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TO STUDY THE EFFICACY OF KETAMINE AS AN ADJUVANT TO LOCAL ANAESTHETIC IN MODIFIED PECTORAL BLOCK IN PATIENTS UNDERGOING BREAST SURGERIES - A RANDOMISED CONTROL STUDY

Anesthesiology

Dr. Malarvizhi R Senior Resident, Department of Anaesthesiology, Bangalore Medical College and Research Institute, Bangalore, India.

Dr. Rachana S Kori Senior Resident, Department of Anaesthesiology, Bangalore Medical College and Research Institute, Bangalore, India.

Dr. Saurabh K Phuleker Senior Resident, Department of Orthopedics, Bangalore Medical College and Research Institute, Bangalore, India.

Dr Sharmila Somayaji* Senior Resident, Department of Anaesthesiology, Bangalore Medical College and Research Institute, Bangalore, India. *Corresponding Author

ABSTRACT

Background And Objectives: Breast surgeries are the most common surgeries in women. Up to two-third of patients who undergo breast surgery have severe post-operative pain. With the advent of regional anesthesia, post-operative pain following breast surgeries can be managed with techniques like paravertebral block, thoracic epidural, pectoral nerve block, intercostal nerve block, interpleural block, inter scalene block, brachial plexus block, wound infiltration. **Materials And Methods:** In this study, 50 patients belonging to ASA I and II, posted for elective breast surgeries were equally randomised into two groups. Group C patients were given ultrasound guided modified pectoral block with 30ml of 0.25% Bupivacaine .10ml injected between pectoralis major and minor & 20ml injected between pectoralis minor and serratus anterior muscle. Group K patients were given ultrasound guided modified pectoral nerve block with 30ml of 0.25% Bupivacaine plus Ketamine (0.5mg/kg).10ml injected between pectoral major and minor & 20ml injected between pectoral minor and serratus anterior muscle. Post-operative analgesia and isoflurane consumption were noted. **Results:** Ketamine plus bupivacaine in modified Pectoral nerve block prolonged the duration of post-operative analgesia, mean time of first request of analgesia than control group. Decreased isoflurane consumption and VAS score noted in ketamine group. Hemodynamic parameters heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure were stable than control group. Demographic data were comparable. No significant changes seen with Spo2, RSS, end tidal isoflurane concentration, end tidal oxygen and train of four. **Conclusion:** Addition of ketamine to bupivacaine in modified pectoral nerve block significantly increased duration of post-operative analgesia and the time of request of first analgesics, decreased isoflurane consumption.

KEYWORDS

Pec block, ketamine, postoperative analgesia.

INTRODUCTION

Breast surgeries are the most common surgeries in women. Up to two-third of patients who undergo breast surgery have severe post-operative pain. Acute postoperative pain management of breast surgery is necessary[1]. Insufficiently controlled postoperative pain may delay recovery, lead to prolonged hospital stay, extend medical cost and causes persistent chronic pain.[2]

NSAID and opioids are the agents of but are associated with major side effects. However with the advent of regional anesthesia, post-operative pain following breast surgeries can be managed with techniques like paravertebral block, thoracic epidural, pectoral nerve block, intercostal nerve block, interpleural block, inter scalene block, brachial plexus block, wound infiltration.[3]

Neuraxial blocks like thoracic epidural, thoracic paravertebral are associated with major complications which are not seen in pectoral nerve block[4].

Pectoral nerve block 1 is an inter-fascial nerve block in which local anaesthetic is deposited in between pectoralis major and pectoralis minor. In pectoral nerve block 2, local anaesthetic is deposited in between pectoralis minor and serratus anterior[5], blocking lateral branch of intercostal nerve that exit at the level of mid-axillary line to innervate mammary gland and skin from T2-T6[6,4].

Ketamine exhibits analgesic and anaesthetic by non-competitive inhibiting N-Methyl-D-Aspartate (NMDA) receptor. It also reduces pre synaptic release of glutamine. It has weak affinity at opioid receptors, both at mu and kappa.[7] It is a dissociative anaesthetic, which also provides profound analgesia. In high doses it has local anaesthetic properties by inhibiting neuronal Na channels.

Addition of ketamine to modified pectoral nerve block is known to decrease post-operative pain intensity and delay the time to request of rescue analgesia. There were very few studies which have used ketamine as an adjuvant to pectoral block, hence we had undertaken this study to compare the efficacy of ketamine 0.5mg/kg as an adjuvant to bupivacaine 0.25% in modified pectoral nerve block for management of post-operative pain in patients undergoing breast surgeries.

METHODOLOGY

Inclusion Criteria:

- Patients who are willing to give informed consent
- Patients of age 18-60 years.
- ASA grade 1 & 2
- Patients with BMI 19-25kg/m^2
- Patients with Fibroadenoma and Fibroadenosis

Exclusion Criteria:

- Patient refusal.
- Patients with history of coagulopathy
- Patients with history of allergic to local anaesthetic
- Patients with severe systemic diseases
- Alcohol abuse
- Morbid obesity
- Psychiatric illness
- Bilateral breast surgeries

AIMS AND OBJECTIVES OF THE STUDY

Primary Objective:

To assess the duration of post-operative analgesia after addition of ketamine to local anaesthetic in pectoral nerve block.

