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Original Research Article

A Prospective Randomized Study Comparing Intrathecal Dexmedetomidine and Fentanyl as Adjuvants to Hyperbaric Ropivacaine in Infra Umbilical Surgeries

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Abstract

Background: Spinal anaesthesia is the most preferred technique for infraumbilical surgeries. Hyperbaric Ropivacaine has been shown to produce reliable and predictable anaesthesia for surgery. Fentanyl, a synthetic lipophilic opioid and Dexmedetomidine, a new highly selective α2-agonist, have been used as neuraxial adjuvants in spinal anaesthesia to prolong intraoperative and postoperative analgesia. The present prospective randomized study is undertaken to investigate and compare the clinical effects of 0.75% hyperbaric ropivacaine with additives such as fentanyl and dexmedetomidine on spinal anaesthesia for infraumbilical surgeries.

Aim: To compare the clinical effects of intrathecal 2ml of 0.75% hyperbaric ropivacaine with fentanyl 25μg and dexmedetomidine 10μg as additives in patients undergoing elective infraumbilical surgeries.

Materials & Methods: The study was conducted on 90 patients of both sexes, aged 18-60 years, of class I or II of the American Society of Anesthesiologists classification, who underwent elective infraumbilical surgery. Patients were randomly assigned to three groups (30 patients each): group RC (control group) received 2ml (15mg) of 0.75% hyperbaric ropivacaine plus 0.5ml of normal saline (0.9%) at a total volume of 2.5ml intrathecally, whereas group RF received 2ml (15mg) of 0.75% hyperbaric ropivacaine plus 0.5ml of 25μg fentanyl (50 μg/ml) at a total volume of 2.5ml intrathecally and group RD received 2ml (15mg) of 0.75% hyperbaric ropivacaine plus 0.5ml of 10μg dexmedetomidine (50μg dexmedetomidine diluted in 2.5ml of normal saline) at a total volume of 2.5ml intrathecally. The onset, extent, duration of sensory and motor blockade, time to first rescue analgesia request, hemodynamic parameters, and side effects such as nausea, vomiting, pruritis, respiratory depression and shivering were recorded.

Results: The onset of sensory block was faster in Group RD (1.5±0.8) and Group RF (2.2±0.4) as compared with Group RC (2.7±0.4) min ($p<0.0001$). Time to achieve the maximum level of sensory block was faster in Group RF (4.13±0.77) compared to Group RD (5.16±0.94) and Group RC (5.63±0.49) min ($P<0.00001$). Two-segment regression time was longer in Group RD (120±15.7) and Group RF (114±14.5) as compared with Group RC

(96±12.2) min (p<0.0001). The time of onset of motor block in Group RD (3.4±0.7), Group RF (3.8±0.9), and Group RC (3.7±0.5) min was statistically insignificant(p=0.08). The duration of the motor block in Group RD (308±19.1) and Group RF (233±18.7) was significantly longer as compared with Group RC (184±10.3) min (*P*<0.0001). The duration of postoperative analgesia was significantly longer in Group RD (365±23.5) and Group RF (275±20.6) as compared with Group RC (232±29.0) min (*P*<0.0001).

Conclusion: The addition of dexmedetomidine to hyperbaric ropivacaine in spinal anaesthesia for infraumbilical surgery hastens the onset of sensory block, prolongs sensory and motor block recovery time and provides excellent quality of postoperative analgesia with minimal hemodynamic and other side effects compared with hyperbaric ropivacaine alone or fentanyl combined with hyperbaric ropivacaine.

Keywords: Spinal Anaesthesia, Hyperbaric Ropivacaine, Bupivacaine, Fentanyl, Dexmedetomidine.

1. INTRODUCTION:

Spinal anaesthesia is the most widely used technique for infraumbilical surgeries as it is very economical, easy to administer and provides a fast onset and effective sensory and motor blockade. It also provides prolonged postoperative analgesia together with early ambulation and early discharge [1]. A wide variety of local anesthetic drugs are available for spinal anesthesia, namely, bupivacaine, levobupivacaine, and ropivacaine.

Ropivacaine is an amide local anesthetic agent with similar local anesthetic properties as bupivacaine. Ropivacaine has a potentially improved safety profile compared with bupivacaine [2]. Ropivacaine is well tolerated after intrathecal use and was found to have a shorter duration of action than bupivacaine, making it a possible alternative to lignocaine for ambulatory surgery because of the low incidence of transient neurological symptoms [3]. Spinal hyperbaric ropivacaine may produce more predictable and reliable anesthesia than plain ropivacaine [4]. Use of hyperbaric ropivacaine is being popular among recent anesthesiological practitioners, as their effect is very predictable, but they have a shorter duration of action. Hence, to overcome this and improve the block characteristics of intrathecally administered hyperbaric ropivacaine, various intrathecal adjuvants are added to hasten the onset and prolongs the postoperative analgesia.

Fentanyl, a short-acting lipophilic opioid, is a highly potent phenylpiperidine derivative known to augment the quality of subarachnoid block. It is the most common opioid that is used intrathecally in combination with local anaesthetics. It has synergistic effects with local anaesthetics and improves the status of intraoperative and postoperative analgesia. Being a lipophilic drug , addition of a small dose to spinal anaesthesia can produce more rapid onset and better quality of surgical block and leads to more rapid recovery of motor function and allow for earlier discharge after surgery. However, worrisome adverse effects such as pruritus, urinary retention, postoperative vomiting, and respiratory depression limit the use of opioids [5],[6].

Dexmedetomidine, a new highly selective α2-agonist with a selectivity ratio for the α2:α1 receptor of 1600:1, as compared with a ratio of 220:1 for clonidine. It acts pre-junctionally to reduce neurotransmitter release and post-junctionally to cause hyperpolarisation and reduction of impulse transmission. Intrathecal α2 receptor agonism in the dorsal horn of the

spinal cord can produce anti-nocioceptive action for both somatic and visceral pain. When used as a neuraxial adjuvant has shown to provide stable hemodynamic conditions, good quality of intraoperative and prolonged postoperative analgesia with minimal side effects [7],[8],[9].

Hence, this study was undertaken to compare the analgesic efficacy and safety of intrathecal fentanyl and dexmedetomidine as an adjunct to hyperbaric ropivacaine in patients undergoing elective infra-umbilical surgeries.

Aims and Objectives:

To compare the clinical effects of intrathecal 2 ml of 0.75% hyperbaric ropivacaine with adjuvants such as fentanyl 25 μg and dexmedetomidine 10 μg in patients undergoing elective infraumbilical surgeries.

Primary objectives:

- Onset of sensory blockade
- Maximum sensory blockade attained and time taken for the same
- Time taken for two-segment sensory regression
- Onset and duration of motor blockade
- Total duration of analgesia

Secondary objectives:

- Hemodynamic changes such as hypotension and bradycardia
- Side effects such as pruritus, nausea and vomiting, shivering, urinary retention, and respiratory depression.

Inclusion criteria:

- Adult patients of either sex, aged between 18 and 60 years
- Patients belonging to ASA physical status Class I and Class II
- Patients without any severe comorbid diseases.

