

**LEVOBUPIVACAINE VS LEVOBUPIVACAINE WITH
DEXAMETHASONE ON THE DURATION OF POST
OPERATIVE ANALGESIA IN POPLITEAL BLOCK FOR
BELOW KNEE SURGERIES – A RANDOMISED DOUBLE
BLIND CONTROLLED TRIAL**

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ABSTRACT

OBJECTIVE – The aim of study was to compare the post operative analgesic effect of 0.5% levobupivacaine and 0.5% levobupivacaine mixed with dexamethasone in ultrasound guided popliteal block for below knee surgeries.

METHOD – A randomised double blind controlled trial was conducted and patients were allotted with systemic sampling technique in two groups; Group A (Levobupivacaine) and Group B (Levobupivacaine and Dexamethasone). Popliteal block was given under USG guidance. Hemodynamic parameters including HR, NIBP, SpO₂ were recorded alongside with onset and duration of sensory blockade were recorded.

RESULT – Duration of sensory blockade was longer in Group B (33.5 ± 5.2 hours) compared to Group A (22.4 ± 2.9 hours). Hemodynamic parameters remained stable in both groups.

CONCLUSION – The addition of Dexamethasone to Levobupivacaine for ultrasound guided popliteal block results in a significant increase in duration of post operative analgesia and also, the use of ultrasonographic guidance not only improves success rate but it necessarily reduces complications performing block and also the faster onset of sensory and motor block is achieved.

KEY-WORDS – *Dexamethasone, Levobupivacaine, Ultrasound guided, Popliteal block.*

INTRODUCTION

General anaesthesia is widely used technique for any operation, but sometimes it is difficult to render it to patients with co-morbidities, as it alters patient's hemodynamic status furthermore. While using regional anesthesia, most of those drawbacks may be overcome. Thus, regional anesthesia is considered to be a stronger alternative to general anesthesia.

When applied properly, peripheral nerve blocks are better for operating conditions. They provide great intraoperative analgesia in addition to good post-operative analgesia. They reduce the requirement for intravenous analgesia, maintain hemodynamic stability and avoid excess opioid administration and its related adverse effects. ⁽¹⁾

Popliteal block is a wonderful anaesthetic choice for below knee surgeries especially in patients who have compromised physiological status. Popliteal block provides hemodynamic stability, profound analgesia, avoidance of systemic complications, earlier discharge from the post operative unit and decreased opioid consumption perioperatively. The drawbacks and complications include incomplete anaesthesia, infection, neuropraxia and local anaesthetic systemic toxicity (LAST).

There are several approaches to administering a popliteal block like in posterior, medial approach, lateral approach. we used lateral approach in our study because it was comfortable to the patient. ⁽²⁾

Ultrasound guidance reduces the number of needles pricks and shortens the time it takes to perform the block. Ultrasound also reduces the dose requirement of drug (LA). ⁽³⁾ Ultrasound guidance can minimize the risk and increase the success rate to almost 100%.

In recent years, studies have shown that Levobupivacaine is superior to Bupivacaine for anaesthesia. It has fewer adverse effects than bupivacaine. Its duration of action is up to 18 hours after peripheral nerve blocks in pharmacodynamic studies, it showed fewer depressant effects on myocardium and central nervous system as well as a superior pharmacokinetic profile. ⁽⁴⁾

Glucocorticoids together with local anaesthetics are shown to prolong nerve blockade in proportion to their rank-order of anti-inflammatory potency. ⁽⁵⁾ Dexamethasone is a glucocorticoid drug which helps attenuating the discharge of inflammatory mediators, reducing ectopic neuronal discharge and inhibiting potassium channel mediated discharge of pain carrying nociceptive C – fibres. ⁽⁶⁾ Thus, addition of dexamethasone with local anesthetics can prolong blocks by up to 50%. Perineural injection of steroids together with anesthetic is reported to prolong post-operative analgesia. It also exerts more hemodynamic stability. Dexamethasone has increased the motor and sensory blockade in human studies. ⁽⁷⁾⁽⁸⁾

METHODS

A randomised double blind controlled trial was conducted following institutional ethics committee approval wherein total 60 patients having ASA I and II and in the age range 18- 65

years were classified into two groups 30 patients in each group using systemic sampling technique. Pre-anaesthetic check-up was done and Informed written consent for procedure and future use of data for publication were obtained. On arrival of patient in the operating room standard monitoring.

