Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Anaesthesia & ICU

A Comparative Study on Spinal Anesthesia verses General Anesthesia for Laparoscopic Cholecystectomy

Dr. Mohammed Mohiuddin Shoman[1*], Dr. Mohammad Mahbub-Ul Haque[2], Dr. Md. Tariquzzaman[1], Dr. Mustaq Ahmmed[3], Dr. Nargis Sultana[4], Dr. Bedoura Sharmin[5]

[1]Assistant Professor, Department of Anaesthesia & ICU, Mugda Medical College & Hospital, Dhaka, Bangladesh
[2]Assistant Professor, Department of Anaesthesia & ICU, National Institute of Cancer Research & Hospital, Working Deputation at Mugda 500 Beded General Hospital, Dhaka, Bangladesh
[3]Junior Consultant, Department of Anaesthesia & ICU, Mugda Medical College & Hospital, Dhaka, Bangladesh
[4]Senior Consultant, Department of Obstetrics & Gynecology, Mugda Medical College & Hospital, Dhaka, Bangladesh
[5]FCPS on Gynae Oncology Trainee, Department of Gynae Oncology, National Institute of Cancer Research & Hospital, Dhaka, Bangladesh

DOI: 10.36347/sjams.2023.v11i01.018 | **Received:** 29.11.2022 | **Accepted:** 06.01.2023 | **Published:** 23.01.2023

***Corresponding author:** Dr. Mohammed Mohiuddin Shoman
Assistant Professor, Department of Anaesthesia & ICU, Mugda Medical College & Hospital, Dhaka, Bangladesh
Email: shoman2010.as@gmail.com

Abstract **Original Research Article**

Background: The main goal of anesthetic management in patients undergoing surgical procedures of laparoscopy includes the management of pneumoperitoneum. Generally, laparoscopic cholecystectomy is done under general anesthesia, but a large number of patients with major medical problems sometimes cannot tolerate such anesthesia where thoracic spinal anesthesia may be suitable. ***Aim of the Study:*** The aim of this study was to compare spinal anesthesia verses general anesthesia for laparoscopic cholecystectomy regarding the efficacy and outcomes. ***Methods:*** This prospective comparative study was conducted in the Department of Anaesthesia & ICU, Mugda Medical College & Hospital, Dhaka, Bangladesh during the period from January 2021 to December 2021. A total 60 patients were enrolled in this study as study population. Patients with physical status ASA I and II were selected as the study population and randomly divided to undergo laparoscopic cholecystectomy with low-tension pneumoperitoneum with CO2 under general anesthesia (n=30) or spinal anesthesia (n=30). Propofol, rocuronium, fentanyl, sevoflurane and tracheal intubation were used for general anesthesia. On the other hand, to achieve a sensorial level of T3, hyperbaric bupivacaine (15 mg) and fentanyl (20 µg) were used for the spinal anesthesia. Data regarding intraoperative parameters, postoperative pain, complications and recovery cost were compared between both groups. ***Results:*** In this study, in analyzing the perioperative comparison of mean ±SD VAS scores in both the general and spinal anesthesia groups we observed that in group 1 after 4, 8, 12 and 24 hours VAS (Visual analogue score) scores were found as 1.21±1.02, 1.62±1.35, 1.59±1.38 and 1.02±0.54 respectively which were found as 2.24±1.15, 3.29±1.62, 3.61±1.28 and 2.33±1.49 respectively in group 2. Between both the groups, in all the reading of VAS scores (4, 8, 12 and 24 hours) we found significant correlations between the groups where the P values were <0.05. So, pain was significantly less at 4 hours, 8 hours, 12 hours, and 24 hours after the procedure for the general anesthesia group, compared with those who received spinal anesthesia. ***Conclusion:*** Regarding complications, hospital stay, recovery or degree of patient satisfaction there was no difference between the general and spinal anaesthesia groups. But, perioperative side effects like 'nausea and vomiting, headache and abdominal pain were found less frequently in general anaesthesia group. Moreover, in pain management, general anaesthesia showed better efficacy than spinal anaesthesia.

