Original Research Paper

Volume - 12 | Issue - 07 | July - 2022 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Anaesthesiology

COMPARATIVE STUDY OF EFFICACY OF DEXMEDETOMIDINE-BUPIVACAINE AND BUPRENORPHINE-BUPIVACAINE IN SPINAL ANAESTHESIA IN LOWER ABDOMINAL AND LOWER LIMB SURGERIES

Dr. Mohammed Yahya* Professor, Department of Anaesthesiology, Mahadevappa Rampure Medical College, Kalaburagi, India.*Corresponding Author

Dr Gurulingappa A Patil Professor, Department of Anaesthesiology, Mahadevappa Rampure Medical College, Kalaburagi, India.

Dr. Sayyada Sameera Mahveen Post Graduate, Department of Anaesthesiology, Mahadevappa Rampure Medical College, Kalaburagi, India.

ABSTRACT **BACKGROUND** The addition of local anaesthetics with adjuvants improves the efficacy of subarachnoid block. The most commonly used drugs are opioids and newer drugs like dexmedetomidine said to be safer and effective spinal adjuvant. **AIMS & OBJECTIVES** To compare and evaluate sensory , motor blockade and haemodynamic effects between dexmedetomidine - bupivacaine and buprenorphine - bupivacaine groups. **METHODS** A prospective randomised study was conducted on 60 patients posted for elective lower abdominal and lower limb surgeries belonging to ASA 1 & 2 grade. Patients were randomly divided into 2 groups, each group containing 30 patients. Group D receives 3ml (15mg) of 0.5% hyperbaric bupivacaine with 5 mcg dexmedetomidine in 0.5 ml NS while group B receives 3ml (15mg) of 0.5% hyperbaric bupivacaine with buprenorphine 75 mcg in 0.5 ml NS. Sensory , motor blockade and haemodynamic effects were recorded between two groups. **RESULTS** There was no significant difference between two groups regarding demographic data and duration of surgery. The rapid onset of sensory block and prolonged duration of sensory and motor blockade achieved with 5µg of dexmedetomidine combined with bupivacaine for spinal anaesthesia suggests that the drug is useful in surgeries requiring prompt onset.

KEYWORDS : Bupivacaine, Buprenorphine, Dexmedetomidine and Subarachnoid block.

INTRODUCTION

Spinal anesthesia is the most commonly used technique for lower abdominal and lower limbs surgeries. Local anesthetics like bupivacaine when used alone is associated with relatively short duration of action, thus early analgesic intervention is needed in the postoperative period[1]. Moreover, use of bupivacaine alone in SA produce associated effects such as bradycardia and systemic hypotension. Therefore SA is used with adjuvant drugs to reduce the local anaesthetic requirement, minimize side effects and prolong duration of anaesthesia[2].

Buprenorphine is a long acting, highly lipophilic opioid which proved to be a promising analgesic by epidural and intrathecal route. It is about 25 times more potent than morphine and has a low level of physical dependence. Buprenorphine is partial agonist with high molecular weight and lipophilic, which may prevent its rostral spread and thus respiratory depression, prolongs the duration of sensory block and hence decreases the need for postoperative analgesia[3].

Dexmedetomidine is a potent α2 agonist used in anaesthetic practice for its sedative, anxiolytic, analgesic, neuroprotective and anaesthetic sparing effect. It prolongs motor and sensory block when used as adjuvant to local anaesthetic for spinal anaesthesia[4]. There are very few studies about intrathecal use of dexmedetomidine. However there are certain advantages and disadvantages with each adjuvant. Hence my study will be conducted to identify safer and effective spinal adjuvant.

OBJECTIVES

1. To study sensory and motor blockade between dexmedetomidine-bupivacaine and buprenorphine-bupivacaine groups.
2. To study haemodynamic effects between two groups.

MATERIALS AND METHODS

Source of data: A prospective comparative interventional study was conducted on 60 patients posted for lower abdominal and lower limb surgeries admitted in Basaveshwara teaching and general hospital attached to Mahadevappa Rampure medical college Kalaburgi.

