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CONVERSION OF LAPAROSCOPIC CHOLECYSTECTOMY TO OPEN CHOLECYSTECTOMY IN ASSOCIATION WITH OLD AGE, MALE GENDER AND OBESITY

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ABSTRACT

INTRODUCTION: Laparoscopic cholecystectomy is regarded as the "gold standard" surgical intervention for the management of cholelithiasis. Yet, sometimes it is impossible to proceed with laparoscopic surgery and the procedure needs to be converted to conventional open technique to avoid complications or to treat complications. Few recent studies claimed that old age, male gender and obesity were associated with increased frequency of conversion and advocated their potential role in the risk stratification and pre-operative planning in future surgical practice.

OBJECTIVES: The objectives of this study were to determine association of old age, male gender and obesity with conversion of laparoscopic cholecystectomy to open cholecystectomy

MATERIAL AND METHODS

It was a prospective cohort study. It was conducted at Department of Surgery, Ghurki Trust Teaching Hospital affiliated with Lahore Medical and Dental College, Lahore. Patient data was collected from 01/07/2019 to 30/06/2020.

This study involved 139 patients of both genders aged between 18-70 years All patients underwent conventional 4 port laparoscopic cholecystectomy. The outcome variable was frequency of conversion of laparoscopic procedure to open cholecystectomy (due to obscured anatomy/uncontrolled bleeding/visceral injury) which was noted and compared across old age (≥60 years), male gender and obesity.

RESULTS: The mean age of the patients was 41.8±16.1 years. There were 38 (27.3%) male and 101 (72.7%) female patients with a male to female ratio of 1:2.7. 26 (18.7%) patients were obese and 31 (22.3%) patients were aged ≥60 years. Conversion to open cholecystectomy was required in 10 (7.2%) patients undergoing laparoscopic cholecystectomy. The frequency of conversion of laparoscopic cholecystectomy to open procedure was significantly higher in patients with age ≥60 years (16.1% vs. 4.6%; p-value=0.029), male gender (15.8% vs. 4.0%; p-value=0.016) and obesity (19.2% vs. 4.4%; p-value=0.008). Similar difference in the frequency of conversion to open cholecystectomy

with old age (≥60 years), male gender and obesity was noted across various subgroups of patients based on duration of disease and ASA status.
CONCLUSION: In the present study, the frequency of conversion of laparoscopic cholecystectomy to open cholecystectomy was found to be significantly higher in patients with old age, male gender and obesity which advocates consideration of such patients at higher risk of conversion so that anticipated pre-operative preparation for open cholecystectomy and relevant informed consent may decrease the morbidity of unplanned open surgery as well as reduce the associated patient anxiety and dissatisfaction in this scenario in future surgical practice.

KEY WORDS: Laparoscopic Cholecystectomy, Conversion to Open Cholecystectomy, Old Age, Male Gender, Obesity

INTRODUCTION

Gallstones represent a highly prevalent condition affecting approximately 10% to 20% of the adult population. The recommended treatment for symptomatic gallstone disease is cholecystectomy. Until the introduction of laparoscopic cholecystectomy in the late 1980s, open cholecystectomy was the standard surgical approach for individuals suffering from symptomatic gallstone disease. The early outcomes associated with laparoscopic cholecystectomy were markedly favorable, demonstrating reductions in pain, healthcare costs, and length of hospital stay, which facilitated its rapid global adoption. However, concerns soon emerged regarding a potential increase in the incidence of common bile duct (CBD) injuries associated with this novel laparoscopic technique. In response to this recognition, concerted efforts in education, awareness, and surgical training have been implemented, resulting in a decreased incidence of such injuries. Consequently, laparoscopic cholecystectomy has established itself as the gold standard for the treatment of symptomatic gallstone disease. (1,3).

The inaugural laparoscopic cholecystectomy (LC) was performed in 1985 and then recognized as the gold standard for the treatment of gallstone disease within decade . The advantages of the laparoscopic approach for patients include much reduced surgical trauma, less postoperative pain, a shorter hospitalization, and accelerated recovery times (1). However, the advantages associated with laparoscopic cholecystectomy may rapidly diappear when a case necessitates conversion to open surgery. Despite advancements in surgical technology and enhancements in surgical proficiency with the laparoscopic technique, conversion rates of up to 10% continue to be reported (2-4). The conversion can be planned when it is anticipated before staring the laparoscopy or can be forced when conversion is required due to issues arising during the surgery (2). Compared to planned conversion, this forced unplanned conversion is associated with poor case outcome in terms of operative times, postoperative outcome, and cost (2-6). Therefore, measures which can help in the anticipation of a difficult laparoscopy and subsequent pre-operative planning for an open procedure are tempting and focus of current research.

