ORIGINAL ARTICLE

THORACIC EPIDURAL VERSUS GENERAL ANAESTHESIA FOR LAPAROSCOPIC CHOLECYSTECTOMY: A RANDOMIZED CONTROLLED TRIAL

Fariha Ahmad[1], Liaquat Ali[1], Madiha Ahmed[2], Mohammed Yasrab[3], Arshad Khusdil[4], Samiullah[5]

[1]Department of Anesthesiology, Fauji Foundation Hospital, Rawalpindi, [2]Department of Gynecology, City Med Hospital Rawalpindi, [3]Department of Anesthesiology, Combined Military Hospital, Sargodha, [4]Department of Pediatrics, Combined Military Hospital, Quetta, [5]Department of Surgery, Fauji Foundation Hospital, Rawalpindi-Pakistan

Background: Laparoscopic cholecystectomy is one of the most commonly performed surgeries worldwide. Aim of our study was to compare the effectiveness of thoracic epidural anaesthesia with general anaesthesia for Laparoscopic cholecystectomy in terms of changes in blood pressure during surgery, postoperative pain, respiratory complications and average length of hospital stay. It was a randomized controlled trial conducted from 1st October 2018 to 31st October 2019. **Methods**: Eighty-two patients planned to undergo elective laparoscopic cholecystectomy were randomly divided into two groups, T and G. In Group T all patients underwent laparoscopic cholecystectomy under thoracic epidural anaesthesia with 12 ml of 0.25% bupivacaine and 1% lignocaine plain whereas in group G all patients underwent surgery under general anaesthesia. Intra-operative mean arterial pressure (MAP) and postoperative opioid consumption in first 24hrs were recorded as primary outcomes whereas presence or absence of respiratory complication and duration of hospital stay as secondary outcome. **Results**: Out of 82 patients, 41 patients underwent laparoscopic cholecystectomy under thoracic epidural anaesthesia and 41 patients had surgery under general anaesthesia. Mean arterial pressure was lower in Group T and the difference was statistically significant. The average time of first complaint of postoperative pain in Group T was 5.4±1.26 hours as compared to less than 0.79±0.25 hours in Group G. Patients in group T required lower doses of opioid analgesia in first twenty-four hours as compared to patients in group G. Mean hospital stay in group T was 1 day as compared to 3 days in group G. **Conclusion**: Thoracic epidural anaesthesia provides a better alternative to general anaesthesia for Laparoscopic cholecystectomy with lower intraoperative mean arterial blood pressure, 24 hours postoperative consumption of opioids, respiratory complications and length of hospital stay.

Keywords: Cholecystectomy, Laparoscopic, Thoracic epidural

Citation: Ahmad F, Ali L, Ahmed M, Yasrab M, Khushdil A, Samiullah. Thoracic epidural versus General anaesthesia for Laparoscopic Cholecystectomy: A randomized controlled trial. J Ayub Med Coll Abbottabad 2022;34(2):279–82.

INTRODUCTION

Laparoscopic cholecystectomy is one of the most commonly performed surgeries worldwide with over 500,000 cholecystectomies being performed annually in United States. During the last two decades over 637,308 laparoscopic cholecystectomies were performed in NY State alone. Out of which 72.81% presented with calculus cholecystitis. The incidence of Laparoscopic cholecystectomy as outdoor surgery has also been increased since last decade.[1–6]

Since its introduction in 1990, Laparoscopic cholecystectomy has taken preference over open cholecystectomy and was classically performed under general anaesthesia with endotracheal intubation.[7] The main benefit of general anaesthesia was considered to be prevention of gastric aspiration due to increase intra-abdominal pressure resulting from pneumoperitoneum. But hypertension resulting from pneumoperitoneum generated increase afterload makes general anaesthesia a less favourable choice of anaesthesia for high risk patients. Therefore with recent advancements in surgical and anaesthetic techniques, Laparoscopic cholecystectomies are now being under regional anaesthesia.[8–11] Several studies have reported the efficacy of spinal anaesthesia for Laparoscopic cholecystectomies but with requirement of higher sensory blockage and resulting hypotension, its use is still limited.[12,13] Thoracic epidural anaesthesia with segmental block provides required sensory blockage with better hemodynamic stability and is now being considered as preferable choice of anaesthesia for Laparoscopic cholecystectomy.[14,15]

