

Laparoscopic Cholecystectomy: Use of the Surgical Glove for Extraction of Gallbladder and Spilled Gallstones Where Traditional Endobag is Not Available or Expensive

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ABSTRACT

Background: Laparoscopic cholecystectomy (LC) may be associated with intraoperative gallbladder perforation with bile and gallstones spillage. This causes peritoneal and extraction port site contamination.

Objectives: To evaluate extraction time, safety, cost effectiveness and incidence rates of intraperitoneal and port site infections when a sterile surgical glove is used as an endobag for extraction of gallbladder specimen and spilled gallstones where the traditional endobag is not available or expensive.

Methods and Patients: This is a prospective observational (cross-sectional) study conducted in AL-Karama Teaching Hospital/ Medical College/ Wasit University/ Iraq. A total of 473 patients who were laparoscopically cholecystectomised for symptomatic cholelithiasis, were included in this study. The patients were divided into 3 groups: Group I included 185 patients with non-perforated gall bladders which were directly extracted without endobag, Group II included 145 patients with non-perforated gallbladders extracted by surgical glove-endobag and Group III included 143 patients with intraoperatively perforated gallbladders extracted by surgical glove-endobag. The follow-up period ranged from 6 to 66 months.

Results: Time Mean \pm SD of gallbladder/ spilled stones extraction of Groups I, II and III were: 5.87 \pm 4.46 minute (m), 8.73 \pm 3.73 m and 10.78 \pm 4.42 m respectively.

Incidence rates of port site infection of Groups I, II and III were: 9.18%, 0% and 2.8% respectively. Incidence rates of port site hernias of Groups I, II, III were: 2.16%, 0 % and 0.7 % respectively.

Conclusion: LC is associated with increased incidence of intraoperative perforation of the gallbladder along with spillage of bile and stones. This prolongs time of gallbladder extraction and increases incidence rates of peritoneal and extraction port site infections. Use of the surgical glove as an endobag shortens the operative time and reduces septic complications of various laparoscopic procedures as well as LC.

Keywords: Laparoscopic Cholecystectomy, Surgical Glove Endobag.

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Article History:

Received: 04-12-2016, Revised: 11-12-2016, Accepted: 21-12-2016

Access this article online	
Website: www.ijmrp.com	Quick Response code 
DOI: 10.21276/ijmrp.2017.3.1.010	

INTRODUCTION

Laparoscopic Cholecystectomy is the gold standard operation for the symptomatic cholelithiasis. LC has many advantages such as; short operative time, low post-operative pain, low cost-effect, rapid recovery from general anesthesia, short hospital stay and excellent cosmetic result when compared with the open cholecystectomy.¹ LC has its own complications. These complications are related to; port site, pneumoperitoneum, loss of tactile sensation and limited surgical access.¹ The common complications of LC are; perforation of the gallbladder during dissection from its hepatic bed causing intra-abdominal bile and stone spillage and port-site contamination during extraction of the gallbladder specimen.² Incidence rates of bile leak and loss of

gallstones into the peritoneum had been reported to be between 3% and 33%.^{3,4}

During LC, the gallbladder may be perforated due to excessive traction of the gallbladder in order to facilitate dissection of cystic artery and duct, when tearing of the gallbladder wall is caused by the tracting grasper, during its dissection from its hepatic bed (due to damage of gall bladder wall) or during its extraction through the port (when attempting to extract a distended or gallstones loaded gallbladder through inadequate port).⁵ In order to prevent the complications mentioned above, gallbladder specimen is extracted while it is in an endobag. Acutely inflamed or distended gallbladder creates a problem during its extraction; in such

conditions, it requires a needle decompression, stone fragmentation and stone extraction from the gallbladder near the extraction port site or extension of fascia of the extraction port site which causes more post-operative port site pain.⁶

