*Original Research Article*

Indian Journal of Anesthesia and Analgesia
2018; 5(6): 957-962
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.5618.13

# Comparision of Fentanyl and Dexmedetomidine when Added to Lignocaine in Intravenous Regional Anesthesia

**Kiran A.V.[1], Bhaskar Babu B.D.[2]**

[1]Associate Professor, Department of Anaesthesia, Mandya Institue of Medical Sciences, Mandya, Karnataka 571401, India.
[2]Associate Professor, Department of Anaesthesia, Sapthagiri Institute of Medical Sciences, Bengaluru, Karnataka 560090, India.

**Abstract**

*Background:* Introduction-Intravenous regional anesthesia (IVRA) is a simple,reliable and cost effective technique for surgeries involving the distal arm.It has the advantage of speed of onset,rapid recovery, reliability of blockade and cost effectiveness. Various adjuvants have been added to local anesthetics to increase the speed of onset and duration of post operative analgesia.The aim of the present study is to compare the effects of adding fentanyl versus dexmedetomidine to lignocaine during IVR. *Materials and Methods:* This study included 60 patients of ASA class 1 and 2 of either sex aged between 20-50 years scheduled for various upper limb surgeries.Patients were randomly divided in to two groups of 30 each.Group LF received 40ml of 0.5% lignocaine with fentanyl 2µg/kg and group LD received 40ml of 0.5% lignocaine with dexmedetomidine 1µg/kg. Postoperative pain score was recorded using Visual Analogue Scale (VAS). Injection paracetamol 1gram intravenous infusion was given as rescue analgesic when VAS score reached >4. Duration of postoperative analgesia was noted from deflation of torniquet to VAS score of 4. Patients were observed for adverse effects like skin rash,bradycardia and sedation intraoperatively and postoperatively following torniquet deflation in both the groups. *Result:* Earlier onset time of both sensory block (4.80±0.60min)and motor block (8.60±3.20min)were noted in group LD compared to sensory block(6.82±1.50min)and motor block (10.80±1.20min)in group LF.Postoperative analgesia was also considerably prolonged in group LD(350.52±42.5min)compared to group LF(204.42±32.5min). Adverse effects like bradycardia and sedation were noted in two and four number of patients respectively in group LD. *Conclusion:* The addition of 1µg/kg dexmedetomidine to lignocaine when compared to 2µg/kg fentanyl in IVRA reduces the time for onset of block, increases the duration of block. Improves quality of anarsthesia prolonged post operative analgesia and reduced rescue analgesia requirement.

**Keywords:** Fentanyl; Dexmedetomidine; IVRA; Lignocaine.

## Introduction

International Association for Study of Pain (IASP)defines pain as –An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage [1]. IVRA is a technically simple and reliable method which can be performed in outpatient extremity suegeries lasting less than one hour[2] with success rates between 94-98% [3].

The main disadvantages include the torniquet pain and inability to provide postoperstive analgesia [4]. Various studies are being done with the aim of decreasing the torniquet pain and improving the duration of postoperative analgesia by adding various adjuvants [5] to LA such as ketamine [6], opioids [7], alpha adrenergic agonists [8] etc. Addition of opioids (morphine) as adjuvant to lidocaine has been shown to improve postoperative analgesia and sensory block with little effect on torniquet pain, motor block quality, analgesia duration or analgesic consumption [7]. Dexmedetomidine an $\alpha_2$-adrenoceptor agonist has a ratio of selectivity towards $\alpha_2/\alpha_1$receptors of 1620:1 with more potent neurological and less

**Corresponding Author: Bhaskar Babu B.D.,** Associate Professor, Department of Anaesthesia, Sapthagiri Institute of Medical Sciences, Bengaluru, Karnataka 560090, India.
E-mail: bhaskarbidarkere@yahoo.in

**Received on** 21.02.2018, **Accepted on** 31.03.2018

cardiovascular effects [8]. Dexmedetomidine-lignocaine mixture used in IVRA has been shown to improve the quality of anesthesia,reduce torniquet pain and post operative analgesia requirement [9]. Our present study was done to compare the effects of adding either fentanyl or dexmedetomidine to lignocaine for IVRA.

