Original Article

DOI: 10.7860/JCDR/2025/76366.21207

Anaesthesia Section

Comparison of Intrathecal Nalbuphine vs Intrathecal Clonidine as Adjuvant with Hyperbaric Bupivacaine in Pelvic and Lower Limb Orthopaedic Surgeries: A Randomised Clinical Study

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ABSTRACT

Introduction: Addition of an adjuvants to local anaesthetic like bupivacaine, helps to make sensory and motor blockade better compare to bupivacaine alone. In this study, comparison was done amongst nalbuphine—a mixed opioid with high efficacy as an agonist of kappa receptors—and clonidine, a selective alpha-2 adreno receptor agonist.

Aim: To determine the effects of intrathecal nalbuphine and clonidine as adjuvant with hyperbaric bupivacaine 0.5% on onset and duration of sensory and motor block with duration of total postoperative analgesia in pelvic and lower limb orthopaedic surgeries.

Materials and Methods: This randomised clinical study was done on 50 patients aged between 18 and 65 years with American Society of Anaesthesiologists (ASA) Grade I or II, of either gender. They were randomly divided 25 in each group as Group BCL (clonidine), containing hyperbaric 0.5% bupivacaine 3.4 mL+30 µg clonidine (total 3.6 mL) and Group BN (nalbuphine) containing hyperbaric 0.5% bupivacaine 3.4 mL+1 mg nalbuphine (total 3.6 mL). Parameters studied were motor and sensory block characteristic like time of onset, duration of sensory and motor block, two-segment regression time, total duration of postoperative analgesia and side-effects. Haemodynamic changes were also noted. Statistical analysis done by using Student's t-test and Chi-square test. Tests were considered statistically significant if p-value was <0.05.

Results: Demographic data, including age, gender, weight, ASA grading and duration of surgery for both the groups, were comparable and statistically non significant. BCL group (4.15±0.57 minutes) had significantly faster onset for motor block than BN (5.06±0.42 minutes) (p-value <0.0001). Group BCL has significantly longer motor block duration (335.2±23.69 minutes) than BN (285.2±23.21 minutes), with significantly longer sensory block duration in group BCL (400.6±30.29 minutes) than BN (357.8±29.51 minutes) (p-value <0.0001). The duration of postoperative analgesia was significantly extended in the BCL group (445.8±33.87 minutes) than BN (410.8±26.56 minutes) (p-value ≤0.0002).

Conclusion: Present study concluded that addition of clonidine 30 µg with hyperbaric bupivacaine 0.5% in spinal anaesthesia, compared to nalbuphine 1 mg, shortens the onset time of motor block and prolongs the duration of both sensory and motor block, while also increasing total postoperative analgesia period, all with haemodynamic stability and minimal side-effects.

Keywords: Alpha2 agonist, Analgesia, Motor block, Opioid, Spinal anaesthesia

INTRODUCTION

For procedures involving the lower extremities, such as orthopaedic surgeries, anaesthesiologist faces particular challenge when it comes to offering patients a quick motor recovery for early ambulation. Therefore, subarachnoid (spinal) block stands relatively safer, more efficient and cost-effective option, as it eliminates the airway management issues that comes with general anaesthesia, especially pulmonary complications and avoidance of multiple drug administration and related side-effects with offering optimal analgesia and muscle relaxation during procedure, as well as sustained analgesia following surgery [1-3].

The commonest spinal local anaesthetic of choice is hyperbaric bupivacaine from amide group. It binds intracellularly to voltage-gated sodium channels, blocks sodium influx into neurons and preventing depolarisation, thereby inhibiting the initiation or propagation of a pain signal. Relatively shorter duration of action and early administration of analgesics is the main drawback of it. Therefore, various opioid like morphine, fentanyl, buprenorphine and nalbuphine while clonidine and dexmedetomidine as non opioids are used as adjuvants along with local anaesthetic agents which increases the efficacy, prolong the neuroaxial blockade and decrease the local anaesthetic drug dosage and related toxicity [4,5].

Nalbuphine is a lipophilic, mixed agonist-antagonist semisynthetic opioid having high efficacy agonist of kappa receptors produces analgesia for visceral nociception, with moderate efficacy partial antagonist of µ receptors produces less side-effect while partial agonist of µ receptor result in ceiling effect on respiratory depression. It has very low affinity for delta and sigma receptors [6,7].

