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RESEARCH ARTICLE

IN TRAOPERATIVE EFFICACY OF ADDITION OF DEXMEDETOMIDINE AS AN ADJUVANT TO LOCAL ANAESTHETIC IN SUBARACHNOID BLOCK

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ABSTRACT

Introduction: Local anaesthetic agent when injected intrathecally provides excellent anaesthesia and analgesia. The aim of our study was to investigate the efficacy of dexmedetomidine as an adjuvant to local anaesthetic bupivacaine, given intrathecally for intra-operative as well as for post-operative analgesia.

Method: A total of Hundred adult patients of ASA grade I&II, undergoing lower limb and lower abdominal surgeries under sub-arachnoid block were selected. Group A(n=50) were given 2.5ml of 0.5% hyperbaric Bupivacaine and 1ml of 0.9% normal saline intrathecally. Group B (n=50) were given 2.5ml of 0.5% Bupivacaine and 10micrograms of Dexmedetomidine. In both groups total volume of drug was 3.5 ml. Time for onset of sensory block, time taken to peak sensory block, total duration of analgesia and time taken to maximum motor blockade were noted. Haemodynamic parameters were also assessed.

Result: Statistically significant decrease in mean heart rate, systolic and mean diastolic B.P was seen in group B. Fast onset of sensory blockade, fast achievement of peak sensory blockade, prolong duration of analgesia and less time to achieve maximum motor blockade are statistically significant in group B as compared to group A.

Conclusion: Addition of Dexmedetomidine to Bupivacaine for intrathecal injection leads to fast and dense neuraxial block and the hypotension is within physiological limits.

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INTRODUCTION

Lower abdominal and lower extremity surgeries may be performed under neuraxialblock or general anaesthesia. But neuraxial block has distinctive advantage over general anaesthesia i.e. minimal physiological disturbances resulting in minimal stress response, optimal operative conditions, minimal intra operative blood loss and less chance of post-operative morbity (Kolawale, 2002). Local anaesthetics when used as sole agent for the neuraxial block have a shorter duration of action and do not provide reliable post operative analgesia. Moreover higher doses when used have toxic effects on central nervous and cardiovascular systems (Mulroy, 2002). The most common local anaesthetic used intrathecally for short duration of surgeries is bupivacaine. In the recent years, use of intrathecal adjuvants has gained popularity with the aim of prolonging the duration of block, better success rate, patient's satisfaction and faster recovery (Staikou and Prakaseva, 2014).

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Various drugs have been used as an adjuvant to local anaesthetic like Clonidine (Mahendru *et al*., 2013). Fentanyl (Gupta, 2014), Midazolam (Chattopadhyay, 2013) and Ketamine (Hussain, 2012) that can effectively enhance the quality of anaesthesia, decrease the dose of local anaesthetics and prolong the duration of post-operative analgesia (Dewandre, 2006). Clinical studies about use of intrathecal dexmedetomidine, a highly selective alpha 2 agonist drug ,as an adjunct to local anaesthetics in human are scarse in literature. When used as intravenous sedative and co-analgesic it is associated with decrease in heart rate and blood pressure (Venn, 2001). In the present study, we intended to observe intra-operative analgesia, post-operative analgesia and haemo dynamic parameters when dexmedetomidine is used as an adjunct to intrathecalbupivacaine, in patients undergoing elective surgeries under spinal anaesthesia.

MATERIAL AND METHODS

After approval from the institution ethics committee, the present study was conducted on hundered patients of the age

group of 18-65 years of either sex, of American Society of Anaesthesiologist grade I-II to undergo elective surgery under spinal anaesthesia. Hundered patients were randomly divided into two groups of 50 each. Group A were given 2.5ml of 0.5% of hyperbaric Bupivacaine (12.5mg) and 1 ml of 0.9% of normal saline intrathecally. Group B were given 2.5ml of 0.5% Bupivacaine (12.5mg) and 10micrograms of Dexmedetomidine in 0.9% of normal saline given intrathecally. The total volume of injection in both the groups was 3.5ml. All the patients were given Inj. Midazolam 1mg intraveneously 30 mins before surgery. Patients were preloaded with 10ml/kg of Ringer Lactate. Under all aseptic measures, intrathecal block was performed in lateral decubitus position between L3-L4 intervertebralspace in the midline. Heart rate and non invasive blood pressure (SBP, DBP) were observed every 2 minutes after block till 10 minutes, thereafter every 15 minutes till the end of the surgery. S_{PO2} and ECG were continuously observed. Need of any intraoperatively additional sedative or analgesic agent is noted. Sensory Blockade was assessed on the following points

- Onset – Time till T-10 sensory level was reached
- Time taken to achieve highest sensory level
- Duration of analgesia

Motor Blockade was assessed on the basis of time to achieve grade 3 block Post-operative duration of analgesia was taken from the time of drug administration to the time when first rescue analgesia was given at VAS>3. Side effects including nausea, vomiting, hypotension, bradycardia, shivering, respiratory distress, headache etc were recorded and treated accordingly.

Statistical analysis

Data from the above study was systematically collected, compiled and stastistically analysed by the student's T-Test and categorical data by Chi-Square test. Any observation with p-value <0.05 is considered statisctically significant.

