



# International Journal of Medical Anesthesiology

E-ISSN: 2664-3774

P-ISSN: 2664-3766

[www.anesthesiologypaper.com](http://www.anesthesiologypaper.com)

IJMA 2019; 2(2): 94-100

Received: 19-05-2019

Accepted: 23-06-2019

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## Effect of intrathecal dexmedetomidine 5µg and fentanyl 25µg as adjuvants to 12.5mg of 0.5% hyperbaric bupivacaine for spinal anaesthesia in total abdominal hysterectomy surgeries

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DOI: <https://doi.org/10.33545/26643766.2019.v2.i2b.37>

### Abstract

Hyperbaric Bupivacaine 0.5% is extensively used in India for spinal anaesthesia. However, postoperative pain control is a major problem encountered during surgeries on female genital organs under spinal anaesthesia because spinal anaesthesia using local anaesthetics alone is associated with relatively short duration of action and thus early analgesic intervention is needed in the postoperative period. Data was collected from 90 patients in the age group of 30-60 years of ASA class I & II, posted for elective TAH without any co-morbid diseases were grouped randomly by using closed sealed opaque envelope technique. The study drug was prepared by an anaesthesiologist, who was not involved with the study. The mean duration of motor blockade in Group-B was  $166.33 \pm 20.84$  min, Group-D was  $367.83 \pm 35.5$  min and Group-F was  $188 \pm 9.53$  min. Statistically there was a highly significant difference with Group-B when compared with Group-F ( $P=0.000$ ) and Group-D ( $P<0.000$ ). The maximum mean sedation score in Group-B was 2, Group-D was 3 and Group-F was 2. Statistically there was no significant difference among the groups ( $p=0.155$ ).

**Keywords:** Intrathecal dexmedetomidine, fentanyl, hyperbaric bupivacaine

### Introduction

Spinal anaesthesia with cocaine was initially produced inadvertently by J Leonard Corning in 1885, and first used deliberately by August Bier in 1898. For decades Lidocaine had been the local anaesthetic of choice for spinal anaesthesia. Its advantages are rapid onset of action and good motor block manifested as good muscle relaxation. Its use was limited by its short duration of action and has been implicated in transient neurologic symptoms and cauda equina syndrome following intrathecal injection. Bupivacaine is three to four times more potent than Lidocaine <sup>[1]</sup> and has longer duration of action. Its disadvantages are slow onset of action, decreased motor block.

Hyperbaric Bupivacaine 0.5% is extensively used in India for spinal anaesthesia. However, postoperative pain control is a major problem encountered during surgeries on female genital organs under spinal anaesthesia because spinal anaesthesia using local anaesthetics alone is associated with relatively short duration of action and thus early analgesic intervention is needed in the postoperative period <sup>[2]</sup>. Various adjuvants have been used along with local anaesthetic agents to avoid intraoperative visceral pain, somatic pain and to prolong postoperative analgesia <sup>[3]</sup>. Fentanyl is a short acting  $\mu$  receptor agonist. It exerts its effect by combining with opioid receptors in the dorsal horn of spinal cord and may have a supra-spinal spread and action. Addition of various doses of Fentanyl intrathecally as an adjuvant to spinal anaesthesia produces faster onset time, decreases visceral pain, somatic pain, improves intra-operative analgesia and excellent quality of peri-operative analgesia. Fentanyl produces shorter duration of post-operative analgesia and is also known to produce side effects like pruritus, respiratory depression, urinary retention and increased incidence of post-operative nausea and vomiting <sup>[4]</sup>.

Recently  $\alpha$ -2 adrenoreceptor agonists are being used as an adjuvant to local anaesthetic agents because of their sedative, analgesic effect, good quality of intra-operative and prolonged post-operative analgesia and haemodynamic stabilising effects with minimal side effects. Dexmedetomidine is  $\alpha$ 2 adrenoreceptor agonist has  $\alpha$ 2/ $\alpha$ 1 (1620:1) selectivity ratio which is eight times higher than that of clonidine (220:1) <sup>[5]</sup>. Various studies conducted in animals using intrathecal dexmedetomidine showed no neurological deficits in the studied

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animals. Although Dexmedetomidine has been approved by the US food and drug administration as an intravenous sedative for mechanically ventilated adult intensive care unit patients. Its intrathecal use is off label. Various clinical studies using Dexmedetomidine as an adjuvant by intrathecal route with Bupivacaine have found to be safe without producing any neurological deficit on short term followup. Dexmedetomidine used as an adjuvant to local anaesthetics for intrathecal anaesthesia has been found to prolong the duration of both motor and sensory blockade without much side effects. Dexmedetomidine, acts by binding to pre-synaptic C-fibers and post synaptic dorsal horn neurons. Dexmedetomidine recently has been introduced in India and not many studies have been done regarding its use as an intrathecal adjuvant to local anaesthetics, a study is required to know its effectiveness as a spinal adjuvant [6].

