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A COMPARATIVE EVALUATION OF TWO DIFFERENT DOSES OF INTRATHECAL 1% 2-CHLOROPROCAINE WITH FENTANYL AS ADJUVANT FOR INFRUMBILICAL SURGERIES

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Abstract

Background: Intrathecal anesthesia is crucial for surgical procedures, providing effective analgesia and muscle relaxation. Among these agents, 2-chloroprocaine has gained popularity due to its rapid onset and shorter duration. This study aims to evaluate and compare the efficacy of two doses (40 mg and 50 mg) of 2-chloroprocaine in terms of analgesia, onset, duration, and anesthesia quality. Secondary objectives include investigating side effects associated with fentanyl and chloroprocaine use.

Methods: This study was conducted at the Department of Anaesthesiology and Intensive Care, Government Medical College, Jammu, over a period of one year from November 2017 to October 2018. The enrolled patients were divided into two equal groups, with 30 patients in each group: Group A received intrathecal 1% 2-chloroprocaine (40 mg) with fentanyl (20 µg), while Group B received intrathecal 1% 2-chloroprocaine (50 mg) with fentanyl (20 µg).

Results: Group B demonstrated a significantly earlier onset of sensory and motor block compared to Group A (p-value<0.001*). The time for two segmental regression of sensory block and the duration of sensory block were also significantly longer in Group B (p-value <0.001*). Furthermore, patients in Group B took a longer time to reach a modified Bromage scale of 0 for motor block. Both groups experienced bradyarrhythmias, hypotension, and nausea, but the differences were not statistically significant. Itching was observed in patients from both groups. However, there were no significant differences in hemodynamic parameters (heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and oxygen saturation) between the two groups.

Conclusion: The amalgamation of intrathecal 1% 2-Chloroprocaine at a dose of 50mg alongside fentanyl at 20µg emerges as a compelling and captivating alternative in the realm of infraumbilical surgical interventions, surpassing the potency of chloroprocaine at 40 mg combined with fentanyl at 20µg.

Keywords: Anaesthetics, 2-chloroprocaine, Fentanyl, Neuraxial Blocks, Regional Anaesthesia, Spinal Anaesthesia

Introduction:

Intrathecal anesthesia, or spinal anesthesia, plays a crucial role in various surgical procedures by providing effective analgesia and muscle relaxation. The choice of an appropriate anesthetic agent and dosage is vital to achieve optimal pain relief while minimizing potential side effects. When selecting a local anesthetic agent for various medical procedures, it is crucial to consider several factors to ensure optimal patient outcomes. The ideal local anesthetic should possess specific qualities, including a rapid onset of action, a faster offset of motor blockade, predictable duration, effective postoperative pain control, low neurotoxicity potential, and minimal systemic side effects. Careful consideration of these factors is essential for the safe and successful management of anesthesia and pain relief.

Among the commonly used intrathecal agents, 2-chloroprocaine, a short-acting ester local anesthetic, has gained popularity due to its rapid onset and shorter duration of action compared to other agents.[1,2] Fentanyl, a potent opioid analgesic, is commonly used as an adjuvant to enhance the effects of local anesthetics.[3] Combining these two agents in intrathecal anesthesia may provide a synergistic effect, resulting in improved pain control during surgical procedures. Evaluating the efficacy of different doses of intrathecal 2-chloroprocaine is crucial for optimizing anesthesia management in surgical procedures. Investigating the potential side effects of fentanyl and chloroprocaine is essential to ensure patient well-being during and after anesthesia administration. Fentanyl, a synthetic opioid with potent analgesic properties, has been widely used as an adjuvant in intrathecal anesthesia.[4,5] However, its association with certain adverse effects, such as respiratory depression and nausea, warrants careful evaluation. Similarly, chloroprocaine, although known for its rapid metabolism and reduced systemic toxicity, may also exhibit side effects that need to be monitored and managed effectively.

The selection of an appropriate dosage should aim to achieve effective analgesia while minimizing the risk of adverse events. By comparing the efficacy of 40 mg and 50 mg doses, this study seeks to identify the optimal dose that can provide reliable pain relief without compromising patient safety.The primary objective of this study is to evaluate and compare the efficacy of the two different doses of 2-chloroprocaine (40 mg and 50 mg) in terms of their analgesic properties, onset, duration of action, and quality of anesthesia. Secondary objectives include investigating the incidence of side effects associated with the use of fentanyl and chloroprocaine. The results obtained will help enhance our understanding of optimal dosing strategies and safety considerations when utilizing these agents in intrathecal anesthesia.