Keywords: Spinal anesthesia, General anesthesia, Laparoscopic cholecystectomy, VAS score, Pain.

INTRODUCTION

The main goal of anesthetic management in patients undergoing surgical procedures of laparoscopy includes the management of pneumoperitoneum. Generally, laparoscopic cholecystectomy is done under general anesthesia, but a large number of patients with major medical problems sometimes cannot tolerate such anesthesia where thoracic spinal anesthesia may be suitable. The first laparoscopic cholecystectomy, which was performed by Philippe Mouret in Lyons in March 1987 might be regarded as the birth of minimally

invasive surgery [1]. Jonnesco [2] described the use of general spinal anesthesia for surgeries in the head, skull, neck and the thorax. On the other hand, Frumin *et al.*, [3] described about the use of segmental spinal block using low thoracic puncture. Van Zundert [4] proposed segmental spinal block for the laparoscopic cholecystectomy among patients with severe obstructive lung disease using by using a low thoracic puncture for combined spinal-epidural block. Then, they conducted a feasibility study of segmental spinal anesthesia on healthy people who were submitted to laparoscopic cholecystectomy [5]. In many studies, it was repeatedly reported that, in 1987 laparoscopic cholecystectomy (LC) was first introduced by Phillipe Mouret and now it is generally performed by many surgeons [6, 7]. This procedure needs only very little incisions and has benefits like less pain as well as shorter hospital stay and prompt return to everyday life [8]. Due to pneumoperitoneum and position changes, considerable difficulties in anesthetic management could be encountered since wide hemodynamic fluctuation may develop. Pneumoperitoneum induces systemic effects as the absorption of CO_2 and in venous return because of increasing intra-abdominal pressure and initially, absorption of CO_2 increases its elimination in the expired air, in the arterial, as well as venous blood [9]. This carboxemia induces metabolic as well as respiratory acidosis decreasing arterial and mixed venous p^H and arterial PO_2 [10]. In the recent years, advanced laparoscopic surgery has targeted older as well as high risk patients for general anesthesia; where regional anesthesia ensures several advantages along with improved patient satisfaction [11]. The aim of this study was to compare spinal anesthesia verses general anesthesia for laparoscopic cholecystectomy regarding the efficacy and outcomes.

METHODOLOGY

This prospective comparative study was conducted in the Department of Anaesthesia & ICU, Mugda Medical College & Hospital, Dhaka, Bangladesh during the period from January 2021 to December 2021. A total 60 patients with were enrolled in this study as study subjects. As per the exclusion criteria of this study, cases with pancreatitis or cholangitis, acute cholecystitis, with previous open surgery in the upper abdomen, patients with contraindication for pneumoperitoneum and/or for spinal anesthesia owing to spinal deformity were excluded. Written consents were taken from all the participants. The whole intervention was conducted in accordance with the principles of human research specified in the Helsinki Declaration [12] and executed in compliance with currently applicable regulations and the provisions of the General Data Protection Regulation (GDPR) [13]. Patients with physical status ASA I and II were selected as the study population and randomly divided to undergo laparoscopic cholecystectomy with low tension pneumoperitoneum with CO2 under general anesthesia (n=30) or spinal anesthesia (n=30). Propofol, rocuronium, fentanyl, sevoflurane and tracheal intubation were used for general anesthesia. On the other hand, to achieve a sensorial level of T3, hyperbaric bupivacaine (15 mg) and fentanyl (20 µg) were used for the spinal anesthesia. Data regarding intraoperative parameters, postoperative pain, complications and recovery cost were compared between both groups. Along with treatment dada, all the demographic and clinical data of the participants were recorded. All data were processed, analyzed and disseminated by using MS Excel and SPSS version 23 program as per necessity.

