Open Access

Original Article

Analysis of Perioperative Findings of Cholecystectomy in relation to American Society of Anesthesiologists (ASA) Status

Faheem, Umar Fayyaz Ghani*, Muhammad Yousaf Shah, Uzma Javed Gul, Rohan Qamar, Rashid Iqbal Khan

Department of Surgery, Combined Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan,
*Department of Surgery, Pak Emirates Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

Objective: To analyze the role of ASA status in carrying out laparoscopic cholecystectomies by evaluating the perioperative findings of patients.
Study Design: Cross-sectional study.
Place and Duration of Study: Combined Military Hospital, Rawalpindi Pakistan, from Jan 2019 to Jan 2021.
Methodology: Laparoscopic cholecystectomies were performed on 385 patients with symptomatic gallstones. The inclusion criteria comprised of symptomatic cholelithiasis, acute cholecystitis and chronic cholecystitis. Data for the perioperative findings such as gallbladder grades, bile, cystic duct, cystic artery and Common Bile Duct were recorded during the study.
Results: The study included 226(59%) female patients and 159(41%) males. The mean age was 48.15±15.5 years. There were 145(37.66%) patients in American Society of Anesthesiologists Classification ASA-I, 174(45.20%) patients in ASA-II and 66(17.14%) in ASA-III. Results showed that the abnormalities of cystic duct were 34(23.4%) in ASA-I, 68(39.1%) in ASA-II and 43(65.2%) in ASA-III. For CBD, they were 7(4.8%) in ASA-I, 49(28.2%) in ASA-II and 44(66.2%) in ASA-III. The complications of cystic artery and bile were 34(23.4%) in ASA-I, 60(34.5%) in ASA-II, 46(69.7%) in ASA-III and 82(56.6%) in ASA-I, 119(68.4%) in ASA-II, 50(75.8%) in ASA-III respectively. The gallbladder grades I were 27(18.6%) in ASA-I and (4.5%) in ASA-III whereas, grades V were 7(4.8%) in ASA-I and 20(30.3%) in ASA-III.
Conclusion: Peri-operative morbidity increased with increasing ASA status, therefore, there is a significant relationship between ASA Status and peri-operative findings.

Keywords: Anesthesia, Bile, Cystic Duct, Gallbladder, Laparoscopic Cholecystectomy.

How to Cite This Article: *Faheem, Ghani UF, Shah MY, Gul UJ, Qamar R, Khan RI. Analysis of Perioperative Findings of Cholecystectomy in relation to American Society of Anesthesiologists (ASA) Status. Pak Armed Forces Med J 2024; 74(3): 712-716. DOI: https://doi.org/10.51253/pafmj.v74i3.6952*

INTRODUCTION

Symptomatic gallstones are one of the most common diseases across the world. It has largely been treated through open surgery in the past but with the advancement in health facilities, new surgical techniques are introduced to ensure safety and minimal invasiveness[1]. Laparoscopic cholecystectomy (LC) is the most prevalent surgical technique for treating cholelithiasis. Its safety has been ensured for high-risk patients as well as patients with no comorbidities[2]. Over the years, the rate of conversion to open surgeries has been greatly minimized due to practice and frequent use of LC. However, the requirement to perform LC is linked to the anesthesiologist's fitness guide. It is essential to make risk stratification available to health care providers and patients through accurate preoperative risk assessment tool to understand the risk of peri-operative and post-operative morbidities which are separate from the surgical disease prognosis[3]. In addition, the tool must be accurate, objective and clinically valuable[4].