Exclusion criteria:

- Patients having any absolute contraindications for spinal anesthesia such as patient not willing, raised intracranial pressure, severe hypovolemia, bleeding diathesis, local infection and cardiac, respiratory, and CNS diseases
- Pregnant females
- Patients with chronic diseases such as diabetes and hypertension
- Patients with body mass index >30 kg/m^2
- Patients shorter than 150 cm.

2. MATERIALS AND METHODS

After obtaining the Institutional Ethical Committee approval, the study was conducted on 90 patients of both sexes, aged between 18 and 60 years, of class I–II of the American Society of Anesthesiologists (ASA) classification posted for elective infra umbilical surgeries at Government hospital, Jammu. The study population was randomly divided by shuffled closed envelope technique into three equal groups.

- Group Ropivacaine + Normal saline (RC) (n = 30): 2 ml of 0.75%(15mg) hyperbaric ropivacaine with 0.5 ml normal saline at a total volume of 2.5 ml

- Group Ropivacaine + Dexmedetomidine (RD) (n = 30): 2 ml of 0.75% hyperbaric ropivacaine with dexmedetomidine 10 μg(50 μg dexmedetomidine diluted in 2.5ml of normal saline) at a total volume of 2.5 ml
- Group Ropivacaine + Fentanyl (RF) (n = 30): 2 ml of 0.75% hyperbaric ropivacaine with fentanyl 25 μg(50 μg/ml) at a total volume of 2.5 ml

After obtaining written informed consent, all patients were examined and investigated a day before surgery. Patients were kept nil per oral for solids 6 hrs and clear fluids 2 hrs before surgery. They were advised to take tablet aplrazolam 0.5mg and tablet ranitidine 150mg night before surgery.

On arrival into OT, ECG, Non Invasive Blood Pressure and Peripheral Oxygen Saturation(as per basic monitoring guidelines) was monitored. An intravenous access was secured using18 Gauge/20 Gauge cannula and patient were preloaded with Ringer lactate solution 15mg/kg.

Spinal anesthesia was performed while placing the patients in the sitting position. Sterilization of patients' back was done with povidone iodine solution 10%. Lumbar puncture was performed using a midline approach at the level of L2–L3 or L3–L4 using 25-G Quincke's spinal needle with the distal port facing laterally. Once free flow of cerebrospinal fluid was obtained, the study drug was injected into the subarachnoid space at a rate of ~0.2 ml/s. The patient was then turned into supine position. The time at which the drug administration was complete, was recorded, and all durations were calculated considering the time of intrathecal injection as time zero. Supplementary oxygen of 4 L was given through simple mask.

The following parameters were noted:

- Onset of sensory blockade
- Maximum level of sensory blockade attained and the time taken for the same
- Time for two-segment sensory regression
- Onset and duration of motor blockade
- Total duration of analgesia

The spread of sensory block was determined using pin prick test (using a blunt 25G hypodermic needle along the midclavicular line bilaterally) at every minute for first 10 mins, every 10 mins till the end of surgery and thereafter every 30 mins until sensory block was resolved. Onset, quality, and duration of motor blockade were assessed by Modified Bromage Scale (0-3). Motor blockade was assessed every minute for first 10 mins, every 10 mins till the end of surgery and thereafter every 30 mins until Modified Bromage score of 0 was achieved.

Postoperative pain was assessed by means of visual analogue scale[VAS] (0–10: 0 = no pain and 10 = worst imaginable pain) at 1 h intervals until requirement for supplementary analgesia arose.

Heart rate, systolic blood pressure (SBP), diastolic blood pressure, mean arterial pressure (MAP), and oxygen saturation (SpO_2) were recorded at baseline, after intrathecal injection, and then every 2 mins for 20 mins and then every 5 mins until the end of the surgical procedure.

Definitions

Onset of sensory blockade

The time from intrathecal injection of the study drug to the time to achieve loss of pin prick sensation at the level of T10.

Time taken for maximum sensory blockade
The time taken to achieve the highest level of sensory blockade from the time of injection.
Duration of two-segment sensory regression
The time interval between intrathecal injection of the study drug to regression of sensory block by two segments from the maximum block height.
Onset of motor blockade
The time from the intrathecal injection of study drug to the time to achieve complete motor block i.e. grade 3 by using Modified Bromage scale.
Modified Bromage scale:
0 = no block
1 = able to flex knees with free movement of feet
2 = unable to flex knees but able to move feet
3 =complete block
Duration of motor blockade
The time from the intrathecal injection of study drug until the patient recovers to Bromage score 0.
Duration of analgesia
The time interval between block onset and the first analgesic request. Rescue analgesia was provided with intravenous diclofenac 1.5 mg/kg when the Visual analogue Scale (VAS) score was 4 or more.
Hypotension
The reduction of SBP of more than 30% from the baseline value or SBP <90 mmHg, and it was treated with an increased rate of intravenous fluids and vasopressors in the form of Inj.mephentermine 6mg intravenously (was repeated if necessary).
Bradycardia
The reduction in heart rate of more than 30% from the baseline or HR <50 bpm, and was treated with injection atropine 0.3mg increments.
Adverse effects
Patients were monitored for adverse effects such as nausea, vomiting, pruritus, respiratory depression.

STATISTICAL ANALYSIS:

Data were entered into Microsoft Excel data sheet and were analyzed using SPSS 22 version software. Categorical data were represented in the form of frequencies and proportions. The Chi-square test was used as test of significance for qualitative data. Continuous data were represented as mean and standard deviation. Analysis of variance (ANOVA) was used as test of significance to identify the mean difference between more than two quantitative variables. If *P* value was significant, then Tukey's honestly significant difference *post hoc* multi comparison test was applied to see the significance between each pair of groups. MS Excel and MS Word were used to obtain various types of graphs. *P* (probability that the result is true) <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

3. RESULTS AND OBSERVATIONS

There was no statistical difference in patient's demographic data, ASA Grade and Duration of surgery between the groups as shown in Tables 1 and 2.

Table 1: Comparison of Patients demographic data between the groups:

Variables	Group RD (Mean±SD)	Group RF (Mean±SD)	Group RC (Mean±SD)	P value
Age(years)	44±12.3	39.3±12.2	46.9±11.05	0.06
Height(cm)	173.3±7.81	174±7.2	172.7 ± 8.3	0.3
Weight(cm)	65.5±8.81	65.6±5.9	65.7± 5.7	0.9
BMI(kg/m2)	21.73±1.91	21.6±1.75	22.0± 1.86	0.6
Duration of Surgery(min)	43.16±15.11	39±10.11	40.9± 8.6	0.3

Table 2. Comparison of patients demographic data, ASA Grade and type of surgery between the groups:

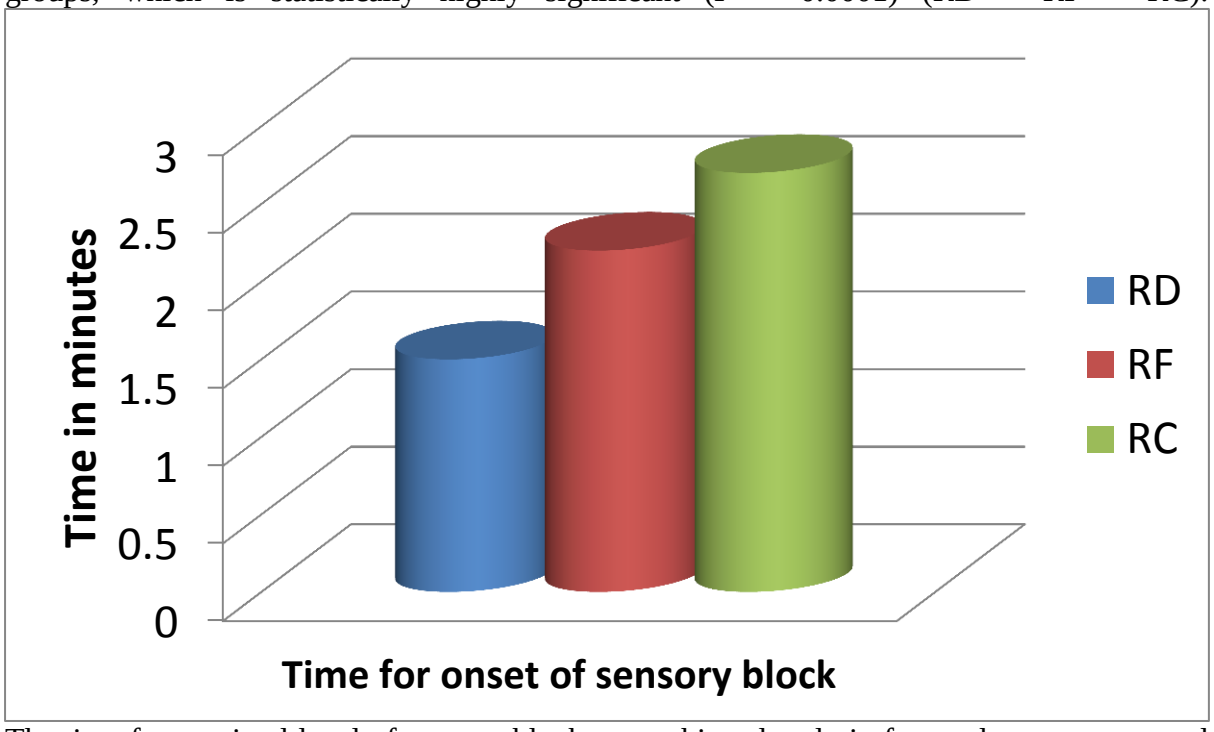
Variables	Group RD	Group RF	Group RC	P value
Gender				0.7
Male	22	24	22	
Female	8	6	8	
ASA Grade				0.3
I	20	21	22	
II	10	9	8	
Type of Surgery				0.2
Orthopedic	10	6	5	
General surgery	20	24	25	

Table 3. Characteristics of spinal block:

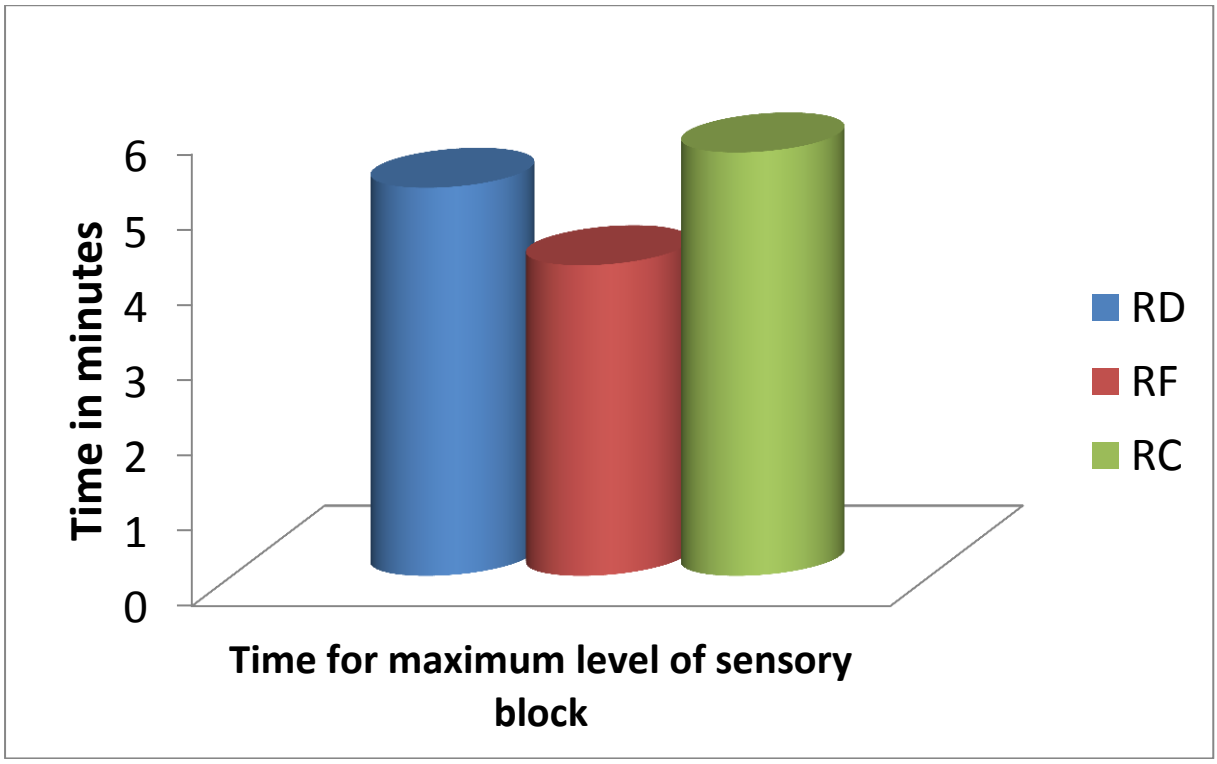
	Group RD (Mean±SD)	Group RF (Mean±SD)	Group RC (Mean±SD)	P value	Group comparison	P value
Onset of Sensory block(min)	1.5±0.8	2.2±0.4	2.7±0.4	< 0.0001	RD compared to RF RD compared to RC RF compared to RC	0.0005 0.00001 0.009
Time for maximum level of sensory block(min)	5.16±0.94	4.13±0.77	5.63±0.49	< 0.00001	RD compared to RF RD compared to RC RF compared to RC	0.000001 0.051 0.000001
Onset of Motor block(min)	3.4±0.7	3.8±0.9	3.7±0.5	0.08	RD compared to RF RD compared to RC RF compared to RC	0.093 0.189 0.934
Two segment	120±15.7	114±14.5	96±12.2	< 0.0001	RD compared to RF	0.237 0.000001

regression time(min)					RD compared to RC RF compared to RC	0.00001
Total duration of motor block(min)	308±19.1	233±18.7	184±10.3	< 0.0001	RD compared to RF RD compared to RC RF compared to RC	0.000001 0.000001 0.000001
Duration of Analgesia(min)	365±23.5	275±20.6	232±29.0	< 0.0001	RD compared to RF RD compared to RC RF compared to RC	0.000001 0.000001 0.000001

