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A COMPARATIVE STUDY ON TWO DOSES OF CLONIDINE 40 MICROGRAMS AND 60 MICROGRAMS ADDED AS ADJUVANT TO 0.5% HYPERBARIC BUPIVACIANE IN SPINAL ANAESTHESIA

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ABSTRACT

Background: Spinal anaesthesia has been employed as a common technique for over a century globally for various surgical interventions below the umbilicus, providing many benefits such as quick onset, dependable anaesthesia, and hemodynamic stability.[1] **Aim:** To compare the effect of addition of two doses of clonidine [40 micrograms and 60 micrograms] to 0.5 percent hyperbaric bupivacaine 2.75 ml, intrathecally for infraumbilical surgeries. **Objectives:** To study the time of onset of sensory and motor blockade, Duration of sensory and motor blockade, Duration of effective post-operative analgesia and Adverse effects.

Materials and Methods: Study Design: A prospective randomized study**. Study area:** The study was conducted in Department of Anaesthesiology, SVRRGH, Tirupati. **Study Period:** 1 year. **Study population:** Patients who undergo infra umbilical surgeries admitted at tertiary care hospital who satisfy inclusion criteria and who give informed written consent. **Sample size**: Study consisted a total of 100 subjects. **Sampling Technique:** Simple Random technique.

Results: The onset of sensory block was slightly later in the 60-mcg group (154 seconds) than in the 40-mcg group (158 seconds), suggesting a slight earlier onset of sensory anesthesia with the higher Clonidine dosage. Conversely, the onset of motor block was significantly quicker in the 60-mcg group (118 seconds) compared to the 40-mcg group (153 seconds), indicating a more rapid onset of motor paralysis with the higher dose.

Conclusion: This indicates that incorporating intrathecal clonidine 60 mcg as an additive to bupivacaine during spinal anaesthesia extends the durations of both sensory and motor blockade intraoperatively in comparison to intrathecal clonidine 40 mcg. The group receiving intrathecal clonidine 60 mcg experiences slightly greater sedation than those receiving intrathecal clonidine 40 mcg, according to the RSS score.

Keywords: Spinal anaesthesia, Bupivacaine, Clonidine, Postoperative analgesia, Adjuncts.

INTRODUCTION

Spinal anaesthesia has been employed as a common technique for over a century globally for various surgical interventions below the umbilicus, providing many benefits such as quick onset, dependable anaesthesia, and hemodynamic stability.[1] For several decades, 5% lignocaine was the standard drug used for spinal anaesthesia; however, in recent years, 0.5% bupivacaine has replaced 5% lignocaine, offering additional benefits due to its greater lipid solubility, enhanced protein binding, resulting in four times the potency and a longer duration of action compared to lignocaine. Nevertheless, bupivacaine

presents some significant disadvantages, including a slower onset of action and a more pronounced impact on the cardiovascular and central nervous systems, which necessitates careful administration in patients with cardiac and neurological conditions.[2]

In addition to its slower onset of action, the absence of post-operative pain relief has led to the use of bupivacaine in combination with adjunct medications such as opioids, in order to address its limitations and improve perioperative results. While opioids offer several benefits, including extended post-operative pain relief without disrupting autonomic functions, they also come with concerning side effects such as unpredictable respiratory depression, nausea and vomiting after surgery, constipation, itching, and urinary retention.

This prompted the search for more secure alternatives to complement bupivacaine. Other adjuncts, such as dexmedetomidine and clonidine, have been extensively researched. Among these, clonidine, which functions as an alpha-2 agonist, has attracted interest due to its potential to extend both sensory and motor blockade, as well as to provide postoperative analgesia when administered in a dose-dependent manner in amounts under 150 micrograms.[3] Therefore, this study aims to clarify the optimal doses of clonidine (40 micrograms versus 60 micrograms) when used alongside hyperbaric bupivacaine in spinal anesthesia, ultimately contributing to the enhancement of anesthetic techniques and improving patient outcomes and satisfaction in surgical practices.

