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Original Research Article.

Epidural Ketamine and Epidural Tramadol for Post-Operative Analgesia: A Comparative Study

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ABSTRACT

Background: Epidural Ketamine and Epidural Tramadol are used for post-operative analgesia in various kinds of surgeries.

Aims and Objectives: To evaluate the onset, duration and quality of post-operative analgesia by a single injection of epidural ketamine and epidural tramadol in various types of surgeries as well as to study the side-effects caused by epidural tramadol and epidural ketamine respectively.

Methods: Patients were divided in two groups using lottery system.

Groups I: Patient were given epidural tramadol (preservative free) 100 mg. in 10 ml of distilled water.

Groups II: Patients were given epidural (preservative free) ketamine 30 mg diluted in 10 ml of distilled water. Drug was given via epidural catheter in post- operative period on first complaint of pain by the patient.

Results: The mean time of onset of analgesia in group-I was found to be 8.90 min, 8.95 min and 8.8 min with 1st, 2nd and 3rd dose respectively. In group-II it was 9.45 min 9.55 min and 9.15 with 1st, 2nd and 3rd dose respectively. Difference was statistically found to be not significant. The mean duration of analgesia increased with every dose of tramadol HCL and ketamine HCL in group-I and group-II was observed as 8.75 hours, 10.50 hours and 12.40 hours with 1st, 2nd and 3rd dose of tramadol and observed as 4.05 hours, 4.9 hours and 5.75 hours with 1st, 2nd and 3rd dose of ketamine respectively.

Conclusion: On comparing the data of group-I with group-II, It was seen that the analgesic effect of 100 mg. tramadol lasted significantly longer than that of 30 mg ketamine.

Keywords: Epidural, Ketamine, Tramadol, Postoperative Pain.

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INTRODUCTION

Tramadol: Tramadol is a centrally acting opioid analgesic with purely agonistic effects. Adverse effects include sedation, nausea, vomiting, dizziness, dry mouth, fatigue, autonomic nervous effects and orthostatic complaints. Nausea is more with rapid iv injection. Respiratory depression is minimal and is reversed by Naloxone. Symtoms of intoxication include miosis, vomiting, coma, respiratory depression or arrest and cardio vascular collapse. Nalaxone is used to treat toxicity.

Ketamine: Ketamine hydrochloride is a phencyclidine derivative. This compound first synthesized by Stevers in 1963 and first used in clinical practice by [1]Corssen and Domino in 1966. The primary site of CNS action of ketamine appears to be the thalamoneocortical projection system. (Domino-1968)[1]

Kitahata (1973)[2] suggested that the the analgesic action of ketamine can be explained by lamina specific suppression of spinal cord activity. The spinal cord analgesic effect of ketamine is due to:

- Interaction with opiate receptors as an agonist but Nalaxone does not antagonize the effect of ketamine analgesia.[3]
- Potentiate the effect of noradrenaline by inhibiting their uptake, by increasing receptor activation at the synapse. (Pekoe 1980)[4]
- Selective suppression of lamina 1& 5 (Kitahata 1973)[2]

Ketamine stimulates cardiovascular system and is usually associated with increase in BP, HR and cardiac output. The mechanism by which ketamine stimulates CV system remains unknown, but it appears that rather than peripheral mechanism such as baroreflex inhibition, it is central. (Chodoff P 1972)[5]

MATERIALS AND METHODS

The present clinical study of epidural tramadol and epidural ketamine for lower abdominal and lower limb surgeries was carried out in the Department of Anesthesiology, S.M.M.H. Medical College & Hospital, Saharanpur.

After approval from the ethical committee a total of 40 patients of either sex and of age group 20-60 years and of ASA grade I and II were included into the study.The patients requiring abdominal surgeries (including gynecological and obstetric surgeries) and lower limb surgeries were included. Patients with any contraindication for epidural block like local sepsis, deformity, backache, coagulopathy, severe hypotensive and hypertensive states, myocardial Ischemia/myocardial infarction, any neurological disease were excluded from the study.

