



Original Article

A Comparative Study of Dexamethasone and Nalbuphine addition to Levobupivacaine for Sciatic Nerve Block for Post-Operative Analgesia in Orthopaedic Surgery

Authors

Dr Jitendra Agrawal¹, Dr Ajay Singh², Dr Bhanu Choudhary³, Dr Rakhi Agrawal⁴,
Dr Vaibhav Gupta⁵, Dr Mirza Aabid Beg⁶

¹Associate Professor, Department of Anaesthesiology, GRMC, Gwalior

²PG 3rd Year Student, Department of Anaesthesiology, GRMC Gwalior

³Professor & HOD, Department of Anaesthesiology, GRMC Gwalior

⁴Anaesthesia Specialist, GRMC Gwalior

^{5,6}PG 2nd Year Student, Department of Anaesthesiology, GRMC Gwalior

Corresponding Author

Dr Ajay Singh

PG 3rd Year Student, Department of Anaesthesiology, GRMC Gwalior, MP India

Email: dr.ajaysingh3@gmail.com, Mob: 9300603670

Abstract

Background: Pain is a predictable part of the postoperative experience. Unrelieved postoperative pain may result in clinical and psychological changes that increase morbidity and mortality as well as the cost and also impairs the quality of life.

Aims and Objectives: To compare postoperative analgesic effect and safety of dexamethasone or nalbuphine in addition to levobupivacaine in lower limb orthopedic surgeries.

Materials and Methods: Ninety patients of ASA grade I and II undergoing lower limb orthopaedic surgeries were studied in the Department of Anaesthesiology, GR Medical College and JA Group of Hospitals, Gwalior from December 2015 to August 2017. The patients were divided into Group D (n= 30, were given 24 ml of 0.25% levobupivacaine hydrochloride + 1ml (4mg) of dexamethasone), Group N (n=30, were given 24ml of 0.25% levobupivacaine hydrochloride + 1 ml(10mg) of nalbuphine) and Group C (n=30, were given 24ml of 0.25% levobupivacaine hydrochloride + 1ml of normal saline). Postoperative analgesia in terms of VAS score, time to first rescue analgesic (duration of analgesia) and side effect or complication were studied in each group.

Results: Male preponderance was noted in each group (27 in Group D, 25 in Group N and 26 in Group C; p=0.749). Mean age of patients in Group D, Group N and Group C was 34.67±13.55, 37.90±10.04 and 38.93±12.54 years respectively (p>0.05). Mean pulse rate (min), SBP (mmHg), DBP (mmHg) and SpO₂ (%) were comparable between groups (P>0.05). MAP (mmHg) was significantly high in Group N compared to Group C. VAS score was 38.56±1.79 at 16 hours in Group N, whereas Group D had VAS score of 42.83±0.99 at 12 hours and Group C had 49.46±1.132 at 8 hours (p value < 0.001). At 24 hours VAS score of group N, D and C were 15.17±1.497, 15.67±1.309 and 15.67±1.714 respectively. Two patients in Group N and one patient in Group D and C experienced nausea and vomiting and one patient in Group C and N experienced postoperative shivering.

Conclusion: Nalbuphine is a good alternative for post operative pain management along with Levobupivacaine hydrochloride compared to dexamethasone with minimal postoperative complication.

Keywords: Orthopaedic surgery, VAS score, first rescue analgesic, dexamethasone, nalbuphine.

Introduction

Unrelieved postoperative pain may result in clinical and psychological changes that increase morbidity and mortality as well as cost and also impairs the quality of life. Effective and appropriate pain management requires a proactive approach using a variety of treatment modalities.¹

Regional anesthesia is a safe, inexpensive technique with an advantage of prolonged postoperative pain relief. Effective treatment of postoperative pain blunts autonomic, somatic and endocrine responses. It has become common practice to use a multimodal approach for the treatment of postoperative pain, as no single drug has yet been identified which inhibits nociception without associated side effects.^{2,3}

Many drugs and adjuvants has been used and research still continues to find out different techniques and drugs that could prolong the duration of regional anesthesia and postoperative pain relief.

