



A Comparative Study Of Intrathecal Fentanyl Versus Intrathecal Dexmedetomidine As An Adjuvant To Hyperbaric Bupivacaine In Infra-Umbilical Surgeries

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Abstract:

INTRODUCTION: Lower abdomen and lower limb procedures are best performed under spinal anaesthetic. Due to its lower neurotoxicity, bupivacaine is the most often used local anaesthetic for subarachnoid blocking. In order to extend the benefits of spinal analgesia, many adjuvants are administered.

Materials and methods: A comparative observational study was conducted among 44 patients undergoing infra-umbilical surgeries under spinal anesthesia. Patients were grouped into Group BD (Bupivacaine + Dexmedetomidine group) & Group BF (Bupivacaine + Fentanyl) with 22 patients in each group. Spinal anesthesia was given as per protocol under aseptic precautions. Sensory and motor analgesia was noted as per the pin prick method and Bromage grade, respectively. Intraoperative assessment and management of adverse events were performed where required. Post-operative pain assessment was done by using visual analogue scale. Duration of analgesia was noted.

Results: The mean onset of sensory block at was 2.5 ± 0.7 minutes in Group BF while 1.9 ± 0.6 minutes in the BD group. The mean time for onset of motor block was 4.22 ± 0.68 min in Group BF while 2.86 ± 0.71 minutes in the participants of BD group, the mean duration of sensory block was 222.18 ± 12.64 minutes in BF group while it was 369.54 ± 23.39 minutes in BD group, the mean duration of motor block was 170.8 ± 18.24 minutes in BF group while it was 304.09 ± 21.30 minutes in BD group, the mean duration of analgesia was 221.54 ± 15.00 minutes in BF group while it was 421.36 ± 25.31 minutes in BD group.

Conclusion: The onset of sensory block and motor block was faster in dexmedetomidine than fentanyl with bupivacaine. Duration of sensory, motor block and duration of analgesia was significantly longer in the dexmedetomidine with bupivacaine group than in fentanyl.

Keywords: Bupivacaine, Dexmedetomidine, Fentanyl, Spinal anesthesia.

Introduction

Due to its low cost and simplicity, spinal anaesthesia is the method utilised for lower abdomen procedures the most frequently. However, spinal anaesthesia using solely local anaesthetics is linked with relatively short duration of action, making early analgesic intervention in the postoperative period necessary. This poses a significant difficulty for postoperative pain control. There are several adjuvants that have been researched to extend the effects of spinal anaesthetic, including clonidine, midazolam, and others.^(1,2)



Vibrational pain, nauseousness, and vomiting are frequent issues following lower abdominal procedures performed under spinal anaesthesia.⁽³⁾ The quality of the intraoperative and immediate postoperative subarachnoid block is enhanced by the addition of fentanyl to hyperbaric bupivacaine.⁽⁴⁾ Opioids can be added to local anaesthetic solutions, however doing so has drawbacks such as itching and respiratory depression. Dexmedetomidine has been tested as a neuraxial adjuvant because it offers stable hemodynamic conditions, high-quality intraoperative analgesia, and prolonged postoperative analgesia with little adverse effects.⁽⁵⁻⁷⁾ The Food and Drug Administration (FDA) has approved dexmedetomidine as a short-term sedative for patients in mechanically ventilated intensive care units (ICUs). It is expected, that intrathecal 5 micro grams of dexmedetomidine combined with hyperbaric bupivacaine in spinal anaesthesia would have a greater postoperative analgesic effect with fewer adverse effects.⁽⁵⁻⁷⁾

Fentanyl and sufentanil are examples of highly lipid-soluble (lipophilic) opioids that enter the spinal cord and bind dorsal horn receptors quickly. As a result, there is a quick onset of analgesia, little cephalic dispersion, and a low risk of delayed respiratory depression.

In this study, intrathecal fentanyl and intrathecal dexmedetomidine are evaluated as an adjuvant to hyperbaric bupivacaine for their analgesic efficacy.