Premedication

All patients were premedicated with 0.25 mg of oral Alprazolam, night before surgery. None of the patients received any analgesic or sedative as premedication on the day of surgery.

Group I: Patients were given epidural (preservative free) tramadol 100 mg diluted in 10 ml of distilled water via epidural catheter in post-operative period on first pain complaint by the patient.

Group II: Patients were given epidural (Preservative free) ketamine 30 mg diluted in 10 of distilled water via epidural catheter in post-operative period on first pain complaint by the patient.

OBSERVATIONS TAKEN

Vital parameters: Like pulse rate, blood pressure and respiratory rate were recorded immediately after epidural injection in a five minutes interval up to half an hour and then every fifteen minutes intraoperatively. Postoperatively they were recorded every 6 hourly for 24 hours. After the injection of tramadol hydrochloride (100 mg)/ ketamine hydrochloride (30 mg) they were again recorded every ten minutes for one hour and then six hourly.

Duration of Postoperative Analgesia: This was the time from the onset of sensory loss to the recovery of sensations. The time at which the patient complained of pain in the postoperative period was noted as the time of recovery of sensation.

Visual Analogue Scale at the time of giving first dose (zero time): The VAS is a 10 cm horizontal line labeled 'no pain' at one end and worst pain' on the other end. The patients were asked to mark on this line where the intensity of pain lies.

Onset of Action: After injection of drug tramadol 100 mg in group I and drug ketamine 30 mg in group-II. it was noted every two minutes until the patient was relieved of pain.

Duration of Pain Relief: It was noted as the time in hours/minutes in which the patient was free of pain after the injection made through epidural catheter.

Side Effects: If any were noted after the injections made through epidural catheter and were treated accordingly.

Degree of Pain Relief

Excellent: Grade-I No pain, patient comfortable.

Good: Grade-II pain reported on questioning.

Fair: Grade-III Patient draws nurse's attention to pain.

Poor: Grade -IV Patient in agony and crying with pain.

Time of Removal of Catheter: Catheter was removed after 48-72 hours in all the cases.

Table 1: Distribution of patients according to onset of pain relief after epidural injection

Onset (minutes)	Group-I						Group-II					
	I Dose		II Dose		III Dose		I Dose		II Dose		III Dose	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
3-5	5	25	3	15	0	0	4	20	3	15	0	0
6-8	3	15	4	20	12	60	1	5	1	5	9	45
9-11	9	45	12	60	8	40	12	60	12	60	7	35
12-14	2	10	1	5	0	0	2	10	4	20	4	20
15-17	1	5	0	0	0	0	1	0	0	0	0	0
18-20	0	0	0	0	0	0	0	0	0	0	0	0
Total	20	100	20	100	20	100	20	100	20	100	20	100
Minimum	5		5		8		5		5		8	
Maximum	15		12		10		15		12		12	
Mean	8.9		8.95		8.8		9.45		9.55		9.15	
S.D.	2.70		1.91		0.98		2.52		2.13		2.39	
p value	>0.5		>0.5		>0.5							

RESULTS

The mean onset of pain relief in group-I was 8.9±2.70 minutes, 8.95±1.91 minutes and 8.80±0.98 minutes after giving first, second and third dose respectively. The mean onset of pain relief in group-II was 9.45±2.51 minutes, 9.55±2.13 minutes and 9.15±2.39 minutes after giving first, second and third dose respectively. The differences were not statistically significant.

It is evident from the above figure that, mean duration of onset of pain relief is shorter in group-I as compare to group-II after first, second and third doses.

