

Early post-operative course and complications in laparoscopic versus open cholecystectomy

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Date Submitted: 04.01.2012

Date Accepted: 14.04.2013

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Abstract

Background: Laparoscopic Cholecystectomy (L.C) is now considered the gold standard in gallbladder surgery. However, Open Cholecystectomy (O.C) is still being performed widely in Iraq. Both types of surgeries have unique problems in the early post-operative period which need to be recognized and dealt with properly. Even with better experience in laparoscopic surgery, complications in the early post-operative period should be expected and addressed promptly and efficiently. **Aims:** To observe and compare the clinical events in the early post-operative period (the first 48 hours) following L.C and O.C, and to recognize the special problems arising during this period. Also, to document and compare the early post-operative complications in both types of surgeries and the methods applied to deal with these complications.

Patients and Methods: All patients admitted for cholecystectomy (open and laparoscopic) to the 2nd surgical team at Al-Yarmouk Teaching Hospital for one year were included in the study. They were evaluated pre-operatively and followed post-operatively with full documentation of the surgical procedures, findings and intra-operative complications. Early post-operative course starting from anesthetic recovery till discharge from hospital was followed very closely and documented. General and specific complications in the early post-operative period were studied and their management observed in details.

Results: The number of patients operated upon was 110, 58 laparoscopically and 52 by open surgery. In the L.C group, the average pain score in the first 24 hours was 1 compared to 3 in the O.C group. Patients with L.C were given analgesia on day zero only, while 25% of patients with O.C received analgesia on day one also. Early nausea was present in 90% of patients in L.C group VS. 90% in O.C group, the L.C group 10.4 % had respiratory symptoms vs. 23.1% with O.C patients with L.C had earlier return of bowel function. In the LC group, there were 17 episodes of bleeding vs 4 episodes in the O.C group. In the L.C group 2.8% had common bile duct injury vs 4.6% in O.C group. Post-operative bile leak was 2.8% in L.C vs 1.9% in O.C, while spillage of gallstones was higher in L.C (65.6% vs. 9.7%).

Conclusions: The early post-operative course is smoother in the L.C group although with better anesthetic techniques and good post-operative care, the course following O.C is improving. Vascular complications related to trocar site, blood vessels and solid organs mainly liver were more in the L.C group. Bile leakage and gallstone spillage were more with L.C but bile duct injuries more with O.C. Better training of surgeons is needed to improve the learning curve and decrease the incidence of complications.

Keywords: Gallbladder, Surgical, Laparoscopy, Post-operative

INTRODUCTION

Laparoscopic cholecystectomy is now considered the gold standard in gallbladder surgery. However in Iraq and because of certain factors, open cholecystectomy is still widely used. Because both types of surgeries have unique problems in the early post-operative period, the situation mentioned above give us a good opportunity to study the early post-operative course and complications of both types of surgeries. Even with the improving learning curve for surgeons performing L.C, complications should be expected and managed promptly and efficiently. L.C is considered superior to O.C in terms of morbidity, cosmetic and rate of complications.^[1] Still, biliary and extra-biliary complications do occur with L.C. The extra-biliary complications can be access-related or procedure-related.^[1] Although these complications are not as common as they were when laparoscopic cholecystectomy was first introduced in the early eighties, they are still a major source of morbidity.^[2] The early post-operative period is crucial in considering the superiority of the laparoscopic approach. Studies claim that the immediate post-operative period is smoother in L.C, allowing for early discharge from hospital and earlier return to work.^[3] There is less post-operative pain and less need for analgesia.^[3] The procedure however is surgically demanding for the inexperienced surgeon and introduces specific risks unique for that type of surgery. Lower complication rates are reported from centers specializing in laparoscopic surgery.^[3] The open technique has its advantages. It allows the surgeon full control of the operative field and the tactile sensation is maximized. Retractors and pads can be used to protect the adjoining organs. In contrast, L.C offers a limited view of the operative field with loss of the dimensional depth perception. There is loss of the tactile sensation and difficulty in controlling minor bleeding.

The objectives of this study are first to analyze and compare the clinical events and course in the immediate post-operative period in L.C and O.C. The second objective is to compare the early post-operative complications between the two procedures.

