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DEXMEDETOMIDINE AS AN ADDITIVE TO BUPIVACAINE IN INTERSCALENE BRACHIAL PLEXUS: EFFECTS ON DURATION OF POSTOPERATIVE ANALGESIA.

Anaesthesiology

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ABSTRACT

Introduction: Interscalene brachial plexus block is an effective nerve block for shoulder and upper arm surgery. Dexmedetomidine as an additive to local anaesthetic decreases anesthetic requirement and provide prolong analgesia to patients. We designed this study to compare the effect of dexmedetomidine on duration of analgesia when added to bupivacaine in interscalene brachial plexus block. Methods: Forty two patients undergoing upper limb surgery were randomly assigned to two groups to receive Interscalene Brachial Plexus block. They received 35 ml of 0.25% bupivacaine and either 0.2 mcg/kg body weight dexmedetomidine (Group D, n = 21) or equal volume of isotonic saline (Group B, n = 21). Sensory block onset time, sedation values, time to first analgesic requirement and any side effects were noted. Results: Shortened sensory block onset times (113.8 sec and 334.7 sec in Group D and Group B respectively, P < 0.0001) and time to first analgesic requirement (625.90 min and 180.01 min in Group D and Group B respectively, P < 0.0001) was significantly longer in dexmedetomidine group. Conclusions: We conclude that the dexmedetomidine as an additive not only increases duration of analgesia but also decreases onset time of Interscalene brachial plexus block.

KEYWORDS:

Interscalene Block; Dexmedetomidine

Table 1: Patient characteristics and outcome measures:

Parameters	Group B (n=21)	Group D (n=21)	t value	P Value
Age (years)	34 ± 11.3	39.1 ± 11.6	1.19	>0.05
Weight (kilograms)	59.29 ± 5.14	62 ± 5.90	1.6	>0.05
Duration of surgery (minutes)	77 ± 17.53	73.08 ± 10.48	0.86	>0.05
Onset of block (seconds)	334.7±52.2	113.8±49.34	13.75	<0.0001
Time to first analgesia (minutes)	180.01 ± 129.63	625.90 ± 120.01	11.29	<0.0001
Sedation Score	2.7 ± 1.1	2.76 ± 1.3	0.157	>0.05

Group B: Bupivacaine; Group D: Bupivacaine + Dexmedetomidine; Values are mean ± SD

Figure

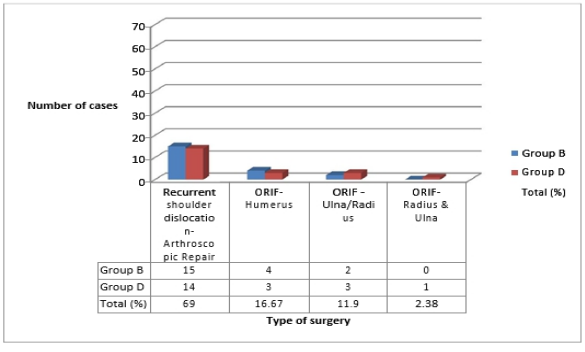

Figure 1: Multiple bar diagram showing types of surgery in study groups.

Group B: Bupivacaine; Group D: Bupivacaine + Dexmedetomidine; ORIF: Open Reduction and Internal Fixation.

Title

Dexmedetomidine as an additive to bupivacaine in Interscalene Brachial Plexus: Effects on duration of postoperative analgesia.

Introduction

Interscalene block was first described in 1970 by Alon Winni. [1] Interscalene brachial plexus block (ISBPB) is one of the most commonly used techniques for regional anaesthesia of the upper limbs.

Different agents have been used as additive to local anesthetic for peripheral nerve block including phencyclidines, opioids, and neostigmine. [2] Dexmedetomidine, a potent alpha α2-adrenoceptor agonist, has been shown to decrease anesthetic requirements by up to 90% and to induce analgesia.[3,4] Addition of dexmedetomidine to bupivacaine in Supraclavicular Brachial plexus block also improves the quality of anesthesia, sensory and motor block onset and regression time.[5-7]

Therefore, we conducted this prospective, randomized, observer-blinded study to test the hypothesis that there is increased duration of analgesia when dexmedetomidine is added as an additive to local anaesthetic used in interscalene block.

