Original Research Article

To determine the frequency of various sources of bleeding in laparoscopic cholecystectomy with special preference to gallbladder bed excluding port site.

Comment [DCC1]: Sugestion to a new title: Laparoscopic cholecystectomy treatment for gall stone disease. Bleeding origins and frequency in a Medical College Hospital

ABSTRACT

Objective: Laparoscopic cholecystectomy (LC) has recognized itself as the 'gold standard' treatment of gallstone disease, but it can, sometimes, be related with considerable complication leads to mortality and morbidity. Therefore, this study was intended to assess the frequency of many sources of bleeding in patients underwent laparoscopic cholecystectomy.

Methodology: This was a cross sectional study conducted in the Department of Surgery, Bhitai Dental and Medical College Hospital by using consecutive sampling technique. The duration of study was about one year from Feb 2021 to Dec 2021. A total of 163 patients of age between 30 to 55 years of both genders of diagnosed cholecystitis with cholelithiasis, disease duration of >6 weeks identified by patient's history were included in the study. To assess the effect modification, age, gender, duration of disease, and amount of bleeding and operative time were stratified followed by application of chi-square with a p value $\leq$ 0.05 considered as significant.

Results: The study results showed that out of 163 cases of laparoscopic cholecystectomy, 141(87%) were females and 22(13%) were males with their mean age were 38.99±10.96 years. Bleeding in laparoscopic cholecystectomy from gallbladder bed was reported in 128(79%) cases followed by cystic artery in 28(17%) cases. There were78(80.4%) cases reported bleeding from gallbladder bed in $\leq$ 40 years of age and 50(75.75%) cases reported in >40 years of age although with an insignificant association between them (p=0.477). 109(77.3%) cases reported bleeding from gallbladder bed in female and 19(86.3%) cases reported in males with an insignificant association between them (p=0.336).

Conclusion: This study concluded that the most frequent bleeding site was the gallbladder bed followed by cystic artery in laparoscopic cholecystectomy. Furthermore, bleeding from

gallbladder bed was common in females and < 40 years of age although there was an insignificant association observed with respect to age and gender.

Keywords: Gallstone disease, laparoscopic cholecystectomy, gall bladder bed, cystic artery

INTRODUCTION

Cholelithiasis is characterized by the presence of one or more calculi (gallstones) in the gallbladder. In emergent nations, approximately 10% adults and 20% of above 65 years aged people carries gallstones. [1] Presently, the incidence rate of cholelithiasis in western countries differs from 10–15% and around 3–4% in Asian countries.[2] It is predicted that over 80% of gallstone suspected people are unfamiliar to their gallbladder disorder and accidently recognized as investigative tests are performed due to any reason. It is stated that Gallstone disease (GSD) has the most widespread inpatient diagnosis among liver and gastrointestinal diseases in the US.[3] In China, Incidence of cholelithiasis has been reported to be approximately 3-11%,[4]in Northern India, it was 7.1% [5] and 5% found in Taiwan[6]. Insufficient data is available in Pakistan; though, former study has reported the frequency of laparoscopic cholecystectomy that was 9.03% from southern Sindh areas of Pakistan.[7]

In 1992, A National Institute of Health consensus statement stated that laparoscopic cholecystectomy is an effective and harmless modality in case of symptomatic gallstones and has become the treatment option for most of the patients.[8] The benefits of laparoscopic cholecystectomy including reduced postoperative pain, lessen the requirement of analgesia postoperatively, reduced the duration of hospital stay from 1 week to <24 hours, and quick recovery of patient in 1 week as compared to 1 month following open cholecystectomy.[9] These benefits of Laparoscopic cholecystectomy was readily recognized and implemented by specialists internationally and grew into gold standard for treatment of cholelithiasis.[10] Although there is a limited data available in Pakistan, but a former research in southern Sindh area of Pakistan represented a surgical occurrence of 9.03%; mainly an incidence rate of 4% in males and 14.2% in females.[7]

Applying laparoscopic cholecystectomy in a management of symptomatic cholelithiasis presented a broad range of related intraoperative and postoperative complications. Mild

complications either biliary or non-biliary are frequently managed conservatively.[11] Major complications associated with biliary and vessels are potentially fatal and raise the mortality rate, consequently making the requirement for transformation to open cholecystectomy. One of the researches reported the incidence of complications accompanied with laparoscopic cholecystectomy differs from 0.5-6% [12]. Injury of common bile duct is most crucial complication that is related with higher mortality rate with a prevalence of 0.1 to 0.6% [13]. In addition to, iatrogenic perforation of the gallbladder with spilt gallstones is common complication with a prevalence rate of 10-30% [14].

