Verapamil as an Adjunct to Local Anaesthetic for Brachial Plexus Blocks

Gp Capt RK Lalla*, Gp Capt S Anant (Retd)⁺, Air Cmde HS Nanda[#]

Abstract

Background: Calcium channel blockers potentiate the effects of local anaesthetics. We examined the effect of adding verapamil to local anaesthetic solution on anaesthetic duration in patients undergoing surgery under brachial plexus block.

Methods: This study was a prospective, randomized, controlled, double blind study. Sixty patients undergoing elective upper limb surgery were divided into two groups of 30 each. Group A received 40 ml of 1% lignocaine with 0.25% bupivacaine, while Group B patients had 2.5 mg verapamil added.

Result: Onset of sensory blockade time was marginally faster in Group B (23.2 ± 3.94 minutes) as compared to Group A (23.9 ± 4.13 minutes). However this difference was statistically not significant. The increase in duration of sensory blockade in Group B (185 ± 46.52 minutes) as compared to Group A (157 ± 44.28 minutes) was statistically significant ($p = 0.011$). Increase in duration of motor blockade in Group B (161 ± 46.14 minutes) as compared to Group A (149 ± 42.76 minutes) was statistically not significant ($p = 0.15$). Similarly prolongation of analgesic duration in Group B (318 ± 69.54 minutes) as compared to Group A (302 ± 0.69 minutes) was statistically not significant ($p = 0.18$).

Conclusion: We conclude that adding verapamil to brachial plexus block can prolong sensory anaesthesia without any effect on analgesic duration.

MJAFI 2010; 66 : 22-24

Key Words : Brachial plexus block; Verapamil

Introduction

The first brachial plexus block was performed in 1885 with cocaine by Halstead. In 1911, Hirschell [1] described the first percutaneous technique for performing the block. In recent years it has gained popularity with addition of various adjuncts to local anaesthetic solution in an attempt to increase its efficacy and duration. Systemic adverse effects and prolonged motor block are avoided along with a reduction in total dose of local anaesthetic used. Adjuncts like epinephrine, bicarbonate opioids, clonidine, neostigmine and tramadol have been injected concomitantly with local anaesthetic solution.

Calcium ions have an important role in analgesia mediated by local anaesthetics. Local anaesthetics reduce calcium permeability and various studies have shown that verapamil can potentiate the analgesic effects of local anaesthetics. The aim of this study is to evaluate whether additional anaesthetic and analgesic effects could be derived from addition of verapamil into local anaesthetics injected into brachial plexus sheath.

Material and Methods

Sixty patients in American Society of Anaesthesiologists (ASA) I and II undergoing upper limb surgery at this hospital were included in the study. Exclusion criteria were age below 18 or above 60 years, weight below 50 or above 100 kg, patients receiving anticoagulants, calcium channel blockers and history of peripheral neuropathies, cardiac conduction abnormalities, coagulation disorders or hypersensitivity to local anaesthetic agents.

Clearance was obtained from hospital ethics committee. The anaesthetic procedure was explained to the patients and consent obtained. All patients received tablet diazepam 10 mg on the night before surgery. They were educated on usage of visual analogy scale.

The patients were randomly divided into two groups of 30 patients each. All patients were administered brachial plexus block by supra-clavicular approach. Local anaesthetic solution was injected only after obtaining paresthesia. Group A patients received 40 ml of 1% lignocaine with 0.25% bupivacaine solution. Group B patients received the same solution with 2.5 mg verapamil added. The solution to be injected was prepared by an independent anaesthesiologist. The block was administered and observations made by anaesthesiologist blinded to the solution.

*Senior Advisor (Anaesthesia & Neuro-Anaesthesia), [#]Dy Commandant, Command Hospital (AF), Bangalore-560007. ⁺Ex Classified Specialist (Anaesthesia), 9 Air Force Hospital, Punjab-141106.

The following parameters were observed: onset time of sensory blockade (time between injection and total abolition of pin prick response), duration of sensory blockade (time between onset and return of pin prick response) and duration of analgesia (time between onset of action and onset of pain) and duration of motor blockade (return of complete muscle power). Observations were made every 30 minutes and rescue analgesia was given with Inj Tramadol 50 mg when visual analog scale (VAS) score was more than 4. All observations were made in 4 major nerve distribution areas (Radial, Median, Ulnar and Musculo-cutaneous).

Table 1
Sex distribution

Sex	Group A		Group B	
	Number	Percentage	Number	Percentage
Male	25	83.33	23	76.66
Female	5	16.66	7	23.33
Total	30	100	30	100

Table 2
Age distribution

Age (in years)	Group A		Group B	
	Number	Percentage	Number	Percentage
18-30	12	40	17	56.66
31-40	9	30	6	20
41-50	6	20	5	16.66
51-60	3	10	2	6.66
Total	30	100	30	100

Table 3
Onset of sensory block

	Group A		Group B		‘t’	p	Remark
	Mean	SD	Mean	SD			
Onset(in minutes)	23.9	4.13	23.2	3.94	1.14	>0.05	Not significant

Table 4
Duration of sensory block

	Group A		Group B		‘t’	p	Remark
	Mean	SD	Mean	SD			
Duration (in minutes)	157	44.28	185	46.52	2.62	<0.05	Significant

Table 5
Duration of analgesia

	Group A		Group B		‘t’	p	Remark
	Mean	SD	Mean	SD			
Duration (in minutes)	302	65.69	318	69.54	1.339	>0.05	Not significant

Table 6
Duration of motor blockade

	Group A		Group B		‘t’	p	Remark
	Mean	SD	Mean	SD			
Duration (in minutes)	149	42.76	161	46.14	1.443	>0.05	Not significant

Results

The sex distribution is given in Table 1 and the age distribution in Table 2. The results were statistically analysed using the student’s t-test.