We have conducted this study to compare the anaesthetic efficacy of thoracic epidural with general anaesthesia for laparoscopic cholecystectomy in terms of better intraoperative hemodynamic stability, postoperative analgesia requirement and respiratory complications. Objective was to compare the effectiveness of thoracic epidural anaesthesia with general anaesthesia for Laparoscopic cholecystectomy in terms of changes in blood pressure during surgery,

postoperative pain, respiratory complications and hospital stay.

MATERIAL AND METHODS

After approval from hospital ethical committee, a prospective randomized controlled trial was conducted at Anaesthesiology Department of Fauji Foundation Hospital Rawalpindi from 1st Oct 2018 to 31thOct 2019. Total 82 patients having American Society of Anaesthesiologists (ASA) physical status I-III, age more than 18 years, of both genders and planned to undergo laparoscopic cholecystectomy were included in our study. Patients who did not give consent, were allergic to local anaesthetic, hemodynamically unstable, pregnant, full stomach, had deranged coagulation profile, had infection at site of insertion of epidural needle, ASA ≥IV or either planned for emergency surgery were excluded from the study. All patients were randomly divided into two groups (T and G) by lottery method, with 41 patients in each group. All patients were assessed pre-operatively in pre-anaesthesia clinic by experienced anaesthetists and counselled in detailed about the thoracic epidural anaesthesia, its advantages and disadvantages and informed written consent was taken. On day of surgery, all patients were prepared for surgery and anaesthesia as per institutional protocols. In group T, after preloading with 10ml/kg Ringer lactate, all patients were supported in sitting position and epidural catheter was passed into T10T11 inter-vertebral epidural space via 16 G tuohy needle and loss of resistance technique by consultant anaesthetist who had successfully passed >50 thoracic epidurals before. After ruling out intravascular or intrathecal insertion of epidural catheter with test dose of 3ml 2% lignocaine with adrenaline, 12ml 0.25% bupvicaine and 1% lignocaine plain were given. Top up with 5ml 0.25% bupvicaine was done 15mins after first top up. After confirmation of effect of block with pin prick test and bromage score, surgery was started. Intraoperatively sedation was given by injection midazolam 2 mg and 3 mg nalbuphine. Visual analogue score (VAS) >4 after 30mins of block was considered as trigger for general anaesthesia. In group G, all patients were given general anaesthesia with injection propofol 2mg/kg, injection nalbuphine 0.1mg/kg and injection atracurium 0.5 mg/kg followed by maintains with sevoflurane 2% and injection atracurium boluses. Baseline blood pressure heart rate and oxygen saturation were noted before induction of anaesthesia and then every 15 mins. Hypertension and hypotension were l if blood pressure increased to or dropped to more than 20% of baseline respectively.

Bradycardia was labelled if heart rate dropped to less than 50 beats per minute and hypoxemia if oxygen saturation dropped to less than 90%. Intraoperative hypertension was managed with injection labetalol 2.5–5 mg bolus; hypotension was managed with injection phenylehrine or atropine boluses. Bradycardia was managed with 0.01 mg/kg of injection atropine. Operating time and intraoperative events like patient discomfort, shoulder tip pain, headache, nausea and vomiting were also recorded. After surgery all patients were shifted to Post anaesthesia care unit. Postoperatively, all patients were given standard intravenous fluids (2 L of Ringer solution for the next 24 hours). For postoperative analgesia, in group T 6hrly epidural top ups with 0.125% bupvicaine was given whereas in group G intravenous ketorolac 30 mg was given 8hrly while opioids were given on demand in both groups. Postoperative pain was assessed using visual analogue score (VAS) and recorded at 0, 4,8,12 and 24 hours. VAS >4 was considered significant and trigger for intravenous injection of 1mg/kg tramadol. We recorded the time duration of first dose of analgesia required after completion of surgery and total dose of analgesia required in first 24 hours of surgery. Other postoperative events recorded were nausea and vomiting, headache and respiratory problems (like cough, dyspnoea, oxygen saturation less than 94% at room air). Patients were started oral feed 6 hours after the surgery and were discharged after 24 hours if everything remained normal. Duration of hospital stay of all the patients was also noted.

