Original Research Article

A prospective randomised comparative study of verapamil (2.5mg) or dexmedetomidine (0.5µg/kg) as adjuvants to lidocaine in intravenous regional anaesthesia for distal upper limb surgeries

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Abstract

Background and Objectives: Intravenous regional anesthesia (IVRA) is one of the simple, cost effective anesthetic technique for the distal upper limb surgeries that provides reliable and rapid analgesia with good muscle relaxation of the extremity distal to the tourniquet. However tourniquet pain, absence of post- operative analgesia and occurrence of local anesthetic systemic toxicity in case of accidental or early tourniquet deflation are the major draw backs. **Materials and Methods:** In this prospective, randomized, double blinded, comparative study,60 patients aged between 20-60 years with ASA class 1 and 2, posted for distal upper limb surgeries (forearm and hand) were selected for IVRA technique. The study population were assigned in to two groups (n=30) to receive either lidocaine 0.5% 3mg/kg diluted up to 40ml with 2.5mg verapamil (Group LV) or lidocaine 0.5% 3mg/kg diluted up to 40ml with dexmedetomidine 0.5µg/kg(Group LD). Parameters like sensory and motor block onset times, sensory and motor block recovery times, tourniquet tolerance, sedation, post -operative VAS score, time of rescue analgesia, duration of analgesia were assessed. The data was statistically analysed with appropriate tests. **Results:** There was no statistically significant difference with respect to onset of sensory block in both the groups (3.38±0.44 in Group LV vs 3.43±0.39 in Group LD). Onset of motor blockade was faster in Group LV (8.77±0.74min) compared to Group LD (9.44±0.77min) ($p<0.001$). Sensory recovery time was significantly prolonged in Group LV (17.89±1.66min) compared to Group LD (8.76±0.94min) ($p<0.001$). Onset of second tourniquet pain was significantly prolonged in Group LD (51.60±2.25 min) compared to Group LV 49.27±2.32min) ($p<0.001$). There was significantly prolonged duration of analgesia in Group LV (253.70±18.29min) when compared to Group LD (181.68±13.74min)($p<0.001$). Significantly higher sedation score was noted at 1st and 2hr in Group LD when compared to Group LV ($p<0.001$). There was no significant differences in VAS score and hemodynamic parameters between both the group. ($p>0.005$). **Conclusion:** Verapamil 2.5mg as an adjuvant to lidocaine for IVRA for distal upper limb surgeries significantly facilitates sensory, motor onset and prolongs sensory recovery time with prolonged duration of postoperative analgesia with lesser sedations when compared 0.5µg/kg dexmeditomidine, without any significant changes in hemodynamic parameters or any adverse events.

Key Words: verapamil, dexmedetomidine, lidocaine, intravenous regional anesthesia.

Introduction

Intravenous regional anesthesia (IVRA) also known as Bier's block is a frequently used intravenous regional anesthetics technique for the surgeries of distal forearm using local anesthetic solution. It was first used in 1908 by German surgeon August KG Bier for the upper limb surgery by injecting Prilocaine intravenously after arterial occlusion of the operating limb with a tourniquet[1].

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This procedure started to gain maximum popularity in the 1960s when Holmes used Lidocaine instead of Prilocaine[2]. Today intravenous regional anesthesia with slight technical modifications is an ideal method of providing anesthesia for minor surgical procedures to the extremities performed on an ambulatory basis.

Due to this technique it is possible for the patients to remain ambulatory, patient who arrive at the operation theater with full stomach face less danger of aspiration, if they vomit. Post anesthetic nausea,vomiting, and other side effects of general anesthesia such as atelectasis,hypotension, ileus, dehydration and deep vein thrombosis can be reduced[3].

IVRA has advantages of speed of onset, rapid recovery, reliability of blockade and cost effectiveness. However disadvantages include local anesthetic toxicity, poor muscle relaxation, early tourniquet pain, short duration of analgesia and possibility of nerve damage if used for a prolong period of time[4,5].

In this regard, adding Adjuvants to local anesthetics have greatly expanded the potential applications of IVRA by providing faster onset time, better tourniquet tolerance, prolonged post-operative analgesia and improved peri-operative analgesia apart from decreasing the risk

of local anesthetic toxicity[6]. Additive effects of these agents results in greater patient satisfaction, rapid hospital discharge, cost effectiveness and minimal risks.

Various adjuncts, e.g. opioid, nonsteroidal anti- inflammatory drugs, muscle relaxants, neostigmine, ketamine, clonidine, dexmedetomidine, dexamethasone, Calcium channel antagonists and magnesium have been tried to hasten the onset, maintain adequate muscle relaxation, reduce tourniquet pain, and increase the duration of analgesia. Two such LA adjuncts are dexmedetomidine, an α-2 adrenoceptor agonist and verapamil, a Calcium channel antagonist.

Dexmedetomidine is a highly selective α-2 adrenoceptor agonist. It has sympatholytic, sedative, amnestic, analgesic properties. It provides a unique analgesia, without respiratory depression best described as opioid sparing and has cardiovascular stabilising property.