Preanaesthetic Examination and Preparation

Preanaesthetic check up was done one day prior to the surgery. Patients were evaluated for any systemic diseases and laboratory investigations were recorded. The procedure of spinal anesthesia was explained to the patients and written consent was taken.

Patients were advised overnight fasting and premedicated with inj 4mg ondansetron and 50mg ranitidine in preoperative holding. Patients were preloaded with an i.v. infusion of 10 to 15 ml /kg of ringer lactate solution.

Method:

Patients were allocated randomly into 2 groups, each group containing 30 patients.

Group D: received 3ml (15mg) of 0.5% hyperbaric bupivacaine with 5 mcg dexmedetomidine in 0.5 ml NS.
Group B: received 3ml (15mg) of 0.5% hyperbaric bupivacaine with buprenorphine 75 mcg in 0.5 ml NS.

Intraoperative management

Boyle's anesthesia machine was checked. Appropriate size endotracheal tubes, working laryngoscope with medium and large size blades, stylet and working suction apparatus was kept ready before the procedure.

After shifting the patient to the operating theatre, IV infusion started with Ringer Lactate. Patients were monitored for heart rate (HR), non invasive blood pressure (NIBP) peripheral oxygen saturation (SpO_2) . Spinal anesthesia was performed with the patient in the lateral position using a 25-gauge Quincke needle at the L3–4 or L4–5 interspaces. The study solution (3.5ml) was administered over 30sec. Patient was turned gently and placed supine. The following variables like time for onset of sensory block, time of onset of motor block, duration of sensory block, duration of motor block and hemodynamic variables (Systolic blood pressure, Diastolic blood pressure, Mean arterial pressure, Heart rate and SPO2) were recorded.

INCLUSION CRITERIA :

1. Age between 18 to 60 yrs of either sex.
2. American society of anaesthesiologists (ASA) grade I & II.
3. Patients scheduled to undergo lower abdominal and lower limb surgeries.

EXCLUSION CRITERIA :

1. ASA grade 3 & 4.
2. Patients with known contraindications for spinal anesthesia.
3. Patients with coagulation disorders or on anticoagulant therapy.
4. Patients with allergy to study drugs.

DEFINITIONS:

Onset of sensory blockade: is defined as time taken from the

completion of the injection of the study drug till the loss of pin prick sensation at T8 level in our study.

Duration of sensory block: is the time taken for regression to L1.

Onset of motor blockade: is defined as the time taken from the completion of injection of the study drug till patient develops Bromage 3.

Duration of motor blockade: is the time taken from complete motor block to complete motor recovery i.e, Bromage 0.

Hypotension is defined as reduction of Systolic Blood Pressure (SBP) more than 30% below baseline or fall in SBP less than 90 mm Hg and was treated with intravenous (IV) fluids and injection Mephentermine 3mg IV increments given if needed.

Bradycardia is defined as heart rate less than 50 beats/minute and was treated with injection Atropine 0.6mg IV.
On completion of surgery, patients were shifted to post anaesthesia care unit for observation. Patients were transferred to postoperative ward after complete resolution of motor blockade and stabilization of blood pressure.

Informed consent:-
Informed consent was taken in the patients own vernacular language.

Ethical clearance has been obtained from the institutional ethics committee Mahadevappa Rampure Medical college, Kalaburagi.

STATISTICAL METHODS

Collected data was analysed by using IBM SPSS 20.0 version software. Data was spread in Excel sheet and calculated mean, standard deviation and other measures .For data analysis independent 2 sample t-test and chi-square test was used for significance. If $p<0.05$ was considered as significant.