Clonidine hydrochloride, an imidazoline derivative, is a lipid-soluble, potent analgesic free of opioid-related side-effects. It acts as an agonist on postsynaptic alpha-2 adrenergic receptors located at brainstem nuclei and substantia gelatinosa in the spinal cord. It interrupts nociceptive stimulus from periphery, spinal cord and supraspinal sites and blocks conduction of C and Aδ fibers via potentiation of potassium conductance which lead to analgesia [8,9].

Studies done by comparison of nalbuphine and clonidine are limited on literature search. Various studies are done to compare different doses of nalbuphine from 0.2 mg to 2.4 mg and for clonidine between 15 µg to 150 µg; but no ideal dose yet found, so this

study was formulated to compare the efficacy of 1 mg nalbuphine and 30 µg clonidine as additive to hyperbaric bupivacaine 0.5% in pelvic and lower limb orthopaedic surgeries [10-14].

Thus, this study emphasises on to observe and compare the effects by intrathecal clonidine 30 µg or nalbuphine 1 mg as adjuvant added with hyperbaric bupivacaine 0.5% on different characteristics of sensory and motor block, haemodynamics and side-effects or complications occurred if any in elective pelvic and lower limb orthopaedic surgeries.

Primary objectives were to compare the onset and duration of sensory and motor block along with postoperative analgesia duration and secondary objectives were to compare haemodynamic changes along with intraoperative and postoperative side-effects if any as adjuvant in subarachnoid block with hyperbaric bupivacaine in pelvic and lower limb orthopaedic surgeries.

MATERIALS AND METHODS

This randomised clinical double-blinded study was conducted in the Department of Anaesthesia, Dheeraj Hospital, Smt. Bhikhiben Kanjibhai Shah Medical Institute and Research Centre, Vadodara, Gujarat, India for the time period of six months from October 2023 to March 2024. With the permission of Institutional Ethical Committee (IEC) (SVIEC/MEDI/SRP/OCT/23/37), this study was executed with written and informed consent obtained from all 50 patients who were going through the pelvic and lower limb orthopaedic surgeries.

Inclusion criteria: Patients aged between 18 to 65 years classified as ASA Grade I or II by ASA of either gender, electively posted for pelvic and lower limb orthopaedic surgeries were included in the study.

Exclusion criteria: Patients below 18 years or above 65 years, those refusing to participate, those with ASA III or higher, having contraindications to spinal anaesthesia (local site infection, raised intracranial pressure, haemodynamic instability), pregnant, having hepatic, renal, cardiac, or respiratory co-morbidities, bleeding disorders or coagulopathies, allergies to study drugs, seizure disorders, neurological disorders, neuropathies, or receiving medications known to influence neuromuscular junction and patients with failed spinal anaesthesia converted to general anaesthesia were excluded from the study.

Sample size: Sample size was calculated on the bases of previous study done by Pandey R et al., considering a variability of 7.28 and 8.08 minutes for onset of motor block in patients receiving nalbuphine and clonidine, respectively, using a 95% confidence interval and a power of 80% [15]. The sample size of 22 was calculated using OpenEpi, Version 3, an open source calculator-SSMean. By adding a 5% dropout rate, the final calculated sample size was 25 in each group.

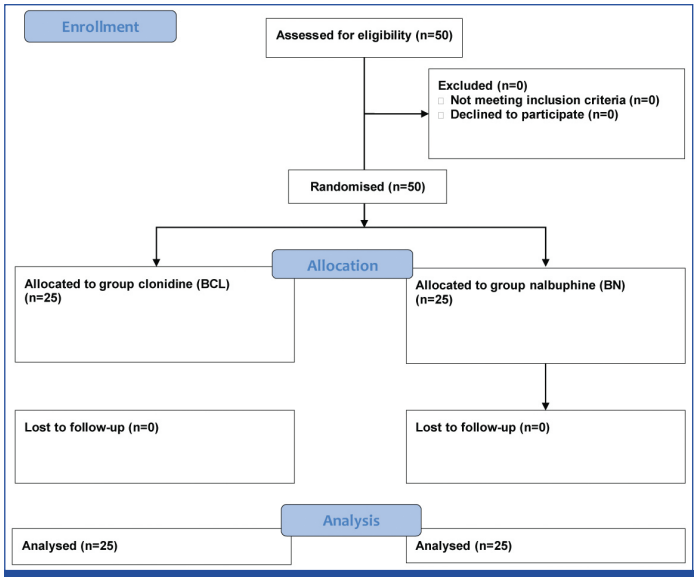
A total of 50 patients were randomly divided into following group on the basis of a computer-generated sequence with sealed envelopes, so assessor and patients were blinded. Drug was administered by the anaesthesiologist, who was not involved in this study [Table/Fig-1]. Doses of nalbuphine as 1 mg and clonidine 30 µg for the study were derived from the study done by Agrawal H et al., [16].

