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Original Article

Anaesthesia Section

Comparison of Intrathecal Dexmedetomidine versus Intrathecal Clonidine as Adjuvant with Hyperbaric Levobupivacaine for Subarachnoid Blockade Characteristics in Lower Limb Orthopaedic Surgeries: A Double-blind Randomised Clinical Study

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ABSTRACT

Introduction: Spinal anaesthesia remains the cornerstone technique for lower limb orthopaedic surgeries due to its rapid onset, reliable surgical conditions, and cost-effectiveness. Alpha-2 adrenergic agonists such as clonidine and dexmedetomidine have emerged as promising adjuvants to local anaesthetics, offering advantages over opioids including absence of respiratory depression and pruritus.

Aim: To compare intrathecal dexmedetomidine versus clonidine as adjuvants to hyperbaric levobupivacaine in patients undergoing lower limb orthopaedic surgeries.

Materials and Methods: The present randomised, double-blind clinical study was conducted at the Department of Anaesthesiology, SBKS Medical Institute and Research Centre, Vadodara, Gujarat, India from January 2023 to December 2023. Sixty American Society of Anesthesiologists (ASA) I-II patients undergoing lower limb orthopaedic surgeries were randomly allocated into two groups: Group-LC (n=30) received 3mL of 0.5% hyperbaric levobupivacaine with 30µg clonidine (total volume 3.5mL), and Group-LD (n=30) received 3mL of 0.5% hyperbaric levobupivacaine with 5µg dexmedetomidine (total volume 3.5mL). Parameters assessed included onset and duration of sensory and motor blockade, haemodynamic parameters, sedation scores, duration of postoperative analgesia, and incidence of side-effects. Data analysed using Jamovi version 2.0. Quantitative variables compared using unpaired Student's t-test and categorical variables using Chi-square test. The p-value <0.05 was considered statistically significant.

Results: Both groups were comparable in demographic characteristics. Onset of sensory blockade (2.88±0.23 min) and motor blockade (1.45±0.30 min) of Group-LD was significantly faster compared to Group-LC sensory blockade (3.02±0.45 min) and motor blockade (1.58±0.32 min). The duration of sensory and motor blockade was longer in Group-LD (394.30±7.66 min and 358.43±9.53 min) compared to Group-LC (277.23±8.65 min and 322.63±14.52 min). The duration of absolute and effective analgesia was longer for Group-LD (443.93±6.48 min and 473.60±9.43 min) compared to Group-LC (314.20±8.59 min and 364.67±11.72 min). Haemodynamic parameters were comparable with no significant differences in side-effects.

Conclusion: Dexmedetomidine (5µg) as an adjuvant to hyperbaric levobupivacaine provides faster onset and prolonged duration of sensory and motor blockade compared to clonidine (30µg), with extended postoperative analgesia and comparable safety profile.

Keywords: Anaesthesia, Analgesia, Nerve block, Postoperative pain

INTRODUCTION

Spinal anaesthesia, introduced by Karl August Bier in 1898, remains one of the most widely used techniques for lower limb orthopaedic surgeries due to its simplicity, reliability, and cost-effectiveness [1]. The ideal spinal anaesthesia should provide rapid onset, adequate surgical anaesthesia, and prolonged postoperative analgesia whilst allowing early ambulation and preventing adverse consequences of surgical trauma [2]. The quest for prolonging the duration of spinal anaesthesia and postoperative analgesia has led to extensive research on various adjuvants that can be added to local anaesthetics [3,4].

Levobupivacaine, the pure S(-)-enantiomer of bupivacaine, has gained popularity due to its efficacy comparable to bupivacaine but with superior pharmacological properties, including less cardiotoxicity and neurotoxicity [3]. The reduced toxicity profile of levobupivacaine makes it particularly suitable for neuraxial anaesthesia where large volumes of local anaesthetic may be required [5,6]. Various adjuvants are being used to prolong the intraoperative and postoperative analgesia. Alpha-2 agonists have advantages over opioids as they do not cause respiratory depression, urinary retention, pruritus, or nausea and vomiting [4,7]. They enhance analgesia by activating $\alpha 2$ receptors in the dorsal horn of the spinal cord, inhibiting the release of nociceptive neurotransmitters and hyperpolarising post-synaptic dorsal horn neurons [8,9].