Aim: To compare the effect of addition of two doses of clonidine [40 micrograms and 60 micrograms] to 0.5 percent hyperbaric bupivacaine 2.75 ml, intrathecally for infraumbilical surgeries.

Objectives: To study the time of onset of sensory and motor blockade, Duration of sensory and motor blockade, Duration of effective post operative analgesia and Adverse effects.

MATERIALS AND METHODS

Study Design: A prospective randomized study.

Study area: The study was conducted in Department of Anaesthesiology, SVRRGH, Tirupati.

Study Period: 1 year.

Study population: Patients who undergo infra umbilical surgeries admitted at tertiary care hospital who satisfy inclusion criteria and who give informed written consent.

Sample size: Study consisted a total of 100 subjects.

Sampling Technique: Simple Random technique.

Inclusion Criteria

1. Patients in age groups of 20 to 50 years
2. ASA-Grade1 and Grade 2
3. Infraumbilical surgeries

Exclusion Criteria

1. ASA Grade 3 and Grade 4
2. Patient refusal
3. Renal and hepatic dysfunction
4. Pregnant women

Ethical consideration: Institutional Ethical committee permission was taken before the commencement of the study.

Study tools and Data collection procedure

All 100 patients who is posted electively for infra umbilical surgeries and who gave written and informed consent was Randomised by Computer Generated opaque field technique. After coming to the operation theatre, the 18G IV Canula was secured and Standard ASA Monitoring [SPO2, ECG, NIBP] was connected to the patient. The patient is positioned for Spinal anaesthesia in a Sitting position, under strict aseptic precautions Spinal Anaesthesia procedure was performed by 25G Quincke's Needle.

- In Group A,2.75 ml of 0.5% Hyperbaric Bupivacaine Hydrochloride +40 Micrograms of Clonidine, is injected into Intrathecal space
- In Group B 2.75 ml of 0.5% Hyperbaric Bupivacaine Hydrochloride +60Micrograms of clonidine is Injected into Intrathecal space.

The Onset and Duration of Sensory blockade and Motor blockade are assessed between two groups. Haemodynamic Parameters like DBP [Diastolic blood pressure], MAP [Mean arterial pressure], SBP [Systolic blood pressure], HEART RATE are assessed and compared between two groups. Adverse Effects like hypotension, bradycardia, nausea, and vomiting are compared between the two groups. Data is entered in Pre-designed Proforma and compared.

Statistical Analysis

The data was entered into Microsoft Excel and statistical analysis was done by using SPSS software version 29.0.0.0(241). The data values were expressed as percentages for discrete data, for continuous data were expressed as mean and standard deviation. To test the association between the two groups, chi square test was used and to test mean difference between the groups, student's t test was used. All parameters with p value less than 0.05 were considered statistically significant.

RESULTS

Table 1: Age Distribution Across Groups

	2.75 ml of 0.5% Bupivacaine with 40 mcg Clonidine.		2.75 ml of 0.5% Bupivacaine with 60 mcg Clonidine.		P-VALUE
AGE	Mean	Std Dev	Mean	Std Dev	0.947
	40.66	7	40.56	7.94	

The age distribution shows Group 1 has an average age of 41 years with a standard deviation of 7, indicating a middle-aged cohort with moderate age variability. In contrast, Group 2, with an average age of 40.56 years.

Table 2: Demographics and ASA Grade

Description	2.75 ml of 0.5% Bupivacaine with 40 mcg Clonidine. [GROUP A]		2.75 ml of 0.5% Bupivacaine with 60 mcg Clonidine. [GROUP B]	
	Count	%	Count	%
SEX				
Female	27	54.0%	7	14.0%
Male	23	46.0%	43	86.0%
ASA GRADE				
1	30	60.0%	42	84.0%
2	20	40.0%	8	16.0%

The sex distribution reveals a notable difference in gender balance between the two groups. Group 1 comprises a more balanced gender distribution with 54% females and 46% males, whereas Group 2 is predominantly male (86%). Regarding the ASA (American Society of Anesthesiologists) Grade, which assesses the physical status of patients before surgery, Group 1 has a majority (60%) in ASA Grade 1 (indicating a patient in normal healthy condition) and 40% in ASA Grade 2 (patients with mild systemic disease). Conversely, Group 2 has a higher proportion of patients in ASA Grade 1 (84%), with only 16% in ASA Grade 2. This distribution suggests that Group 2 generally consists of healthier individuals compared to Group 1.