Group BN: Patients in this group were given 1 mg of nalbuphine (0.2 mL) along with 17 mg (3.4 mL) of 0.5% bupivacaine injection intrathecally (total volume: 3.6 mL).

Group BCL: Patients in this group were given 30 µg of clonidine (0.2 mL) along with 17 mg (3.4 mL) of 0.5% bupivacaine injection intrathecally (total volume: 3.6 mL).

Study Procedure

Day before surgery, patients who were undergoing for the surgery taken for routine preoperative assessment and examination. All routine investigations, including Complete Blood Count (CBC), Random Blood Sugar (RBS), coagulation profile, Liver Function Test (LFT), Renal Function Test (RFT), Electrocardiogram (ECG), serology and other specific investigation if required done. Patients were advised not to take solids for six hours and clear fluids for two hours.



[Table/Fig-1]: CONSORT flow diagram.

On the day of surgery, 18 G i.v. cannula secured and preloading of ringer lactate solution at 10 mL/kg given intravenously. Inside the operation room, baseline vitals such as pulse rate, Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Respiratory Rate (RR) and Oxygen Saturation (SpO_2) noted. All patients were given inj. Glycopyrrolate 0.004 mg/kg and inj. Ondansetron 0.08 mg/kg i.v. as premedication. As per the convenience, patient was given sitting position. After taking all aseptic and antiseptic precautions, subarachnoid block was performed with 25 G Quincke spinalneedle at the L3-L4 or L4-L5 intervertebral space and drug was administered according the group allocated. From this time, pin prick method was used to evaluate sensory block and the modified Bromage score was employed to assess motor block. Changes in pulse rate, SBP, DBP, RR and SpO_2 were noted at 0, 2 and 5 minutes and then every 10 minutes up to 30 minutes, then every 15 minutes till the surgical procedure got over.

(A) Sensory block assessment: Using hypodermic needle, sensory block level was assessed.

Time taken for sensory block onset: Time period from the end of injection of the drugs intrathecally to sensation loss at L1 dermatome using pinprick sensation [17].

Highest level of sensory block: Till two successive levels of sensory block will be a like (i.e., level fixation).

Time interval for two segment regression: Time period to regress sensory block two segment from highest level.

Duration of sensory block: Time consumed for sensory regression to S2 dermatome.

Assessment was done at 2, 5, 10, 20 and 30 minutes after injection and then 15 minutes interval till two successive levels of sensory block was alike (i.e., level fixation) after which assessment was done every 15 minutes till surgery lasted and every 30 minutes till complete regression of sensory blockade. When sensory block was achieved equal to T10 or above than that, the surgeon was allowed for starting of the surgery.

(B) Motor block assessment: Modified Bromage scale was used for evaluation [18].

Time taken for motor block onset: Time period from intrathecal injection to motor block till grade 3.

Duration of motor block: Time interval from intrathecal injection till motor block was grade 0 was documented.

Assessment was conducted at 0, 5, 10, 20 and 30 minutes after intrathecal drug injection and then every 15 minutes interval till the surgery lasted and every 30 minutes till complete regression of motor blockade postoperatively.

Duration of rescue analgesia (considered when the Visual Analogue Scale (VAS) score became ≥4) [19]: Time interval from intrathecal injection to the time rescue analgesia given. Inj. diclofenac sodium 75 mg was administered for that. Sedation was measured by Ramsay Sedation Scale [20].

Side-effects such as nausea, hypotension, vomiting, pruritus and respiratory depression were noted and treatment given for the same.