RESULTS

Table 1: Demographic data and duration of surgery

Variable	Group B (n=30)	Group D (n=30)	p-value	Test Used
Age (years)*	36.93 ± 7.750	41.03 ± 11.403	0.109	Independent 2 sample T-Test
Sex (M:F)	2:1	19:11	0.592	Chi-Square Test
Duration of surgery (minutes)*	117.83 ± 21.2	147.17 ± 28.608	0.0001	Independent 2 sample T-Test

Demographic data was studied in terms of age in years and sex. The P value of mean age is 0.109 which is not statistically significant. Male and female ratio is not equal in either group and there was no statistical significant difference. The p value for duration of surgery is statistically significant (p value : 0.0001).

Table 2: Characteristics of subarachnoid block

Parameters	Group B (n=30)	Group D (n=30)	p-value	Test Used
Onset of sensory block (minutes)*	3.37 ± 0.556	2.6 ± 0.498	0.0001	Independent 2 sample T-Test
Onset of motor block (minutes)*	3.77 ± 0.774	4.2 ± 0.761	0.033	Independent 2 sample T-Test
Duration of sensory block (min)	315.13 ± 23.876	490.90 ± 20.109	0.0001	Independent 2 sample T-Test
Duration of motor block (min)	271.23 ± 26.039	412.53 ± 19.823	0.0001	Independent 2 sample T-Test
* Mean ± Standard deviation				

The time of onset of sensory block is slower in group B (3.37 ± 0.556) when compared to group D (2.6 ± 0.498) and it is statistically significant (p value : 0.0001). Average time taken onset of motor block in group B is 3.77 ± 0.774 than group D (4.2 ± 0.761) and p value is 0.033 which is statistically significant.

The duration of sensory block is shorter in group B (315.13 ± 23.876) when compared to group D (490.90 ± 20.109) and it is statistically significant with p value 0.0001. The duration of motor block is shorter in group B (271.23± 26.039) when compared to group D (412.53 ± 19.823) and it is statistically significant with p value 0.0001.

Table 3: Comparison of Heart rate (bpm) between the groups

Parameters	Group B (n=30)	Group D (n=30)	P-Value	Test Used
HR 0 MIN	82.2 ± 9.796	77.27 ± 8.898	0.046	Independent 2 sample T-Test
HR 3 MIN	85.6 ± 10.257	73.4 ± 9.209	0.0001	Independent 2 sample T-Test
HR 5 MIN	86.57 ± 8.997	81.13 ± 11.44	0.045	Independent 2 sample T-Test
HR 10 MIN	85.87 ± 8.262	78.27 ± 11.462	0.005	Independent 2 sample T-Test
HR 15MIN	81.8 ± 9.876	77.27 ± 12.849	0.131	Independent 2 sample T-Test
HR 20MIN	81.1 ± 9.89	80.1 ± 12.834	0.737	Independent 2 sample T-Test
HR 25 MIN	81.27 ± 9.021	77.47 ± 11.629	0.163	Independent 2 sample T-Test
HR 30 MIN	81.5 ± 7.361	79.67 ± 11.778	0.473	Independent 2 sample T-Test
HR 40 MIN	82.57 ± 7.477	78.8 ± 11.81	0.145	Independent 2 sample T-Test
HR 50 MIN	82.9 ± 7.871	80.9 ± 11.251	0.428	Independent 2 sample T-Test
HR 60 MIN	82.53 ± 7.921	76.43 ± 11.072	0.017	Independent 2 sample T-Test

Heart rate was recorded in 11 intervals, out of which 5 intervals (0, 3 min,5 min,10 min and 60 min) were statistically significant.

Fig 1: Line diagram represents Comparison of Heart rate (bpm) in two groups of patients