American Society of Anesthesiologists (ASA) classification is helpful in decisions related to perioperative and postoperative care of patients. Singh *et al*. studied the spectrum of postoperative admissions into the ICU of tertiary care hospital in which the planned allocation of beds was done by assessing the postoperative condition of patients. Most of the patients admitted into ICU were classified as ASA-III, i.e. 155/261 (59.4%) [5]. The ASA classification is a simple estimation technique for physiological status that can be applied to every patient without requiring any clinical resources[6]. Although, emergency General Surgery comprises of acutely ill patients with high rates of mortality and perioperative morbidity, few risk stratification tools have been studied in such settings[7]. However, more than two million cases have been demonstrated in a multi-institutional cohort study for an association between ASA physical status of patients and postoperative medical complications,

Correspondence: Dr Faheem, Department of Surgery, Combined Military Hospital, Rawalpindi Pakistan
Received: 23 Jun 2021, revision received: 23 Feb 2022; accepted: 25 Feb 2022

including mortalities, from the American College of Surgeon National Surgical Quality Improvement Program[8]. Madni *et al*. reviewed intraoperative GB grades using parkland grading system. They found that patients having severely inflamed gallbladders are high risk and have increased operating time[9]. The aim of this study is to assess the importance of ASA physical status of patients in relation to perioperative findings of laparoscopic cholecystectomy and perioperative morbidity.

METHODOLOGY

The cross-sectional study was conducted at Combined Military Hospital, Rawalpindi Pakistan, from January 2019 to January 2021 after the permission from the Ethical Institutional Review Board (IRB: 171/6/21), The sample size for the present study was estimated using WHO Calculator with standard prevalence of 50%.10 their final diagnoses, ultrasound reports and pre-anesthesia assessment.

Inclusion Criteria: Patients of either gender diagnosed with cholelithiasis, acute cholecystitis and chronic cholecystitis, selected for LC and classified according to the ASA stratification score were included.

Exclusion Criteria: Patients with choledocholithiasis, acute cholangitis, and gallbladder polyps were excluded.

The data for the study was collected through consecutive sampling technique. The consent of patients was taken using pre-operative proforma. Their safety and privacy were maintained and no violation of human rights had been observed. According to the American Society of Anesthesiologists' Relative Value Guide, there are 6 ASA physical status classes and if the surgery is emergent, then E letter is added to the respective class. ASA-I is a normal healthy patient, ASA-II is a patient with mild systemic disease, ASA-III is a patient with severe systemic disease, ASA-IV is a patient with severe systemic disease that is a constant danger to life, ASA-V is a run-down patient whose survival is not expected without the operation and ASA-VI is a patient who is declared brain-dead and his organs are being removed for donor purposes[11].

The patients included in ASA-I were 145(37.66%), in ASA-II were 174 (45.20%) and in ASA-III were 66 (17.14%). The emergency cholecystectomies were excluded and only elective cholecystectomies were included in the study. Per-operatively the CBD, bile, cystic artery and cystic duct were observed for morbidities in association with ASA status. It was done to assess the importance of ASA stratification score in carrying out elective laparoscopic cholecystectomy by examining the patients' gall bladder grades and perioperative complications using Parkland grading Scale[12].

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 26. The variables in this study included cystic duct, cystic artery, CBD and bile. They were taken as dichotomous categorical variables, "0" being "Not-normal" and "1" as "Normal". All the anomalies of per operative variables were gathered in the Not-normal category to see its relation with ASA status. Another, categorical variable gallbladder grade (GB grades) was also included to see its relation with ASA status. Chi-square test was applied to see if there was any association between the perioperative variables and ASA status. The p value of 0.05 or less was considered statistically significant.

RESULTS

Three hundred and eighty-five patients with chole-lithiasis were analyzed while performing laparoscopic cholecystectomy. The age of patients ranged from 11 years to 90 years. The mean age was 48.9±15.5 years. The study included 226(59%) female patients and 159(41%) males. Results showed that the normal category of cystic duct included 240(62.3%) patients. The patients with abnormal cystic duct were 145(37.6%) out of which 34(23.4%) were in ASA-I, 68(39.1%) in ASA-II and 43(65.2%) in ASA-III. The abnormalities of cystic duct consisted of impacted stones, thick, dilated and short cystic ducts. Patients with normal CBD were 285(74.02%) and not-normal CBD were 100(25.98%). The complications of bile duct included thick, dilated and massively dilated CBD. The total number of patients with normal cystic artery were 245(63.6%) and not-normal cystic artery were 140(36.3%). The complications of cystic artery included high and low cystic arteries. The not-normal category consisted of 2x cystic arteries with aberrant (Moynihan's), 1x arising from Moynihan's hump, 1x sclerosed and short with Moynihan's hump. The patients with these complications were 34(23.4%) in ASA-I, 60(34.5%) in ASA-II, 46(69.7%) in ASA-III. The normal category of bile had 134(34.8%) patients and not-normal category had 251(65.1%) patients out of which 82(56.6%) were in ASA-I, 119(68.4%) in ASA-II, 50(75.8%) in ASA-III. The anomalies included concentrated bile, concentrated bile with sludge, pus