Clonidine, an $\alpha 2$-adrenergic agonist with a selectivity ratio of 220:1 ($\alpha 2$:$\alpha 1$), was the first to be extensively studied as an adjuvant in neuraxial anaesthesia [5,10,11]. It inhibits voltage-gated sodium channels and hyperpolarises $A\delta$ and C fibres in the spinal cord, thereby producing prolonged postoperative analgesia [5]. Multiple clinical trials have demonstrated the efficacy of clonidine in doses ranging from 15-75 µg as an intrathecal adjuvant, with 30µg being commonly used to balance efficacy and side-effects [10-12].

Dexmedetomidine, a highly selective $\alpha 2$-adrenergic receptor agonist with a selectivity ratio of 1620:1 ($\alpha 2$:$\alpha 1$), is approximately

8-10 times more selective for α2 receptors than clonidine [6]. Though not FDA-approved for intrathecal use, several studies have demonstrated its efficacy and safety as an adjuvant in neuraxial anaesthesia [7,13,14]. Its higher selectivity may result in more potent analgesia with potentially fewer side-effects. The mechanism of action of dexmedetomidine in the spinal cord involves activation of α2A and α2C receptor subtypes, leading to hyperpolarisation of dorsal horn neurons and inhibition of substance P release [13,14].

Despite multiple studies comparing these adjuvants with bupivacaine, there is limited literature comparing their efficacy with hyperbaric levobupivacaine, particularly in orthopaedic surgeries [15-17]. The need for this study arises from the paucity of comparative data specifically examining dexmedetomidine and clonidine as adjuvants to levobupivacaine in the context of lower limb orthopaedic procedures, where prolonged postoperative analgesia is crucial for early mobilisation and rehabilitation. The novelty of this study lies in the direct comparison of these two α2-agonists at commonly used clinical doses (dexmedetomidine 5µg versus clonidine 30µg) with hyperbaric levobupivacaine, which has a better safety profile compared to racemic bupivacaine. The aim of the present study was to compare the efficacy and safety of intrathecal dexmedetomidine (5µg) versus clonidine (30µg) as adjuvants to hyperbaric levobupivacaine in patients undergoing lower limb orthopaedic surgeries.

The primary objectives were to compare the onset and duration of sensory and motor blockade between intrathecal dexmedetomidine (5µg) and clonidine (30µg) as adjuvants to hyperbaric levobupivacaine in patients undergoing lower limb orthopaedic surgeries and the secondary objectives were to compare the duration of postoperative analgesia and rescue analgesic requirements between the two groups, to evaluate and compare the haemodynamic effects of both adjuvants and to assess and compare the incidence of side-effects including sedation, bradycardia, hypotension, nausea, vomiting, and shivering between the groups.