Methods

This study was conducted at the Department of Anaesthesiology and Intensive Care, Government Medical College, Jammu, over a period of one year from November 2017 to October 2018.Ethical approval was obtained from the Institutional Ethics Committee, and informed written consent was obtained from all patients scheduled for infraumbilical surgeries lasting less than one hour under spinal anesthesia.

Inclusion and Exclusion Criteria:

Sixty patients, classified as ASA grade I and II, between the ages of 18 and 60, and of either sex, were enrolled for the study. Patients who refused spinal anesthesia, had contraindications (e.g., skin infection at injection site, spinal deformities, existing neurological disease, severe hypertension, cardiac ailments, deranged coagulation profile), had a history of hypersensitivity to chloroprocaine and PABA ester group, were on long-term opioid use, had autonomic neuropathies, were chronic

alcoholics or drug addicts, had head injuries, or had a history of postural hypotension were excluded from the study.

Group Allocation:
The enrolled patients were divided into two equal groups, with 30 patients in each group:
- Group A received intrathecal 1% 2-chloroprocaine 40 mg with fentanyl 20 μg.
- Group B received intrathecal 1% 2-chloroprocaine 50 mg with fentanyl 20 μg.

Pre-Anesthetic Check-Up and Preparation:
A pre-anesthetic check-up was conducted one day prior to surgery, including a detailed history, thorough physical examination, and relevant investigations such as hemoglobin, bleeding time, clotting time, serum urea, serum creatinine, serum electrolytes, PT, PTI, fasting blood sugar, ECG, and X-ray chest. Overnight sedation was provided with tablet alprazolam 0.25 mg.On the day of surgery, patients fasted for 6 hours before surgery. A peripheral intravenous line was established with an 18 G cannula. Patients received intravenous rantidine (1.5 mg/kg), intravenous ondansetron (0.1 mg/kg), and preloaded with 7-10 ml/kg of Ringer Lactate solution 20 minutes prior to shifting them to the operating room (OT). Monitoring was initiated in the operating room, including heart rate, non-invasive blood pressure (NIBP), ECG, and pulse oximetry.

Anesthetic Technique:
With the patient in the sitting position, the spine was palpated and the position of the patient's body was adjusted to ensure that the plane of the back was perpendicular to the floor. A sterile field was established with povidone iodine, and a fenestrated sterile drape was applied. The skin and interspinous ligament over the L3-L4 space were infiltrated with 2 ml of 1% lidocaine. Lumbar puncture was performed at the L3-L4 level through a midline approach using a 25 gauge Quincke spinal needle. Cerebrospinal fluid aspiration confirmed the correct placement of the spinal needle in the subarachnoid space. The study drugs were then injected at a rate of approximately 0.25 ml/sec.

Parameters Studied:
The study assessed sensory and motor blocks (using modified Bromage scale) every minute until readiness for surgery, with subsequent assessments every 5 minutes until reaching the maximum level of sensory block. Additional evaluations were conducted every 15 minutes during the first 60 minutes. Hemodynamic parameters, including blood pressure, heart rate, and pulse oximetry, were recorded at specific intervals. If mean arterial pressure decreased by more than 20%, mephentermine was administered incrementally, and if heart rate dropped below 50 beats/minute, incremental doses of atropine were given. The time for two-segment regression of sensory block and the duration of sensory and motor block were noted. Side effects such as bradyarrhythmias, hypotension, respiratory depression, seizures, anaphylaxis, anxiety, dizziness, restlessness, tremors, tinnitus, blurred vision, nausea, vomiting, and itching were recorded. Transient neurological symptoms after 24 hours were also documented.

Statistical analysis:
The collected data was subjected to rigorous statistical analysis using MS Excel and SPSS version 20.0 for Windows. To ensure baseline comparability between groups, appropriate statistical tests such as chi-square or t-tests were employed. Mean and standard deviation (SD) were calculated to summarize the data, and statistical significance was determined using repeated measures ANOVA. A p-value of less than 0.05 was considered to indicate statistical significance. It is important to note that all p-values reported in this study were two-tailed, providing a comprehensive assessment of statistical significance.

