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Comparision of spinal Anaesthesia vs General Anaesthesia for laparoscopic cholecystectomy: A Randomized study

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Abstract
Introduction: laparoscopic surgical techniques have been rapidly accepted by surgeons worldwide with published reports describing the benefits of less post-operative pain, decreased hospital stay and earlier return to work.
Aims and Objectives: The study was planned to assess comparative superiority of spinal anaesthesia with general anaesthesia for elective laparoscopic Cholecystectomy in healthy patients.
Materials and Methods: The study was conducted in the department of anaesthesia, H.N.B. Base Teaching Hospital Srinagar Garhwal Uttarakhand, in which a total of 60 patients aged between 20-60 years of either sex with ASA Grade status I and II undergoing elective laparoscopic Cholecystectomy were selected. After taking consent from the ethical committee, they were divided into two groups
Group A (n=30) received General Anaesthesia.
Group B (n=30) received spinal Anaesthesia.
Study Design: A randomized study.
Exclusion Criteria: The patients with ASA grade III and IV high risk patients, all emergency procedures, bleeding disorders, acute cholecystitis, pancreatitis and acute cholangitis, previous open surgery in upper abdomen, contraindication for pneumoperitoneum, cardiovascular disorders, respiratory disorders, renal disease and liver disease, circulatory instability, and patients with known sensitivity to local anesthetics.
Results: All the procedures were completed by the allocated method of anesthesia, as there were no conversions from spinal to general anesthesia. Pain was significantly less at 4 hours (P<0.0001), 8 hours (P<0.0001), 12 hours (P<0.0001), and 24 hours (P=0.0001) after the procedure for the spinal anesthesia group, compared with those who received general anesthesia. There was no difference between the two groups regarding complications, hospital stay, recovery, or degree of satisfaction at follow-up.
Conclusion: In our study we observed that in comparision to general anaesthesia, spinal anaesthesia provides better safety and adequacy in healthy patients and hence provides better post-operative pain control without limiting the recovery. Post-operative complications like nausea, vomiting, dizziness and pneumonia are less in spinal anaesthesia.

Keywords: general anesthesia, laparoscopic cholecystectomy, spinal anesthesia

1. Introduction
It is surprising that regional anesthesia has been successfully used for laparoscopic cholecystectomy in patients unfit to have the procedure under general anesthesia but has not been tested in healthy patients in whom any presumed risk would be theoretically much lower. Hamad and Ibrahim El-Khattary [1] used spinal anesthesia for laparoscopic cholecystectomy for the first time in a small series of healthy patients but they had used nitrous oxide as a pneumoperitoneum instead of standard carbon dioxide. Recently, it has been shown that laparoscopic cholecystectomy can be done successfully using carbon dioxide pneumoperitoneum under spinal anesthesia in healthy patients with symptomatic gallstone disease [2]. Laparoscopic cholecystectomy has become very popular after it was first described in 1987 by Philippe Mouret in France. Laparoscopic surgical techniques have been rapidly accepted by surgeons worldwide with published reports describing the benefit of less postoperative pain, decreased hospital stay and earlier return to work [3]. Minimally invasive therapy is done with the general aim to minimize the trauma of interventional process whilst still achieving satisfactory result.[4] Johnson[5] noted that "all laparoscopic procedures are merely a change in access and still require general anesthetic; hence the difference from conventional surgery is likely to be small." This statement is predominantly based on the assumption that laparoscopy necessitates endotracheal intubation to prevent aspiration and respiratory embarrassment secondary to the induction of carbon dioxide pneumoperitoneum, which is not well tolerated in a patient who is awake during the procedure [6, 7]. The incidence of postoperative morbidity like nausea, vomiting, dizziness, respiratory complication, thromboembolism and pneumonia was much less as compared to general anesthesia [8] Also, the total cost of spinal anesthesia with respect to hospital stay, induction and recovery, the need for postoperative antiemetics and analgesia and the incidence of other complication was much lower when compared to general anesthesia [9]. This study was planned to asses comparative superiority of spinal anaesthesia with general anaesthesia for elective laparoscopic Cholecystectomy in healthy patients.

2. Materials and Methods
This study was conducted in H.N.B. Base Teaching Hospital Srinagar Garhwal Uttarakhand. After taking approval of the hospital research ethics committee, sixty adult patients ASA physical status I and II aged between 20-60 years, scheduled

for elective laparoscopic Cholecystectomy procedure were taken. Criteria for exclusion from the study included The patients with ASA grade III and IV high risk patients, all emergency procedures, bleeding disorders, acute cholecystitis, pancreatitis and acute cholangitis, previous open surgery in upper abdomen, contraindication for pneumoperitoneum, cardiovascular disorders, respiratory disorders, renal disease and liver disease, circulatory instability, and patients with known sensitivity to local anesthetics.