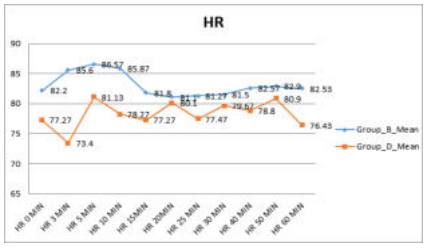


Table 4: Comparison of Mean arterial pressure between the groups

MAP 0 MIN	81.7 ± 6.824	80.3 ± 8.38	0.481	Independent 2 sample T-Test
MAP 3 MIN	78.77 ± 4.987	77.43 ± 9.5	0.499	Independent 2 sample T-Test
MAP 5 MIN	76.57 ± 5.399	76.97 ± 8.896	0.834	Independent 2 sample T-Test
MAP 10 MIN	74.13 ± 6.224	76.27 ± 8.658	0.278	Independent 2 sample T-Test
MAP 15 MIN	73.17 ± 4.942	76.27 ± 6.313	0.038	Independent 2 sample T-Test
MAP 20 MIN	75.6 ± 6.626	76.37 ± 4.803	0.61	Independent 2 sample T-Test
MAP 25 MIN	77.77 ± 7.881	77.33 ± 5.785	0.809	Independent 2 sample T-Test
MAP 30 MIN	80.77 ± 6.543	77.67 ± 4.964	0.043	Independent 2 sample T-Test
MAP 40 MIN	81.13 ± 6.996	78.7 ± 4.843	0.123	Independent 2 sample T-Test
MAP 50MIN	81.13 ± 6.942	78.83 ± 5.147	0.15	Independent 2 sample T-Test

MAP 60MIN	80.77 ± 6.061	80.3 ± 5.615	0.758	Independent 2 sample T-Test

Mean arterial pressure was monitored from 0 min to 60 min of procedure (11 intervals), out of which one interval (30 min) was statistically significant.

Fig 2: Line diagram represents Comparison of Mean arterial pressure between the groups

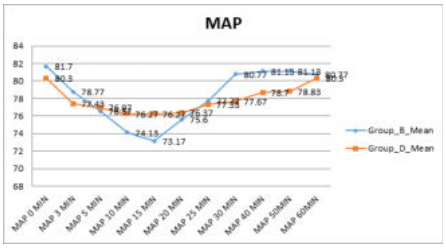
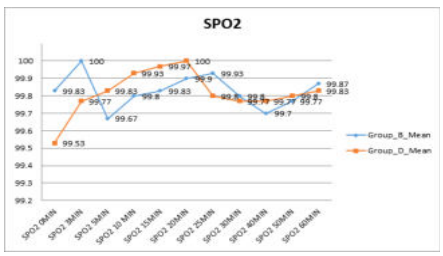


Table 5: Comparison of SPO2 between the groups

SPO2 0MIN	99.83 ± 0.461	99.53 ± 0.73	0.062	Independent 2 sample T-Test
SPO2 3MIN	100 ± 0	99.77 ± 0.43	0.004	Independent 2 sample T-Test
SPO2 5MIN	99.67 ± 0.547	99.83 ± 0.379	0.175	Independent 2 sample T-Test
SPO2 10 MIN	99.8 ± 0.407	99.93 ± 0.254	0.133	Independent 2 sample T-Test
SPO2 15MIN	99.83 ± 0.379	99.97 ± 0.183	0.088	Independent 2 sample T-Test
SPO2 20MIN	99.9 ± 0.305	100 ± 0	0.078	Independent 2 sample T-Test
SPO2 25MIN	99.93 ± 0.254	99.8 ± 0.484	0.187	Independent 2 sample T-Test
SPO2 30MIN	99.8 ± 0.551	99.77 ± 0.504	0.808	Independent 2 sample T-Test
SPO2 40MIN	99.7 ± 0.75	99.77 ± 0.626	0.71	Independent 2 sample T-Test
SPO2 50MIN	99.77 ± 0.626	99.8 ± 0.484	0.818	Independent 2 sample T-Test
SPO2 60MIN	99.87 ± 0.346	99.83 ± 0.461	0.753	Independent 2 sample T-Test

Oxygen saturation was in the range of 99 to 100%. In majority of intervals p value is not statistically significant.