Blinding was achieved through the use of equal amount of drugs. Identical coded syringes were kept ready by person not involving in study, for example OT consultant, and were randomly handed over to Anaesthesiologist who was unaware of the identities of the drug. Syringe were labelled as A and B according to their content. 2 groups labelled as follow

Group A	Inj. levobupivacaine 0.5% 20 ml + 0.9% NS 2ml
Group B	Inj. levobupivacaine 0.5% 20 ml + dexamethasone 8 mg 2ml

Landmarks: Anatomical landmarks were identified and marked with a skin marker which included the course of the semitendinosus tendon and the biceps femoris tendon. The mid popliteal crease was identified and marked.

Technique: Patient was asked to lie down in lateral position, with the limb to be operated upon kept as the dependent one. high frequency (5-12 MHz) ultrasound probe was placed in popliteal fossa. After localizing the popliteal artery, it was moved proximally to locate the sciatic nerve at or prior to its bifurcation into the tibial and peroneal branches. A 23G spinal needle was inserted using in plane approach. The needle is advanced along the long axis of the transducer in the same plane as the ultrasound beam. Once placement was confirmed by questioning the patient verbally regarding the presence of paresthesia in the foot and ankle region, injection Levobupivacaine 0.5% 20 ml with 2cc NS or Dexamethasone 8 mg (2ml) was injected following repeated negative aspiration test.

Intraoperatively hemodynamic parameters like pulse, blood pressure, saturation of oxygen was monitored at 5, 10, 15, 30, 45, 60 minutes and postoperatively at 120 min, 180 min, 6,12,18,24,36 and 48 hours.

TABLE 1: Pulse variation with time

	GROUP A	GROUP B
Pre-operative	79.6±7.7	72.4±8.0
After block	88.2±7.3	81.4±8.0
5 mins	86.9±7.2	80±7.8.0
15 mins	83.5±7.1	76.5±8.0
30 mins	80.2±6.9	73.9±8.0
60 mins	77.8±6.7	72.3±7.7
120 mins	77.1±6.4	72±7.5
180 mins	78.1±6.9	72.6±7.4
6 hours	80.0±7.1	73.9±7.4
12 hours	81.6±6.7	75.3±7.1

18 hours	82.3±6.6	77.2±7.3
24 hours	83.2±6.3	78.2±7.1
36 hours	83.7±5.7	80±7.3
48 hours	84.1±5.5	81.5±7.2

Table 1 shows that the heart rate increases just after applying block for the first 5 minutes, and then settles down and remains stable. gradually starts increasing after about 6 hours post operative period in Group A and after 12 hours post operative period in Group B.