Table 3: Distribution of Maximum Sensory and Motor Block for 2 groups

Description	2.75 ml of 0.5% Bupivacaine with 40 mcg Clonidine.[GROUP A]	2.75 ml of 0.5% Bupivacaine with 60 mcg Clonidine.[GROUP B]
MAXIMUM SENSORY BLOCK		
T4	19 (38.0%)	1 (2.0%)
T6	11 (22.0%)	16 (32.0%)
T8	19 (38.0%)	33 (66.0%)
T10	1 (2.0%)	-
MAXIMUM MOTOR BLOCK 4	50 (100%)	50 (100%)

2.75 ml of 0.5% Bupivacaine with 40 mcg Clonidine: This group demonstrates a balanced distribution between T4 and T8 levels for maximum sensory block, each accounting for 38.0% of the patients. A smaller fraction reached a T6 level (22.0%), and a minimal portion (2.0%) achieved a T10 level. The spread suggests that this dosage effectively achieves a mid-to-high thoracic-level sensory block in the majority of cases.

2.75 ml of 0.5% Bupivacaine with 60 mcg of Clonidine: This group shows a significant shift towards higher sensory block levels. The majority (66.0%) reached a T8 level, while 32.0% achieved a T6 level, indicating a more profound sensory block effect with the increased Clonidine dosage. Notably, only a single patient (2.0%) reached a T4 level, and none achieved a T10 level, highlighting the potency and upward shift in sensory blockade with higher Clonidine dosages.

Maximum Motor Block 4 Consistency:

Both groups reported a 100% rate of achieving maximum motor block, underscoring the efficacy of Bupivacaine in rendering complete motor blockade irrespective impacting sensory block levels.

Table 4: Surgical and Anaesthetic Metrics Comparison

Metric	2.75 Ml of 0.5% Bupivacaine With 40 Mcg Clonidine.[GROUP A]		2.75 Ml of 0.5% Bupivacaine With 60 Mcg Clonidine.[GROUP B]	
	Mean	Std Dev	Mean	Std Dev
Duration Of Surgery (Hrs)	3	1	2	1
Onset Of Sensory Block (Secs)	158	40	154	36
Onset Of Motor Block (Secs)	153	36	118	22
RSS Score	1	0	2	3
Two Segment Regression (Mins)	183	41	228	23
Total Duration Of Motor Block (Mins)	231	57	347	62
Total Duration Of Analgesia (Mins)	283	35	301	54

Onset of Sensory and Motor Blocks

The onset of sensory block was slightly earlier in the 60-mcg group (154 seconds) than in the 40-mcg group (158 seconds), suggesting a slight earlier onset of sensory anesthesia with the higher Clonidine dosage.

Conversely, the onset of motor block was significantly quicker in the 60-mcg group (118 seconds) compared to the 40-mcg group (153 seconds), indicating a more rapid onset of motor block with the higher dose.

RSS Score

The Ramsay Sedation Scale (RSS) score, indicating the level of sedation, averaged higher in the 60-mcg group (2) with a greater variability (std dev of 3) compared to the 40-mcg group, which had an average score of 1 with no variability. This suggests patients in the 60-mcg group experienced varying levels of sedation, whereas those in the 40-mcg group were consistently less sedated.

Two-Segment Regression and Duration of Effects:

The two-segment regression time, or the time it took for the sensory block to decrease by two dermatomal segments, was significantly longer in the 60-mcg group (228 minutes) than in the 40-mcg group (183 minutes), indicating a more prolonged sensory block with the higher dose.