Fentanyl is commonly used as an adjuvant to local anaesthetic for spinal anaesthesia in our institution. A study is required to compare the traditionally used Fentanyl with recently introduced Dexmedetomidine as adjuvants to Bupivacaine intrathecal anaesthesia. Hence this study is to evaluate onset, duration of sensory and motor block, hemodynamic effects, post-operative analgesia, and adverse effects of Dexmedetomidine and Fentanyl given intrathecally with 0.5% hyperbaric Bupivacaine for patients undergoing elective total abdominal hysterectomy.

### Methodology

The study population was randomly selected based on the closed sealed opaque envelope technique.

Group-B: Received 12.5mg (2.5ml) of 0.5% hyperbaric Bupivacaine with 0.5ml normal saline.

Group-D: Received 12.5mg (2.5ml) of 0.5% hyperbaric Bupivacaine with 5µg of Dexmedetomidine in (0.5ml normal saline).

Group-F: Received 12.5mg (2.5ml) of 0.5% hyperbaric Bupivacaine with 25µg Fentanyl in (0.5ml normal saline).

### Inclusion criteria

Patients aged between 30 – 60 years belonging to ASA class I & II without any co-morbid disease admitted for elective TAH were included in the study.

### Exclusion criteria

1. Patients with co-morbid conditions like diabetes

mellitus, asthma, hypertension, cardiac disease, haematological disease etc.

2. Allergy to local anaesthetics.
3. Patients belonging to ASA class III, IV and V.
4. Patients posted for emergency surgeries.
5. Patients with body mass index more than 28kg/m<sup>2</sup>.
6. Patients having absolute contraindication for spinal anaesthesia like raised intracranial pressure, severe hypovolaemia, bleeding diathesis and local infection.
7. Patient's refusal.

Data was collected from 90 patients in the age group of 30-60 years of ASA class I & II, posted for elective TAH without any co-morbid diseases were grouped randomly by using closed sealed opaque envelope technique. The study drug was prepared by an anaesthesiologist, who was not involved with the study. All spinal blocks were given by the same anaesthesiologist who also was the observer. Hence the patient and the observer were blinded for the study drug.

- Preoperative assessment was done for each patient on the night before the surgery and written informed consent was taken.
- Patients were kept Nil per Oral for solids 6hrs and clear fluids 2hrs before surgery.
- Patients were pre-medicated on the night before surgery with the tablet Ranitidine 150mg and tablet alprazolam 0.5mg.
- Patients were not pre-medicated on the day of surgery.
- Intravenous line was obtained with 18G cannula and preloaded with ringer lactate 500ml (10ml/kg body weight) half an hour before anaesthesia.
- Patients were connected to multi-channel monitor (Star plus Larsen Toubro Ltd. India) for monitoring pulse rate (PR), arterial oxygen saturation (SPO<sub>2</sub>), electrocardiograph (ECG), non-invasive blood pressure (NIBP) and mean arterial pressure (MAP).
- Patients were positioned in flexed lateral position.
- Under aseptic precautions, subarachnoid blocks were performed at L<sub>2</sub>-L<sub>3</sub>/L<sub>3</sub>-L<sub>4</sub> inter-space through a midline approach using 25G Quincke's spinal needle after confirming the clear and free flow of CSF and the study drug was injected into the subarachnoid space. Patients were turned to supine posture immediately with the table kept flat and supplemental oxygen was given.