The analgesic properties of α-2-agonists are mediated by supra-spinal (locus ceruleus) and spinal (dorsal horn) mechanisms. Moreover, it decreases sympathetic outflow through a central action in a dose-dependent manner. This inhibitory effect on neurotransmitter release is mediated by the blockage of Calcium entry into nerve terminals.

α -2adrenoceptor agonists are shown to dose dependently enhance the local anesthetic action of lidocaine and prolong its duration. The possible mechanisms for this action proposed are vasoconstriction around the site of injection, resulting in a delay of the absorption of the local anesthetic and a prolonging of the local anesthetic effect. Another mechanism for the action of dexmedetomidine on peripheral nerves may be a direct effect on peripheral nerve activity[7].

In the present study, we have evaluated and compared the effects of adding verapamil or dexmedetomidine to lignocaine for IVRA in distal upper limb surgeries.

Materials and methods

Source of data

The present study was conducted in Krishna Rajendra Hospital of Mysore Medical College and Research Institute, Mysore.

Method of collection of data (including sampling procedure, if any)

After institutional ethical committee approval, this prospective, double blinded and randomised study on IVRA was conducted in Krishna Rajendra Hospital of Mysore Medical College and Research Institute.

Type of study

double blinded randomised prospective study

Sample Size

58 patients

Based on the primary end point of the study, "time needed for first rescue analgesia" with α error 0.05 and power of the study (1−β) =80%, sample size was calculated to be 28 in each study group. The primary outcome variable being postoperative analgesia, assuming that the mean duration of the sensory block of lidocaine is 2 hours, two-tailed α error probability of 0.05 and β error probability of 0.2 (power of 80%); a total sample size of 56 patients was required to detect a presumed minimum clinically significant difference of 10% in the duration of sensory block. Allowing for patients lost to analysis, 60 patients are selected and 30 patients were randomly allocated into two equal groups (30 patients each).

Quantitative variables were analyzed and reported as mean and standard deviation. Demographic data, haemodynamic parameters, surgical duration, and time to onset and recovery of sensory and motor blocks were compared using the Student's t-test. Non-parametric data -VAS scores, both intraoperative and post-operative time to the first analgesia requirement following tourniquet deflation, analgesic consumption intra-operatively and post-operatively, were compared using the Mann–Whiney U test. Categorical variable were analyzed using the Chi-square test. Statistical significance among the groups were evaluated using one-way analysis of variance (ANOVA) followed by application of Bonferronis t test to look for intergroup comparisons.

A $P<0.05$ is considered statistically significant and $P < 0.001$ as statistically highly significant.

Inclusion criteria

Normal adult patients of either sex, aged between 20-60 years belonging to ASA class 1 and 2 with body weight 50-70 kg without any co-morbid diseases admitted for upper limb surgeries (hand and forearm).

Exclusion criteria

1.Patient refusal.
2. Infection at the site Of injection
3. Patient with known coagulopathy or receiving anticoagulants.
4. Patients on treatment with Calcium channel blockers.
5. Patients on treatment with opioids analgesics and gabapentin 24 h before surgery.
6. Patients with Reynaud's disease, sickle cell anaemia or with a history of peripheral neuropathies
7. Patients with severe systemic co morbidities. (respiratory, cardiac, hepatic, renal diseases- coronary artery disease, uncontrolled hypertension, congestive heart failure, presence of cardiac conduction abnormalities) Morbidly obese patients
9. Pregnant and lactating patients
10. Patients with neurological , psychiatric or neurovascular disorders
11. Patients with known hypersensitivity to study drugs.

60 patients aged between 20-60 years with ASA class 1 and 2, posted for distal upper limb surgeries (forearm and hand) were selected for IVRA technique. The study population were randomly divided and assigned by shuffled sealed envelope method in to two groups with 30 patients in each group.

Group LV: will receive IVRA with Lidocaine 0.5% 3mg/kg and Verapamil.

Group LD: will receive IVRA with Lidocaine and dexmedetomidine.

The Study solution was prepared by diluting 3mg/kg of preservative free lidocaine 2% with normal saline to make the total volume up to 40ml (0.5%), to this solution either 2.5mg (1ml) verapamil (Group LV) or 0.5µg/kg Dexmedetomidine (Group LD) was added. This study solution was prepared by a senior anesthesiologist who was involved with the randomization and not involved further in the study. IVRA in the study was given the same anesthesiologist who was the observer too. Thus the observer and the subjects were blinded to the study drugs.

Materials used particularly for IVRA

1. Esmarch's bandage
2. Two electronic pneumatic tourniquet with battery backup.
3. Disposable 50 ml syringe
4. Intravenous (i.v) cannula 20 gauge
5. Lignocaine 2% preservative free.
6. 0.9% saline two ampoules of twenty five ml each.

Fig-1: Necessary equipments for IVRA.

Monitors

1. ECG with heart rate 2. Non invasive blood pressure monitor set to measure every five minutes 3. Pulse oximeter

Pre anaesthesia checkup was done for all the patients and appropriate investigations was done. The procedure was explained to the patients and consent was taken. All the patients were explained about the Visual analogue scoring system prior to the procedure.