Male sexual characteristics, age, existence of systemic inflammatory response syndrome characterized by raised inflammatory factors (increased white blood cell count and C- reactive protein), acute inflammatory gallbladder and preoperative increased thickness of the gallbladder wall on ultrasonographic finding, and/or existence of gallbladder empyema, are all parameters that raise the probability of laparoscopic complications intraoperatively eventually turn to open cholecystectomy. [15,16]

Biliary complications arising following LC have a great emphasis because they cause substantial morbidity such as jaundice, bile collections, sepsis, fistulae, cholangitis, and further complications of bile stasis that requires re-operation by an expert surgeon in order to rebuild and drain the biliary tree effectively. In contrast, non-biliary complications are not so much life threatening and potentially fatal as biliary complications although they observed with a variable prevalence in many literature and case reports. These complications lead to minor to major damages of the bladder, bowel, diaphragm or intra-abdominal / vasculature around gallbladder and potentially fatal to cause substantial morbidity and mortality.[17]

Vascular damages are typically the most intense and happened either in placement of the first trocar or in retraction/ dissection, and were infrequently observed prior to initiation of laparoscopic surgical treatment. The placement of the pneumoperitoneum needle and the first trocar is identified as the most risky phase in LC, as mostly bleeding complications ensue in this stage of the surgery. It is basically a ‘blind’ stage of the operation that is common in all laparoscopic surgeries.[18] Though, epigastric vessels are the most frequently injured vessels,[19] but 0.04% - 0.18% of patients reported injury of the major intra-abdominal vessels

for instance aorta, vena cava, iliac vessels.[18] Therefore, clear visualization of anatomical landmarks, cautious dissection of tissues with accurate operative skill can prevent the injuries during the laparoscopic cholecystectomy. Intraoperative cholangiography should be used in crucial cases. [20].

In Pakistan, there is insufficient data available on frequency of different bleeding sites during laparoscopic cholecystectomy. Therefore, it was intended to design this study to assess the incidence of various sites of bleeding involved in laparoscopic cholecystectomy.

METHODOLOGY

This was a cross sectional study conducted in the Department of Surgery, Bhitai Dental and Medical College Hospital by using consecutive sampling technique. Synopsis was approved by research evaluation unit of college of physician and surgeons of Pakistan, Karachi. The duration of study was about one year from Feb 2021 to Dec 2021. A total of 163 patients of age between 30 - 55 years of both genders of diagnosed cholecystitis with cholelithiasis, duration of disease over 6 weeks identified by patient's history were included in the study whereas patients with HBV or HCV +ve diagnosed on basis of serology, patients with severe co-morbidity i.e. decompensate cardio respiratory function, carcinoma of gall bladder established by CT scan abdomen, acute pancreatitis confirmed by increased serum amylase level greater than 1200meq/ml, patients with Common bile duct stones confirmed by ultrasound abdomen and patient who were reluctant to participate were excluded from the study.

Data was gathered from surgical OPD with patients presenting complaint of pain at right hypocondrium from more than six weeks diagnosed on basis of positive murphy's sign confirmed by the Ultrasound showing echogenic shadow and gallbladder wall thickness of over 3mm. All Laparoscopic Cholecystectomy was performed by senior consultant surgeons having minimum 5 year experience of laparoscopic cholecystectomy. Demographic variables like name, age, gender and duration of illness were documented. Sites of bleeding (from cystic artery, gall bladder bed, middle hepatic vein and from mesentery), duration of surgery and amount of bleeding were documented as counted no of soaked gauze. (1 soaked gauze = 10 cc of blood).

All data was entered and analyzed in SPSS version 21. Continuous variables like age, duration of surgery and amount of blood loss were documented as mean and standard deviation (Mean ± SD). Categorical variables such as gender and sources of bleeding in LC were reported in frequencies and percentages. To evaluate the effect modification, age, and gender, amount of bleeding and operative time were stratified followed by application of chi-square with a p value ≤ 0.05 taken as significant.