## Materials and Methods

This prospective randomized was conducted after obtaining clearance from institutional ethical committee and informed written consent from all the patients. Sixty patients of either sexes aged between 20 and 50 years with ASA physical status 1 or 2 scheduled for elective and emergency upper limb procedures lasting less than 90 minutes were included in this study. Exclusion criteria included history of drug allergy/hypersensitivity to LA, patients with severe peripheral vascular and neurological disease, patients with hemolytic disease like sickle cell anemia, hypertension, diabetes mellitus, liver disease and kidney disease.

### *Design of the Study*

Patients were randomly divided in to two groups (30 patients each)

Group LF-received 40ml of 0.5% lignocaine (preservative free) with fentanyl 2µg/kg in 2.0ml to make final volume to 42ml.

Group LD-received 40ml of 0.5% lignocaine (preservative free) with dexmedetomidine 1µg/kg in 2.0ml to make final volume to 42ml.

### *Technique*

Premedication was not given to any patients. Resuscitation equipments and emergency drugs were kept ready to deal with any complications during the procedure. Monitoring with pulse rate, non invasive blood pressure, electrocardiogram and pulse oximetry were started. Intravenous line was secured in the contralateral arm with either 18G or 20G cannula. Another 22 Gcannula was secured on the operating limb for injecting the drug in a peripheral vein distal to the operative site preferably on the dorsum of the hand.

Esmarch bandage was used for exsanguination of the operative arm and a premature torniquet was placed around the upper arm followed by the inflation of proximal cuff to 250mmHg. It was confirmed by the absence of radial pulse and circulation in the arm followed by the loss of waveform tracing in pulse oximetry in the ipsilateral arm. Then a dose of 40ml lignocaine 0.5% with fentanyl 2µg/kg (2ml) or dexmedetomidine 1µg/kg (2ml) was injected slowly depending on the group mentioned earlier.

### *Assessment of Sensory Blockade*

After injecting the drug, the sensory block was assessed every 30 seconds starting 2 minutes after injection until complete sensory block was established in the dermatomal distribution of the ulnar, median and radial nerves by a pinprick sensation in all the three skin areas was considered as complete sensory block.

### *Assessment of Motor Block*

Motor function was evaluated by adding the patient to flex and extend his wrist and fingers. Inability to do so was taken as motor blockade.

Distal cuff was inflated to 250mmHg after 20 minutes to drug injection followed by deflation of the proximal cuff so as to avoid torniquet pain. After that the surgeons were allowed to proceed. Following the completion of surgery, torniquet cuff is deflated with repeated deflation inflation technique. The cuff was not deflated until 30 minutes after LA injection even if surgery was completed and not inflated more than 90 minutes. Patients were observed 30 minutes after surgery.

### *Assessment of Quality of Block*

The quality of overall block was assessed according to the grading described by Ware. R.J. (1979) as follows-

1. Excellent-Complete anesthesia(lack of any sensation to pinprick and no movements of wrists/fingers)
2. Good-Complete anesthesia (touch sensation may be preserved but no pain to pin prick and minor movement of fingers.
3. Fair-Adequate anesthesia (slight discomfort but tolerabla without any supplementation)
4. Poor-Inadequate anesthesia (requiring supplementation with either sedative systemic analgesics or general anesthesia).

### *Assessment of Postoperative Pain*

Postoperatively, VAS was used for recording the pain score which varies between 0-10 (0-no pain to

10-most severe pain).Injection Paracetamol 1g i.v. infusion was given as rescue analgesic when VAS score reached >4. Duration of postoperative analgesia was noted from deflation of torniquet to VAS score of 4.

Patients were also observed for any possible side effects like skin rash, bradycardia, sedation and hypotension intraoperatively and postoperatively following torniquet deflation in both the groups.

