ORIGINAL RESEARCH

Assessment of the safety and efficacy of laparoscopic cholecystectomy under spinal anaesthesia vs general anaesthesia: A comparative study

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Received: 02Sept, 2023 Accepted: 25Sept, 2023

ABSTRACT

Aim: The aim of the present study was to evaluate the efficacy, safety and advantages of conducting Laparoscopic Cholecystectomy under Spinal Anaesthesia (SA) in comparison to General Anaesthesia (GA).

Methods: The study was conducted in the Department of Anaesthesiology. Informed consent was obtained from all the patients who had agreed to participate in the study. A detailed explanation of the procedure and risks involved was given. A total number of 50 patients were included in the study.

Results: Both groups had comparable demographic characteristics. Within the SA group, there were 33 female patients and 17 male patients. The average age was 46 ±12.68 years in the SA group and 48.82 ±10.45 years in the GA group. The surgical procedure lasted for an average of 82.98±21.99 minutes in the GA group and 98.2±36.04 minutes in the SA group. However, this difference in time between the two groups did not reach statistical significance. Out of the 6 patients, 2 had persistent shoulder discomfort even after receiving Inj. fentanyl and had to be given general anaesthesia. These 2 patients were therefore eliminated from the further study. All patients in the SA group did not have immediate postoperative discomfort at the location of the operation. In the first 24h tramadol required as rescue in the GA group was 84±26 mg which was significantly higher than the SA group requiring only 31±32.18 mg.Although the GA group had a higher incidence of postoperative nausea and vomiting, this difference was not statistically significant. There were no instances of postoperative infections or headache among the patients.

Conclusion: Our findings indicate that laparoscopic cholecystectomy may be safely conducted with the use of spinal anaesthesia with hyperbaric bupivacaine, and fentanyl as adjuvant. Spinal anaesthesia offers consistent intraoperative hemodynamic and respiratory parameters, requires fewer postoperative analgesics due to its prolonged analgesic effects, and is associated with less problems and higher patient satisfaction.

Key words: Cholecystectomy, gallstone disease, laparoscopic cholecystectomy, laparoscopy, regional anesthesia, spinal anesthesia

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INTRODUCTION

Since the introductionin 1988, laparoscopic cholecystectomy is considered the procedure of choice for the management of symptomatic cholelithiasis.[1,2] The procedure usually requires general anesthesia with endotracheal intubation to avoid aspiration and respiratory complications secondary to the induction of pneumoperitoneum. Regional block such as low thoracic epidural[3], spinal[4],and combined spinal-epidural.[5]

Laparoscopic cholecystectomy under spinal anaesthesia alone has been reported occasionally in the past and these reports included patients unfit to receive general anaesthesia, mainly with chronic obstructive airway disease.[6] Laparoscopic cholecystectomy is conventionally done under general anaesthesia and may be associated with postoperative pain, postoperative nausea and vomiting(PONV). Spinal anaesthesia is commonly used anaesthetic technique that has good safety profile and has several advantages over general anaesthesia. These

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advantages include the patient being awake and oriented at the end of the procedure, less postoperative pain and the ability to ambulate earlier than patients receiving general anaesthesia.[7]Moreover, the incidences of nausea and vomiting are less with selective spinal anaesthesia than with general anaesthesia.[8]

It was thought that laparoscopy cholecystectomy necessitates endotracheal intubation. This was to prevent aspiration, abdominal discomfort and hypercarbia which was expected secondary to induction of CO_2 pneumoperitoneum.[9]Recent studies demonstrate that laparoscopic cholecystectomy with low-pressure CO_2 pneumoperitoneum can indeed be safely performed under spinal anaesthesia (SA).[10] In spite of the emerging evidence that laparoscopic cholecystectomy can be performed safely under regional anaesthesia, it has not gained widespread acceptance.

The aim of the present study was to evaluate the efficacy, safety and advantages of conducting laparoscopic cholecystectomy under SA in comparison to GA.

MATERIALS AND METHODS

The study was conducted in the Department of Anaesthesiology. Informed consent was obtained from all the patients who had agreed to participate in the study. A detailed explanation of the procedure and risks involved was given. A total number of 50 patients were included in the study.

The inclusion criteria were: American Society of Anaesthesiologists Grade I and II patients belonging to the age groups of 20-70 y of either sex, admitted with uncomplicated symptomatic cholelithiasis. Exclusion criteria were patients with acute cholecystitis, gallbladder malignancy, previous upper abdominal surgeries, pregnancy and patient unfit or refusing SA.

After detailed preoperative evaluation and preparation for surgery, patients were randomly allocated to either the SA group or the GA group using a table of computer-generated random numbers. All patients were premedicated with oral 150 mg of Ranitidine on the night before and morning of surgery. On arrival in the preoperative room the patient`s non-invasive blood pressure (NIBP), oxygen saturation(SpO2), and heart rate(HR) were recorded. Intravenous(iv) cannulation was done with an 18 G catheter inserted in the forearm and patients received 500ml of Ringer lactate solution, 1mg Midazolam IV and 4mg Ondansetron IV. A 14F nasogastric tube was inserted routinely in all patients and they received prophylactic preoperative intravenous antibiotic ceftriaxone 1 gm IV.