Awan et al. reported significantly higher frequency of conversion in old age; ≥60 years (10.3% vs. 4.7%; p-value=0.042), male gender (15.1% vs 3.4%; p value of <0.001) and obese patients (10.6% vs. 4.3%; p value 0.017) in Indian population (5). Similar results have been published in another Indian study by Thyagarajan et al. who too observed significantly higher frequency of conversion in old age (15.55% vs. 5.45%; p-value=0.005), male gender (17.67% vs. 5.64%; p value=0.048) and obese patients (47.83% vs. 9.13%; p-value=0.008) (3).

In pursuance of this evidence, simple demographic features of patients like old age (≥60 years), male gender and obesity (BMI≥30 Kg/m^2) can be utilized as to identify patients at risk of conversion to open cholecystectomy and anticipated pre-operative preparation and management can thus reduce the hazards of unplanned open procedure. However, the existing evidence is not conclusive. Maitra et al. in their study didn't observe any statistically significant difference in the frequency of conversion

across old age (9.5% vs. 7.1%; p-value>0.05), male gender (9.2% vs. 6.3%; p-value>0.05) and obesity (8.2% vs. 6.7%; p-value>0.05) in Bangladeshi population (6). Al Ghadhban et al also reported an insignificant difference in the freq. of conversion across old age (5.0% vs. 6.1%; p-value=0.842) and male gender (4.4% vs. 6.5%; p-value=0.618) in Indian population (7). Owing to this controversy in the existing literature and lack of local such published material, the purpose of the current study is to further confirm this association. If such an association is found, the results of the present study will provide simple and cost-effective way of risk stratification for the patients undergoing laparoscopic cholecystectomy which with appropriate pre-operative planning will reduce the hazards of unplanned open procedure.

OBJECTIVE: The objective was to determine association of old age, male gender and obesity with conversion of laparoscopic cholecystectomy to open cholecystectomy

OPERATIONAL DEFIINITION

1. **Laparoscopic Cholecystectomy:** It was performed in patients presenting with pain (VAS score ≥3, Appendix-I) right hypochondrium ≥6 weeks along with the ultrasound evidence of cholelithiasis (echogenic shadows in the gallbladder) under general anesthesia in reverse Trendelenburg position and with conventional 4 ports (minimal 5cm apart).
2. **Conversion to Open Cholecystectomy:** It was decided by operating consultant surgeon upon one or more of following clinical findings during surgery

a. Obscured anatomy at Calot's triangle
b. Uncontrolled bleeding (≥250 ml blood in the suction jar emptied at the start of procedure)
c. Visceral injury (perforation of duodenum and colon evident on laparoscopic examination)

3. **Attributing Factors:**

a. **Old Age:** Age ≥ 60 years was considered as an attributing factor for conversion.
b. **Male Gender:** was considered as an attributing factor for conversion.
c. **Obesity:** BMI ≥30 Kg/m^2 was considered as an attributing factor for conversion.

MATERIALS AND METHODS

A prospective cohort study was conducted at Surgical Department of Ghurki Trust Teaching Hospital affiliated with Lahore Medical &Dental College Lahore. In this study 139 patients' data was collected from 01/07/2019 to 30/06/2020.

Sample size was calculated keeping confidence level 95% and margin of error 5% while taking expected frequency of conversion to open cholecystectomy to be 10.0% in patients undergoing laparoscopic cholecystectomy (3). Patient Selection done by Non-Probability Consecutive Sampling. All patients enrolled were meeting following criteria

Inclusion Criteria

1. Patients of both genders aged between 18-70 years admitted for elective laparoscopic cholecystectomy (as per operational definition)
2. Written informed consent by the patient.

Exclusion Criteria

1. Previous abdominal surgery (as per clinical record)
2. Surgical jaundice (T. Bilirubin level of more than 3.5 mg/dl)
3. Ultrasound-proven choledocholithiasis (echoes in the common bile duct)
4. Acute gallstone-induced pancreatitis (serum amylase three times above normal)
5. Those with significant comorbid conditions falling under ASA class ≥III (Appendix-II).

DATA COLLECTION PROCEDURE

A prior approval was acquired from ERB of Lahore Medical and Dental college for the study. 139 adult patients included who were admitted for laparoscopic cholecystectomy on elective lists at Ghurki Trust Teaching Hospital, Lahore. All patient enrolled were meeting the inclusion criteria. A written informed consent was taken from each patient.