All the patients were examined to assess their preoperative condition, demographic data and routine investigations which were recorded in brief. The patients were divided into two groups of 30 each: group A receiving general anesthesia and group B receiving spinal anesthesia.

After taking the patients to the operation theater, an intravenous line was secured in the right upper limb and infusion of 500 ml of Ringer's Lactate solution started. Blood pressure cuff, ECG electrode and capnography monitor were applied. The initial pulse, blood pressure (BP), respiratory rate, ECG and end tidal CO_2 ($EtCO_2$) were noted. All the patients were premeditated with Inj. Glycopyrrolate 4 mcg/kg, Inj. Midazolam 0.02 mg/kg and Inj. Ondansetron 0.08 mg/kg intravenously (i.v.).

In patients randomized for spinal anesthesia, the patient was first made to lie in supine position and all the monitors were attached. Oxygen was then administered through venturi mask at 3 l/minute. Then the patient was made to lie in left lateral decubitus position. A 25-G Quincke spinal needle was introduced in subarachnoid space at L3-L4 interspace under all aseptic and antiseptic precautions. After confirming free flow of cerebrospinal fluid, 0.3 mg/kg of hyperbaric Bupivacaine 0.5% was injected intrathecally in cephalad direction Then, after keeping the patient in the 15º Trendelenburg position for 5 minutes, the patient was again made to lie in a supine position. Approximately 10 minutes after intrathecal injection, the level of analgesia was checked. During this period, 500 ml of 0.9% Ringer's Lactate was infused. A segmental sensory (pin-prick) block, extending between T4 and L5 dermatomes, was obtained without any respiratory distress. Laparoscopic cholecystectomy was performed using the same techniques in both the groups with standard for trocar insertion. After painting and draping, Inj. Bupivacaine plain (0.2%) 10 ml was injected subcostally under diaphragm equally on both sides in both the groups. Pneumoperitoneum was established by using the open (Hasson) technique with carbon dioxide at maximum intra-abdominal pressure of 12 mm Hg. Intraoperatively, the patients randomly allocated to general anesthesia group received fentanyl citrate 2 µg/kg i.v. as an adjuvant while those allocated to spinal anesthesia group were given 25 µg i.v. as bolus and when required. All the patients were monitored continuously both for clinical observation and noninvasive hemodynamic monitoring like electrocardiography, pulse, blood pressure, respiratory rate, pulse oximetry and $EtCO_2$ which were recorded at 15 minute interval. Operative times as well as any intraoperative events such as shoulder pain, headache, nausea, and discomfort were recorded.

Postoperative pain was assessed at 4, 8, 12 and 24 hours by using the Visual Analogue Scale (VAS) after completion of procedure. Other postoperative events, either related to surgical or especially to anesthetic procedure, such as discomfort, nausea and vomiting, shoulder pain, urinary retention, pruritus, headache and other neurological sequel, were recorded.

3. Results

None of the patients withdrew their consent and there was no conversion to open cholecystectomy.

Demographic data are shown in [Table 1] and were similar in both the groups.

Table 1: Demographic date

Characteristics of patient	G/A	S/A
Sex		
Female	20	16
Male	10	14
Mean age (years)	38.3	39.1
Mean operative time (minutes)	66.03	66.63
Average hospital stay (hours)	48.33	36.53

All the procedures were completed within the allocated method of anesthesia and there was no conversion of spinal to general anesthesia. Intraoperatively, there was no bradycardia in either group. In group B, hypotension (i.e. >30% fall in BP) was noted in 9 (30%) cases, out of which mephentermine 6 mg was given in only 2 cases and the rest were managed with i.v. fluids, while in group A, hypotension was noted in 3 (10%) cases and all of them were managed with i.v. fluids. Pain/discomfort in right shoulder was noted in 7 (23%) cases but it was severe enough in only 3 (10%) cases which received i.v. fentanyl 25 µg bolus once. Rest were managed with massage over right shoulder. The remaining patients did not require any additional medication or other intervention, and procedures were completed uneventfully in all cases which [Figure 1] shows intraoperative comparison of mean pulse rate in group A and group B shows less tachycardia. [Figure 2] and [Figure 3] show mean systolic and diastolic pressure, respectively, in both the groups, which was found to be higher in group A compared to group B.