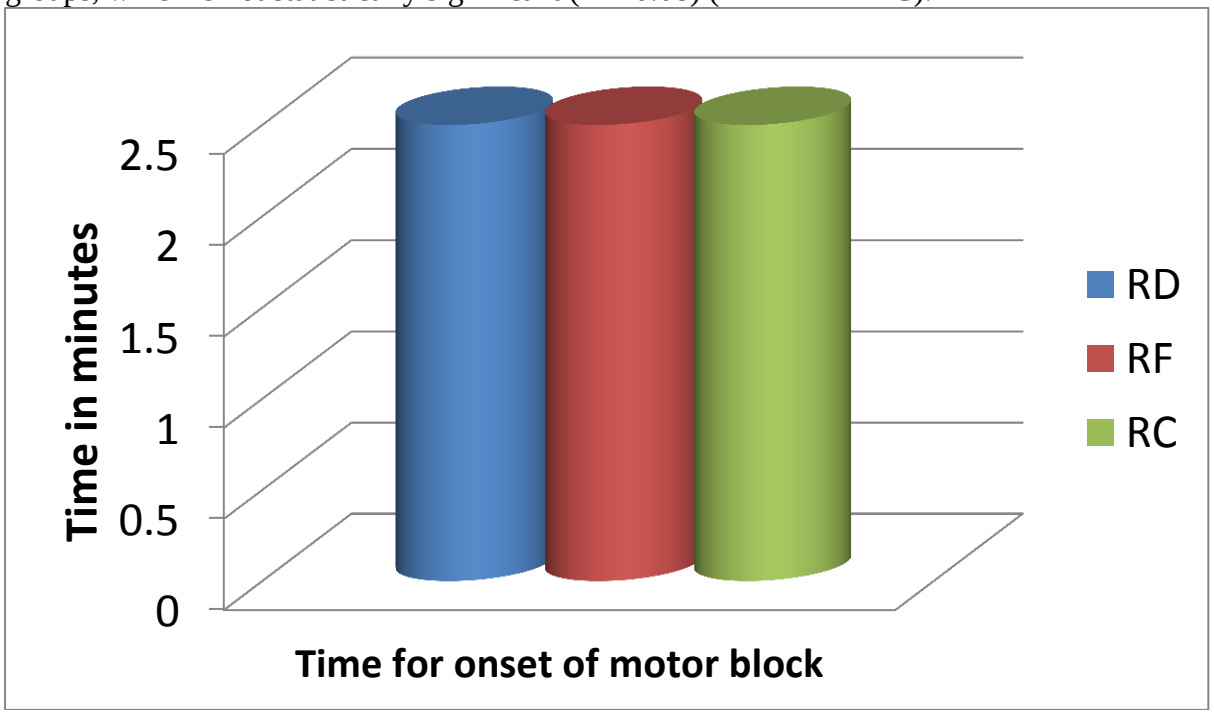
The time of onset of sensory block was faster in RD group when compared to RF and RC groups, which is statistically highly significant (P < 0.0001) (RD < RF < RC).



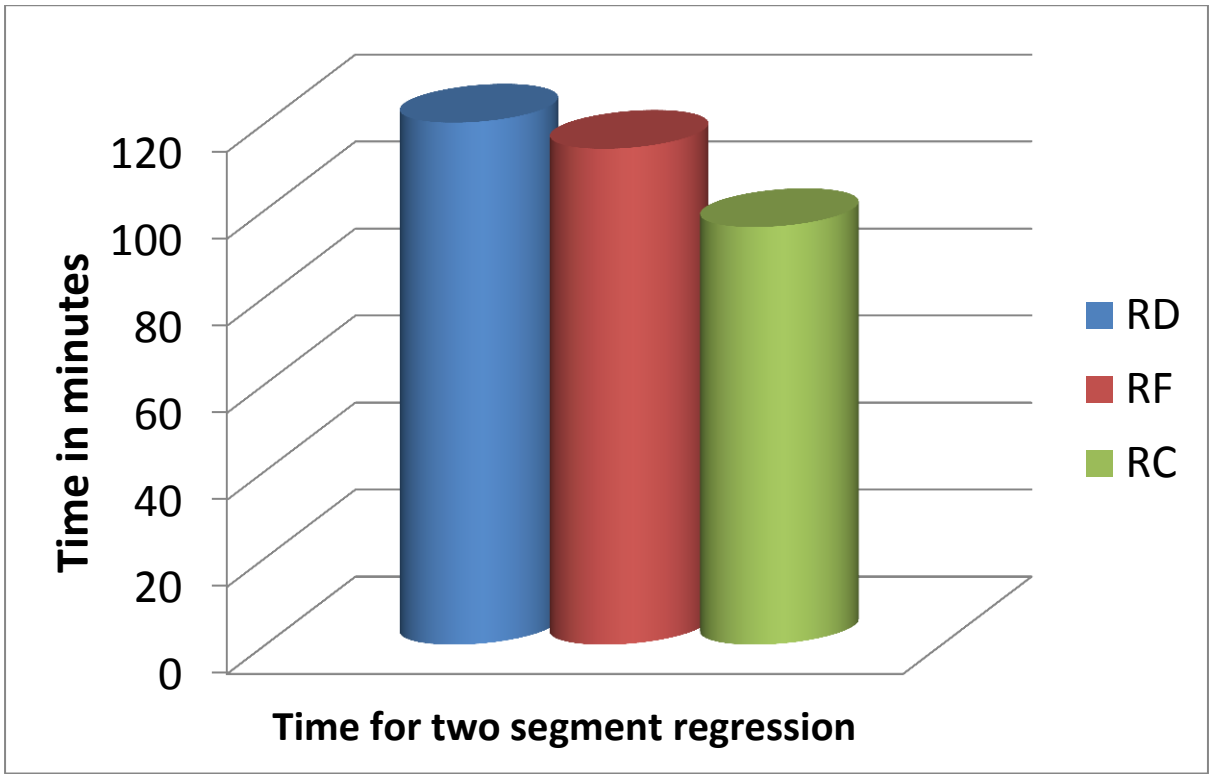
The time for maximal level of sensory block was achieved early in fentanyl group compared to RD group and control group which is statistically highly significant (P < 0.00001) (RF < RD = RC).