Patients BMI was measured and obesity was labeled if it was ≥30 Kg/m^2 as per operational definition. Patient's age and gender was also noted and recorded into the attached proforma. All these patients underwent laparoscopic cholecystectomy after an overnight fast under general anaesthesia in reverse Trendelenburg position and with conventional 4 ports (minimal 5cm apart). Need for conversion to open cholecystectomy (as per operational definition) was noted and recorded into the attached proforma. All the laparoscopic surgeries were performed by a single consultant laparoscopic surgeon (15 years of experience) to eliminate bias. Confounding variables were controlled by exclusion.

DATA ANALYSIS PROCEDURE

The collected data was analyzed using SPSS version 23.0.

1. The Numerical variables like age and duration of disease have been presented by mean ±SD.
2. The Catagorical variables i-e gender, ASA-Class (I/II), conversion to open cholecystectomy and attributing factors (old age, male gender and obesity) have been drafted by frequency and percentage.
3. The Frequency of procedure conversion has been compared across old age (<60 years vs. ≥60 years), male gender (male vs. female) and obesity (in terms as BMI <30 Kg/m^2 vs. ≥30 Kg/m^2)
4. Data has been stratified for duration of disease and ASA-Class (I/II) to address effect modifiers.
5. The chi-square test has been applied (p-value of ≤0.05 as significant).

RESULTS

In our patients in this study age rang was seen as 18 to 70 years with a mean of 41.8±16.1 years. 31 (22.3%) patients were aged 60 years and above. There were 38 (27.3%) male patients & 101 (72.7%) female patients with a male to female ratio of 1:2.7. 26 (18.7%) patients were obese. The duration of symptomatic disease ranged from 6 weeks to 17 weeks with a mean of 11.9±3.5 weeks. Majority (n=83, 59.7%) of the patients belonged to ASA Class II followed by 56 (40.3%) patients in ASA Class I as shown in Table 1.

Conversion to open cholecystectomy was required in 10 (7.2%) patients undergoing laparoscopic cholecystectomy as shown in Table 2.

There is no statistically significant difference in the frequency of conversion to open procedure across various subgroups based on duration of symptomatic disease (p- value = 0.761) and ASA grades status (p-value = 0.985) as shown in Table 3.

The frequency of conversion of laparoscopic cholecystectomy to open procedure was significantly higher in patients with age ≥60 years (16.1% vs. 4.6%; p-value=0.029), male gender (15.8% vs. 4.0%; p-value=0.016) and obesity (19.2% vs. 4.4%; p-value=0.008) as shown in Tables 4 – 6 respectively. Similar difference in the frequency of conversion to open cholecystectomy with old age (≥60 years), male gender and obesity was noted across various subgroups of patients based on duration of disease and ASA status as shown in Tables7 – 9 respectively.

Table 1 Study Sample Characteristics

Characteristics	Participants n=139
Age (years)	41.8±16.1
• **<60 years**	108 (77.7%)
• **≥60 years**	31 (22.3%)
Gender	
• **Male**	38 (27.3%)
• **Female**	101 (72.7%)
Obesity	
• **Yes**	26 (18.7%)
• **No**	113 (81.3%)
Duration of Disease (weeks)	11.9±3.5
• **6-11 weeks**	62 (44.6%)
• **12-17 weeks**	77 (55.4%)
ASA Status	
• **Class-I**	56 (40.3%)
• **Class-II**	83 (59.7%)

Table 1 Frequency of Conversion to Open Cholecystectomy*n=139*

Conversion	Frequency (n)	Percent (%)
Yes	10	7.2
No	129	92.8
Total	139	100.0

Table.2 Stratification of Conversion to Open Cholecystectomy based on Duration of Disease and ASA Status

Subgroups	n	Conversion n (%)	P-value
Duration of Disease			
• **6-11 weeks**	62	4 (6.5%)	0.761
• **12-17 weeks**	77	6 (7.8%)	
ASA Status			
• **Class-I**	56	4 (7.1%)	0.985
• **Class-II**	83	6 (7.2%)	

Chi-square Test is statistically insignificant

Table 3 Comparison of Conversion to Open with Respect to Old Age *n=139*

Age	Conversion to Open Cholecystectomy		Total	P-value
	Yes (n=10)	No (n=129)		
<60 years (n=108)	5 (4.6%)	103 (95.4%)	108 (100.0%)	0.029*
≥60 years (n=31)	5 (16.1%)	26 (83.9%)	31 (100.0%)	

Chi-square test, statistically significant

Table 4 Comparison of Conversion to Open Cholecystectomy with Respect to Male Gender n=139