A 22G IV cannula was secured on the dorsum of the operative limb. Two pneumatic tourniquet were applied in the arm.

Fig-2: securing of I.V line on the dorsum of operating limb.

Baseline blood pressure and heart rate was noted in all the patients and the mean arterial pressure was calculated. A 20 G I V cannula was secured on the non-operative hand and injection 1MG midazolam injected to all patients.

The limb was exsanguinated with the Esmarch bandage. But in patients where this was not possible because of a wound or pain, the limb was kept elevated for three minutes. The proximal tourniquet was inflated to at least 100 mm Hg above the systolic blood pressure. The Esmarch bandage was removed and the IVRA solution is injected.

Fig-3: Esmarch bandage:exsanguination of operating limb.

Fig-4: Injection of study solution

The following parameters were observed:-

- Onset time of sensory blockade (patients were evaluated every 5 min using the pinprick test.);
- Time for onset of the complete motor blockade (interval between the times of injection of the study solution until the time the patient is not able to move his fingers).

All observations were made in the four major nerve distribution areas (radial, median, ulnar, and musculocutaneous).

Sensory characteristics of the block were assessed using response to pinprick to 23-gauge hypodermic needle using the Hollmen scale.

1. Normal sensation to pinprick.
2. Pinprick felt as sharp pointed but weaker with the same area in other limb.
3. Pinprick recognized as touch with blunt object.
4. no response to pinprick.

A modified Lovett rating scale was used for assessing motor block, ranging from 6 (usual muscular force) to 0 (complete paralysis). Thumbabduction was evaluated for the radial nerve, thumb adduction for the ulnar nerve, thumb opposition for the median nerve and flexion of elbow for the musculocutaneous nerve.

Lovett Rating Scale:[21]

6-Normal muscular force.

5- Slightly reduced muscular force.
4-Pronounced reduction of muscular force
3-Slightly impaired mobility.
2-Pronounced mobility impairment.
1-Almost complete paralysis.
0-Complete paralysis.
Surgery was allowed to start at sensory block scale-3.
After achievement of motor and sensory block, the distal cuff was inflated to 250 mmHg followed by the release of the proximal tourniquet. The tourniquet cuff was deflated after 60 min or at the end of surgery, with total duration not exceeding 90 min.
The time of onset of sensory block is defined as the interval between the injection of drug to Hollmen sensory scale 2.
The duration of the sensory block is defined as the time interval between the complete sensory block and the return of normal sensation (Scale-1).
The onset time of motor block is defined as the time between the completion of the local anesthetic injection and complete paralysis.
The duration of motor block is defined as the time interval between the complete paralysis and complete recovery of motor function.
The time to first analgesic use and total dose of analgesics needed was recorded during the first postoperative 24 h.
Pain was evaluated using the Visual Analog Scale (VAS) where zero represents no pain and 1–3 mild pain, 4–7 moderate pain, and 8–10-severe pain. VAS will be monitored at 2 h, 4 h, 6 h, 8 h, 10 h, 12 h, 18 h, 24 h after surgery. If VAS values are >4, it will be considered that analgesic action of the drugs has terminated and rescue analgesic (iv paracetamol 1 g) will be given. Time to the first dose of rescue analgesia will be noted.
PR, SBP, and DBP will be monitored at every 15 min interval up to 2 h and then at 4 h, 8 h, 12 h, and at 24 h. The level of sedation will be assessed by Ramsay Sedation Score.

Table-1: Ramsay sedation score

Score	Response
1	Anxious or restless or both
2	Cooperative, orientated and tranquil
3	Responding to commands
4	Brisk response to stimulus
5	Sluggish response to stimulus
6	No response to stimulus

This postoperative sedation scoring was performed every four hours until scoring <2 or for 12 h.
The possible side-effects such as drowsiness, pruritus, nausea/vomiting, bradycardia, hypotension, and hypoxemia if any were noted.

- Bradycardia is defined as heart rate less than 60 beats per minute.
- Hypotension is defined as mean arterial pressure less than 30% of the baseline.

In the circumstance of inadequate or patchy block, the block was to be supplemented with general anaesthesia.

After institutional ethical committee approval, this prospective ,double blinded and randomised comparative study on IVRA was conducted in Krishna Rajendra Hospital of Mysore Medical College and Research Institute.
The study population consisted of 60 adult patients belonging to ASA1 and 2 posted for distal upper limb surgeries. They were randomly devided in to 2 groups of 30 each(n=30).
Group LV: received lidocaine 0.5% 3mg/kgdiluted up to 40ml with 2.5mg verapamil.
Group LD: received lidocaine 0.5% 3mg/kgdiluted up to 40ml with dexmedetomidine0.5µg/kg.

