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Comparison between efficacy of intrathecal 1% 2-Chloroprocaine VS intrathecal 0.5% Bupivacaine with General anaesthesia for short duration laparoscopic surgeries

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Abstract
Background: The ideal anesthetic technique for laparoscopic surgery should maintain stable cardiovascular and respiratory functions, provide rapid postoperative recovery, lead to minimal postoperative nausea and vomiting and provide good postoperative pain relief for early mobility. Administering subarachnoid blocks before general anesthesia in laparoscopic surgeries offer the benefits of good surgery field, hemodynamic stability and reduced requirement of general anesthesia. When subarachnoid block is utilised for short duration laparoscopic surgeries, sympathectomy counteracts the increased systemic vascular resistance (due to pneumoperitoneum) and it contracts the bowel, thereby giving a better field to the surgeon.
Methodology: In this study, 60 patients, aged 18-60 years belonging to ASA class I and II were taken and randomly allocated in 2 groups of 30 each. Group A (30 patients) given intrathecal 1% 2-chloroprocaine 30mg(3ml) combined with General anesthesia and Group B (30 patients) given intrathecal 0.5% bupivacaine 15mg (3ml) combined with General anesthesia.
Result: The study revealed there is significant difference (p value <0.05) between both the groups with respect to recovery from sensory and motor blockade but no significant difference (p value > 0.05) between both the groups with respect to hemodynamic parameters.
Conclusion: Recovery from sensory motor blockade was faster with 1% 2-chloroprocaine thereby enabling surgeons to perform short duration laparoscopic surgeries on a day-care basis and hence minimising hospital stay. We recommend conjunction of two anesthesia techniques in patients undergoing short duration laparoscopic surgeries.

Keywords: General anesthesia, subarachnoid block, laparoscopy, 1% 2-chloroprocaine, 0.5% bupivacaine

1. Introduction
The ideal anaesthetic technique for laparoscopic surgery should maintain stable cardiovascular and respiratory functions, provide rapid postoperative recovery, lead to minimal postoperative nausea and vomiting (PONV) and provide good post-operative pain relief for early mobility. Despite there being a plethora of articles on the combination of epidural and general anesthesia, only a few studies focus on combining SA with GA. However, unopposed increase in systemic vascular resistance (SVR) associated with pneumoperitoneum has to be managed by increasing anesthetic concentrations and, at times, administering vasodilators. This eventually leads to deepening of anesthesia, delayed awakening and is not cost effective. While SA is being used for short laparoscopic procedures, the sympathectomy counteracting SVR. Motivated by this fact, this study was designed to compare 1% 2- chloroprocaine and 0.5% bupivacaine in the combination of SA and GA. Chloroprocaine is an amino-ester local anaesthetic with a very short half-life. 2-Chloroprocaine has a rapid onset time (5-10 minutes) and short-lived duration of action (70-150 minutes). Hence it is useful in short duration surgeries for early ambulation of the patient. Bupivacaine is an amino-amide local anesthetic with a long duration half-life. Bupivacaine has a rapid onset time (5-10 minutes) and long duration of action (240-480 minutes).

1.1 Aim
To compare the efficacy Intrathecal 1% 2-Chloroprocaine combined with General Anaesthesia Vs Intrathecal 0.5% Bupivacaine combined with General Anaesthesia for short duration laparoscopic surgeries.

1.2 Objectives
- **Primary Objectives**

1. Onset and recovery from sensorimotor block.
2. Intraoperative and post-operative haemodynamic changes.

- **Secondary Objectives**

1. Time required for first rescue analgesia and total doses of analgesics required in the first 24 hours.
2. Ambulation time.
3. Voiding Time.

2. Materials and Methods
This study was carried out in the Department of Anaesthesiology, Smt. Kashibai Navale Medical College, Pune.

2.1 Study Design: Prospective, randomized double blinded study.
Ethical committee clearance is obtained prior to the study.