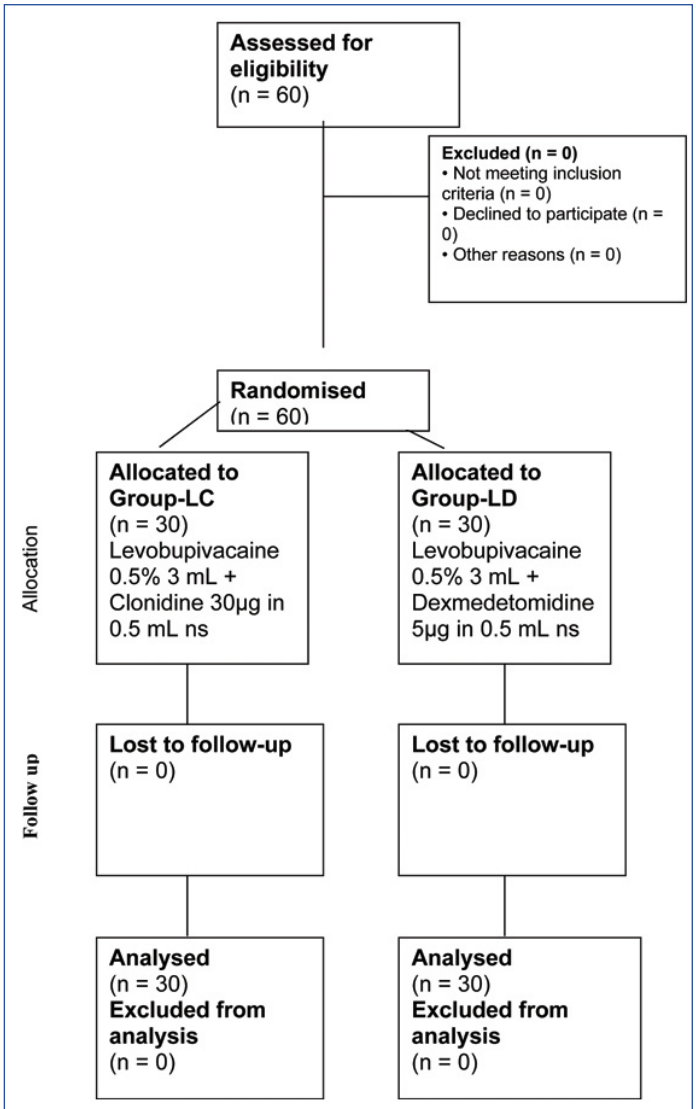
MATERIALS AND METHODS

The present, randomised, double-blind clinical study was conducted in the Department of Anaesthesiology at SBKS Medical Institute and Research Centre, Sumandeep Vidyapeeth Deemed to be University, Vadodara, Gujarat, India from January 2023 to December 2023 (12 months). The current study was initiated after obtaining institutional ethical committee approval (IEC/SVIEC/ANAES/2023/042) and registration with Clinical Trials Registry of India (CTRI/2024/11/076520). Written informed consent was obtained from all patients before enrolment.

Sample size calculation: Sample size was calculated using the formula: $n = (Z\alpha/2+Z\beta)^2 \times 2\sigma^2 / d^2$ [18]. Based on previous studies by Mahendru V et al., and Singh R et al., assuming a mean difference in duration of analgesia of 60 minutes between groups with a standard deviation of 75 minutes, at 80% power (Zβ=0.84) and 5% significance level (Zα/2=1.96), the calculated sample size was: $n=(1.96+0.84)^2\times2\times(75)^2/(60)^2=7.84\times11250/3600=24.5\approx25$ patients per group [3,10]. We enrolled 30 patients per group to account for potential dropouts (20% attrition rate).

Inclusion criteria: Patients of both genders, aged 18-65 years, with ASA physical status I-II, scheduled for elective lower limb orthopaedic surgeries under spinal anaesthesia were included in the study.

Exclusion criteria: Patients refusing consent, with known allergies to study drugs, contraindications to spinal anaesthesia (local site infection, spine deformity, coagulation disorders), neurological disorders, or taking antihypertensives were excluded. A total of 60 patients were assessed for eligibility and all 60 patients were enrolled in the study with no exclusions [Table/Fig-1].



[Table/Fig-1]: CONSORT flow diagram showing patient allocation and follow-up.

Study Procedure

Randomisation and blinding: Patients were randomly allocated using a computer-generated randomisation sequence (Random Allocation Software version 2.0, using block randomisation with block size of 4) into two groups

- **Group-LC (n=30):** Hyperbaric levobupivacaine 0.5% 3 mL with 30 µg clonidine diluted with normal saline to 0.5 mL (Total volume: 3.5 mL)
- **Group-LD (n=30):** Hyperbaric levobupivacaine 0.5% 3 mL with 5 µg dexmedetomidine diluted with normal saline to 0.5 mL (Total volume: 3.5 mL)

The total volume of intrathecal injection was 3.5mL in both groups. The anaesthesiologist preparing the drug solution was not involved in the administration or assessment. Both the patient and the anaesthesiologist evaluating the block characteristics were blinded to group allocation. The drug doses were selected based on previous literature demonstrating optimal efficacy and safety profiles: dexmedetomidine 5µg as per Mahendru V et al., and clonidine 30µg as per Dobrydnjov I et al., [3,5].

Anaesthetic procedure: All patients underwent thorough pre-anaesthetic evaluation and standard pre-operative investigations. They were kept nil by mouth for eight hours before surgery. In the operating room, standard monitors (Electrocardiogram (ECG), non-invasive blood pressure, pulse oximetry) were attached and baseline vital parameters recorded. An 18G intravenous cannula was secured, and patients were preloaded with Ringer's Lactate (RL) solution at 10 mL/kg.