Results

Table 2: Distribution of subjects according to sex

	Female	Male	Total
Group LV	8	22	30
	26.7%	73.3%	100%
Group LD	10	20	30
	33.3%	66.7%	100%
Total	18	42	60
	30%	70%	100%

Table 2 shows sex distribution of patients in Groups LV and Group LD. There was no statistically or clinically significant difference found between the groups with respect to Sex. (p value 0.779).

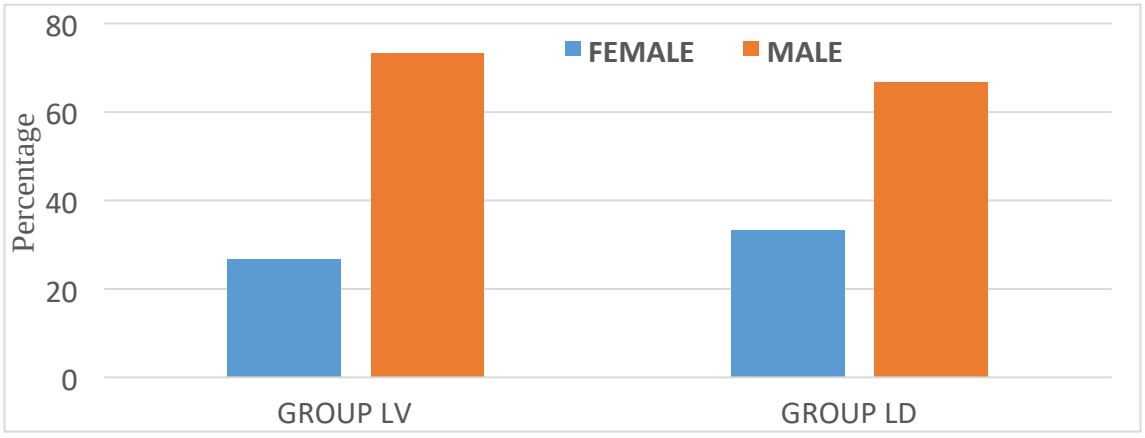

Fig-1:- Graph showing Distribution of subjects according to sex and groups.

Table 3: Comparison of mean age between two groups

	Group LV		Group LD		P Value
	Mean	SD	Mean	SD	
Age(yrs)	36.63	9.89	38.17	9.28	0.538

Table 3 shows age distribution and mean age of patients in Group LV and Group LD. All the patients posted for distal limb surgeries were in the age group of 20-60 years. The mean age in Group LV was 36.63±9.89 years and in Group LD was 38.17±9.28 years the difference in mean age of both groupswas not statisticallysignificant (P value 0.538) .The two groups were more or less homogeneous with respect to age.

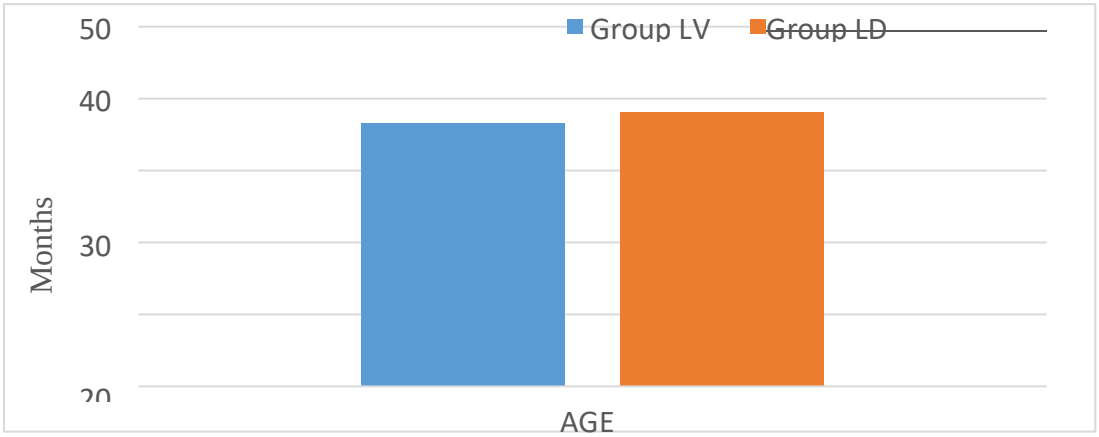

Fig 2:- Graph showing Comparison of mean age between two groups.

Table 4:- Comparison of mean Duration of surgery between two groups

	Group LV		Group LD		P value
	Mean	SD	Mean	SD	
Duration of surgery(min)	71.60	8.36	69.33	6.66	0.250

Table 4 shows duration of surgery in Group LV and Group LD. The mean duration of surgery in Group LV was 71.60±8.36 min and in Group LD was 69.33±6.66 mins, the difference in the duration of surgery between the groups was not statistically significant. (p=0.250)

