Original Article

Indian Journal of Anesthesia and Analgesia
2017, 4 (4, Part-II), 1142-1146
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.4417.36

Assessment of Sensory and Motor Blockade by Bupivacaine with Dexmeditomedine or Fentanyl as Adjuvant in Lower Abdominal and Lower Limb Surgeries

Gurudatta K.N.[1], Ashwini[2]

[1]Associate Professor [2]Assistant Professor, Department of Anaesthesiology, Shivamogga Institute of Medical Sciences, Shivamogga, Karnataka 577201, India.

Abstract

Introduction: In the present-day practice of Anaesthesiology Bupivacaine is the most commonly used drug for subarachnoid block. Many adjuvants have been tried to improve the quality of analgesia and to prolong the duration of action. The present study was conducted to assess the efficacy between dexmedetomedine versus Fentanyl as an adjuvant to Bupivacaine in lower abdominal and lower limb surgeries. *Methods:* 60 patients of ASA gr I and II aged between 18-60 years undergoing elective lower abdominal, urologic, lower limb surgeries were selected and divided into two groups of 30 each. Group "BP" received intrathecally 12.5mg 0.5% of Bupivacaine + 5 µg of dexmeditomedine while group "BF" received 0.5% Bupivacaine +12.5µg of Fentanyl. Onset of sensory and motor block, highest level of sensory blockade, duration of analgesia was assessed. *Result:* The onset of Sensory and motor blockade was same in both the groups. Duration of sensory block and analgesia was significantly prolonged in Dexmeditomedine group. So also, was the duration of motor block. *Conclusion:* Dexmeditomedine potentiates Bupivacaine spinal anaesthesia more than Fentanyl.

Keywords: Subarachnoid Block; Dexmeditomedine; Fentanyl; Bupivacaine.

Introduction

Spinal anaesthesia is most common technique for surgical procedures below the level of umbilicus. The advantage of awake patient, simple to perform, rapid onset of action, minimal drug cost are its offered advantages.

These advantages are sometimes offset by relatively short duration of action and uncomfortable postoperative period when its action wears off. Sensory blockade can be enhanced into postoperative period by combining adjuvants like opioids, clonidine with the main drug like Bupivacaine. α-2 adrenergic receptor (A.R) agonists have been the focus of interest due to their sedative, analgesic, perioperative sympatholytic properties. Dexmeditomedine is a highly selective A.R. agonist with a relative high ration of α-2/α-1 activity. Lack of respiratory depression makes it a safe adjuvant (1). Intrathecal opioids are commonly combined with local anaesthetics to improve the qualities of the block (2).

Fentanyl, a lipophilic opioid has rapid onset of action following intrathecal administration. Respiratory depression is less with Fentanyl as compared to morphine. Fentanyl provides better analgesia and a safer alternative to morphine in the management of early postoperative pain. Therefore, the present study has been designed to compare the effect of Dexmeditomedine with Bupivacaine versus Fentanyl with Bupivacaine for spinal Anaesthesia in lower abdominal and lower limb surgeries.

Corresponding Author: Gurudatta K.N., Associate Professor, Department of Anaesthesiology, Shivamogga Institute of Medical Sciences, Shivamogga, Karnataka 577201, India.
E-mail : drkngurudutt@gmail.com

Received on 05.08.2017, **Accepted on** 01.09.2017

Materials and Methods

This clinical study was conducted on 60 patients of ASA physical status I/II in the age group of 18year to 60 years of either sex, posted for elective lower abdominal, urologic, gynaecologic, lower limb surgeries, under spinal Anaesthesia after taking written informed consent.

Approval from the hospital ethical committee was taken prior to the study. patients were randomly divided into two groups of 30 each. Patients were divided into two groups. GroupBD: Received intrathecally 12.5mg of 0.5% hyperbaric Bupivacaine with 5 µg of Dexmeditomedine as adjuvant.Group BF: Received intrathecally 12.5mg of 0.5 % hyperbaric Bupivacaine with 25µg of Fentanyl as adjuvant.

Patient refusal, ASA grade III & IV, Patients with dependency of narcotic, patients with gross spine anomalies and localized skin lesions, Patients with cardiac, Pulmonary, hepatic or renal disorders, Patients having inadequate subarachnoid blockade and who were later supplemented by general anaesthesia were excluded from the study.