Premedication included intravenous glycopyrrolate 0.004 mg/kg and ondansetron 0.1 mg/kg [19]. Under aseptic precautions, lumbar puncture was performed by the consultant anaesthesiologist at L2-L3 interspace in sitting position using a 23 G Quincke spinal needle. After confirming free flow of cerebrospinal fluid, the study drug was injected intrathecally according to group allocation. Patients were immediately positioned supine, and the time of intrathecal injection was noted as time zero.

Primary outcome measures:

1. **Sensory block:** Assessed by pinprick method using a 23G hypodermic needle. Onset of sensory block was defined as time from intrathecal injection to loss of pinprick sensation at L1 Anterior Superior Iliac Spine (ASIS) dermatome. Duration of sensory block was defined as time from intrathecal injection to regression of sensory block to S1 dermatome. Assessments were made at 0, 2, 4, 6, 8, 10 minutes, then every five minutes up to 30 minutes, and thereafter every 15 minutes till end of surgery.
2. **Motor block:** Assessed using modified Bromage scale (0=no motor block, 1=inability to raise extended leg, 2=inability to flex knee, 3=inability to flex ankle). Onset of motor block (time to achieve Bromage grade 1), time to achieve complete motor block (Bromage grade 3), and duration of motor block (time to regression to Bromage grade 0) were recorded.

Secondary outcome measures:

3. **Haemodynamic parameters:** Heart Rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), oxygen saturation (SpO_2), and Respiratory Rate (RR) were monitored every two minutes for first 10 minutes, then every five minutes for next 20 minutes, and thereafter every 15 minutes till end of surgery.
4. **Sedation score:** Assessed using a 5-point sedation scale described by Chernik et al., [20]: 1=awake and alert, 2=drowsy but responsive to verbal stimuli, 3=drowsy but arousable to physical stimuli, 4=unarousable. Sedation was assessed at baseline, 15, 30, 45, 60, 90, and 120 minutes postinjection.
5. **Postoperative analgesia:** Visual Analogue Scale (VAS) (0=no pain, 10=worst imaginable pain) was used. Duration of absolute analgesia (time from intrathecal injection to VAS ≥1) and effective analgesia (time from intrathecal injection to VAS ≥4) were recorded. VAS scores were assessed at 30-minute intervals in the postoperative period until the patient required rescue analgesia. Rescue analgesia (intravenous diclofenac 1.5mg/kg) was administered when VAS ≥4.
6. **Side-effects:** Bradycardia (HR<60 beats/min), hypotension (SBP <20% from baseline), nausea, vomiting, shivering, respiratory depression (RR<10/min), and urinary retention were noted and treated appropriately.

STATISTICAL ANALYSIS

Data were analysed using Jamovi version 2.0 statistical software. Quantitative variables were expressed as mean±standard deviation and compared using unpaired Student's t-test after checking for normality using Shapiro-Wilk test. Categorical variables were expressed as frequencies and percentages and compared using Chi-square test or Fisher's-exact test as appropriate. The p-value <0.05 was considered statistically significant.

RESULTS

All 60 patients completed the study with no dropouts. Demographic characteristics including age, gender, weight, ASA status, and duration of surgery were comparable between the two groups with no statistically significant differences, indicating successful randomisation [Table/Fig-2].

Parameters	Group-LC (n=30)	Group-LD (n=30)	p-value
Age (years)	44.36±14.28	40.43±10.53	0.542
Gender (Male/Female)	16/14	18/12	0.771
Weight (kg)	62.28±8.86	61.73±9.12	0.496
ASA Status (I/II)	13/17	15/15	0.605
Duration of Surgery (min)	93.46±23.18	95.63±21.84	0.728

[Table/Fig-2]: Demographic and baseline characteristics.
Data expressed as mean±SD or n; Unpaired student's t-test for continuous variables, Chi-square test for categorical variables

Group-LD demonstrated significantly faster onset of both sensory and motor blockade compared to Group-LC. The duration of sensory and motor blockade was significantly prolonged in the dexmedetomidine group. The duration of both absolute and effective analgesia was significantly prolonged in the dexmedetomidine group, resulting in reduced requirement for rescue analgesics in the 24-hour postoperative period [Table/Fig-3].