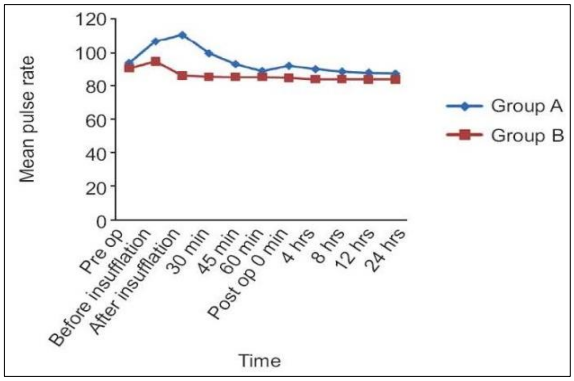

Fig 1: perioperative comparison of mean pulse rate in group A and B

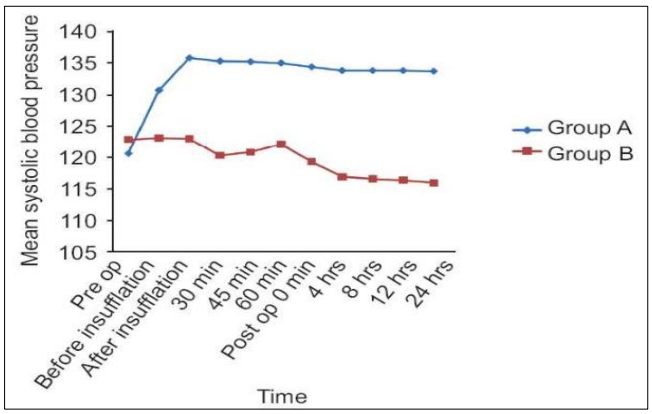

Fig 2: perioperative comparison of mean systolic blood pressure I groups A and B

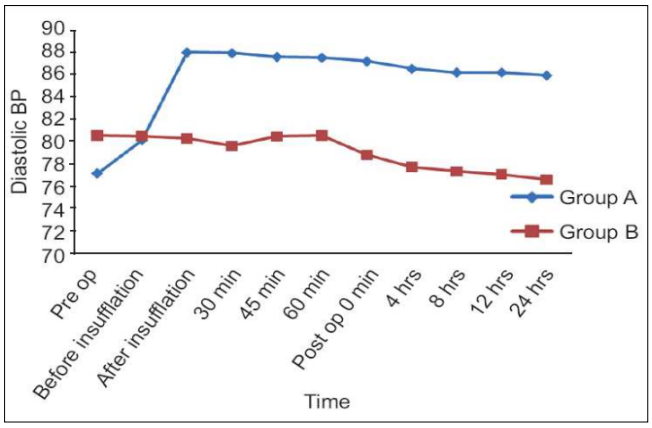

Fig 3: perioperative comparison of mean diastolic blood pressure in group A and B

In group A, to maintain the EtCO $_2$ in between 35 and 40 mm Hg, respiratory rate has to be increased, while in group B, in spontaneously ventilated patients of spinal anesthesia, the increase in respiratory rate was similar to that of group A. This shows that there was no pain or respiratory distress in group B as shown in [Figure 4].

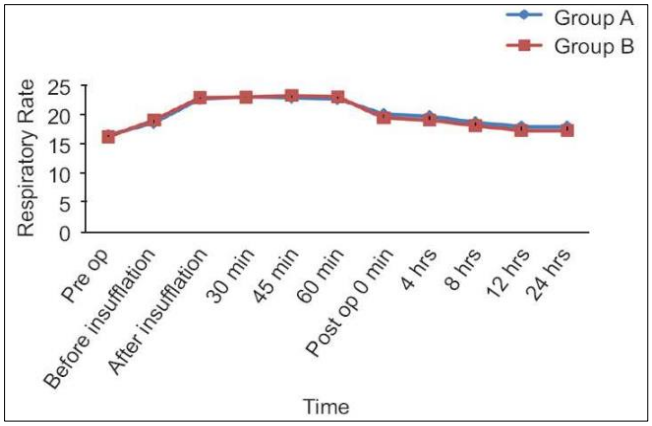

Fig 4: Perioperative Comparison of respiratory Rate in groups A and B

[Figure 5] shows that the mean EtCO $_2$ in both the groups initially increased after peritoneal insufflations and then gradually returned to baseline values after several minutes. Hence, EtCO $_2$ readings in both the groups were similar.