### Results

**Table 1:** Mean time taken for sensory onset in minutes

Time taken for sensory onset in minutes	Group-B	Group-D	Group-F	P value B vs F	P value B vs D	P value F vs D
Mean±SD	2.80±0.407	1.73±0.450	1.07±0.254	0.000	0.000	0.000
Minimum	2	1	1			
Maximum	3	2	2			

The mean time of onset of sensory blockade at T 10 in Group-B was 2.80±0.407mins, Group-D was 1.73±0.450mins and Group-F was 1.07±0.254mins. Statistically there was a highly significant difference with

Group-B when compared with Group-F ( $P<0.000$ ) and Group-D ( $P<0.000$ ). Statistically there was highly significant difference when Group-D was compared with Group-F ( $P<0.000$ ).

**Table 2:** Maximum level of sensory block attained

Maximum level of sensory block attained	Groups						P value B vs F	P value B vs D	P value F vs D
	Group-B		Group-D		Group-F				
	No	%	No	%	No	%			
T4	10	33.3%	27	90%	25	83.3%	0.000	0.000	0.052
T6	20	66.7%	3	10%	5	16.7%			
Total	30	100%	30	100%	30	100%			

10 out of 30 patients in Group-B, 27 out of 30 patients in Group-D and 25 out of 30 in Group-F had T4 level of sensory blockade. 20 out of 30 in Group-B, 3 out of 30 in Group-D and 5 out of 30 in Group-F had T6 level of blockade. Statistically there was a highly significant

difference with Group-B when compared with Group-F ( $P<0.000$ ) and Group-D ( $P<0.000$ ). Statistically there was no significant difference when Group D was compared with Group F ( $P=0.052$ ).

**Table 3:** Mean time taken for maximum sensory blockade in minutes

Mean time taken for maximum sensory blockade in minutes	Group-B	Group-D	Group-F	P value B vs F	P value B vs D	P value F vs D
Mean±SD	10.4±0.81	9.86±0.89	10.13±0.73	0.213	0.129	0.387
Minimum	10	8	8			
Maximum	12	12	12			

The mean time taken for maximum sensory blockade in Group-B was 10.4±0.81 min, Group-D was 9.86±0.89mins and Group-F was 10.13±0.73mins. Statistically there was no significant difference when Group-B was compared with

Group-D (0.129). Statistically there was no significant difference when Group-B was compared with Group-F (0.213). Statistically there was no difference when Group-D was compared with Group-F ( $P=0.387$ ).

**Table 4:** Mean time taken for regression of sensory block by two segments

Regression of sensory block by two segments in minutes	Group-B	Group-D	Group-F	P value B vs F	P value B vs D	P value F vs D
Mean±SD	79±9.77	137.93±11.5	102.66±8.66	0.000	0.000	0.000
Minimum	60	120	90			
Maximum	95	158	122			

The mean time taken for regression of sensory block by two segments in Group-B was 79±9.77min, Group-D was 137.93±11.5min and Group-F was 102.66±8.66min. Statistically there was a highly significant difference with

Group-B when compared with Group-F ( $P<0.000$ ) and Group-D ( $P<0.00$ ). Statistically there was highly significant difference when Group-F was compared with Group-D ( $P<0.000$ ).

**Table 5:** Mean duration of analgesia in minutes

Duration of analgesia in minutes	Group-B	Group-D	Group-F	P value B vs F	P value B vs D	P value F vs D
Mean±SD	133.13±15.84	303.33±35.38	201.16±8.49	0.000	0.000	0.000
Minimum	110	240	185			
Maximum	160	360	215			

The mean duration of analgesia in Group-B was 133.13±15.84min, Group-D was 303.33±35.38min and in Group-F was 201.16±8.49min. Statistically there was a highly significant difference with Group-B when compared

with Group-F ( $P<0.000$ ) and Group-D ( $P<0.000$ ). Statistically there was a highly significant difference between Group-F and Group-D ( $P<0.000$ ).

**Table 6:** Mean duration of sensory regression to S1 in minutes

Mean duration of sensory regression to S1	Group-B	Group-D	Group-F	P value B vs F	P value B vs D	P value F vs D
Mean±SD	200.66±39.8	396.80±30.87	226.50±13.62	0.001	0.000	0.000
Minimum	200	335	202			
Maximum	255	445	250			

The mean duration of sensory regression to S1 in Group-B was 200.66±39.8min, in Group-D was 396.80±30.87min and Group-F was 226.50±13.62min. Statistically there was a highly significant difference with Group-B when compared

with Group-F ( $P<0.001$ ) and Group-D ( $P<0.000$ ). Statistically there was a highly significant difference between Group-F and Group-D ( $P<0.000$ ).