Gender	Conversion to Open Cholecystectomy		Total	P-value
	Yes (n=10)	No (n=129)		
Male (n=38)	6 (15.8%)	32 (84.2%)	38 (100.0%)	0.016*
Female (n=101)	4 (4.0%)	97 (96.0%)	101 (100.0%)	

Chi-square test, statistically significant

Table 5 Comparison of Conversion to Open Cholecystectomy with Respect to Obesity ***n=139***

Obese	Conversion to Open Cholecystectomy		Total	P-value
	Yes (n=10)	No (n=129)		
Yes (n=26)	5 (19.2%)	21 (80.8%)	26 (100.0%)	0.008*
No (n=113)	5 (4.4%)	108 (95.6%)	113 (100.0%)	

Chi-square test, statistically significant

Table 7 Stratification of Laparoscopic procedure Conversion to Open Cholecystectomy in subgroups of Duration of Disease & ASA statuswith Respect to Old Age

n=139

	Subgroups	Age	Conversion to Open Cholecystectomy		Total	P-value
			Yes (n=10)	No (n=129)		
Duration of Disease	6-11 weeks (n=62)	<60 years (n=49)	2 (4.1%)	47 (95.9%)	49 (100.0%)	0.140
		≥60 years (n=13)	2 (15.4%)	11 (84.6%)	13 (100.0%)	
	12-17 weeks (n=77)	<60 years (n=59)	3 (5.1%)	56 (94.9%)	59 (100.0%)	0.109
		≥60 years (n=18)	3 (16.7%)	15 (83.3%)	18 (100.0%)	
ASA Status	ASA-I (n=56)	<60 years (n=43)	2 (4.7%)	41 (95.3%)	43 (100.0%)	0.188
		≥60 years (n=13)	2 (15.4%)	11 (84.6%)	13 (100.0%)	
	ASA-II (n=83)	<60 years	3 (4.6%)	62 (95.4%)	65 (100.0%)	0.081

		(n=65)				
		≥60 years (n=18)	3 (16.7%)	15 (83.3%)	18 (100.0%)	

Chi-square test, statistically insignificant

Table 6 Stratification of Conversion to Open Cholecystectomy in subgroups of Duration of Disease & ASA status with Respect to Male Gender *n=139*

	Subgroups	**Gender**	**Conversion to Open Cholecystectomy**		**Total**	**P-value**
			Yes (n=10)	**No (n=129)**		
Duration of Disease	**6-11 weeks (n=62)**	**Male (n=19)**	3 (15.8%)	16 (84.2%)	19 (100.0%)	0.047*
		Female (n=43)	1 (2.3%)	42 (97.7%)	43 (100.0%)	
	12-17 weeks (n=77)	**Male (n=19)**	3 (15.8%)	16 (84.2%)	19 (100.0%)	0.134
		Female (n=58)	3 (5.2%)	55 (94.8%)	58 (100.0%)	
ASA Status	**ASA-I (n=56)**	**Male (n=16)**	2 (12.5%)	14 (87.5%)	16 (100.0%)	0.325
		Female (n=40)	2 (5.0%)	38 (95.0%)	40 (100.0%)	
	ASA-II (n=83)	**Male (n=22)**	4 (18.2%)	18 (81.8%)	22 (100.0%)	0.021*
		Female (n=61)	2 (3.3%)	59 (96.7%)	61 (100.0%)	

Chi-square test, statistically significant

Table 7 Stratification of Conversion to Open Cholecystectomy in subgroups of Duration of Disease & ASA status with Respect to Obesity *n*=139

	Subgroups	**Obesity**	**Conversion to Open Cholecystectomy**		**Total**	**P-value**
			Yes (n=10)	**No (n=129)**		
Duration of Disease	**6-11 weeks (n=62)**	**Yes (n=12)**	2 (16.7%)	10 (83.3%)	12 (100.0%)	0.109
		No (n=50)	2 (4.0%)	48 (96.0%)	50 (100.0%)	
	12-17 weeks (n=77)	**Yes (n=14)**	3 (21.4%)	11 (78.6%)	14 (100.0%)	0.035*
		No (n=63)	3 (4.8%)	60 (95.2%)	63 (100.0%)	
ASA Status	**ASA-I (n=56)**	**Yes (n=11)**	2 (18.2%)	9 (81.8%)	11 (100.0%)	0.113
		No (n=45)	2 (4.4%)	43 (95.6%)	45 (100.0%)	

	ASA-II (n=83)	**Yes (n=15)**	3 (20.0%)	12 (80.0%)	15 (100.0%)	0.035*
		No (n=68)	3 (4.4%)	65 (95.6%)	68 (100.0%)	