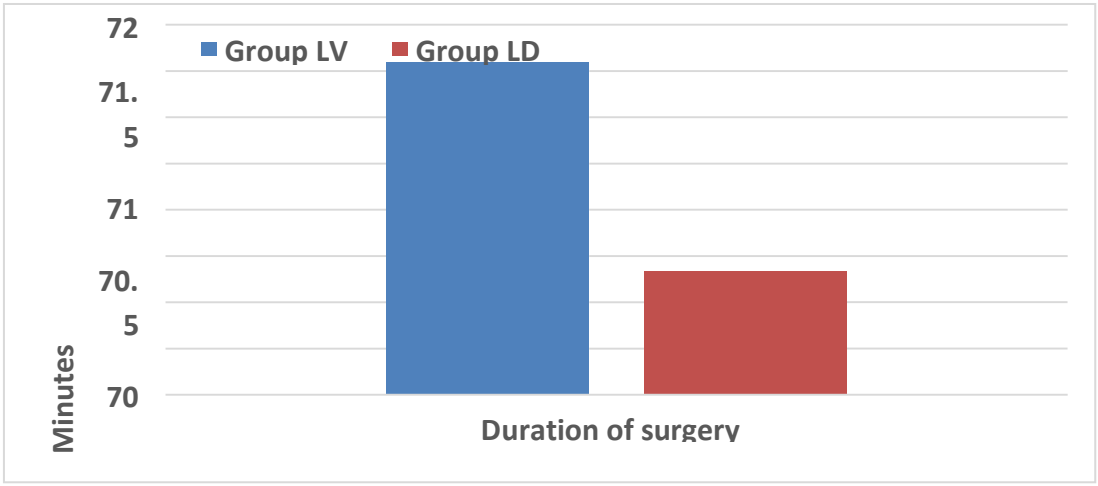

Fig- 3:- Graph showing Comparison of mean Duration of surgery between two groups

Table 5:- Comparison of mean Sensory Onset Time between two groups.

	Group LV		Group LD		P Value
	Mean	SD	Mean	SD	
Sensory OnsetTime(min)	3.38	.44	3.43	.39	0.665

Table 5 shows time of onset of sensory block in Group LV and Group LD. The mean time of onset of sensory block in Group LV was 3.38±0.44mins and in Group LD was 3.43±0.39 mins. There was no statistically significant difference in mean time observed between both the groups (p=0.665)

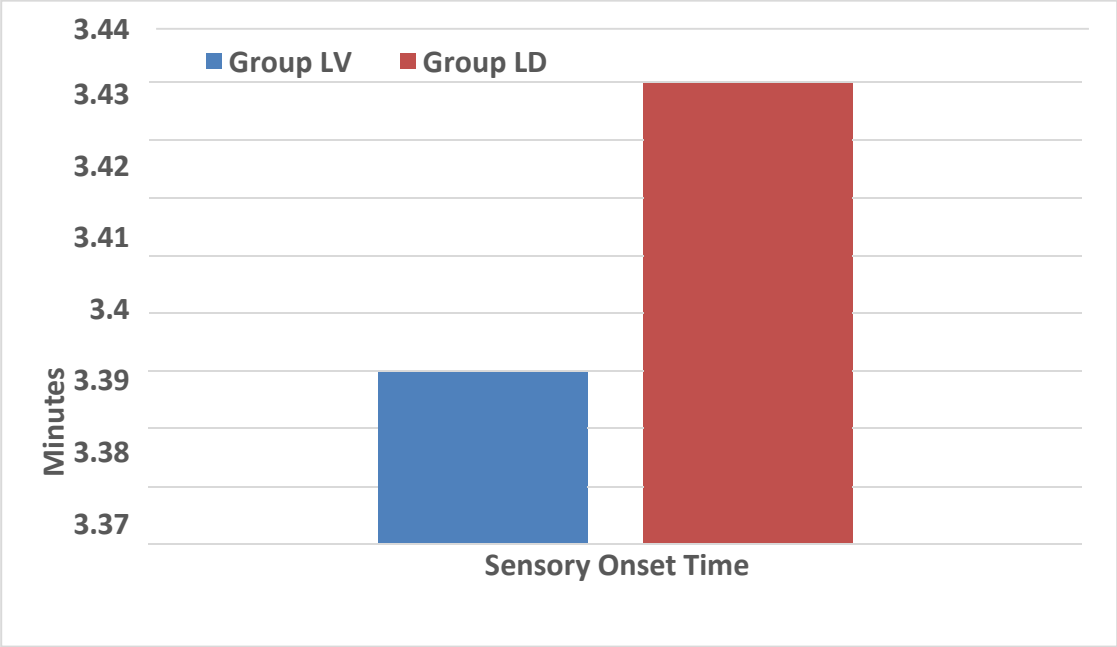

Figure 4: time of onset of sensory block

Table 6:- Comparison of mean Motor Onset Time between two groups.

	Group LV		Group LD		
	Mean	**SD**	**Mean**	**SD**	**P Value**
Motor Onset Time(min)	8.77	.74	9.44	.77	**0.001**

Table 6 shows time of onset of motor block in Group LV and Group LD. The mean time of onset of motor block in Group LV was 8.77±0.74mins and in Group LD was 9.44±0.77 mins. The difference in the mean time of onset of motor block between the two groups was highly significant (p=0.001).