*Statistical Analysis*

All recorded data were entered using MS Excel and analyzed using SPSS 22 version software for determining the statistical significance.

Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean SD and results on categorical measurements are presented in Number (%). Student t test (two tailed, independent) has been used to find the significance of study parameters between two groups. Chi-square test was used to test the association.

"p" value of >0.05 was considered not to be statistically significant, <0.05 was considered to be statistically significant, a value of <0.01 was highly statistically significant & a "p" value of <0.001 was considered as extremely statistically significant.

*Sample Size*

Total Sample Size is studied is 60, and 30 in each group.

## Results

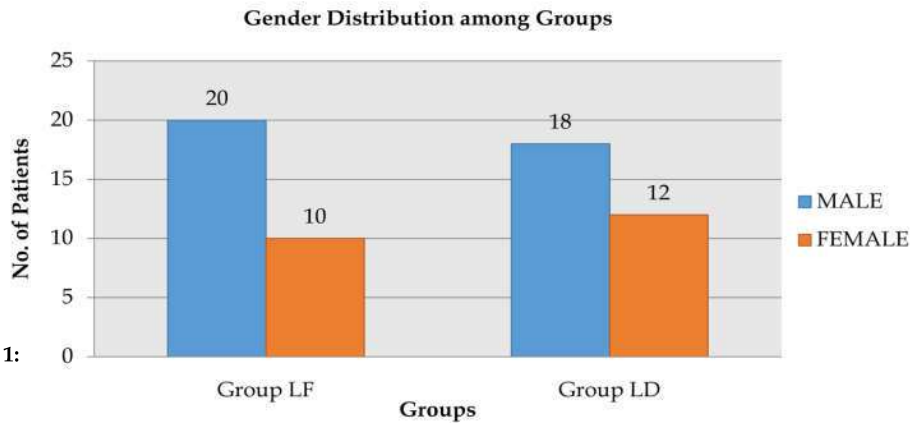
In Group LF, out of 30 patients, the maximum number of patients (40%) was noted in the two age groups of 30- 40 and 40-50 years, followed by 20% in the age group 20-30 years. With mean 37 and SD 7.5 years. In Group LD, out of 30 patients, the maximum number of patients (46.7%) was noted in the age group of 30- 40 and 40-50 years, followed by 36.7% in the age group 40-50 years and 16.7% of the study subjects were in the age group 20-30 years.

**Table 1:** Age-Distribution of Patients

| Age (years) | Group LF | | Group LD | |
|---|---|---|---|---|
| | No. | % | No. | % |
| 20-30 | 6 | 20.0 | 5 | 16.7 |
| 30-40 | 12 | 40.0 | 14 | 46.7 |
| 40-50 | 12 | 40.0 | 11 | 36.7 |
| Total | 30 | 100.0 | 30 | 100.0 |
| Mean ± SD | 37 ± 7.5 | | 37 ± 7.0 | |
| | t-statistic = 0.000 | | p value = 1.000 | |

**Table 2:** Gender-Distribution of Patients

| Gender | Group LF | | Group LD | |
|---|---|---|---|---|
| | No. | % | No. | % |
| Male | 20 | 66.7 | 18 | 60.0 |
| Female | 10 | 33.3 | 12 | 40.0 |
| Total | 30 | 100.0 | 30 | 100.0 |
| | Chi-square = 0.2871 | | p value = 0.5920 | |




**Graph 1:**

With mean 37 and SD 7 years. Since p >0.05 was considered not to be statistically significant (Table 1).

In Group LF, out of 30 patients, the maximum number of patients (66.7%) were male and 33.3% were females. In Group LD, out of 30 patients, the maximum number of patients (60.0%) were male and 40.0% were females. Since p>0.05 the result is not significant, there is an association between Gender and Groups. (Table 2 and Graph 1).