PATIENTS AND METHODS

All patients with gallstone disease admitted for cholecystectomy to the 2nd surgical team at Al-Yarmouk Teaching Hospital for a one year period starting from January the 1st 2010 were included in the study. Personal and clinical data were recorded in detail. The operative

details including anesthesia, findings and procedures were documented. The choice of the procedure, whether open or laparoscopic was decided by the surgeon in charge. All patients were observed closely post-operatively until their discharge from hospital. Relevant clinical information, drugs and analgesics received and results of investigations were recorded in a prepared form. Intra- and post-operative complications were looked for and documented including general and specific complications and complications related to anesthesia. Specific complications related to the pneumoperitoneum, biliary tree, vascular tree and gastrointestinal system were thoroughly analyzed.

RESULTS

During the period from January the 1st 2010 to January the 1st 2011, 110 patients were admitted for cholecystectomy to the 2nd surgical team at Al-Yarmouk Teaching Hospital. Of those, 94 (85.5%) were females and 16 (14.5%) were males. Laparoscopic cholecystectomy was done for 58 (52%) and open surgery done for 52 patients (48%). Most of the patients in the L.C group were in the 3rd decade of age (61.8%) while most of the patients in the open group were in the 5th and 6th decades (60.1%). Ninety-four were married and of the female patients, 84 were multiparous with more than 3 children. Twenty-two patients (20%) were smokers but none was alcoholic. Sixty-two patients (56.5%) had comorbid conditions, mainly hypertension and diabetes mellitus and 34 patients (34.5%) had previous surgery for other causes. For demographic data table (1).

Table 1. Demographic Data

		L.C	O.C
Age	20-29 year	68 (61.8 %)	4 (3.6 %)
	30-39 year	33 (30 %)	5 (4.5 %)
	40-49 year	7 (6.3 %)	35 (31.8 %)
	>50 year	2 (1.8 %)	66 (60 %)
Gender	Female	94	85.5 %
	male	16	14.5 %
marital states	married	94	85.5 %
	Not married	16	14.5 %

Clinically, 104 (94.5%) presented as right hypochondrial pain, 52 had vomiting, 4 had jaundice and one had a mass. On examination, 106 (96.4%) had right hypochondrial tenderness, 4 had clinical jaundice and 9 had fever. clinical data are shown in table (2).

Table 2. Clinical Data

		No. of cases	%
History	Pain	104	94.5 %
	Vomiting	52	47.4 %
	Jaundice	4	3.6 %
	Mass	1	0.9 %
	Nausea / dyspepsia	110	100 %
Findings on Examination	Tenderness, + ve Murphy - ve sign	106	96.4 %
	Fever	9	8.6 %
	Jaundice	4	3.6 %
	Mass	1	0.9%

Ultrasonography revealed gallstones, single or multiple in 102 (92.8%) patients, evidence of chronic cholecystitis or wall thickening in 94 (85.5%) and picture of acute cholecystitis in 9 (8.8%). Intra-operatively, gallstones were confirmed in 102 patients (92.8%). Common bile duct stones were found in two patients and 8 had chronic acalculous cholecystitis. Post-operatively, all patients were followed closely for the first 48 hours. Operative data are shown in table (3).

Table 3. Operative Data

		No. of cases	%
Type of surgery	L.C	58	52 %
	O.C	52	48 %
Surgical findings	Calculous cholecystitis	102	92.8 %
	Acalculous cholecystitis	8	7.3 %
	C.B.D stones	2	1.9 %

All clinical events and the early complications were recorded and analyzed. In the L.C group, the average pain score in the first 24 hours was 1 and in the second 24 hours it was zero. In the open group, the score was 3 and 2 respectively. Early nausea was present in 90% of patients in the L.C group versus 92% in the open group. All patients with L.C pass flatus and start mobilization on day zero, while patients who had O.C pass flatus and

start moving after 24 hours. All patients with L.C were given analgesia on day zero only (Tramadol). Tramadol and Diclofenac were given to all patients with O.C on day 0 and to 25% of patients on day 1. Early post-operative course data are shown in table (4).