Similarly, the total duration of motor block and analgesia was longer in the 60-mcg group (347 and 301 minutes, respectively) compared to the 40-mcg group (231 and 283 minutes, respectively). This demonstrates a more extended period of both motor block and analgesia with the increased dose of Clonidine.

Table 5: Summary table of comparing parameters between the groups

Metric	2.75 ml of 0.5% Bupivacaine with 40 mcg Clonidine. [GROUP A]	2.75 ml of 0.5% Bupivacaine with 60 mcg of Clonidine. [GROUP B]	Significance (p-value)
Demographic Data			
Age	40.66 (7.24)	40.56(7.94)	0.9477
Height (cm)	151.98 (4.73)	152.48 (22.68)	0.879
Weight (kg)	62.08 (5.84)	59.26 (5.24)	**0.013**
Surgical Details			
Duration of Surgery (hrs)	2.56 (0.80)	2.34 (0.79)	0.183
Anaesthesia Metrics			
Onset of Sensory Block (secs)	158.32 (39.59)	154.90 (29.55)	**0.020**
Onset of Motor Block (secs)	152.80 (36.42)	118.20 (22.20)	**<0.001**
RSS Score	1.08 (0.27)	2.02 (2.92)	**0.026**
Post-operative Recovery			
Total Duration of Motor Block (mins)	231.10 (57.03)	346.60 (62.32)	**<0.001**
Total Duration of Analgesia (mins)	282.60 (35.07)	309.50 (35.07)	**<0.005**

Demographic Data

Age: There was no significant age difference between the two groups.

Height and Weight: While there's no significant difference in height (p=0.879), the weight difference is statistically significant (p=0.013), with Group 1 being heavier. These factors can influence drug distribution and efficacy.

Surgical Details: Duration of Surgery: The slight difference in the duration of surgery is not statistically significant (p=0.183), indicating that the anaesthesia approach did not significantly affect surgery length.

Anesthesia Metrics: The onset of Sensory Block: The onset in Group 2 (p=0.020) suggests that a higher dose of Clonidine may slightly earlier the sensory block's initiation.

The onset of Motor Block: The onset in Group 2 (p<0.001) indicates that a higher Clonidine dosage accelerates the motor block's onset, potentially offering faster operative readiness.

RSS Score: The lower RSS score in Group 2 (p=0.026) signifies more sedation, which couldnot impact patient comfort and the need for additional sedative medications are less during surgery.

Post-operative Recovery: Total Duration of Motor Block and Analgesia: Both metrics show longer durations in Group 2 (p<0.001 for motor block and p<0.005 for analgesia), suggesting that higher Clonidine dosages enhance and prolong the anesthetic effect, potentially improving post-operative pain management but also requiring closer monitoring for delayed motor function return.

The heart rate variability over time between two groups receiving different dosages of Clonidine (40 mcg vs. 60 mcg) showed significant variations at several intervals. At baseline, Group 2 (60 mcg of Clonidine) starts with a higher heart rate compared to Group 1 (40 mcg of Clonidine), but as time progresses, heart rate differences fluctuate. Both groups exhibit similar heart rates at 1-, 3-, and 5-minutes post-administration. However, by 15 minutes, Group 2 shows a lower heart rate than Group 1, a trend that continues notably at 30 and 60 minutes. At 90 minutes, Group 2's heart rate surpasses Group 1's. Significant divergences are

again seen at 180, 240, and 270 minutes, indicating that higher Clonidine dosage affects heart rate variability at various time points, with notable reductions and occasional increases compared to the lower dosage group.