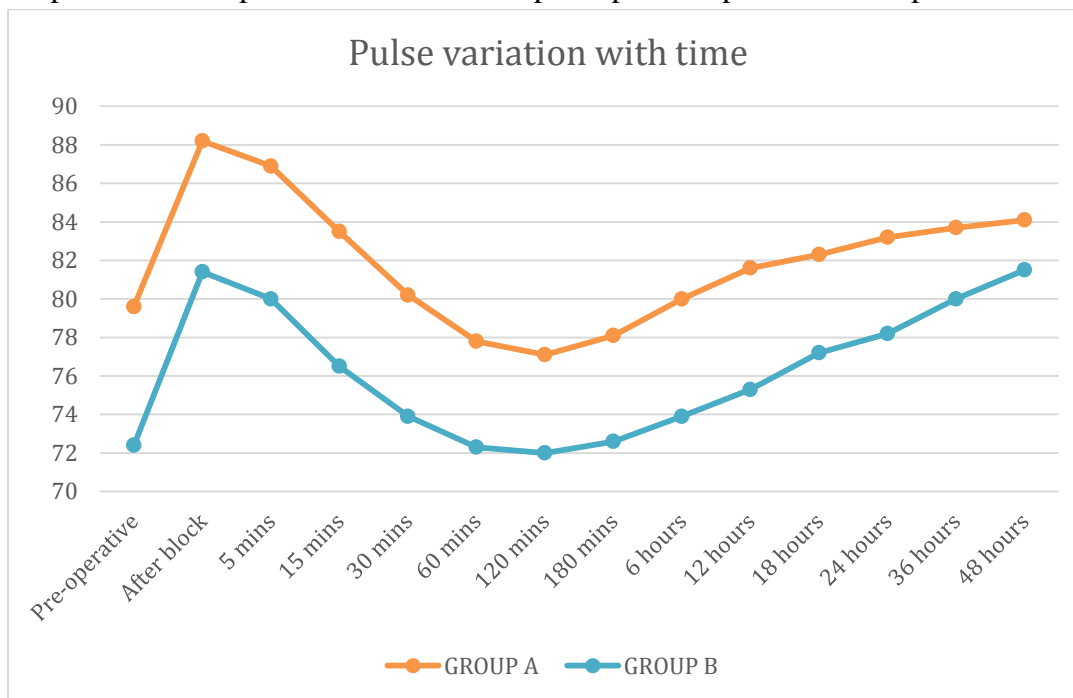


Figure 1: Pulse variation with time

TABLE 2: Systolic blood pressure variation with time

	GROUP A	GROUP B
5 mins	132.93±11.46	130±11.46
15 mins	130.46±11.40	131.6±10.49
30 mins	128.33±11.51	131.86±8.57
60 mins	130.33±11.51	130±8.50
120 mins	131.33±11.38	130.73±8.07
180 mins	133.06±11.19	129.26±8.05
6 hours	134.46±10.54	131±7.89
12 hours	136.33±10.39	132.93±7.89
18 hours	137.53±9.57	134.33±7.43
24 hours	138.8±9.30	136.06±7.40

36 hours	138.2±8.63	137.73±7.38
48 hours	139.46±8.26	139±7.13

Table 2 shows that there is a gradual rise in systolic blood pressure over time in both the groups.

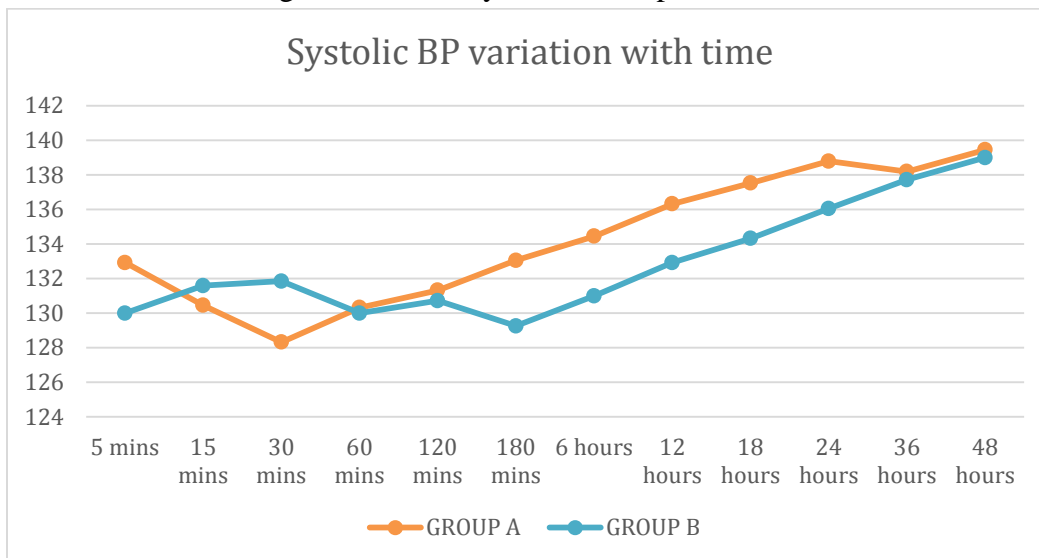


Figure 2: Systolic BP variation with time

TABLE 3: diastolic blood pressure variation with time

	GROUP A	GROUP B
5 mins	83.4± 6.69	80.8±6.12
15 mins	81.13±6.80	82±5.11
30 mins	79.06±6.90	82.8±4.24
60 mins	81.2±7.07	80.93±4.24
120 mins	82.33±7.13	79.06±4.24
180 mins	83.8±6.93	80.33±4.10
6 hours	84.13±5.74	81.73±3.74
12 hours	85.66±5.46	83.73±3.74
18 hours	86.93±4.89	85.26±3.66
24 hours	88.2±4.6	86.4±3.40
36 hours	87.66±4.62	87.86±3.22
48 hours	89.13±4.46	89.06±2.99

Table 3 shows that there is a gradual rise in diastolic blood pressure over time in both the groups.

