

Anaesthesia Concern in High-Risk Cases Under-Going Ambulatory Laparoscopic Cholecystectomy

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ABSTRACT:

Objective: To evaluate pre-operative implications, anesthetic management and post-operative anesthetic concerns in patients with co-morbid diseases undergoing ambulatory laparoscopic cholecystectomy under general anesthesia.

Study Design and setting: Retrospective study was conducted at Rawal Institute of Health Sciences, Islamabad from 8th Oct 2017 to 5th Nov 2018.

Methodology: Total one hundred and twelve patients were placed in American society of Anaesthesiologist (ASA) class II, III & IV (medically optimized) on pre-operative evaluation for ambulatory laparoscopic cholecystectomy. General anesthesia was administered with co-induction (nalbuphine 0.1mg/kg plus midazolam 0.01mg/kg) tracheal intubation facilitated by 0.15mg/kg cis-atracurium. Post-operatively on clinical status evaluation and Post Anesthesia Discharge score, patients were shifted to respective ward /intensive care. Statistical analysis was done by SPSS v.21.

Results: Pre-operatively medical and cardiologist evaluation was taken in 34(30.35%) and 42(37.5%) cases respectively whereas consultant anesthesiologist reviewed all cases. In study single case was converted to open method due to mirrzi syndrome and adhesions creating difficult laparoscopic dissection in 9(8.03%) of cases. Post-operatively in single case atrial fibrillation with fast ventricular response noted followed by sudden bradycardia, managed and sinus rhythm restored, whereas in other case of ischemic heart disease with viral respiratory infection, needed ventilatory support after 2 hours due to respiratory distress and weaned off after 24hrs. In the study 76(67.9%) cases were shifted post-operatively to surgical ward and 36 cases (32.1%) needed intensive care treatment.

Conclusion: Laparoscopic cholecystectomy in patients with co-morbid states requires balanced anesthetic technique considering consequences of pneumoperitoneum to decrease morbidity.

Keywords: Co-morbid, General anesthesia, Gallstones, Laparoscopy.

How to cite this Article:

Maqbool MS, Alam M, Draz MU, Shahid A, Ashfaq S. Anaesthesia Concern in High-Risk Cases Under-Going Ambulatory Laparoscopic Cholecystectomy. J Bahria Uni Med Dental Coll. 2021; 11(4):179-183. DOI: <https://doi.org/10.51985/JBUMDC2021045>

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INTRODUCTION:

Since Phillipe Mouret had described his initial experience with successful laparoscopic cholecystectomies,¹ the

procedure has gained vast popularity on various grounds. The major benefits include lesser post-operative pain, early mobilization, and a shorter hospital stay.² After the surgery, the physiological effects of CO₂ induced pneumoperitoneum are mainly due to mechanical effects of increased intra-peritoneal pressure as well as chemical effects of carbon dioxide itself, that may cause significant cardiovascular side effects due to patient positioning³ These can have marked impact in patients with compromised reserves.

The restriction of day case surgical procedures of American society of Anaesthesiologist⁴(ASA) class I and II do not uphold nowadays, as advanced medical treatment has resulted in patients with cardiac and non-cardiac illnesses for surgical procedures in geriatric age. Few years back physicians treated cases of acute cholecystitis with gallstones conservatively and surgery was performed later, but now surgeons operate acute cholecystitis with gallstones cases urgently. Also, invasive procedures such as total knee arthroplasty, advanced laparoscopic surgery which were considered inappropriate for are done on day-case basis these days.⁵ The national data from American College of Surgeons-National Surgical Quality Improvement Program

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Received: 16-Aug-2021
Accepted: 28-Sep-2021

reports incidence of morbidity and mortality within 72 hours of ambulatory surgery in adults to be less than 0.1%, whereas high body mass index and ASA⁵ physical status class, chronic obstructive pulmonary disease, prolonged surgery time, previous cardiac intervention, hypertension, and an advanced age (> 80 years) were identified as independent risk factors in ambulatory surgery.⁶

The co-morbid diseases defined as cerebrovascular disease, previous myocardial ischemia, renal disease, heart failure, diabetes mellitus, peripheral vascular disease, and obesity were all found to be independent risk factors for complications in cholecystectomy.⁷ In view of these considerations a study was planned at our hospital to analyze various clinical management steps in high-risk cases (multiple co-morbid states) undergoing day case laparoscopic cholecystectomy in a private teaching hospital setting. The pre-operative implications of study included patient optimization with review by concerned medical departments. Anesthetic management included smooth induction, maintenance of hemodynamic stability, safe recovery evaluated by fast track criteria⁸ inside operating room fifteen minutes after extubation, and post anesthesia discharge scoring system^{9,10} in post anesthesia care unit before shifting patient to either ward or intensive care unit.