Secondary Objective:

To assess isoflurane consumption and sedation post-operatively.

After obtaining approval from institutional ethical committee, an informed written consent was taken from patients. After doing routine pre anaesthetic evaluation, patients who were posted for elective breast surgeries and who was belonging to ASA 1 and ASA 2 categories was randomly allocated into one of the two groups using numbers from www.random.org.

Group C

Group C patients were given ultrasound guided modified pectoral

block with 30ml of 0.25% Bupivacaine 10ml injected between pectoralis major and minor & 20ml injected between pectoralis minor and serratus anterior muscle.

Group K

Group K patients were given ultrasound guided modified pectoral nerve block with 30ml of 0.25% Bupivacaine plus Ketamine (0.5mg/kg) .10ml injected between pectoral major and minor & 20ml injected between pectoral minor and serratus anterior muscle.

The patients were kept nil per orally for 8 hours prior to surgery. All patients were pre-medicated with tablet Alprazolam 0.5mg & tablet Ranitidine 150 mg on the night before surgery. Patients were educated regarding the use of visual analog scale.

Group allocation was done based on randomization sequence. The group allocation was revealed to the attending anaesthesiologist till the end of study. The Anaesthesiologist was aware of the drug used and group allocation.

On arrival at operation theatre standard anesthesia monitors including non-invasive blood pressure (NIBP), electrocardiogram (ECG) and pulse oxymetry was attached and baseline hemodynamic parameters like heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial blood pressure (MAP) and oxygen saturation (SPO_2) was noted. Patient state index (PSI) for depth of anaesthesia was monitored by Masimo root monitor.

18 G intravenous (IV) cannulae was secured in contralateral arm and Ringer lactate was started. Injection midazolam 0.03 mg/kg, injection glycopyrrolate 0.004mg/kg, injection fentanyl 2 µg/kg was given intravenously 2 minutes before induction. Patient was pre-oxygenated with 100 % oxygen for 3 minute and was induced with injection propofol 2mg/kg. Depth of neuromuscular blockade was monitored using Train of Four (TOF), which was connected after induction of anaesthesia but just before administration of muscle relaxant and it was maintained below TOF count of 2 with Inj.Vecuronium increments. Injection vecuronium 0.1mg/kg was given & patient was ventilated for 3 minutes. Later trachea was intubated with appropriate size endotracheal tube (ET Tube). After confirmation of bilateral equal air entry ET tube was secured and connected to ventilator. Patient was maintained with 50% O2, air and isoflurane to maintain PSI between 25-50. Initial fresh gas flow was set at 4.5 litre/min and isoflurane dial concentration set at 2%. The fresh gas flow was reduced to 2.5 litre / min once there is equilibrium between the set dial concentration and the inspired concentration of isoflurane.

Pectoral block was performed using 2 needle approach. Patient was placed in supine position with ipsilateral upper limb abducted 90 degrees. Using a Linear array ultrasound probe of high frequency (Sonosite), a 23g spinal needle was used for giving the block. The needle was inserted into fascial planes between pectoral major and minor and 10ml of 0.25% bupivacaine was injected and ultrasound probe moved towards axilla until the serratus anterior identified above 2^{nd},3^{rd},4^{th} rib and then the needle was inserted into fascial planes between pectoralis minor and serratus anterior and 20 ml of 0.25% bupivacaine injected after negative aspiration for blood.

Haemodynamic parameters (heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure), SPO2, End-tidal carbon dioxide (ETCO2), TOF, PSI were continuously monitored and recorded every 5 minutes for half an hour and every 15 minutes till the end of surgery. End tidal isoflurane concentration, age adjusted MAC were recorded every 5 minutes for half an hour and every 15 minutes till the end of surgery and volume of isoflurane consumed was recorded at 30 min interval from agent gas module of Datex Ohmeda Avance S5™ anaesthesia work station. Increase in heart rate and mean arterial pressure more than 25% of basal was considered as tachycardia and hypertension respectively and inspired concentration of isoflurane was increased. Injection fentanyl 1mcg/kg boluses was administered if tachycardia and hypertension persist inspite of administration of adequate amount of isoflurane (2%). Hypotension defined as more than 25% fall in mean arterial pressure and was treated with 100 ml of crystalloid boluses. At the end of surgery isoflurane and air was discontinued. Reversal of neuromuscular blocking agent was done with inj. Neostigmine 0.5mg/kg and inj. Glycopyrolate 10 mcg/kg. Extubation was done after complete recovery assessed by clinical observation and neuromuscular monitoring.