Results

In this section, the results of the study will be described:

Table 1: Showing age and sex distribution of study patients in two groups

Category	**Group A**	**Group B**	**P-value**
Age (years)	**No. (%)**	**No. (%)**	
20-29	4 (13.3%)	6 (20.0%)	
30-39	13 (43.3%)	14 (46.7%)	
40-49	4 (13.3%)	3 (10.0%)	0.869
50-59	9 (30.0%)	7 (23.3%)	
Total	30 (100%)	30 (100%)	
Mean±SD	38.3±10.89	37.9±10.86	
Gender	No. (%)	No. (%)	
Male	27 (90.0%)	26 (86.7%)	0.688
Female	3 (10.0%)	4 (13.3%)	
Total	30 (100%)	30 (100%)	

The most common age group in Group A was 30-39 years, accounting for 43.3% of patients, followed by the 50-59 age group at 30%. In Group B, the most common age group also 30-39 years, comprised 46.7% of patients, followed by the 50-59 age group at 23.3%. The mean age ± standard deviation for Group A was 38.3 ± 10.89 years, while for Group B, it was 37.9 ± 10.86 years. However, with a p-value of 0.869, the mean age difference was comparable between the groups. In Group A, out of 30 patients, 27 (90.0%) were male and 3 (10.0%) were female. In Group B, out of 30 patients, 26 (86.7%) were male and 4 (13.3%) were female. The p-value was 0.688, indicating statistical insignificance.

Group A (n=30) had a mean height of 158.7 cm (SD=7.53) with a range of 146-170 cm. Group B (n=30) had a mean height of 157.5 cm (SD=7.58) with a range of 145-169 cm. The p-value was 0.552, indicating no significant difference in height between the groups. Furthermore; in Group A (n=30), the mean weight was 58.9 Kg (SD=6.98) with a range of 48-70 Kg. In Group B (n=30), the mean weight was 57.3 Kg (SD=8.45) with a range of 45-71 Kg. The p-value was 0.409, again indicating no statistically significant difference in weight between the groups.

Table 2: Showing comparison of block characteristics between the two groups

Block Characteristic	**Group A**	**Group B**	**P-value**
Onset of Sensory Block (min) Range	5.2 ± 0.461 4-6	3.9 ± 0.571 3-5	<0.001*
Onset of Motor Block (min) Range	6.1 ± 0.403 5-7	4.6 ± 0.679 4-6	<0.001*
Two Segmental Regression of Sensory Block (TSRSB) (min) Range	44.5 ± 4.02 40-50	53.5 ± 3.26 50-60	<0.001*
Duration of Sensory Block (min) Range	93.3 ± 7.11 80-100	112.0 ± 6.10 100-120	<0.001*
Duration of Motor Block (min) Range	89.0 ± 9.23 70-100	98.0 ± 4.07 90-100	<0.001*

Table 2 compares the onset of sensory, motor block, TSRSB and duration of sensory and motor block (minutes). Group A (n=30) had a mean onset time of 5.2 minutes (SD=0.461) with a range of 4-6 minutes, while Group B (n=30) had a mean onset time of 3.9 minutes (SD=0.571) with a range of 3-5 minutes. The p-value was <0.001, indicating a significant difference in the onset of sensory block between the groups. Table 1, also presents the onset of motor block (in minutes), where Group

A had a mean onset time of 6.1 minutes (SD=0.403) and a range of 5-7 minutes, while Group B had a mean onset time of 4.6 minutes (SD=0.679) and a range of 4-6 minutes. The p-value was <0.001, indicating a significant difference in the onset of motor block between the groups. The time taken for two segmental regression of sensory block (in minutes), with Group A having a mean regression time of 44.5 minutes (SD=4.02) and a range of 40-50 minutes, while Group B had a mean regression time of 53.5 minutes (SD=3.26) and a range of 50-60 minutes. The p-value was <0.001, indicating a significant difference in the two segmental regression of sensory block between the groups. The duration of sensory block (in minutes), revealed that Group A had significantly a smaller mean duration of 93.3 (±SD=7.11) minutes compared to Group B with a mean duration of 112.0(±SD=6.10) minutes. The duration of motor block (in minutes), reflected that Group A had a mean duration of 89.0 minutes (SD=9.23) with a range of 70-100 minutes, while Group B had a mean duration of 98.0 minutes (SD=4.07) with a range of 90-100 minutes. The p-value was <0.001, indicating a significant difference in the duration of motor block between the groups.