and mucus. Gall bladder grades were observed throughout the sample. Patients having GB grade I with thin walls and no adhesions were 8. Majority of the patients had GB grade II with thin walls and adhesion. They were counted as 164(42.59%) out of which 77(53.1%) patients were placed in ASA-I, 76(43.7%) patients belonged to ASA-II and 11(16.7%) patients were in ASA-III. Patients having GB Grade III with thick walls were a total of 96(24.9%) out of which 26(17.9%) patients were placed in ASA-I, 56(32.2%) patients belonged to ASA-II and 41(21.2%) patients were in ASA-III. The total of 45(11.6 %) patients were found to have GB grade IV with thick contracted walls out of which 8(5.5%) patients were placed in ASA-I, 19 (10.9%) patients belonged to ASA-II and 18(27.3%) patients were in ASA-III. 48(12.46%) patients had GB grade V which was acute on chronic inflammation and 1 patient had chronic inflammation with gangrene out of which 7(4.8%) were in ASA-I, 21(12.2%) in ASA-II and 20(30.3%) in ASA-III. Results are shown in Table.

Table: Relationship of American Society of Anesthesiologists (ASA) Status and Per-operative variables (n=385)

Perioperative Variables	American Society of Anesthesiologists (ASA) Status			*p*-value
	I (n=145)	II (n=174)	III (n=66)	
Cystic duct, n(%)				
Not-Normal	34(23.4%)	68(39.1%)	43(65.2%)	0.001
Normal	111(76.6%)	106(60.9%)	23(34.8%)	
CBD, n(%)				
Not-Normal	7(4.8%)	49(28.2%)	44(66.7%)	0.001
Normal	138(95.2%)	125(71.8%)	22(33.3%)	
Cystic Artery, n(%)				
Not-Normal	34(23.4%)	60(34.5%)	46(69.7%)	0.001
Normal	111(76.6%)	114(65.5%)	20(30.3%)	
Bile, n(%)				
Not-Normal	82(56.6%)	119(68.4%)	50(75.8%)	0.012
Normal	63(43.40%)	55(31.6%)	16(24.2%)	
GB Grades				
I	27(18.6%)	2(1.1%)	3 (4.5%)	0.001
II	77(53.1%)	76(43.7%)	11(16.7%)	
III	26(17.9%)	56(32.2%)	14(21.2%)	
IV	8(5.5%)	19(10.9%)	18(27.3%)	
V	7(4.8%)	21(12.1%)	20(30.3%)	

The post-op stays of patients with status ASA-I ranged from 1 to 3 days, ASA-II ranged from 1 to 7 days including 1 patient with acute cholecystitis who stayed for 35 days. The stay of patients with ASA-III stretched from 1 to 7 days, with one patient aged above 76 years with chronic cholecystitis staying for 16 days.

DISCUSSION

Laparoscopic Cholecystectomy is preferred due to its advantages such as minimal invasiveness, minimization of hospital stay, less post-surgery pain and shorter procedure time[13]. However, pre-operative assessment is required, which includes final diagnoses of patients through USG and anesthesiologist examination. Also, their general health status by assigning them ASA (American Society of Anesthe-siology) stratification score[14]. In our study 385 patients were diagnosed with cholelithiasis and related complications in which 145(37.6%) were placed in ASA-I, 174(45.1%) in ASA-II, and 66(17.1%) patients in ASA-III.