Parameters	Group-LC (n=30)	Group-LD (n=30)	p-value
Onset of sensory block at L1 (min)	3.02±0.45	2.88±0.23	<0.001*
Onset of motor block (min)	1.58±0.32	1.45±0.30	<0.001*
Time to complete motor block (min)	3.05±0.69	2.84±0.35	<0.001*
Duration of sensory block (min)	277.23±8.65	394.30±7.66	<0.001*
Duration of motor block (min)	322.63±14.52	358.43±9.53	<0.001*
Duration of absolute analgesia (min)	314.20±8.59	443.93±6.48	<0.001*
Duration of effective analgesia (min)	364.67±11.72	473.60±9.43	<0.001*
Number of rescue analgesia in 24 hours	1.60±0.50	1.37±0.49	0.003*

[Table/Fig-3]: Block characteristics.
*Statistically significant (p<0.05)
Data expressed as mean±SD; Unpaired Student's t-test used for comparison

Haemodynamic parameters including HR, BP, and RR showed similar trends in both groups without any clinically significant differences. There was a slight decrease in heart rate and blood pressure from baseline in both groups, but none of the patients required therapeutic intervention [Table/Fig-4]. The incidence of side-effects was comparable between the groups with no statistically significant differences, suggesting both drugs have similar safety profiles [Table/Fig-5]. Sedation scores were slightly higher in Group-LD compared to Group-LC, but all patients remained easily arousable with no incidence of respiratory depression. Sedation scores mentioned in [Table/Fig-6] and VAS scores are mentioned in [Table/Fig-7].

DISCUSSION

The addition of adjuvants to local anaesthetics for spinal anaesthesia aims to improve block quality and prolong postoperative analgesia whilst minimising side-effects. The present study compared the efficacy of intrathecal dexmedetomidine (5 µg) versus clonidine (30µg) as adjuvants to hyperbaric levobupivacaine in patients undergoing lower limb orthopaedic surgeries.

Onset of block characteristics: The current study demonstrated that dexmedetomidine provided a faster onset of both sensory and motor blockade compared to clonidine. These findings are consistent with multiple studies in the literature. Singh R et al., reported quicker onset of sensory (2.1±0.4 min vs 3.2±0.6 min) and motor blockade with dexmedetomidine compared to clonidine when used as adjuvants to bupivacaine [10]. Similarly, Mahendru V et al., found that dexmedetomidine produced faster onset of sensory block (3.38±0.59 min) compared to clonidine (4.98±0.78 min) [3]. Gupta R et al., in their 2011 study comparing these adjuvants with ropivacaine also reported significantly faster onset with dexmedetomidine [21]. The faster onset could be attributed to dexmedetomidine's higher selectivity for α2-adrenergic receptors,