DISCUSSION

Sub-arachnoid block is commonly used for providing surgical anaesthesia for lower limb and lower abdominal surgeries. The balanced anaesthesia achieved with adequate sensory and motor blockade popularise the use of adjuvants to augment the effect of local anaesthetic and reduce the adverse effects with high doses of local anaesthetic agent. The present study was designed to study the effect of dexmedetomidine added to intra-thecal bupivacaine for patients undergoing surgery under spinal anaesthesia. In this study, both the groups were similar with respect to age, sex, baseline haemodynamic parameters and duration of surgery.In our study though the heart rate, systolic blood pressure and diastolic blood pressure were statistically lower in group B i.e. those who received dexmedetomidine but none required pharmacological treatment. This may be because block produced by bupivacaine is nearly maximum thereby decreasing the need for pharmacological intervention for decreased blood pressure, even in patients in which dexmedetomidine is used intrathecally for neuraxial block (Klimscha, 1995). On the contrary intravenous dexmedetomidine decreases heart rate due to central sympathetic blockade (Dyck, 1993). Mean time for onset of sensory block in group A was 4.05±0.63 minutes and in group B was 3.4±0.31 minutes (Table 1).

Table 1. Comparison of onset of sensory blockade (p<0.0001)

	Group A	Group B
Mean (min)	4.05	3.4
SD	0.63	0.31

The comparison of p-value was found to be statistically significant (p<0.0001). Time taken to achieve peak level of sensory blockade was 7.97±0.84 minutes in group A and 6.89±0.27 minutes in group B (Table 2). The comparison of p-value among both the groups was found to be statistically significant (p<0.0001).

Table 2. Comparison of time taken to peak sensory block (p<0.0001)

	Group A	Group B
Mean (min)	7.97	6.89
SD	0.84	0.27

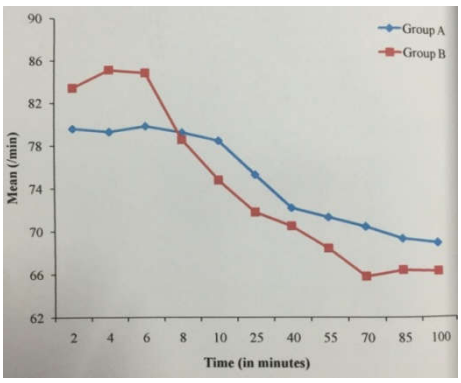
Table 3. Duration of complete analgesia (p<0.0001)

	Mean (min)	SD
Group A	185.6	37.4
Group B	423.8	55.7

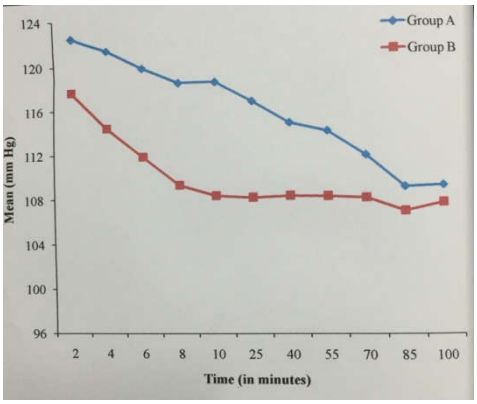
The duration of analgesia was 185.6±37.4 minutes in group A as compared to 423.8±55.7 minutes in group B which was significantly longer (p<0.0001) (Table-3). Duration of analgesia was thus found to be significantly prolonged by adding dexemdetomidine to bupivacaine intra-thecally in our study. Results were supported by other similar studies by Gupta *et al.* (2011), and Kanazi *et al*. (2006) Grandhe *et al.* (2008), in respect to duration of analgesia,assessed by thetime taken for sensory regression with bupivacaine plusdexmedetomidine as compared to plain bupivacaine. Mahmood *et al.* (2009) also concluded that dexmedetomidine has a dose dependent effect on the onset and regression of sensory blockade when used as an adjuvant to bupivacaine in spinal anaesthesia.

Table 4. Comparison of time taken to maximum motor blockade (p-0.0011)

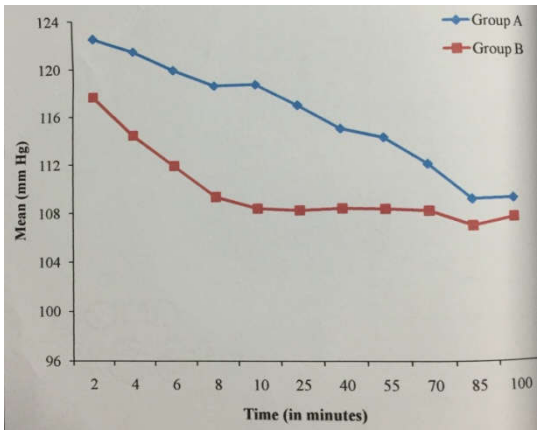
	Mean (min)	SD
Group A	8.15	0.73
Group B	7.69	0.68



Graph 1. Comparison of intraoperative mean heart rate



Graph 2. Comparison of intraoperative mean systolic blood pressure



Graph 3. Comparison of intraoperative mean diastolic blood pressure

Hala Eid *et al*. (2011), also concluded that intrathecal dexmedetomidine in doses of 10mcg and 15mcg significantly prolonged the anaesthesia and analgesic effects of hyperbaric bupivacaine in a dose dependant manner. In this study, Bromage Scale (Bromage, 1978) was used to evaluate motor blockade. The mean time of motor block grade three in group A was 8.15± 0.73 minutes and in Group B was 7.69±0.68 minutes which is statistically significant (p=0.001) (Table 4). This observation is supported by the findings of Mahmood *et al* (2009).

Conclusion

We concluded that addition of 10mcg dexmedetomidine to bupivacaine intra-thecally, significantly provide a faster onset , faster peak of intra-operative analgesia, longer duration of analgesia and fast achievement of motor block, as compared to the bupivacaine alone. Decrease in haemodynamic parameters, though clinically significant, falls within physiological limits and doesn't required pharmacological intervention.

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