In the SA group, SA was performed with the patient in sitting position. After infiltration with 2% lignocaine, a 25gauge lumbar puncture was done in the L2-L3 intervertebral space. Three ml of hyperbaric bupivicaine (0.5%) and 25 micrograms (mcg) of Fentanyl was injected intrathecally. The patient was then placed in the supine position for 5min. The sensory level of T4 dermatome level was accepted as to allow laparoscopic cholecystectomy. A Trendelenburg position was given in patients who did not achieve a level of T4 at 5 minutes and sensory level was checked every minute till T4 level was achieved. At the end of 20min if adequate level was not achieved, GA was administered and the patient excluded from the study. As soon as the sensory block level reached T4 dermatome level, the surgery was started. HR, NIBP, and SpO2 were measured and recorded at five minute intervals during the surgery. A decrease in the mean arterial blood pressure(MAP) by more than 20% below the pre-anaesthetic level was managed by intermittent incremental iv boluses of Ephedrine 5mg. Intraoperative shoulder pain was treated with fentanyl 25mcg iv bolus repeated at five-minute intervals, with a maximum of 50mcg. GA was induced on persistence of severe pain despite maximum dose of fentanyl.

In the GA group, after pre-oxygenation, induction was done with Fentanyl (2mcg/kg), Propofol (2mg/kg), and Atracurium (0.5mg/kg).An appropriate size endotracheal tube was inserted after 3min of ventilation. Maintenance of anaesthesia was done with air oxygen mixture enriched with sevoflurane (1.2-2%) and controlled mechanical ventilation.

The patients were then placed in the supine, reverse Trendelenburg position with the arms fully abducted and a right up lateral tilt was given. A minimal possible tilt to facilitate exposure of the gallbladder of the patient was used (i.e. minimal use of both reverse Trendelenburg positioning and right shoulder elevation).Pneumoperitoneum was set at a pressure of 12mmHg, initial insufflation of Carbon Dioxide (CO^2)was done at a low flow rate (2L/min) and gradually increased to 5L/min. A standard four-trocar technique of laparoscopic cholecystectomy was followed. Open technique was used for the placement of the umbilical port for the creation of pneumoperitoneum. A zero-degree optical scope was used for the surgery. Dissection of the gallbladder was started at the triangle of Calot with the identification and clipping of both the cystic duct and artery. Mobilization of the gallbladder from the liver bed started at the triangle of Calot.

The operation time was recorded and intraoperative incidents like right shoulder pain, hypotension, nausea and/or vomiting were recorded. Postoperative pain was assessed regularly using a visual analog scale from 0 to 10, with 10 being most severe, for 24h. Intramuscular Tramadol 50mg was used as rescue analgesic and the total dose administered during the first 24h postoperatively was recorded. If the pain did not reduce to a VAS < 4 in 45min, 1gm Paracetamol iv. infusion was given and repeated every six hours. Patients were discharged after 48h. Follow up of the

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patients was performed at the end of the first and fourth postoperative week.

STATISTICAL ANALYSIS

Statistical analysis was done by student t-test. ANOVA and Chi-square test were performed for nonparametric values and corresponding p-value was computed using SPSS (Statistical Package for the Social Sciences (software version 17) for windows and p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Demographics of patients in both groups studied

	SA Group	GA Group	p-value
Age (years) Mean ±SD	46 ±12.68	48.82 ±10.45	0.360
Gender			
Male (N %)	10 (40)	7 (28)	0.384
Female (N %)	15 (60)	18 (72)	
Age in years	61.95±7.78	64.44±10.22	0.364

Both the groups had similar demographic profile. In the SA group, 33 patients were females and 17 patients were males. The mean age was 46 ±12.68 years and 48.82 ±10.45 in SA and GA groups respectively.

Table 2: Surgery duration & Surgeon score of operating conditions

Surgery duration	SA Group (n=25)	GA Group (n=25)	p-value
Duration of surgery	98.2±36.04	82.98±21.99	0.096
Surgeon score of operating conditions	2.42±0.58	2.46±0.54	0.844
Surgeon score			
Grade 1	2	3	0.786
Grade 2	20	21	
Grade 3	3	1	

The duration of surgery was 82.98±21.99 min and 98.2±36.04 min in the GA and SA groups which was not statistically significant. For each procedure the surgeon was asked to give a score of 1-3, regarding the surgical conditions and muscle relaxation; 1 was bad, 2 good and 3 being excellent.