Time	Heart rate (beats/min)			SBP (mmHg)			DBP (mmHg)			SpO_2 (%)			RR (breaths/min)		
	LC	LD	p-value	LC	LD	p-value	LC	LD	p-value	LC	LD	p-value	LC	LD	p-value
0 min	81.0± 11.1	81.7± 5.3	0.756	127.3± 9.8	126.7± 8.9	0.805	79.3± 7.9	81.3± 8.1	0.337	99.3± 0.8	99.7± 0.6	0.032	14.7± 1.6	15.3± 1.8	0.178
2 min	82.3± 10.8	81.3± 6.4	0.664	129.7± 10.1	125.3± 9.5	0.088	77.7± 8.2	79.0± 7.7	0.529	99.7± 0.6	99.7± 0.6	1.000	14.3± 1.5	14.7± 1.7	0.338
4 min	81.7± 10.9	80.0± 7.6	0.486	120.3± 9.0	119.7± 8.3	0.789	75.3± 7.5	76.7± 8.3	0.496	99.7± 0.6	99.7± 0.6	1.000	14.0± 1.3	14.3± 1.5	0.411
6 min	78.3± 11.5	78.7± 8.2	0.877	118.7± 9.2	117.3± 7.9	0.530	73.7± 6.9	74.3± 7.1	0.741	99.3± 0.8	99.7± 0.6	0.032	14.3± 1.5	14.7± 1.6	0.322
8 min	76.0± 10.9	77.3± 7.9	0.599	114.0± 7.9	113.7± 8.1	0.885	72.0± 6.8	71.3± 6.9	0.694	99.3± 0.8	99.3± 0.8	1.000	14.7± 1.6	15.0± 1.7	0.484
10 min	75.3± 11.2	76.0± 8.1	0.782	108.7± 8.5	107.3± 7.7	0.506	70.3± 6.5	69.7± 6.2	0.716	99.7± 0.6	99.7± 0.6	1.000	14.3± 1.5	14.7± 1.6	0.322
15 min	77.0± 9.8	77.7± 7.9	0.762	111.3± 7.8	109.7± 8.2	0.442	71.7± 6.8	70.3± 6.5	0.418	99.7± 0.6	99.7± 0.6	1.000	14.0± 1.3	14.3± 1.5	0.411
20 min	79.3± 10.5	78.3± 8.3	0.684	116.0± 8.9	114.3± 7.5	0.427	74.0± 7.1	72.7± 6.9	0.475	99.3± 0.8	99.3± 0.8	1.000	14.3± 1.5	14.7± 1.6	0.322
25 min	81.0± 9.8	79.7± 7.9	0.574	119.3± 9.1	117.7± 8.7	0.489	76.3± 7.5	75.0± 7.2	0.496	99.7± 0.6	99.7± 0.6	1.000	14.7± 1.6	15.0± 1.7	0.484
30 min	82.3± 9.9	80.3± 8.5	0.405	118.7± 8.8	116.3± 7.9	0.271	78.7± 7.9	77.3± 7.7	0.490	99.7± 0.6	99.7± 0.6	1.000	14.3± 1.5	14.7± 1.6	0.322
45 min	83.7± 8.9	81.7± 7.8	0.358	120.0± 9.3	118.7± 8.1	0.566	79.3± 8.1	78.0± 7.5	0.521	99.3± 0.8	99.3± 0.8	1.000	14.0± 1.3	14.3± 1.5	0.411
60 min	84.0± 8.8	82.3± 7.3	0.419	122.3± 8.7	120.0± 7.8	0.285	80.0± 8.3	78.7± 7.9	0.537	99.7± 0.6	99.7± 0.6	1.000	14.3± 1.5	14.7± 1.6	0.322
90 min	83.3± 9.1	81.0± 7.9	0.300	121.7± 9.1	119.3± 8.5	0.296	79.7± 8.1	78.3± 7.7	0.495	99.3± 0.8	99.3± 0.8	1.000	14.7± 1.6	15.0± 1.7	0.484
120 min	82.7± 9.5	80.7± 8.1	0.384	120.0± 8.9	118.7± 7.9	0.552	78.3± 7.9	77.0± 7.5	0.516	99.7± 0.6	99.7± 0.6	1.000	14.3± 1.5	14.7± 1.6	0.322

[Table/Fig-4]: Intraoperative haemodynamic parameters - comprehensive comparison.

Side-effect	Group-LC (n=30)	Group-LD (n=30)	p-value
Bradycardia	4 (13.3%)	5 (16.7%)	0.718
Hypotension	9 (30%)	8 (26.7%)	0.774
Nausea	2 (6.7%)	1 (3.3%)	0.554
Vomiting	1 (3.3%)	0 (0%)	0.313
Shivering	2 (6.7%)	1 (3.3%)	0.554

[Table/Fig-5]: Side-effects.

Time (min)	Group-LC (n=30)	Group-LD (n=30)	p-value
Baseline	1.0±0.0	1.0±0.0	1.000
30	1.3±0.5	1.5±0.5	0.128
60	1.4±0.5	1.7±0.5	0.024*
90	1.3±0.5	1.6±0.5	0.026*
120	1.2±0.4	1.4±0.5	0.086

[Table/Fig-6]: Sedation Scores (5-point sedation scale).
5-point scale: 1=awake, 2=drowsy/verbal response, 3=drowsy/physical response, 4=unarousable; Data expressed as mean±SD; *p<0.05

Time (min)	Group-LC (n=30)	Group-LD (n=30)	p-value
180	0	0	-
240	0.5±0.5	0	<0.001*
300	1.8±0.8	0.2±0.4	<0.001*
360	3.5±1.2	0.8±0.6	<0.001*
420	4.2±1.0	1.5±0.8	<0.001*
480	4.8±0.9	3.2±1.1	<0.001*

[Table/Fig-7]: Visual Analogue Scale (VAS) scores at different time points.
Data expressed as mean±SD. Unpaired Student's t-test used. *p<0.05 statistically significant.

particularly the α2A and α2C subtypes, which might enhance the local anaesthetic effect more efficiently than clonidine [7,13,14].