The sterile surgical glove can be used as an endobag to remove the gallbladder specimen and the intraperitoneal spilled stones safely without complications in countries where the traditional endobag is not available or expensive.⁷ The missed gallstones can lead to formation of an abscess, abdominal wall mass, or a persistent discharging sinus.⁸ The incidence rate of such complications is more common when operating on an acutely inflamed gallbladder⁹, it is also more common in men, elderly patients, obese patients, and in the presence of adhesions.¹⁰ The limited ability of the surgeon to remove spilled stones laparoscopically leads many surgeons to miss some of them behind if efforts for removal are not straightforward.¹¹

The aim of this study was to compare direct extraction without endobag versus surgical glove-endobag extraction of the gallbladder specimens and spilled gallstones regarding time of extraction and intra and postoperative complications.

PATIENTS AND METHODS

This is a prospective observational (cross-sectional) study performed in department of surgery/ Al-Karama teaching hospital/ College of Medicine/ Wasit University/ Iraq during the period from April 2011 to April 2016.

The project of this study was approved by Ethical Committee of Medical College/ Wasit University. An informed written consent was obtained being signed by the patient or his/her guardian. All patients were operated on by single consultant laparoscopic surgeon.

These patients were divided into 3 groups: Group I included patients, whose gallbladders were not intraoperatively perforated. These gallbladders were directly extracted without using any endobag. Group II included patients whose gallbladders were not intraoperatively perforated. These gallbladders were extracted by surgical glove-endobags. Group III included patients whose gallbladders were intraoperatively perforated with intraperitoneal spillage of bile and gallstones. These perforated gallbladders and the spilled gallstones were extracted by surgical glove-endobags.

All patients were operated on under general anesthesia with endotracheal intubation and in reverse Trendelenburg's position with tilt to the patient's left side.

The extraction time was calculated in minutes from moment of completing dissection of the gallbladder from its hepatic bed till its complete removal from the abdomen through the extraction port. Dissection of the gallbladder was performed using a combination of electrocautery and blunt dissection with fine graspers. The cystic artery was sealed either with electrocautery or clipped with Titanium clips. Cystic duct was clipped with Titanium clips. Dilated cystic ducts were sealed either with vascular clips or transfixed with 2/0 Vicryl. When perforation of the gallbladder occurred, attempts were made to remove all spilled stones, and the peritoneal cavity was irrigated with normal saline solution to evacuate the spilled bile. In Groups II and III gallbladder specimens and the spilled gallstones were extracted through epigastric port by a sterile surgical glove (size 6 ½ or 7 inches) as an endobag after being tied and divided at the level its finger roots with 0 silk. (Fig 1)

For patients of Groups II and III, after completing dissection of the gallbladder, the surgical glove-endobag was inserted into the peritoneal cavity through 10mm epigastric port using grasper under direct vision. Surgical glove-endobag was put on the superior surface of the liver or on the greater omentum in acute cholecystitis. The spilled gallstones in the peritoneal cavity due to an intraoperative perforation of the gallbladder also were put in the same surgical glove-endobag. (Fig 2)



Fig 1: A Surgical glove was prepared as an endobag



Fig 2: Retrieval of surgical glove-endobag containing gallbladder.



Fig 3: Retrieval of the gallbladder specimen and surgical glove-endobag through the epigastric port.

The open end of surgical glove-endobag was delivered outside the epigastric port, infundibulum of the gallbladder was also delivered through the epigastric port then opened, the bile in the gallbladder was sucked out, the stones were extracted using as small sponge forceps .If the10 mm extraction (epigastric) port could accommodate the empty gallbladder specimen, it was removed out within surgical glove-endobag. If the empty gallbladder specimen was too large to be accommodated by the10 mm extraction port, it was divided inside the surgical glove-endobag, into pieces and removed as a piece-meal from the lumen of the endobag. (Fig 3) All the port sites were closed with 2/0 Nylon, skin only was closed while fascia was not closed. The demographic data, clinical examination, the time from dissection of gallbladder from its hepatic bed to removal from the extraction (epigastric) port, intraoperative complications and postoperative complications for 6 months were recorded. Follow-up was based on a clinic visit 2 weeks, one month and 6 months postoperatively.