Table 7: shows time of recovery of sensory block in Group LV and Group LD

	Group LV		Group LD		
	Mean	**SD**	**Mean**	**SD**	**P Value**
Sensory recoverytime(min)	17.89	1.66	8.76	.94	**<0.001**

Table 7 shows time of recovery of sensory block in Group LV and Group LD. The mean time of sensory block recovery in Group LV was 17.89±1.66mins and in Group LD was 8.76±0.94mins. The difference in the mean time of recovery of sensory block between the two groups was highly significant (p<0.001).

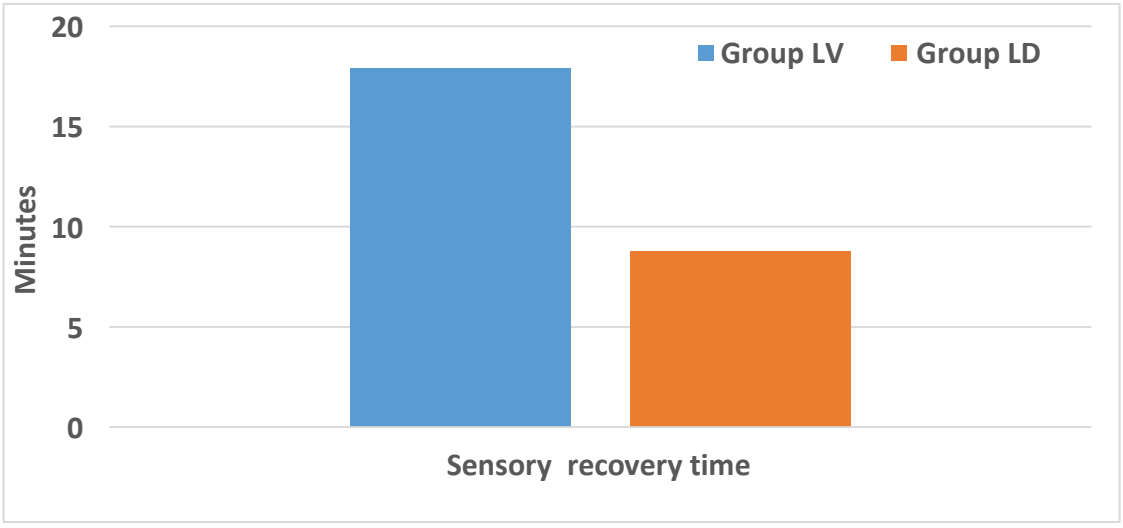

Fig 5: time of recovery of Sensory block

Table 8: Comparison of mean Motor recovery time between two groups

	Group LV		Group LD		P Value
	Mean	SD	Mean	SD	
Motor recovery time (min)	9.45	.83	15.76	0.83	<0.001

Table 8 shows time of recovery of motor block in Group LV and Group LD. The mean time of motor block recovery in Group LV was 9.45±0.83mins and in Group LD was 15.76±0.83mins. The difference in the mean time of recovery of motor block between the two groups was highly significant (p<0.001).

Table 9: Comparison of mean Second tourniquet pain between two groups

	Group LV		Group LD		P value
	Mean	SD	Mean	SD	
Second tourniquetpain(min)	49.27	2.32	51.60	2.25	**<0.001**

Table 9 shows onset of second tourniquet pain in Group LV and Group LD. The mean time of onset of second tourniquet pain in Group LV was 49.27±2.32mins and in Group LD was 51.60±2.25mins. The difference in the mean duration of onset of tourniquet pain between both the groups was statistically highly significant. (p<0.001)

Table 10:Comparison of mean Duration of Analgesia between two groups

	Group LV		Group LD		P value
	Mean	SD	Mean	SD	
Duration OfAnalgesia(min)	253.70	18.29	181.68	13.74	**<0.001**

Table 10 shows total duration of analgesia (requirement of first rescue analgesic) in Group LV and Group LD. The mean duration of analgesia in Group LV was 253.70±18.29 mins and in Group LD was 181.68±13.74mins. The difference between the two group with respect to the duration of analgesia was highly significant (p<0.001).

Table 11:Comparison of heart rate between two groups at various time interval

Heart Rate	Group LV		Group LD		P Value
	Mean	SD	Mean	SD	
Before Tourniquet	83.37	5.35	82.83	5.92	0.716
5min	82.07	6.34	83.37	5.35	0.394
10min	82.83	5.92	82.97	5.60	0.929
15min	81.80	6.09	81.80	6.09	1.00
20min	82.20	5.63	81.73	5.91	0.755
30min	81.73	5.91	82.73	4.98	0.481
40min	82.73	4.98	82.97	5.60	0.865
60min	82.97	5.60	82.83	5.92	0.929
After Tourniquet Release	82.20	5.63	82.97	5.60	0.599

Table 11 shows the mean heart rate per minute at various time intervals in Group LV and Group LD. No significant difference was observed in mean heart rate between thetwo groups at various time intervals. (p>0.05)

Table 12:- Comparison of systolic Blood pressure between two groups at various time intervals