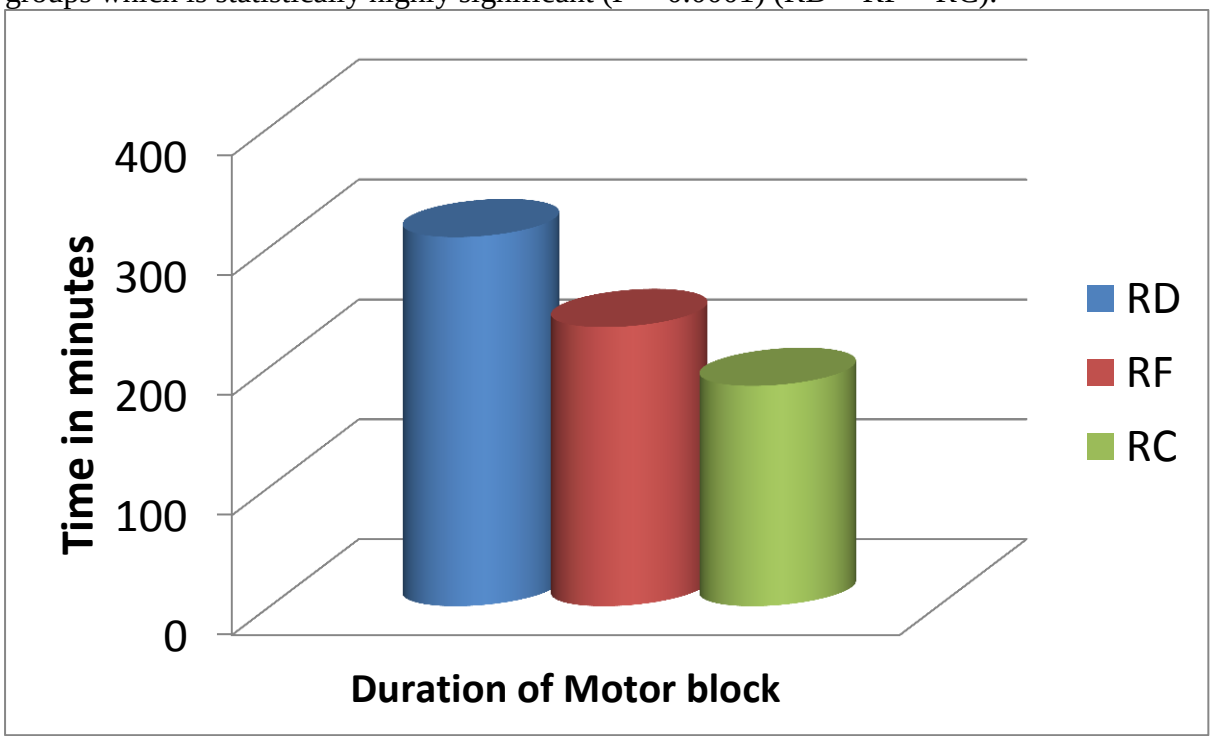
The time of onset of motor block was early in RD group when compared to RF and RC groups, which is not statistically significant (P = 0.08) (RD < RF < RC).



The time for two-segment sensory regression was early in RC group when compared to RD and RF groups which is statistically significant (P < 0.0001) (RC < RF < RD).



Total duration of motor block was maximum in RD group when compared to RF and RC groups which is statistically highly significant ($P < 0.0001$) (RD > RF > RC).



The total duration of analgesia was maximum in Group RD (365±23.5) min when compared to RF and RC groups which is statistically highly significant ($P < 0.0001$) (RD > RF > RC).

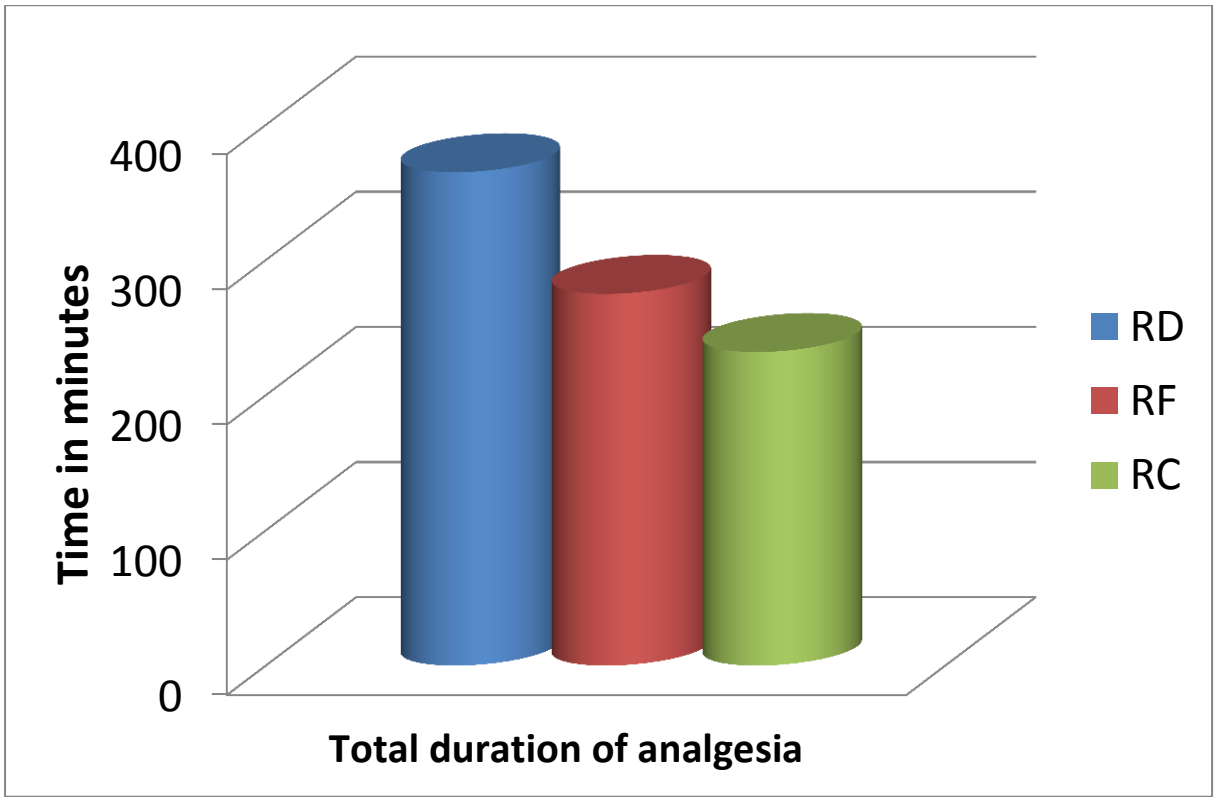


Table 4. Distribution of the subject according to maximal level of sensory block and group:

Maximum level of sensory blockade	Group RD	Group RF	Group RC
T4	8	9	0
T5	5	3	0
T6	8	8	6
T7	6	8	12
T8	3	2	12
Total	30	30	30

T4 level of peak sensory blockade was achieved by 8 patients in RD group and 9 patients in RF group. T5 level of peak sensory blockade was achieved by 5 patients in RD group and 3 patients in RF group. None of the patients in the control group achieved T4 or T5 level of peak sensory level. Peak sensory level of T6 was achieved by 8 patients of RD group, 8 patients of RF group and 6 patients of RC group. T7 level was achieved by 6 patients of RD group, 8 patients of RF group and 12 patients of RC group. T8 level was achieved by 3 patients of RD group, 2 patients of RF group and 12 patients of RC group.

