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Effects of Buprenorphine and Clonidine added to Bupivacaine in Supraclavicular Brachial Plexus Block: A Comparative Study

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I. Introduction:

In brachial plexus blocking, a variety of methods and procedures are available. This study focuses on one of them, the supraclavicular method. Several investigations have been conducted on the supra clavicular method. Many researches have focused on local anaesthetics, the various concentrations that are utilised, and the resulting effects on patients. Adjuvants are simply the medications that are added to local anaesthetics in order to hasten the onset of blockage, prolong block duration, or enhance blockage quality(1).

Few drugs that are used as adjuvants are Epinephrine, sodium bicarbonate, clonidine, dexamethasone, tramadol,dexmedetomidine, butorphanol, buprenorphine, fentanyl, alfentanyl(2). The purpose of this study is to compare the effects of buprenorphine and clonidine when used in conjunction with bupivacaine to block the supraclavicular brachial plexus.

II. Aims and Objectives:

To assess the efficacy of 0.5% bupivacaine combined with the adjuvants buprenorphine and clonidine in blockade of the supraclavicular brachial plexus in terms of: (a) The beginning time for sensory and motor blockade, (b) The time for full motor and sensory blockade, (c) The overall duration of sensory and motor blockade, (d) Adverse effects

III. Methodology:

This is a prospective comparative study conducted on 60 patients attending Govt. General Hospital, Guntur.
Inclusion criteria:
• ASA I, II
• Age 20 to 50
• Unilateral upper limb orthopedic surgeries
Exclusion Criteria:
• Suspected coagulopathy
• Infection at the site of block
• Patient's with documented neuromuscular disorders
• Allergy to local anesthetics and study drug
• ASA III, IV
• Bilateral upper limb procedures
Methodology:
After getting institutional level ethical authorized committee level permission, written level informed, explained consent from the patients, they have been allocated randomly into 3 groups:
Patients in Group A (n = 20) were given a supraclavicular block with 30ml of 0.5%bupivacaine and 1 ml of normal saline as the CONTROL GROUP.
Patients in Group B (n = 20) had a supraclavicular block with 30ml of 0.5%bupivacaine and 300 mcg of buprenorphine (referred to as the BUPRENORPHINE GROUP).
Patients in Group C (n = 20) received 1 ml of 150 mcg of clonidine in a supraclavicular block along with 30ml of 0.5%bupivacaine.
The data were entered into excel sheets and analysed using Microsoft excel. Informed and written consent were taken from all the participants. This study abides by the guidelines laid by the declaration of Helsinki.

IV. Results:

	Group	N	Mean	SD	*p*-value
AGE	A	20	36.5	7.5	0.6
	B	20	42.2	8.2	
	C	20	38.6	6.9	

Most patients underwent ORIF, followed by buttress plating with interlocking.

Onset time for the blocks:

Block	Group	N	Mean	SD	*p*-value
Sensory block	A	20	6.3	0.4	$p < 0.05$ for B compared with A & C
	B	20	4.7	0.3	
	C	20	6.2	0.4	
Motor block	A	20	4.5	0.5	$P<0.05$ for C compared with A & B
	B	20	4.2	0.6	
	C	20	9.3	0.5	

Time for complete blockade:

Block	Group	N	Mean	SD	*p*-value
Sensory block	A	20	20.6	1.8	*>0.05*
	B	20	20.7	2.3	
	C	20	21.7	1.9	
Motor block	A	20	17.8	1.3	$P<0.05$ for C compared with A & B
	B	20	19.5	2.1	
	C	20	16.8	1.8	

Duration of blocks in minutes:

Block	Group	N	Mean	SD	*p*-value
Sensory block	A	20	320.8	14.6	Significant difference noted between all groups
	B	20	620.5	17.5	
	C	20	432.2	18.2	
Motor block	A	20	310.2	11.8	*>0.05* for all groups
	B	20	330.2	14.5	
	C	20	333.5	12.6	

V. Discussion:

The mean ages of A, B, and C groups were 36.5, 42.2 and 38.6 years respectively. They did not differ between them significantly (P>0.05). The mean weights of three groups were 65.6±4.3, 64.3±5.4, and 61.4±6.9 kgs respectively. The weights of the three groups were not significantly different (P>0.05).

The OTSB of B group was significantly lower than A & C groups. The OTMB of C group was significantly higher than A&B groups. The findings presented here contrast with those of the study by Jadon et al., which found that adding buprenorphine speed up the onset of motor block alone but delayed the start of sensory block. The TCSB of three groups were not significantly different. The TCMB of C group was significantly higher than A&B groups. The TDSB of B group was significantly longer than the C and C longer than A groups.

There were no significant, major adverse effects found in any of the three groups when adverse effects were also being monitored, with the exception of one episode of nausea in the B group, which was not significant.Similar analgesic duration (median 20 hours) following buprenorphine injection has been noted by Prasannaet al(3). Similar to this, Sonali et al. found that buprenorphine induced analgesia that lasted three times as long as it did with just local anaesthetics(4).Ajay Hrishi et al have conducted a study and have determined that the combination of 100 µg of clonidine with bupivacaine in ultrasound-guided supraclavicular brachial plexus blocks prolongs both sensory and motor blockade. Moreover, it offers substantial postoperative analgesia and modest sedation, both of which are helpful in the challenging early postoperative period(5).

Buprenorphine's strong affinity for the mu opioid receptor and high lipid solubility may be responsible for the longer analgesic duration that has been observed(6).

This characteristic encourages simple penetration across the neuronal membrane and axonal myelin. Another aspect that may have contributed to buprenorphine's prolonged analgesia was its potency. The potency of buprenorphine is 33–35 times that of morphine(7).

VI. Conclusion:

This randomized controlled trial leads us to the following conclusions: buprenorphine considerably increases the duration of analgesia compared to clonidine, hastens the start of sensory block, and has no significant impact on the onset or duration of motor block.

Buprenorphine is therefore a superior adjuvant over clonidine to bupivacaine in supraclavicular brachial plexus block.

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