All patients were transferred to the postoperative recovery cell where pulse rate, SBP, DBP, RR and SpO_2 were evaluated, along with duration of sensory block and motor block evaluated every 30-minutes till complete regression of sensory and motor blockade. Assessment of pain intensity done via VAS (where no pain is represented by 0, mild pain by 1-3, moderate pain: 4-6, severe pain: 7-9 and very severe pain by 10) and rescue analgesia given at VAS ≥4. Data collected from the respective case performa of each patient was decoded and analysed at the end of the study.

STATISTICAL ANALYSIS

All the data were compiled in a tabulated manner and processed by Microsoft Excel 2019 (Microsoft® Corp., Redmond, WA). Analysis done using statistical package for social sciences for windows, version 22.0 (IBM SPSS, Armonk,NY). Mean and Standard Deviation (SD) were used as the means of numerical variables, while categorical variables were presented as frequency and percentage. To compare between groups, an unpaired student t-test was utilised for numerical variables and a Chi-square test was utilised for categorical variables. A significant difference (p≤0.05 was considered statistically significant.

RESULTS

Demographic distribution (age, weight and gender), ASA grade and duration of surgery were comparable amongst both the groups and were statistically non significant (p≥0.05) [Table/Fig-2].

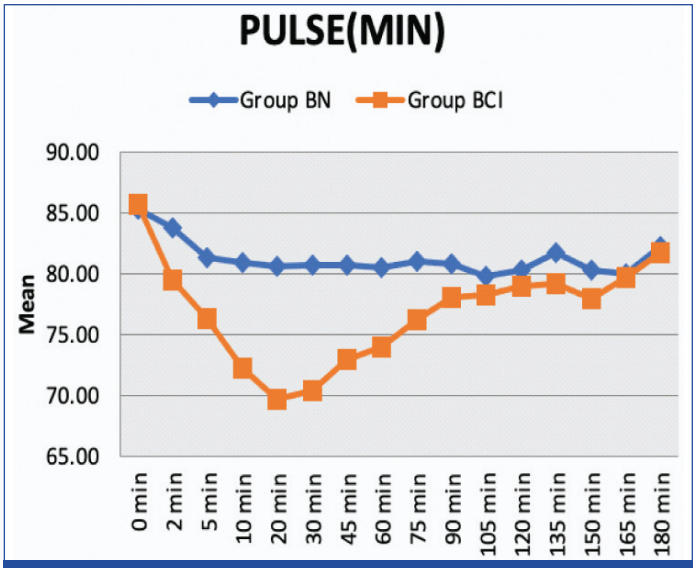
Parameter	Group BN Mean±SD	Group BCL Mean±SD	t-test	p-value
Age (years)	38.68±12.4	39.12±11.96	0.128	0.8989
Weight (kg)	60.76±6.39	61.08±5.8	0.185	0.8537
Gender				
Male	17	15	0.0868	0.7683
Female	8	10		
ASA grade				
1	8	6	0.0992	0.7528
2	17	19		
Duration of surgery (mins)	139.8±32.32	138.6±32.19	-0.132	0.8959

[Table/Fig-2]: Demographic distribution comparison.
p-value <0.05* statistically significant; Chi-square test used to compare categorial data and student's t test used to compare continuous data

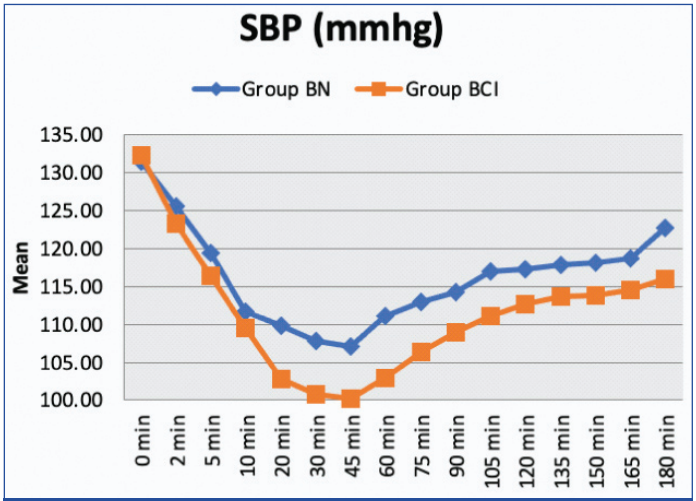
[Table/Fig-3-7] represent intraoperative Heart Rate (HR), SBP, DBP, RR and SpO_2 during surgery.