This study was aimed to evaluate pre-operative implications, anesthetic management and post-operative anesthetic concerns in patients with co-morbid diseases undergoing ambulatory laparoscopic cholecystectomy under general anesthesia.

METHODOLOGY:

A retrospective analysis study was conducted at Rawal General and Dental Hospital in Rawal Institute of Health Sciences, Islamabad from 8th Oct 2017 up to 5th Nov 2018. The sampling technique was purposive. Head of Research Ethics Committee, Rawal Institute of Health Sciences, and Dean consented for study vide (letter No. RIHS-REC/001/54 of 21-06-2019). Analysis of 112 patients assessed and placed in respective American Society of Anesthesiologist⁴ physical status class I-II and medically optimized III was conducted who underwent elective laparoscopic cholecystectomy were included in the study. Inclusion criteria was gall stones, acute/chronic cholecystitis, medically optimized hypertension with systemic involvement like pulmonary hypertension, non-restrictive valvular heart disease like mitral / tricuspid regurgitation, controlled asthmatic and obstructive pulmonary diseases, cardiac diastolic dysfunction, controlled diabetes mellitus with organ involvement, like nephropathies. Exclusion criteria was patients with acute bleeding disorder, gastro-esophageal diseases (e.g., hiatal hernia) and ASA⁴ physical status class-IV and V patients. Patients were given tablet lorazepam 1mg and ranitidine 50mg at night. On arrival in operating room large bore intravenous cannula was placed under local

infiltration. General anesthesia was begun with co-induction^{10,11} by injection nalbuphine 10mg plus midazolam in dose of 0.01mg/kg. Inj. ondansetron 4 mg and dexamethasone 8mg was given as anesthetic adjunct in all cases. Electrocardiograph (lead II and V), pulse oximetry, end-tidal CO₂ and inhalational anesthesia agent percentage monitoring, non-invasive blood pressure monitors, volume and pressure sensors parameters were monitored. The balanced anesthesia technique^{12,13} (employing 2 or more agents that are considered safe rather than using large dose of single agent with adverse effects) started with co-induction (which results in improvement in induction, reducing maintenance need and facilitating recovery phase of anesthesia) was further continued by using according to baseline monitoring parameters and ASA⁵ physical disease status, employing sevoflurane 6-8% with oxygen and /or propofol 1mg/kg incremental titrated dose till patient lost control to verbal command. Injection lidocaine 1mg/kg was given to attenuate laryngoscopy hypertensive response. Endo-tracheal intubation was eased with 0.2mg/kg cisatracurium administration. Hemodynamic stability at intubation (heart rate, blood pressure, oxygen saturation) was particularly monitored and treated. Injection paracetamol 15mg/kg was given to all patients as non-narcotic analgesia. Maintenance of anesthesia was done in all cases with sevoflurane 1-2% with 50% oxygen in nitrous oxide. Patients were extubated and assessed by fast track criteria⁸ after 10 minutes before shifting to post-anesthesia care unit where clinical monitoring continued, all patients received 2L/minute supplemental oxygen via nasal cannula. Port sites were infiltrated with 0.5% lidocaine local anesthetic agent by surgeon at end of procedure. Patients were assessed by Post Anesthesia Discharge score⁹, prior shifting to respective ward /intensive care. All the data was entered on statistical analysis SPSS v.21.

RESULTS:

A total of 112 patients were enrolled in the study; all of them presenting with symptomatic gall stones. Eighty-three of them (74%) were females and 29 males (26%). As regard co-induction and securing airway is concerned in study, at intubation (loss of consciousness) was attained in 69.6 seconds (SD +31.32) and endotracheal intubation was completed in mean time of 4.42 minutes (SD +1.30). Smooth uneventful intubation was achieved in 106 patients (94.64%) and only 6 patients (5.4%) had minor unexpected movement noted at time of intubation. The mean extubation time from stopping anesthesia in study being 9.00 minutes (SD +6.123). In 45 cases (40.17%) lidocaine had to be administered at extubation also because of its membrane stabilizing effect. The mean recovery fast track score⁸ inside operating room being 11.37(SD +1.73). The post-anesthesia care unit assessment prior to shifting was done by post anesthesia discharge scoring⁹ (mean score being 8.70) with SD +.721. The ASA⁴ class II cases were 47 (42%), while class III were