Table 4. Early Post-operative course

		L.C	O.C
Pain score (Average)	1 st 24 hours	1	3
	2 nd 24 hours	0	2
Nausea		100 (90%)	103 (92%)
Flatus		Day 0	Day 2
Mobility		Day 0	Day 2
Cough & chest pain		6 (10.4%)	12 (23.7 %)
Analgesics used Average		Tramadol (Day Zero)	Tramadol & Diclofenac (Day Zero (100%)) (Day 1 (25%))

Early cough or chest pain was present in 6 patients (10.4%) with L.C and in 12 patients (23.1%) with O.C. Two patients with L.C needed admission to the intensive care unit and 4 in the O.C group. Three patients with O.C developed deep vein thrombosis (2.8%) and 2 of them developed pulmonary embolism. No patient with L.C had venous thrombosis or embolism. Delayed recovery from general anesthesia was observed on 4 patients with L.C and 3 with O.C. Three patients (2.8%) with L.C developed early jaundice of different causes versus 5 (4.6%) with O.C. Two patients (1.9%) with L.C developed signs suggesting early port site infection while 4 with O.C had early surgical site infection. Complications related to the pneumoperitoneum were not recorded. Early post-operative complication (general) is shown in table (5).

In the L.C group, there were 6 episodes of bleeding due to organ injury mainly the liver (5.5%), 9 episodes of bleeding from the trocar site (8.2%) and 2 with injury to large or medium vessels (0.9%). In the open group, 3 patients had bleeding due to liver injury (2.8%) and one vascular injury (1.9%) as shown in table (6). In the L.C

group, 3(2.8%) had bile leak and another 3 had bile duct injury (2.8%). In the open group, 2 (1.9%) had bile leak and 5 (4.6%) had bile duct injury.

One patient with L.C (0.9%) had bowel injury during the procedure and one during needle or trocar insertion. In L.C, there was spillage of gallstones in 38 patients (65.6%) versus 5 (9.7%) in the open group as shown in table (7).

Table 5. Early Post-operative complication (general)

	L.C	O.C
Delayed Recovery	4 (3.7 %)	3 (2.8 %)
Need for L.C.U / R.C.U	2 (1.9 %)	4 (3.7 %)
D.V.T	0	3 (2.8 %)
Pulmonary Embolism	0	2 (1.9 %)
Early Jaundice	3 (2.8 %)	5 (4.6 %)
Wound Infection	2 (1.9 %)	4 (3.7%)
Bile leak	3 (2.8 %)	2 (1.9%)

Table 6. Specific complication – Hemorrhage

Site	L.C	O.C
Organ (liver)	6 (5.5 %)	3 (2.8 %)
Trocar site	9 (8.2 %)	----
Vascular	2 (1.9 %)	1 (0.9 %)

Table 7. Specific complication

		L.C	O.C
Biliary complication	Common bile duct injury	3 (2.8 %)	5 (4.6 %)
	Post-operative bile leak	3 (2.8 %)	2 (1.9 %)
Bowel injury	Caused by Veress needle or trocar	1 (0.9 %)	0
	During dissection	1 (0.9 %)	0
Spillage of gallstones		38 (65.6 %)	5 (9.7 %)

DISCUSSION

Laparoscopic cholecystectomy is now established as the gold standard for gallstone disease.^[1] However, in Iraq because of the deficiency of necessary equipment and lack of training, open cholecystectomy is still performed widely. The early post-operative period is critical in

patients having laparoscopic surgery. A smooth, complication-free period is one of the main causes of the popularity of L.C. However, with advances in anesthetic techniques and post-operative care, even patients having open surgery should have a smooth uneventful post-operative period and early discharge from hospital. In this study, most of these patients are females (85.5%), married (80%) and multi parous (76.5%). In this study, the majority in the L.C group were in the third decade (61.2%). This may be explained by the fact that more fit patients are selected for L.C., especially those with no co-morbid conditions. In the open group, 56.5% of the patients had associated medical problems like hypertension and diabetes mellitus. About one third (34.55) of patients had history of previous abdominal surgery. In this study, 20% of patients were chronic smokers and there was a strong family history of gall stone disease (61.8%). There seems to be a strong genetic correlation with gallstone disease, since stones are more than four times as likely to occur among first degree relatives.^[3] The main presentation is epigastric or right upper abdominal pain (94.5%) and clinically, 69.4% had right hypochondrial tenderness on presentation. Jaundice was present in 3.6% of patients and one patient had a mass. Other studies showed that in 33% of cases with acute cholecystitis, the gallbladder can be felt with palpation and mild jaundice can be present in 20% of cases.^[4] Ultrasonography revealed the presence of gallstones in 92.8% of patients. Other findings were: thickening of the wall or features of chronic cholecystitis and were present in 85.5%. Intra-operatively, gallstones were found in 102 patients (92.8%) with gallbladder changes like wall thickening, distension or evidence of chronic cholecystitis. Acalculous cholecystitis was present in 8 patients (7.3%) and two patients had common bile duct stones. The operative findings noticed in the study by Khan included: gallstones (62.3%), pericholecystic adhesions (34.7%), acute cholecystitis (22.3%), mucocoele (3.8%), empyema (1.47%), tumor (0.58%), gangrene (0.58%) and perforation (0.29%).^[5] During the first 24 hours, the main pain score in the L.C group was 1 versus 3 in the open group on a scale of 5. During the second 24 hours, the score was zero vs. 2.