RESULTS

In this study, in group 1 (General anesthesia), male participants were 33% whereas female participants were 67%. In group 2 those were 37% and 63% respectively. Besides this, in group 2, the mean ±SD age (Years), weight (Kg), height (cm) and BMI (Kg/m2) were found as 43.9±11.57, 84.96±13.58, 168.64±5.13 and 29.44±3.29 respectively which were 44.71± 12.18, 85.34±14.03, 167.77±5.42 and 29.37±3.58 respectively in group 2 (Spinal anesthesia). In this study, all the procedures were completed within the allocated method of anesthesia and there was no conversion of spinal to general anesthesia. Intra-operatively, there was no bradycardia in either group. In Group 2, hypotension (>30% fall in BP) was found in 11 (37%) 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 1 it was found in 4 (13%) cases and all of them were managed with i.v. fluids. Intraoperative comparison of mean ±SD pulse rate in group 1 and group 2 showed less tachycardia. In this study, the mean ±SD systolic blood pressure (SBP) and diastolic blood pressure (DBP), were found higher in group 1 compared to group 2 where the measuring trend was pre-operation-before insufflation after insufflation - after 30 min. after 45 min. after 60 min. post-operative: at 4 hours- at 8 hours -at 12 hours – at 24 hours. In group 1, to maintain the EtCO2 in between 35 and 40 mm Hg, respiratory rate has to be increased, while in group 2, in spontaneously ventilated patients of spinal anesthesia, the increase in respiratory rate was similar to that of group 1. In this study, it was found that, the mean EtCO2 in both the groups initially increased after peritoneal insufflations and then gradually returned to baseline values after several minutes. EtCO2 readings in both the groups were found about similar. In this study, in analyzing the perioperative comparison of mean ±SD VAS scores in both the general and spinal anesthesia groups we observed that in group 1 after 4, 8, 12 and 24hours VAS (Visual analogue score) scores were found as 1.21±1.02, 1.62±1.35, 1.59±1.38 and 1.02±0.54 respectively which were found as 2.24±1.15, 3.29±1.62, 3.61±1.28 and 2.33±1.49 respectively in group 2. Between both the groups, in all the reading of VAS scores (4, 8, 12 and 24 hours) we found significant

correlations between the groups where the P values were <0.05. Mean discharge from the hospital in group 1 was 47.67 hours and in group 2 it was 45.91 hours. There was no mortality and/or morbidity in either group. In this study, as the side effects in group 1 'nausea and vomiting', headache and abdominal pain were found in 4, 2 and 1 cases which were found in 2, 1 and 0 cases in group 2. Beside these, as complications, dizziness, pruritus, pain at local site, backache and urinary retention were found in some cases in both the groups.

Table 1: Demographic status of participants (N=60)

Characteristics	Group 1(n=30)		Group 2(n=30)		P value
	General anesthesia		Spinal anesthesia		
	n (%)/Mean ±SD		n (%)/Mean ±SD		
Male	10	33%	11	37%	
Female	20	67%	19	63%	
Age (Years)	43.9 ± 11.57		44.71 ± 12.18		>0.05
Weight (Kg)	84.96 ± 13.58		85.34 ± 14.03		>0.05
Height (cm)	168.64 ± 5.13		167.77 ± 5.42		>0.05
BMI (Kg/m^2)	29.44 ± 3.29		29.37 ± 3.58		>0.05