The systolic blood pressure (SBP) over time between two groups receiving different dosages of Clonidine (40 mcg vs. 60 mcg) revealed notable fluctuations at various intervals. Group 2 (60 mcg Clonidine) initially starts with a significantly higher SBP at baseline. As time progresses, both groups exhibit similar SBP at 1 and 3 minutes. However, by 5 and 10 minutes, Group 2's SBP drops significantly lower than Group 1's. This pattern reverses at 90 minutes, where Group 2 shows a significantly higher SBP. The trend continues with Group 2 maintaining higher SBP values at 150 and 180 minutes. The differences diminish at later intervals (210, 240, 270, and 300 minutes), where both groups display similar SBP levels. This indicates that Clonidine dosage impacts SBP significantly at various times post-administration, with Group 2 initially showing higher, then lower, and again higher SBP values compared to Group 1.

The diastolic blood pressure (DBP) over time between two groups receiving different dosages of Clonidine (40 mcg vs. 60 mcg) reveals significant variations at multiple intervals. Group 2 (60 mcg Clonidine) initially starts with a higher DBP at baseline. The DBP levels between the two groups remain similar at 1 and 3 minutes. However, by 5 minutes, Group 2 shows a higher DBP than Group 1. This similarity continues at 10, 15, and 30 minutes. At 60 minutes, Group 2's DBP is again higher. The trend continues with Group 2 maintaining higher DBP levels at 90, 120, and 210 minutes. By 270 minutes, Group 1 exhibits a higher DBP, which persists at 300 minutes. This pattern indicates that Clonidine dosage significantly impacts DBP at various times post-administration, with Group 2 generally having higher DBP values except at certain intervals where Group 1 shows higher readings.

The mean arterial pressure (MAP) over time between two groups receiving different dosages of Clonidine (40 mcg vs. 60 mcg) showed distinct variations across several intervals. Group 2 (60 mcg Clonidine) initially starts with a significantly higher MAP at baseline. The MAP levels between the two groups become similar at 1 and 3 minutes. By 5 minutes, Group 2's MAP drops significantly lower than Group 1's, a trend that continues through 10, 15, and 30 minutes. This pattern of lower MAP for Group 2 persists at 60 minutes. At 90 minutes, the MAP levels between the groups are nearly identical. Significant differences reappear at 120, 180, and 210 minutes, with Group 2 showing a higher MAP at 180 minutes. Mixed results are observed at 150, 240, and 270 minutes, with Group 2 having a lower MAP at 270 minutes. By 300 minutes, Group 1 exhibits a slightly higher MAP compared to Group 2. This indicates that Clonidine dosage significantly influences MAP at various intervals, with Group 2 generally showing a lower MAP except at specific time points where the trends reverse.

Table 6: Showing the comparison of side effects with different doses of clonidine

Side effects	40mcg clonidine No. of cases (percentage)	60mcg clonidine No. of cases (percentage)	P-VALUE
Nausea/vomiting	1 (2%)	1 (2%)	0.706
Bradycardia	1 (2%)	4 (8%)	
Hypotension	4 (8%)	7 (14%)	

Between the two different dosages, there was a difference noted in the occurrence of nausea and vomiting. There was also a significant difference in the occurrence of hypotension (8% vs. 14%) and bradycardia (2% vs. 8%). This indicates that increasing the dosage of clonidine may impact the hemodynamics.

DISCUSSION

Clonidine, when combined with bupivacaine in spinal anesthesia, can affect the speed of onset and the duration of both motor and sensory blockade. Clonidine activates alpha,[2] adrenergic receptors located in the brain and spinal cord. This activation results in a decreased sympathetic outflow from the central nervous system. Additionally, it causes a reduction in peripheral vascular resistance, renal vascular resistance, plasma renin levels, heart rate, cardiac output, and blood pressure.