Onset of sensory block and time to achieve highest level were comparable between both the groups and statistically non significant (p-value >0.05). Mean time for motor block onset was more rapid and statistically significant with BCL group (4.15±0.57 mins) in relation to BN group (5.06±0.42 mins) (p-value <0.0001). Two-segment regression of sensory analgesia from highest level achieved was extended and statistically significant with BCL group (144.4±14.53 mins) in relation to BN group (131±7.77 mins) (p-value <0.0002).

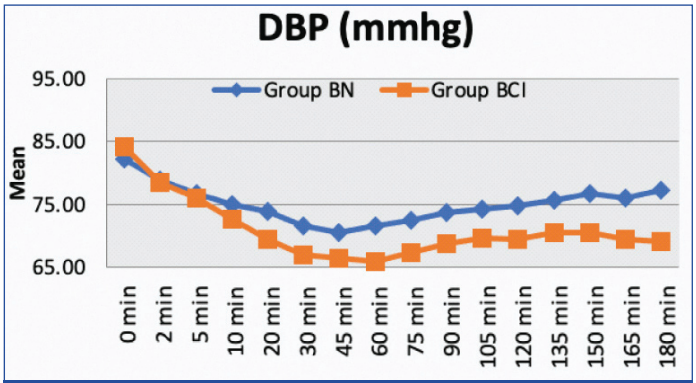
Time of sensory blockade was extended with BCL group (400.6±30.29 mins) than BN group (357.8±29.51 mins) (p-value <0.0001). Time of motor block was longer with BCL group



[Table/Fig-3]: Intraoperative Heart Rate (HR) comparison. Intraoperative pulse rate between 10 to 75 minutes during surgery were statistically highly significant between both the group (p-value <0.05). Student's t-test used to compare continuous data.



[Table/Fig-4]: Intraoperative Systolic Blood Pressure (SBP) comparison. Student's t-test used to compare continuous data.
Intraoperative SBP was significantly lower in clonidine group (BCL) than nalbuphine group (BN) (p-value <0.05)



[Table/Fig-5]: Intraoperative Diastolic Blood Pressure (DBP) comparison.
Student's t-test used to compare continuous data; Intraoperative DBP was significantly lower in clonidine group (BCL) than nalbuphine group (BN) (p-value <0.05)

Parameters	Group BN Mean±SD	Group BCI Mean±SD	t-test	p-value
0 min	15.44±1.69	15.12±1.83	-0.642	0.5237
2 mins	15.2±1.53	15.36±1.5	0.373	0.7105
5 mins	14.88±1.17	14.72±1.51	-0.419	0.6772
10 mins	14.32±0.95	14.32±1.25	0.000	1.0000
20 mins	14.16±1.14	14.24±1.33	0.228	0.8203
30 mins	14.4±1.63	14±1.29	-0.962	0.3408

45 mins	14±1.15	14±1.15	0.000	1.0000
60 mins	14.16±1.28	14±1.53	-0.401	0.6902
75 mins	14.56±1.47	14.32±1.38	-0.595	0.5545
90 mins	14.64±1.25	14.24±1.2	-1.154	0.2541
105 mins	14.52±1.08	14±1.07	-1.710	0.0937
120 mins	14.42±1.26	14.32±1.2	-0.287	0.7751
135 mins	14.57±0.94	14.43±1.4	-0.415	0.6799
150 mins	14.55±1.29	14.36±0.81	-0.624	0.5358
165 mins	14.25±0.71	14.44±0.88	0.840	0.4050
180 mins	14.75±1.04	14.33±0.82	-1.586	0.1194

[Table/Fig-6]: Intraoperative Respiratory Rate (RR) comparison.
Student's t-test used to compare continuous data