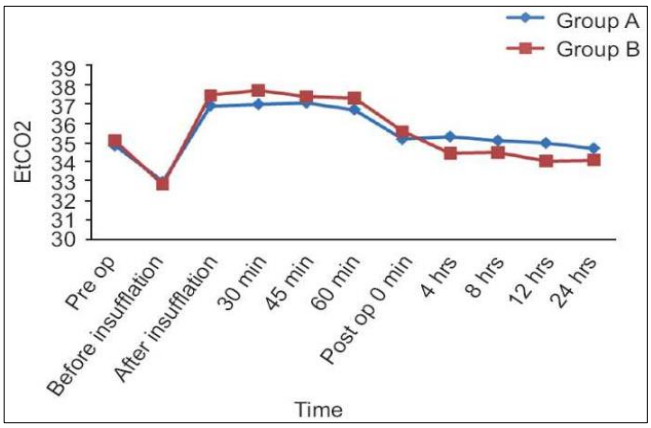

Fig 5: Perioperative comparison of ETCO2 in group A and B

Mean discharge from the hospital in group A was 48.33 hours and in group B it was 36.53 hours. There was no mortality or morbidity in either group. Regarding the postoperative complications, nausea was present in 10 (30%) cases in group A while none had it in group B. Dizziness was there in 6 (20%) cases in group A while none had it in group B. Pruritus was there in 4 (13%) cases in group A and 2 (6.6%) cases in group B. There was no shoulder pain in cases of either group. VAS score was highly significant postoperatively at 0, 4, 8, 12 and 24 hours while comparing both the groups, which suggests that group B had better analgesia than that of group A [Table 2].

Table 2: visual analogue scale score

Interval (hours)	Group A	Group B	*P* value
0	4.23±0.77	2.2±0.4	<0.0001
4	3.63±0.76	1.93±0.253	<0.0001
8	3.86±0.77	1.23±0.43	<0.0001
12	3.56±0.678	1.06±0.253	<0.0001
24	2.43±0.5	1.1±0.305	<0.0001

Pain at local site was noted in 20 (66%) cases in group A and in only 4 (13%) cases in group B. VAS score of >5 received rescue analgesia in the form of i.v. fentanyl 25 µg. There was no headache, backache, urinary retention or any other major complication. At the time of discharge, all patients were asked about the satisfaction regarding the general as well as spinal anesthesia and the patients were more satisfied with spinal anesthesia than general anesthesia.

4. Discussion

The present study has not only confirmed the feasibility of safely performing laparoscopic cholecystectomy under spinal anesthesia as the sole anesthetic procedure but also shown superiority of spinal anesthesia in terms of better postoperative pain control as compared to general anesthesia. Pain assessed throughout any time in the postoperative period during the patients' hospital stay was significantly lesser in spinal group as compared to general anaesthesia group, which is due to residual analgesic effect of local anesthetic in subarachnoid space and decrease in discomfort due to avoidance of general anesthesia [2, 10]. Pain relief, an important component for rapid and smooth recovery, was seen in spinal anesthesia group.

Intraoperatively, two things were noted - hypotension and pain/discomfort in right shoulder in the spinal group. Hypotension is due to sympathetic blockade and mechanical effect of pneumoperitoneum, while pain and discomfort over right shoulder can be attributed to diaphragmatic irritation from pneumoperitoneum with carbon dioxide. Most of this was managed without drugs, i.e., reassurance to the patient, massage of the right shoulder, keeping the intra-abdominal pressure to 12 mm Hg, avoiding excessive tilting of table and thereby minimizing diaphragmatic irritation. In our study, diaphragmatic irritation was much less as there was subcostal instillation of Inj. Bupivacaine plain (0.2%) 10 ml each on both sides just prior to incision. Sometimes, this diaphragmatic irritation is so severe that there may be conversion of the procedure to general anesthesia. The use of low pressure pneumoperitoneum was adequate, especially with spinal group, as spinal anesthesia causes high level of motor, sensory and sympathetic blockade and thereby good abdominal muscle relaxation as compared to general anesthesia.

In group A, the initial increase in pulse rate and BP after peritoneal insufflations are due to both mechanical and neurohumoral effects [11]. The return of pulse rate and BP to normal baseline was gradual. In group B, there was little variation in pulse and BP after peritoneal insufflation as spinal anesthesia tends to decrease the pulse and BP, while the neurohumoral and mechanical effects of pneumoperitoneum tend to increase them. After several minutes, the neurohumoral and mechanical effects are compensated so that there is slight decrease in the pulse rate and BP. The decrease in pulse rate and BP in group B as compared to group A can be explained as due to decrease in pain caused by residual analgesic effect of local anesthetic in subarachnoid space. Nausea and vomiting are particularly troublesome after laparoscopic surgery; over 50% of patients required antiemetics, so prophylactic antiemetics had been given routinely. Regarding the postoperative complications, nausea, vomiting and dizziness were more common with general anesthesia due to intubation of trachea and intravenous drugs. As spinal anesthesia is a regional block, there is less procedure-related cost and hospital stay because of less postoperative pain and complications.

5. Conclusion

In our study we observed that in comparision to general anaesthesia, spinal anaesthesia provides better safety and adequacy in healthy patients and hence provides better post-operative pain control without limiting the recovery. Post-operative complications like nausea, vomiting, dizziness and pneumonia are less in spinal anaesthesia.

6. References

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