Material & Methods

After approval from our Institutional ethics committee, a written, informed consent from the patient was obtained. Patients with ASA class I and II scheduled for upper extremity or shoulder arthroscopy with no contraindications to peripheral nerve block were enrolled. Patients with pre-existing pulmonary disease, clinically significant coagulopathy, infection at the injection site, allergy to local anesthetics, severe cardiopulmonary disease, body mass index greater than 35 kg/m2, diabetes mellitus, or known neuropathies, as well as patients receiving major opioid for chronic analgesia were excluded.

In the operating room standard premedication (intravenously 0.03 mg/kg midazolam) and standard monitoring was used throughout the procedure, including noninvasive arterial blood pressure, heart rate, and pulse oximetry. Patients were randomly allocated to either Group B or Group D. Group B (n=21) received 0.25% Bupivacaine and Group D (n=21) received dexmedetomidine 0.5 mcg/kg as an additive to 0.25% Bupivacaine. 0.9% Normal Saline was used to make up the total volume to 35 ml in both the groups. All blocks were placed by one of the same two investigators, who had substantial expertise in regional anesthesia techniques.

The patients were placed in the supine position with the arm adducted completely. ISBPB was performed with a nerve stimulator (Plexygon; Vygon) using a 22-gauge, 35 mm long, short-beveled, Teflon- coated needle (Locoplex; Vygon). [8] The nerve stimulator was set with pulse duration of 0.15 ms, a current intensity of 1 mA, and a frequency of 2 Hz. After the deltoid twitch was elicited, the stimulating intensity was progressively reduced to less than 0.5 mA maintaining the proper twitch; then, 2 ml local anaesthetic was injected. After this injection stopped the twitch, the location was considered adequate, and the remaining anaesthetic was injected. Sensory Block was assessed as loss of sensation over the upper lateral aspect of the upper arm in the distribution of the C6 dermatome. [9] Analgesia was supplemented with intravenous fentanyl to a maximum dose of 2 µg/kg whenever patient complained of pain as measured on visual analogue scale (VAS>3) during the surgery.

The demographic profile (Age, Sex and Weight) were noted. Any complication of the block, duration of the surgery and supplementation was noted. Block was considered ineffective if the sensory or motor block was incomplete or partial or patient complained of pain (VAS>4) and required more than 2 µg/kg of fentanyl as supplementation. In case of ineffective block general anaesthesia was given for the surgery. However, the case was excluded from the study group.

Data analysis: Statistical analysis was performed using student t test accepting a two-tailed error of 5%. Variables were presented as mean + SD. Categorical data are presented as number (%). A P value of 0.05 was considered as significant. Data were analyzed using the software package SPSS version 11. The sample size was chosen after reviewing many randomized control studies on the same subject and had a sample size ranging between 20 and 30 patients. With α 5% and β 20% error, and assuming difference of 100 min in duration of analgesia in both the groups to be significant we estimated that we required 19 patients per group.

Results: The demographic profile (age and weight) were comparable in both the groups. All cases were male in both the groups. There was insignificant difference in the duration of surgery in both the groups. The number of block requiring supplementation and cases of ineffective block were two in both the groups. None of the patients in either group required any oxygen supplementation or airway manipulation as there was no significant difference in oxygen saturation as measured by pulse oximetry and it remained above 98% in both the groups. The pain scores (VAS) remained < 3 in all patients throughout the surgery and in post operative recovery room [Table 1]. The type of surgery is depicted in Figure 1. No treatment was needed for hypotension or bradycardia in any patient.

Shortened sensory block onset times (113.8 sec and 334.7 sec in Gp D and Gp B respectively, P < 0.0001, Fig 2) and time to first analgesic requirement (625.90 min and 180.01 min in Gp D and Gp B respectively, P < 0.0001, Fig 3) was significantly longer in dexmedetomidine group. Sedation score was comparable in both the groups. No patient had any post operative pulmonary complication as observed clinically for 48 hours after surgery.