In the comparison of intra-operative parameters between two groups, the analysis of heart rate (HR) revealed no significant differences between Group A and Group B. Group A exhibited mean HR values ranging from 82.47 to 77.40 beats/min, with standard deviations ranging from 13.29 to 1.52, while Group B had mean HR values ranging from 83.83 to 76.27 beats/min, with standard deviations ranging from 13.05 to 16.43. The p-values, ranging from 0.689 to 0.881, indicated no statistically significant disparities in HR levels between the two groups. Similarly, the comparison of systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and oxygen saturation (SpO2) yielded no statistically significant differences. For SBP, DBP, and MAP, the mean values and standard deviations showed no meaningful variations between Group A and Group B, with p-values ranging from 0.974 to 0.842, 0.645 to 0.676, and 0.738 to 0.719, respectively. Likewise, the analysis of SpO2 demonstrated no substantial distinctions, with mean values ranging from 99.52% to 99.40% in Group A and from 98.87% to 99.63% in Group B. The corresponding p-values ranged from 0.081 to 0.825, indicating no statistically significant disparities in SpO2 levels between the groups.

Table 3: Showing various side effects among two groups

Side Effects	Group A		Group B		P-value
	No.	%age	No.	%age	
Bradyarrythmias	2	6.7	3	10.0	0.641
Hypotension	2	6.7	1	3.3	1.000
Respiratory Depression	0	0.0	0	0.0	-
Nausea	1	3.3	0	0.0	1.000
Vomiting	0	0.0	0	0.0	-
Itching	2	6.7	2	6.7	1.000
TNS after 24 hours (Headache)	0	0.0	0	0.0	-

Table 3 presents the occurrence of various side effects among two groups. In Group A, 6.7% of participants experienced bradyarrhythmias, while in Group B, 10.0% of participants reported the same side effect. The p-value for this comparison was 0.641, indicating no significant difference between the groups. Hypotension was observed in 6.7% of participants in Group A and 3.3% in Group B, with a p-value of 1.000, indicating no significant difference. There were no instances of respiratory depression, vomiting, or postoperative headache (TNS) reported in either group. One participant (3.3%) in Group A experienced nausea, while no participants in Group B reported this side effect. Itching was reported by 6.7% of participants in both Group A and Group B. The p-value for itching was 1.000, suggesting no significant difference in its occurrence between the two groups. Overall, no significant disparities in the occurrence of these side effects were observed between Group A and Group B.

Discussion

Spinal anesthesia, renowned for its expeditious onset, exceptional blockade, lower failure rate, and cost-effectiveness, stands as the favored technique among numerous anesthesiologists for lower limb surgeries. Nevertheless, its major drawback lies in the realm of post-operative pain control, as spinal anesthesia utilizing solely local anesthetics is associated with a relatively limited duration of action. Hence, timely intervention for analgesia becomes imperative during the postoperative period. Adjuvant drugs, which are pharmacological agents employed to augment the effects of local anesthetics when co-administered, have gained considerable popularity in recent years, particularly intrathecal adjuvants. The objective behind their administration revolves around extending the duration of block, enhancing patient satisfaction, reducing resource utilization compared to general anesthesia, and expediting the recovery process. Optimal pain management plays a pivotal role in facilitating rehabilitation and expediting functional recovery, thereby enabling patients to swiftly resume their regular activities. Notably, the addition of opioids has been shown to enhance the quality of spinal anesthesia as reported in the literature.[6]By integrating intrathecal adjuvants, anesthesiologists strive to ameliorate the challenges posed by the limited duration of action of local anesthetics, ultimately aiming to achieve superior pain control and improved patient outcomes. This paradigm shift in practice not only serves to optimize the efficacy of spinal anesthesia but also contributes to enhancing the overall perioperative experience for patients undergoing lower limb surgeries. The present study aimed to compare the effects of intrathecal administration of 1% 2-Chloroprocaine at a dose of 40 mg with fentanyl 20 μg and 1% 2-Chloroprocaine at a dose of 50 mg with fentanyl 20 μg in terms of their analgesic properties, onset of action, duration of action, and quality of anesthesia. Additionally, the study included the examination of the incidence of side effects associated with the administration of fentanyl and chloroprocaine.

