

Comparative study of dexmedetomidine and fentanyl as adjuvant to bupivacaine in spinal anaesthesia

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Abstract

Background: In this emerging anaesthesia, so many drugs like benzodiazepines, opioids, alpha agonist and many were used as an adjuvant to Bupivacaine in spinal anaesthesia. In this study dexmedetomidine which is an highly selective alpha 2 agonist and fentanyl are used as an adjuvant in intrathecal anaesthesia. The aim of this study is to evaluate intraoperative hemodynamic stability, sedative effect, post operative duration of analgesia and side effects caused by fentanyl and dexmedetomidine. **Materials and Methods:** In this study sixty patients who were randomly allocated in two groups as follows **Group D:** (n=30) thirty patients in this group receive 5mcg dexmedetomidine (0.5ml with non preservative normal saline) with 15 mg (3cc) hyperbaric bupivacaine. **Group F:** (n=30) thirty patients in this group receive 25 mcg fentanyl with 15 mg (3cc) hyperbaric bupivacaine. **Result:** The thirty patients in Group D who received dexmedetomidine have prolonged sensory and motor block compared to patients received fentanyl, there is slower regression of sensory and motor in group D patients. **Conclusion:** Thus in this study it is concluded that the patients received dexmedetomidine intrathecally have prolonged motor and sensory blockade and slower regression of spinal level and good intraoperative hemodynamic stability and prolonged post operative analgesia compared to fentanyl.

Key Words: Dexmedetomidine, Fentanyl, Hyperbaric bupivacaine, spinal anaesthesia

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INTRODUCTION

Spinal anaesthesia is the preferred technique for most of the lower abdomen and lower limb surgeries. It allows the patient to remain awake, minimize or completely avoid the problem associated with airway management. The technique is simple to perform as it reduces surgical stress

and attenuates the increase in plasma catecholamine's and other hormones. Regional anaesthesia gives intra and post operative pain relief with full preservation of mental status and normal reflexes. with spinal anaesthesia, the onset of anaesthesia is more rapid and also provides post operative analgesia. post operative pain relief is a growing concern for an anaesthesiologist, as an uneventful post operative period makes surgery a comfortable proposition for surgical patients. : In this emerging anaesthesia, so many drugs like benzodiazepines, opioids, alpha agonist and many were used as an adjuvant to Bupivacaine in spinal anaesthesia. The major issue in a lower abdominal surgery is when patient complains about pain either during handling the visceral organ or when there is no adequate analgesia given to the patients, Thus addition of fentanyl to hyperbaric bupivacaine improves the intraoperative analgesic effect of the patient and addition of dexmedetomidine to hyperbaric bupivacaine can improve

the intraoperative sedative effect of the patient while maintaining the hemodynamic stability of the patient and also addition of dexmedetomidine has prolonged post operative analgesia compared to other adjuvants. Dexmedetomidine is a good sedative drug used in intensive care unit in intubated patients and gives sedation and analgesic effect without disturbing the circadian rhythm of the patient

MATERIALS AND METHODS

This study was conducted on sixty patients after getting ethical committee recognition, who were pre-operatively assessed thoroughly regarding their physical status, General examination and systemic examination and pre-operative investigations were assessed properly then patients categorized into American Society of Anesthesiology 1 and 2 who were taken for this study. All the patients were given T. Rantac 150 mg stat and T. diazepam 0.2mg/kg orally given. They were preloaded with intravenous fluid 10 to 15 ml/kg ringer lactate. The inclusion criteria were patient between 18-50 years, presenting to lower abdominal and lower limb surgeries, exclusion criteria were patient with comorbidities which are life threatening, uncontrolled diabetes or hypertensive then they were randomly allocated into two groups as follows

GROUP D: (n=30) Thirty patients were given intrathecal 5 mcg dexmedetomidine (diluted in non-preservative added normal saline) along with 15 mg hyperbaric bupivacaine (3cc)

GROUP F: (n=30) In this group thirty patients were given 25mcg fentanyl along with 15 mg hyperbaric bupivacaine (3cc)

Intrathecal injection was given in sitting position around 15 secs and then immediately after giving intrathecal injection patient was made to lie in supine position. Patient was carefully monitored and hypotension (ie) 30% fall of systolic blood pressure from basal level is treated with inj ephedrine and adequate intravenous fluid replacement is done for hypotension, Bradycardia (ie) fall in heart rate less than 50 is treated with inj. Atropine. 0.3 to 0.6 mg IV. Then further occurrence of symptoms such as nausea, vomiting, pruritis, respiratory depression are documented and treated symptomatically, oxygen 2 to 4 L/min is given in case there is fall in saturation to less than 90%. Once the level is adequately reached surgeon is informed to start the surgery, Sensory level is checked by pin prick and motor level is assessed by modified Bromage scale. The intra-op monitoring regarding time of intrathecal injection to time taken to reach maximum sensory level and time of regression of sensory level beyond S1 is documented, and also hemodynamic status during intraoperative period and occurrence of any symptoms are recorded. During

intraoperative period sedation was measured by modified Ramsay sedation score which is as follows

Ramsay Sedation Scale	
Score	Definition
1	Anxious and agitated or restless or both
2	Cooperative, oriented, and tranquil
3	Responds to commands only
4	Brisk response to a light glabellar tap or loud auditory stimulus
5	Sluggish response to a light glabellar tap or loud auditory stimulus
6	No response to a light glabellar tap or loud auditory stimulus

Performed using a series of steps: observation of behavior (score 1 or 2), followed (if necessary) by assessment of response to voice (score 3), followed (if necessary) by assessment of response to loud auditory stimulus or light glabellar tap (score 4 to 6) [35]

Figure 1: RAMSAY sedation scale[14]

Post-operatively pain was monitored using visual analog scale (VAS).