Chi-square test, statistically significant

DISCUSSION

The mean age of the patients undergoing laparoscopic cholecystectomy was 41.8±16.1 years in the present study. Similar mean age of 41.2 ± 10.4 years has been reported by Jamil et al. (8) among patients with acute cholecystitis undergoing lap. cholecystectomy at Bahawal Victoria Hospital Bahawalpur. Chhajed et al. (9) and Arafa et al. (10) reported similar mean age in their studies as of 41.8±11.6 years 41.1±6.9 years respectively in different population groups. Jee et al. (11) reported mean age of 42.5 ±11.6 years among patients of acute cholecystitis undergoing laparoscopic cholecystectomy in Malaysia. In our observed results, there were 38 (27.3%) male and 101 (72.7%) female patients with a M:F ratio of 1:2.7. Damani et al. reported similar female predominance with male to female ratio of 1:2.8 at Jinnah Postgraduate Medical Centre Karachi (12) while Afzal et al. reported it to be 1:2.4 among patients undergoing laparoscopic cholecystectomy at CMH Peshawar (13). Similar female predominance (M:F; 1:2.6) has been reported by Al-Qahtani et al. among Saudi such patients (14) and Ozkardes et al. (15) among Turkish patients undergoing laparoscopic cholecystectomy with male to female ratio of 1:2.1(15). Macafee et al. (1:1.9) in UK and Khan et al. in (1:1.9) in Pakistan also reported female predominance among patients undergoing laparoscopic cholecystectomy (16,17).

In the present study, 18.7% patients undergoing laparoscopic cholecystectomy were obese. Our observation is in line with that of Ghazanfar et al. who reported that 17.0% of patients undergoing cholecystectomy at Holy Family Hospital, Rawalpindi were obese (18). Maitra et al. reported a comparable frequency of 19.8% in Bangladeshi such patients (19).

We observed that conversion to open cholecystectomy was required in 7.2% patients undergoing laparoscopic cholecystectomy. Our observation is in line with another local study Rashid et al. reported the frequency of conversion to be 7.0% in patients undergoing laparoscopic cholecystectomy at Social Security Teaching Hospital Islamabad (20). Farooq et al. in another local study reported the frequency of conversion to be 7.3% among patients undergoing laparoscopic cholecystectomy (21). Comparable frequency of 9.8% has been reported by Zaidi et a among patients undergoing laparoscopic cholecystectomy at PNS Shifa Karachi (22). A much lower frequency of conversion has been reported by Afzal et al. (1.3%) in Pakistan (13) and Radu et al. (3.3%) in Romania (23) while a much higher frequency of 20.0% has been reported by Gill et al. in India (24). A possible explanation for this conflict among studies can be the population differences associated with risk factors for conversion as well as variation in the quality of available hardware and surgeon's laparoscopic skills.

We observed that the frequency of conversion of laparoscopic cholecystectomy to open procedure was significantly higher in patients with age ≥60 years (16.1% vs. 4.6%; p-value=0.029), male gender (15.8% vs. 4.0%; p-value=0.016) and obesity (19.2% vs. 4.4%; p-value=0.008). Our findings are is in line with that of Awan et al. (5) who also reported that the frequency of conversion was significantly higher in old age; ≥60 years (10.3% vs. 4.7%; p-value=0.042), male gender (15.1percent versus 3.4 percemt; p-value<0.001) and obese patients (10.6% vs. 4.3%; p-value=0.017) in Indian population. Similar results have been published in another Indian study by Thyagarajan et al. (3) reported significantly higher freq. of conversion in older age (15.55% vs. 5.45%; p-value=0.005), male gender (17.67% vs. 5.64%; p-value=0.048) and obese patients (47.83% vs. 9.13%; p-value=0.008).
The strengths of the present study is large sample (n=139) with strict exclusion criteria. In the present study, the frequency of conversion of laparoscopic cholecystectomy to open procedure has beem

found to be significantly higher in patients with old age, male gender and obesity. In the light of this evidence it can be advocated that elderly and obese male patients shall be considered at elevated risk of conversion, Appropriate pre-operative preparation in anticipation for open cholecystectomy may decrease the morbidity of an unplanned open surgery. A pre-operative consent in this regard will also decrease the associated patient anxiety and dissatisfaction in this very scenario in future surgical practice.

CONCLUSION:

In our study, the frequency of conversion of laparoscopic cholecystectomy to open cholecystectomy is significantly higher in patients with old age, male gender and obesity which advocates consideration of such patients at higher risk of conversion for pre-operative preparation for open cholecystectomy and relevant informed consent. This would decrease the morbidity of unplanned open surgery as well as reduce patient anxiety and dissatisfaction in this scenario in future surgical practice.

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