Fig 3: Line diagram represents comparison of SPO2 between the groups



DISCUSSION

Subarachnoid block is most commonly used technique for lower abdominal and lower limb surgeries. Local anaesthetics were used intrathecally for several years but combination of opioids and local anaesthetics have a potent synergistic effect. Drugs with longer duration of action provide pain free recovery with decreased requirement of systemic analgesics.[3]

Redistribution by rostral spread following intrathecal administration of opioids results in adverse effects such as nausea, vomiting and respiratory depression that become limiting factor for the use of intrathecal opioids. Therefore, several spinal adjuvant drugs such as α2 agonists (clonidine or dexmedetomidine) have been studied as alternatives to intrathecal opioids.[5]

Kanazi GE et al [6] found that 3mcg dexmedetomidine had a comparable equipotent effect to clonidine. Hala EA Eid et al [7] studied the effects of dexmedetomidine on analgesia duration in a dose-dependent manner (control, 10mcg, and 15mcg) and confirmed the prolongation of analgesia duration. Many studies[8,9] have used 5mcg of dexmedetomidine as an additive to intrathecal hyperbaric bupivacaine and found it to be effective. As a result in our study, we used 5mcg dexmedetomidine as an additive to hyperbaric bupivacaine.

Few studies have been conducted with higher doses of buprenorphine. Capogna et al [10] and Sapkal Praveen S et al[11] have studied 60µg of buprenorphine as an additive to intrathecal bupivacaine and found it to have a significant prolonged duration of analgesia and nausea, vomiting were not statistically significant.

In our study, mean onset of sensory block is slower in buprenorphine group compared to dexmedetomidine group. Average time taken for onset of motor block in group B is faster than group D . Our findings are similar to study done by kannan Bojaraaj et al. [12] where in onset of sensory block is slower in buprenorphine group 3.47± 0.507 minutes than dexmedetomidine group 2.57 ± 0.504 min and mean onset of motor blockade is faster in buprenorphine group 3.83±0.817 min than dexmedetomidine group 4.13±0.78 min.

In our study, mean duration of sensory blockade, motor blockade is shortened in buprenorphine group compared to dexmedetomidine group. Mahim gupta et al [13] study shows the duration of sensory blockade was 289.6 minutes in buprenorphine group and 493.6 minutes in dexmedetomidine group which is comparable to dexmedetomidine group (490 minutes) in our study.

The duration of motor block in buprenorphine group of Mahima gupta et al [13] study was 205.17 minutes which is significantly lower than our study. This could be explained by the increased dosage used in our study where as the duration of motor block in dexmedetomidine group was 413.4 minutes which is similar to our study.

In both groups, there was no statistically significant change in perioperative blood pressure and heart rate. Because the sympathetic blockade is near maximal at the usual doses used for spinal anaesthesia, the inclusion of a low dose of α2-agonist has no or only a minor effect. Bradycardia and hypotension are the most common side effects of intrathecal adrenergic receptor agonists. These side effects were not important in our study, which could be attributed to the small doses of intrathecal dexmedetomidine and buprenorphine used. In our study five patients in groups B and three patients in group D received one dose of mephentermine for hypotension. Two patients in group D and three patients in group B required atropine for bradycardia.

Similar results were found in a previous study done by Mahima gupta et al. dose [13], which compared intrathecal buprenorphine and dexmedetomidine for their hemodynamic profile and found it to be similar in both groups. In both groups, 5 patients experienced bradycardia after subarachnoid block (2 in Group D and 3 in Group B), which was treated with atropine injection. Dexmedetomidine causes bradycardia, but the effect is more pronounced when administered intravenously and at a higher dose[14].

In this study, we observed that the sensory block characteristics of buprenorphine were less significant than those of dexmedetomidine adjuvant and dexmedetomidine has the added benefit of prolonging motor block. The rapid onset of sensory block and prolonged duration of sensory and motor blockade achieved with 5µg of dexmedetomidine combined with bupivacaine for spinal anaesthesia suggests that the drug may be useful in surgeries requiring prompt onset.

CONCLUSION

Dexmedetomidine as intrathecal adjuvant with 0.5% hyperbaric bupivacaine prolong the sensory and motor blockade with better hemodynamics compared to buprenorphine.