In Group LF, out of 30 patients, the maximum number of patients (33.3%) were in group 45- 50 kg, followed by 26.7% in the group 50-55 kg, and 20% of patients were in two groups 40-45 and 55-60 kg. With mean 49.8 and SD 13.8 kg. In Group LD, out of 30 patients, the maximum number of patients (40%) were in group 45-50 kg, followed by 30% in the group 45-50 kg, and 16.7% patients were found in 55-60 kg and 13.3% were in 40-45kg. With mean 50 and SD 13.8 kg. Since p>0.05 was considered not to be statistically significant (Table 3).

In Group LF, Quality of Block, 66.7% were Excellent, 26.7% were Good and 6.7% Fair. In Group LD, Quality of Block, 70% were Excellent, 23.3% were Good and 6.7% Fair. There were no Poor qualities in both the groups. (Table 4 and Graph 2).

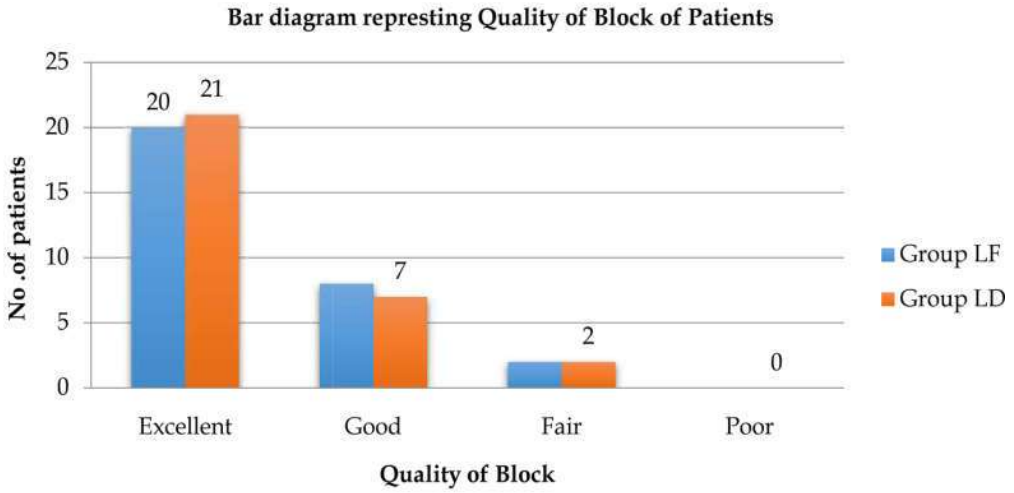
Surgery time (min) and Time of torniquet application (min) were staistically not significant. Sensory block onset time, motor block onset time,

**Table 3:** Weight-Distribution of Patients

| Weight (kg) | Group LF | | Group LD | |
|---|---|---|---|---|
| | No. | % | No. | % |
| 40-45 | 6 | 20.0 | 4 | 13.3 |
| 45-50 | 10 | 33.3 | 12 | 40.0 |
| 50-55 | 8 | 26.7 | 9 | 30.0 |
| 55-60 | 6 | 20.0 | 5 | 16.7 |
| Total | 30 | 100.0 | 30 | 100.0 |
| Mean ± SD | 49.8 ± 13.8 | | 50 ± 13.8 | |
| | t-statistic = 0.0561 | | p value = 0.9554 | |

**Table 4:** Quality of Block of Patients

| Quality of Block | Group LF | | Group LD | |
|---|---|---|---|---|
| | No. | % | No. | % |
| Excellent | 20 | 66.7 | 21 | 70.0 |
| Good | 8 | 26.7 | 7 | 23.3 |
| Fair | 2 | 6.7 | 2 | 6.7 |
| Poor | 0 | 0.0 | 0 | 0.0 |
| Total | 30 | 100.0 | 30 | 100.0 |