Statistical analysis

The results were processed and analyzed by using SPSS, version 22; unpaired T test and Fischer's exact test. The level of

significance was accepted at P- 0.05, highly significant at P < 0.01 and non-significant at P > 0.05.

RESULTS

A total of 473 patients with symptomatic cholelithiasis who underwent LC, were included in this study; 56 male patients (11.83 %), Mean±SD of their ages was 46.73±13.78 years (y) (range 20 –77 y) and 417 female patients (88.17 %). Mean±SD of their ages was 38.64±11.89 y (range 16 –75 years). Total patients Mean±SD was 39.6±12.36y (Table 1). The age Mean±SD of Group III (42.83±12.67 y) was more than that of Group I (39.18±12.54 y) and Group II (36.95±11.25 y). Twenty five (44.64%) male patients out of 56 male patients, their gallbladders were intraoperatively perforated. One hundred eighteen (28.29%) female patients out of 417 female patients their gallbladders were intraoperatively perforated.

Group I included 185 patients, their gallbladder extraction time Mean±SD was 5.87±4.46 m, P-Value <0.0001. Group II included 145 patients, their gallbladder extraction time Mean±SD was 8.73± 3.73 m, P-Value <0.0001. Group III included 143 patients, their gallbladder extraction time Mean±SD was 10.16± 3.68m, P-Value =0.01. (Table 2)

Table 1: Demographic Distribution of The Study Patients

Patients' Groups	No. of patients	Percentage	Age Statistics	
			Mean±SD / Year	Median / Year
Group I	185	39.1 %	39.18±12.54	38
Group II	145	30.7 %	36.95±11.26	35
Group III	143	30.2 %	42.83±12.67	41
Total	473	100 %	39.6±12.36	38

Table 2: Statistical analysis of time of extraction of the dissected GB and the spilled gallstones.

Method of gallbladder and spilled gallstones extraction	N	%	Time statistics / minute			
			Mean±SD	Median	95% CI	P-Value
Group I	185		5.87±4.46	4	5.23 -6.52	<0.0001
Group II	145	30.2	8.73±3.73	8	8.13 -9.35	<0.0001
Group III	143		10.16±3.68	10	9.55-10.77	0.01

CI; Confidence Interval

Table 3: Intraoperative and Postoperative Complications of this Study

The Study Complications	Group I		Group II		Group III	
	N	%	N	%	N	%
Intraoperative Gall bladder perforation	0	0	0	0	143	100
Bile duct injury	0	0	0	0	0	0
Visceral injury	0	0	0	0	0	0
Bleeding	2	1.08	0	0	2	1.39
Wound infection	17	9.18	0	0	4	2.79
Port site hernia	4	2.16	0	0	1	0.69
Total	24	12.42	0	0	150	30.2

Table 4: Shows hospital stay analysis results.

Hospital Stay/Technique of extraction	Mean±SD /day	Median	Range	P-Value
Group I	1.55±0.66	1	1-4	
Group II	1.56±0.68	1	1-4	0.1
Group III	1.62±0.70	2	1-4	

DISCUSSION

The Mean±SD of time of gallbladder specimen/ spilled gallstones extraction of our study Groups I, II, and III was 5.87±4.46 m, 8.73± 3.73 m and 10.16± 3.68m respectively, P-value < 0.0001, this is statistically significant. This study showed that the shortest time gallbladder specimen/ spilled gallstones extraction was in Group I when the gallbladder was not incidentally perforated and extracted without endobag (Mean±SD=5.87±4.46 m). The longest extraction time was in Group III when the gallbladder was incidentally perforated and extracted with its spilled stone in side surgical glove-endobag (Mean±SD=10.16± 3.68m). We reviewed most on-line published related English-written literatures but, we did not find any study calculated time of gallbladder specimen/ spilled gallstones extraction.

