

Safety of Laparoscopic Cholecystectomy in Patients Having Cardiovascular Dysfunction: A Cross-Sectional Study

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Abstract

Aim: To assess the safety of laparoscopic cholecystectomy in patients having cardiovascular dysfunction.

Study design: A cross-sectional study

Place and Duration: This study was conducted at Bolan Medical Complex Hospital Quetta Pakistan from April 2020 to April 2021.

Methodology: The current study involved 80 participants having cardiovascular dysfunction and who had undergone laparoscopic cholecystectomy. Their demographic data and details before and after surgical procedures were recorded and assessed. Transthoracic echocardiography and resting ECG were performed to conduct an assessment before surgery. All the patients were grouped according to the functional classification by New York Heart Association (NYHA) and only those patients were included in the study who belonged to groups II and III.

Results: It was observed that 30 patients belonged to grade II NYHA, and 10 patients belonged to grade III NYHA, and the male to female ratio was 21:7. By transthoracic echocardiography 13 patients had an ejection fraction of 20-30%, whereas 15 patients had an ejection fraction of 30-

40%. The most common problem faced by surgeons during surgery was persistent hypertension observed in 3 patients which were brought back to normal by infusing GTN.

Conclusion: The current study exhibited that laparoscopic cholecystectomy can be safely performed in patients having cardiac disorders.

Keywords: cardiac disorders, hypertension, laparoscopic cholecystectomy, safety

Introduction

When in 1987, the laparoscopic cholecystectomy was introduced by Philip Mouret, the surgeons wholeheartedly adapted the technique because of decreased fatigue, pain, better cosmesis, and early resumption to routine activities.¹ However, laparoscopic cholecystectomy was avoided in certain situations such as pregnancy, old age, acute cholecystitis, abdominal surgery, or cases of morbid obesity.^{2,3} The recent development in surgical interventions has made it possible to conduct laparoscopic cholecystectomy in individuals who have severe medical illnesses.^{4,5} Even after that, there are still certain concerns regarding adopting this technique on patients who have cardiac comorbidity because using carbon dioxide for the positive pressure of pneumoperitoneum during laparoscopy might have a significant impact on the cardiovascular system of individuals, which is why it is not recommended to use this procedure on individuals having a laparoscopic cholecystectomy.^{6,7} Anesthetists and surgeons also don't recommend laparoscopic cholecystectomy in individuals who previously have any significant cardiac morbidity whereas physiological stress is comparatively lesser on the patients who are having open cholecystectomy due to laparoscopy being minimally invasive procedure.^{8,9} This is why it has become a point of concern whether the pneumoperitoneum risk can be minimized by the decreased stress due to comparatively lesser invasive surgical procedure of laparoscopic cholecystectomy in patients with cardiovascular diseases.¹⁰ This study was conducted to assess the safety of laparoscopic cholecystectomy in patients having cardiac disorders.

Methodology

The data about demographics, operation details, and the postoperative course of all the patients were recorded in a database. Permission was taken from the ethical review committee of the institute. Transthoracic echocardiography and resting ECG were performed to conduct an assessment before surgery. All the patients were grouped according to the functional classification by New York Heart Association (NYHA) and only those patients were included in the study who belonged to groups II and III. If patients were on any kind of antiplatelet medications previously, they were asked to stop taking those 5 days prior to surgery whereas beta-blockers were given to all the patients who were not receiving any kind of such drugs previously. All the patients have been advised to take Omeprazole (20 mg), Ondansetron (4 mg), and Nitrazepam (10 mg) the night before surgery. Laparoscopic cholecystectomy was conducted in the morning after fasting of 4 hours. By using an 18 G peripheral venous cannula, venous access was obtained. Anesthesia with Fentanyl and Sevoflurane was given with anesthesia after

peroxygenating the patients with 100% oxygen. Vecuronium was also given along with maintaining the anesthesia with oxygen. Oxygen saturation, heart rate, ECG, blood pressure, and end-tidal CO₂ were continuously monitored. All the patients were ventilated mechanically and 30-35 mmHg end-tidal CO₂ was maintained properly. The standard procedure of laparoscopic cholecystectomy was performed in all the patients. Using open technique infra-umbilical camera port was inserted into the body. Higher intraabdominal pressure limit was kept at 8 mmHg and the surgery was conducted in the reverse Trendelenburg position up to 15-20 degrees in a rightly tilted position. Once the surgery was completed, a slow release of peritoneal carbon dioxide was performed. Once the surgery was completed, patients were shifted to the post-anesthetic care unit and were monitored closely for 4-5 hours, and after that, they were shifted to the ward other than the ones who had faced problems during surgery were shifted to ITU for further observation. For giving analgesia after surgery, fentanyl and diclofenac sodium (oral) were given. Oral intake was continued after 4-5 hours and fluid was given till evening intravenously, and after that anticoagulants were given according to the suggested guidelines.

Results

There were 80 participants with cardiac disorders who had a laparoscopic cholecystectomy. A total of 10 participants had dilated cardiomyopathy and were managed accordingly, 40 had the bypass grafting of their coronary artery whereas 30 patients had their stenting and angioplasty done in past. A total of 30 patients belonged to grade II and 10 patients belonged to grade III NYHA in this study as indicated in Table number 1.