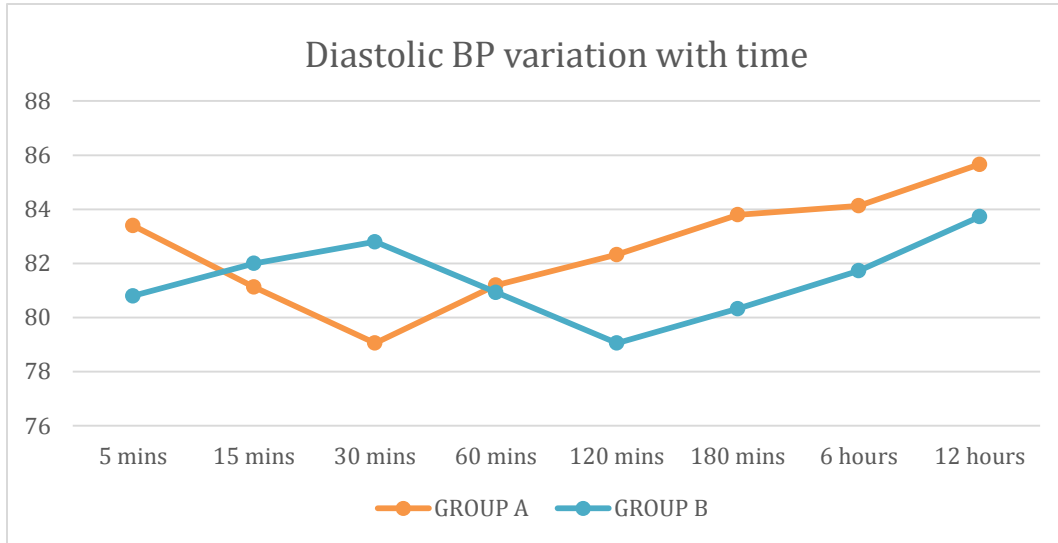


Figure 3: Diastolic BP variation with time

TABLE 4: Onset of sensory blockade

SENSORY ONSET	NUMBER OF PATIENTS	
	GROUP A	GROUP B
0-1 min	3	2
1.1-2 mins	7	9
2.1-3 mins	9	9
3.1-4 mins	6	6
4.1-5 mins	3	2
5.1-6 mins	2	2

Table 4 shows that the onset of sensory blockade is almost same in both group A and group B.

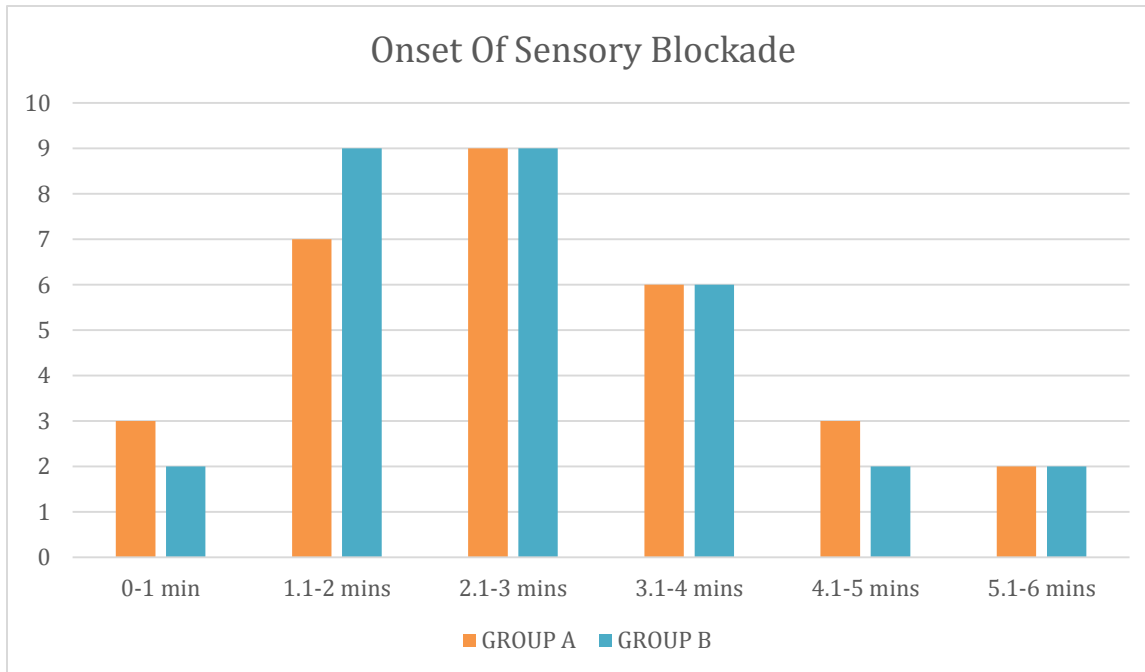


Figure 4: Onset of Sensory Blockade

TABLE 5: Comparison of onset of sensory blockade

	GROUP A (mean ± SD)	GROUP B (mean ± SD)	P VALUE
ONSET OF SENSORY BLOCK (IN MINUTES)	3.16 ± 1.34	3.1 ± 1.27	<0.05

Duration of analgesia (in hours)	Number of patients	
	GROUP A	GROUP B
17-20	6	0
20.1-23	17	0
23.1-26	5	2
26.1-29	2	4
29.1-32	0	10
32.1-35	0	4
35.1-38	0	2
38.1-41	0	5