Duration of block characteristics: The duration of both sensory and motor blockade was significantly prolonged in the dexmedetomidine group compared to the clonidine group in our study. This corresponds with findings from multiple investigators. Mahendru V et al., reported that intrathecal dexmedetomidine prolonged sensory block duration (476.33±22.45 min) compared to clonidine (316.66±21.44 min) when added to bupivacaine [3]. Patro SS et al., in 2016 and Yektaş A et al., in 2014 also demonstrated significantly prolonged duration of block with dexmedetomidine compared to clonidine [22,23]. The prolonged blockade with dexmedetomidine may be due to its higher lipid solubility allowing better penetration into the spinal cord and greater affinity for α2-adrenergic receptors [8,13].

Postoperative analgesia: Our study demonstrated that dexmedetomidine significantly extended the duration of both absolute and effective analgesia compared to clonidine, resulting in reduced requirement for rescue analgesics in the 24-hour postoperative period. These findings are consistent with those of Kataria AP et al., who found that adding dexmedetomidine to levobupivacaine significantly prolonged the duration of analgesia (398.46±42.15 min vs 246.13±35.82 min) [15]. Al-Mustafa MM et al., in 2020 also reported similar findings with significantly prolonged postoperative analgesia in the dexmedetomidine group [24]. The enhanced analgesic effect of dexmedetomidine could be attributed to its action at both spinal and supraspinal levels, modulating nociceptive transmission through activation of α2-adrenergic receptors [9,13,14].

Sedation and haemodynamic effects: Both drugs produced mild sedation, with slightly higher sedation scores in the dexmedetomidine group. However, all patients remained easily arousable with no incidence of respiratory depression. This is consistent with the known sedative properties of α2-agonists, which produce sedation mimicking natural sleep without respiratory depression [9]. Haemodynamic stability is a crucial consideration when using α2-agonists. In the present study, both groups showed similar haemodynamic profiles with mild reductions in heart rate and blood pressure from baseline. This aligns with findings from Shaikh SI et al., who reported comparable haemodynamic effects between clonidine and dexmedetomidine when used with levobupivacaine [16].

Safety profile and Side-effects: The incidence of side-effects was minimal and comparable between the groups, suggesting that both dexmedetomidine 5 µg and clonidine 30 µg are safe for intrathecal use as adjuvants to levobupivacaine. The low incidence of side-effects in our study is consistent with Sudeep NR et al., who reported minimal complications when using clonidine with levobupivacaine [17]. Similar safety profiles were reported by Gupta M et al., in 2016 [25]. The lack of significant respiratory depression, urinary retention, or pruritus highlights the advantage of α2-agonists over opioids as spinal adjuvants.

While previous studies have compared dexmedetomidine and clonidine with bupivacaine, the present study specifically evaluated their efficacy with hyperbaric levobupivacaine, which has a superior safety profile. The findings confirm that the advantages of dexmedetomidine over clonidine observed with bupivacaine are maintained when used with levobupivacaine. Additionally, the present study provides evidence that lower doses of dexmedetomidine (5µg) can achieve better clinical outcomes than higher doses of clonidine (30 µg), which may have cost implications for clinical practice.

Limitation(s)

The present study had certain limitations. First, the authors used a fixed dose of adjuvants rather than weight-based dosing, which might have influenced the results. Second, the quality of recovery or patient satisfaction scores were not assessed. Third, long-term follow-up for chronic pain was not conducted. Future studies with larger sample sizes and dose-finding designs would help establish the optimal doses of these adjuvants.

CONCLUSION(S)

Dexmedetomidine (5µg) as an adjuvant to intrathecal hyperbaric levobupivacaine provides faster onset and prolonged duration of sensory and motor blockade compared to clonidine (30µg) in patients undergoing lower limb orthopaedic surgeries. Additionally, dexmedetomidine significantly extends the duration of postoperative analgesia, reducing the requirement for rescue analgesics. Both adjuvants maintain haemodynamic stability with minimal side-effects, making them suitable options for spinal anaesthesia. However, dexmedetomidine appears to be a superior choice due to its enhanced efficacy with a comparable safety profile. Therefore, the authors recommend using dexmedetomidine 5µg may be considered as an adjuvant to intrathecal hyperbaric levobupivacaine for lower limb orthopaedic surgeries to achieve optimal surgical conditions and prolonged postoperative analgesia.

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