Dexamethasone synergises with local anesthetics on blockage of impulse conduction in nerve fibers. It alters the function of potassium channels in excitable neurons.⁴ It occupies the glucocorticoid receptors in the endothelium of cutaneous blood vessels.⁵

Nalbuphine is an opioid, structurally related to oxy-morphone with an agonist action at the κ -opioid receptor and an antagonist activity at the μ -receptor. Nalbuphine and other κ agonists had provided reasonably potent analgesia in certain models of visceral nociception.⁶ Nalbuphine is popular in producing analgesia during conscious sedation and has been used as ambulatory sedative for MRI and other outpatient surgeries.

Hence present study was planned to compare postoperative analgesic effect and safety of dexamethasone or nalbuphine in addition to levobupivacaine in lower limb orthopedic surgeries.

Materials and Methods

A prospective study including 90 patients of ASA grade I and II undergoing lower limb orthopaedic surgeries was performed in the Department of Anaesthesiology of GR Medical College and JA Group of Hospitals, Gwalior, Madhya Pradesh from December 2015 to August 2017.

Patients who were able to provide written informed consent, willing to participate in study, patients scheduled for lower limb orthopaedic surgeries belonging to ASA physical grade I and II, age group between 18 to 65 years of either sex and having weight 50-90 kg and height \geq 150 cm were included.

Uncooperative patients and those who were not able to understand pain assessment test, history of clinically significant cardiovascular, pulmonary, hepatic, renal, neurological, psychiatric, or metabolic disease, patients who are unable to understand VAS assessment, patients having severe obesity (BMI $>$ 35 kg/m²), coagulation disorder, on anticoagulants, severe spinal deformity, allergy to local anaesthetic, or any contraindication to spinal anaesthesia, patients with history of drug allergy, drug addict / patient on long term steroid therapy and pregnant patients were excluded from the present study.

Study cohort was divided as Group D (n= 30, were given 24 ml of 0.25% levobupivacaine hydrochloride + 1ml (4mg) of dexamethasone), Group N (n=30, were given 24ml of 0.25% levobupivacaine hydrochloride + 1 ml(10mg) of nalbuphine) and Group C (n=30, were given 24ml of 0.25% levobupivacaine hydrochloride + 1ml of normal saline)

Results

Most of the patients were male in all the groups (27 in Group D, 25 in Group N and 26 in Group C; p=0.749). Mean age of patients in Group D, Group N and Group C was 34.67 ± 13.55 , 37.90 ± 10.04 and 38.93 ± 12.54 years respectively (p>0.05).

