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Original Research Article

Bupivacaine Versus 2 Chloroprocaine Spinal Anesthesia Comparison Study at a Tertiary Hospital

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Abstract

Background: For surgery on the lower abdomen and lower limbs, spinal anesthesia is a tried-and-true, dependable, and safe anesthetic approach. It is simple to administer, acts quickly, poses little danger of infection, and has a low failure rate.

Aims & objectives: The goal of the current study was to compare the effectiveness and readiness for discharge of the two local anesthetics used for spinal anesthesia, Bupivacaine and 2-Choroprocaine.

Material and Methods: The current study was a short-duration (60min) elective ambulatory perineal surgery (such as a hemorrhoidectomy, a fistula in ano, a rectal biopsy, etc.) or gynecological procedure (such as a check curettage, hysteroscopy, etc.) prospective randomized double-blind study conducted in patients of 18 to 60 years of age, ASA grades 1 and 2, in 60 patients were randomly divided into two groups using a computer-assisted table: Group B received 40 mg of 1-chloroprocaine and Group C received 10 mg of bupivacaine hydrochloride as the spinal anesthetic.

Results: In terms of mean age, gender, and ASA grade distribution, there was no discernible statistical difference between the two groups. A statistically significant difference was found between groups B and C for the mean time for onset of sensory block, mean time for onset of motor block, mean time to achieve maximum sensory block, mean duration of sensory block, and mean duration of sensory block. The chloroprocaine group showed better results in these areas. The mean length of stay in group C was 1.40 ±0.64 days and group B was 1.42 ± 0.82 days. There was significant difference in length of stay in two groups. ($p<0.05$) The mean time to ambulation in group C was 225.46 ±56.22 and group B was 265.36 ±58.46 minutes. The time it took for two groups to ambulate varied significantly. ($p<0.05$) This demonstrates that patients in Group C are discharged and ambulated earlier than those in Group B.

Conclusion: In comparison to intrathecal Bupivacaine, intrathecal 2 percent 2-Chloroprocaine has the advantages of early ambulation and early hospital discharge. It also has an earlier and more satisfactory onset of sensory and motor block, the desired level of spinal block, and an adequate duration of sensory and motor block.

Keywords: Intrathecal, 2-Chloroprocaine, Bupivacaine, spinal anesthesia, short duration surgeries

Introduction

For surgery on the lower abdomen and lower limbs, spinal anesthesia is a tried-and-true, secure, and dependable anesthetic approach [1]. It is simple to administer, acts quickly, poses little danger of infection, and has a low failure rate. In order to allow for early patient release and minimal side effects, a spinal anesthetic should have a rapid onset and faster offset of its own effect. However, no local anesthetic can deliver a block that is quick to start, predictable in length, effective and reliable, recovers quickly, and has no adverse effects [2]. Smaller doses of the long-acting local anesthetic hyperbaric bupivacaine have been tried in an ambulatory context. With these smaller doses, the block's duration is still protracted, and they might not be enough anesthetic [3]. Bupivacaine frequently causes urinary retention, which extends the period before discharge for individuals who are ambulatory. Then, 2-chloroprocaine is available in a formulation devoid of preservatives and has been administered to patients all over the world without causing neurotoxicity [4]. The main benefits of 2-chloroprocaine are a quicker recovery from anesthesia and a quicker release from the hospital due to its shorter period of action, appropriate duration, and density of block for short-term operations [5].

Aims & objectives: The goal of the current study was to compare the effectiveness and readiness for discharge of the two local anesthetics used for spinal anesthesia, Bupivacaine and 2-Choroprocaine.

Material and Methods

The current study was a hospital-based prospective randomized double-blind study carried out in Central India's Department of Anaesthesia. The study lasted for 18 months. The institutional ethical committee approved the study.

Patients must be between the ages of 18 and 60, have an ASA score of 1 or 2, be willing to participate in the study, and be scheduled for elective ambulatory perineal surgery (such as a hemorrhoidectomy, a fistula in ano, a rectal biopsy, etc.) or a short-duration gynecological procedure (such as check curettage, hysteroscopy, etc.).

Exclusion standards: patients with an ASA rating of 3 or 4. those who are sensitive to or allergic to bupivacaine or chlorprocaine. Patients who cannot undergo spinal anesthesia (INR > 1.3, Platelets 75 000, anticoagulant usage). neurological illness patients (multiple sclerosis, symptomatic lumbar herniated disc, spinal stenosis). patients who are restricted in fluids (cardiac and renal insufficiency). By computer assisted table, 120 patients were randomly divided into two groups, each with 60 participants. 10 mg of 0.5 percent Bupivacaine Hydrochloride were given to Group B (bupivacaine) (n=60).