Discussion

ISBPB is one of the most reliable and commonly performed techniques for regional anaesthesia of the upper extremity. It anaesthetizes the caudal portion of the cervical plexus (C3, C4) and the superior (C5, C6) and middle (C7) trunks of the brachial plexus. The most common complication associated with this block is phrenic nerve palsy, which occurs in 100% of patients.

Nerve stimulator can be used to identify brachial plexus anatomy and guide needle placement. This technique may improve correct placement of local anaesthetic and minimize complications because individual nerves can be more effectively located and lower volumes of local anaesthetic directed around the target structure. In turn, this may decrease the unintentional spread of local anaesthetic to the phrenic nerve.

Clonidine has been shown to decrease tourniquet pain and intraoperative analgesic requirement in intravenous regional anaesthesia (IVRA).[12] Dexmedetomidine is approximately eight times more selective toward the 2-adrenoceptors than

clonidine.[13] Centrally active -adrenergic agonists exert powerful analgesic action

that probably is transduced at several levels. Dexmedetomidine has been shown to

enhance the local anesthetic action of lignocaine via 2A adrenoceptor. [13]

Perioperative dexmedetomidine administration decreases the requirements for opioid or non-opioid analgesics both intra and postoperatively. [14,15] Intravenous dexmedetomidine as a premedication has been effective before IVRA because it reduces patient anxiety, sympathoadrenal responses, and opioid analgesic requirements but it did not reduce tourniquet pain.[16,17] Addition of dexmedetomidine to bupivacaine in supraclavicular brachial plexus block decreases pain scores, improves anesthesia quality, decreases analgesic requirement, shortens sensory block onset time, and prolongs sensory block recovery time.[7] Our study demonstrated that the addition of dexmedetomidine, in dose of 0.5 mcg/kg of body weight to bupivacaine in ISBPB not only increased duration of postoperative analgesia without causing significant side effects but also shortened the onset of sensory block as compared to control. Dexmedetomidine administration produces abrupt hypotension and bradycardia until the central sympatholytic effect dominates, resulting in moderate decrease in both mean arterial pressure and heart rate from baseline.[13] In our study, no such hemodynamic changes were observed with use of dexmedetomidine in ISBPB. Intravenous dexmedetomidine is also known to exert a sedative effect, which was not observed in our study.

This is the first clinical study comparing the addition of dexmedetomidine to bupivacaine for ISBPB. We conclude that the Dexmedetomidine as an additive not only increases duration of analgesia but also decreases onset time of Interscalene brachial plexus block.

Conflict of Interest: None

Figure

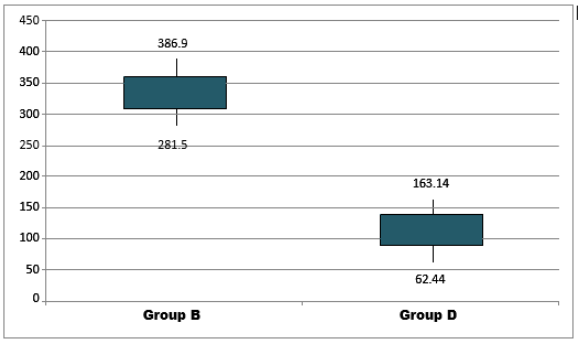

Figure 2: Onset of block (seconds), P Value<0.0001

Group B (n=21) : Bupivacaine ; Group D (n=21) : Bupivacaine and Dexmedetomidine

Figure

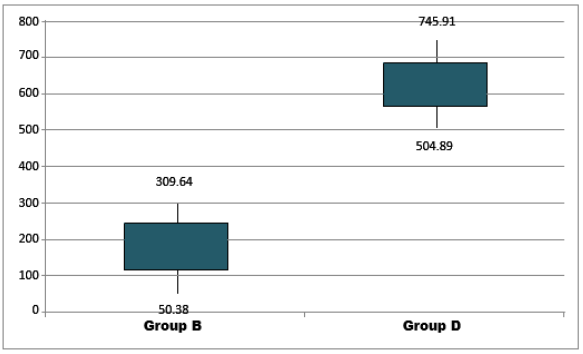

Figure 3: Time to first analgesia (minutes), P Value<0.0001.

Group B (n=21) : Bupivacaine ; Group D (n=21) : Bupivacaine and Dexmedetomidine

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