following induction upto 3 minutes but the decrease in group B was statistically significant when compared to group A. Post operatively about 10 patients required oxygen supplementation in group B where as only 2 patients required oxygen supplementation in group A when saturation fell below 90 %. There was no significant change in Spall in O2 in the post operative period among both the groups.

There was a significant fall in EtCO2 in propofol-fentanyl group as compared to propofol-ketamine group following induction with the maximum decrease noted 10 minutes following induction. Intraoperatively there was a fall in saturation in both the groups and the difference among them was statistically significant ($p<0.05$) The decrease in Group B was more when compared to group A. In group A only 2 patients required oxygen supplementation through face mask post operatively where as about 10 patients required oxygen supplementation in group B. The EtCO2 changes , intraoperative SpO2 levels among the propofol-ketamine and the propofol-fentanyl groups were consistent with the results of Babita Ramdev et al (2015), Sukwinder Bajwa et al (2010), Sandhya Pandey et al (2017) and Madhavi S Mavani et al (2016).

In group A, 21 patients attained the sedation score of 6 within 2 minutes following induction whereas in group A 14 patients attained the sedation score of 6 within 5 minutes following induction. The recovery time was 6.78±1.74 minutes in the propofol-ketamine group whereas the recovery time with the propofol-fentanyl group was 4.43±0.93 minutes which suggests the faster recovery time was seen with the group B individuals as compared to the group A.

Guit J.B.M. et al (1991) in their study on 18 patients who underwent non-cardiac surgery using ketamine propofol in one group and comparing it with fentanyl propofol in the second group as TIVA found that the awakening after stopping TIVA was 17 minutes in propofol-ketamine group and 13 minutes in propofol-fentanyl group which was statistically nonsignificant .**Hernandez C et al (1999)** compared the characteristics of induction, maintenance and awakening of three techniques of combined total intravenous anaesthesia (TIVA) using propofol-ketamine, midazolam- ketamine and propofol-fentanyl, found that the time of awakening was 11.8±5 minutes in group I and 20.2±12.5 min in group II and 16.6±5.6 minutes in group III. **Kaushik Saha et al (2001)** in their study found that recovery time in propofol-ketamine group was 11.71±7.17

minutes and in propofol-fentanyl group it was 8.7±3.28 minutes and the difference was statistically significant[18]. The findings in our study are comparable to Kaushik Saha et al .The prolonged recovery in group A could be because of the prolonged duration of action of ketamine.

Post operative pain assessment by the VAS score showed that propofol-ketamine had a score of 0.80±1.02 and the propofol-fentanyl group had a score of 1.02±1.04 which was statistically insignificant. This conclude that propofol-ketamine group had better analgesic properties when compared to propofol-fentanyl group as observed with Aditya Pradeep Reddy et al (2019) and Babita Ramdev et al (2015).

Post operatively 28(60.9%) patients in group A and 38(82.6%) patients in group B had no complications. Whereas 4 (8.7%) in group A had delirium, 9 (19.6%) in group B had nausea and vomiting post operatively which were consistent with the studies conducted by Babita Ramdev et al (2015), Sukwinder Bajwa et al (2010), R Mahajan et al (2009) and Madhavi S Mavan

V. CONCLUSION :

My study shows that both the Propofol-Ketamine and Propofol- Fentanyl are equally safe and effective in total intravenous anaesthesia for patients undergoing short surgical procedures.Though there is statistically significant difference in hemodynamic parameters when both the groups are compared, clinically there was no significant difference.The induction time was slightly quicker with the Propofol-Ketamine group as compared to Propofol-Fenatnyl group.There is a slight reduction in systolic blood pressure and heart rate in the Propofol-Fentanyl group after induction whereas there was slight increase in systolic blood pressure and heart rate in the Propofol- Ketamine group after induction.So Propofol-Ketamine appears to be slighltly better hemodynamic stability compared to Propofol-Fenatnyl group.Also the post operative recovery is superior in Propofol- Fentanyl group though the post operative nausea and vomiting is higher in Propofol-Fentanyl group as compared to Propofol- Ketamine group. Post operatively almost no patient in the propofol-ketamine required

rescue analgesia and had a VAS score of 0-1 as comparable to the propofol-fentanyl group who required rescue analgesia with a VAS score of

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