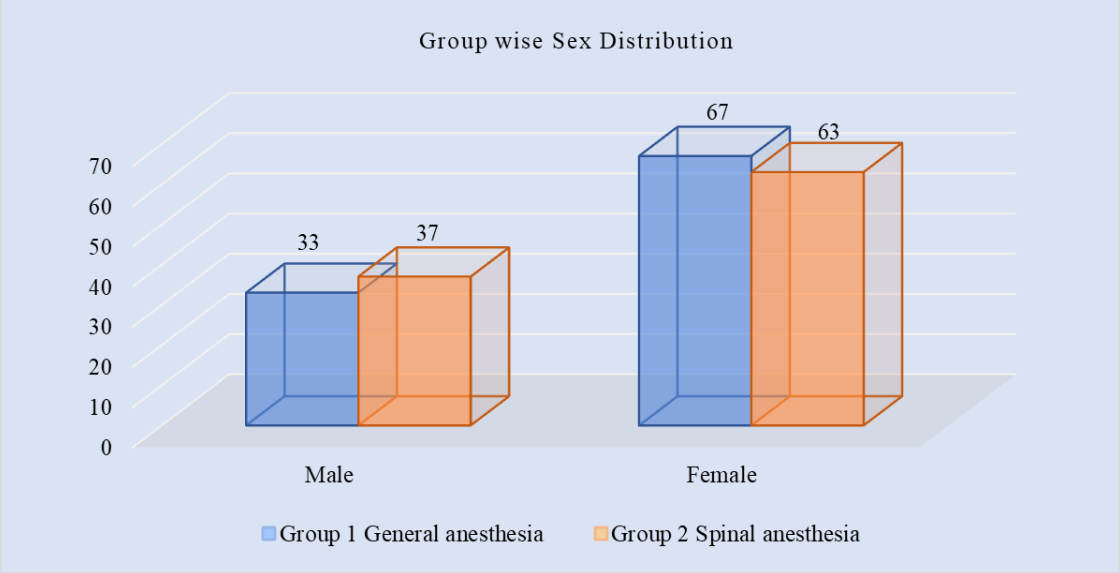

Figure I: Bar chart showed group wise participants by sex (N=60)

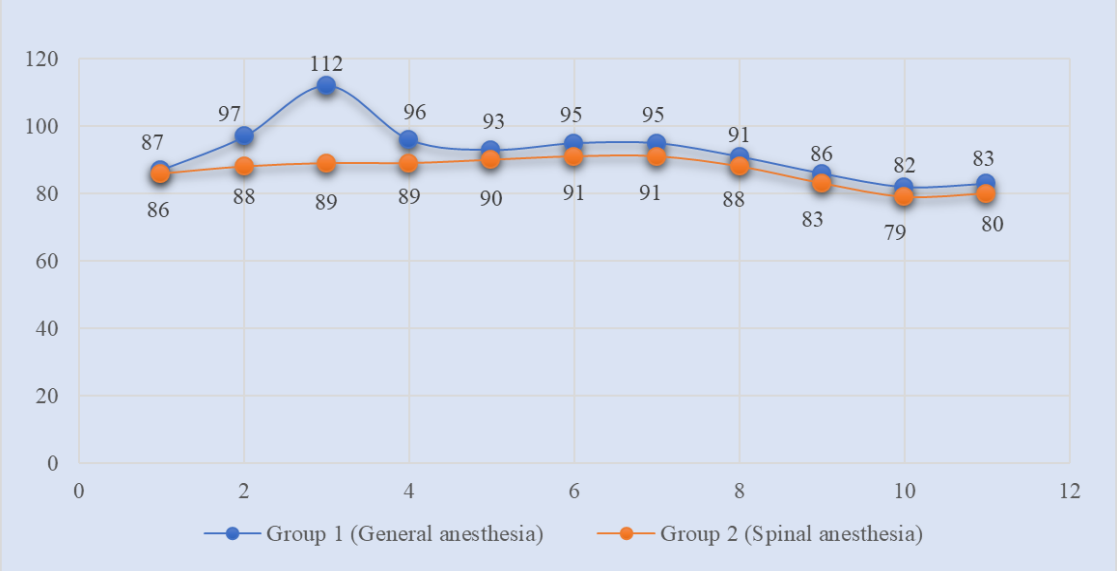

Figure II: Line chart showed perioperative comparison of mean pulse rate in group 1 and group 2 (N=60)