According to the paper of De Cassai *et al*. which analyzed the relationship of ASA status assignment and anesthesiologists' experience, the inter-rater agreement varied greatly among the different cases answered by respondents of the study[15]. In the current study all the patients were assigned the ASA physical status by the same anesthesiologist to minimize the varying interpretations of different clinicians, also, it may help in finding alternate techniques for high-risk surgical patients. For instance, the study of Pham *et al*, suggested that increased risk patients with acute cholecystitis and high ASA Score should get per-cutaneous cholecystostomy as an effective bridging procedure before cholecystectomy[16]. In the paper by Kuan *et al*. twenty-four critically ill patients with a median age of 79 years presented with acute cholecystitis, classified as ASA III and ASA IV were treated with per-cutaneous cholecystostomy in which 14 patients improved clinically within 24 hours and the rest within 72 hours[17].

According to Baral *et al*. the peri-operative GB grading as per Parkland Grading Scale enables the prediction of possible outcome of surgery and early conversion possibility while doing LC procedure[18]. In our study, most of the patients as shown in table 1 had grade II GB with thin walls and adhesions. This result suggested that most of the total patients with GB grade II belonged to ASA-1. The CBD, cystic artery and cystic duct were normal in most of the patients in the entire ASA score. Whereas bile was normal in 133 patients and not normal in 240 patients.

Our study showed that there was a significant relationship between perioperative variables and ASA Status. This is in concurrence with a study by Catherine et al. about the predictive ability of ASA. It was found that ASA physical status is a great

predictor of postoperative complications, length of stay and ventilator days. It is also a good predictor of mortality in patients undergoing surgery[19].

Patients with higher ASA status tend to have worsened gall bladder grades. Consequently, advanced treatment techniques have been introduced like percutaneous cholecystostomy besides LC for patients with higher ASA physical status and severe GB grades which is suggested by Tokyo Guideline flowchart to effectively cure acute cholecystitis[20].

LIMITATIONS OF STUDY

The main limitation of our study was that the subjective nature of ASA classification of patients may have effects on the precision of results. Furthermore, the study took place at only one hospital. The results would have been more accurate if the sample size was increased and was done in multiple hospitals to reduce the possible bias in study. It is recommended that early Laparoscopic cholecystectomy would act as an effective treatment of choice for patients with cholecystitis to ensure quick recovery.

CONCLUSION

There is sufficient evidence that ASA status is related to gall bladder grades and hence to the perioperative findings. Peri-operative morbidity increases with increasing ASA status.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