Materials And Method :-

An observational study was conducted at the Dhiraj Hospital's anesthesiology department after receiving ethics committee clearance. 44 patients aged between 20 to 60 years old belonging to American Society of Anesthesiologists (ASA) grade I or II undergoing infra umbilical surgeries was taken for the study. Written and informed consent was taken from all the selected patients. Exclusion criteria would be the patient's d, or V(renal, patients with past pre-existing Co-morbidities, patients with ASA grades III, IV (Heart diseases, Respiratory disease, Kidney diseases, Central nervous system diseases), expectant women, any indication against using spinal anaesthesia (local site infection, spine deformity, deranged coagulopathies)

Each patient will receive inj. Glycopyrrolate 0.004 mg/kg, inj. Ondansetron 0.08 mg/kg as premedication. Before spinal anesthesia, baseline vitals including pulse rate, systolic blood pressure, diastolic blood pressure, oxygen saturation, and respiratory rate will be monitored in the operating room on multi-para monitors.

Each patient will be preloaded with 15 ml/kg of ringer lactate i.v. solution. With the patient in the sitting position under all aseptic and antiseptic precautions lumbar puncture will be performed with spinal needle size 23G at the L3-L4 lumbar space. 44 patients will be divided in two groups of 22(n=22) each.

Patients will be divided in following groups

GROUP-BF: Inj. 3ml(15mg) Bupivacaine (0.5% hyperbaric) +Inj. 0.5ml Fentanyl(25µg) intrathecally.

GROUP-BD: Inj. 3ml(15mg) Bupivacaine (0.5% hyperbaric) +Inj. 0.1ml Dexmedetomidine(5µg) + 0.4 ml Normal saline intrathecally.

Immediately after intrathecal injection of the drugs, supine position will be given to the patient. From this moment, the level of the sensory block will be evaluated by Pinprick method and Motor block will be evaluated by Bromage scale every 5 minutes till maximum levels of both sensory and motor blocks are achieved.

Pulse rate, systolic blood pressure, diastolic blood pressure, oxygen saturation & respiratory rate will be monitored every 5 minutes upto 30 minutes and then every 15 minutes till the end of surgery.

By using a hypodermic needle and the pin prick method, the degree of sensory block was identified. Starting point of sensory block, duration between intrathecal drug injection and lack of pinprick sensation at L1 dermatome. Time between the start of the sensory block and sensation returned at S2, Assessment will then be performed every 5 minutes until two successive levels of sensory block are identical (i.e., fixation of level), at which point it was performed every 15 minutes.

Motor block was evaluated, Time of motor block onset: the interval between intrathecal injection and grade 3 motor block as measured by the Bromage scale. Time from intrathecal injection to grade 0 motor block, according to the Bromage scale, is the duration of the motor block.

All patients were shifted to recovery room and watched for pulse, blood pressure, duration of sensory block and motor block assessed every 30 minutes till complete regression of both sensory and motor block. Pain score was



assessed using Visual Analog Scale. The duration of analgesia was calculated from the time of intrathecal injection to the time when visual analogue scale was ≥ 4 . Inj. Diclofenac sodium 1.5 mg/kg was given intravenous as rescue analgesia.

An observational analysis will be made. Following approval from the ethics committee, we continued to gather data for six months. Unpaired student t tests was utilised in the statistical analysis for group comparisons, and the chi-square test will be employed for categorical variables. P-value ($p < 0.05$) is considered significant.

Observation And Results :-

Table 1: Demographic data

PARAMETER	Group BF		Group BD		P value	Significant (S) or non-significant (NS)
	N	Mean \pm SD	N	Mean \pm SD		
Age (Years)	22	44.72 \pm 13.23	22	43.09 \pm 12.78	0.66	NS
Weight (kg)	22	60.81 \pm 10.12	22	60.68 \pm 10.35	0.966	NS

In our study, the demographical parameters and ASA grading, both the groups BF and BD were comparable to each other and was statistically non-significant.