Parameters	Group BN Mean±SD	Group BCI Mean±SD	t-test	p-value
0 min	99.12±0.97	99.12±0.97	0.000	1.0000
2 mins	99.08±0.95	99.12±0.97	0.368	0.7143
5 mins	99±0.91	99.04±0.84	0.161	0.8724
10 mins	99.2±0.76	99.04±1.02	-0.629	0.5324
20 mins	99±0.96	99.08±0.91	0.302	0.7637
30 mins	99±1	99±0.87	0.000	1.0000
45 mins	99.08±0.76	99.2±0.91	0.506	0.6151
60 mins	98.96±0.93	99.08±0.91	0.461	0.6468
75 mins	98.96±0.93	98.92±0.86	-0.158	0.8752
90 mins	99.04±0.79	99.04±0.98	0.000	1.0000
105 mins	99.13±0.92	99.09±0.87	-0.158	0.8752
120 mins	98.95±0.85	99±0.88	0.204	0.8390
135 mins	99.07±1	99±1.11	-0.234	0.8158
150 mins	98.64±1.21	98.82±1.17	0.535	0.5953
165 mins	99±0.53	99.22±0.83	1.117	0.2696
180 mins	99±0.76	98.83±1.17	-0.609	0.5452

[Table/Fig-7]: Intraoperative Oxygen Saturation (SpO_2) comparison.
Student's t-test used to compare continuous data

(335.2±23.69 mins) than BN group (285.2±23.21 mins) (p-value <0.0001). Rescue analgesia time was extended with BCL group (445.8±33.87 mins) than BN group (410.8±26.56 mins) (p-value <0.0002) [Table/Fig-8].

Parameters	Group BN Mean±SD	Group BCL Mean±SD	t-test	p-value
Onset of sensory analgesia at L1 (min)	2.3±0.44	2.35±0.46	0.393	0.6963
Onset of sensory analgesia at T10 (min)	4.5±0.41	4.72±0.41	1.897	0.0638
Time to achieve highest level (mins)	7.36±0.77	7.28±0.54	-0.425	0.6725
Time of 2 segment regression of sensory analgesia (mins)	131±7.77	144.4±14.53	4.066	0.0002
Time of onset of grade 3 motor block (mins)	5.06±0.42	4.15±0.57	-6.426	<0.0001
Total duration of motor block (mins)	285.2±23.21	335.2±23.69	7.538	<0.0001
Total duration of sensory block (mins)	357.8±29.51	400.6±30.29	5.06	<0.0001
Rescue analgesia (mins)	410.8±26.56	445.8±33.87	4.066	0.0002

[Table/Fig-8]: Comparison of sensory and motor block assessment.
p-value <0.05* statistically significant; p<0.001** statistically highly significant; Student t-test used to compare continuous data; SD: Standard deviation

Mean time for rescue analgesia was extended with clonidine (BC group) in relation to nalbuphine (BN group) significantly after two hours of postoperative period [Table/Fig-9].

Time	Group BN Mean±SD	Group BCI Mean±SD	p-value
0 min	0±0	0±0	NA
30 mins	0±0	0±0	NA
1 hrs	0.88±0.33	0±0	NA
1.5 hrs	1.6±0.5	1±0	NA
2 hrs	2.28±0.61	1.28±0.46	<0.0001
3 hrs	2.92±0.76	1.68±0.56	<0.0001
4 hrs	2.8±1.22	2.52±0.87	0.3548
5 hrs	2.16±1.37	2.72±1.24	0.1363
6 hrs	1.6±0.71	2.08±1.41	0.1350
7 hrs	2.2±0.5	1.48±0.71	0.0001
8 hrs	2.72±0.84	1.76±0.52	<0.0001
12 hrs	3.28±1.02	2.72±0.84	0.0393

[Table/Fig-9]: Postoperative Visual Analog Scale (VAS) comparison.

Ramsay Sedation Scale were comparable between both the groups and patients were co-operative and calm throughout the procedure.

Side-effects and complications were comparable and statistically non significant (p-value >0.05) [Table/Fig-10].

Complications	Group BN N	Group BCI N	p-value
Hypotension	2	3	0.1765

[Table/Fig-10]: Postoperative complications.

DISCUSSION

The rationale behind the combination of opioids and local anaesthetics administered intrathecally is that the two distinct drug classes reduce pain by acting at two distinct sites in the spinal cord. Local anaesthetics at the nerve axonal level by blocking voltage-gated sodium channels, while intrathecal opioids act at the receptor level within the substantia gelatinosa to modulate the function of afferent pain-carrying nerve fibres. A portion of the intrathecal opioid is absorbed into the systemic circulation and acts on the opioid receptors in the brain [6,7,11]. Rawal N et al., studied the safety of nalbuphine when used intrathecally in both animal and human subjects [21].

