



## COMPARISON OF THE CLINICAL EFFECTS OF INTRATHECAL FENTANYL AND INTRAVENOUS FENTANYL DURING SPINAL ANAESTHESIA WITH BUPIVACAINE

**Dr Lulu Sherif**

Associate professor, Department of Anesthesiology, Father Muller Medical College, Mangalore

**Dr Mala Jose\***

Senior Resident in Anesthesiology, Bombay Hospital, Indore \*Corresponding Author

### ABSTRACT

This study was done to compare the clinical effects of intrathecal fentanyl versus the same dose of intravenous fentanyl for lower abdominal and orthopaedic surgeries, with respect to the onset, duration, and quality of bupivacaine induced spinal anaesthesia.

The participants were randomly allocated into 3 groups of 30 each.

Group IC (control) was the first group in whom 2.5 ml of 0.5 % bupivacaine plus 0.5 ml normal saline was given intrathecally and 0.5ml of NS was given IV.

Group IT was the second group in whom 2.5 ml of 0.5% bupivacaine plus 0.5 ml of fentanyl (25 micrograms) was given intrathecally and 0.5 ml of NS was given IV.

Group IV was the third group in whom 2.5 ml of 0.5% bupivacaine plus 0.5 ml normal saline was given intrathecally and 0.5ml of fentanyl (25 micrograms) was given IV.

The results showed a statistically significant longer duration of motor blockade in the Group IT & Group IV when compared to that of Group IC. But the duration of motor blockade amongst Group IT and Group IV showed no statistical difference.

Hence the study concluded with the inference that there is not much difference when fentanyl is administered intrathecally or intravenously as an adjuvant to Bupivacaine induced spinal anaesthesia.

### KEYWORDS :

### INTRODUCTION

Administration of fentanyl intrathecally is an established method for intraoperative anaesthesia. Although opioids supplement spinal anaesthesia, that fact alone does not prove that the drug site of analgesic action resides only in the spinal cord.

Studies showed that a significant amount of an intrathecally administered lipophilic opioid, such as fentanyl, is lost by diffusion into the epidural space and subsequently into the plasma, suggesting that intrathecally administered fentanyl may induce analgesia more by a systemic rather than by a spinal action.<sup>[1]</sup>

In accordance with the above hypothesis, fentanyl added intrathecally along with bupivacaine should give a fairly similar effect as that of fentanyl administered intravenously. Hence, we undertook this study to compare the clinical effects of intrathecal fentanyl versus the same dose of intravenous fentanyl for lower abdominal surgeries and orthopaedic surgeries, with respect to duration, and quality of bupivacaine induced spinal block.

### METHODOLOGY

After obtaining Ethical clearance from the Ethics Committee at Father Muller Medical College Hospital, 90 consented patients between the age group of 18 to 65 years undergoing lower abdominal surgery and orthopaedic surgeries were divided into the following three groups and each group received 2.5 ml of 0.5% of Bupivacaine intrathecally along with the below mentioned adjuvants,

**GROUP CONTROL(IC):** Intravenous: 0.5ml Normal Saline  
Intrathecally: 2.5ml of 0.5% Bupivacaine + 0.5ml Normal Saline

**GROUP INTRATHECAL (IT):** Intravenous: 0.5ml Normal Saline  
Intrathecally: 2.5ml of 0.5% Bupivacaine + 0.5ml (25 mcg) Fentanyl

**GROUP INTRAVENOUS (IV):** Intravenous: 0.5ml (25 mcg) Fentanyl  
Intrathecally: 2.5ml of 0.5% Bupivacaine + 0.5ml Normal Saline

All patients were pre-medicated with Intravenous Midazolam 1 mg 15 minutes before the beginning of surgery. The patients were then pre-loaded with Ringer Lactate 10 ml/kg 20 minutes prior to the administration of spinal anaesthesia. The study drug was injected

into the L3-L4 sub arachnoid space using 23 G Quinke Babcock spinal needle after confirming free flow of cerebrospinal fluid and the time of injection was recorded as 0 minute. All the patients were monitored with Noninvasive blood pressure monitor, pulse oximeter and ECG monitor and the baseline values were noted. The vital parameters were recorded every 10 mins for a duration of 2 hours. Post-operative Bromage scale was scored for every half hour till the score returned to 1. Rescue analgesia with injection Butorphanol 1 mg was administered when VAS score >4 (visual analogue scale), and it was monitored every half hour post operatively. Adverse effects like Post-operative nausea vomiting (PONV), Sedation (Ramsay sedation scale) and pruritus were also monitored.

Collected data was analysed by mean, standard deviation, Post HOC test & analysis of variance (ANOVA) for repeated measures. The analysis was performed using SPSS software.

### RESULTS

#### DEMOGRAPHIC DATA:

The mean Age group was 40.8 years. The mean weight was 57.63 kg. The gender distribution had 56 males and 34 females and the mean duration of surgery was 41.03 +/- 15.97 minutes.

#### DURATION OF BLOCK

The overall mean difference of duration when comparing

IT and IC was 47.20430 minutes

IV and IC was 35.58065 minutes

IT and IV was +/- 11.6231 minutes

\*Mean difference significant at 0.05 level

#### TIME FOR RESCUE ANALGESIA:

The overall mean difference of duration when comparing

IT and IC was 52.18280 minutes

IV and IC was 50.93548 minutes

IT and IV was +/- 1.24731 minutes

\*Mean difference significant at 0.05 level

#### ADVERSE EVENTS:

SEDATION was similar in all three groups with no statistically significant difference in any particular group.