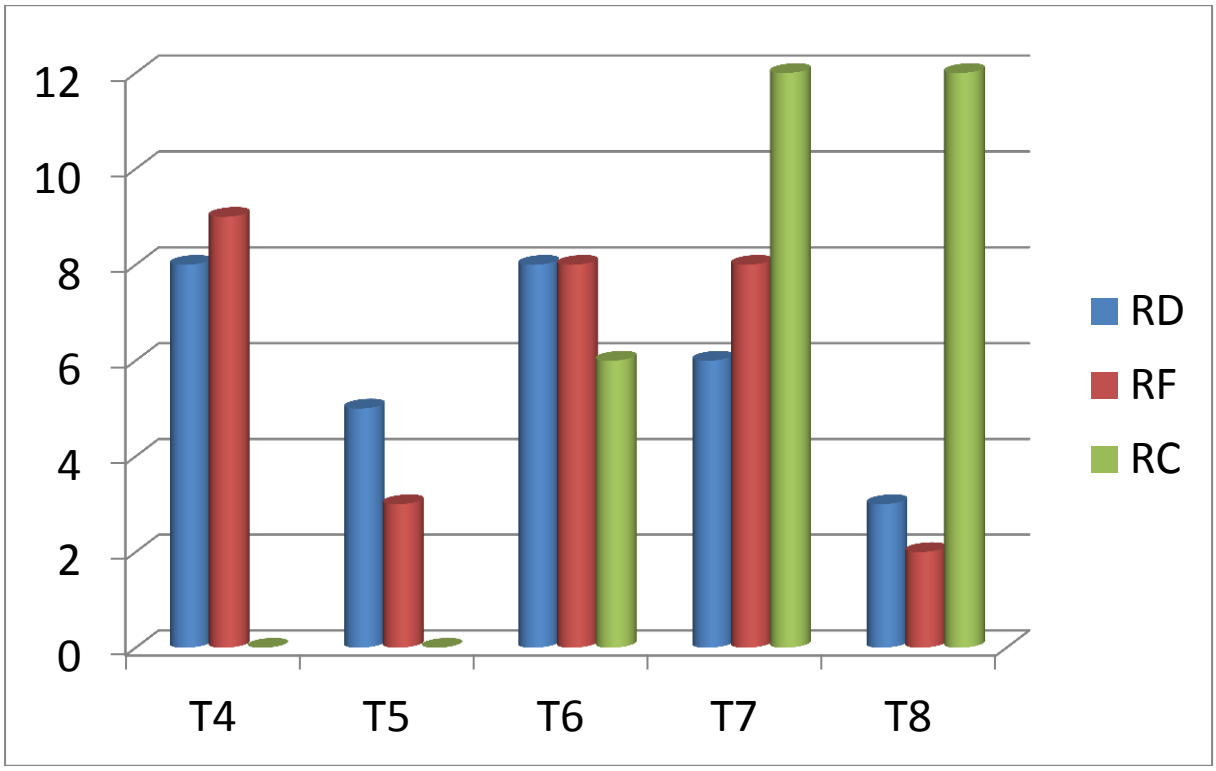


Table 5: Group comparison of mean Heart Rate (Beats/min):

Time interval (in min)	Group RD		Group RF		Group RC		p-value
	Mean	SD	Mean	SD	Mean	SD	
0	86.37	±17.14	91.13	±14.34	92.70	±13.91	0.25
2	85.33	±16.06	91.77	±16.03	89.80	±16.63	0.29
4	85.80	±15.45	89.03	±13.72	89.67	±16.83	0.58
6	87.87	±16.18	90.70	±14.35	91.00	±16.57	0.69
8	88.50	±15.52	91.20	±14.63	89.87	±17.04	0.80
10	87.53	±15.95	92.07	±15.05	89.40	±18.82	0.57
12	86.20	±14.80	91.03	±15.01	88.40	±18.13	0.51
14	85.66	±16.26	90.83	±18.30	86.20	±18.60	0.47
16	82.57	±15.53	91.00	±19.13	86.53	±18.68	0.19
18	84.23	±14.52	91.00	±18.55	86.59	±18.14	0.31
20	83.23	±14.59	89.83	±17.78	85.80	±17.84	0.31
25	82.83	±14.17	89.27	±17.27	86.40	±16.73	0.31
30	83.23	±16.58	87.50	±17.78	85.97	±17.27	0.62
35	83.40	±17.61	87.97	±19.14	86.20	±17.52	0.61
40	83.47	±17.33	85.63	±18.75	86.27	±17.25	0.82
45	82.06	±16.92	85.13	±18.21	84.47	±17.85	0.78
50	83.80	±17.80	85.40	±18.12	85.27	±17.50	0.93
55	83.30	±17.56	86.87	±18.70	83.57	±18.22	0.69
60	83.03	±17.86	87.13	±17.86	88.50	±22.86	0.54

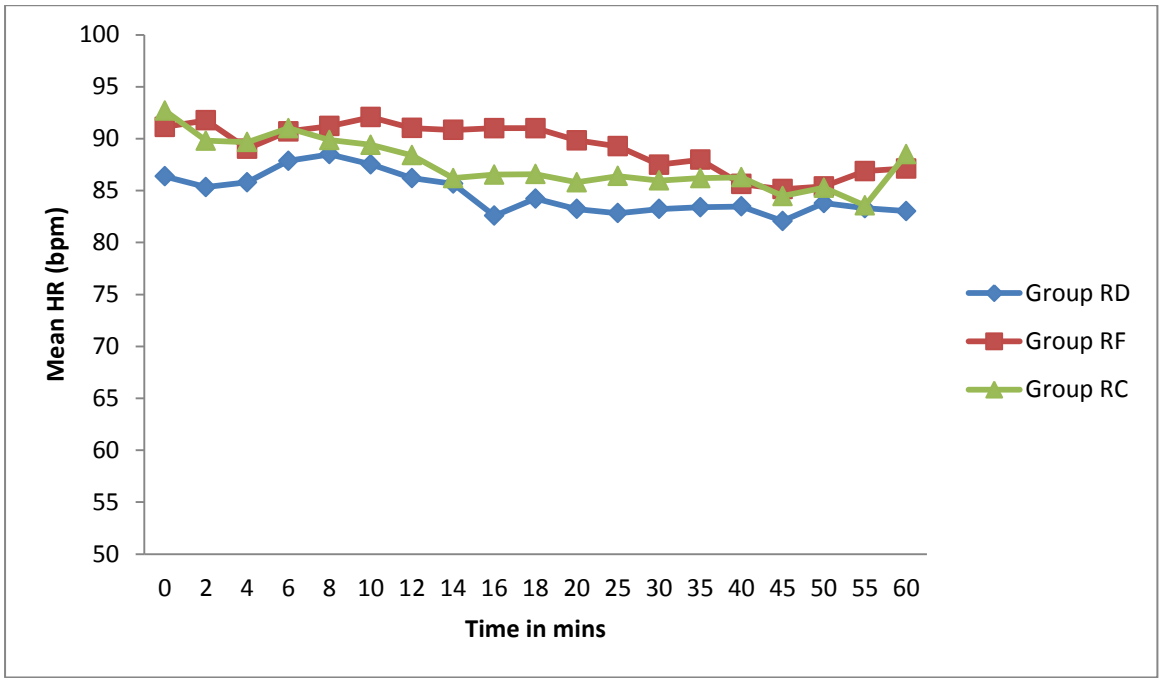


Table 6: Group comparison of Mean Arterial Pressure (mmHg):