**Table 7:** Time taken for onset of motor blockade in minutes

Mean time taken for onset of motor blockade	Group-B	Group-D	Group-F	P value B vs F	P value B vs D	P value F vs D
Mean±SD	1±0.00	1.10±0.30	1.03±18	0.781	0.321	0.309
Minimum	1	1	1			
Maximum	1	2	2			

The mean time taken for onset of motor blockade in Group-B was 1±0.00min, Group-D was 1.10±0.30min and Group-F was 1.03±18min. Statistically there was no significant difference with Group-B when compared with Group-F

(P=0.781) and Group-D (P=0.321). Statistically there was no difference when Group-F was compared with Group-D (P=0.309).

**Table 8:** Mean time taken for maximum motor blockade in minutes (Bromage-3)

Mean time taken for maximum motor blockade	Group-B	Group-D	Group-F	P value B vs F	P value B vs D	P value F vs D
Mean±SD	10.13±7	10.4±0.81	10.13±0.73	1.00	0.187	0.187
Minimum	8	10	8			
Maximum	12	12	12			

The mean time taken for maximum motor blockade in Group-B was 10.13±7min, Group-D was 10.4±0.81min and Group-F was 10.13±0.73 min. Statistically there was no significant difference with Group-B when compared with

Group-F (P=1) and Group-D (P=0.187). Statistically there was no difference when Group-F was compared with Group-D (P=0.187).

**Table 9:** Mean duration of motor blockade in minutes

Mean duration of motor blockade in minutes	Group-B	Group-D	Group-F	P value B vs F	P value B vs D	P value F vs D
Mean±SD	166.33±20.84	367.83±35.5	188±9.53	0.000	0.000	0.000
Minimum	135	300	170			
Maximum	210	420	205			

The mean duration of motor blockade in Group-B was 166.33±20.84min, Group-D was 367.83±35.5min and Group-F was 188±9.53min. Statistically there was a highly significant difference with Group-B when compared with

Group-F (P=0.000) and Group-D (P<0.000). Statistically there was highly significant difference when Group-F was compared with Group-D (P<0.000).

**Table 10:** Sedation score (Ramsay sedation scale)

Mean sedation	Group-B	Group-D	Group-F	P value B vs F	P value B vs D	P value F vs D
Mean±SD	1.93±00	2.07±25	2.00±00	0.155	0.155	0.155
Minimum	1	2	2			
Maximum	2	3	2			

The maximum mean sedation score in Group-B was 2, Group-D was 3 and Group-F was 2. Statistically there was no significant difference among the groups (p=0.155).

## Discussion

### Onset of sensory blockade

In our study, the mean time taken for onset of sensory block was 2.80±0.407min in Group-B, 1.73±0.450min in Group-D and 1.07±0.254min in Group-F. Statistically there was a highly significant shorter onset time of sensory blockade in Group-F and Group-D as compared to Group-B. Statistically there was highly significant shorter onset time of sensory blockade in Group-F when compared to Group-D (P<0.000).

Our study compares with the study conducted by Mohamed A A *et al.* [7] who also have found statistically significant difference in the mean onset of sensory block between Dexmedetomidine group (3.07±0.33min) and Bupivacaine

group (5.50±0.28min) P<0.001. Our study compares with the studies conducted by Al-Mustafa MM *et al.* [8], Abdelhamid S A *et al.* [9], Halder S *et al.* [10] who also have found statistically significant difference in the mean onset of sensory block between Dexmedetomidine group and bupivacaine group.

Our result does not compare with the studies conducted by Al-Ghanem S M *et al.* Gupta R *et al.* and Khan A L *et al.* where in, the authors of these studies have not found any significant difference in the onset of sensory block in both Dexmedetomidine group and Fentanyl group.

In the study conducted by Al-Ghanem S M *et al.* all the patients were given SAB in sitting posture and authors have not mentioned how much time was taken to bring the patients to supine position after completion of SAB. The dose of Bupivacaine used in their study was 10mg unlike our study of 12.5mg. They have used isobaric Bupivacaine instead of hyperbaric Bupivacaine unlike our study. Hence,



probably the onset time of sensory blockade was prolonged in all the three groups in their study when compared to our study.

