

A comparative study of intrathecal bupivacaine heavy (0.5%) with bupivacaine heavy (0.5%) plus dexmedetomidine for lower abdominal surgeries

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Abstract

Introduction: Several adjuncts like adrenaline, opioids and alpha-2 adrenergic agonists are being used with local anaesthetics intrathecally for prolongation of intra-operative and post-operative analgesia and to reduce the side-effects of high doses of local anaesthetics.

Aim: The present study was done to evaluate the onset and duration of sensory and motor block, hemodynamic effects, post-operative analgesia and adverse effects of Dexmedetomidine given intrathecally with hyperbaric 0.5% Bupivacaine.

Materials And Methods: Sixty inpatients of ASA class I and II scheduled for various lower abdominal surgeries under Sub-Arachnoid Block were randomly divided into two groups of 30 each namely C (Control), D(Dexmedetomidine) . All received 12.5mg hyperbaric bupivacaine plus 0.5 ml Normal Saline in Group C(Control),10µg Dexmedetomidine (diluted in preservative free Normal saline of 0.5ml) in Group D

(Dexmedetomidine). The onset time to reach peak sensory and motor level, the regression time for sensory and motor block, hemodynamic changes and side-effects were noted.

Results: The duration of sensory and motor block, rescue analgesia was significantly prolonged in Dexmedetomidine group when compared to that of Control group.

Conclusion: Dexmedetomidine 10 µg seems to be a better neuraxial adjuvant to hyperbaric Bupivacaine.

Keywords: Bupivacaine; Dexmedetomidine; intrathecal .

Introduction

Many adjuncts such as adrenaline, opioids, midazolam, clonidine etc., were added to the local anaesthetics given intrathecally to avoid intra-operative visceral and somatic pain and also prolong the post-operative analgesia ^[1]. Therefore, the present study is an attempt to explore the usefulness and compare this newer alpha-2 adrenergic

agonist Dexmedetomidine as a neuraxial adjuvant with heavy Bupivacaine.

Materials and Methods

Sixty inpatients, scheduled for major lower abdominal surgeries under Sub-Arachnoid Block (SAB), at J.L.N.M.C.H Bhagalpur were chosen for the study. Inclusion Criteria were ASA physical status class I, II and 18-60 years of either sex. Exclusion Criteria were emergency surgery, deformities of the spine, hypersensitivity to any of the drugs in the study, contraindications to spinal anaesthesia like patient refusal, bleeding diathesis, heart block/dysrhythmia and therapy with Adrenergic Receptor Antagonist, Calcium Channel Blocker or ACE Inhibitor. The protocol of the study was approved by the ethical committee of the medical college and written consent was obtained pre-operatively. Patients were premedicated with Tab. Ranitidine 150 mg and Tab. Alprazolam 0.5 mg at night before surgery. All patients were preloaded with 15 ml/ Kg Ringer's Lactate, 15 minutes before the surgery and randomly allocated into two groups of 30 each namely C(Control), D (Dexmedetomidine). Baseline vitals were recorded. Under strict asepsis, using 25 BD spinal needle, lumbar puncture was performed at L 3 – L 4 intervertebral space in sitting position. Group C (Control) received 3.5 ml, 0.5% hyperbaric bupivacaine (3ml)+ 0.5 ml Normal Saline. Group D (Dexmedetomidine) received 3.5ml, 0.5 % hyperbaric bupivacaine (3ml) + 10µg Dexmedetomidine (diluted in preservative free Normal saline of 0.5ml). Immediately after giving the intrathecal injection over 10-15sec approximately, the patients were made to lie supine. Intra-operatively pulse rate, non-invasive blood pressure and SpO₂ were recorded at 0, 5, 10, 20, 30, 40, 50, 60, 90, 120, 180 minutes continued till the end of surgery. Time of onset of sensory block to T10