Sample Size Estimation

Sample size was calculated based on previous study by **Ahmed H Othman et al** [6], where the duration of analgesia in those given only bupivacaine 0.25% was 12.56 ± 2hours and assuming a minimum increase in the duration of analgesia with ketamine as 2 hours with a power of 80% and α error of 0.05

The sample size calculation

$$\frac{n=2*(Z_{\alpha}+Z_{1-\beta})^2\sigma^2}{d^2}$$

n = 23

Z_{α} = Standard table value for 95% CI

$Z_{1-\beta}$ = Standard table value for 80% power

σ = Standard deviation

d = Effect size

A minimum of 23 patients were required in each group. For further validation of the study, assuming a dropout rate of 10% a minimum of 25 patients were taken in each group .

RESULTS

All the variables were summarized and presented through tables, charts and diagrams. Descriptive and inferential statistical analysis has been carried out in the present study.

Results on continuous measurement are presented on Mean ± SD (Min –Max) and results on categorical measurements are presented in number (%). Significance is assessed at 5% level of significance.

Graphical Representation Of Data:

MS Excel and MS word was used to obtain various types of graphs such as bar diagram, Pie diagram, Column Diagram and Line Diagram.

P value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

Statistical Software:

MS Excel**,** SPSS version 22 **(**IBM SPSS Statistics, Somers NY, USA) was used to analyze data.

RESULTS:

Table 1: Mean Age Of Patients

	Group				p value
	Control		Ketamine		
	Mean	SD	Mean	SD	
Age in years	39.88	12.61	34.36	7.73	0.068

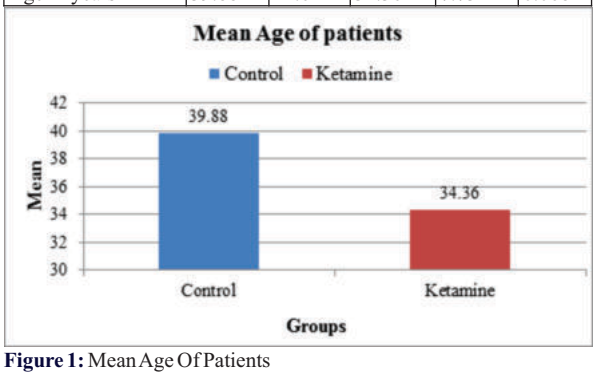

Figure 1: Mean Age Of Patients

In Control Group, Mean age in years was 39.88 ± 12.61 and in Ketamine Group was 34.36 ± 7.73. There was no significant difference in Mean Age Comparison between two groups at different intervals of time.

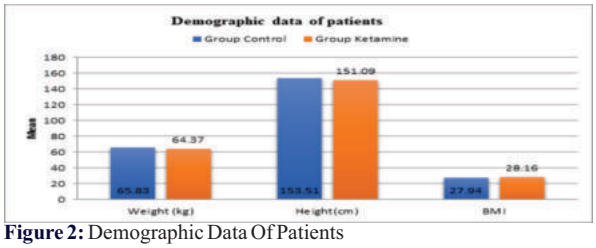

Figure 2: Demographic Data Of Patients

Table 2: Demographic Data Of Patients

Parameter	Group		P Value
	Group Control Mean (SD)	Group Ketamine Mean (SD)	
Weight (kg)	65.83 (5.37)	64.37 (7.74)	0.364
Height (cm)	153.51 (3.23)	151.09 (4.16)	0.078
BMI	27.94 (2.35)	28.16 (3.01)	0.734

There was no significant difference between two groups. Demographic data in both the groups are comparable**.**

Table 3: Comparison Of Heart Rate (bpm) Between Two Groups At Different Time Intervals

HR	Group				p value
	Control		Ketamine		
	Mean	SD	Mean	SD	
Baseline	86.52	5.97	85.12	8.27	0.496
Before Induction	86.68	6.02	85.48	9.72	0.602
After Induction	85.36	4.18	85.48	9.99	0.956
Before Intubation	86.8	5.64	84.12	8.89	0.209
After Intubation	87.72	5.91	88.04	7.6	0.869
Block	89.24	5.85	85.12	6.74	0.062
5min	89.32	6.05	84	7.39	0.008*
10min	90.28	7.44	83.52	6.79	0.002*
15min	89.92	7.44	84.36	6.14	0.006*
20min	89.48	7.84	83.64	6.68	0.007*
25 min	89.88	7.48	82.76	5.09	< 0.001*
30 min	95.36	4.72	82.24	5.56	< 0.001*
45 min	93.96	2.59	83.8	5.47	< 0.001*
1hr	91.48	3.68	83.12	6.04	< 0.001*
1hr 15min	93.2	4.46	81.72	5.41	< 0.001*
1hr 30min	94.08	5.18	83.6	5.44	< 0.001*
1hr 45min	96.24	7.78	84.16	5.76	< 0.001*
2 hours	96.04	6.93	80.6	4.67	< 0.001*

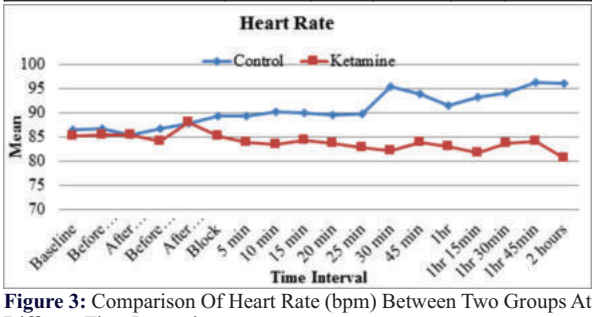

Figure 3: Comparison Of Heart Rate (bpm) Between Two Groups At Different Time Interval

In our study, there was significant increase in heart rate in control group than ketamine group after administration of block from 5th minute to 2 hours intra operatively.