2.2 Study Period: from August, 2019 to December, 2020 (18 months)

2.3 Sample size: 60 patients
Group A- 30mg (3 ml) 1% 2-Chloroprocaine intrathecally combined with GA.
Group B- 15mg (3 ml) 0.5% Bupivacaine intrathecally combined with GA.

2.4 Mode of Selection: In this case study, observer and patient were not aware about treatment allocation. Observer was not actively included in induction of case. He collected data for analysis.

2.5 Inclusion Criteria
1. Patients 18-60 years of age.
2. Patients who are ASA I/II were eligible to be included in this study.
3. Patients to be posted for short duration laparoscopic surgeries including laparoscopic appendicectomy, laparoscopic cholecystectomy and laparoscopic ovarian cystectomy.

2.6 Exclusion Criteria
1. Patient refusal for procedure.
2. ASA physical status III/IV.
3. Patients with contraindications to SA.
4. Surgeries going on for more than 1 hour and laparoscopic surgeries getting converted to open surgeries.

2.7 Procedure
Written, informed consent was taken from patients in their own language. Detailed history and pre-anaesthetic evaluation done before surgery. A routine pre-anaesthetic examination is done assessing general condition of the patient, airway by Mallampati grading, nutritional status and body weight of the patient and a detailed examination of the cardiovascular system and respiratory system. Investigations like CBC, RFT, serum electrolytes, LFT, random blood sugar, PT/INR, blood grouping and cross matching, urine routine and microscopy examination, standard 12-lead electrocardiogram and chest X-ray were done in all patients. All patients included in the study were kept NPO 10 pm onwards on the previous night.
On arrival of the patient in the operating room, large bore IV access was secured and connected to IV fluid Ringer, s Lactate solution 10ml/kg. All multipara monitors like pulse oximeter, non-invasive BP monitoring and ECG leads were attached to record heart rate, oxygen saturation, non-invasive measurements of SBP, DBP, MAP, $etCO_2$ and continuous ECG monitoring. The baseline heart rate, SBP, DBP and MAP were recorded after 5 minutes of settling in the operative room. The cardiac rate and rhythm monitored from a continuous visual display of electrocardiogram from lead II.
SA was given in sitting position with 26 G Quincke needle in L3-L4 interspace using 30mg(3ml) 2-chloroprocaine in Group A and 15 mg(3ml) of 0.5% bupivacaine in Group B. Patients were made supine and table height was adjusted to reach a spinal level of T6. Onset of sensory anesthesia was checked with pin prick, and motor block assessment was carried out with modified Bromage scale. A waiting period of 20 min or time for maximal spinal action, whichever occurred earlier, was allowed to pass before GA induction.
All patients were pre-medicated with Inj. Glycopyrrolate 0.004mg/kg IV, Inj. Midazolam 0.03mg/kg IV, Inj. Ondansetron 0.1mg/kg IV and Inj. Fentanyl 2 mcg/kg IV. The patients were pre-oxygenated for 3 minutes via a face mask, induction was done with Inj. propofol 2 mg/kg IV (titrated till loss of eyelash reflex). Endotracheal intubation was facilitated with Inj. Succinylcholine 2 mg/kg IV prior to laryngoscopy and intubation. After confirmation of bilateral equal air entry and $etCO_2$, the endotracheal tube was fixed. Anaesthesia was maintained using 50% air and 50% of oxygen with Sevoflurane and followed by Inj. Atracurium 0.5mg/kg. IV. At the end of the procedure patients were reversed with Inj. Neostigmine 0.05 mg/kg IV and Inj. Glycopyrrolate 0.008mg/kg IV.
Haemodynamic parameters of patients including HR, SBP, DBP and MAP were recorded as baseline, before endotracheal intubation and at 5, 10, 15 and 30 minutes after it. Hypotension was defined as SBP $\leq$ 20% of baseline value. Tachycardia was defined as HR > 25% of baseline value.