The recorded mean age of patients was 60 years with a range of 26-78 years, and it was observed that the male to female ratio was 21:7. There were 12 patients who had some kind of cardiac intervention before the surgery whereas the other ones were managed medically. Table number 2 suggests that 3 patients were experiencing bifascicular block and didn't require a temporary pacemaker. By transthoracic echocardiography 13 patients had an ejection fraction of 20-30%, whereas 15 patients had an ejection fraction of 30-40%. Echocardiography also showed other abnormalities described in Table number 2. All the patients had undergone laparoscopic cholecystectomy as described in Table number 3

The most common problem faced by surgeons during surgery was persistent hypertension observed in 3 patients which were brought back to normal by infusing GTN. There was 1 patient who had tachyarrhythmia and was treated with amiodarone. However, these complications were not critical enough for a contraindication to laparotomy. After surgery, 3 patients had developed tachyarrhythmia, out of which 1 patient was treated with defibrillation whereas 2 patients didn't have any hemodynamic compromise, who were monitored carefully and the signs of tachycardia were subsided spontaneously

Table 1. Profiling of study participants

Parameters	Number
Male to female ratio	21:7
Mean age with a range	60 years ranging from 26-78 years
Asthma/COPD	4
CABG	7
Hypertension	20
Hypothyroidism	6
Diabetes mellitus	15
CRF	1
PTCA	2
Earlier cardiac intervention history	12
Pacemaker	2
Replacement of aortic valve	2
Grade II NYHA	30
Grade III NYHA	10

Table 2. Cardiac status of patients before surgery

Parameters	Number of patients
Valvular disease	3
Dilated cardiomyopathy	10
Bifascicular block	3
LVEF between 20-30%	13
LVEF between 30-40%	15
Abnormality of regional wall	13

Table 3. Results of laparoscopic cholecystectomy

Complications during surgery	Number of patients	Treatment
Complications during surgery	5	
Tachyarrhythmia	1	Amiodarone
Persistent hypertension	3	GTN
Bradycardia and hypotension	1	Intravenous pressor support and desufflation
Complications after surgery	4	
Mortality within 30 days	1	
Tachyarrhythmia	3	1 patient had defibrillator
Acute myocardial infarction	1	

Discussion

The current study was conducted to assess the safety of laparoscopic cholecystectomy in patients who are suffering from cardiac illnesses or had cardiac intervention earlier. This situation poses a risk to surgeons and high-risk patients because this kind of experience is not common and a part of routine clinical practices. Cardiovascular and hemodynamic changes for the positive pressure CO₂ pneumoperitoneum on a patient who has already been given anesthesia and lying in Trendelenberg reverse position are usually related and their contribution cannot be disentangled. For generalization, pneumoperitoneum presents a stress response in which heart rate, blood pressure, and vascular resistance are increased. This can increase the afterload and oxygen consumption which is not good for cardiac patients.¹¹ However, elevated pressure of the abdomen and the reverse Trendelenburg position reduces the preload, venous return, and cardiac output. Patients having heart disease are usually prone to developing atrial fibrillation which can easily be precipitated by carbon dioxide pneumoperitoneum.¹² Multiple studies have been conducted to assess the effects of carbon dioxide pneumoperitoneum on the cardiovascular system in healthy individuals who can tolerate pneumoperitoneum without any problem.¹³ Laparoscopic cholecystectomy has been successfully performed in individuals such as 10, and 14 patients having cardiac dysfunction. In order to avoid complications, the gasless technique (abdominal wall lifting) is employed as an alternative to laparoscopy. This is related to fewer changes in circulation and better cognitive function after surgery but increased surgical error risk.¹⁴ Different scoring systems such as NYHA functional classification, Canadian cardiac scoring system, and Goldman cardiac index are used to assess the cardiovascular risk during and after the surgery. Out of which NYHA is the grading system most commonly used.¹⁵ However, left ventricular ejection is not part of any scoring system and hence must be assessed separately. In this study, fasting for more than 4 hours was avoided and patients were operated on early in the morning. Intravenous fluid was administered after surgery till evening and oral intake was started 4-5 hours after surgery. For reducing stress on the heart, sevoflurane and isoflurane were given, which cause very little circulatory and cardiac changes. The effects or pressure on pneumoperitoneum can be partially offset by using low insufflation pressure, where low pressure is defined as 5-7 mmHg and normal pressure as 12-15 mmHg. Studies showed that patients having cardiac dysfunction exhibited less hemodynamic alterations with low insufflation pressure.¹⁶ The current study used 8 mmHg peritoneal pressure. Rapid insufflation along with carbon dioxide stretches the peritoneum and can precipitate arrhythmia, which is why 5 liters/min was used in this study.

Conclusion

The current study exhibited that laparoscopic cholecystectomy can be safely performed in patients having cardiac disorders but such patients require proper evaluation by anesthesiologists and cardiologists.

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Conflict of interest: None

Permission: Permission was obtained from the ethical review committee of the institute.

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