In the study done by Mahendru V *et al.* [11], the sensory onset time has been defined as the time for onset of sensory block to T8 unlike our study wherein we have taken onset time to T10 level. Hence the onset duration is more prolonged in their study when compared to our study.

Though Ahmad Dar F *et al.* and Al-Ghanem S M *et al.* had taken T10 dermatome for onset of sensory block, there was an increase in sensory onset time compared to our study. In their studies all the patients were given SAB in sitting posture and authors have not mentioned how much time was taken to bring the patients to supine position after completion of SAB.

### Time taken for maximum sensory blockade

The mean time taken for maximum sensory blockade in our study was in  $10.4 \pm 0.81$  min Group-B,  $9.86 \pm 0.89$  min in Group-D and  $10.13 \pm 0.73$  min in Group-F. Statistically there was no significant difference among the groups. In the study conducted by Mahendru V *et al.* [11], statistically there was no significant difference with Fentanyl group ( $9.6 \pm 2.9$  min) and Dexmedetomidine group ( $10.3 \pm 3.3$  min) when compared to Bupivacaine group ( $10.1 \pm 3.5$  min) in the mean time taken for maximum sensory blockade which concurs with our study.

Our study compares with the studies conducted by Al Ghanem S M *et al.*, Gupta R *et al.* and Mahendru V *et al.* who also found no statistical significant difference in the mean time taken for maximum sensory blockade between Dexmedetomidine group and Fentanyl group.

In the study conducted by Singh H *et al.* [12] time taken for maximum sensory blockade is less when compared to our study in the Fentanyl group and Bupivacaine group. In their study the concentration of drug used was 0.75% Bupivacaine instead of 0.5% Bupivacaine unlike our study. Hence probably the difference.

In the study conducted by Gupta R *et al.* [13], time taken for maximum sensory block was higher than in our study between Dexmedetomidine group and Fentanyl group. This was probably because of spinal anaesthesia given in sitting position and time taken to bring the patients to supine position was not mentioned. The time of checking for maximum sensory block was not mentioned after bringing the patients to supine position. Hence probably the difference.

### Maximum level of sensory blockade achieved

In our study 27 patients in Group-D and 25 patients in Group-F have attained a T4 level of block compared to only 10 patients in Group-B. Statistically this was highly significant with Group-B when compared to Group-F and Group-D. But statistically there was no significant difference when Group-D was compared with Group-F.

Our result does not compare with the study conducted by Mahendru V *et al.* [11], where in the authors have not found statistically significant difference among three groups regarding maximum level of sensory block achieved. However, the level of block achieved was T8 in more number of patients in all the three groups. Similar findings were observed by Tarbeeh GA *et al.* who also found no statistically significant difference among the three groups and maximum level of block achieved was T8 in both the

studies. The spinal anaesthesia was given in sitting position compared to lateral position used in our study. Hence may be the difference.

Our study compares with the studies conducted by Al-Ghanem S M *et al.* and Gupta R *et al.* [13], where in they have also not found statistically significant difference between Dexmedetomidine and Fentanyl group.

### Mean time taken for sensory regression by two segments

The mean time taken for regression of sensory block by two segments in Group-B was  $79 \pm 9.77$  min, in Group-D was  $137.93 \pm 11.5$  min and in Group-F was  $102.66 \pm 8.66$  min. Statistically there was significant increase in mean time taken for sensory regression by two segments in Group-D and Group-F as compared to Group-B. Statistically there was a significant increase in time taken for sensory regression by two segments in Group-D as compared to Group-F.

Our study compares with the study conducted by Tarbeeh G A *et al.* [14] who also found statistically significant difference in the mean time taken for two segments sensory regression between Fentanyl group ( $114 \pm 35$  min) and Dexmedetomidine ( $150 \pm 42$  min) group when compared with Bupivacaine group ( $100 \pm 25$  min).

Our study compares with the studies conducted by Tarbeeh G A *et al.* [14], Gupta R *et al.* [13] and Khan A L *et al.* who also found statistically significant difference in the mean time taken for two segments sensory regression between Fentanyl group and Dexmedetomidine group.

In the study conducted by Gupta R *et al.* [13], the mean time taken for sensory regression by two segments in Dexmedetomidine group was  $120 \pm 22.2$  minutes which concurs with our study ( $137 \pm 11$  minutes). The duration for two segments sensory regression with Fentanyl was less ( $76 \pm 20.2$  min) compared to our study ( $102.8 \pm 8$  min). The reason probably is the maximum level of sensory blockade in their study with Fentanyl group was T6 when compared to our study (T4).