41.1-44	0	3
44.1-47	0	0
47.1-50	0	0

TABLE 6:

Post Operative Analgesia

Duration of

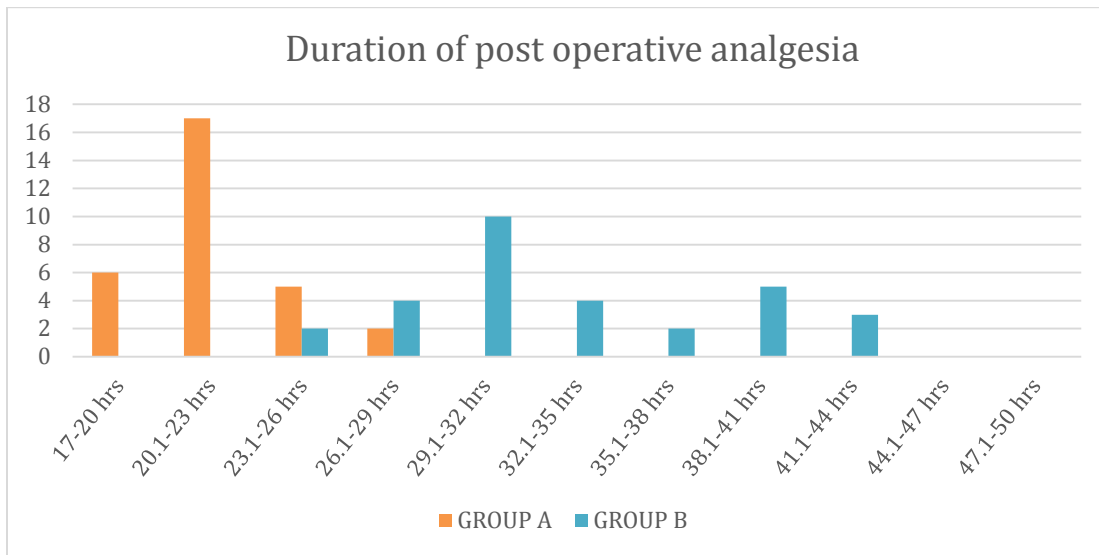


Figure 5: Duration of post operative analgesia

Table 6 shows that in Group A the patients had a post operative total duration of analgesia up to 29 hours while in Group B the patients had a post operative total duration of analgesia up to 44 hours.

TABLE 7: Comparison of total duration of analgesia

	Group A (mean ± SD)	Group B (mean ± SD)	P value
Total duration of analgesia (in hours)	22.4 ± 2.9	33.5 ± 5.2	<0.0001

Table 7 shows that the total duration of analgesia was longer in group B (33.5 ± 5.2 hours) as compared to group A (22.4 ± 2.9 hours) which is statistically significant (p value = <0.0001)

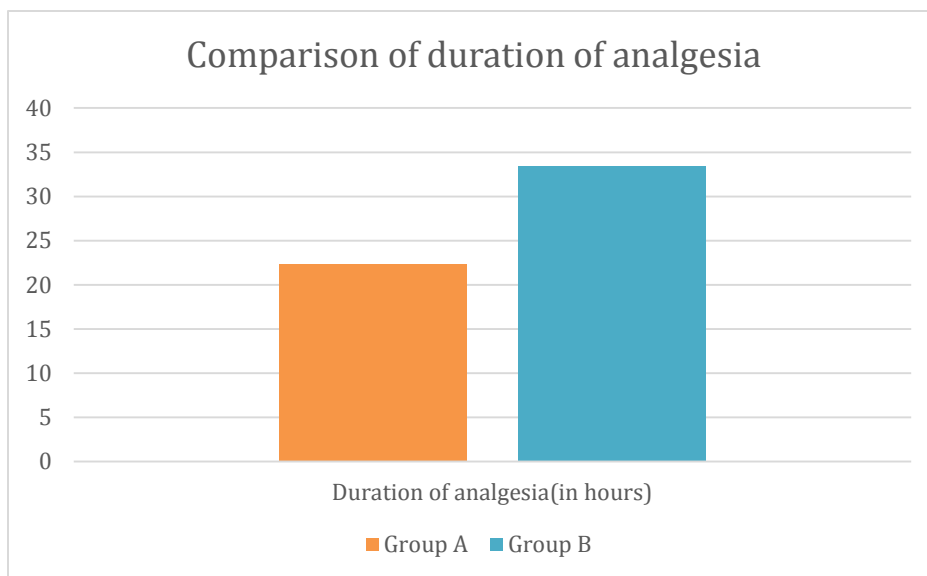


Figure 6: Comparison of duration of analgesia

TABLE 8: Complications and Adverse Effects

	GROUP A	GROUP B
Hematoma	NIL	NIL
Infection	NIL	NIL
Neuropraxia	NIL	NIL
Nausea and vomiting	NIL	NIL
Bradycardia	NIL	NIL
Hypotension	NIL	NIL
LAST	NIL	NIL
Post operative peripheral neuropathy	NIL	NIL