After collection, all data was entered and analysed using SPSS Version 16. Mean and SD were calculated for quantitative variables, i.e., age, mean arterial pressure, dose of opioid. Frequency and percentage were calculated for qualitative variables, i.e., gender, presence of vomiting, nausea and respiratory complications. To compare the two groups, Chi square was calculated for qualitative variables and unpaired T-test for quantitative variable. *p*-value <0.05 was considered statistically significant.

RESULTS

A total of eighty-two patients were enlisted in our trial. Sixty-five (80%) patients were female and seventeen (20%) patients were male. No significant difference was found between two groups in terms of gender distribution. Mean age was 46±1.29 with 49±13 mean age in Group T and 47±1.1in group G. The two groups were comparable regarding baseline pulse rate (HR 0min) and mean arterial pressure (MAP 0 min).

The mean arterial pressure was lower in Group T than Group G and the difference was statistically significant. None of the patients suffered hypotension (MAP <65 mmHg). However, the incidence of hypertension (MAP >80 mmHg) was more in Group G. Eight patients in group T and seven patients in group G suffered bradycardia which was managed with injection atropine 0.5 mg bolus. Discomfort was reported after the introduction of pneumoperitoneum in 15 patients (39%)

in group T but was relieved by propofol infusion of 10-20 µg/kg/hr and none of them required conversion to general anaesthesia. Surgery was completed uneventfully in all the patients. Average time of surgery was comparable in the two groups with average time 48 minutes in group T and 47 minutes in group G.

After the surgery shoulder tip pain was complained by 5 patients in group T and 1 patient in group G. The average time of first complaint of postoperative pain in Group T was 5.4 hours as compared to less than 1 hour (0.79 hours) in Group G. Mean opioid consumption in first 24hrs was lower in Group T (30±14) than Group G (136±56) with *p*-value <0.05. The incidence of Post op nausea vomiting was 20% (8/40 patients) in Group G whereas incidence was 2% (1 patient out of 40) in Group T. Respiratory problems were reported by 2 patients in group T and 11 patients in group G. These problems included cough and dyspnoea which were relieved by nebulization and chest physiotherapy. Average duration of hospital stay in patients of group T was 1 day while it was 3 days in group G.

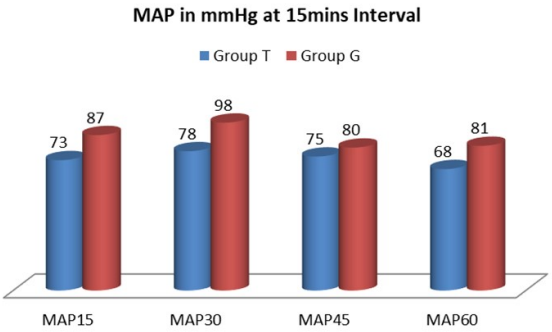

Figure-2: Trend of mean arterial pressure in both

Table 1: Average postoperative pain free interval, analgesic requirement, respiratory problems and length of hospital stay among patients of the two groups

Parameters	Group T (n=41)	Group G (n=41)	*p*-value
Average pain free interval after completion of surgery	5.4±1.26 hours	0.79±0.25hours	*p*<0.0001
Average dose of injection Tramadol required (after surgery for pain relief)	30.73±14.89 mg	136.43±56.42 mg	*p*<0.0001
Respiratory problems	2 (4.9%)	11 (26.8%)	*p*<0.05 (0.007)
Average duration of hospital stays (Days)	1.26 days	2.8 days	*p*<0.0001