SBP	Group LV		Group LD		P value
	Mean	SD	Mean	SD	
Pre-op	131.87	21.21	129.80	13.67	0.655
5min	125.27	9.81	125.27	9.81	1.00
10min	127.33	17.60	124.27	4.92	0.366
15min	122.60	3.83	122.60	3.83	1.00
20min	117.87	8.32	117.87	8.32	1.00
30min	121.53	11.26	119.07	4.65	0.135
40min	113.47	7.39	113.47	7.39	1.00
60min	123.00	14.62	119.47	2.03	0.097
After Tourniquet Release	125.40	4.07	125.40	4.07	1.00

Table 12 shows the mean systolic blood pressure at various time intervals in Group LV and Group LD. No significant difference was observed in mean systolic blood pressure between the two groups at various time intervals. (p>0.05

Table 13:-Comparison of diastolic Blood pressure between two groups at various time intervals

DBP	Group LV		Group LD		P Value
	Mean	SD	Mean	SD	
Pre-op	83.50	11.96	79.53	7.69	0.064
5min	71.83	6.58	71.83	6.58	1.00
10min	81.07	12.23	76.73	4.97	0.077
15min	77.33	4.30	77.33	4.30	1.00

20min	75.33	4.18	75.33	4.18	1.00
30min	78.17	9.50	76.00	7.43	0.07
40min	80.00	2.52	80.00	2.52	1.00
60min	77.50	10.52	77.80	2.80	0.881
After Tourniquet Release	81.40	2.42	81.40	2.42	1.00

Table 13 shows the mean diastolic blood pressure at various time intervals in Group LV and Group LD. No significant difference was observed in mean diastolic blood pressure between the two groups at various time intervals. (p>0.05)

Table 14-Comparison of MAP between two groups at various time intervals

MAP	Group LV		Group LD		P value
	Mean	SD	Mean	SD	
Pre-op	99.50	14.78	97.23	7.74	0.229
5min	89.50	6.15	89.50	6.15	1.00
10min	96.93	12.90	92.50	4.93	0.084
15min	92.23	3.40	92.23	3.40	1.00
20min	88.13	.97	88.13	.97	1.00
30min	91.60	9.06	89.77	5.48	0.174
40min	91.23	2.34	91.23	2.34	1.00
60min	92.27	10.68	90.40	2.63	0.356
After Tourniquet Release	96.30	2.02	96.30	2.02	1.00

Table 14 shows the mean arterial pressure at various time intervals in Group LV and Group LD. No significant difference was observed in mean arterial pressure between the two groups at various time intervals. (p>0.05)

Table 15:- Comparison of SPO2 between two groups at various time intervals.

SPO2	Group LV		Group LD		P Value
	Mean	SD	Mean	SD	
5min	99.30	.53	99.30	.53	1.00
10min	98.37	.49	98.37	.49	1.00
15min	99.10	.88	99.10	.88	1.00
20min	99.20	.71	99.20	.71	1.00
30min	99.40	.62	99.40	.62	1.00
40min	98.87	.73	98.87	.73	1.00
60min	99.43	.63	99.43	.63	1.00
After Tourniquet Release	99.33	.55	99.33	.55	1.00

No significant difference between Group LV and Group LD with respect to oxygensaturation throughout the procedure.(p>0.05)

Table 16:- Comparison of Ramsay Sedation score between groups.

	Group LD		Group LV		P Value
	Mean	SD	Mean	SD	
0HR	1.00	.00	1.00	.00	Not applicable
1HR	1.56	.50	1.00	.00	<0.001
2HR	2.50	.51	1.48	.50	<0.001
4HR	1.60	.49	1.40	.49	0.057.
6HR	1.00	.00	1.00	.00	Not applicable
12HR	1.00	.00	1.00	.00	Not applicable
24HR	1.00	.00	1.00	.00	Not applicable

Table 16 shows modified Ramsay sedation scores at various time intervals between the Group LV and Group LD. Sedation scores were comparable between the groups at all the time period except for the first 2hr after tourniquet deflation, during which Group LD was statistically highly significant (p<0.001) than in Group LV.

Discussion

The present study titled "a prospective randomised comparative study of verapamil (2.5mg) or dexmedetomidine (0.5µg/kg) as adjuvants to lidocaine in intravenous regional anaesthesia for distal upper limb surgeries", Was conducted in Krishna Rajendra hospital, a teaching hospital of Mysore medical college and Research institute Mysore from November 2017 to October 2019. Due to the special anatomical nature of the nerves supplying the upper and lower extremities by the spinal nerves forming a plexus, anesthesia for surgeries on the extremities presence an unique opportunity for the use of regional aesthesia techniques. In the upper limb, the brachial plexus can be approached at various levels depending upon the surgical site and the dermatomes to be blocked. While these plexus blocks provide adequate perioperative analgesia, they are technically difficult, require accurate identification of land marks and peri -neural deposition of the anesthetics and other adjuvants. These plexus blocks may not be an idea of choice for minor surgical procedures in the forearm, wrist and hand in the ambulatory settings. The alternative regional analgesic option available for such situations in such settings is the intravenous regional aesthesia (IVRA). This technique was first used by the German surgeon august KG bier. After arterial occlusion by using pressure to the proximal extremity he injected prilocaine intra venouslyinto the limb isolated from systemic circulation to alleviate various pain states. Ransohoff in 1908 applied the method but introduced the agents intra arterially. Leriche used intra venous local aesthetics (1935) for the treatment of various vascular disturbances. But the credit for popularising IVRA goes to holmes (1963) who used lidocaine as the local anesthetic and by his careful attention to technical details, he named the technique as Bier's block[8]. IVRA is technically simple and reliable with success rates between 94%-98%.1The other advantageous of IVRA with lidocaine include rapid onset , good muscle relaxation ,cost effectiveness, reduced operating