Table 8 shows that no complications or adverse effects were observed in any patients of Group A or Group B after the application of drugs through popliteal block.

DISCUSSION

We studied 60 patients belonging to ASA grade I, II undergoing below knee surgeries under ultrasound guided popliteal fossa block and randomly divided them into 2 equal groups. One group A (Levobupivacaine 0.5% + 2 cc NS) and another group B (Levobupivacaine 0.5% + Dexamethasone 8mg). We monitored them closely and analyzed the data obtained.

In our study of 60 cases, pulse rate increased on giving popliteal block for the first 5 minutes. heart rate increases just after applying block for the first 5 minutes, and then settles down and remains stable. gradually starts increasing after about 6 hours post operative period in Group A and after 12 hours post operative period in Group B.

Also, there is a gradual rise in systolic blood pressure and diastolic blood pressure over time in both the groups.

Yun Suk Choi et al ⁽⁹⁾ studied USG guidance popliteal sciatic nerve blocks and femoral block for below knee surgery in patients with severe cardiac disease and witnessed that peripheral nerve blocks (PNBs) provide more stable operative hemodynamics than general anesthesia or central neuraxial blocks. In patients with dilated cardiomyopathy or acute myocardial infarction and a coagulation abnormality when ultrasound-guided femoral and popliteal sciatic nerve blocks was given for lower limb surgery. Ultrasound-guided combined femoral and sciatic nerve blocks are mainly chosen for lower limb surgery. Peripheral nerve blocks have the strong advantage of hemodynamic stability, which has been reported to be related to increased survival.

Arjun, B K et al ⁽¹⁰⁾ studied USG guidance Adductor canal block and popliteal block for below-knee surgeries in high-risk patients and came to conclusion that this is way better alternative anaesthetic technique for below-knee surgeries with stability of haemodynamic parameters and pain management in high-risk patients.

In our study, the time for sensory onset with group A is 3.16 ± 1.34 minutes and with group B is 3.1 ± 1.27 minutes

Santorsola R et al ⁽¹¹⁾ observed that the mean time for sensory onset for Levobupivacaine was 15 min in sciatic nerve block. In a similar study, Fournier R et al ⁽¹²⁾ and Casati A et al ⁽¹³⁾ also observed the median time for sensory onset for Levobupivacaine to be 15(5-40) and 30 min respectively for sciatic nerve block.

Duma et al ⁽¹⁴⁾ in their study on nerve stimulator guided axillary block comparing Levobupivacaine + Clonidine, Levobupivacaine, Bupivacaine + Clonidine, Bupivacaine found that in Levobupivacaine 0.5% group the sensory onset, motor 60 onset and duration of analgesia were 10 (5–60) minutes, 10 (5–120) minutes, 1083 (785–1680) minutes respectively. We observed much faster onset of sensory and motor block. The reason may be due to difference in the technique used for the localization of tibial and common peroneal nerve. They have used elicitation of paresthesia or electric nerve stimulator technique for localization of nerve plexus. The likely explanation for faster onset for sensory blockade in our study could be that ultrasound guidance allow us to detect the division of sciatic nerve into a tibial and peroneal branch. So that both branches are effectively blocked before their division.

Our finding is in accordance with Perlas A et al (2008) ⁽¹⁵⁾ who in their study showed that when compared to neurostimulation or other techniques, ultrasound has a higher success rate, faster onset and faster progression of sensorimotor block.

Hanumansetty et al ⁽¹⁶⁾ in their study of supraclavicular brachial plexus block, observed that addition of Dexamethasone as an adjuvant to Levobupivacaine 0.5% had no effect on the onset of sensory and motor block. Our observations are in accordance with the above study as we also

found no difference in sensory and motor onset between group LS and LD that is addition of Dexamethasone had no effect on sensory and motor block.

In our study of ultrasound guided popliteal block, the duration of post-operative analgesia for Group A was 22.4 ± 2.9 hours and for Group B was 33.5 ± 5.2 hours.