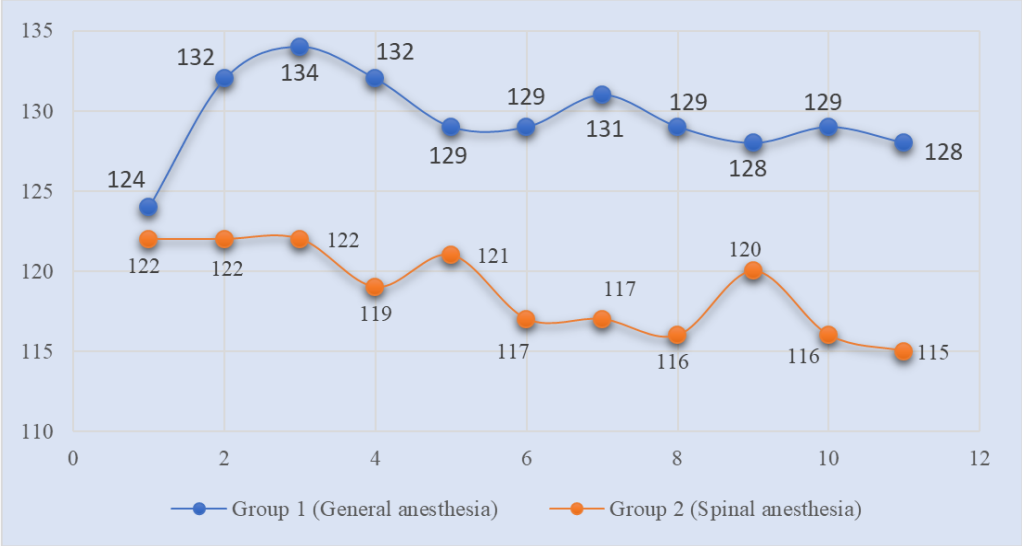

Figure III: chart showed perioperative comparison of mean systolic blood pressure in both groups (N=60)

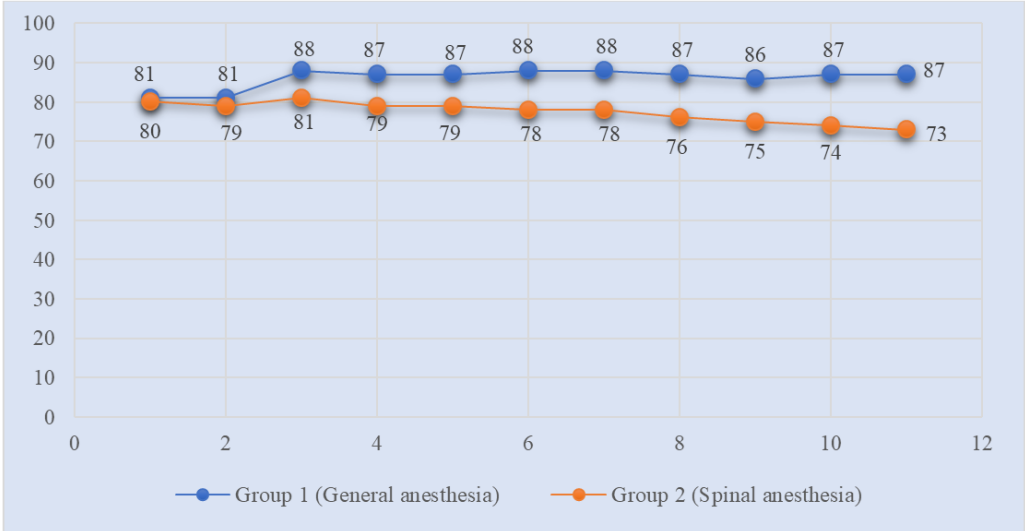

Figure IV: Line chart showed, perioperative comparison of mean diastolic blood pressure in both groups (N=60)