Assessment of Sensory Blockade

The onset of sensory block was tested by pin prick method using a hypodermic needle. The time of onset was taken from the time of injection of drug into subarachnoid space to loss of pin prick sensation. The highest level of sensory block and time required to achieve it was noted. The time for two dermatomal segmental regression of sensory level was noted. The duration of sensory blockade was taken as time from onset to time of return of pin prick sensation to S1 dermatomal area.

Assessment of Motor Blockade

This was assessed by modified Bromage scale [3], given below: Grade 0: Full flexion of knees and feet.

Grade 1: Just able to flex knees, but full flexion of feet possible.

Grade 2: Unable to flex knees but some flexion of feet possible

Grade3: Unable to move legs or feet. The time interval between injection of drug into sub arachnoid space, to the patient's inability to lift the straight extended leg was taken as onset time [3]. The duration of motor block was taken from time of injection to complete regression of motor block ie, ability to lift the extended leg [3].

Assessment of Analgesia was done by Visual Analogue scale [4]. Visual Analogue Scale (VAS) consists of a 10-cm line, anchored at one end by a label such as 'No pain' and at the other end by a label' worst pain imaginable. The patients simply mark the line to indicate the pain intensity. Al the patients were instructed about the VAS and to point out the intensity of pain on the scale (0-2:No Pain to slight pain. 2-5:Mild pain, 5-7:Moderate Pain, 7-9:Severe Pain and 10:Worst Possible pain).

Duration of complete analgesia was defined as the time from the intrathecal injection to VAS score 0 to < 4. Analgesics were avoided until demanded by the patient and the time taken for the first pain medication was also noted. (i.e., when VAS >6) VAS also recorded 3,6,12, hours post operatively.

Quality of Intra operative analgesia was assessed on fourpoints modified Belzarena scale (5) as 1: Unable to tolerate pain, 2: Able to tolerate discomfort with additional analgesia, 3: Some discomfort no additional analgesic requirement and 4: Completely satisfied.

Sedation scores were assessed both intra and post operatively using a four-point score as, Grade 0: Patient wide awake, Grade 1: Patient sleeping comfortably but responding to verbal commands, Grade 2: Deep sleep but arousable and Grade 3: Deep sleep, unarousable.

Post operatively monitoring of vital signs, VAS scores and sedation scores were continued every 30 minutes until the time of regression of sensory block to L_1 dermatome. The incidence of hypotension (arterial blood pressure<20% baseline) was treated with injection Mephenteramin 5 mg intravenous increments. Bradycardia (pulse rate <50/M) was treated by inj. Atropine 0.6mg intravenously.

Statistical Analysis

The demographic data were analysed using student 't' test and qualitative data were analysed by chi-square test. All values were expressed as mean±standard deviation. P<0.05 was.

Results

The mean age of patient in group BD was 38.6±11.8 and in group BF was 38.3±12.8. This difference was insignificant (p=0.89). In both the groups there were 20 males and 10 females. There was no significant difference in Height and weight

characteristics of patients (p>0.05, Table 1).The onset of sensory block was tested by pin prick method using a hypodermic needle. The time of onset was significantly different (p>0.05, Table 2) between BD group and BF group.

Highest level of sensory block in patients administered Bupivacaine with Dexmeditomedine (Group-BD) or Fentanyl (Group-BF) as adjuvant was found to be T_8(Table 3). The time of two segment regression was significantly lower (p<0.05) in group BD compared with group BF. Time to complete sensory recovery in BD group was significantly longer than that in BF group (p<0.001). Similarly, time to complete motor recovery in group BD was significantly longer as compared to that in group BF (p<0.001, Table 4).

The mean duration of complete analgesia (without need of analgesic) was 333.9 ± 28.4 min in group BD while it was 180.0±19.6 min in group BF which was statistically significant (p<0.001). Similarly, the duration of effective analgesia (first pain medication) in group BD was significantly longer than that in group BF (p<0.001, Table 5).