Table 4: Comparison Of Systolic Blood Pressure (SBP) (mm Hg) Between Two Groups At Different Time Intervals

SBP	Group				p value
	Control		Ketamine		
	Mean	SD	Mean	SD	
Baseline	126.6	3.15	123.48	8.46	0.09
Before Induction	126.2	3.58	121.96	7.38	0.073
After Induction	125.2	5.16	118.32	10	0.064
Before Intubation	125.88	5.13	121.52	8.43	0.062
After Intubation	128.2	4.92	124.04	5.33	0.066
Block	127.12	5.15	124.08	5.42	0.068
5 min	127.12	5.15	123.04	5.78	0.081
10 min	130.24	5.09	121.92	6.51	**< 0.001***
15 min	130.6	5.98	120.16	5.74	**< 0.001***
20 min	133.32	7.3	122.04	5.95	**< 0.001***
25 min	135.88	6.72	120.2	4.6	**< 0.001***
30 min	138.4	8.7	119.68	5.43	**< 0.001***
45 min	139.48	8.66	119.64	5.75	**< 0.001***
1 hour	141.16	7.13	119.88	4.94	**< 0.001***
1hr 15min	141.36	6.5	120.32	7.66	**< 0.001***
1hr 30min	140.64	6.43	120.08	4.55	**< 0.001***
1hr 45min	141.08	7.78	123.96	4.32	**< 0.001***
2 hours	141.88	6.27	123.84	5.02	**< 0.001***

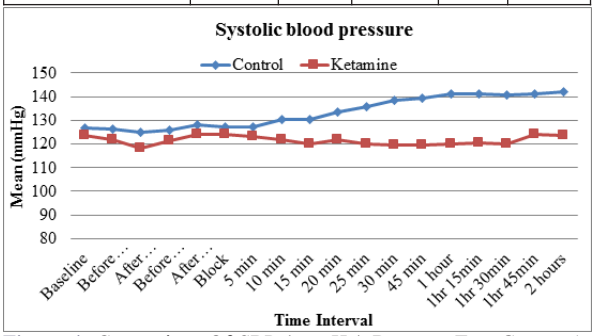

Figure 4: Comparison Of SBP (mm Hg) Between Two Groups At Different Time Intervals

In our study, SBP was higher in control group than ketamine group after administration of block from 10th minutes to 2 hours intraoperatively and it was statistically significant.

Table 5: Comparison Of Diastolic Blood Pressure (DBP) (mm Hg) Between Two Groups At Different Time Intervals

DBP	Group				p value
	Control		Ketamine		
	Mean	SD	Mean	SD	
Baseline	75.68	3.64	78.44	6.19	0.06
Before Induction	76.56	4.74	76.72	6.92	0.924
After Induction	75.64	5.84	77.76	6.77	0.242
Before Intubation	77.28	4.99	75.72	3.89	0.223
After Intubation	77.88	6.06	77.88	3.66	1.000
Block	76.8	4.92	76.96	5.67	0.916
5 min	76.8	4.92	76	4.62	0.556
10 min	77.2	5.14	75.52	5.46	0.268
15 min	77.56	5.28	75.8	4.64	0.216
20 min	78.56	5.92	77.44	4.49	0.455
25 min	79.24	5.01	77.4	5.25	0.211
30 min	82.44	5.95	76.64	5.47	**0.001***
45 min	83.52	5.35	76.32	5.53	**< 0.001***
1 hour	85.52	4.04	75.8	4.48	**< 0.001***
1hr 15min	87.12	4.74	76.96	4.69	**< 0.001***
1hr 30min	85.72	5.62	76.64	5.45	**< 0.001***
1hr 45min	87.24	4.4	79.16	4.39	**< 0.001***
2 hours	84.88	5.46	78.68	4.34	**< 0.001***

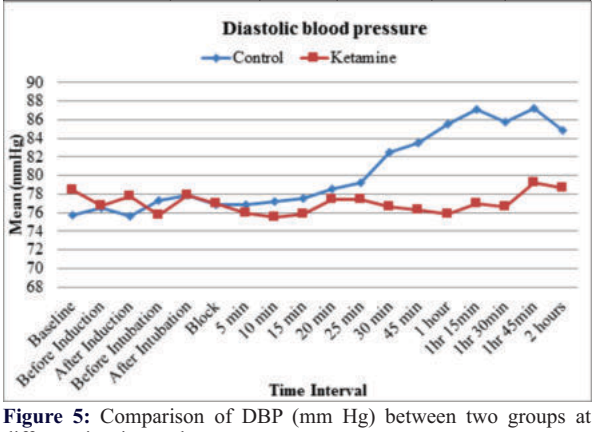

Figure 5: Comparison of DBP (mm Hg) between two groups at different time intervals

In our study, there was significant increase in DBP in control group than ketamine group from 30 minutes to 2 hours intraoperatively and it was statistically significant.