FS: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

UFG & MYS: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

UJG, RQ & RIK: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Waleed MS, Khawaja UA, Akhtar M, Sadiq W. Laparoscopic Cholecystectomy: An Early Experience at A Tertiary Care Hospital in Islamabad. Comm Med Pub Health Rep 2020; 1(4). https://doi.org/10.38207/jmcrcs20201053
2. Hela AH, Khandwaw HM, Kumar R, Samad MA. Experience of Laparoscopic Cholecystectomies in a Tertiary Care Hospital: a Retrospective Study. Galician Med J 2020; 27(4): E202043. https://doi.org/10.21802/gmj.2020.4.3
3. Lucocq J, Scollay J, Patil P. Defining Prolonged Length of Stay (PLOS) Following Elective Laparoscopic Cholecystectomy and Derivation of a Preoperative Risk Score to Inform Resource Utilization, Risk Stratification, and Patient Consent. Ann Surg 2023; 277(5): e1051-e1055. https://doi.org/10.1093/bjs/znab430.057
4. Kannaujia AK, Gupta A, Verma S, Srivastava U, Haldar R, Jasuja S. Importance of Routine Laboratory Investigations Before Elective Surgery. Discoveries 2020; 8(3): e114. https://doi.org/10.15190/d.2020.11
5. Singh V, Datta R, Sasidharan S, Tomar L. Spectrum of Postoperative Admissions in the Intensive Care Unit of a Tertiary Care Hospital: An Indian Update. Saudi Crit Care J 2020; 4(3): 96-102. https://doi.org/10.4103/sccj.sccj_24_20
6. Cevik B, Yuce Y. Risk Assessment in Surgical Patients: American Society of Anesthesiologist's (ASA) Classification vs Intraoperative Therapeutic and Diagnostic Interventions (I-ITS. Am J Clin Med Res 2018; 6(1): 15-19. https://doi.org/10.12691/ajcmr-6-1-4
7. Havens JM, Columbus AB, Seshadri AJ, Brown CVR. Risk stratification tools in emergency general surgery. Trauma Surg Acute Care Open 2018; 3(1): e000160. https://doi.org/10.1136/tsaco-2017-000160
8. Gen Li, Jeremy P. Walco, Dorothee A. Mueller, Jonathan P Wanderer, Robert E. Freundlich. Reliability of the ASA Physical Status Classification System in Predicting Surgical Morbidity: a Retrospective Analysis. J Med Syst Vol 2021; 45(9): 83. https://doi.org/10.1007/s10916-021-01758-z
9. Madni TD, Leshikar DE, Minshall CT, Nakonezny PA, Cornelius CC, Imran JB, et al. The Parkland grading scale for cholecystitis. Am J Surg 2018; 215(4): 625-630. https://doi.org/10.1016/j.amjsurg.2017.05.017
10. Kamangar F, Islami F. Sample Size Calculation for Epidemiologic Studies: Principles and Methods. Arch Iran Med 2013; 5(16). https://doi.org/10.1177/096228029500400404
11. Lupei MI, Chipman JG, Beilman GJ, Oancea SC, Konia MR. The Association Between ASA Status and Other Risk Stratification Models on Postoperative Intensive Care Unit Outcomes. Anesth Analg 2014; 5(118): 989–994. https://doi.org/10.1213/ane.0000000000000187
12. Abdul-Razack GS, Avinash K, Manjunath BD, Harindranath HR, Archana CS. Pre-operative evaluation with parkland grading system in assessing difficult laparoscopic cholecystectomy and expectant operative and post-operative complications. Int J Surg Sci 2019; 3(3): 20–25. https://doi.org/10.33545/surgery.2019.v3.i3a.141
13. Shea-Jesse JA, Berlin-Dale A, Bachwich R, Staroscik RN, Malet PF. Indications for and Outcomes of Cholecystectomy. Ann Surg 1998; 3(227): 343–350. https://doi.org/10.1097/00000658-199803000-00005
14. Lunn JN. The National Confidential Enquiry into Perioperative Deaths. J Clin Monit Comput 1994; 6(10): 426–428. https://doi.org/10.1007/bf01618430
15. De Cassai A, Boscolo A, Tonetti T, Ban I, Ori C. Assignment of ASA-physical status relates to anesthesiologists' experience: a survey-based national-study. Korean J Anesthesiol 2019; 72(1): 53-59. https://doi.org/10.4097/kja.d.18.00224
16. Rerknimitr R, Pham KC. Practical Approaches for High-Risk Surgical Patients with Acute Cholecystitis: The Percutaneous Approach versus Endoscopic Alternatives. Clin Endosc 2020; 53(6): 678-685.https://doi.org/10.5946/ce.2019.186
17. Kuan LL, Oyebola T, Mavilakandy A, Dennison AR. Retrospective Analysis of Outcomes Following Percutaneous

Cholecystostomy for Acute Cholecystitis. World J Surg 2020; 1(44). https://doi.org/10.1007/s00268-020-05491-5

18. Baral S, Chhetri RK, Thapa N. Utilization of an Intraoperative Grading Scale in Laparoscopic Cholecystectomy: A Nepalese Perspective. Gastroenterol Res Pract. 2020; 2020: 8954572. https://doi.org/10.1155/2020/8954572
19. Catherine-Kuza CM, Matsushima K, Mack WJ, Pham C, Hourany T, Lee J et al. The role of the American Society of anesthesiologists physical status classification in predicting trauma mortality and outcomes. Am J Surg 2019; 218(6): 1143-1151. https://doi.org/10.1016/j.amjsurg.2019.09.019.
20. Okamoto K, Suzuki K,Takada T, Steven M. Strasberg,Horacio J. Asbun,Itaru Endo. Tokyo Guidelines 2018: flowchart for the management of acute cholecystitis. J Hepato-Biliary-Pancreat Sci 2017; 26(11): 534–534. https://doi.org/10.1002/jhbp.526