DISCUSSION

Since its introduction, Laparoscopic cholecystectomy is classically being performed under general anaesthesia. But over the last few years neuroaxial anaesthesia has taken preference over general anaesthesia with its reduction in incidence of airway trauma, better intra operative hemodynamic stability and better postoperative pain control[15].Spinal anaesthesia has been used by several anaesthetists as mode of anaesthesia for laparoscopic cholecystectomy with additional advantage of intubation and extubation avoidance, preservation of neurological status and early ambulation than when administered GA.[15–18] But with higher incidence of intraoperative hypotension, its use in high risk patients is still limited.[13]

Epidural anaesthesia because of its segmental block produces minimum fluctuations in blood pressure and is considered as preferable choice for anaesthesia in laparoscopic cholecystectomies especially in elderly patients.[19–21] In our study we found out that intraoperative hypotension and hypertension both were less in patients having cholecystectomy under thoracic epidural. However higher incidence of hypertension (25%) was seen in general anaesthesia group. These findings were similar to Writuparna Das *et al* study.[22] The incidence of pneumo-peritoneum related bradycardia was almost similar in both groups.

Postoperative pain control was significantly better in thoracic epidural group with less postoperative consumption of opioids and less visual analogue score. This superior analgesic effect of epidural anaesthesia, reduced post operative nausea, vomiting and respiratory complications also contributes to early mobilization leading to shorter hospital stay and early recovery of the patient.

The incidence of postoperative shoulder pain was more in thoracic group. But its incidence was less than reported by studies of Amit Gupta et al and Ji Hyun Lee et al. The most likely reason for this reduction in incidence was use of low intraabdominal pressure (10 cmH2O) for pneumo-peritoneum and also because of infiltration of local anaesthetic in right sub diaphragmatic space.

Requirement of sedation was more in thoracic group then used in other studies. The most likely explanation was inadequate preoperative counselling of patients and the head up position. As a result, we recommend thoracic epidural anaesthesia as better choice of anaesthesia for laparoscopic cholecystectomies in elderly patients with respiratory or cardiac comprise.

CONCLUSION

Thoracic epidural anaesthesia provides a better alternative to general anaesthesia for Laparoscopic cholecystectomy with lower intraoperative mean arterial blood pressure, 24hrs post operative

consumption of opioids, respiratory complications and length of hospital stay.

AUTHORS' CONTRIBUTION

FA: Literature search, data collection, data interpretation. MA: Data analysis, data interpretation, write-up. LA: Conceptualization of study design, proof reading. MY: Data interpretation, literature search. AK: Data analysis, proof reading, write-up. Samiullah: Data collection, proof reading.