Table 6: Comparison of Mean Arterial Pressure (MAP) (mm Hg) Between Two Groups At Different Time Intervals

MAP	Group				p value
	Control		Ketamine		
	Mean	SD	Mean	SD	
Baseline	92.68	2.64	92.68	4.99	1.000

Before Induction	93.08	3.59	91	4.91	0.094
After Induction	92	4.88	90.16	6.45	0.261
Before Intubation	93.44	4.67	90.76	5.07	0.058
After Intubation	94.72	4.89	92.16	3.1	0.072
Block	93.52	3.58	91.2	3.59	0.087
5 min	93.52	3.58	91.32	3.66	0.077
10 min	95.24	3.56	90.72	4.48	< 0.001*
15 min	95.4	4.56	90.44	3.47	< 0.001*
20 min	96.92	5.27	91.8	3.69	< 0.001*
25 min	98.2	4.67	90.72	3.17	< 0.001*
30 min	100.92	5.99	90.48	3.73	< 0.001*
45 min	101.76	6.55	89.92	3.17	< 0.001*
1 hour	104.56	3.98	90.6	3.74	< 0.001*
1hr 15min	104.96	4.43	91	4.99	< 0.001*
1hr 30min	104.36	5.03	90.36	3.77	< 0.001*
1hr 45min	105.16	4.37	92.76	3.39	< 0.001*
2 hours	103.68	4.76	92.92	4.34	< 0.001*

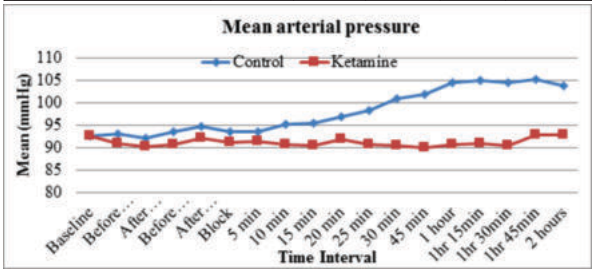

Figure 6: Comparison of MAP (mm Hg) between two groups at different time intervals

In our study there was significant increase in MAP in control group than ketamine group from 10 minutes to 2hours intraoperatively.

Table 7: Comparison Of Isoflurane Consumption (ml) Between Two Groups At Different Time Intervals

Isoflurane Consumption After Intubation	Group				p value
	Control		Ketamine		
	Mean	SD	Mean	SD	
30 mins	3.2	0.41	2.4	0.5	< 0.001*
1 hour	3.2	0.41	1.96	0.54	< 0.001*
1hour 30mins	2.28	0.68	2.4	0.58	0.504
2hours	2.88	0.67	2.28	0.61	0.002*

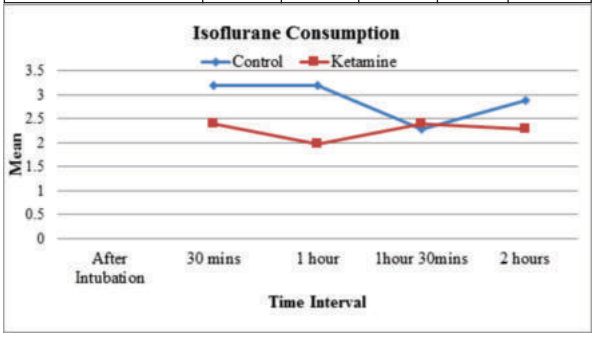

Figure 7: Comparison of Isoflurane Consumption (ml) Between Two Groups At Different Time Intervals

In our study, isoflurane consumption was higher in control group than ketamine group.

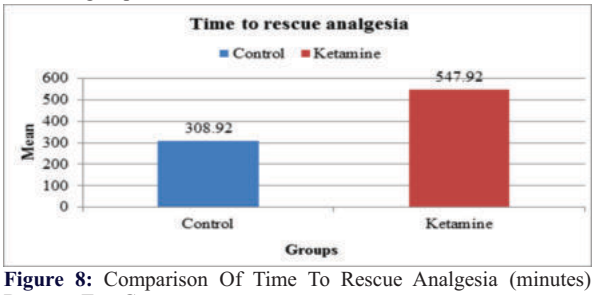

Figure 8: Comparison Of Time To Rescue Analgesia (minutes) Between Two Groups

Table 8: Comparison Of Time To Rescue Analgesia (minutes) Between Two Groups

	Group				p value
	Control		Ketamine		
	Mean	SD	Mean	SD	
Time to rescue analgesia in minutes	308.92	42.49	547.92	29.81	< 0.001*

In Control Group, Time to rescue analgesia was 308.92 ± 42.49 and in Ketamine Group was 547.92 ± 29.81. There was a significant difference in Time to rescue analgesia between two groups.