Clonidine, when used alongside bupivacaine in spinal anesthesia, produces several effects that improve the anesthetic's efficacy, including.[1] Extension of Sensory and Motor Block: Clonidine extends both sensory and motor block when administered in the spinal cord. This results in an increased duration of numbness and immobility in the targeted area, which is advantageous for lengthy surgical procedures.[4,2] Enhanced Sedation: Due to the systemic absorption of clonidine, patients may experience heightened sedation. This can lead to a more comfortable state, benefiting patient comfort during and post-procedure.[17,3] Risk of Hypotension and Bradycardia: Although clonidine can help stabilize hemodynamics, it may also increase the risk of hypotension and bradycardia.4 These potential side effects must be monitored and addressed during the administration of spinal anesthesia.[4] Dose-Dependent Analgesia: Clonidine improves spinal anesthesia in a dose-dependent manner. Larger doses can lead to more significant analgesia, although they

also carry a higher chance of side effects such as hypotension and bradycardia.[4,5] Hemodynamic Stability: At lower doses, clonidine can maintain satisfactory hemodynamic stability, which is crucial for ensuring patient safety during surgeries.[5] Optimal Dose: The ideal dose of clonidine for spinal anesthesia continues to be a topic of investigation. Lower doses have shown effectiveness without causing major hemodynamic disturbances, while higher doses may yield longer-lasting effects but come with a heightened risk of side effects.[6]

In summary, clonidine serves as a beneficial addition to bupivacaine in spinal anaesthesia, providing the possibility of improved and extended anaesthetic effects. Nonetheless, its administration must be judiciously weighed against the potential for adverse effects, and determining the ideal dosage calls for thoughtful evaluation taking into account the unique characteristics of each patient and the details of the surgical procedure.

The initiation of sensory block is a crucial factor in spinal anaesthesia, as it indicates when surgical procedures can begin. Previous research has examined the impact of Clonidine as an additive to local anaesthetics in spinal anaesthesia. For example, a publication in Anesthesiology discusses the various elements that can affect both the onset and duration of spinal anaesthesia, including the incorporation of adjuvants like Clonidine.[7] A study featured in the International Journal of Scientific Study revealed that when intravenous Clonidine was administered, the onset of sensory block was the quickest compared to oral Clonidine or no Clonidine at all.[8] Furthermore, research in the Indian Journal of Clinical Medicine Research indicated that in a group that received Bupivacaine combined with Clonidine, the onset of sensory block averaged 2.8 ± 0.75 minutes.[9]

In our study, the mean time to onset of the sensory block with 40 mcg of Clonidine was 158.32 ± 39.59 seconds, and with 60 mcg of Clonidine, it was 154.90 ± 29.55 seconds. This suggests that a higher dose of Clonidine may slightly earlier the onset of sensory block when added to Bupivacaine. This finding is consistent with previous research, such as the study by Raval et al,[10] (2020), which discusses using Clonidine as an adjuvant in spinal anaesthesia. Raval et al. found that doses of 15 and 30 mcg of Clonidine when added to spinal local anaesthetics, provided better sensory and motor blocks than local anaesthetics alone.

Another study by Coelho G et al,[11] available on Academia.edu, compares different doses of Clonidine with isobaric Levobupivacaine for spinal anesthesia. This study aimed to identify the lowest effective dose of Clonidine that could provide adequate anesthesia while minimizing potential side effects such as hypotension and bradycardia. Furthermore, a study by Bhushan S et al,[12] from the WHO's Eastern Mediterranean Region Office compares three different doses of Clonidine as an adjuvant to intrathecal Bupivacaine for spinal anesthesia in cesarean sections. The objective was to identify the lowest effective dose among them, which aligns with the general trend of optimizing dose efficacy while minimizing side effects. This study is particularly significant as it examines the application of Clonidine in a specific and critical surgical setting, providing valuable insights into its safe and effective use during cesarean sections.

By examining moderate doses, our study fills a gap between the lower and higher dose studies, offering a more comprehensive understanding of Clonidine's dose-response characteristics. This contributes to the enhanced approach required in anaesthesia, where both efficacy and safety must be meticulously balanced to optimize patient outcomes. Our findings advocate for a tailored approach to dosing Clonidine, taking into account the specific requirements and constraints of each surgical situation.