There was pain relief in 100% cases of both the groups. The mean duration of pain relief after first dose was 8.75±1.92 hours and 4.05±1.19 hours in group-I and group-II respectively. The results are statistically highly significant. ($p<0.01$)

The mean duration of pain relief after second dose was 10.50±1.53 hours and 4.90±1.22 hours in group-I and group-II respectively. The values differ markedly and the results are statistically highly significant. ($p<0.01$)

The mean duration of pain relief after third dose was 12.40±5.91 hours and 5.75±1.32 hours in group-I and group-II respectively. The values differ markedly and the results are statistically highly significant. After giving third dose of tramadol, 25 percent patients did not demand any more analgesia.

After analyzing above figure it is clear that mean duration of pain relief is longer in case of group-I(Tramadol) as compare to group-II (Ketamine) after first, second, and third dose.

Assessment of pain was done by Visual Analogue Scale. Before first dose the visual analogue score was 8.60±1.02 and 8.25±0.88 in group-I and group-II respectively. It was observed that there was gradual reduction in visual analogue score in both the groups after 5, 10, 15 and 20 minutes of first dose. On comparing the values of pre-injection to 20 minutes post-injection the results found statistically highly significant.

The means VAS before second dose was 7.60±0.36 and 7.15±0.47 in Group-I and Group-II respectively. It was observed that there was gradual reduction in visual analogue score in both the groups after 5, 10, 15 and 20 minutes of second dose. On comparing the values of pre-injection to 20 minutes post-injection the results found statistically highly significant.

The means VAS before second dose was 6.55±0.72 and 6.90±1.70 in Group-I and Group-II respectively. It was observed that there was gradual reduction in visual analogue score in both the groups after 5, 10, 15 and 20 minutes of third dose. On comparing the values of pre-injection to 20 minutes post-injection the results found statistically highly significant.

Above table shows distribution of patients according to the side effects between the two groups. Nausea and vomiting occurred in 20% cases in Group-I while sedation occurred in 25% cases of Group-II.

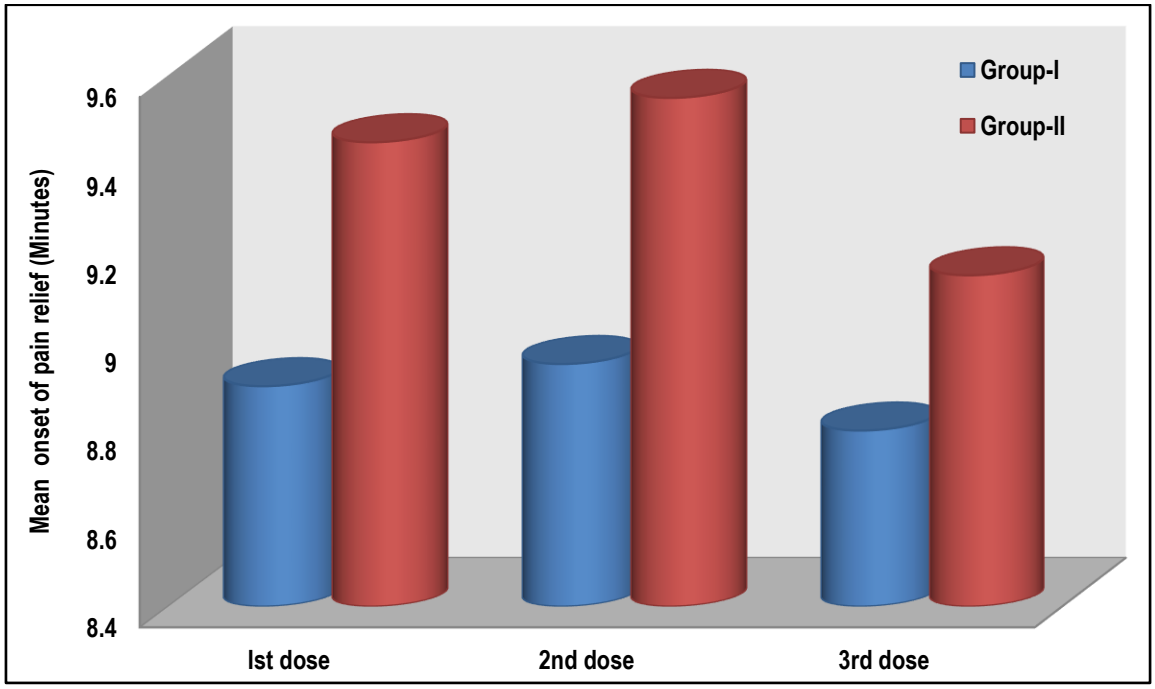


Fig 1: Shows Distribution of patient according to onset of pain relief after epidural injection