Time interval (in min)	Group RD		Group RF		Group RC		p-value
	Mean	SD	Mean	SD	Mean	SD	
0	97.33	±10.85	95.80	±12.53	97.00	±9.75	0.85
2	96.00	±8.15	92.30	±12.18	94.20	±8.72	0.35
4	92.57	±10.29	91.17	±11.66	93.30	±9.24	0.73
6	90.97	±12.02	89.63	±13.52	91.80	±7.37	0.75
8	88.93	±11.58	89.80	±10.74	89.17	±8.23	0.94
10	87.97	±9.89	89.33	±12.25	87.87	±9.25	0.84
12	87.33	±11.60	87.87	±10.43	86.37	±9.22	0.85
14	88.53	±9.79	88.00	±8.49	87.93	±8.88	0.96
16	87.50	±9.93	88.43	±8.69	87.73	±8.22	0.92
18	87.23	±10.68	88.30	±10.16	86.40	±8.49	0.75
20	88.03	±9.62	87.93	±8.71	88.70	±7.34	0.93
25	86.53	±10.25	86.63	±7.33	86.27	±8.19	0.99
30	85.37	±7.69	84.83	±7.76	86.20	±5.59	0.75
35	84.47	±8.34	85.70	±9.49	85.47	±7.21	0.83
40	84.17	±7.52	84.57	±9.09	85.57	±7.65	0.79
45	83.67	±9.79	84.30	±9.11	85.33	±7.73	0.77
50	84.60	±8.61	84.27	±9.95	85.03	±7.92	0.95
55	85.30	±9.50	84.67	±10.42	84.93	±6.66	0.96
60	84.57	±9.07	84.43	±8.49	87.47	±7.43	0.29

In all the three groups, the SBP, DBP, MAP, HR AND SpO_2 values were recorded and analyzed and their values were found to be comparable and statistically insignificant ($p < 0.05$). [Table 5-6]

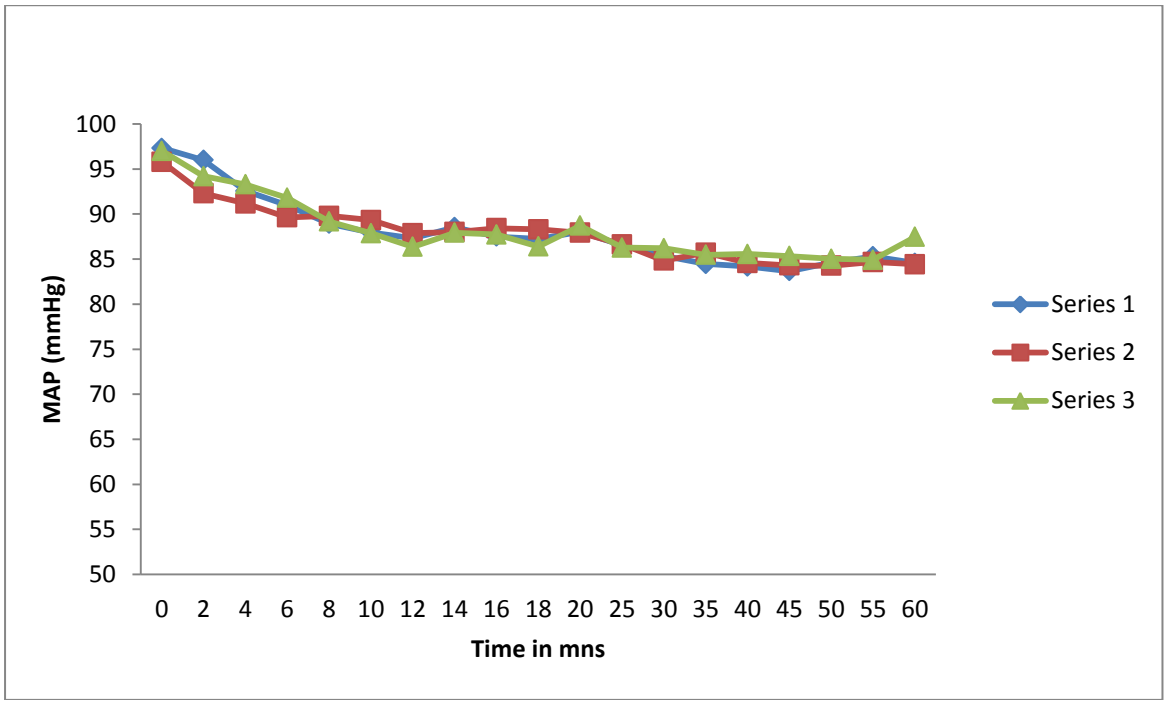
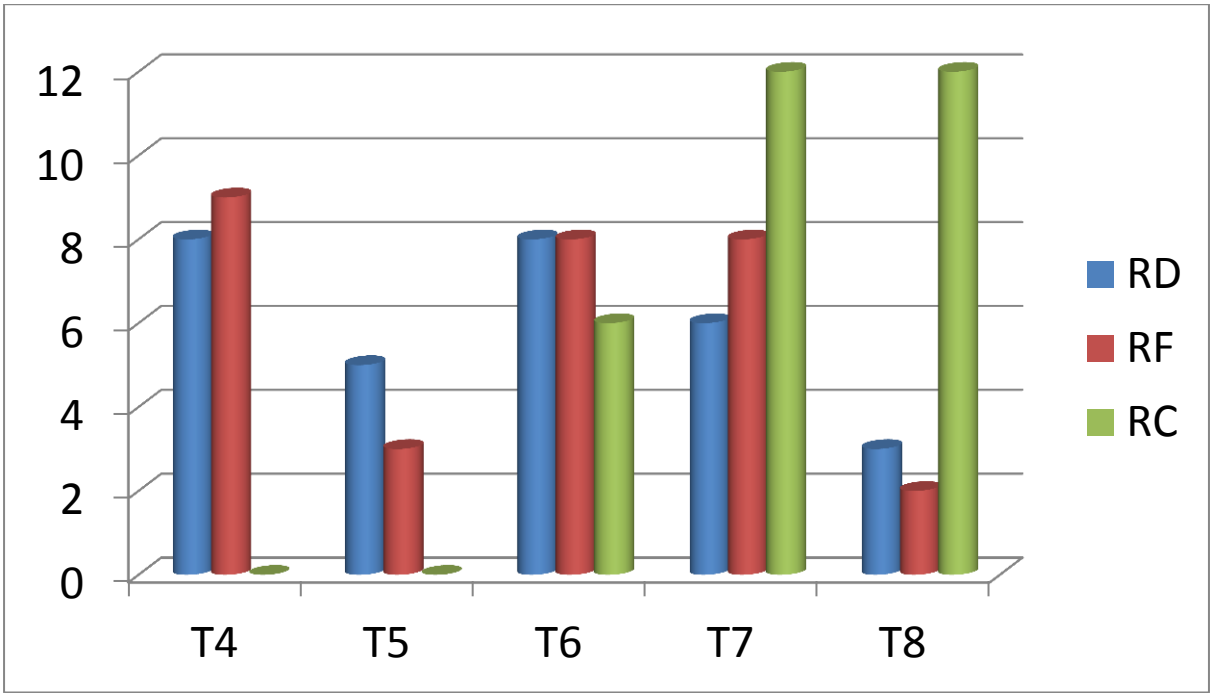


Table 7: Comparison of adverse Effects of three groups:

Adverse Effects	Group RD		Group RF		Control Group		P value
	N	%	N	%	N	%	
Hypotension	7	23.33	2	6.66	1	3.33	0.031
Bradycardia	3	10	0	0	0	0	0.045
Nausea/Vomiting	0	0	1	3.33	1	3.33	0.60
Shivering	2	6.66	1	3.33	1	3.33	0.77
Pruritis	0	0	1	3.33	0	0	0.36

Hypotension was reported in 7 (23.33%) patients in group RD, 2 (6.66%) patients in group RF and in 1 (3.33%) patient in group RC. This result is found to be statistically significant (p=0.031) with increased incidence of hypotension in RD group. Bradycardia was reported in 3 (10%) patients in group RD, whereas no incidence of bradycardia was reported in group RF and group RC. This result is found to be statistically significant (p=0.045). Nausea/Vomiting was observed in 1 (3.33%) patient in group RF and 1 (3.33%) patients in group RC. No episode of nausea/vomiting was observed in Group RD. The result is statistically insignificant (p= 0.60). Shivering was seen in 2 (6.66%) patients in group RD, 1 patient in group RF and in 1 (3.33%) patients in group RC. The result is statistically insignificant (p=0.77). 1 (3.33%) patient in RF group and none in RD and RF group complained of pruritis in our study. However, the difference is found to be statistically insignificant (p=0.36).