In our study, the onset of the motor blockade with 40 mcg of Clonidine was 152.80 ± 36.42 seconds, while with 60 mcg of Clonidine, it was 118.20 ± 22.20 seconds. This indicates that a higher dose of Clonidine, in this case, resulted in a faster onset of motor block when combined with Bupivacaine. This finding is consistent with the general trend observed in the literature, where increased doses of Clonidine often lead to more rapid and pronounced anaesthetic effects. A study published by Whizhar Lugo et al,[10] suggests that lower doses of Clonidine, such as 15 and 30 mcg when added to spinal local anaesthetics, provide better sensory and motor blockade compared to local anaesthetics alone. This study implies that even small doses can significantly enhance the effects of spinal anaesthesia, reinforcing the concept that dose optimization is crucial for balancing efficacy and side effects.

Another study by Coelho G. et al,[12] aimed to find the lowest effective dose of Clonidine to avoid side effects like hypotension and bradycardia. It compared different doses of Clonidine with isobaric Levobupivacaine for spinal anaesthesia, indicating that lower doses might be effective while minimising side effects. This finding is important as it underscores the need to avoid higher doses that could lead to adverse effects, particularly in vulnerable populations.

Our study adds to this body of knowledge by suggesting that increasing the dose of Clonidine can decrease the time to the onset of motor blockade, which could have implications for the management of anesthesia onset times in clinical practice. When choosing the appropriate dose of clonidine, it's important to consider the potential trade-offs between onset time, duration of blockade, and side effects. While higher doses may expedite the onset of motor blockade, they may also increase the risk of side effects, such as sedation or hemodynamic instability. The comparison between the two groups using 2.75 ml of 0.5% Bupivacaine with either 40 mcg or 60 mcg of Clonidine as adjuncts in spinal anaesthesia reveals distinct differences in the distribution of maximum sensory blockade levels. In the group with 40 mcg of Clonidine, the sensory blockade

distribution is relatively balanced between the T4 and T8 levels, each observed in 38.0% of the patients, with 22.0% reaching T6 and a minimal 2.0% achieving T10. This pattern indicates an effective mid-to-high thoracic sensory blockade in most cases. Conversely, the group with 60 mcg of Clonidine demonstrates a marked shift towards higher sensory block levels, with 66.0% of patients reaching the T8 level and 32.0% achieving T6. Only 2.0% of patients reached T4, and none reached T10, signifying a stronger and higher sensory blockade with the increased dosage of Clonidine. This comparison highlights the potency of the 60-mcg dosage in achieving a more pronounced and higher sensory blockade distribution than the 40-mcg dosage.

Both groups reported a 100% rate of achieving maximum motor blockade, underscoring the efficacy of Bupivacaine in rendering complete motor blockade irrespective of the Clonidine dosage. This uniformity emphasises the role of Bupivacaine as the primary agent for motor blockade, with Clonidine dosage variations more significantly impacting sensory blockade levels. In our study, the Ramsay Sedation Score was used to assess the level of sedation in patients, with scores ranging from 1 (anxious and agitated) to 6 (no response to stimuli). The mean Ramsay sedation score with 40 mcg of Clonidine was 1.08 ± 0.27, indicating minimal sedation. In contrast, the mean score with 60 mcg of Clonidine was 2.02 ± 2.92, suggesting a higher level of sedation and more significant variability within this group.

In our study, the duration of motor block with 40 mcg Clonidine was 231.10 ± 57.03 mnts, and with 60 mcg Clonidine, it was 346 ± 62.32 mnts. This suggests that a higher dose of Clonidine prolongs the duration of the motor block when combined with Bupivacaine. A study whizhar Lugo et. Al,[10] indicates that Clonidine, as an alpha2 agonist, prolongs sensory and motor block when injected into the spinal cord. High doses (150, 300, and 450 µg) produce dose-dependent analgesia and enhance spinal anesthesia with relative hemodynamic stability.[1] It also mentions that smaller doses (15 and 30 µg) added to spinal local anesthetics provide better motor block compared to local anesthetics alone. Research from the Bhushan et al,[12] aimed to find the lowest effective dose of Clonidine as an adjuvant to intrathecal Bupivacaine for spinal anesthesia in cesarean sections. This study aligns with the general trend of optimizing dose efficacy while reducing side effects.