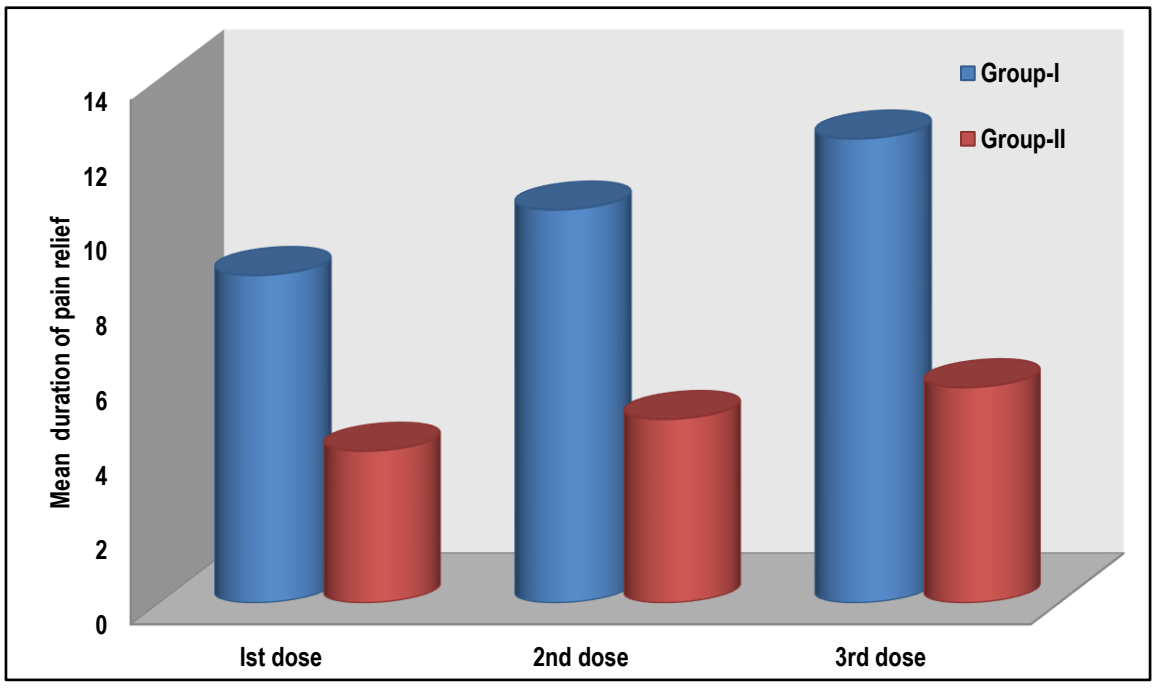


Fig 2: Shows duration (Hours) of pain relief after 1st,2nd and 3rd dose of Epidural injection

Table 2: Duration of pain relief after 1st dose of epidural injection

Duration (hrs.)	Group-I		Group-II	
	No.	%	No.	%
1-3	0	0	6	30
4-6	5	25	14	70
7-9	5	25	0	0
10-12	10	50	0	0
13-15	0	0	0	0
16-18	0	0	0	0
19-21	0	0	0	0
No pain	0	0	0	0
Total	20	100	20	100
Minimum	6		2	
Maximum	12		6	
Mean	8.75		4.05	
S.D.	1.92		1.193	
p value	<0.1			