Discussion

Regional anaesthesia techniques offer important advantages compared with general anaesthesia. Like excellent pain control, reduced side effects and shortened stay in the post anaesthesia care unit (PACU). However, these advantages can be short lived and limited by the relatively brief duration of action of local anaesthetics (LAs). A variety of perineural adjuvants including buprenorphine, clonidine, dexmeditomedine and Midazolam have been used to prolong the duration of nerve blocks with varying degrees of success.

Alpha α-2 (áadrenergic receptor (AR) agonists have been the focus of interest for their sedative, analgesic,sympatholytic anaesthetic sparing and hemodynamic stabilizing properties.

Dexmeditomedine, a highly selective α-2 AR agonist with a relatively high ratio of α-2/α-1 activity. (1620:1 as compared to 220:1 for clonidine) possesses all these properties but lacks respiratory depression making it a useful and safe adjunct in diverse clinical applications. In the spinal cord, activation of both α 2-c and α-2 ARs , situated in the neurons of superficial dorsal horn especially lamina II, directly reduces pain transmission by reducing the release of pronociceptive transmitter substance P and glutamate from primary afferent terminals and by hyperpolarising spinal interneurons via G-protein mediated activation of potassium channels, postsynaptic activation of central α-2 ARs results in sympatholytic effect leading to hypotension and bradycardia, an effect judiciously used to attenuate the stress response of surgery.

Onset of Sensory and Motor Blockade

In our study mean time of onset of sensory block in group BD was 3.33 minutes as compared to 3.27 minutes in the group BF. Mean times for onset of motor block were respectively 6.13 and 5.70 min. There was statistically no significant difference with regard to onset of sensory and motor block between the two groups, Rajni Gupta et al [6] in their study also have concluded that there was statistically no significant deference with onset of sensory and motor blockade between the two groups. Al. Ghaneem SM et al [7] conducted a study on 76 patients to evaluate the effect of adding dexmeditomedine/fentanyl to intrathecal Bupivacaine and concluded that there was no statistically significant difference with onset of sensory and motor block between two groups.

Highest Sensory Level blockade

Al- Ghaneem SM et al [7] in their study concluded that the peak sensory level was T6 (T4-T9) in Dexmeditomedinegroup and T6 (T3-T8) in Fentanyl group (p=0.88). In our study, the observations were comparable with this and there was no significant difference between the two groups (P>.05)

Rajni Gupta at al [6] in their study observed that Dexmeditomedine groups patient had highest sensory level T3 (T4-T8) and in Fentanyl group it was T6 (T4-T7). There was no significant difference between the groups.

Time for Two Segment Regressions

The time of two segment regression was considerably slow in group BD with 127.5 min. compared to the group BF with 102 min., which was statistically significant. Rajni Gupta et al [6] in their study noted that time for two segment regressions were 120 ± 22.2 min in Dexmeditomedine group and 76±20.3 min in Fentanyl group, which was significant statistically. Gechan A Tarbech et al [8] conducted a study in 60 diabetic patients. The time for two segment regressions were 150±42 min

(Dexmeditomedine group) and 114±35 min (Fentanyl group). These result correlate with our study results.

Time for Complete Sensory Recovery

The mean duration of sensory block (time for complete recovery) in BD and BF groups were 301.5 min and 208.7 min. respectively, which is statically highly significant. Gehan a Tarbech et al [8] have reported that time for or complete sensory recovery were 300±82 minutes and 198±52 minutes in dexmeditamine and fentanyl group respectively. The corresponding results were 476±20 minutes and 187±12.3 in the study of Rajni Gupta et al [6]. Similarly, the corresponding times were 300±82 minutes and 198±52 minutes in the study by AlGhaneem SM et al [7].

Time to Complete Motor Blockade

Rajni Gupta et al [6], Ghaneem SM et al [7], Gehan A Tarbeeh et al [8] reported a statistically significant difference between dexmeditamine and fentanyl group. There was a prolonged motor blockade in Dexmeditomedine group.

Duration of Analgesia

The mean duration of effective analgesia (time up to first pain medication) in BD group was 362.7 minutes while it was 210.8 minutes in BF group. which is statistically highly significant ($p<0.001$). The mean duration of effective analgesia (timeup to first pain medication) in BD group was 362.7 minutes while it was 210.8 minutes in BF group.