Table 2: Comparison between group BF and group BM

PARAMETER	GROUP BF (MEAN \pm SD)	GROUP BD (MEAN \pm SD)	P VALUE	SIGNIFICANT (S) OR NOT SIGNIFICANT (NS)
ONSET OF SENSORY BLOCKADE	2.5 \pm 0.7	1.9 \pm 0.6	<0.003	S
ONSET OF MOTOR BLOCKADE	4.22 \pm 0.68	2.86 \pm 0.71	<0.001	S
DURATION OF SENSORY BLOCKADE	222.18 \pm 12.64	369.54 \pm 23.39	<0.001	S
DURATION OF MOTOR BLOCKADE	170.8 \pm 18.24	304.09 \pm 21.30	<0.001	S
DURATION OF ANALGESIA	221.54 \pm 15.00	421.36 \pm 25.31	<0.001	S

- Dexmedetomidine group has significantly faster onset of sensory and motor block, longer duration of sensory and motor block and longer duration of analgesia in comparison of fentanyl group.
- There were no intraoperative side effects in either of group in our study.

Discussion:-

It is unknown how intrathecal alpha 2-adrenoceptor agonists lengthen the motor and sensory block caused by local anaesthetics. They work by attaching to dorsal horn post- and presynaptic C-fibers. Their ability to relieve pain is due to the inhibition of C-fiber transmitter release and hyperpolarization of postsynaptic dorsal horn neurons.⁽⁸⁾ Agents used for local anaesthesia work by obstructing sodium channels. While the motor block of spinal anaesthetics may be prolonged as a result of the binding of 2-adrenoceptor agonists to motor neurons in the dorsal horn, the extension of effect may be caused by synergism between local anaesthetic and 2-adrenoceptor agonist.⁽⁹⁾ It has been discovered that intrathecal 2-receptor agonists have antinociceptive activity for both somatic and visceral pain. Fentanyl is an opioid that is a lipophilic -receptor agonist. Fentanyl may



spread and act supra-spinally when administered intravenously because it interacts with opioid receptors in the dorsal horn of the spinal cord.⁽¹⁰⁾

In our study we compared dexmedetomidine and fentanyl with hyperbaric bupivacaine intrathecally. In our study, there was no discernible difference in the mean age, weight, or ASA grade between the fentanyl and dexmedetomidine groups. ($p>0.05$)

Similar findings were observed by subsequent research.

A research by P. Rahimzadeh et al.⁽¹¹⁾ revealed no statistically significant demographic differences between the groups. ($p>0.05$). They have compare 25 microgram of fentanyl and 5 microgram of dexmedetomidine with 12.5 mg bupivacaine intrathecally.

F. Safari et al.⁽¹²⁾ found no statistically significant demographic differences between the groups. ($p>0.05$). They had compared 25 microgram of fentanyl and 5 microgram of dexmedetomidine with 12.5 mg bupivacaine intrathecally.

In terms of demographic information, a research by Rajni Gupta et al.⁽¹³⁾ did not find any statistically significant differences between the groups. ($p>0.05$)

In our study, onset of sensory block and motor block were significantly faster in dexmedetomidine group than who received fentanyl. This same result is obtained with the studies done by P. Rahimzadeh et al.⁽¹¹⁾ and F. Safari et al.⁽¹²⁾

Duration of sensory block and motor block was longer in dexmedetomidine group than fentanyl group. In a study done by P. Rahimzadeh et al.⁽¹¹⁾ same result was observed and also F. Safari et al.⁽¹²⁾ study same observation was there.

Duration of analgesia was also statistically longer in patient who received dexmedetomidine than fentanyl group. In both study by P. Rahimzadeh et al.⁽¹¹⁾ and F. Safari et al.⁽¹²⁾ duration of analgesia was better in dexmedetomidine group.

Conclusion :

At the end, we concluded with our study that onset of sensory and motor block was significantly faster in dexmedetomidine group than fentanyl group. Duration of sensory, motor and analgesia were longer in dexmedetomidine group than fentanyl group. Thus dexmedetomidine as adjuvant with hyperbaric bupivacaine is better than fentanyl group.

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