RESULTS

A total of 163 cases of laparoscopic cholecystectomy with various bleeding sites were included in this study wherein 141(87%) were females and 22(13%) were males with female to male ratio of 6.4:1.There was wide variation of age ranging from a minimum of 20 year to 66 years. The mean age was 38.99±10.96 years. Operative time was observed range from 20 to 50 minutes with mean 29.97±6.18 minutes. Amount of blood loss 5 to 30 cc with mean 12.65±4.11 was observed. Bleeding in laparoscopic cholecystectomy from gallbladder bed was reported in 128(79%) cases followed by cystic artery in 28(17%) cases, mesenteric vessel 5(3%) cases and hepatic artery 2(1%), as shown in Table I.

Stratification of bleeding site with respect to age revealed that there was 78(80.4%) cases reported bleeding from gallbladder bed in ≤ 40 years of age and 50(75.75%) cases reported in >40 years of age although with an insignificant association between them (p=0.477). Bleeding from cystic artery was observed in 13(13.4%) patients in ≤ 40 years of age and 15(22.72%) cases reported in >40 years of age with an insignificant association between them (p=0.121). Moreover, only 1(1.0%) case reported bleeding from hepatic artery in both age groups with an insignificant association between them (p=0.783). Furthermore, Bleeding from mesenteric vessels were observed in 4(4.12%) patients in ≤ 40 years of age and 1(1.5%) cases reported in >40 years of age with an insignificant association between them (p=0.343), as shown in Table II.

Stratification of bleeding site with respect to gender revealed that there was 109(77.3%) cases reported bleeding from gallbladder bed in female and 19(86.3%) cases reported in males although with an insignificant association between them (p=0. 0.336). Bleeding from cystic artery was observed in 26(18.43%) females and

2(9.09%) cases reported in male gender with an insignificant association between them (p=0.280). Moreover, only 2(1.4%) case reported bleeding from hepatic artery only in females with an insignificant association between them (p=0.574). Furthermore, Bleeding from mesenteric vessels were observed in 4(2.45%) female patients and 1(0.06%) cases reported in males with an insignificant association between them (p=0.666), as shown in Table III.

Tab I: Demographic characteristics of patients (n=163)

Variables		**Mean ± SD/n(%)**
Gender	**Male**	22 (13%)
	Female	141(87%)
Bleeding Site	**Gall Bladder Bed**	128(79%)
	Cystic Artery	28(17%)
	Hepatic Artery	2(1%)
	Mesenteric Vessels	5(3%)
Age (years)		38.99±10.96
Duration of Surgery (Min)		29.97± 6.18
Amount of Blood Loss (cc)		12.65± 4.11

Table II: Stratification of bleeding site with respect to age.

Variables		Age of patients		p-value
		≤ 40 years	>40 years	
Gall Bladder Bed	Yes	78(80.4%)	50(75.75%)	0.477
	No	19(19.58%)	16(24.24%)	
Cystic Artery	Yes	13(13.4%)	15(22.72%)	0.121
	No	84(86.6%)	51(77.27%)	
Hepatic Artery	Yes	1(1.0%)	1(1.5%)	0.783
	No	96(98.9%)	65(98.48%)	
Mesenteric Vessels	Yes	4(4.12%)	1(1.5%)	0.343
	No	93(95.87%)	65(98.48%)	

Table III: Stratification of bleeding site with respect to gender.

Variables		Gender		p-value
		Male	Female	
Gall Bladder Bed	Yes	19(86.36%)	109(77.3%)	0.336
	No	3(13.63%)	32(22.6%)	
Cystic Artery	Yes	2(9.09%)	26(18.43%)	0.280
	No	20(90.9%)	115(81.56%)	
Hepatic Artery	Yes	0	2(1.4%)	0.574
	No	22(100.0%)	139(98.58%)	
Mesenteric Vessels	Yes	1(0.06%)	4(2.45%)	0.666
	No	21(95.45%)	137(97.16%)	

DISCUSSION

Laparoscopic cholecystectomy turned into the old standard technique for the management of symptomatic cholelithiasis. Laparoscopic cholecystectomy has numerous benefits over the usual open cholecystectomy including negligible injury, reduced aching, lesser hospitalization stay, acceptable cosmetic consequence and rapid regaining of normal activity. Although, several researches have revealed that greater incidence of complications are associated with laparoscopic cholecystectomy than open cholecystectomy comprising injury of common bile duct, damage to the vessels and internal organs in the course of application of needle and trocar with deadly consequences [21-23]. The present study demonstrated the frequency of bleeding that occurs from various sources followed by Laparoscopic cholecystectomy.