**Graph 2:**

**Table 5:** Comparison of Parameters between the Groups

| Parameters | Mean ± SD | | t-statistic | p value |
|---|---|---|---|---|
| | Group LF | Group LD | | |
| Surgery time (min) | 44.0 ± 16.8 | 48.2 ± 14.2 | 1.0458 | 0.3000 |
| Time of torniquet application (min) | 54.0 ± 10.2 | 58.2 ± 8.8 | 1.7076 | 0.0931 |
| Sensory block onset time (min) | 6.82 ± 1.50 | 4.8 ± 0.6 | 6.8484 | 0.0001 |
| Motor block onset time (min) | 10.80 ± 1.20 | 8.60 ± 3.20 | 3.5258 | 0.0008 |
| Duration of postoperative analgesia (min) vas >4 | 204.42 ± 32.25 | 350.52 ± 42.5 | 14.9993 | 0.0001 |

duration of postoperative analgesia (min) vas Ã4 were statistically significant. (Table 5)

The two groups were comparable in respect of their distribution in age, gender and weight (Table 1, 2 & 3). Though the parameters like surgery and torniquet application time were statistically not significant, other parameters like sensory onset time (6.82±1.50 min in LF v/s 4.80±0.6 min in LD), motor block onset time (10.80±1.20 min in LF v/s 8.60±3.20 min in LD), duration of postoperative analgesia with VASÃ4 (204.42±32.25 min in LF v/s 350.52±42.5 min in LD) were statistically significant between the two groups (Table 5). Quality of block was excellent (66.7% in LF v/s 70% in LD), good (26.7% in LF v/s 23.3% in LD) and fair (6.7% in both the groups) with no reported poor quality of block (Table 4). The notable side effects reported in LD group include sedation in four patients and bradycardia (HR<50/min) in two patients which was reversed with injection atropine 0.6mg intravenously.

## Discussion

Intravenous Regional Anesthesia (IVRA) is a simple and reliable method of providing anesthesia for extremity surgery. The administration of IVRA requires only the skill to perform a venipuncture. Limitation of IVRA has been torniquet pain and the inability to provide postoperative analgesia as compared to peripheral nerve blocks [10].

To improve the quality of IVRA as well as to prolong the duration of postoperative analgesia,the addition of various drugs to local anesthetics with controversial results such as tramadol [11], clonidine [12], neostigmine [13] and NSAIDS. Recent studies have been tried with use of α2-agonists like clonidine and dexmedetomidine as adjuncts in IVRA.The use of α2-agonists improves the quality of IVRA mainly through their action at the central and peripheral sites [15].

Addition of dexmedetomidine to lignocaine in IVRA in a randomized controlled study by Kumar A, Sharma DK,Dutta B showed the onset of sensory block to be 4.3±0.6 seconds which was comparable to our study with onset at 4.8±0.6 seconds. Memis D,Turan A et al studied the addition of 0.5µg/kg of dexmedetomidine to lignocaine and their results were almost identical to our study in sensory block onset time(5±2 min) and motor block onset time (10±4 min). Our results were also comparable to the results of the study conducted by Chatrath V, Sharan R et al in terms of onset of sensory block (4.85±0.49 min) and motor block (10.91±0.6 min) by adding 1µg/kg of dexmedetomidine to lignocaine [17]. Sertoz N, Kocauglu N et al in their study of adding 2ml (100µg) fentanyl to lignocaine in IVRA resulted in the sensory block onset time of 6.73±1.49 min and motor block onset time of 8.73±1.58 min which was almost comparable to our study [18].

Dubey K, Paddalwar S, Chandak A in their study of adding 1µg/kg fentanyl to lignocaine in IVRA obtained the sensory block onset time of 7.13±0.81 min and motor block onset time of 11.90±1.18 min. Our results were of slightly earlier onset because of addition of 2µg/kg of fentanyl [19]. Our study concluded that addition of 1µg/kg of dexmedetomidine to 40 ml of 0.5% lignocaine resulted in faster sensory and motor block onset time with considerable increase in the duration of postoperative analgesia compared to addition of fentanyl 2µg/kg to 40 ml of 0.5% lignocaine in IVRA for upper limb surgeries.