In the study conducted by Kanazi *et al.* the mean time taken for sensory regression by two segments in Bupivacaine group was  $80 \pm 28$  minutes and in Dexmedetomidine group was  $122 \pm 37$  min which compares with our study.

In a study conducted by Singh H *et al.* [12], there was significant increase in sensory regression by two segments in Fentanyl group ( $93 \pm 22$  minutes) as compared to Bupivacaine group ( $74 \pm 18$  minutes) which correlates with our study.

### The mean time taken for sensory block to regress to S1

The time taken for sensory block to regress to S1 in our study was  $200.66 \pm 39.8$  min in Group-B,  $396.80 \pm 30.87$  min in Group-D and  $226.50 \pm 13.62$  min in Group-F. Statistically there was highly significant increase in the mean time taken for regression of sensory block to S1 in Group-D and Group-F as compared to Group-B. There was also significant increase in mean time taken for regression of sensory block to S1 in Group-D as compared to Group-F.

Our study compares with the study conducted by Tarbeeh G A *et al.* [14] who have also found statistically significant difference in Fentanyl group ( $198 \pm 52$  min) and Dexmedetomidine group ( $300 \pm 82$  min) when compared to Bupivacaine group ( $165 \pm 34$  min).

In our study there was a prolonged sensory blockade with Dexmedetomidine group ( $396.80 \pm 30.87$  min) when

compared to Bupivacaine group ( $200.66 \pm 39.8$ min). Our study compares with the studies conducted by Tarbeeh GA *et al.* (Bupivacaine group- $165 \pm 34$ min and Dexmedetomidine group  $300 \pm 82$ min), Kanazi *et al.* (Bupivacaine group  $90 \pm 48$ min and Dexmedetomidine  $303 \pm 82$ min) and Ahmad Dar F *et al.* (Bupivacaine  $226 \pm 26$ min and Dexmedetomidine group  $356 \pm 35$ min) who also statistically have found a highly significant difference between Dexmedetomidine group when compared with Bupivacaine group.

In our study there was a statistically significant difference in the duration of sensory blockade with Fentanyl group when compared with Bupivacaine group. Our study compares with study conducted by Tarbeeh G A *et al.* [14] (Bupivacaine group- $165 \pm 34$ min and Fentanyl group  $198 \pm 52$ min).

In the study conducted by Al-Ghanem S M *et al.* the mean time taken for sensory regression to S1 in Dexmedetomidine group ( $274 \pm 73$ min) and in Fentanyl Group ( $179 \pm 47$ min) was slightly lower than our study in the Dexmedetomidine group ( $396.80 \pm 30.87$ min) and Fentanyl group ( $226.50 \pm 13.62$ min). This was probably due to the dose of Bupivacaine used in their study (10mg) unlike our study (12.5mg). In their study they have used isobaric Bupivacaine instead of hyperbaric Bupivacaine unlike our study and as such the maximum level of block attained was T6 in both Dexmedetomidine and Fentanyl groups compared to T4 in our study. Hence, the difference.

### Mean duration of analgesia

In our study the mean duration of analgesia in Group-B was  $133.13 \pm 15.84$ min, Group-D was  $303.33 \pm 35.38$ min and Group-F was  $201.16 \pm 8.49$ min. Statistically there was a highly significant increase in mean duration of analgesia in Group-D and Group-F as compared to group-B. Our study compares with the study conducted by Tarbeeh G A *et al.* [14] who have also found the statistically significant difference between the Dexmedetomidine and Fentanyl groups when compared with Bupivacaine group.

In our study the mean duration of analgesia in Group-D was higher and statistically significant compared with Fentanyl group. Our study correlates with the study conducted by Gupta R *et al.* (Dexmedetomidine group  $251 \pm 30$ min and Fentanyl group  $168 \pm 15$ min), Khan A L *et al.* (Dexmedetomidine group  $280 \pm 7.8$ min and Fentanyl group  $173.8 \pm 8$ min) and Tarbeeh GA *et al.* (Dexmedetomidine group  $450 \pm 84$ min and Fentanyl group  $280 \pm 61$ min).