4. DISCUSSION:

Spinal anaesthesia, an age‑old technique, used popularly for various infraumbilical surgeries, has traditionally used hyperbaric Bupivacaine as the drug of choice. However, Ropivacaine, owing to its lower cardio and neurotoxic profile, as evident from a number of studies, has been emerging as a useful alternative.

Earlier, ropivacaine was available as isobaric solution commercially. However, Intrathecal isobaric ropivacaine reported to cause inadequate or variable block [10]. But addition of dextrose made the drug hyperbaric which has been shown in various studies to produce a consistent block and less variation in sensory and motor block [11,12,13]. Thus, complete regression occurs sooner helping patients to be mobilised sooner. Since Hyperbaric ropivacaine has been recently made commercially available, so not many studies have been conducted on hyperbaric ropivacaine.

The beneficial effects of hyperbaric ropivacaine are offset by the perception of pain in the post operative period, hence, necessitating the use of intrathecal adjuvants. Dexmedetomidine, a new highly selective α2-agonist by producing dose dependent analgesia and fentanyl, a short acting opioid potentiating afferent sensory blockade, they facilitate dose reduction of intrathecal local anaesthetics and prolongs postoperative analgesia. Hence, the present study compared dexmedetomidine 10 mcg and fentanyl 25 mcg as additives to 0.75% hyperbaric ropivacaine.

In the present study, the demographic data are statistically not significant. All three groups were comparable in respect to age, sex, weight, height and duration of surgery.
In our study, the onset of sensory block was fastest in Group RD (1.5 ± 0.8) min, followed by Group RF (2.2 ± 0.4) min, followed by Group RC (2.7 ± 0.4) min, which is statistically highly significant ($P < 0.0001$). The results of our study are in accordance with the study conducted by Pocham V and Naik L G in 2018, where they compared intrathecal

dexmedetomidine and fentanyl as adjuvants to hyperbaric bupivacaine in lower umbilical surgeries and found that group dexmedetomidine produced early onset of sensory block (2.6 ± 0.056) min compared to the group fentanyl (3.38± 0.83) min.

The time for maximal level of sensory block in Group RF (4.13 ± 0.77) min was earlier in comparison to Group RD (5.16 ± 0.94) and Group RC (5.63 ± 0.49) min which is statistically highly significant ($P < 0.00001$). However, the difference between the RD group and the RC group was statistically insignificant (p=0.051). Our study compares with the study conducted by T.K. Shashikala et al. in 2019 [14], where the time for maximal level of sensory block in RF group was (3.86 ± 1.22) min which were earlier than Group RD (5.94 ± 1.88) min and in Group RC (5.99 ± 0.46) min.

The time of onset of motor block in RD group was earlier (3.4 ± 0.7) min when compared to Group RF (3.8 ± 0.9) min and RC group (3.7 ± 0.5) min, which is statistically not significant ($P = 0.083$). Our study compares favourably with the study conducted by Pocham V and Naik L G in 2018, where group dexmedetomidine was (10.38 ± 1.08) min and the group fentanyl (10.59 ± 1.0) min, who also did not find any significant difference between the two groups.

The time for two-segment sensory regression in our study was earliest in RC group (96 ± 12.2) min when compared to Group RF (114 ± 14.5) min and Group RD (120 ± 15.7) min, which is statistically significant ($P < 0.0001$). However, the difference between the RD and RF group was statistically insignificant (p = 0.237). Our results were comparable with the study conducted by T.K. Shashikala et al. in 2019, where two-segment sensory regression was earliest in RC group (94.03 ± 6.520) min when compared to Group RF (100.00 ± 30.368) min, in Group RD (113.27 ± 38.091) min, which was statistically significant.

Total duration of motor blocked in our study was maximum in Group RD (308 ± 19.1) min when compared to Group RF (233 ± 18.7) min and Group RC (184 ± 10.3) min, which is statistically highly significant ($P < 0.0001$). Our results compares favorably with the study conducted by T.K. Shashikala et al. in 2019. In their study, total duration of motor block in Group RD was 319.57 ± 64.52 min, in Group RF was 236.83 ± 33.797 mins and in Group RC was 183.93 ± 35.252 mins.

In the present study, total duration of analgesia was maximum in Group RD (365 ± 23.5) min when compared to Group RF (275 ± 20.6) min and Group RC (232 ± 29.0) min, which is statistically highly significant ($P < 0.0001$). Our study is comparable with the study conducted by T.K. Shashikala et al. in 2019, where the total duration of analgesia in Group RD (356.67 ± 63.022) min was found to be maximum in comparison to Group RF (255.10 ± 35.626) min and Group RC (197.67 ± 37.605).

The hemodynamic parameters in our study such as HR, SBP, DBP, MAP and SpO_2 in the three groups were comparable at different time periods, and the findings revealed that there was no significant statistical difference among them ($p > 0.05$).

In our study, hypotension was noted in 7 patients (23.33%) in RD group, 2 patients (6.66%) in RF group and 1 patient (3.33%) in RC group which was statistically significant ($P = 0.031$), and was treated with an incremental dose of injection mephentermine.

Bradycardia was seen in 3 patients (10%) in the RD group which was treated with an injection of atropine 0.6 mg IV stat. However, no episode no bradycardia was seen in group RF and group RC. This difference in the episodes of bradycardia among the groups were statistically significant (p = 0.045).

Nausea/Vomiting was observed in 1 patient (3.33%) in each Group RC and RF. No episode of nausea/vomiting was observed in Group RD. 1 patient (3.33%) in the RF group and none in the RD and RC group complained of pruritis. Shivering was noticed in 2 patients (6.66%) in Group RD, 1 patient (3.33%) in Group RF, and 1 patient (3.33%) in Group RC. Statistically none of these were significant ($P > 0.05$).

5. CONCLUSION:

To conclude, the addition of dexmedetomidine to hyperbaric ropivacaine in spinal anaesthesia for infraumbilical surgery hastens the onset of sensory block, prolongs sensory and motor block recovery time, and provides excellent quality of postoperative analgesia with minimal hemodynamic and other side effects compared with hyperbaric ropivacaine alone or fentanyl combined with hyperbaric ropivacaine.

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