Table 9:Comparison Of Post-operative Heart Rate (bpm) Between Two Groups At Different Time Intervals

HR	Group				p value
	Control		Ketamine		
	Mean	SD	Mean	SD	
15min	83.48	4.57	84.4	5.96	0.543
30min	85.24	4.65	84.76	5.08	0.729
1hours	85.16	5.05	83.48	5.63	0.272
2hours	86.28	5.38	83.88	5.74	0.134
3hours	85.44	6.44	81.92	8.36	0.102
4hours	87.28	7.24	80.04	6.59	0.001*
6 hours	91.08	5.45	80.32	6.16	< 0.001*
8 hours	92.6	4.69	82.36	5.33	< 0.001*
12 hours	94.04	3.8	81.52	6.31	< 0.001*
16 hours	92.12	5.36	80.8	6.58	< 0.001*
20 hours	92.32	4.38	83.56	5.55	< 0.001*
24 hours	92.88	3.83	83	6.12	< 0.001*

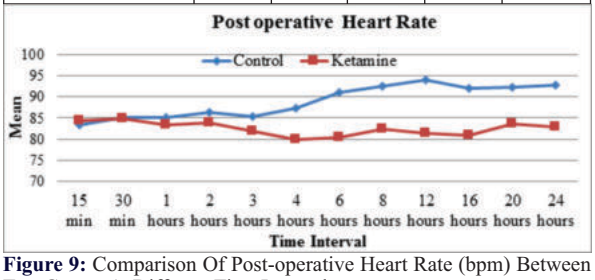

Figure 9: Comparison Of Post-operative Heart Rate (bpm) Between Two Groups At Different Time Intervals

In our study, there was significant increase in heart rate in control group than ketamine group from 4 hours to 24 hours post operatively.

Table 10: Comparison Of Post-operative Systolic Blood Pressure (SBP) (mm Hg) Between Two Groups At Different Time Intervals

SBP	Group				p value
	Control		Ketamine		
	Mean	SD	Mean	SD	
15 min	124.56	4.59	124.8	5.59	0.869
30 min	124.24	5.26	122.16	6.54	0.221
1 hour	124.28	3.4	119.72	6.24	**0.002***
2 hours	125.6	4.27	118.56	7.34	**< 0.001***
3 hours	126.6	5.69	120.4	5.93	**< 0.001***
4 hours	129.12	5.74	119.04	7.62	**< 0.001***
6 hours	134.4	5.4	120.16	6.16	**< 0.001***
8 hours	135.04	5.56	120.92	8.06	**< 0.001***
12 hours	136.28	6.13	119.52	5.72	**< 0.001***
16 hours	134.52	6.62	119.2	6.92	**< 0.001***
20 hours	135.44	8.23	120.36	6.46	**< 0.001***
24 hours	137.6	6.47	119.08	3.91	**< 0.001***

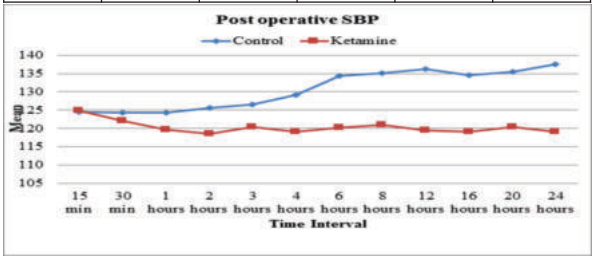

Figure 10: Comparison Of Post-operative SBP (mm Hg) Between Two Groups At Different Time Intervals

In our study, SBP was higher in control group than ketamine group from 1 hour to 24 hours post operatively.

Table 11: Comparison Of Post-operative Diastolic Blood Pressure (DBP) (mm Hg) Between The Groups At Different Time Intervals

DBP	Group				p value
	Control		Ketamine		
	Mean	SD	Mean	SD	
15 min	75.96	4.89	78.8	6.67	0.092
30 min	77.04	5.98	76.96	4.97	0.959
1 hour	78	3.86	74.24	4.06	0.002*
2 hours	77.64	3.99	74	5.69	0.012*
3 hours	76.36	4.97	75.68	4.07	0.039*
4 hours	79.88	6.67	75.08	4.04	0.003*
6 hours	87	5.12	76	4.92	< 0.001*
8 hours	87.88	4.27	77.44	3.99	< 0.001*
12 hours	87.92	4.41	75.88	5.65	< 0.001*
16 hours	88.84	3.42	75.72	5.16	< 0.001*
20 hours	88.68	5.24	74.04	5.36	< 0.001*
24 hours	86.8	3.82	73.72	3.55	< 0.001*

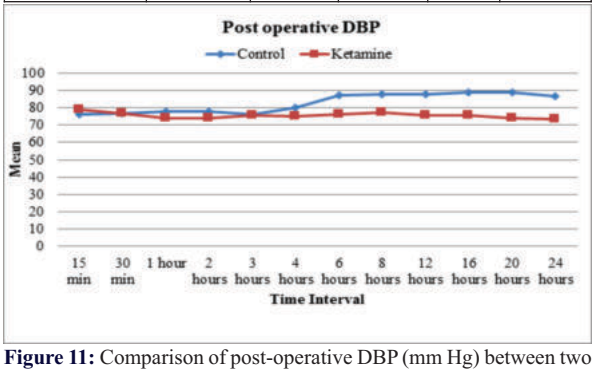

Figure 11: Comparison of post-operative DBP (mm Hg) between two groups

In our study, there was significant increase in DBP in control group than ketamine group from 1 hour to 24 hours post operatively.