Table 1: Comparing Intra-operative parameters between groups

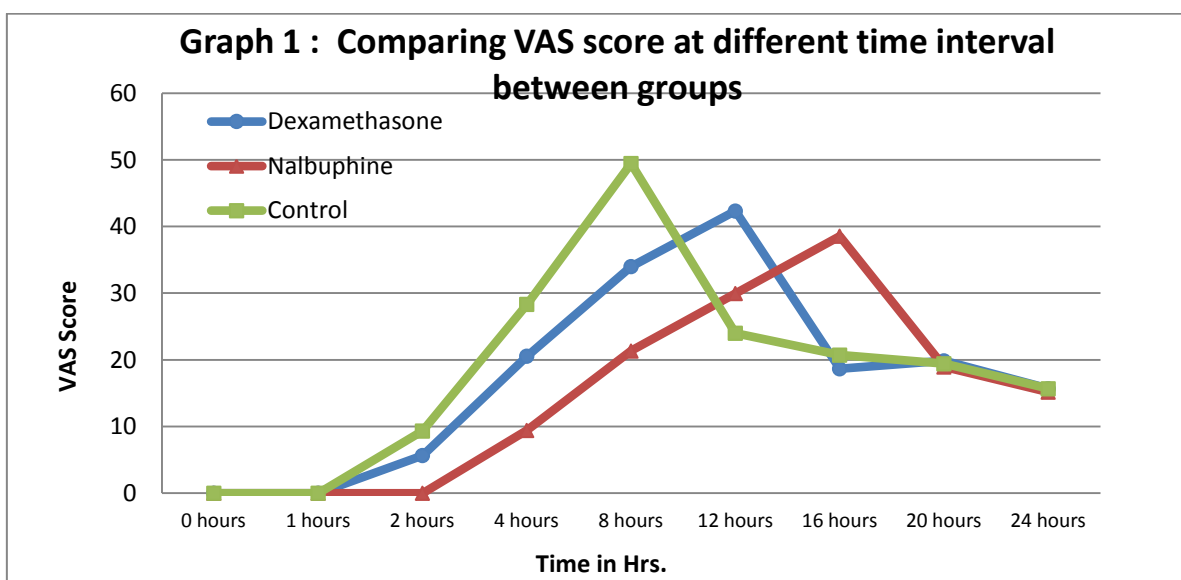
Intra-operative Parameters	Group D	Group N	Group C	P value
Pulse rate (min)	89.711±13.64	86.752±4.19	91.519±15.79	NS
SBP (mmHg)	120.085±8.5	117.440±23.22	118.743±27.60	NS
DBP (mmHg)	76.315±7.34	85.522±5.36	89.619±7.60	NS
MAP (mmHg)	89.212±9.35	82.325±4.90	82.694±5.60	NS
SpO2 (%)	98.402±4.26	98.567±12.74	97.214±7.07	NS

SBP; systolic blood pressure, DBP; diastolic blood pressure, MAP; mean arterial pressure, SpO2; partial pressure of oxygen, NS; not significant, P value of <0.05 is considered as significant

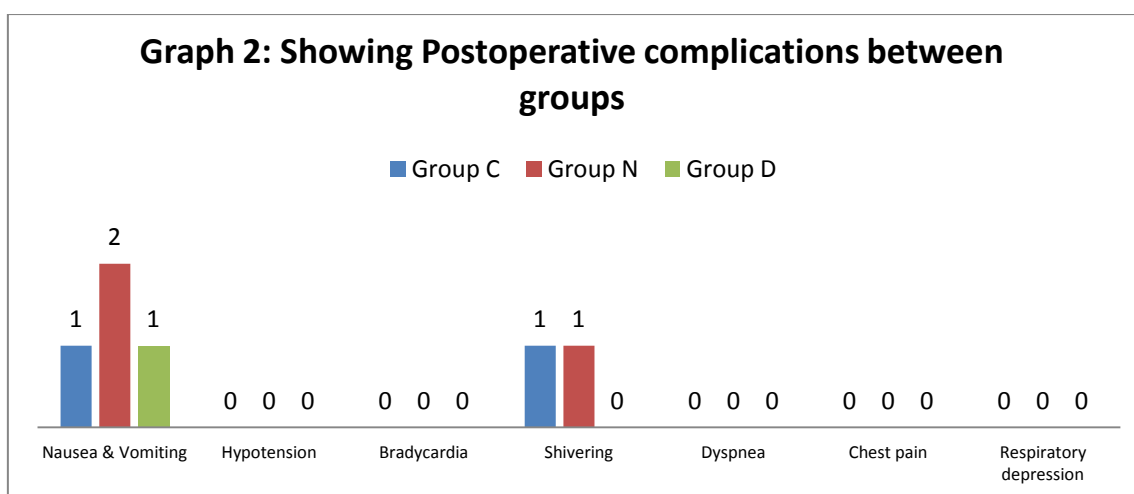
Table 2: Comparing Post-operative parameters between groups