40 mg of 1-% 2-chloroprocaine was given to group C (n=60). One day before the procedure, a preanesthetic examination was performed. Patients had evaluations for any systemic disorders, and lab tests were documented. The patients were informed of the spinal anesthesia process, and their written agreement was acquired.

Prior to the surgery, all patients fasted for at least six hours. After the patient was moved to the OT, an 18G cannula was used to ensure IV access, and 10ml/kg of crystalloids were then infused. ECG, NIBP, and Spo2 probe monitors were all linked. Heart rate, SBP, DBP, and Spo2 were recorded at baseline. The patient was then placed in a sitting position while being painted and draped while taking aseptic precautions. The free flow of cerebrospinal fluid was then tested utilizing a midline approach and a 25 gauge Quincke Babcock spinal needle to puncture the L3-L4 region. The patient was randomly assigned to receive an intrathecal injection of either 0.5 percent bupivacaine or a 2 percent 2-CP formulation

without preservatives or bisulfite. A facemask was used to provide 5 L/min of oxygen.

When the sensory block had regressed to the S2 dermatome, the sensory and motor blocks were assessed every three minutes for 15 minutes, every five minutes for 45 minutes, every ten minutes for 60 minutes, and ultimately every 15 minutes. The patient's ECG, pulse oximetry, and blood pressure (both systolic and diastolic) were all monitored throughout the procedure. A lack of cold sensation greater than T10 was deemed to be surgical readiness.

Descriptive statistics were used in the statistical analysis.

Microsoft Excel was used to collect and compile the data, and SPSS 23.0 was used to analyze it. For the continuous variables, ratios and proportions were determined, while for the categorical variables, frequency, percentage, averages, and standard deviations (SD) were computed.

Depending on the situation, either the chi-square test or the Fisher exact test was used to examine differences in proportions between qualitative variables. A statistically significant value was defined as one with a P value less than 0.5.

Results

There was no significant statistical difference in mean age, gender and ASA grade distribution amongst two groups.

Table 1: Demographic profile

Characteristics	Group C (n=60) (%)	Group B (n=60) (%)	P Value
Mean age (years)	38.26 ±13.44	38.48 ±11.82	0.783
Gender			
Male	46	42	0.71
Female	14	18	
ASA			
I	36	42	0.42
II	24	18	

Vital signs such as heart rate, systolic and diastolic blood pressure, oxygen saturation, and mean arterial pressure were assessed at baseline and at 0, 3, 5, 10, 15, 20, 25, 30, 45, 60, 90, 120, 150, 180, and 240 minutes after spinal anesthesia, and there was no statistically significant difference between Group C and Group B. In group C, the mean time for the start of sensory block was 4.26± 1.64 seconds, whereas in group B, it was 4.29± 1.92 seconds. It was statistically significant that the mean time for the onset of sensory block differed. In group C, the mean time for the beginning of motor block was 5.26± 0.29 seconds, whereas in group B, it was 5.32± 0.46 seconds. The difference in the motor block's average onset time was statistically significant. (P <0.5) In group C, the mean time to reach the maximal sensory block was 12.06± 3.24 minutes, but in group B, it was 13.38± 3.82 minutes. It was statistically significant that the difference in mean to obtain the greatest sensory block. (P <0.05) In group C, the mean time of the sensory block was 153.06± 19.38 minutes, but in group B, it was 194.32± 21.22 minutes. The variation in the average length of the sensory block was statistically very significant. (P <0.0001) In group C, the mean motor block lasted 169.52± 19.76 minutes, but in group B, it lasted 197.36± 21.39 minutes. Statistics showed that the difference in the mean time for a motor block was quite significant. (P <0.0001)

Table 2: Anaesthesia characteristics

Parameters	Group C	Group B	P value	
Onset of Sensory block (sec)	4.26 ±1.64	4.29 ±1.92	0.02	Significant
Onset of motor block (sec)	5.26 ±0.29	5.32 ±0.46	0.02	Significant
Time to achieve maximum sensory block (minutes)	12.06 ±3.24	13.38 ±3.82	0.01	Significant
Duration of sensory block (minutes)	153.06 ±19.38	194.32 ±21.86	<0.0001	Highly Significant
Duration of motor block (min)	169.52 ±19.76	197.36 ±21.39	<0.0001	Highly Significant

Out of a total of 120 patients, it was shown that 32 (53.33%) of Group C patients and 28 (46.67%) of Group B patients, respectively, had a maximal level of sensory block at T6. When two groups were statistically compared, the degree of sensory block did not differ between the two. (p>0.05).