level and maximum sensory level achieved were noted using pin prick method. Time of onset to Bromage scale 3 motor blocks was noted too. The onset of sensory block was defined as the time between injection of intrathecal anaesthetic and the absence of pain at the T10 dermatome assessed by sterile pinprick every 2 min till T10 dermatome was achieved. The highest level of sensory block was evaluated by pinprick at midclavicular line anteriorly every 5 min for 20 min after the injection, thereafter every 15 min. The duration of sensory block was defined as the time of regression by two segments in the maximum block height, evaluated by pinprick. Motor block was assessed with Modified Bromage scale. Time for onset of motor block was defined as modified Bromage score of 3. Complete motor block recovery was assumed when modified Bromage score was 0. Hypotension (> 30 % fall from baseline blood pressure) was treated with a bolus dose of 6 mg mephenteramine IV. Bradycardia (pulse rate < 50 bpm) was treated with 0.6 mg atropine IV. Incidence of respiratory depression defined as respiratory rate less than 9/min and SpO₂ less than 90 % on room air. Any other side effects were noted. Post-operatively, regression of the sensory block and the time to reach modified Bromage 0 was noted. Pain was assessed using "Visual Analogue Scale" advocated by Revill and Robinson in 1976. It is linear scale consisting of 10 cm line anchored at one end by a label such as "No pain" and other end by "Worst pain imaginable". 0=no pain, 10=severe pain. Rescue analgesia Inj. Diclofenac 50mg was given intramuscularly when VAS was more than 4. Total number of rescue analgesics in the first 24hrs postoperative period was noted. (Each Rescue Analgesic equals to 50mg Inj. Diclofenac IM).

Statistical Analysis

Data obtained was coded and entered into Microsoft Excel spreadsheet. Descriptive statistical analysis has been carried out in the present study. The categorical data was expressed in terms of percentage and continuous data was expressed as mean ± standard deviation (SD). The data was analysed by One-way Analysis of Variance (ANOVA) using SPSS 20.0 version. For a probability value (p value) of less than or equal to 0.05 was considered as statistically significant. p value more than 0.05 was considered statistically insignificant.

Results

The groups were comparable with respect to age, height, and weight. The time of onset of sensory and motor block is similar in both the groups.

The duration of sensory and motor block, time for rescue analgesia were significantly prolonged in Dexmedetomidine group when compared to that of Control group as seen in the Table-1 below.

| Characteristics | Group c | Group d | P-value |
|---------------------------------------|-------------|--------------|----------|
| Age(yr) | 38.30±13.65 | 40.54±13.66 | >0.05 |
| Height(cm) | 160.41±3.46 | 162.78±5.78 | >0.05 |
| Sensory onset to T10(min) | 2.63±0.75 | 3.10±1.28 | >0.05 |
| Time to maximum sensory level T6(min) | 12.28±4.68 | 12.89±5.02 | >0.05 |
| Time to Bromage scale 3 | 9.58±1.62 | 9.86±1.98 | >0.05 |
| Sensory regression by 2 segments(min) | 72±6.34 | 134.87±16.82 | <0.001** |
| Rescue analgesia(min) | 122.56±7.86 | 226.24±16.86 | <0.001** |

Table 1: Demographic data and characteristics of sensory and motor block *significant, **highly significant.

Mean heart rate and mean arterial pressure were shown in the graph-1 and 2 below.