Table 3: Duration of pain relief after 2nd dose of epidural injection

Duration (hrs.)	Group-I		Group-II	
	No.	%	No.	%
1-3	0	0	3	15
4-6	0	0	16	80
7-9	4	20	1	5
10-12	16	80	0	0
13-15	0	0	0	0
16-18	0	0	0	0
19-21	0	0	0	0
No pain	0	0	0	0
Total	20	100	20	100
Minimum	8		3	
Maximum	12		8	
Mean	10.5		4.9	
S.D.	1.533		1.221	
p value	<0.1			

Table 4: Duration of pain relief after 3rd dose of epidural injection

Duration (hrs.)	Group-I		Group-II	
	No.	%	No.	%
1-3	0	0	0	0
4-6	0	0	17	85
7-9	1	5	3	15
10-12	5	25	0	0
13-15	7	35	0	0
16-18	2	10	0	0
19-21	0	0	0	0
No pain	5	25	0	0
Total	20	100	20	100
Minimum	8		4	
Maximum	no pain		8	
Mean	12.4		5.75	
S.D.	5.908		1.326	
p value	highly significant			

Table 5: Pain assessment by visual analogue score (1st dose)

Groups	Visual Analogue score (Before Inj.)			
	Mean		S.D.	
Group-I	8.60		1.020	
Group-II	8.25		0.887	
Time (min)	Visual Analogue score (After Inj.)			
	Group-I		Group-II	
5	7.10	1.64	7.00	1.549
10	3.00	1.449	3.70	1.735
15	1.10	1.221	2.25	0.972
20	0.65	0.726	1.20	0.510
p value	> 0.5		> 0.5	

Table 6: Pain assessment by visual analogue score (2nd dose)

Groups	Visual Analogue score (Before Inj.)			
	Mean		S.D.	
Group-I	7.60		0.860	
Group-II	7.15		0.477	
Time	Visual Analogue score (After Inj.)			
(min)	Group-I		Group-II	
5	6.5	1.204	6.05	0.589
10	3.2	0.98	3.85	1.062
15	1.75	0.433	2	0.632
20	0.95	0.589	0.55	0.497
p value	>0.5		>0.5	

Table 7: Pain assessment by visual analogue score (3rd dose)

Groups	Visual Analogue score (Before Inj.)			
	Mean		S.D.	
Group-I	6.55		0.726	
Group-II	6.9		1.7	
Time	Visual Analogue score (After Inj.)			
(min)	Group-I		Group-II	
5	5.65	0.853	5.55	0.497
10	3	1.049	3.65	0.91
15	1.9	0.3	1.8	0.678
20	0.5	0.5	0.2	0.4

Table 8: Side effects at various stages

Side Effect	POST INJECTION			
	Group-I		Group-II	
	No.	%	No.	%
Pain	0	0	0	0
Tachycardia	0	0	0	0
Pruritis	0	0	0	0
Rigors/Shiver	0	0	0	0
Urinary Retention	0	0	0	0
Hypotension	0	0	0	0
Respiratory difficulty	0	0	0	0
Sedation	0	0	5	25
Nausea/Vomiting	4	20	0	0
Headache	0	0	0	0
Backache	0	0	0	0
None	16	80	15	75
Total	20	100	20	100

Fig 3: Shows pain assessment by visual analogue score (1st dose)