Our study has found a prolonged duration of analgesia with Dexmedetomidine group when compared with Bupivacaine group. The same results have been obtained by Tarbeeh GA *et al.* [14] (Dexmedetomidine group  $450 \pm 84$ min and Bupivacaine group  $250 \pm 57$ min).

We could not compare our results with other studies because many of the authors have not taken duration of analgesia as a parameter and some authors have not defined duration of analgesia.

### Mean time taken for onset of motor blockade

In our study mean time taken for onset of motor blockade in Group-B was  $1 \pm 0.00$ min, Group-D was  $1.10 \pm 0.30$ min and Group-F was  $1.03 \pm 0.18$ min. There was statistically no significant difference among the groups regarding mean time taken for onset of motor blockade.

Our study does not compare with the studies conducted by

various authors. This was probably due to the mean time taken for onset of motor block in their studies was Bromage 3 unlike our study which was Bromage 1. Hence the onset time of motor blockade was prolonged in their studies compared to our study.

### Mean time taken for maximum motor blockade

In our study mean time taken for maximum motor blockade in Group-B was  $10.13 \pm 7$ min, Group-D was  $10.4 \pm 0.81$ min and Group-F was  $10.13 \pm 0.73$ min. Statistically there was no significant difference among the groups regarding mean time taken for maximum motor blockade. In the study conducted by Mahendru V *et al.* mean time taken for onset of motor blockade in Bupivacaine group was  $9.2 \pm 2.9$  min, Fentanyl group was  $9 \pm 3$ min and Dexmedetomidine group was  $9.7 \pm 3.2$ min. Statistically there was no significant difference in mean time taken for onset of motor block and hence compares with our study.

In study conducted by Gupta R *et al.* the mean time taken for maximum motor blockade was  $11.6 \pm 1.8$ min in Group-D,  $11.2 \pm 1.3$ min in Group-F who also did not find statistically significant difference which correlates with our study. Our study compares with studies conducted by Ahmad dar *et al.* (Bupivacaine group was  $14.3 \pm 7$ min and in Dexmedetomidine group was  $13.9 \pm 6.9$ min) and Al-Ghanem S M *et al.* (Dexmedetomidine group- $14.4 \pm 6.7$ min and Fentanyl group- $14.3 \pm 5.7$ min) who also have not found the statistically significant difference in the mean time taken for maximum motor blockade.

In study conducted by Makwana J *et al.* the time taken for maximum motor blockade in Bupivacaine group was  $4.7 \pm 0.8$ min and in Fentanyl group was  $5.74 \pm 0.46$ min which does not correlate with our study. This could be because of higher dosage of Bupivacaine 15mg used unlike our study 12.5mg.

### Mean duration of motor blockade

In our study mean duration of motor blockade in Group-B was  $166.33 \pm 20.84$ min, Group-D was  $367.83 \pm 35.5$ min and Group-F was  $188 \pm 9.53$ min. Statistically there was significant increase in mean duration of motor blockade in Group-D and Group-F as compared to Group-B. Statistically there was significant increase in mean duration of motor blockade in Group-D as compared to Group-F. Our study compares with the study conducted by Tarbeeh G A *et al.* [14] who also found statistically significant difference in mean time taken for duration of motor blockade between Dexmedetomidine group and Fentanyl group compared with Bupivacaine group.

In our study the mean duration of motor blockade was prolonged in Fentanyl group compared with Bupivacaine group. Our study compares with the study conducted by Mahendru V *et al.* [11] who also found statistically significant difference (Bupivacaine group- $161 \pm 19$ min and Fentanyl group- $196 \pm 26$ min).

### Mean sedation score

In our study mean sedation score was assessed using Ramsay sedation scale. There was no statistical significant difference among the groups ( $p=0.155$ ).

Our study compares with the studies conducted by Mahendru V *et al.* [11] who also found no statistical significant difference among three groups.

Our study compares with the study conducted by Kanazi *et*

*al.* <sup>[15]</sup> who also found no statistical significant difference between Dexmedetomidine group and Bupivacaine group.

### Conclusion

Both Fentanyl and Dexmedetomidine will shorten the onset of sensory block and motor block, prolong the time for regression by two segments, prolong the duration of sensory block and motor block and duration of analgesia compared to bupivacaine alone.

However, Dexmedetomidine as an adjuvant produces more prolonged duration of sensory block and motor block and duration of analgesia compared to Fentanyl as an adjuvant.

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