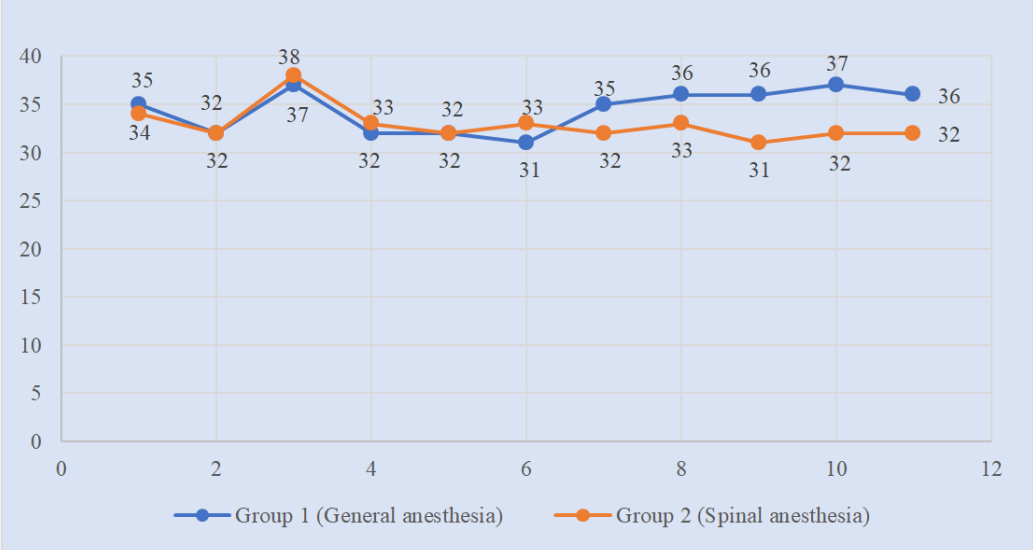

Figure V: Line chart showed, perioperative comparison of respiratory rate in both groups (N=60)

Table 2: Perioperative comparison of mean VAS scores in both groups (N=60)

Period	Group 1	Group 2	P value
	General anesthesia	Spinal anesthesia	
After 4 h	1.21 ± 1.02	2.24± 1.15	0.0005
After 8 h	1.62 ± 1.35	3.29 ± 1.62	<0.0001
After 12 h	1.59 ± 1.38	3.61 ± 1.28	<0.0001
After 24 h	1.02 ± 0.54	2.33 ± 1.49	0.0014

Table 3: Perioperative comparison of side effects in both groups (N=60)

Side effects	Group 1	Group 2
	General anesthesia	Spinal anesthesia
Nausea and vomiting	4	2
Headache	2	1
Abdominal pain	1	0

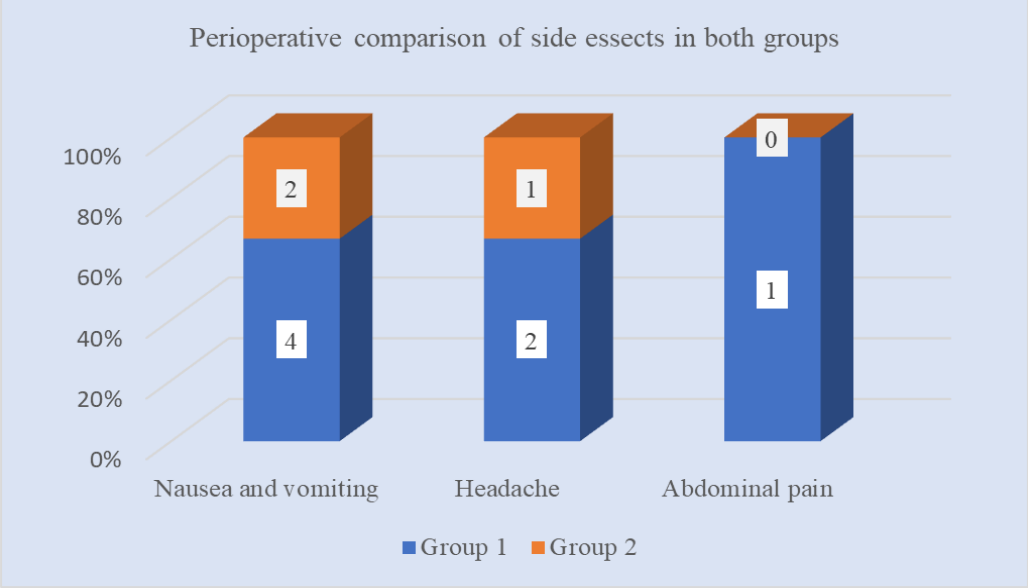

Figure VI: Bar chart showed, perioperative comparison of respiratory rate in both groups (N=60)