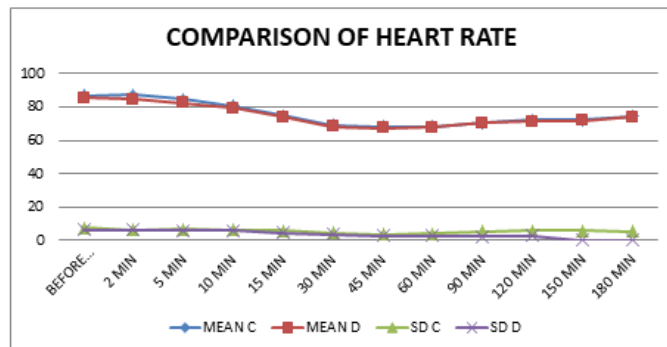


Figure 1: comparison of heart rate in both study groups over time

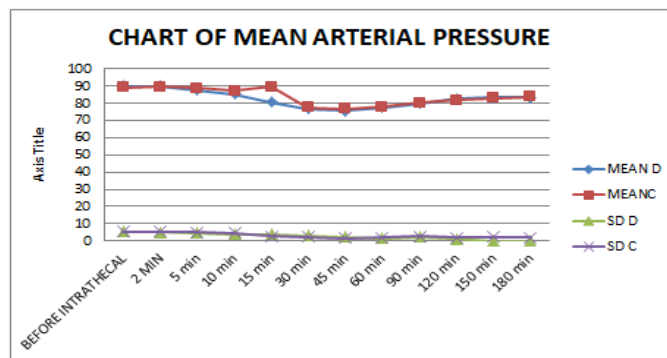


Figure 2: comparison of mean arterial pressure of both study groups over time

Hypotension and bradycardia were more in the Dexmedetomidine group than the control group but it is not of statistical significance. Other side-effects like nausea, vomiting, respiratory depression, pruritus and urinary retention were not noticed in any of the groups as seen in the Table-2 below.

| Sn. | Side Effects | No. Of Patients | |
|-----|------------------------|-----------------|---------|
| | | Group C | Group D |
| 1 | Hypotension | 4 | 5 |
| 2. | Bradycardia | 2 | 4 |
| 3. | Nausea | 0 | 0 |
| 4. | Vomiting | 0 | 0 |
| 5. | Respiratory Depression | 0 | 0 |
| 6. | Urinary retention | 0 | 0 |

Table 2: side effects

Discussion

Alpha-2 adrenergic agonists are being evaluated extensively as an alternative to neuraxial opioids, as an adjuvant [2]. Dexmedetomidine, a highly selective α_2 Adrenergic Receptor agonist with a relatively high ratio of α_2/α_1 -activity (1620:1 as compared to 220:1 for Clonidine), has a synergistic effect when added to intrathecal local anaesthetics [3]. It hastens the onset of motor block, provides stable intra-operative hemodynamics, enhances and extends sensory and motor blockade. It also prolongs post-operative analgesia in a dose dependent manner [4]. Intrathecal Dexmedetomidine when combined with spinal Bupivacaine prolongs the sensory block by depressing the release of C-fiber transmitters and hyperpolarisation of post-synaptic dorsal horn neurons [5]. Local anaesthetics act by blocking sodium channels. The prolongation of effect may result from synergism between local anaesthetic and α_2 -adrenoceptor agonist. The prolongation of motor block may result from a) binding of α_2 -adrenoceptor agonists to motor neurons in the dorsal horn of the spinal cord [6]. b) Direct impairment of excitatory amino acid release from spinal interneurons [7]. Intrathecal α_2 receptor agonists have been found to have anti-nociceptive action for both somatic and visceral pain [8]. From Kanazi et al. [9] and Post et al [10] studies, it is evident that 3-5 μ g Dexmedetomidine would be equipotent to 30-45 μ g Clonidine when used as a neuraxial adjuvant to Bupivacaine [11]. They concluded that 5 μ g Dexmedetomidine produced prolonged motor and sensory block compared with 25 μ g Fentanyl. In the present study, it was observed that in the Dexmedetomidine group there was longer duration of both sensory and motor blockade, stable hemodynamic condition, and good patient satisfaction.

Conclusion

Intrathecal Dexmedetomidine as an adjuvant to Bupivacaine produces significant prolongation of sensory and motor blockade. It also provides good quality of intra-operative analgesia, hemodynamic stability with minimal side effects and excellent post-operative analgesia. Thus, 10 μ g Dexmedetomidine seems to be an attractive alternative as a neuraxial adjuvant to hyperbaric Bupivacaine in lower abdominal surgeries. However, prolonged duration of motor blockade with Dexmedetomidine may be undesirable for ambulatory surgeries. This study includes the young and otherwise healthy patients and the effects in older patients with cardiovascular comorbidities are yet to be investigated.

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