Table 12: Comparison Of Post-operative Mean Arterial Pressure MAP (mm Hg) Between Two Groups At Different Time Intervals

Map	Group				p value
	Control		Ketamine		
	Mean	SD	Mean	SD	
15 min	75.96	4.89	78.8	6.67	0.822
30 min	77.04	5.98	76.96	4.97	0.255
1 hour	78	3.86	74.24	4.06	**< 0.001***
2 hours	77.64	3.99	74	5.69	**0.001***
3 hours	76.36	4.97	75.68	4.07	**0.012***
4 hours	79.88	6.67	75.08	4.04	**< 0.001***
6 hours	87	5.12	76	4.92	**< 0.001***
8 hours	87.88	4.27	77.44	3.99	**< 0.001***
12 hours	87.92	4.41	75.88	5.65	**< 0.001***
16 hours	88.84	3.42	75.72	5.16	**< 0.001***
20 hours	88.68	5.24	74.04	5.36	**< 0.001***
24 hours	86.8	3.82	73.72	3.55	**< 0.001***

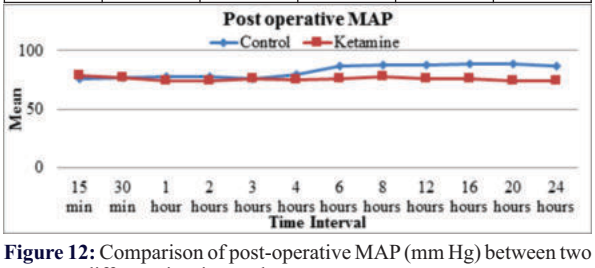

Figure 12: Comparison of post-operative MAP (mm Hg) between two groups at different time intervals

In our study, MAP was higher in control group than ketamine group from 1 hour to 24 hours post operatively and it was statistically significant.

Table 13: Comparison Of Visual Analogue Scale (VAS) Between Two Groups At Different Time Intervals

VAS	Group				p value
	Control		Ketamine		
	Mean	SD	Mean	SD	
15mins	1.96	0.73	0.92	0.91	< 0.001*
30mins	2	0.58	1.8	0.65	0.254
1hour	2.4	0.5	2.32	0.63	0.62
2hours	2.6	0.5	2.8	0.71	0.254
3hours	2.4	0.5	3.04	0.73	**0.001***
4hours	3.84	0.85	3.08	0.81	**0.002***
6 hours	6.36	0.99	3.68	0.48	**< 0.001***
8 hours	4.68	0.8	3.56	0.65	**< 0.001***
12 hours	3.28	0.68	5.52	0.51	**< 0.001***
16 hours	2.72	0.74	3.92	0.49	**< 0.001***
20 hours	2.44	0.58	3.56	0.58	**< 0.001***
24 hours	2.56	0.65	3.88	0.73	**< 0.001***

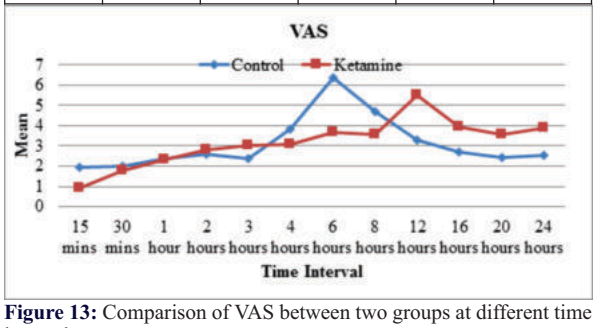

Figure 13: Comparison of VAS between two groups at different time intervals

There was a significant difference in VAS between two groups at 15 mins and from 3 hours to 24 hours. At other intervals there was no significant difference.

Table 14: Comparison Of Ramsay Sedation Scale Between Two Groups At Different Time Intervals

Ramsay Sedation Scale	Group				p value
	Control		Ketamine		
	Mean	SD	Mean	SD	
15 mins	2.42	0.59	2.8	0.41	0.061
30 mins	2.26	0.51	2.5	0.41	0.056
1 hour	2.48	0.51	2.4	0.51	0.07
2 hours	2.26	0.51	2.2	0.44	0.06
3 hours	2.34	0.49	2.4	0.57	0.08
4 hours	2.5	0.5	2.4	0.41	0.06
6 hours	2.14	0.49	2.5	0.56	0.09
8 hours	2.08	0.48	2.1	0.67	0.07
12 hours	2.08	0.48	2.4	0.54	0.057
16 hours	2.14	0.49	2.4	0.58	0.296
20 hours	2.08	0.51	2.2	0.4	0.07
24 hours	2.14	0.49	2.4	0.4	0.08

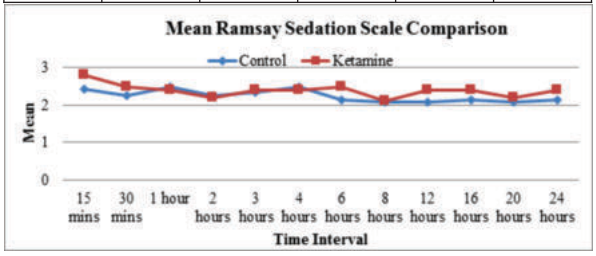

Figure 13: Comparison Of Ramsay Sedation Scale Between Two Groups At Different Time Intervals

There was no significant difference in Ramsay Sedation Scale between two groups.