The demographic profile of the patients in both Group A and Group B, including age, sex, height, and weight, was comparable and showed no statistically significant differences ($p>0.05$). This indicates that the two groups were well-matched in terms of these demographic variables, minimizing any potential confounding effects. In Group A, the patients received intrathecal administration of 1% 2-chloroprocaine at a dose of 40 mg with fentanyl 20 μg, while in Group B, the patients received intrathecal administration of 1% 2-chloroprocaine at a dose of 50 mg with fentanyl 20 μg. The comparable demographic profile ensures that any observed differences in the outcomes can be attributed to the varying doses of 2-chloroprocaine and fentanyl rather than demographic factors. This enhances the validity and reliability of the study findings and allows for a more accurate assessment of the effects of the different treatment protocols.

The sensory level was meticulously assessed by evaluating the loss of pin prick sensation using a blunt 25 G needle at regular intervals during the study. The onset of sensory block was significantly faster in Group B (3.9±0.571 minutes) compared to Group A (5.2±0.461 minutes). The faster onset of sensory block in Group B can be attributed to the dose-dependent nature of local anesthetics, with increasing dosage leading to a more rapid onset, prolonged duration, and deeper neural blockade. The pKa of the local anesthetic plays a role, as agents closer to the body's pH exist in a more unionized form, facilitating easier diffusion across the nerve membrane and a quicker onset. Chloroprocaine, with a pKa of 8.7, demonstrates the fastest onset among local anesthetics. Additionally, the inclusion of fentanyl as an adjuvant in Group B further contributes to the rapid onset by depressing C-fiber reflexes and both A delta and C reflexes without efferent effects. Our findings align with a study conducted by Patel et al. where they compared two groups of patients receiving different doses of 2-Choloroprocaine; Group A (receiving 20mg 1% 2-Chloroprocaine) and Group B (receiving 30mg 1% 2- Chloroprocaine). They reported that time to achieve sensory T12 block in Group A was 154.33±6.41 seconds and in Group B was 129.83±22.83 seconds and the difference was significant, which is compatible with our study.[7]Casati et al compared different doses of chloroprocaine without an adjuvant. They reported that the onset of sensory block was faster in the chloroprocaine 50 mg group, followed by the chloroprocaine 40 mg group, and then the chloroprocaine 30 mg group, which is in line with our study.[8] Consistent with our study, Forster et

al. in 2011 compared chloroprocaine with articaine and prilocaine and concluded that chloroprocaine exhibited a faster onset of sensory block when compared to the other two local anesthetics.[9] In contrast, a study by Tiwari et al. in 2016 investigated the intrathecal administration of hyperbaric bupivacaine in combination with fentanyl and found that the mean onset of sensory block was faster compared to bupivacaine with normal saline.[10] However, in a study conducted by Srinivasagam et al. in 2016, the addition of fentanyl to local anesthetics did not demonstrate any alteration in the onset of sensory block, which differs from the findings of our study.[11] These additional studies provide further support for our findings and contribute to the existing body of literature regarding the effects of different doses and combinations of local anesthetics and adjuvants on the onset of sensory block.

Our study revealed a statistically significant difference in the time taken to achieve Bromage 3 motor block between Group A (6.1 ± 0.403 minutes) and Group B (4.6 ± 0.679 minutes). The motor block is primarily attributed to the blockage of voltage-gated sodium channels in the axonal membrane. However, fentanyl, acting by opening potassium channels and reducing calcium influx, inhibits transmitter release. The early onset of motor block observed in Group B can be attributed to the higher dose of chloroprocaine (50 mg) combined with fentanyl. The increased dose of chloroprocaine enhances the blockade of sodium channels, resulting in a more rapid onset of motor block.