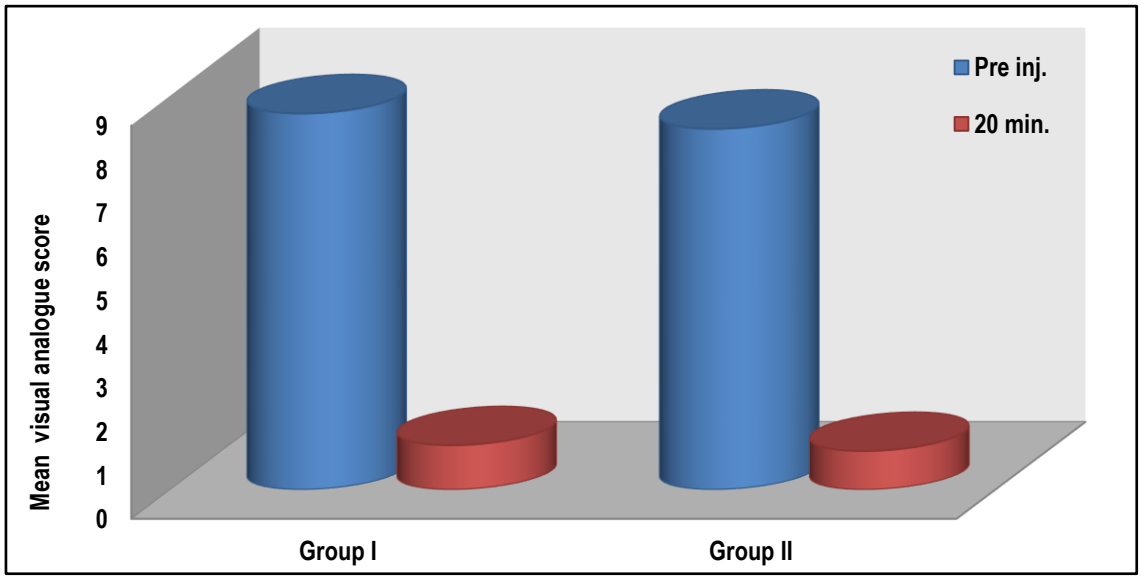


Fig 4: Shows pain assessment by visual analogue score (2nd dose)

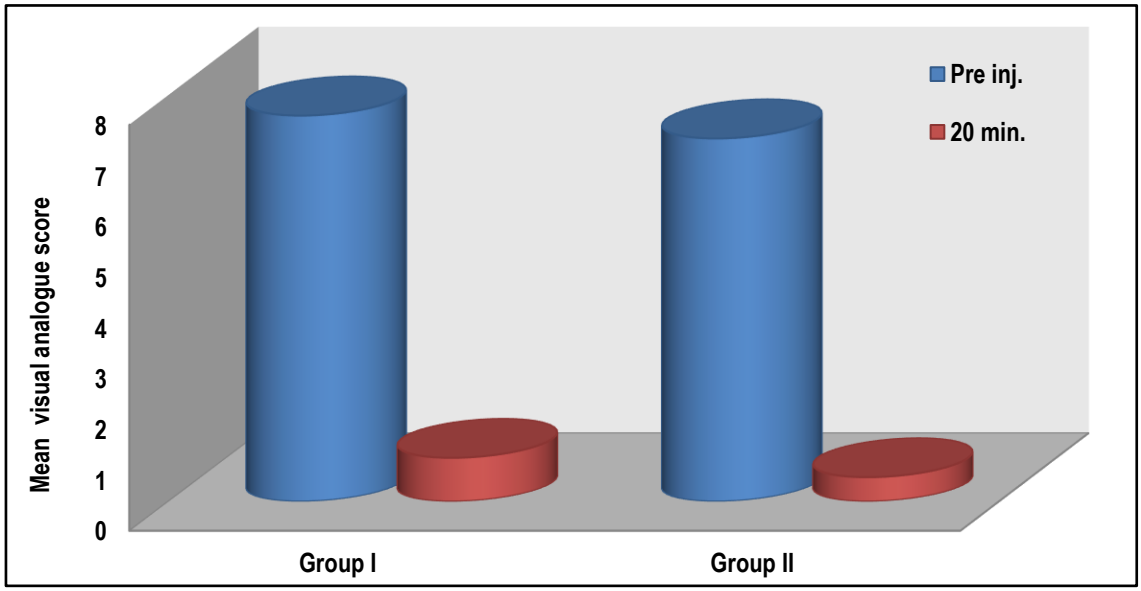
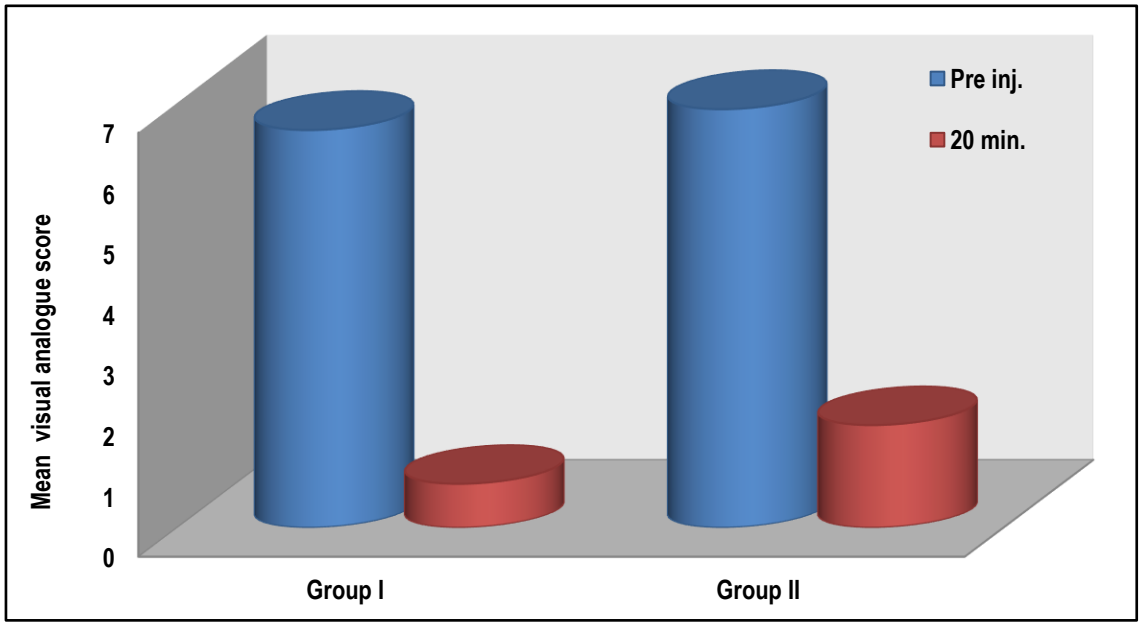