Table-1: Demographic data.

| | Mean | Std Deviation + |
|--|---------|-----------------|
| Age(years) | 49.13 | 15.08 |
| Hematocrit (%) | 39.49 | 4.66 |
| Weight(kg) | 71.89 | 13.57 |
| Surgery time(minutes) | 54.25 | 33.61 |
| Discharge time from Post Anesthesia Care Unit(min) | 54.95 | 14.34. |
| Crystalloid fluid (ml) | 1103.57 | 261.29 |

65 (58%). To optimize the various co-morbid states, the peri-operative consultation included medical advice for 40 cases (35.71%) cases, and cardiologist consultation in 38 cases (33.92%) cases respectively whereas consultant anesthesiologist reviewed all cases. The mean systolic and diastolic blood pressure readings in study were 128.6 mmHg (+ 27.3) and 78.7 mmHg (+ 18.6) respectively; while mean heart rate was 86.3/minute (+ 17.7). In 48 cases (42.85%) intra-venous labetalol was used to control blood pressure and in 11 cases (9.82%) anticholinergics were administered during anesthesia. In study 76(67.9%) cases were shifted post-operatively to surgical ward and 36 cases (32.1%) to intensive care. In study within few hours after surgery analgesia was given in only 15 cases (13.4%) and in 97 cases (86.6%) no rescue analgesics was needed. Demographic data depicted in table-1. The co-morbid disease pattern depicted in table-2. The per-operative implication presented in table-3.

DISCUSSION:

In the study per-operatively in single case sudden atrial fibrillation with fast ventricular response was noted followed by sudden bradycardia, managed with beta-blocker, along with 100% oxygen, lowering of intra-abdominal pressure to 8cm/H₂O the sinus rhythm restored, whereas in other case with old ischemic heart disease and recent viral respiratory infection, being extubated successfully inside operating room was not maintaining saturation in intensive care after 2 hours and needed ventilatory support due to respiratory distress and weaned off after 24-hours. In Post-anesthesia care unit, low pulse oximeter readings were noted, managed by 60% venturi mask oxygen attachment with oxygen at 12L/minute, 45° head-up position done given oxygen saturation improved to 92% and in few minutes to 98%; intra-venous dexamethasone and hydrocortisone was given. In various studies, pre-operative morbidity risk factors included; body weight, high ASA class (III), acute attack of cholecystitis(leukocytosis), were morbidity risk factors delaying discharge, whereas male (gender), and operative factors (surgeon skill), vessels and bile ducts injury may lead to complicated surgery, while respiratory acidosis and systemic CO₂ systemic absorption, may show adverse effects in patient with co-morbid diseases while use of lower intra-

abdominal pressure is helpful^{14,15,16,17}. In this study insufflation pressure was kept at or below 8 cmH₂O.

A study entailing intra-venous (propofol) with volatile anesthetic (isoflurane employed) noted that in depth of anesthesia and recovery phase there was no significant difference statistically therefore they can be used as part of general anesthetic technique¹⁸.

Another study to foresee hemodynamic stability (suppress adverse response) particularly at intubation as well as at extubation stated that lidocaine (being the commonest agent) showed good analgesic effect in the immediate post-surgical period, among the other agents in study stable mean blood pressure values were noted with no statistical difference¹⁹.

In other studies, they patients with gall stones and acute cholecystitis attack the management was guided on basis of symptoms severity. ASA class, CCI index (Tokyo Guidelines severity risk scale grading) planned for laparoscopic cholecystectomy need to be done at a tertiary care set-up with support of functional intensive care after full peri-operative optimization and these patients cannot be discharged on same day of procedure^{20,21,22}. Early surgical laparoscopic cholecystectomy for acute cholecystitis cases even with medical diseases is the approach recommended in another study^{23,24}. Literature revealed, a balanced anesthesia (intra-venous induction and top-up drugs, volatile inhalational agent such as sevoflurane and optimal use of non-depolarizing neuro-muscular blockers) was used to achieve smooth anesthesia course and recovery profile, while suggesting use of local wound infiltration, non-narcotic agents etc. help in providing post surgery pain relief²⁵. The study had limitations as it was not multicentered, invasive monitoring was not available and morbidly obese population were not extrapolated.

CONCLUSION:

This study highlighted the advantages of anesthesiologist first as peri-operative physician and later employing balanced anesthetic management plan in high-risk cases for favorable outcome. On statistical evaluation, in study at 72 degree of freedom, Pearson Chi square test probability value falls between 0.975 and 0.20 and shows a significant chance that patients with co-morbid diseases will need further intensive care treatment post-operatively.