Table 3: Maximum level of sensory block

Level	Group C	Group B	P value
T4	16	12	X2=1.44; DF=3; P=0.69*
T6	32	28	
T8	10	16	
T10	02	04	

(P>0.05 Statistically Not Significant)

Out of a total of 120 patients, it was shown that Bromage 3 had the greatest degree of motor block, with 56 (93.33%) and 60 (96.67%) patients in Group R and Group B, respectively. When two groups were compared, there was statistically no discernible difference in the degree of motor blockage. (p>0.05)

Table 4: Intensity of motor blockade

Intensity	Group C	Group B	P value
Bromage 1	00	00	X2=1.07; DF=2; P=0.31*
Bromage 2	04	0	
Bromage 3	56	60	

(P>0.05 Statistically Not Significant)

There were 10 (8.33 percent) patients with back discomfort out of a total of 120 individuals. 6 from group B and 4 from group C (6.67%) (10 percent). When complications between two groups were statistically compared, there was no difference. (p>0.05)

Table 5: Complications

Complication	Group C (n=60)	Group B (n=60)	Total
Headache	02	02	04
Transient neurologic symptoms	02	02	04
Back Pain	04	06	10

The average length of stay in groups C and B was 1.40 ±0.64days and 1.42 ± 0.82 days, respectively. The length of stay in the two groups varied significantly. (p<0.05) The

mean time to ambulation in group C was 225.46 ±56.22 minutes, while that in group B was 265.36 ±58.46 minutes. The time taken for ambulation in the two groups varied significantly. ($p<0.05$) This demonstrates that patients in Group C are discharged earlier than those in Group B and are ambulated earlier.

. **Table 6: Hospital stay among various groups**

Stay	Group C (n=60)	Group B (n=60)	P value
Length of stay	1.40 ±0.64	1.42 ±0.82	<0.05 (S)
Time to ambulation (min)	225.46 ±56.22	265.36 ±58.46	<0.05 (S)

Discussion

One of the cornerstones of balanced anaesthesia is the management of pain during and after operation. Despite experiencing varying levels of popularity over the many years since it was first used in clinical practice, spinal anesthesia remains one of the fundamental procedures in contemporary anesthesia [6,7]. To enhance the effectiveness of intraoperative and postoperative pain treatment, many medications have been tested in subarachnoid blocks together with local anesthetics. Because it enables early detection of symptoms brought on by overhydration, transurethral resection syndrome, and bladder perforation, spinal anesthesia has been routinely employed for urologic procedures. Long-acting local anesthetic bupivacaine is administered in lesser dosages in the ambulatory context. With these smaller doses, the block's duration is still protracted, and they might not be enough anesthetic [8]. The main benefits of 2-chloroprocaine are a quicker recovery from anesthesia and a quicker release from the hospital due to its shorter period of action, appropriate duration, and density of block for short-term operations. Age, sex, and ASA grade demographic characteristics were comparable between the two groups. No difference between them was statistically significant ($p>.05$). Marie Andre'e Lacasse et al., Ben Gys et al., and C Camponovo et al. reported similar findings. In a study conducted by Ben Gys et al., the beginning time of sensory block in both groups was 10.8 min in the C group and 11.1 min in the B group, with a statistically significant difference between the two groups [9,10]. Similar results were found in the current investigation, and C Camponovo et al. found no statistically significant difference between the groups' beginning times for sensory block. In contrast to the current study, this was. The mean time for the beginning of motor block was 5.26± 0.29 seconds in group C and 5.32 ±0.46 seconds in group B, according to our study. The difference in the motor block's average onset time was statistically significant. (P <0.5). According to a research by Camponovo et al., Group C experienced motor block onsets that were statistically different from Group B (5 vs. 6 min). Chloroprocaine group in An Teunkens et al. study had a considerably faster time for motor block onset than bupivacaine group. In group C, the mean time of the sensory block was 153.06 ± 19.38 minutes, but in group B, it was 194.32 ± 21.86 minutes. The difference in the average length of the sensory block was statistically very significant. (P <0.0001) Similar results were found by Ben Gys et al., who found that the median duration of sensory block at the T10 dermatome was substantially longer in the B group (5.3 hours) than the C group (2.8 hours). ($p<0.05$) According to a study by Marie-André Lacasse, the 2-CP group's sensory block lasted for less time than the bupivacaine group (146 min vs 329 min, a difference of 185 min; P0.001). According to a research by C. Camponovo et al., Group C demonstrated significantly faster resolution of sensory blocks (105 vs. 225 min). In the study by An Teunkens et al., patients in the chloroprocaine group recovered from sensory block in considerably less time