Clonidine functions as a mixed α1- and α2-adrenoceptor agonist, primarily activating the α2 receptor with an α2:α1 activity ratio of 200:1. Analgesia at the spinal level is produced by central sympatholysis at the presynaptic ganglionic site and the activation of the descending medullospinal noradrenergic tract activation, whereas analgesia at the supraspinal locus coeruleus is produced via transduction. Clonidine's analgesic effects are partly attributed to its suppression of spinal substance P release and enhancement of cholinergic release. The goal of intrathecal clonidine-induced analgesia is to reach a high concentration near α2-adrenoreceptors in the substantia gelatinosa [8,9,11]. Walker SM et al., studied the safety of clonidine usage intrathecally in animal and human [22].

In this randomised study, clonidine 30 µg and nalbuphine 1 mg added to 0.5% hyperbaric bupivacaine in subarachnoid block in pelvic and lower limb orthopaedic surgeries. It concluded that clonidine provided a longer duration of sensory and motor block with a longer time taken for two-segment regression compared to nalbuphine. It extended postoperative analgesia time period with lessor side-effects (p-value <0.05). No statistical significance seen in time of onset of sensory block and time to achieve highest level (p-value >0.05). Demographic parameters, like age, gender, weight, ASA grading and duration of surgery, were statistically non significant (p-value >0.05).

In present study, onset time for the sensory block was 2.3±0.44 minutes at L1 level and 4.5±0.41 min at T10 level in group

nalbuphine while 2.35±0.46 minutes at L1 level and 4.72±0.41 min at T10 level in the clonidine group. The results between both groups were comparable and statistically non significant (p-value >0.05). Similarly, Kumar R et al., compared clonidine (30 µg) and nalbuphine (800 µg) with 0.5% heavy bupivacaine (12.5 mg) in 100 patients undergoing infraumbilical surgeries. The mean time taken for sensory block onset was found to be 2.52±0.45 minutes for the nalbuphine group compared to 2.7±0.72 minutes in the clonidine group. Result was comparable and statistically non significant (p-value >0.05) which was in contrast to study done by Chetty DK et al., [23,24].

Present study found that the time interval for two-segment regression with nalbuphine (131±7.77 minutes) was longer in duration compared to clonidine (144.4±14.53 minutes). This result was statistically significant (p-value <0.05). Similarly, Bansal M et al., found that utilising 30 µg of clonidine and 2 mg of nalbuphine as additive to hyperbaric bupivacaine 0.5% (3.5 mL) resulted in a more rapid two-segment regression in 60 patients undergoing gynaecological procedures (157.51±18.25 minutes) than in patients who received clonidine alone (216.33±12.43 minutes) and this result was statistically significant (p-value <0.05) [14]. Similarly seen with study done by Agrawal H et al., and Chetty DK et al., [16,24].

Duration of sensory block in present study found a significant difference in the mean duration of sensory block between the clonidine group (BCL) (400.6±30.29 minutes) and the nalbuphine (BN group) (357.8±29.51 minutes) (p-value <0.05). Similarly, John S et al., observed that adding clonidine (30 µg) and nalbuphine (1.6 mg) as additives to hyperbaric bupivacaine 0.5% (3.5 mL) resulted in a mean duration of sensory block (205.6±5.32 minutes) the nalbuphine group and (246.51±16.38 minutes) with the clonidine group considered statistically significant (p-value <0.05) [25]. Similarly, Girish BK et al., has done the study using 30 µg clonidine and hyperbaric bupivacaine 0.5% 3 mL with 0.4 mg nalbuphine as additive in hyperbaric bupivacaine 0.5% resulted mean duration of sensory block (211.33±16.13 minutes) with nalbuphine (BN group) and (251.33±25.43 minutes) for the clonidine group, which considered statistically significant (p-value <0.05) [26].

Present study noted that motor block was significantly earlier with clonidine (4.15±0.57 minutes) contrasted to the nalbuphine group (5.06±0.42 minutes) (p-value <0.05). Similarly, Agrawal H et al., found that the clonidine group (6.95±1.02 min) had a more rapid onset of motor block than nalbuphine group (8.29±0.71 minutes) and control group (10.10±1.21 minutes), which was comparable and significant (p-value <0.05) [16]. Similarly seen with Chetty DK et al., [24].