The onset of action in the two groups is given in Table 3. There was a marginal decrease in onset time of Group B (23.2 ± 3.94 minutes) as compared to Group A (23.9 ± 4.13 minutes), which was statistically not significant ($p > 0.05$).

The difference in duration of sensory block (Table 4) between the two groups was statistically significant ($p < 0.05$). The difference in duration of analgesia in two groups (Table 5) was not statistically significant ($p > 0.05$). The difference in duration of motor block between the two groups (Table 6) was not statistically significant ($p > 0.05$).

Discussion

Pain is a highly subjective phenomenon and a variety of receptors mediate pain perception. Nowycky et al [2] in 1985 reported the evidence of three distinct types of calcium channels in sensory neurons namely L, T, and N type. Of these L and N type of channels have a significant role in regulating neurotransmitter release from neurons. The N type has much more potent antinociceptive effects than L type. Studies in rats have shown that application of morphine and N type calcium channel blockers attenuate pain mediated by A delta and C fibre [3]. N type channel blockers were not clinically suitable for use because of their severe neurotoxicity.

Various adjuncts have been attempted to prolong

duration of analgesia. Saied et al [4], concluded that addition of 150 microgram of clonidine to ropivacaine for axillary plexus blockade prolongs motor and sensory analgesia without increased incidence of side effects. Of recent studies, Culebras et al [5], showed that clonidine (150 microgram) combined with 0.5% of 40 ml Bupivacaine does not prolong post operative analgesia but does produce significant haemodynamic changes.

In a series of in vitro experiments on rats, Hara et al [6] showed that L type channel blockers verapamil and diltiazem produced both somatic and visceral pain relief in a dose dependent manner suggesting the relevance of L type channel blockers in pain management.

Verapamil, a synthetic papaverine derivative, is an L type calcium channel blocker. Verapamil has been shown to have potent local anaesthetic activity, reflecting inhibition of fast sodium channels. It induces fast channel blocking effects similar to local anaesthetics.

Omote et al [7], showed that although intrathecal verapamil alone demonstrated neither sensory nor motor block, combination of lidocaine-tetracaine solution and verapamil produced potent and prolonged pain relief with motor blockade when compared with the local anaesthetic solution alone.

Choe et al [8], demonstrated that addition of verapamil to bupivacaine administered epidurally resulted in less post-operative analgesic requirement. Laurito et al [9], demonstrated that verapamil failed to prolong duration of lignocaine anaesthesia when given subcutaneously.

Some researchers have suggested that the analgesic effect of verapamil is centrally and not peripherally mediated. Delpozio et al [10] found that subcutaneous verapamil failed to exhibit anti-nociceptive effects, but was clearly analgesic when administered by intracerebroventricular route in rats. Perhaps the analgesic effect of verapamil in our study was short lived and masked by local anaesthetic effect of lignocaine/bupivacaine.

In conclusion, addition of verapamil to local anaesthetic solution for brachial plexus block can modify the action of the local anaesthetic. Although in our study

it did not significantly modify the onset or duration of analgesia, there was a statistically significant increase in duration of sensory blockade. There is scope for further study using different calcium channel blocking drugs or in different dosage strengths.

Conflicts of Interest

None identified

Intellectual Contribution of Authors

Study Concept : Air Cmde HS Nanda

Drafting & Manuscript Revision : Gp Capt RK Lalla,

Gp Capt S Anant (Retd)

Statistical Analysis : Gp Capt RK Lalla, Gp Capt S Anant (Retd)

Study Supervision : Air Cmde HS Nanda

References

1. Buttner J. Axillary and Mid humeral approach for Brachial Plexus Block. *Curr Opin Anaesthesiol* 1998; 11: 499-502.
2. Nowycky MC, Fox AP, Tsein RW. Three types of calcium channels with different calcium agonist sensitivity. *Nature* 1985; 316: 440-3.
3. V Pirec, E Charles, MD Laurito. The combined effect of N-type calcium channel blockers and morphine on A delta versus C fibre mediated nociception. *Anesth Analg* 2001; 92: 239-43.
4. El Saied AH, Steyn MP, Ansermino JH. Clonidine prolongs the effect of ropivacaine for axillary plexus blockade. *Can J Anaesth* 2000; 47: 962-7.
5. Culebras X, Van Gessel E, Hoffmeyer P, Gamulin Z. Clonidine combined with a long acting local anaesthetic does not prolong postoperative analgesia after brachial block but does induce hemodynamic changes. *Anesth Analg* 2001; 92: 199-204.
6. Hara K, Saito Y, Krihara Y. Antinociceptive effects of intrathecal L-type calcium channel blockers on visceral and somatic stimuli in the rat. *Anaesth Analg* 1998; 87: 382-7.
7. Omote K, Sonada H, Kwamata M. Effects of Verapamil on spinal anaesthesia with local anaesthetics. *Anaesth Analg* 1995; 80: 444-8.
8. Choe H, Kim JS, Ko SH. Epidural Verapamil reduces analgesic consumption after lower abdominal surgery. *Anaesth Analg* 1998; 86: 786-90.
9. Laurito CE, Cohn SJ, Becker GL. Effect of subcutaneous Verapamil on duration of local anaesthetic blockade. *J Clin Anesth* 1994; 6: 414-8.
10. Delpozio E, Caro Z, Baeyens JM. Analgesic effects of diltiazem and verapamil after central and peripheral administration in the hot plate test. *Gen Pharmacol* 1990; 21: 681-5.