REFERENCES

1. A.Parimala. Comparative Study of Intrathecal Dexmedetomidine and Buprenorphine as Adjuvant to Bupivacaine in Spinal Anaesthesia in a teaching hospital. International Journal of Health and Clinical Research, 2021;4 (10):7-11.
2. Shirishkumar Talakkati, Kalpana Kulkarni. Comparison of efficacy of buprenorphine adjuvant to bupivacaine and plain bupivacaine in spinal anaesthesia for lower abdominal and lower limb surgeries. International Journal of Medical Science and Current Research, March-April 2021. Vol 4, Issue 2.
3. Soumya Samal, P. Rani, Chandrasekar LJ and Saubhagya Kumar Jena. Intrathecal Buprenorphine or intrathecal Dexmedetomidine for postoperative analgesia: A comparative study.The Health Agenda, Volume 2. Issue 1. January, 2014.
4. B Maharani, M sathya Prakash, Paramesh kalaiah, N.C Elango. Dexmedetomidine and

Buprenorphine as Adjuvant to Bupivacaine in Spinal Anaesthesia -A comparative study. Int J Cur Res Rev, June 2013/ Vol 05 (11).
5. Kaur N, Goneppanavar U, Venkateswaran R, Iyer SS. Comparative effects of buprenorphine and dexmedetomidine as adjuvants to bupivacaine spinal anaesthesia in elderly male patients undergoing transurethral resection of prostrate: A randomized prospective study. Anesth Essays Res 2017;11:886-91.
6. Kanazi GE, Aouad MT, Jabbour-Khoury SI, Al Jazzar MD, Alamedine MM, Al- yaman R, et al. effect of low dose dexmedetomidine or clonidine on the characteristics of spinal block.Acta Anaesthesiol scand. 2006;50:222-7.
7. Hala E A Eid et al 2011 studied dose related effect of intrathecal Dexmedetomidine with hyperbaric bupivacaine-a prospective randomized double blind study. Ain Shams Journal of Anesthesiology.2011 July;4(2);83-95.
8. Gupta R , Varma R , Bogra J, Kohli M, Raman R, Kushwala J K. A comparative study of intrathecal Dexmedetomidine and Fentanyl as adjuvants to Bupivacaine. Journal of Anaesthesiology and clinical Pharmacology|July-september 2011 | vol 27 | issue 3.
9. Al Mustafa MM, Abu- Halaweh SA, Aloweidi AS, Murshidi MM, Ammari BA, Awward ZM, et al. Effect of Dexmedetomidine added to spinal Bupivacaine for urological procedure. Saudi Med J 2009; vol.30 (3):365-370.
10. Capogna G, celleno D,Tagariello v, Loffreda-Mancinelli C. Intrathecal buprenorphine for postoperative analgesia in the elderly patient.Anaesthesia.1988;43: 128-30.
11. Sapkal PS, Kulkarni KD, Rajurkar SS, Nandedkar pd. Comparative study of intrathecal clonidine and intrathecal Buprenorphine for postoperative analgesia after lower limb orthopaedic surgery.International journal current Res Rev. 2013;5:87-91.
12. Bojaraaj K, Vijayaragavan S, Senthilkumar S, Khan MAM. Comparative Study of Intrathecal Dexmedetomidine and Buprenorphine as Adjuvant to Bupivacaine in Spinal Anesthesia: A Randomized Controlled Trail. Int J Sci Stud 2016;4(1):248-253.
13. Mahima Gupta, S shailaja, K sudhir hedge. Comparison of Intrathecal Dexmedetomidine with Buprenorphine as Adjuvant to Bupivacaine in Spinal Anesthesia. Journal of Clinical and Diagnostic Research. 2014 Feb, Vol-8 (2):114-117.
14. Iirola T, Aantaa R, Laitio R, Kentala E, Lahtinen M, Wighton A, Garratt C, Ahtola-Satila T, Olkkola KT. Pharmacokinetics of prolonged infusion of high-dose dexmedetomidine in critically ill patients.Critical care. 2011 Oct 26;15(5):R257.