PONV was seen in 2 patients in Group IT

PRURITUS was seen in 1 patient in Group IT  
Both results were not statistically significant

**Table 1: Demographic data**

		Age	Weight	Duration of Surgery
N	Valid	92	92	92
	Missing	0	0	0
Mean		40.8043	57.6304	41.0326
Std. Deviation		12.71690	7.98449	15.97625
Minimum		18.00	45.00	20.00
Maximum		65.00	80.00	90.00

**Table 2: Gender Distribution**

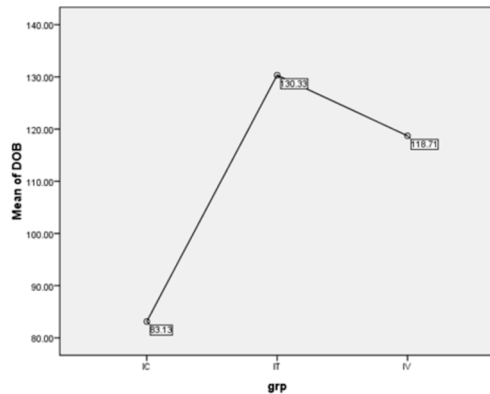
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	F	34	37.0	37.0	37.0
	M	58	63.0	63.0	100.0
	Total	92	100.0	100.0	

**Table 3: Duration of Block**

Multiple Comparisons						
Bonferroni						
(I) grp	(J) grp	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
IC	IT	-47.20430*	4.26556	.000	-57.6126	-36.7960
	IV	-35.58065*	4.23045	.000	-45.9032	-25.2580
IT	IC	47.20430*	4.26556	.000	36.7960	57.6126
	IV	11.62366*	4.26556	.023	1.2154	22.0319
IV	IC	35.58065*	4.23045	.000	25.2580	45.9032
	IT	-11.62366*	4.26556	.023	-22.0319	-1.2154

\*. The mean difference is significant at the 0.05 level.

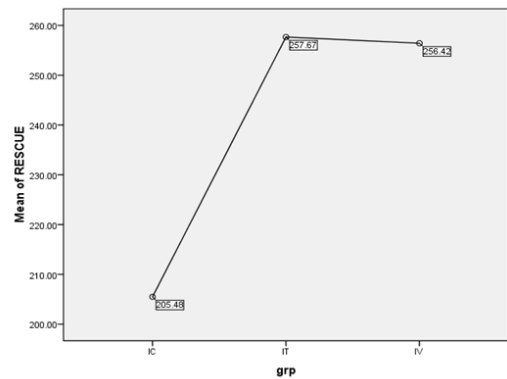
**Figure 1: Duration of Block**



**Table 4: Time to Rescue Analgesia**

Multiple Comparisons						
Bonferroni						
(I) grp	(J) grp	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
IC	IT	-52.18280*	7.94116	.000	-71.5598	-32.8058
	IV	-50.93548*	7.87580	.000	-70.1530	-31.7180
IT	IC	52.18280*	7.94116	.000	32.8058	71.5598
	IV	1.24731	7.94116	1.000	-18.1297	20.6243
IV	IC	50.93548*	7.87580	.000	31.7180	70.1530
	IT	-1.24731	7.94116	1.000	-20.6243	18.1297

**Figure 2: Time to Rescue Analgesia**



## DISCUSSION

Administration of opioids intrathecally is an established method for intraoperative anaesthesia. Studies showed that a significant amount of an intrathecally administered lipophilic opioid, such as fentanyl, is lost by diffusion into the epidural space and subsequently into the plasma, suggesting that intrathecally administered fentanyl may induce analgesia more by a systemic rather than by a spinal action.<sup>[1]</sup>

When we compared the three groups, the group receiving Fentanyl via the Intravenous and Intrathecal route had a longer duration of block when compared to the Control group. The time to rescue analgesia was also longer in the Fentanyl groups when compared to the control group.

Whereas when we compared the duration of block and the time to rescue analgesia of the groups that received fentanyl via the Intravenous and Intrathecal route, there was no significant difference.

The results of our study are in comparison to the study conducted by Loper KA et al which concluded that continuous intravenous fentanyl infusion versus continuous epidural fentanyl infusion offered no clinical advantages for the management of postoperative pain after knee surgery.<sup>[2]</sup>

Another study conducted by Wolfgang C. et al. compared the distribution of different opioids in the intrathecal space and reported that fentanyl distributed rapidly into the epidural space and fat and subsequently into the plasma.<sup>[3]</sup>

The adverse effects of fentanyl like PONV & Pruritis, though not significant were noticed more in the Intrathecal group than in the Intravenous group. Sedation was comparable in all three groups probably because of the effect of midazolam given as premedication and also the minimal dose of fentanyl administered.

## CONCLUSION

We have inferred from our study that whether the opioid fentanyl is given intrathecally or intravenously, there is no significant difference in the action probably due to the fact that the opioid action is mostly by systemic absorption of the drug. Further studies are required to substantiate our findings.

## REFERENCES

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