DISCUSSION

The aim of this study was to compare spinal anesthesia verses general anesthesia for laparoscopic cholecystectomy regarding the efficacy and outcomes. In this study, all the procedures were completed within the allocated method of anesthesia and there was no conversion of spinal to general anesthesia. Intra-operatively, there was no bradycardia in either group. In group 2, hypotension (>30% fall in BP) was found in 11(37%) 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 1 it was found in 4 (13%) cases and all of them were managed with i.v. fluids. Several researchers have tested intraperitoneal instillation or aerolization of local anesthetic agents, use of the newer anti-inflammatory COX-2 inhibitors, addition of epidural analgesia along with oral or epidural administration of steroids, finding some effect on postoperative pain, which varies between several studies [14, 15]. Intraoperative comparison of mean ±SD pulse rate in group 1 and group 2 showed less tachycardia. In this study, the mean ±SD systolic blood pressure (SBP) and diastolic blood pressure (DBP), were found higher in group 1 compared to group 2 where the measuring trend was pre-operation before insufflation-after insufflation after 30 min. after 45 min. after 60 min. -post operative: at 4 hours at 8 hours at 12 hours at 24 hours. In another study [16], it was reported that, intraoperative events of note in the spinal anesthesia group included a decrease of the arterial blood pressure (BP) of >20% below the preanesthetic value as well as right shoulder pain. In group 1, to maintain the EtCO2 in between 35- and 40.mm Hg, respiratory rate has to be increased, while in group 2, in spontaneously ventilated patients of spinal anesthesia, the increase in respiratory rate was similar to that of group 1. In a study [17], it was found that, the mean EtCO2 in both the general and spinal anaesthesia groups initially increased after peritoneal insufflations and then gradually returned to baseline values after several minutes: hence, EtCO2 readings in both the groups were similar. In this study, it was found that, the mean EtCO2 in both the groups initially increased after peritoneal insufflations and then gradually returned to baseline values after several minutes. EtCO2 readings

in both the groups were found about similar. In this study, in analyzing the perioperative comparison of mean ±SD VAS scores in both the general and spinal anesthesia groups we observed that in group 1 after 4, 8, 12 and 24-hours VAS (Visual analogue score) scores were found as 1.21±1.02, 1.62±1.35, 1.59±1.38 and 1.02±0.54 respectively which were found as 2.24± 1.15, 3.29±1.62, 3.61±1.28 and 2.33±1.49 respectively in group 2. Between both the groups, in all the reading of VAS scores (4, 8, 12 and 24 hours) we found significant correlations between the groups where the P values were <0.05. But, in another study [18], the mean postoperative VAS score (VAS) at 4, 8, 12, and 24 h was significantly less in thoracic spinal group patients, when compared with general anesthesia group patients. In this study, the mean discharge from the hospital in group 1 was 47.67 hours and in group 2 it was 45.91 hours. There was no mortality and/or morbidity in either group. In this study, as the side effects in group 1 'nausea and vomiting', headache and abdominal pain were found in 4, 2 and 1 cases which were found in 2, 1 and 0 cases in group 2. Beside these, as complications, dizziness, pruritus, pain at local site, backache and urinary retention were found in some cases in both the groups. All the findings of this study, may be helpful in the treatment arena of laparoscopic cholecystectomy and in similar further studies.

Limitation of the Study

This was a single centered study with small sample size. Moreover, the study was conducted at a very short period of time. So, the findings of this study may not reflect the exact scenario of the whole country.

CONCLUSION & RECOMMENDATION

Regarding complications, hospital stay, recovery or degree of patient satisfaction there was no difference between the general and spinal anaesthesia groups. But, perioperative side effects like 'nausea and vomiting', headache and abdominal pain were found less frequently in general anaesthesia group. Moreover, in pain management, general anaesthesia showed better efficacy than spinal anaesthesia. For getting more specific results we would like to recommend for conducting similar more studies with larger sized samples.