Authors Contribution:
Muhammad Salman Maqbool: Concept & design of study, drafting, revisiting critically, data analysis, final approval of version.
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Table-2: Peri-operative co-morbid diseases patterns. (n=112)

| Comorbid disease states causing Anesthetic concerns | Number |
|--|--------|
| Acute abdomen, Acalculous cholecystitis (sepsis), empyema, left ventricular dysfunction, Ejection Fraction (EF)35%, pulmonary hypertension, Tricuspid regurgitation (TR), Mitral regurgitation (MR). | 1 |
| Old Ischemic heart disease known case | 10 |
| Acute calculus cholecystitis | 53 |
| EF 60%, AS moderate, AR mild, Severe Tricuspid regurgitation (TR), PAP of 123mmHg, | 1 |
| Myocardial ischemia, EF60%, E/A ratio reversed, Hypertension | 2 |
| EF60%, Diastolic dysfunction Grade-1, Pulmonary HTN, Moderate TR | 1 |
| Fibrotic lung patch, Old Pulmonary tuberculosis | 1 |
| Asthma/Chronic Obstructive Pulmonary Disease/Viral upper respiratory tract infection | 6 |
| Hypertension, Diabetes Mellitus, grade-I diastolic dysfunction | 2 |
| Hypertension, mild Tricuspid regurgitation, Aortic valve sclerotic EF 60%, | 1 |
| Known case of thyrotoxicosis (Euthyroid on thyroid function test) | 5 |
| Pancreatitis, Pulmonary Hypertension, Ischemic Heart Disease, Sclerotic aortic valve, RVSP 98mmHg, grade-I diastolic dysfunction, Mild Tricuspid regurgitation | 1 |
| Pan-endoscopy report of gastritis & duodenitis | 1 |
| Fatty infiltration liver, hepatomegaly, splenomegaly, Biliary Acute pancreatitis with modified CTSI value of 6. | 3 |
| Uncontrolled diabetes mellitus, angina pectoris, stopped antiplatelet drugs perioperatively | 1 |
| Ischemic Heart Disease, grade-1 left ventricular dysfunction, moderate cardiac risk, grade-III fatty liver infiltration | 1 |
| Biliary Pancreatitis, Sclerotic Aortic degenerative valve,60%EF, Trivial AR, Mild Concentric LVH, Grade 1 Diastolic dysfunction, Hypertension | 1 |
| Obstructive jaundice, Chronic calculus cholecystitis | 2 |
| NYHA class-III | 1 |
| Empyema gall bladder, Chronic liver disease, Hypertension, Angina pectoris, Grade-1 diastolic dysfunction, calcified mitral leaflet, Diabetes Mellitus | 1 |
| Hypertension, Diabetes Mellitus, EF60%, Concentric LVH | 1 |
| Ischemic heart disease, Trace Tricuspid regurgitation (TR), Hypertension, Rt renal stones | 1 |
| LBBB, Septal paradoxical movement, Tricuspid regurgitation, Mild Pulmonary Hypertension | 1 |
| Mild AR, EF60%, Grade-1 diastolic dysfunction with PVC unifocal | 1 |
| Mucocele gall bladder with acute cholecystitis | 2 |
| Repeated biliary attacks, chronic calculus cholecystitis, moderate TR, MR with mild pulmonary hypertension | 4 |
| Rheumatic heart disease, Mild MR, RVSP of 55mmHg, angina pectoris, Hypertension, EF 55%. | 1 |
| Sclerotic Aortic valve, Concentric LVH, HTN, Grade-1 diastolic dysfunction. | 1 |
| Sclerotic aortic valve, grade-1 LVDD | 1 |
| coronary artery disease with acute cholecystitis | 1 |
| Trivial TR, EF60%, Concentric LVH, Grade1DD | 1 |
| Vitamin K therapy pre-operatively to correct coagulopathy | 1 |
| Hereditary Spherocytosis (clinical hematologist consulted) | 1 |

Table-3: Per-operative implications

| Implications | Number |
|---|--------|
| Adhesions creating difficult laparoscopic dissection | 09 |
| Mirrizi syndrome. (Converted to open cholecystectomy) | 02 |
| Cirrhotic liver finding during surgery | 01 |
| Premature Ventricular Contractions & Premature atrial contraction noted during anesthesia | 2 |
| Bigeminies noted at induction settled with intra-venous lidocaine | 2 |

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