Post-operative Parameters	Group D	Group N	Group C	P value
Pulse rate (min)	90.62±16.09	97.59±2.81	97.94±0.90	NS
SBP (mmHg)	122.11±7.34	105.522±5.36	111.619±7.60	NS
DBP (mmHg)	90.58±13.96	72.30±4.56	79.89±5.68	NS, 0.01*
MAP (mmHg)	90.62±16.09	97.59±2.81	97.94±0.90	NS
SpO2 (%)	98.402±4.26	97.567±12.74	98.214±7.07	NS

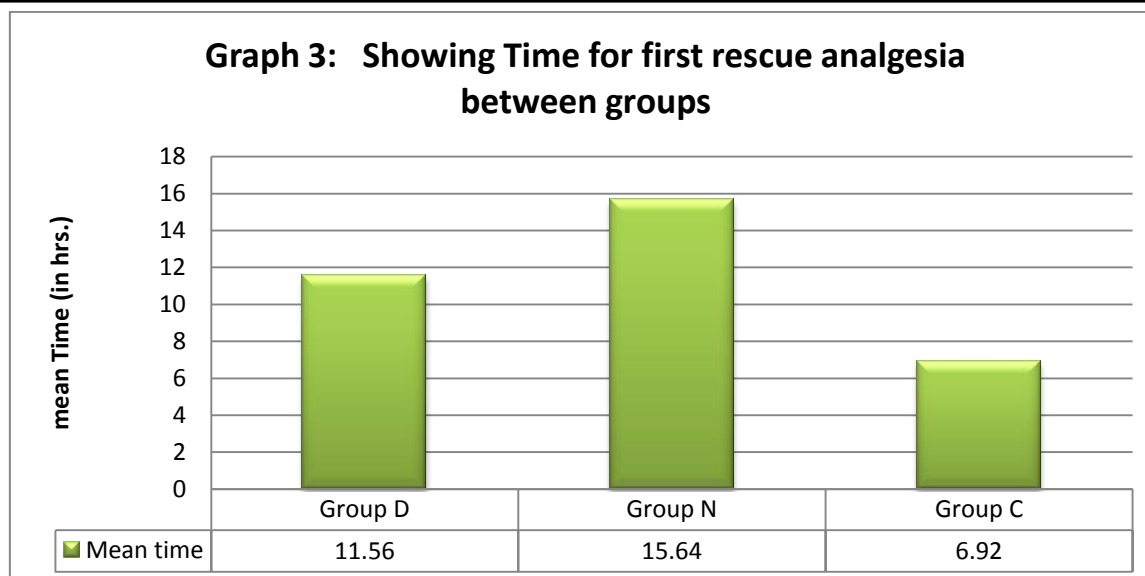
*between Group N and Group C, SBP; systolic blood pressure, DBP; diastolic blood pressure, MAP; mean arterial pressure, SpO2; partial pressure of oxygen, NS; not significant, P value of <0.05 is considered as significant



Data is expressed as mean, VAS; visual analogue scale,



Data is expressed as no of patients.



Discussion

Pain is reported to be the most common medical cause of delayed recovery and discharge after ambulatory surgery and leads to unplanned admission and subsequently delayed return to work. Treatment for postoperative pain after orthopedic surgical procedure based on conventional drugs (consisting of maximal dose of paracetamol, non-steroidal anti-inflammatory drugs, and oral or intravenous opioid) with pain escape is very important. Nonetheless, this is associated with adverse effects, such as nausea, sedation, hypotension, reduced lung capacity and increased cardiac load. All these effects impede rehabilitation and early discharge.⁷

Mean age of patients in Group D, Group N and Group C were 34.67 ± 13.55 years, 37.90 ± 10.04 years and 38.93 ± 12.54 years respectively. Mean (\pm SD) age of patients were almost identical in three groups ($P > 0.05$). The Mean (\pm SD) age of the patients in our study was well in accordance with the study done by other workers.^{8,9}

It is evident that males are more prone to accidents in comparison to females in present study may be because of their nature of job. Since all the patients were taken for surgery only after the preanaesthetic assessment, the study was conducted only in routine hours.