REFERENCES

1. Crozier, T. A. (2004). Anaesthesia for Minimally Invasive Surgery. 1st ed. England: *Cambridge Publications.*
2. Jonnesco, T. (1909). Remarks on general spinal anesthesia. *Br Med J*, 2, 1935.
3. Frumin, M. J., Schwartz, H., Burns, J., Brodie, B. B., & Papper, E. M. (1954). Dorsal root ganglion blockade during threshold segmental spinal anesthesia in man. *Journal of Pharmacology and Experimental Therapeutics*, *112*(3), 387-392.
4. Van Zundert, A. A. J., Stultiens, G., Jakimowicz, J. J., Van den Borne, B., Van der Ham, W. G. J. M., & Wildsmith, J. A. W. (2006). Segmental spinal anaesthesia for cholecystectomy in a patient with severe lung disease. *BJA: British Journal of Anaesthesia*, *96*(4), 464-466.
5. Van Zundert, A. A. J., Stultiens, G., Jakimowicz, J. J., Peek, D., Van der Ham, W. G. J. M., Korsten, H. H. M., & Wildsmith, J. A. W. (2007). Laparoscopic cholecystectomy under segmental thoracic spinal anaesthesia: a feasibility study. *British journal of anaesthesia*, *98*(5), 682-686.
6. Vecchio, R, MacFayden, B. V., & Palazzo, F. (2000). History of laparoscopic surgery. *Panminerva Med*, 42, 87-90.
7. Spaner, S. J., & Warnock, G. L. (1997). A brief history of endoscopy, laparoscopy, and laparoscopic surgery. *J Laparoendosc Adv Surg Tech A*, 7, 369-73.
8. Soper, N. J., Barteau, J. A., Clayman, R. V., Ashley, S. W., & Dunnegan, D. L. (1992). Comparison of early postoperative results for laparoscopic versus standard open cholecystectomy. *Surg Gynecol Obstet*, 174, 114-8.
9. Kotzampassi, K., Kapanidis, N., Kazamias, P., & Eleftheriadis, E. (1993). Hemodynamic events in the peritoneal environment during pneumoperitoneum in dogs. *Surgical endoscopy*, *7*(6), 494-499.
10. Gandara, V., De Vega, D. S., Escriu, N., & Zorrilla, I. G. (1997). Acid–base balance alterations in laparoscopic cholecystectomy. *Surgical endoscopy*, *11*(7), 707-710.
11. Pursani, K. G., Bazza, Y., Calleja, M., & Mughal, M. M. (1998). Laparoscopic cholecystectomy under epidural anesthesia in patients with chronic respiratory disease. *Surg Endosc*, 12,1082-4.
12. World Medical Association. (2001) . World Medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects. *Bulletin of the World Health Organization*, 79(4) , 373-374. World Health Organization. https://apps.who.int/iris/handle/10665/268312.
13. Voigt, P., & Axel von dem, B. (2017). "Enforcement and fines under the GDPR." The EU General Data Protection Regulation (GDPR). Springer, Cham, 201-217.
14. Alkhamesi, N. A., Peck, D. H., Lomax, D., & Darzi, A. W. (2007). Intraperitoneal aerosolization of bupivacaine reduces postoperative pain in laparoscopic surgery: a randomized prospective controlled double-blinded clinical trial [published online ahead of print December 16, 2006]. *Surg Endosc*, 21(4), 602-606.
15. Papadima, A., Lagoudianakis, E. E., Antonakis, P. T., Pattas, M., Kremastinou, F., Katergiannakis, V., ... & Georgiou, L. (2007). Parecoxib vs. lornoxicam in the treatment of postoperative pain

after laparoscopic cholecystectomy: a prospective randomized placebo-controlled trial. *European journal of anaesthesiology*, *24*(2), 154-158.

16. Tzovaras, G., Fafoulakis, F., Pratsas, K., Georgopoulou, S., Stamatiou, G., & Hatzitheofilou, C. (2008). Spinal vs general anesthesia for laparoscopic cholecystectomy: interim analysis of a controlled randomized trial. *Archives of Surgery*, *143*(5), 497-501.
17. Mehta, P. J., Chavda, H. R., Wadhwana, A. P., & Porecha, M. M. (2010). Comparative analysis of spinal versus general anesthesia for laparoscopic cholecystectomy: A controlled, prospective, randomized trial. *Anesthesia, essays and researches*, *4*(2), 91.
18. Ellakany, M. (2013). Comparative study between general and thoracic spinal anesthesia for laparoscopic cholecystectomy. *Egyptian Journal of Anaesthesia*, *29*(4), 375-381.