- **Testing of sensory blockade**:-Pin prick method.
- **Testing of motor blockade**:- Modified Bromage scale

Grade 0 - No Motor Block
Grade 1 - Inability to raise extended leg, able to move knees and feet
Grade 2 - Inability to raise extended leg and move knee, able to move feet
Grade 3 - Complete Motor Block of lower limbs.

Visual Analogue Scale
1. Grade 0 (0-1): good analgesia
2. Grade 1 (1-4): moderate analgesia
3. Grade 2 (4-7): mild analgesia
4. Grade 3 (7-10): No analgesia

- **Rescue Analgesia**: Injection Tramadol 50 mg I.V.

3. Results

3.1 Comparison of Demographic Data

Both the groups under study were comparable to each other with respect to age, weight, height and gender.

Table 1: Demographic Data

Parameter	Group A (n 30)	Group B (n 30)	*p* value
Age	35± 9.70	37.03± 12.22	>0.05
Weight	62.33 ± 11.25	59.04 ± 15.04	>0.05
Height	158.96 ± 12.58	154.06 ± 15.84	>0.05

The age distribution in group A and group B was from 18-60 years with *p* value >0.05 which is statistically not significant. The mean weight of the patients in both the groups was comparable with *p* value being >0.05. Both the groups were comparable in terms of height with a statistically insignificant *p* value of >0.05.

Table 2: Gender distribution

Gender	Group A	Group B	*p* value
Male	18	18	>0.05
Female	12	12	>0.05
Total	30	30	

The two tailed *p* value is >0.05, which is statistically insignificant. So both groups were comparable in terms of gender distribution.

Table 3: Comparison of hemodynamics

Parameters	Group A n=30 Mean ± SD	Group B n=30 Mean ± SD	*p* value
Mean HR (per minute)	78.5 ±5.2	77.7 ±7.04	>0.05
Baseline MAP(mm Hg)	102.75 ±6.44	101.66 ±7.64	>0.05
MAP at 15 min	104.6 ±3.4	107.0 ±2.4	>0.05
MAP at 30 min	96.4 ±4.4	98.6 ±3.2	>0.05
MAP at 60 min	90.17 ±2.84	97.6 ±3.2	>0.05

The p value was >0.05 in both groups for all hemodynamic parameters. Hence both groups were comparable in terms of all hemodynamics.

Table 4: Comparison in Onset and Recovery from block

Parameters	Group a N=30	Group b N=30	P value
Onset of Block	2 ±4mins	6 ±4mins	<0.05
Time taken for Highest Achieved Level	8 ±2mins	14 ±3mins	<0.05
Complete recovery of Sensory Block	122 ±10mins	353 ±22mins	<0.05
Complete recovery of Motor Block	78 ±6mins	240 ±7mins	<0.05

The p value for onset of block is statistically significant. The p value for time taken for the highest level achieved was <0.05 which is statistically significant. The p value for complete recovery of sensory block was <0.05 statistically significant and the p value for complete recovery of motor block was <0.05 which was statistically significant.

Table 5: Comparison in Ambulation time

Parameters	Group A N=30	Group B N=30	P value
Ambulation Time	103 ±12 min	360 ±26 min	< 0.001

Mean values suggest that time to voiding of urine (min) was significantly less for Group A than that for Group B. In our study, the ambulation time was significantly shorter in Group A than in Group B, (105.88 +/- 8.23 vs. 299.63 +/- 9.29), P =0.0001.

Table 6: Time required for 1st dose of rescue analgesia and total number of doses in first 24 hrs.

Parameters	Group A n=30	Group B n=30	P value
Time required for 1st dose of rescue analgesia(in mins)	79 ± 7.54	279.73 ± 10.14	< 0.001
Total number of doses in first 24 hours	2.78 ± 0.66	2.13 ± 0.76	< 0.001

Since p value < 0.05 for time required for 1st dose of rescue analgesia, the level of significance; the difference was significant.