Table 3: Spinal Anaesthesia group intraoperative events

	N
Shoulder pain	6
Conversion to GA	2
Hypotension	10
Nausea intraoperatively	2
Vomiting	0
Immediate Post op pain	0

6 patients complained of shoulder pain, 2 patients required conversion to GA as the pain did not subside with Fentanyl and they were excluded from further analysis. None of the patients in the SA group had immediate postoperative pain at operated site.

Table 4: Pain scores and tramadol usage

VAS±SD	SA group (n=25)	GA group (n=25)	p-value
Immediate postoperative period	0	6±1.17	< 0.001
1 hour post op	0	4.44±1.36	< 0.001
2 hour post op	0	3.79±1.31	< 0.001
4 hour post op	0.47±1.33	4.18±1.22	< 0.001
8 hour post op	3.58±0.92	4.94±1.36	< 0.001
24 hour post op	3.79±0.91	3.46±0.94	0.22
Total Tramadol used on first post op day (mg±sd)	31±32.18	84±26	< 0.001

All the patients (100%) in the GA group had pain at operated site immediately after completion of operation and their pain score ranged from 4-7, all patients received rescue analgesic before shifting to the ward. In the first 24h tramadol required as rescue in the GA group was 84±26 mg which was

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significantly higher than the SA group requiring only 31±32.18 mg.

Table 5: Postoperative complication

VAS±SD	SA group (n=25)	GA group (n=25)	p-value
Postoperative nausea & vomiting	4	6	0.44
Postoperative spinal headache	0	0	-
Urinary retention	1	0	0.44
Wound sepsis	0	0	-

Although, the GA group had more patients experiencing postoperative nausea & vomiting it was not statistically significant. None of the patients had postoperative infections or headache.

DISCUSSION

Laparoscopic cholecystectomy is the gold standard for surgical treatment of symptomatic gallstones due to the minimally invasive nature of the procedure, less postoperative pain, reduced hospital stay and early return of daily activities.[10]Until recently the choice of anaesthetic techniquefor laparoscopic cholecystectomy had been limited to general anaesthesia with muscle relaxation, tracheal intubation and positive pressure ventilation.[11] Spinal anaesthesia is a less invasive and has lower morbidity and mortality rates as compared to general anaesthesia. Under spinal anaesthesia patient is awake, there is no airway instrumentation, less postoperative pain and absence of nausea and vomiting.[12]Also the cost effectiveness of spinal anaesthesia makes it an attractive choice. The limiting factor for use of spinal anaesthesia in laparoscopic cholecystectomy was the patient discomfort because of respiratory embarrassment associated with pneumoperitoneum and the shoulder tip pain.[13]

Both the groups had similar demographic profile. In the SA group, 33 patients were females and 17 patients were males. The mean age was 46 ±12.68 years and 48.82 ±10.45 in SA and GA groups respectively. The duration of surgery was 82.98±21.99min and 98.2±36.04 min in the GA and SA groups which was not statistically significant. For each procedure the surgeon was asked to give a score of 1-3, regarding the surgical conditions and muscle relaxation; 1 was bad, 2 good and 3 being excellent. 6 patients complained of shoulder pain, 2 patients required conversion to GA as the pain did not subside with Fentanyl and they were excluded from further analysis. None of the patients in the SA group had immediate postoperative pain at operated site. Referred pain to right shoulder is a well described phenomena and is thought to occur due to irritation of subdiaphragmatic surface by the CO_2 pneumoperitoneum.[14,15] The postoperative VASscouldbe influenced by intraperitoneal pressure, use of local anesthetics, peritoneal irrigation, psychological factors and type of incision.[16-18]

All the patients (100%) in the GA group had pain at operated site immediately after completion of operation and their pain score ranged from 4-7, all patients received rescue analgesic before shifting to the ward. In the first 24h tramadol required as rescue in the GA group was 84±26 mg which was significantly higher than the SA group requiring only 31±32.18 mg. Although, the GA group had more patients experiencing postoperative nausea & vomiting it was not statistically significant. None of the patients had postoperative infections or headache.The post-operative recovery of patients was normal in all patients of both the groups. It is described that SA is associated with lower frequency of serious peri-operative morbidities and an improved outcome when compared to GA.[19,20]The patients in SA group seemed to have lesser pain in immediate post-operative period but by the time of discharge the level of post-operative pain/ discomfort was same for both groups. The reduced pain in the SA group may be due to a persistent neuraxial blockade by SA and also the use of a low-pressure pneumoperitoneum. A recent meta-analysis concluded that the use of a low-pressure pneumoperitoneum appears effective in decreasing pain after laparoscopic cholecystectomy.[21]

CONCLUSION

Our findings indicate that laparoscopic cholecystectomy may be conducted with a high level of safety by using spinal anaesthesia with hyperbaric bupivacaine and fentanyl as an adjuvant. Spinal anaesthesia offers consistent intraoperative hemodynamic and respiratory parameters, requires fewer postoperative analgesics due to its prolonged analgesic effects, and is associated with less problems and higher patient satisfaction.

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