Lee et al. hypothesized that combining fentanyl with intrathecal 2-chloroprocaine would result in faster resolution of motor block and shorter time to meet recovery room discharge criteria compared to hyperbaric bupivacaine. Although no difference in time to motor block resolution was observed, patients receiving chloroprocaine experienced significantly shorter times for both sensory block resolution and meeting recovery room discharge criteria compared to bupivacaine recipients, which is consistent with our study.[12]Our findings are also consistent with a study conducted by Camponovo et al. in 2014, where they compared 50 mg of plain 1% 2-chloroprocaine with 10 mg of 0.5% plain bupivacaine without an adjuvant. They reported a rapid onset of motor block in the chloroprocaine group compared to the bupivacaine group.[13]In their study,byGu et al, authors found that chloroprocaine offers a viable spinal anesthetic option for total knee and hip arthroplasties, even in academically complex settings with longer surgical times.[14] When combined with preoperative peripheral nerve blocks, intrathecal chloroprocaine enables faster motor function recovery and shorter time to micturition compared to bupivacaine spinals.[14]However, in a recent study conducted by Ghisi et al., they compared three different intrathecal doses (30, 40, and 50 mg) of 2-chloroprocaine 1%. In contrast to our study, they did not report any significant differences in the onset of motor blocks among the three dosage groups.[15] The lack of significant differences in motor block onset observed in Ghisi et al.'s study could be attributed to several factors various factors like; heterogenic patient populations, including differences in age, sex, body weight, and comorbidities, these factors can influence the response to local anesthetics and may contribute to varying results between studies.

In our study, the mean time for two segmental regression of sensory block was 44.5 ± 4.02 minutes in Group A and 53.5 ± 3.26 minutes in Group B, indicating a highly significant difference. This disparity can be attributed to the increased dose of chloroprocaine in Group B and the addition of fentanyl in both groups. Fentanyl's ability to depress C-fiber reflexes alone, coupled with the opioid-local anesthetic combination, leads to the depression of both A delta and C reflexes without any efferent effect. Our findings align with a study by Vath and Kopacz in 2004, where they reported a longer time for two segmental regression of sensory block in chloroprocaine 40 mg with fentanyl compared to chloroprocaine 40 mg with saline.[16] Similarly, Lacasse et al. in 2011 compared hyperbaric bupivacaine with 2-chloroprocaine without an adjuvant and found that the time for two segmental regression of sensory block was faster in the chloroprocaine group (50 minutes) compared to the bupivacaine group (75 minutes), with a statistically significant difference.[17] In a study conducted by Patel et al., the comparison of two groups of patients was based on the dosage of 2-Chloroprocaine administered. Group A received 20mg of 1% 2-Chloroprocaine, while Group B

received 30mg of 1% 2-Chloroprocaine. In their study, the duration of two dermatome regression of sensory block was assessed, and the results indicated that Group B (59.9±6.55) had a significantly longer duration compared to Group A (39.83±5.91) with a high statistical significance ($p<0.0001$).[7]These findings further support the impact of dose and the addition of adjuvants on the duration of sensory block regression.

In our study, Group A had a significantly shorter mean duration of sensory block at 93.3 minutes (±SD=7.11), whereas Group B had a longer mean duration of 112.0 minutes (±SD=6.10).The duration of sensory block is influenced by protein binding and lipophilicity, with chloroprocaine's low protein binding explaining its shorter duration. Our findings align with several studies, including Casati et al. (2006), Teunkens et al. (2016), Gebhardt et al. (2018), Camponovo et al. (2014), Tandan et al. (2018), Casati et al. (2007), and Gys et al. (2017), which consistently reported similar results regarding the duration of sensory block and the effectiveness of chloroprocaine compared to other agents. For instance; Casati et al. (2006) found that different doses of chloroprocaine without adjuvant resulted in sensory block durations of 97 minutes in the 50 mg group, 85 minutes in the 40 mg group, and 60 minutes in the 30 mg group.[8]Teunkens et al. (2016) compared chloroprocaine with lidocaine and bupivacaine and found that the chloroprocaine group had a significantly shorter time until sensory block recovery.[18]Gebhardt et al. (2018) observed faster recovery in patients receiving spinal anesthesia with chloroprocaine compared to those receiving general anesthesia.[19]Camponovo et al. (2014) reported a shorter time for sensory block resolution in the chloroprocaine group compared to the bupivacaine group.[13]Tandan et al. (2018) found a significant difference in the time for complete regression of sensory block between chloroprocaine and hyperbaric bupivacaine.[20]Casati et al. (2007) compared lidocaine and chloroprocaine and noted a shorter recovery time in the chloroprocaine group.[21]Gys et al. (2017) observed faster resolution of sensory block with chloroprocaine compared to prilocaine and bupivacaine.[22] These studies provide further support for our findings and contribute to the existing literature on the duration of sensory block with different local anesthetics.