(median, 2.6 hours; P 0.0001) than those in the bupivacaine group (6.1 hours). In group C, the mean motor block lasted 169.26 ±19.38 minutes, compared to 197.18± 21.78 minutes in group B. Statistics showed that the difference in the mean time for a motor block was quite significant. (P <0.0001) C According to a study by Camponovo et al., Group C experienced faster onsets of motor block (5 vs. 6 min), maximal sensory block level (8.5 vs. 14 min), and resolution of both sensory and motor blocks (105 vs. 225 min) [11]. When compared to the chloroprocaine group, Yoos et al. found that the time to complete motor block regression was substantially longer with bupivacaine. According to a study by Marie-Andrée Lacasse, the 2-CP group's motor block duration was noticeably shorter. In the study, 10 (8.33 percent) of the 120 patients overall had back pain. When complications between two groups were statistically compared, there was no difference. (p>0.05) In a study conducted by Marie-Andrée Lacasse et al. and Ben Gys et al., similar results were observed. In a study conducted by Marie-Andre'e Lacasse et al., they found that the 2-CP group had considerably shorter times to ambulation, micturition, and eligibility for discharge. When 40 mg of 2-CP and 7.5 mg of small-dose bupivacaine were compared in a volunteer trial by Yoos et al., the time to simulated discharge was substantially longer with bupivacaine [12,13,14].

Conclusion

In comparison to intrathecal Bupivacaine, intrathecal 2 percent 2-Chloroprocaine has the advantages of early ambulation and early hospital discharge. It also has an earlier and more satisfactory onset of sensory and motor block, the desired level of spinal block, and an adequate duration of sensory and motor block. Given all of the aforementioned benefits, patients scheduled for short or ultra-short duration procedures are advised to have spinal anaesthetic using 2% 2-Chloroprocaine.

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References

1. Mulroy MF, Salinas FV, Larkin KL, Polissar NL. Ambulatory surgery patients may be discharged before voiding after short-acting spinal and epidural anesthesia. Anesthesiology. 2002;97(2):315–319.
2. Förster JG, Rosenberg PH. Revival of old local anesthetics for spinal anesthesia in ambulatory surgery. Curr Opin Anaesthesiol. 2011; 24(6):633– 637.
3. Korhonen AM. Use of spinal anaesthesia in day surgery. Curr Opin Anaesthesiol 2006; 19: 612-6.
4. Liu SS, Ware PD, Allen HW, Neal JM, Pollock JE. Dose-response characteristics of spinal bupivacaine in volunteers: clinical implications for ambulatory anesthesia. Anesthesiology 1996; 85: 729-36.
5. Breebaart MB, Vercauteren MP, Hoffmann VL, Adriaensen HA. Urinary bladder scanning after day-case arthroscopy under spinal 390 M.-A. Lacasse et al. 123 anaesthesia: comparison between lidocaine, Ropivacaine, and levobupivacaine. Br J Anaesth 2003; 90: 309-13.
6. Smith KN, Kopacz DJ, McDonald SB. Spinal 2-chloroprocaine: a dose-ranging study and the effect of added epinephrine. AnesthAnalg 2004; 98:81–8.
7. Vath JS, Kopacz DJ. Spinal 2-chloroprocaine: the effect of added fentanyl. Anesth Analg 2004;98:89–94.
8. Warren DT, Kopacz DJ. Spinal 2-chloroprocaine: the effect of added dextrose. AnesthAnalg 2004;98:95–101.
9. Yoos JR, Kopacz DJ. Spinal 2-chloroprocaine for surgery: an initial 10-month experience. AnesthAnalg 2005;100:553–8.
10. Lacasse MA, Roy JD, Forget J, Vandenbroucke F, Seal RF, Beaulieu D, McCormack M, Massicotte L. Comparison of bupivacaine and 2- chloroprocaine for spinal anesthesia for outpatient surgery: a double-blind randomized trial. Canadian

Journal of Anesthesia/Journal canadiend'anesthésie. 2011 Apr 1;58(4): 384-91.
11. Gys B, Lafullarde T, Gys T, Janssen L. Intrathecal prilocaine, 2-chloroprocaine and Bupivacaine for ambulatory abdominal wall herniorrhaphy: A prospective observational study. Ambul Surg. 2017 Jan 1;23:8-12.
12. Camponovo C, Wulf H, Ghisi D, Fanelli A, Riva T, Cristina D, Vassiliou T, Leschka K, Fanelli G. Intrathecal 1% 2-chloroprocaine vs. 0.5% bupivacaine in ambulatory surgery: a prospective, observer-blinded, randomized, controlled trial. Acta Anaesthesiologica Scandinavica . 2014 May;58(5):560-6.
13. Teunkens A, Vermeulen K, Van Gerven E, Fieuws S, Van de Velde M, Rex S. Comparison of 2-chloroprocaine, Bupivacaine, and lidocaine for spinal anesthesia in patients undergoing knee arthroscopy in an outpatient setting: a double-blind randomized controlled trial. Regional Anesthesia and Pain Medicine. 2016 Sep 1;41(5):576-83.
14. Munive A. M., Rosenthalc J. L., Gómez M. S. T., & García D. J. C. A Useful Maneuver to Install Pneumoperitoneum for Laparoscopy in a Frozen Abdomen: Case Report. Journal of Medical Research and Health Sciences, 2022:5(7), 2083–2090.