REFERENCES

1. Alli VV, Yang J, Xu J, Bates AT, Pryor AD, Talamini MA, *et al*. Nineteen-year trends in incidence and indications for laparoscopic cholecystectomy: the NY State experience. Surg Endosc 2017;31(4):1651–8.
2. Strosberg DS, Nguyen MC, Muscarella P, Narula VK. A retrospective comparison of robotic cholecystectomy versus laparoscopic cholecystectomy: operative outcomes and cost analysis. Surg Endosc 2017;31(3):1436–41.
3. Csikesz NG, Singla A, Murphy MM, Tseng JF, Shah SA. Surgeon volume metrics in laparoscopic cholecystectomy. Dig Dis Sci 2010;55(8):2398–2405.
4. Brauer DG, Hawkins WG, Strasberg SM, Brunt LM, Jaques DP, Mercurio NR, *et al*. Cost variation in a laparoscopic cholecystectomy and the association with outcomes across a single health system: Implications for standardization and improved resource utilization. HPB (Oxford) 2015;17(12):1113–8.
5. Shaffer EA. Epidemiology and risk factors for gallstone disease: has the paradigm changed in the 21st century? Curr Gastroenterol Rep 2005;7(2):132–40.
6. Song Z, Safran DG, Landon BE, Landrum MB, He Y, Mechanic RE, *et al*. The 'alternative quality contract,' based on a global budget, lowered medical spending and improved quality. Health Aff (Millwood) 2012;31(8):1885–94.
7. Kapoor T, Wrenn SM, Callas PW, Abu-Jaish W. Cost Analysis and Supply Utilization of Laparoscopic Cholecystectomy. Minim Invasive Surg 2018;2018:7838103.
8. Das W, Bhattacharya S, Ghosh S, Saha S, Mallik S, Pal S. Comparison between general anaesthesia and spinal anaesthesia in attenuation of stress response in laparoscopic cholecystectomy: a randomized prospective trial. Saudi J Anaesth 2015;9(2):184–8.
9. Gramatica L Jr, Brasesco OE, Mercado Luna A, Martinessi V, Panebianco G, Labaque F, *et al*. Laparoscopic cholecystectomy performed under regional anaesthesia in patients with chronic obstructive pulmonary disease. Surg Endosc 2002;16(3):472–5.
10. Kim YI, Lee JS, Jin HC, Chae WS, Kim SH. Thoracic epidural anaesthesia for laparoscopic cholecystectomy in an elderly patient with severely impaired pulmonary function tests. Acta Anaesthesiol Scand 2007;51(10):1394–6.
11. Savas JF, Litwack R, Davis K, Miller TA. Regional anaesthesia as an alternative to general anaesthesia for abdominal surgery in patients with severe pulmonary impairment. Am J Surg 2004;188(5):603–5.
12. Ahmed I. Laparoscopic cholecystectomy using spinal anaesthesia. Br J Anaesth 2007;99(5):744–5.
13. Kim JT, Shim JK, Kim SH, Jung CW, Bahk JH. Trendelenburg position with hip flexion as a rescue strategy to increase spinal anaesthetic level after spinal block. Br J Anaesth 2007;98(3):396–400.
14. Lee JH, Huh J, Kim DK, Gil JR, Min SW, Han SS. Laparoscopic cholecystectomy under epidural anaesthesia: a clinical feasibility study. Korean J Anesthesiol 2010;59(6):383–8.
15. Bessa SS, Katri KM, Abdel-Salam WN, El-Kayal el-SA, Tawfik TA. Spinal versus general anaesthesia for day-case laparoscopic cholecystectomy: A prospective randomized study. J Laparoendosc Adv Surg Tech A 2012;22(6):550–5.
16. Yuksek YN, Akat AZ, Gozalan U, Daglar G, Pala Y, Canturk M, *et al*. Laparoscopic cholecystectomy under spinal anaesthesia. Am J Surg 2008;195(4):533–6.
17. Tzovaras G, Fafoulakis F, Pratsas K, Georgopoulou S, Stamatiou G, Hatzitheofilou C. Spinal vs general anaesthesia for laparoscopic cholecystectomy: Interim analysis of a controlled randomized trial. Arch Surg 2008;143(5):497–501.
18. Sinha R, Gurwara AK, Gupta SC. Laparoscopic surgery using spinal anaesthesia. JSLS 2008;12(2):133–8.
19. Gupta A, Gupta K, Gupta PK, Agarwal N, Rastogi B. Efficacy of thoracic epidural anaesthesia for laparoscopic cholecystectomy. Anesth Essays Res 2011;5(2):138–41.
20. Ali Y, Elmasry MN, Negmi H, Al Ouffi H, Fahad B, Rahman SA. The feasibility of spinal anaesthesia with sedation for laparoscopic general abdominal procedures in moderate risk patients. Middle East J Anaesthesiol 2008;19(5):1027–39.
21. Pal I, Bhatti U, Bari J. Changing trends in surgical management for acute cholecystitis,in light of Tokyo guidelines - 14 year experience. J Pak Med Assoc 2019;69(10):1505–8.
22. Das W, Bhattacharya S, Ghosh S, Saha S, Mallik S, Pal S. Comparison between general anaesthesia and spinal anaesthesia in attenuation of stress response in laparoscopic cholecystectomy: A randomized prospective trial. Saudi J Anaesth 2015;9(2):184–8.

Submitted: January 28, 2021	*Revised: August 20, 2021*	*Accepted: October 24, 20211*

Address for Correspondence:

Dr Fariha Ahmad, Anesthetist (FCPS), Fauji Foundation Hospital, Rawalpindi-Pakistan
Cell: +92 305 9714800
Email: Fariha875@yahoo.com