In our study, the total duration of analgesia by adding two different doses of Clonidine to hyperbaric Bupivacaine in spinal anaesthesia. The mean duration of analgesia with 40 mcg of Clonidine was found to be 282.60 ± 35.07 minutes. When the dose was increased to 60 mcg of Clonidine, the mean duration of analgesia increased to 309.7 ± 40.36 minutes. This difference was statistically significant, with a p-value of 0.00053, indicating that the higher dose of Clonidine significantly prolongs the duration of analgesia in comparison to the lower dose.

The study by Arora et al. titled found a mean duration of analgesia of 342.0 ± 40.22 minutes. In comparison, our study with 40 mcg of Clonidine showed a mean duration of 282.60 ± 35.07 minutes, and with 60 mcg of Clonidine, the mean duration was 309.7 ± 40.36 minutes. The significantly longer duration of analgesia observed in Arora et al.'s study suggests that their methodology or patient characteristics may have contributed to enhanced analgesic effects compared to our findings13,14. Strebel et al,[15] conducted a study titled "Small-dose Intrathecal Clonidine and Isobaric Bupivacaine for Orthopedic Surgery: A Dose-Response Study," which reported a mean duration of analgesia of 321.0 ± 36.04 minutes. Our findings with 40 mcg and 60 mcg of Clonidine showed mean durations of 282.60 ± 35.07 minutes and 309.7 ± 40.36 minutes, respectively.

A systematic review by Elia et al,[16] included data from 22 randomized trials with 1,445 patients using a variety of spinal Clonidine doses. It was found that Clonidine doses ranging from 15-150 mcg prolonged the time to two-segment regression in a linear, dose-dependent manner. An evaluation of the effectiveness of different doses of Clonidine as an adjuvant to spinal anaesthesia showed that two-segment regression time was highest in the group receiving the highest dose of Clonidine, with a significant difference observed among the groups.[17]

This current research corroborates the efficacy of Clonidine as a potent adjunct to spinal anesthesia, with higher dosages facilitating more prolonged sensory and motor blocks. This affirmation is congruent with the corpus of existing scholarly literature. It accentuates the criticality of customising the dosage to the specificities of the surgical procedure and patient profile, thereby optimising therapeutic outcomes and mitigating risks.

In our study, the occurrence of nausea and vomiting with both 40 mcg and 60 mcg doses of Clonidine added to hyperbaric Bupivacaine in spinal anaesthesia was reported at 2%. This incidence rate is relatively low compared to some previous studies. For example, postoperative nausea and vomiting (PONV) is considered one of the most common adverse events following various types of surgeries, with higher incidence rates reported in general surgical populations.[18] It's important to note that while higher doses of Clonidine can enhance the analgesic and sedative effects of spinal anaesthesia, they also increase the risk of side effects. Therefore, the choice of dose should be tailored to the individual patient's needs, considering factors such as the duration of surgery, the patient's cardiovascular status, and the desired level of sedation. Clinicians must weigh the benefits of prolonged analgesia against the potential for side effects when determining the appropriate dose of Clonidine to use as an adjunct to Bupivacaine in spinal anaesthesia.

CONCLUSION

This indicates that incorporating intrathecal clonidine 60 mcg as an additive to bupivacaine during spinal anaesthesia extends the durations of both sensory and motor blockade intraoperatively in comparison to intrathecal clonidine 40 mcg. The group receiving intrathecal clonidine 60 mcg experiences slightly greater sedation than those receiving intrathecal clonidine 40 mcg, according to the RSS score. The overall length of analgesia is increased with intrathecal clonidine 60 mcg relative to intrathecal clonidine 40 mcg, with fewer adverse effects such as bradycardia and hypotension.

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