Fournier R et al ⁽¹²⁾ in their study of sciatic nerve block with Levobupivacaine observed the median duration of analgesia to be 1605(575-2400) min. Casati A et al ⁽¹³⁾ also observed the median duration of analgesia to be 16 (13-20 h) hours with Levobupivacaine in sciatic nerve block. In a similar study Santorsola R et al ⁽¹¹⁾ observed the median duration of analgesia to be 16(8-24) hours.

Pujol E et al ⁽¹⁷⁾ observed that in USG guided popliteal nerve block the duration of sensory and motor block with Levobupivacaine was upto 24 hours. They also observed that the patients had less pain at rest 24 hours after surgery.

Hauritz RW et al ⁽¹⁸⁾ did a study in popliteal sciatic nerve block and divided the patients in 2 groups. Group 1 receiving Bupivacaine- Epinephrine + Dexamethasone 8 mg and the other group 2 receiving Bupivacaine- Epinephrine alone. They observed for the patients in Group 1, the time until return of normal sensory and motor functions was increased by 10 hours and the first opioid request was delayed by 19 hours as compared to Group 2.

Our observations are in accordance with the above studies. Duration of analgesia was longer in group B in comparison to group A. Thus, on adding Dexamethasone to Levobupivacaine 0.5% significantly prolonged the postoperative anesthesia and analgesia.

It is assumed that Dexamethasone improves the duration of peripheral nerve block than when infiltrated with local anaesthesia alone. The mechanism of action of Dexamethasone as an addition to local anaesthetics is guessed to be due to the reduction in release of inflammatory mediators, thus minimizing ectopic neuronal discharge, and inhibiting potassium channel-mediated discharge of nociceptive C fibres.

In our study of 60 cases of foot and ankle surgeries operated under ultrasonography guided popliteal fossa block, no complications were noted whatsoever.

Hajek V, et al ⁽¹⁹⁾ studied 157 cases where a continuous popliteal nerve block was used for hallux valgus surgery. He noted complications like postoperative peripheral neuropathy in 1.26%, complete block failure in 4%, and partial failure in 10% of the patients. Thus, the best technique should be implemented.

Canales MB et al ⁽²⁰⁾ noted that popliteal blocks tend to decrease the amount of perioperative opioid utilization. This can aid in limiting opioid related complications including nausea and vomiting, respiratory depression, constipation, and dependency.

CONCLUSION

From this study, it can be concluded that:

- 1) The addition of Dexamethasone 8 mg to Levobupivacaine 0.5% for ultrasound guided popliteal block results in a significant increase in duration of post operative analgesia, but the onset time is similar in both.

- 2) The use of ultrasonographic guidance not only improves success rate but it necessarily reduces complications performing block and also the faster onset of sensory and motor block is achieved.
- 3) Due to hemodynamic stability and better postoperative analgesia, popliteal fossa block can be a safe alternative for below knee surgeries as compared to central neuraxial block in high-risk patients.

REFERENCES

1. Hajashareef HM, Murugan T. Comparative study of ropivacaine 0.5% and ropivacaine 0.5% with dexmedetomidine 50 µg in ultrasound guided supraclavicular brachial plexus block for upper limb orthopaedic surgery. *Int J Sci Stud*. 2017 Mar 1.
2. Zetlaoui PJ, Bouaziz H. Lateral approach to the sciatic nerve in the popliteal fossa. *Anesth Analg*. 1998 Jul;87(1):79-82
3. Koscielniak- Nielsen ZJ. Ultrasound- guided peripheral nerve blocks: what are the benefits? *Acta Anaesthesiologica Scandinavica*. 2008 Jul;52(6):727-37.69
4. Burm AG, Van der Meer AD, Van Kleef JW, Zeijlmans PW, Groen K. Pharmacokinetics of the enantiomers of bupivacaine following intravenous administration of the racemate. *British journal of clinical pharmacology*. 1994 Aug;38(2):125-9.
5. Noss C, MacKenzie L, Kostash M. Dexamethasone a promising adjuvant in brachial plexus anesthesia? A systematic review. *J Anesth Clin Res*. 2014;5(7):1-7.
6. Azzazi E, Mohamed H, El Sayed El Agamy A, Mohamed MM, Al-Salam A, Nageeb MM. Effect of Adding Dexamethasone to Bupivacaine in Ultrasound Guided Supraclavicular Brachial Plexus Block Versus Bupivacaine alone for Upper Limb Orthopedic Surgery; A Comparative Study. *Egyptian Journal of Hospital Medicine*. 2018 May 8;71(7).
7. Biradar PA, Kaimar P, Gopalakrishna K. Effect of dexamethasone added to lidocaine in supraclavicular brachial plexus block: A prospective, randomised, double-blind study. *Indian journal of anaesthesia*. 2013 Mar;57(2):180.
8. Bigat Z, Boztug N, Hadimioglu N, Cete N, Coskunfirat N, Ertok E. Does dexamethasone improve the quality of intravenous regional anesthesia and analgesia? A randomized, controlled clinical study. *Anesth Analg*. 2006 Feb;102(2):605-9. doi: 10.1213/01.ane.0000194944.54073.dd. PMID: 16428570.
9. Yun Suk Choi, Hyeon Ju Shin et al. Ultrasound guided femoral and popliteal sciatic nerve blocks for below knee surgery in patients with severe cardiac disease. *Korean J Anesthesiol*. 2015 Oct; (5): 513-515.
10. Arjun, B K; Prijith, R S¹. Ultrasound-guided popliteal sciatic and adductor canal block for below-knee surgeries in high-risk patients; *Indian Journal of Anaesthesia*. August 2019- volume 63- Issue 8- p635-639
11. Santorsola R, Casati A, Borghi B, Fanelli G, et al. A double-blinded, randomized comparison of either 0.5% levobupivacaine or 0.5% ropivacaine for sciatic nerve block. *Anesth Analg*. 2002;94(4).