Some complications occur more in LC than in open cholecystectomy. One of these complications is intraoperative

perforation of gallbladder and spillage of bile and gallstones into the peritoneal cavity. Spilled gallstones are often asymptomatic but can lead to complications in only 0.1 - 0.3 of patients.¹² The sequelae of the missed spilled gallstones in the peritoneal cavity are not fully documented because majority of such cases were unreported.¹³ The incidence of the intraoperative GB perforation, in our study, was 30.23%, higher incidence was among male patients (44.46%) while in female patients was 28.29%.

Also, the incidence rate of the intraoperative GB perforation was increasing with patient's age; Group III (perforated GB) had patient's age Mean±SD =42.83±12.67 y, while Groups I and II (non-perforated GB) had patient's age Mean±SD = 39.18±12.54 y and 36.95±11.25 y respectively. In Ibrahim A. Mohamed study.¹⁴ The perforation incidence rate was 29% and the same finding among sex group male to female (43% vs. 28%) also with increasing age (56 ±15 years vs. 52 ± 16).

Table 5: Regarding intraoperative gallbladder perforation during LC, comparison of our study versus some global studies

Author	Study Year	No. of patients	Gallbladder Perforation
Ibrahim A. Mohamed et al ¹⁴	2014	80	29%
A.I. Memon et al ¹⁶	2013	400	5%
Jawad Kathim S.Al-Dhahiry ¹⁵	2015	301	3.8%
Dhaval Patel ⁷	2015	300	10%
Soper et al ⁴	1991	250	32%
Peters et al ¹⁷	1991	283	40%
Our study	2016	473	30.23%

Incidence rates of port site infection of our study Groups I, II and III were; 9.18%, 0% and 1.38% respectively. Taj M N et al study¹⁸ reported similar results; port site infection occurred in 5.28 % of patients without using endobag while it was 0.20 % when using endobag. Our study had no intraperitoneal sepsis.

Wound infections can be prevented by; appropriate administration of antibiotic prophylaxis, sterile techniques and use of endobags for gallbladder and spilled gallstones extraction.¹⁹ Endobag facilitates collection of operative specimens, spilled gallstones and minimizes the chances of contamination of the abdominal cavity and the extraction port site.^{19,20}

In our study 4 patients (2.16%) belonged to Group I developed hernia at the extraction port site and only one patient (0.69%) belonged to Group II .This may be due to extention of fascial layers in Group II in order to extract the gallbladder, other cause was wound infection; 2 out of the 4 patients who developed hernia had post-operative wound infection. Memon et al¹⁶ reported 2.14% umbilical port site hernia despite use of endobag for gallbladder extraction.

The majority of our patients belong to low socioeconomic status. The traditional disposable endobag prices range from 14 -15 US \$ (endosac, Zenith medical), and 14 US \$ for (Dexdelac).²¹ A single pair of disposable sterile surgical glove cost is about 1/6 of US \$.¹⁶

CONCLUSION

This study revealed that usage of sterile surgical glove as an endobag is simple, economical and safe technique for extraction of gallbladder specimens and spilled gallstones. Also it shorten the operative time and reduces the septic complications of various laparoscopic procedures as well as LC. It can be used where the

traditional endobag is not available and in countries of low economy where the traditional endobag is relatively expensive.

ABBREVIATIONS

LC: Laparoscopic Cholecystectomy,
 GB: Gallbladder,
 M: Minute, Y: Year

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Source of Support: Nil. **Conflict of Interest:** None Declared.

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Cite this article as: Jawad Kadhim S. Al-Dhahiry, Hassan Khalil Melek, Tareq Khalid Abduljabbar. Laparoscopic Cholecystectomy: Use of the Surgical Glove for Extraction of Gallbladder and Spilled Gallstones Where Traditional Endobag is Not Available or Expensive. *Int J Med Res Prof.* 2017; 3(1):55-59.
DOI:10.21276/ijmrp.2017.3.1.010