Similar results were found by Gupta who stressed the minimal post-operative discomfort in the L.C group.^[6] In this study, there was less need for analgesia in the L.C group. Other studies confirmed this observation.^[6] All patients with L.C had normal bowel sounds and pass flatus within the first 24 hours, while patients in the open group pass flatus on the second day. More patients with L.C had nausea (90% vs.92%). It is believed that pneumoperitoneum is the causative factor for nausea/vomiting in laparoscopic surgery.^[7] It causes also shoulder tip pain.^[7] These two problems are the most common cause of delayed discharge from hospital after laparoscopic procedures.^[8,9] All L.C patients were mobile within 12 hours following recovery from anesthesia while the O.C patients were mobile after 24 hours. Following both L.C and O.C, all the general complications expected in surgery can be seen. Laparoscopic surgery harbors similar physiological risks as do major abdominal operations.^[10] Considering the intraoperative hemodynamic and cardiovascular effects of CO₂ insufflation, some authors conclude that there is nothing minimal about the invasive nature of L.C.^[11] Deep venous thrombosis was seen in 3 patients in the O.C group (2.8%) but no patients in the L.C group were affected. Two patients in the O.C group had pulmonary embolism (1.9%) and none in the L.C group. In the open group, 4 patients had been admitted to Respiratory Care Unit (3.7%) versus 2 patients in the L.C group (1.9%). In the L.C group, 4 patients had delayed recovery from anesthesia (3.7%) versus 3 patients in the open group (2.8%). Studies showed that pneumoperitoneum and reverse Trendelenburg position may contribute to venous stasis in the lower limbs.^[11] In L.C patients, there were 8 episodes of significant bleeding (7.3%) versus 4 (3.7%) with O.C., on the other hand, 9 O.C patients (8.25) had early wound infection compared with 2 L.C patients. Those results were statistically significant. Early jaundice of different causes developed in 5 O.C patients (4.6%) and 3 L.C patients (2.8%). There are complications inherent to all laparoscopic procedures which are related to laparoscopic instrumentation.^[12] In this study, there was one instance of bowel injury to the small bowel during the procedure. The overall reported incidence of bowel injury during L.C is 0.14 %.^[13] In this study, there was no incidence of major vessels injury. The incidence of trocar site bleeding in the L.C group was 8.2%. Solid organ injury with bleeding, mainly involving the liver, was present in 5.5% and 1.9% had medium and small vessels injury. In the open group, 2.8% had bleeding from solid organs and 0.9% had vascular injury. In a