Present study also found the duration of motor block duration was significantly longer with clonidine (335.2±23.69 minutes) than nalbuphine group (285.2±23.21 minutes) (p-value <0.05). Similarly, Agrawal H et al., has noted that the clonidine group (238.57±24.14 minutes) had a prolong motor block duration than nalbuphine group (195.75±17.86 minutes), which was comparable and significant (p-value <0.05) [16]. Similar results seen with Chetty DK et al., [24].

In present study, the duration of postoperative analgesia duration (VAS score) or first rescue analgesia duration was extended with clonidine (445.8±33.87 minutes) than nalbuphine group (410.8±26.56 minutes), with statistically significance (p-value <0.05). Similarly, Agrawal H et al., has observed that postoperatively duration of analgesia was extended with clonidine (292.86±24.94 minutes) than nalbuphine group (216.75±25.96 minutes) (p-value <0.05) [16]. This finding was supported by the study done by Chetty DK et al., [24] in 2018, where 15 mg of 0.5% hyperbaric bupivacaine administered, patients of groups BS, BN and BC received 15 mg of 0.5% hyperbaric bupivacaine, along with 0.9% normal saline, 1.6 mg of nalbuphine and 30 µg of clonidine has found that extended period of rescue analgesia was extended with clonidine (218.3±35.1 minutes) compared to the nalbuphine group (330.7±47.7 minutes) (p-value <0.05). Similarly, Bansal M et al., reported similar results using 2 mg of nalbuphine (231.50±26.18 minutes) and 30 mcg clonidine (283.00±14.18 minutes) (p-value <0.05) [14].

Overall, in present study, incidences of side-effects like bradycardia and hypotension were more in group (BCL) than BN but were statistically insignificant. None of the patients had nausea, vomiting, pruritus and respiratory depression. Patients were cooperative and calm throughout the procedure, with comparable Ramsay sedation score in both the groups. Results were supported by Bansal M et al., Agrawal H et al., and Chetty DK et al., [14,16,24].

In present study, both groups had comparable haemodynamic parameters such as HR, BP, RR and SpO_2 levels. The mean heart rate in the clonidine group was significantly lower between the 10 minutes to 75 minutes time interval however none of the patients required any medication. Clonidine group had significantly lower mean BP and hypotension noted during intraoperative was treated with i.v. fluids and an injection Mephentermine 6 mg in both groups. Otherwise side-effects in intra and postoperative period were comparable and statistically not significant. Similarly, Agrawal H et al., has observed in the study of total 63 patients using 30 µg clonidine, 1 mg nalbuphine and normal saline to 0.5% heavy bupivacaine (15 mg) where the HR was significantly lower with clonidine than other two groups consisted of nalbuphine and normal saline at all the time interval and at 30 minutes intraoperatively, BP falls significantly in nalbuphine group and treated. Otherwise, amongst three groups complications were comparable throughout and postoperatively and statistically non significant [16].

This was also supported by the study done by Chetty DK et al., where patients received 15 mg of 0.5% hyperbaric bupivacaine administered, patients of groups BS, BN and BC received 0.9% normal saline, 1.6 mg of nalbuphine and 30 µg of clonidine [24].

Limitation(s)

This study lacks a placebo group and included only normotensive patients. As a result, the outcomes may not accurately reflect the effectiveness and safety in hypertensives in whom intraoperative haemodynamics are crucial. Since this study was done in hospital, its generalisability is confined.

CONCLUSION(S)

As per the results of the present study, it can be concluded that intrathecal clonidine and nalbuphine are most commonly used additives to 0.5% hyperbaric bupivacaine in subarachnoid block. For pelvic and lower limb orthopaedic surgeries, addition of intrathecal 30 µg of clonidine to 0.5% hyperbaric bupivacaine as an adjuvant is preferable over 1 mg of nalbuphine, as it provides more prolonged motor and sensory blockade compare to nalbuphine with better and prolonged postoperative analgesia without any major side-effects.

Acknowledgement

Authors acknowledge their department's anaesthetic professionals, nursing team in the operating theatre and recovery room. Authors also appreciate the patients who enrolled in it by providing consent.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Oct 18, 2024
- Manual Googling: Feb 22, 2025
- iThenticate Software: Feb 25, 2025 (16%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Oct 17, 2024**
Date of Peer Review: **Dec 19, 2024**
Date of Acceptance: **Feb 27, 2025**
Date of Publishing: **Jul 01, 2025**