## Conclusion

The addition of 1µg/kg dexmedetomidine to lignocaine when compared to 2µg/kg fentanyl in IVRA reduces the time for onset of block, increases the duration of block. Improves quality of anarsthesia prolonged post operative analgesia and reduced rescue analgesia requirement.

## References

1. Mersky H. Pain terms: A list with definition and notes on usage. Recommended by the IASP subcommittee on Taxonomy. Pain. 1979;6:249-252.

2. Candido KD, Winnie AP. Intravenous regional block for upper and lower extremity surgery, ed: Hadzick A-Textbook of Regional Anesthesia and Acute Pain Management, 2.Ed, NewYoork, McGraw-Hill Professional 2007;565-578.
3. Brown EM, McGriff JT, Malinowski RW. Intravenous Regional Anesthesia(Bier Block):review of 20 years experience.Can J Anesth 1989;36:307-10.
4. Johnson CN. Intravenous regional anesthesia: new approaches to an old technique. CRNA 2000;11: 57-61.
5. Khanna P, Arora MK, Sunder RA. Adjuvants for IVRA. J Anaesth Clin Pharmacol. 2010;26(3):287-91.
6. Viscomi CM, Friend A, Parker C et al. Ketamine as an adjuvant in lignocaine intravenous regional anesthesia: A randomized,double blind,systemic control trial.Reg Anesth Pain Med 2009;34:130-133.
7. Aslan B, Izdes S, Kesimci E et al. Comparison of the effects of lignocaine, lignocaine plus tramadol and lignocaine plus morphine for intravenous regional anesthesia. Agri, 2009;21:22-28.
8. Virtanen R, Savola JM, Saano V, Nyman L. Characterization of selectivity, specificity and potency of medetomidine as a alpha2-adrenoceptor agonist. Eur J Pharmacol 1988;150:9-14.
9. Memis D, Turan A, Karamanlioglu B et al. Adding dexmedetomidine to lignocaine for intravenous regional anesthesia. Anesthesia Analg, 2004;98: 835-840.
10. Gupta A, Mahobia M, Narang N, Mahendra R.A comparative study of two different doses of dexmedetomidine as adjunct to lignocaine in Intravenous Regional Anesthesia of Upper Limb Surgeries. International Journal of Scientific Study June 2014; 2(3):53-62.
11. So KY, Kim HJ, Go WS. Intravenous Regional Anesthesia using mepivacaine and tramadol. Korean J Anesthesiol 2002 Feb;42(2):172-176.
12. Gentili M, Bernard J-M, Bonnet F. Adding clonidine to lignocaine for IVRA prevents torniquet pain.Anesth Analg 1999;88:1327-30.
13. Kyu Sik Kang, Sung Hak Jung, Ki Ryang Ahn et al. The effects of neostigmine added to ropivacaine for IVRA. Korean Journal of Anesthesiology 2004 Nov; 47(5):649-654.
14. Steinberg RB, Reuben SS, Gardner G. The dose response relationship of ketorolac as a component of IVRA with lignocaine. Anesth Analg 1998;86:791-793.
15. Kamibayashi T,Maze M.Clinical use of alpha-2-adrenergic agonists.Anesthesiology 2000;93:1345-1349.
16. Kumar A, Sharma DK, Datta B. Addition of ketamine or dexmedetomidine to lignocaine in IVRA: A randomized controlled study JOACP 2012;28(4):501-504.
17. Chatrath V, Sharan R, Rajana et al. Comparative evaluation of adding clonidine versus dexmedetomidine to lignocaine during Bier 2s block in upper limb orthopedic surgeries. J of Evolution of Med and Dent Sci 2014; 74(3):15511-20.
18. Sertoz N, Kocaoglu N et al. Comparison of lornoxicam and fentanyl when added to lignocaine in IVRA. Rev Bras Anestesiol 2013;63(4):311-16.
19. Dubey K, Paddalwar S, Chandak A. A comparative double blind study of tramadol and fentanyl as adjuvants to lignocaine for IVRA for forearm orthopedic surgeries. Indian Journal of Pain 2014;28(1):29-34.