There was significant difference in variable stated above between the Groups A & B. Mean values suggest that total number of analgesics in 24 hrs was significantly higher for Group A than that for Group B.

4. Discussion

The introduction of laparoscopy in the field of surgery revolutionised surgical techniques due to reduction in medical costs and reduced incidence of bleeding, lesser postoperative surgical and pulmonary complications and early recovery. With the recent trend towards the use of laparoscopy in daycare surgeries, anaesthetic techniques have changed, with more emphasis on shorter and more favourable techniques.

To investigate the most suitable anaesthetic technique for day surgery, Liu *et al*. published a meta-analysis in 2005 comparing regional and general anaesthesia, including more than 1,300 patients 11. Regional anaesthesia reduced pain scores and pain medication requests in the post-anaesthesia care unit. However, neither central neuraxial block nor peripheral nerve blocks decreased the overall ambulatory surgery unit time and both required longer induction time versus general anaesthesia. However, Liu *et al*. used long-acting or intermediate-acting local anaesthetics for regional anaesthesia, which may have delayed fulfilment of discharge criteria in a few meta analysis studies. Although even low doses of long-acting local anaesthetics are usually administered intrathecally, they are associated with risk of delayed discharge. Regional anaesthesia may provide pre-emptive analgesia, and some evidence exists that regional analgesia may block the progression of severe acute postoperative pain into a chronic pain syndrome.

Teunkens A *et al*. compared the three drugs 2-Chloroprocaine, Bupivacaine and Lidocaine for Spinal anaesthesia for ambulatory Knee Arthroscopy. This study explains the outcomes in terms of recovery of sensorimotor block, urinary retention and transient neurological symptoms. In their study, patients in the Chloroprocaine group had a significantly shorter time until recovery from

sensory block (median, 2.6 hours IQR, 2.2-2.9 hours) than patients in the lidocaine group (median, 3.1 hours IQR, 2.7-3.6 hours; *P*< 0.006) and in the bupivacaine group (median, 6.1 hours IQR, 5.5 hours to undefined hours: *P*< 0.0001). Chloroprocaine showed faster recovery from motor block than lidocaine and bupivacaine also faster ambulation and lesser time for voiding.

Camponovo C *et al*. in their study compared the same two drugs with respect to sensory block onset time to T10 level after Spinal injection used 50 mg of plain 1% 2-Chloroprocaine (Group C, n = 66) or 10mg of plain 0.5% bupivacaine (Group B, n = 64). Times to sensory and motor block onsets, maximum sensory block level, regression of sensorimotor blockade, first analgesic requirements, unassisted ambulation, discharge from hospital and side effects after 24 hours and 7 days were registered blindly.

Ghodki *et al*. in their study compared spinal anesthesia and general anesthesia with general anesthesia for laparoscopic hysterectomy and patients in group SGA maintained stable and acceptable MAP values throughout pneumoperitoneum. The difference as compared to group GA was statistically significant (*P*< 0.01). Group GA showed additional requirement of metoprolol (53.33%) and higher concentration of isoflurane (*P*< 0.001) to combat the increased MAP. Recovery was early and quick in group SGA as against group GA (*P* = 0.000). There were no adverse/residual effects of SA concluding that the hemodynamic repercussions during pneumoperitoneum can be effectively attenuated by combining SA and GA, without any adverse effects.

5. Conclusion

When general anesthesia was supplemented by subarachnoid block, the field of surgery and hemodynamic stability were equally good in both groups. But recovery from sensory motor blockade was significantly faster with 1% 2-chloroprocaine thereby enabling surgeons to perform short duration laparoscopic surgeries on a day-care basis and hence minimising hospital stay. We recommend the conjunction of two anesthesia techniques in patients undergoing short duration laparoscopic surgeries.

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