Mean intra-operative pulse rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, SpO₂ were found to be stable among the

3 groups and statistically insignificant ($P > 0.05$). Mean post-operative pulse rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure among the 3 groups increased with increase in time due to bearing off of analgesic effect of drugs given intra-operatively but found to be statistically insignificant ($P > 0.05$). This result was in accordance with the study conducted by Padma et al to establish the effectiveness of intrathecal nalbuphine as an adjunct and also the efficacy of nalbuphine for post operative analgesia. They found that intra operative and post operative haemodynamic were not showing any significant difference.⁹

In present study in Group N, maximum VAS score was at 16 hours (38.56), in Group D, maximum VAS score was at 12 hours (42.33) and in Group C, maximum VAS score was at 8 hours (49.46). These findings were in accordance to Das et al who studied the effect of nalbuphine with levobupivacaine in supraclavicular brachial plexus block for upper limb surgeries. They found that in group nalbuphine, VAS score was lower at 24 hours postoperatively.¹⁰ Several hypothesized mechanisms of action have been suggested to explain the analgesic effect of nalbuphine. Nalbuphine is a synthetic mixed κ -agonist, μ antagonist opioid with a moderate analgesic effect when compared to morphine. Apart from μ opioid based spinal and supraspinal analgesia, inhibition

of neuronal serotonin uptake leads to augmentation of the spinal inhibitory pathways for pain.¹¹

Use of dexamethasone as an adjuvant for peripheral nerve blockade remains controversial. Some recent studies questioned the benefit of perineural dexamethasone compared with intravenous route. Rahangdale et al found that perineural dexamethasone (8 mg) did not improve quality of recovery. However, perineural dexamethasone prolonged analgesia and reduced pain on postoperative day one.¹² In another study De Oliveira et al gave 4 mg dexamethasone perineurally as adjuvant to brachial plexus block and concluded that there is no improvement in pain. This might be due to the dose taken in their study was less.¹³

Nalbuphine has been used extensively as an adjunct for peripheral nerve blockade. Tiwari et al observed that nalbuphine is very effective in subarachnoid as well as epidural route for prolonging sensory block duration and delays analgesic requirements.¹⁴

Time for the first rescue analgesia was 11.56 ± 3.42 hrs, 15.64 ± 4.34 hrs and 6.92 ± 1.24 hrs in dexamethasone, nalbuphine and control group respectively which was found to be higher in nalbuphine group ($p < 0.01$).

In our study, we have found nausea and vomiting in all three groups. Nalbuphine group had 2 patients whereas dexamethasone and control group had 1 patient each. Incidence was quite comparable in all the groups. All the patients were managed with Inj. Ondansetron 4 mg i.v. 1 patient in each nalbuphine and control group had shivering postoperatively. Ahulwalia et al found that nausea and vomiting was associated with intrathecal nalbuphine group¹⁵ while Mukherjee et al¹⁶ reported nausea and vomiting associated with higher dose of nalbuphine given intrathecally.

Conclusion

Nalbuphine and dexamethasone both provide pain relief post operatively. However nalbuphine is a good alternative for post operative pain

management given in sciatic nerve block along with Levobupivacaine hydrochloride compared to dexamethasone with Levobupivacaine hydrochloride for post operative analgesia with minimal postoperative complication.