study from Romania, the incidence of hemorrhage in L.C was 2.3%.^[14,15] Most were caused by Bleeding from the gallbladder bed as noted in 1.2%, especially in those patients with acute cholecystitis or cirrhosis.^[15] On the other hand, a Pakistani study showed bleeding from the trocar site in 9.97% of cases, from vascular injury in the Callot triangle in 16.23% and from liver bed in 11.11%.^[16] A study from Italy showed that the incidence of major vascular injuries (including aorta, iliac vessels, vena cava, inferior mesenteric and lumbar vessels) was 0.007-0.4%, and for minor injuries (branches of the epigastric vessels, mesenteric and omental vessels) was 0.1-1.2 %.^[17] The mortality rate due to bleeding was 0.005 -0.2%. Another complication related to all laparoscopic procedures is surgical subcutaneous emphysema. This is due to insufflation of the abdominal wall by inserting the Veress needle into the preperitoneal space (15) No such complication was reported in this study. Pneumoperitoneum may result also in pneumothorax or pneumomediastinum. The above complications were also not reported in this study. Early wound infection can present as wound abscess or cellulitis without purulent collection. The umbilical trocar site frequently used for gallbladder retrieval is the most commonly infected site.^[16] In this study, 1.9% in the L.C group developed early port site infection. The estimated incidence of wound infections in other studies range from 0% to 3.2 %, ^[16] and compares favorably to that reported for open surgery. No such complication was reported in this study. The most important complications are those specific to laparoscopic cholecystectomy. The most devastating complications of L.C are bile duct injuries. In this study, the incidence of intra-operative bile duct injuries was 2.8% and the incidence of post-operative bile leak was 2.8% also. In the open group, 4.6% had intra-operative bile duct injury and 1.9% had post-operative bile leak. In this study, the incidence of intra – operative bile duct injuries was higher in the open group, this finding differs from the results of other studies, it can be explained by the fact that process of choosing the patients was more selective in this study.^[10] Many cases in which complication were anticipated were referred to the open method. The incidence worldwide of bile duct injury for O.C is estimated as 0% to 0.4% and for L.C is 0% to 2%.^[10] Less than 50% of bile duct injuries are detected intra-operatively.^[10] Among the 77,604 cases reported by Deziel et al.^[11] delayed bile leak as recognized in 0.29% of cases (2.8% in this study). Comparing the incidence of biliary duct injuries in general in this study with other published studies in the

world literature, it is noticed that it is higher in this study; this can be explained by the fact of the longer experience of surgeons and better learning curve in western countries. In the study from Romania,^[15] the incidence of bile duct injury was 0.1% and most of the injuries were identified intraoperatively. According to Way classification, most of the injuries were grade IIIa (total sectioning without loss of substance).^[15] There were three cases of grade I injury (tangential) and one case of grade IV (total sectioning with loss of substance).^[15] In this study the injuries were considered to be grades I and II. The study from Pakistan showed minimal bile duct injury and the incidence of bile leak was 3.98%.^[16,17] In most of these cases, the leak stopped after the 5th day of operation without intervention. In a study from Yemen, there were major biliary complications in 9.1% of cases.^[18] There were bile leaks in 13.7% and transient jaundice in 13.7%. All complications were recognized intra-operatively. But in a review paper by Lau only 25%-32.4% of injuries were recognized intra-operatively.^[19] The review showed that the incidence of bile duct injury with L.C was 0.4-0.7%. In the open group it was 0.1-0.2%. Detachment of the gallbladder may open any accessory bile ducts present in the gallbladder bed. In this study, there were no instances of biliary complications related to this anomaly. In general, most of these injuries are avoidable if an adequate intraoperative cholangiogram is performed prior to dividing any ductal structures. Postoperative biliary leaks and collections are often drained using the percutaneous technique with or without sphincterotomy and stenting of the outflow tract. Some patients require eventual laparotomy for definitive management of their ductal injuries.^[10] In this series all the cases of bile leak in the L.C group were managed conservatively. No patient required re-laparotomy. Spillage of bile and gallstones from the gallbladder are common during L.C. In most cases, these are inconsequential events. However, unlike O.C, laparoscopic retrieval of spilled stones may be challenging and, unlike spilled bile, irrigation alone will have no effect on spilled stones. There have been reports of morbid complications including generalized peritonitis, peritoneal and retroperitoneal abscess formation, draining umbilical sinuses, and penetration of internal organs by spilled stones.^[11,20] In this study, the incidence of spillage was 65.6% in the L.C group and 9.7% in the O.C group. Shamiyeh reported an incidence of 10-30%.^[14] It was higher with L.C. Two main factors were predictive for the mishap of spillage: the surgeon experience in L.C and the degree of inflammation.

CONCLUSIONS: The early post-operative course was smoother in laparoscopic cholecystectomy compared to open cholecystectomy. There was less pain, less need for analgesia, earlier mobility and earlier discharge from hospital. The incidence of vascular injuries was higher in the L.C group. These were mainly bleeding from trocar site, blood vessels injury and bleeding from solid organs mainly liver. Bile leak and spillage of stones were commoner in L.C but the incidence of bile duct injury was slightly higher in O.C. Better training of surgeons is needed to improve the learning curve and decrease the incidence of complications.

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