DISCUSSION

PEC 1 and PEC 2 blocks were introduced by Blanco et al in 2011 for pain management in patients undergoing reconstructive breast surgeries[8]. The aim of our study was to assess the duration of post-operative analgesia after addition of ketamine to local anaesthetic in modified pectoral nerve block and to assess isoflurane consumption

and sedation.

There are only few studies which have used ketamine as an additive to local anaesthetic. So we have undertaken to study the efficacy of ketamine (0.5mg/kg) as an adjuvant to local anaesthetic in modified pectoral block in patients undergoing breast surgeries. In this study both intra operative and post-operative parameters were evaluated.

In our study mean time to rescue analgesia is longer in group K than group C. This was similar to the findings of **Ahmed H Othman et** al where they found that addition of prolonged time of first request of analgesia. Similar findings were observed in a study conducted by **lashgarina et al** where they found that ketamine can prolong local anaesthetic effect in USG guided supraclavicular brachial plexus block for patients undergoing elective upper extremity surgery[9]. Time of request of pethidine in ketamine group was longer compared to lignocaine group. **Dal et al** in his study found that intra articular administration of ketamine 0.5mg/kg provided longer and effective analgesia in patients undergoing arthroscopic surgeries[10], which was similar to our study. Similar findings were observed in a study conducted by **Khezri et al** and they found that intrathecal ketamine 0.1mg/kg administered with spinal bupivacaine prolonged the time to first analgesic request[11].

In our study, Visual Analogue Scale was significantly lower in group K than group C post operatively. **Ahmed H Othman et al** found that addition of ketamine to local anesthetic in modified pectoral block in patients undergoing modified radical mastectomy found that there was no difference in VAS, which is contrary to our study[6]. In a study conducted by **DH Kim et al** found that axillary Numerical rating scale(NRS) was significantly lower in ketamine than in control group in patients undergoing breast conservative surgeries and sentinel lymph node biopsy which was similar to our study[12]. Similar findings were observed in a study conducted by **Dal et al** where they found that intravenous or peritonsillar infiltration of ketamine reduced post-operative pain in children following adenotonsillectomy and found that observational pain score was less in ketamine [10].

In our study, isoflurane consumption was higher in control group than ketamine group from 30mins to 1 hour and at 2hours. This was similar to a study conducted by **Tomaki et al** where he found that general anaesthesia combined with infra orbital nerve block is effective in reducing the consumption of isoflurane and post-operative pain intensity in endonasal maxillary sinus surgery[13]. **Shivinder singh et al** in his study found that oral clonidine of 150 mcg as a premedicant in patients undergoing laparoscopic cholecystectomy and **Ranjitha et al** in their study found that oral melatonin 3mg resulted in improved perioperative hemodynamic stability and reduction in isoflurane consumption and post-operative analgesic requirements, which is similar to our study[14]

In our study we observed that there was decrease in heart rate in ketamine group than the control group which was statistically significant from 5th minute to 2 hours intraoperatively and from 4 hours to 24 hours post operatively but not clinically significant. **Ahmed H Othman** et al in 2016 found that addition of ketamine to local anesthetic in modified pectoral block in patients undergoing modified radical mastectomy produced no difference in hemodynamic parameters like heart rate, this is contrary to our study[6].

In our study, SBP, DBP and MAP was higher in control group than ketamine group after administration of block from 10 minutes to 2 hours intraoperatively and from 1 hour to 24 hours post operatively but not clinically significant. Similar to our study **Manzoor et al** in his study on addition of dexmeditomedine to local anaesthetic in Pec block in patients undergoing breast surgeries found that there was significant difference in post-operative DBP, MAP between two groups at 1 hour[15]. **Ahmed H Othman et al** in 2016 found that addition of ketamine to local anesthetic in modified pectoral block in patients undergoing modified radical mastectomy showed no difference in systolic blood pressure, diastolic blood pressure and mean arterial pressure, this is contrary to our study[6].

In our study postoperative Ramsay Sedation Scale did not show any statistical difference between two groups. **Dal et al** in his study on peritonsillar infiltration of ketamine in children undergoing adenotonsillectomy found that ketamine group had higher sedation at 15 minutes which was contrary to our study[16].

CONCLUSION:

Addition of ketamine to local anaesthetic in modified pectoral nerve block resulted in

- Increase in duration of postoperative analgesia and time to request of first analgesic
- Decrease in VAS scores
- Decrease in isoflurane consumption.

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