In our study, motor block duration was assessed using the modified Bromage scale. Group B patients took longer to reach a modified Bromage scale of 0, with a duration of 98 ± 4.07 minutes compared to Group A, which had a duration of 89 ± 9.23 minutes. The prolonged motor block in Group B can be attributed to the higher dose of chloroprocaine. These findings are consistent with the study by Patel et al, who reported that Group B who received 30mg of 1% 2-Chloroprocaine, had longer duration of motor block compared to Group A receiving 20mg of 1% 2-Chloroprocaine.[7] Similarly, Casati et al. (2006), which also reported a prolongation of motor block in the chloroprocaine 50 mg group compared to the 40 mg group without adjuvant.[8]Gys et al. (2017) compared chloroprocaine 40 mg with bupivacaine 10.5 mg and prilocaine 60 mg, and observed earlier motor regression in the chloroprocaine 40 mg group.[22]Our results also align with the study by Kouri and Kopacz (2004), who compared chloroprocaine 40 mg with lidocaine 40 mg and found earlier motor regression in the chloroprocaine group.[23]Teunkens et al. (2016) compared chloroprocaine with lidocaine and bupivacaine and found that chloroprocaine was associated with faster recovery from motor block.[18] These studies provide additional support to our findings and contribute to the understanding of motor block duration with different local anesthetics and adjuvants.

The intra-operative comparison of parameters between Group A and Group B showed no significant differences in heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and oxygen saturation (SpO2). The analysis of HR, SBP, DBP, and MAP revealed mean values and standard deviations that were similar between the groups, with p-values indicating no statistically significant disparities. Similarly, the analysis of SpO2 demonstrated no substantial distinctions between the groups. These findings are consistent with the study conducted by Patel et al., and Ghisi et al which reported no variations in hemodynamic parameters and the absence of intraoperative complications in both groups.[7,15]

In our study, bradyarrhythmias occurred in 6.7% of patients in the chloroprocaine 40 mg group and 10% of patients in the chloroprocaine 50 mg group. Similar findings were reported by Vathet al.[16]Casati A et al, 2006 also found bradyarrhythmias in the chloroprocaine 30 mg group.[8]In the present study, hypotension occurred in 6.7% of patients in the chloroprocaine 40 mg group and 3.3% of patients in the chloroprocaine 50 mg group, which is consistent the study of Zhang Y et al, 2014.[24] Nausea was reported in 3.3% of patients in the chloroprocaine 40 mg group and none in the chloroprocaine 50 mg group, which is in consonance with the study ofCasati A et al.[8] We observed that itching was observed in 6.7% of patients in both the chloroprocaine 40 mg and chloroprocaine 50 mg groups, which is consistent with the study of Vath et al.[16] None of our patients in either the chloroprocaine 40 mg or chloroprocaine 50 mg groups developed transient neurologic symptoms (TNS) after 24 hours in our study. Studies by Ghisi et al , Forster et al and Kouri ME et al also showed no TNS with the use of chloroprocaine.[15,23,25] However, Lacasse M A et al, 2011 reported TNS in both the chloroprocaine 40 mg and bupivacaine 7.5 mg groups.[17]

Conclusion

Our study revealed that Group B exhibited earlier onset of sensory and motor block compared to Group A, and these differences were statistically significant. However, there were no significant disparities in hemodynamic parameters (heart rate, SBP, DBP, MAP, and Spo2) between the two groups. The time for two segmental regression of sensory block and the duration of sensory block were significantly longer in Group B. Additionally, patients in Group B took a longer time to reach modified Bromage scale 0 for motor block. While bradyarrhythmias, hypotension, and nausea occurred in both groups, the differences were statistically insignificant. Itching was observed in patients from both groups. Furthermore, none of the patients in either group experienced transient neurologic symptoms (TNS) after 24 hours. Based on these findings, we recommend further investigation into the factors contributing to the earlier onset and prolonged duration of sensory and motor block in Group B. Additionally, a larger sample size may provide more robust insights into the potential significance of the observed differences in bradyarrhythmias, hypotension, and nausea between the two groups. Further studies could explore preventive measures to mitigate these adverse events.

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