Fig 5: Shows pain assessment by visual analogue score (3rd dose)



DISCUSSION

Tramadol: In comparative studies using patient controlled analgesia (PCA) in patients with post-operative pain, epidural tramadol was one thirteenth as potent as morphine in patients following abdominal surgery and was more effective than epidural bupivacaine.(Lee, Mc Touis, Sorkin et al[6] 1993). At doses providing analgesic efficacy similar to that of pethidine, typical opioid side effects such as respiratory depression or effects on smooth muscles are less pronounced with tramadol.(Vickers et al[7] 1992).It can be used to produce prolonged post-operative analgesia without serious side effects. (Baraka A et al[8] 1993) Rajiv Lakhotia et al[9] (1998) conducted a study on epidural tramadol for post-operative pain relief. Pain scores were significantly less with epidural tramadol 50mg in combination with 2% lignocaine 20 ml (Tramadol group) compared with control group receiving 2% lignocaine 20 ml

Ketamine: Gebhardt B[10] (1994) studied the clinical results with epidural and intrathecal administration of ketamine. Epidurally administered ketamine in dose of 30 mg are seen to provide adequate analgesia while smaller doses might be effective in chronic pain syndrome.

CONCLUSION

Inter group comparison shows that the onset of analgesia is faster with tramadol than with ketamine but the difference was statistically found to be nonsignificant. On comparing the observation of group I (Tramadol) with group II(Ketamine) it was seen that the analgesic effect of tramadol lasted significantly longer than that of ketamine. In most of the cases the side effects noted were mostly nausea and vomiting in group I and sedation in group II.

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