room time, early ambulatory patient discharge, controllable extent of anesthesia and avoidance of polypharmacy of general anesthesia [4,5].In the present study patients with 0.5µg/kg Dexmedetomidine in IVRA, the complete recovery from motor block occurred in 15.76±0.83min after tourniquet deflation. Of the few literature available studying this parameter in IVRA, Memis D et al (8±3min), Abdelkader AA et al126 (6±0.7min) have observed a faster recovery times with 0.5µg/kg Dexmedetomidine in IVRA. The lower volume (25ml) of LA solution used by Abdelkader AA et al may have been a factor in early motor recovery. Even with 1µg/kg Dexmedetomidine, Sardesai SP et al103 (9.53±1.07min), Elramely Met al (10.3±1.2min) , Esamoglue et al (5.4±1.7min) have obtained a faster motor recovery time. In the present study there were no major haemodynamic alterations in all subjects in both the Groups perioperatively as evidenced by the monitored parameters of HR, MAP, SPO2. This hemodynamic stability is due to the lowest safe dose of adjuvants used in IVRA and adhering to the protocol of release of tourniquet 30 min after inflation or at the end of surgery[9].

Side effects

In our present study no significant side effects related to verapamil or Dexmedetomidine were evidenced. In the study by Esmat IM et al use of 5mg of verapamil was associated with increased incidence of side effects like bradycardia, nausea, vomiting, drowsiness and paraesthesia and he concluded that use of 2.5 mg of verapamil is both effective and safe dose for IVRA. Lack of any side effects in our study may be due to the use of low dose verapamil and Dexmedetomidine which are effective and safe[10].

Conclusion

The present study demonstrates that, for surgeries of distal upper limb, 0.5% lidocaine (3mg/kg) with either verapamil (2.5mg) or Dexmedetomidine 0.5µg/kg through Intravenous Regional Anaesthesia provides adequate intraoperative analgesia and motor block without significant side effects. Though Dexmedetomidine provides better tourniquet tolerance, duration of analgesia is significantly prolonged by verapamil. Hence verapamil appears to be a better adjuvant to local anaesthetic in IVRA than Dexmedetomidine.

Conflict of Interest: Nil
Source of support: Nil

References

1. Brown BL, Fink BR. The history of neural blockade and pain management. In: Cousins MJ, Bridenbaugh PO (Eds.). Neural Blockade in Clinical Anaesthesia and Management of Pain, 3rd ed. Philadelphia: Lippincott- Raven, 1998: 3–34.
2. Holmes C. Intravenous regional anesthesia: a useful method of providing analgesia in the limbs. Lancet. 1963; 1: 245-7.
3. Brown DL, Birdenbaugh DL, cousins MJ, Bridenbaugh PO 3rd ed.: Neural Blockade; 1998; 10: 345-6.
4. McDonald S. Intravenous regional anaesthesia. In: Mulroy MF BC, McDonald SB, Salinas FV, editors. A Practical Approach to Regional Anesthesia.4th ed. Philadelphia, PA: Lippincott Williams & Wilkins;2009:203–9.
5. Chilvers CR, Kinahan A, Vaghadia H, Merrick PM. Pharmaco-economics of intravenous regional anaesthesia vs general anaesthesia for outpatient hand surgery. Can J Anesth 1997; 44: 1152–6.
6. Brown EM, McGriff JT, Malinowski RW. Intravenous regional anaesthesia (Bier block): review of 20 years' experience. Can J Anesth. 1989; 36(3 Pt 1):307–310.
7. Yoshitomi T, Kohjitani A, Maeda S, Higuchi H, Shimada M, Miyawaki T. Dexmeditomidine enhances the local anaesthetic action of lidocaine via an alpha-2A adrenoceptor. Anaesth Analg 2008;107:96-101.
8. Kamibayashi T, Maze M. Clinical uses of alpha-2-adrenergic agonists. Anesthesiology 2000; 93:1345–1349.
9. Fassoulaki A, Zotou M. Nitrous oxide enhances the level of sensory block produced by intrathecal lidocaine. Anesth Analg 1997; 85:1108–11.
10. Smith FL, Davis RW, Carter R. Influence of Voltage-sensitive Ca (++) channel drugs on bupivacaine infiltration anaesthesia in mice. Anaesthesiology 2001; 95: 1189-97.