Hourly monitoring was done for first 2 hours followed by second hourly monitoring for every four hours and then eighth hourly monitoring was done for next 24 hours. Intramuscular injection of diclofenac is given when VAS score reaches more than 5. Further case was followed up a week later for any symptoms of headache and dysaesthesia.

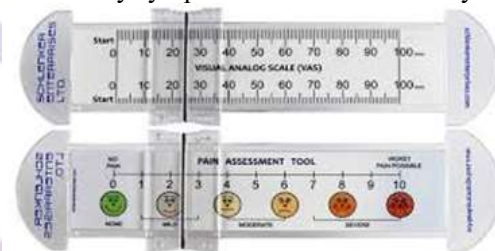


Figure 2: VAS SCALE – 0- NO PAIN, 10- VERY SEVERE PAIN

RESULTS

Regarding age, height, weight and ASA status patients were compared and there was no statistical significant difference in onset of motor and sensory block and there was no significant difference in duration taken to attain the highest level of sensory and motor level but in turn patients who were given intrathecal dexmedetomidine have slower regression of sensory level to S1 compared to patients given intrathecal fentanyl. The duration taken to reach highest sensory and motor level and time taken for regression of sensory and motor level are shown in the table below. There was no requirement of rescue analgesic in group D for first 24 hours compared to group F

Table 1

Patient details	GROUP D (n=30)	GROUP F (n=30)	P value
AGE(yrs)	43.21 ± 4.0	44.4±5.0	P>0.05
HEIGHT(cm)	158±2.0	157±1.4	P>0.05
WEIGHT(kg)	64±14	65±40	P>0.05
SEX(m:f)	19	21	P>0.05
DURATION OF SX(min)	179±44	168±50	P>0.05
ASA 1:2	20:10	19:11	P>0.05

Values given in above table are based on mean \pm SD, ASA – American society of anaesthesiology , kg- kilograms , cm-centimeters , yrs –years , min -minutes

Types of surgery

Surgery done	GROUP D	GROUP F	P VALUE
Open appendectomy	21	20	P>0.05
Inguinal hernia	9	10	P>0.05

TIME TAKEN	GROUP D	GROUP F	P VALUE
Highest sensory level	T5	T6	P>0.05
Time from injection to highest sensory level	13 \pm 1.8	13 \pm 2.4	P>0.05
Two segment regression from highest sensory level	140 \pm 2.6	86 \pm 4.4	P<0.001
Time from sensory regression to S1 level	480 \pm 4.0	206 \pm 3.4	P<0.001
Total analgesic dose in first 24 hrs(mg)	50	200	P<0.001
Time to rescue analgesia	160 \pm 20	80 \pm 30	P<0.001
Onset of bromage 3	10.34	10.20	P>0.005
Regression to bromage 0	462 \pm 20	162 \pm 30	P<0.0001

Eventhough hemodynamically both the groups were stable intra operatively , sedation score was more in group D patients , ie) the sedation score of group D patients where 4.0 \pm 2.0 and group F where 2.8 \pm 3.6, which is statistically significant .ie) P>0.05 There was no complications like nausea, vomiting, pruritis, respiratory depression in both groups and the requirement of vasopressor was more in group d compared to group f and one patient in group d had bradycardia (HR<50) which is managed by intravenous inj Atropine 0.3 mg and the following is the table regarding complications documented in both the groups.

Complications	Group D (n=30)	Group F (n=30)	P value
Nausea	1	2	P>0.05
Vomiting	1	0	P>0.05
Pruritis	0	1	P>0.05
Respiratory depression	0	0	-
Hypotension	3	0	P>0.05
Bradycardia	1	0	P>0.05
Urinary retention	0	0	-

There was no neurological deficit or post dural puncture headache noted in any patients.

DISCUSSION

Dexmedetomidine given intrathecally with local anaesthetic prolongs both motor and sensory block and this mechanism is not known clearly . By depression of release of C fibre transmitters and post synaptic dorsal horn neuron causing hyperpolarization results in analgesia .Synergesim

occurring between local anaesthetics and alpha 2 adrenoceptor agonist may lead to prolongation of motor and sensory block . The antinociceptive action for visceral and somatic pain is due to intrathecal alpha 2 adrenoceptor agonist .Local anesthetic acts by sodium channel blocking effect. Fentanyl is a selective μ receptor agonist opioid , when given intrathecally it acts by binding with dorsal horn of spinal cord and shows supraspinal action and spread. There are so many animal studies where conducted with intrathecal dexmedetomidine dose ranging between 2.5 to 100 μ gm and there was no neurological deficit recorded , In our study dose is decided based on numerous previous studies. In our study 5 μ g of dexmedetomidine added with intrathecal hyperbaric bupivacaine 15mg (3cc) and 25 μ g of fentanyl added with hyperbaric bupivacaine 15mg (3cc) are compared each with thirty patients , the onset of sensory block , onset of motor block , heighest sensory level , heighest motor level where compared and all these where statistically insignificant as shown in the above table , ie) all where equal. The regression of sensory level and regression of motor level where slower in the dexmedetomidine added group compared to fentanyl group which were statistically significant . In conclusion addition of 5 μ g dexmedetomidine is more effective than 25 μ g fentanyl added intrathecally ie) dexmedetomidine group were intraoperatively hemodynamically stable , with minimal adverse effects and showed prolonged post operative analgesia adequate intra operative sedation which was more comfortable for patients.

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