Table 1: Demographic Profile of the patients undergoing lower abdominal and lower limb surgeries N=60

Parameter	Group BD	Group BF	t	P value
Age (Y)	38.6 ±11.8	38.3 ±12.8	0.1335	0.8940 NS
Sex M/F	20:10	20:10	-	-
Height (Feet)	5.49 ±0.31	5.46 ±0.35	0.37	0.71 NS
Weight (KG)	56.2 ±6.7	58.1 ±8.4	0.99	0.33 NS

Values are expressed as Mean ± S.D, NS = Not Significant.

Table 2: Onset of Sensory and Motor Block in patients administered Bupivacaine with Dexmeditomedine or Fentanyl as adjuvant N=60

	Group BD	Group BF	t	P value
Sensory block (Min)	3.33 ±0.96	3.27 ±0.74	0.30	0.76, NS
Motor block (Min)	6.13 ±1.31	5.70 ± 1.12	1.38	0.17 NS

P>0.05 not significant.

Table 3: Highest level of sensory blockin patients administered Bupivacaine with Dexmeditomedine or Fentanyl as adjuvant N=60

Level	Group BD(%)	Group BF(%)
T_6	13 (43.3%)	11 (36.6%)
T_7	1 (3.3%)	3 (10%)
T_8	15 (50%)	13 (43.3%)
T_9	-	1 (3.3%)
T_{10}	1 (3.6%)	2 (6.6%)
Total	**30**	**30**

Table 4: Recovery Parametersin patients administered Bupivacaine with Dexmeditomedine or Fentanyl as adjuvant N=60

Recovery Parameters (min.)	BD	BF	t	P value
Time to 2 segment regressions	127.5 ± 8.2	102.0 ± 8.0	12.17	<0.05
Time to complete sensory recovery	301.5 ± 18.6	208.7 ± 4.2	21.74	<0.001
Time to complete Motor recovery	271.3 ± 18.4	179.9 ± 11.4	23.11	<0.001

Table 5: Duration of Analgesia in patients administered Bupivacaine with Dexmeditomedine or Fentanyl as adjuvant N=60

	BD	BF	t	P value
Duration of complete analgesia (min.)	339.0 ± 28.4	180.0 ± 19.6	25.24	< 0.001 H. Significant
Duration of effective analgesia (min.)	362.7 ± 39.2	210 ±25.4	17.82	<0.001

Conclusion

On the basis of the present clinical comparative study, we can conclude that 5 µg dexmeditomedine seems to be an attractive alternative to 25 µg fentanyl as an adjuvant to intrathecal bupivacaine in surgical procedures of lower abdomen and lower limbs.

References

1. Grewal:Dexmeditomedine: New advances, Journal of Anaesthesiology and clinical Pharmacology, 2011;27 (3):297-30.
2. B.N. Biswas: Intrathecal Fentanyl with hyperbaric Bupivacaine improves analgesia during caesarean delivery and in early postoperative period, Indian Journal of Anaesthesia 2002;46(6):469-472.
3. John D Loesser, Stephen H Butler, S. Richard Chapman, Dennis C Turk, Bonica's Management of Pain. 3rd Ed. Lippincott Williams and Wilkins 2001:310-326.
4. Vincent J Collins: Spinal anaesthesia principles in principles of anaesthesiology. 3rd Ed. Lea and Fibiger Philadelphia, 1993:1480-1482.
5. Sethi B.S Samuel M, Srivastava D. Efficacy of analgesic effects of low dose intrathecal clonidine as adjuvant to Bupivacaine in Indian Journal of Anaesthesia, 2007; 51(5):415-419.
6. Rajni Gupta, Reetuvarma. A comparative study of intrathecal Dexmeditomedine and Fentanyl as adjuvants to Bupivacaine. Journal of Anaesthesiology and clinical Pharmacology, 2011;27(3):339-343.
7. Al-Ghaneem S M, Al-Mustafa MM et al. effect of adding dexmeditomedine vs. Fentanyl to intrathecal Bupivacaine on spinal block characteristics in Gynaecological procedures. A double blind controlled study. American Journal of Applied sciences, 2009;6(5):882-887.
8. Gehan . A Tarbeeh. Effect of intrathecal Bupivacaine, Fentanyl versus Bupivacaine dexmeditomedine in diabetic surgical patients. Egyptian Journal of Anaesthesia, 2013;29:13-18.