References

1. Sivrikaya GU. Multimodal Analgesia for Postoperative Pain Management. Sisli Etfal Training and Research Hospital, Department of 2nd Anaesthesiology and Reanimation, Istanbul, Turkey; 9:177-211.
2. Bone ME, Dowson S, Smith G. A comparison of nalbuphine with fentanyl for postoperative pain relief following termination of pregnancy under dya care anaesthesia. *Anaesthesia*. 1988;43:194-7.
3. Tourtier JP, Raynaud L, Murat I, Gall O, Audit of protocols for treatment of paediatric burns in emergency department in the Ile de France. *Burns*. 2010;36:1196-200.
4. Maharajan SK, Shreshtha BR, Tabedar S: Supraclavicular brachial plexus block with & without dexamethason—A comparative study. *Kathmandu university medical journal*(2003):vol 1:No:3:158-160.
5. Marks R, Barlow JW, Funder JW: Steroid induced vasoconstriction; glucocorticoid antagonist studies. *J Clin EndoMeta*1982; 54;1075-7.
6. Pick CG, Paul D, Pasternak GW. Nalbuphine, amixed kappa 1 and kappa 3 analgesic in mice. *J Pharmacol Exp Ther*. 1992;262:1044-50.
7. Vallano A, Aguilera C, Arnau JM, Baños J-E, Laporte J-R, Postoperative Analgesia Study Group of the Spanish Society of Clinical Pharmacology Coordinating Centre and Data Analysis: Management of postoperative pain in abdominal surgery in Spain. A multicentre drug utilization study. *British Journal of Clinical Pharmacology*. 1999;47(6):667-673.

8. Casati A, Santorsola R, Aldegheri G, Ravasi F, Fanelli G, Berti M et al. Intraoperative epidural anesthesia and postoperative analgesia with levobupivacaine for major orthopaedic surgery: A double-blind, randomized comparison of racemic bupivacaine and ropivacaine. *J clin Anesth* 2003; 15(2): 126-31.
9. Padma T, Mydhili K. A comparative study of post operative analgesia after spinal nalbuphine with bupivacaine and spinal bupivacaine for lower limb surgeries. *J of Evidence Based Med & Healthcare* 2015; 2(38): 6105-6109.
10. Das A, RoyBasunia S, Mukherjee A, Biswas H, Biswas R, Mitra T, Chattopadhyay S, Mandal SK. Perineural nalbuphine in ambulatory upper limb surgery: A comparison of effects of levobupivacaine with and without nalbuphine as adjuvant in supraclavicular brachial plexus block – A prospective, double blind, randomized controlled study. *Anesth Essays Res* 2017 Jan-Mar;11 (1):40-46.
11. Pick CG, Paul D, Pasternak GW. Nalbuphine, amixed kappa 1 and kappa 3 analgesic in mice. *J Pharmacol Exp Ther.* 1992;262:1044-50.
12. Rahangdale R, Kendall MC, McCarthy RJ, Tureanu L, Doty Jr R, Weingart A et al. The Effects of Perineural Versus Intravenous Dexamethasone on Sciatic Nerve Blockade Outcomes: A Randomized, Double-Blind, Placebo-Controlled Study. *Anesth Analg* 2014;118:1113–9.
13. De Oliveira Jr GS, Alves LJC, Nader A, Kendall MC, Rahangdale R, McCarthy RJ. Perineural Dexamethasone to Improve Postoperative Analgesia with Peripheral Nerve Blocks: A Meta-Analysis of Randomized Controlled Trials. *Hindawi Publishing Corporation Pain Research and Treatment* 2014; 2014:1-9.
14. Tiwari AK, Tomar GS, Agrawal J. Intrathecal Bupivacaine in Comparison With a Combination of Nalbuphine and Bupivacaine for Subarachnoid Block: A Randomized Prospective Double-Blind Clinical Study. *Am J Ther.* 2011 Sep 8.
15. Ahluwalia P, Ahluwalia A, Varshney R, Thakur S, Bhandari S. A Prospective Randomized Double Blind Study to Evaluate the Effects of Intrathecal Nalbuphine in Patients of Lower Abdominal Surgeries Under Spinal Anaesthesia. *Int J Sci Stud* 2015;3(3):19-23.
16. Mukherjee A, Pal A, Agarwal J, Mehrotra A, Dawar N. Intrathecal nalbuphine as an adjuvant to subarachnoid block: what is the most effective dose? *Anaesth Essays Res* 2011;5:171-5.