Comment [DCC2]: Change Laparoscopic cholecystectomy is the gold standard technique …….

One of the studies assessed the frequency of laparoscopic cholecystectomy in patients diagnosed with gall stone disease. In their study, mean age was reported 40.77 ±10.95 years [2] that showed similarity to the research of Mir M et al [24] and Taj MN et al [25] who also reported mean age of 43 and 46 years correspondingly. In contrast to above studies, the present study reported the mean age was 38.99±10.96 years.

Similarly, another research proved that the frequency of female patients (61.42%) had cholelithiasis underwent laparoscopic cholecystectomy was greate ras compared to males (38.58%), with 2.5:1 proportion. So, this study has emphasized that females were more affected by cholelithiasis. [2] that showed a relationship with several former researches.[24,25]In another research by Al Naser KH reported the female predilection over male.[26] The present study was consistent with the above reported studies and revealed the preponderance of females 141(87%) who underwent laparoscopic cholecystectomy as compared to males 22(13%)with female to male ratio 6.4:1.

As broader acceptance of Laparoscopic cholecystectomies, the range of complications related with this technique also became extensive. Vessels injuries are frequently observed subsequent to complications of anaesthesia, they are the second leading cause of mortality and morbidity in laparoscopic surgery [27]. Likewise, one research evaluated the bleeding site during laparoscopic cholecystectomy. Their study revealed that there were 21 patients with hemorrhage from the neighboring tissues of gallbladder, 5(0.67%) cases reported intraoperative bleeding from the cystic artery, and 9 (1.21%) cases reported bleeding from the port and 4 (0.54%) cases observed blood loss from the ligaments of the liver during insertion of ports. Even though, they did not have main vascular complications while they had 4 conversions to open cholecystectomy from laparoscopic cholecystectomy owing to excessive bleeding. [11] The present study was not in accordance with the above cited research and reported that most common source of bleeding was gallbladder bed in 128(79%) cases followed by cystic artery in 28(17%) cases while blood loss from mesenteric vessels reported in 5(3%) cases and only 2(1%) cases reported hepatic artery damage

Similarly, one retrospective analysis assessed the incidence of complications in laparoscopic cholecystectomies with symptomatic gallstones and also evaluated the percentage of converse onto open cholecystectomy. Blood loss was the most commonly found intra-operative complication reported in (1.3%) cases.[28] In the current analysis, complications related to LC

involved immense blood loss (0.3-1%), trauma of bile duct (0.13%), colon injury (0.06%) duodenal injury in (0.13%) cases [29]. Likewise, a Saudi study revealed the frequency of complications related to LC was 7.5% with (35%) due to hemorrhage and infection (22.5%) was reported being the most frequent [30]. As far as the present study is concerned, most commonly observed bleeding site was Gall bladder Bed 128(79%) followed by cystic artery 28(17%) and mesenteric vessels were bleed in 5(3%) cases.

Another analysis investigated the 865 patients who had bleeding due to laparoscopic cholecystectomy. They revealed that 3 patients had bleedings from gallbladder bed while 4 patients had bleeding from cystic artery, epigastric port site, mesocolon and ambiguous site.[31]The present study endorsed the above research and showed that most commonly bleeding was reported from gall bladder bed in 128(79%) cases followed by cystic artery 28(17%) cases.

Therefore, it was revealed that laparoscopic cholecystectomy, rather than the open technique, is regarded as the treatment of choice for gallstone disorder. Bleeding is the rare complication associated with laparoscopic cholecystectomy. Timely intervention with accurate technique can prevent complications in addition to lower the risk of morbidity and mortality.

CONCLUSION

This study concluded that Laparoscopic cholecystectomy is a safe and effective treatment for gall stone disease. Females had more laparoscopic cholecystectomies than males. Bleeding is a rare but serious complication after laparoscopic cholecystectomy. The most frequent bleeding site was the gallbladder bed followed by cystic artery. Furthermore, bleeding from gallbladder bed was common in females with < 40 years of age although there was an insignificant association observed with respect to age and gender.

Comment [DCC3]: Remove it

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