12. Fournier R, Faust A, Chassot O, Gamulin Z. Levobupivacaine 0.5% provides longer analgesia after sciatic nerve block using the Labat approach than the same dose of ropivacaine in foot and ankle surgery. *Anesth Analg*. 2010 May 1;110(5):1486-9.
13. Casati A, Vinciguerra F, Santorsola R, Aldegheri G, Putzu M, Fanelli G. Sciatic nerve block with 0.5% levobupivacaine, 0.75% levobupivacaine or 0.75% ropivacaine: a double-blind, randomized comparison. *Eur J Anaesthesiol*. 2005;22(6):452-456.
14. Duma A, Urbanek B, Sitzwohl C, Kreiger A, Zimpfer M, Kapral S. Clonidine as an adjuvant to local anaesthetic axillary brachial plexus block: a randomized, controlled study. *British journal of anaesthesia*. 2004 Oct 29;94(1):112-6.
15. Perlas A, Brull R, Chan VW, McCartney CJ, Nuica A, Abbas S. Ultrasound guidance improves the success of sciatic nerve block at the popliteal fossa. *Regional anesthesia and pain medicine*. 2008 May 1;33(3):259-65
16. Hanumansetty K, Hemalatha S, Gurudatt CL. Effect of dexamethasone as an adjuvant to 0.5% levobupivacaine in supraclavicular brachial plexus block for upper extremity surgeries. *International Journal of Research in Medical Sciences*. 2017 Apr 26;5(5):1943-7.
17. Pujol E, Faulí A, Anglada MT, López A, Pons M, Fàbregas N. Ultrasoundguided single dose injection of 0.5% levobupivacaine or 0.5% ropivacaine for a popliteal fossa nerve block in unilateral hallux valgus surgery. *Revista española de anestesiología y reanimación*. 2010 May;57(5):288-92.
18. Hauritz, Rasmus & Hannig, et al. The effect of perineural dexamethasone on duration of sciatic nerve blockade: A randomized, double-blind study. *Acta Anaesthesiologica Scandinavica*. 62. 10. 1111/aas.13054.
19. Hajek V, Dussart C, Klack F, et al. Neuropathic complications after 157 procedures of continuous popliteal nerve block for hallux valgus surgery. A retrospective study. *Orthop Traumatol Surg Res*. 2012;98(3):327-333.
20. Canales, Michael & Huntley, Homer. The Popliteal Nerve Block in Foot and Ankle Surgery: An Efficient and Anatomical Technique. *Journal of Anesthesia & Clinical Research*. 06. 10.4172/2155-6148.1000553

ABBREVIATIONS

ASA- American society of Anaesthesiologists

BP- Blood pressure

cm- Centimeter

DBP- Diastolic blood pressure

et al- et alia

gm- Grams

HR- Heart rate

Kg- Kilograms

L- Litres

LA- Local Anaesthetic

MAP- Mean arterial pressure

ml- Millilitres

mg- Milligrams

min- Minutes

NS- Normal saline

OT- Operation theatre

PNB- Peripheral Nerve Block

SBP- Systolic blood pressure

SCBP- Supraclavicular brachial plexus

SD- Standard deviation

Spo2- Oxygen saturation

USG- Ultrasonography

VAS- Visual analogue scale