ORIGINAL ARTICLE

Dry Mopping versus Saline Irrigation of Gall Bladder Fossa after Bile Spillage During Laparoscopic Cholecystectomy

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ABSTRACT

Introduction: Gallbladder perforation with bile spillage is common during laparoscopic cholecystectomy and may lead to complications ranging from mild inflammation to abscess formation. While saline irrigation with suction is traditionally used, some surgeons prefer dry mopping to limit contamination. The optimal approach remains controversial. This study compares peritoneal irrigation and aspiration versus dry mopping in terms of early and late postoperative outcomes.

Methods: An observational study was carried out in the department of General Surgery at Kathmandu Model Hospital Institute of Health Sciences/ Kritipur Hospital during the period of 6 months from June 2025 to November 2025, among all patients undergoing saline irrigation or dry mopping following biliary spillage when present during laparoscopic cholecystectomy.

Results: One hundred twenty patients were included, 60 patients in each group, 61.6% were female and the rest were male. Majority of the patients belonged to age group 39-55 years (median age 45) in both dry mopping group (group A) and saline irrigation group (group B). There was no significant difference in surgical site infection (SSI) between the two groups (p = 0.272). Dry mopping resulted in fewer surgical site infections, with similar intra-abdominal collection rates, while port site infections were higher in the saline irrigation group.

Conclusions: Dry mopping to be better than saline irrigation in terms of increased surgical site infection. There was no statistically significant correlation between intraoperative stone spillage and postoperative outcomes.

Keywords: Biliary spillage, dry mopping Laparoscopic cholecystectomy

INTRODUCTION

Laparoscopic cholecystectomy is the gold standard procedure for management of cholelithiasis.[1] About 10% to 15% of asymptomatic people and 20% of symptomatic patients develop gallstones.[2] Cholelithiasis prevalence is 5.9–21.9% in Western Europe and 2.44–6.45% in Nepal.[3] Laparoscopic cholecystectomy, the standard treatment for gallstones, carries risks such as bile spillage, bile duct injury and hemorrhage.[4] Gallbladder perforation commonly occurs during retraction, dissection, or extraction, especially in acutely inflamed, fragile gallbladders with omental adhesions.[5] Gallbladder perforation during laparoscopic cholecystectomy occurs in 6–40% of cases, influenced by surgeon experience, disease severity and surgical technique.[6] Gallbladder perforation does not worsen outcomes, but retained stones may rarely cause pain, fever, or abscess due to infection or bile-induced peritonitis.[7] During laparoscopic cholecystectomy,

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spilled bile is typically managed by retrieving stones and performing peritoneal irrigation with suction or dry mopping, though the optimal technique remains controversial.[8]

METHODS

This study was carried out in the department of General surgery at Kathmandu Model Hospital Institute of Health Sciences / Kritipur Hospital, during the period of six months from June 2025 to November 2025. All patients undergoing saline irrigation or dry mopping following biliary spillage when present during laparoscopic cholecystectomy were included in this study. Sample size was calculated as per standard formula;

Sample Size (n) = $2x (Z+Z)^2 x p x q / d^2$

n = the number of patients in each group, Z = constant at given alpha error, Z= constant at given beta error, p= incidence of the events, q= 1-p, d = difference between incidence of the events

So, from the study.[8]

p1 = 3.33%, p2 =13.33%, p= (p1+p2)/2 that is (3.33+13.33)/2 = 8.33%, q=100-p i/e 100-8.33 =91.67

d=13.33-3.33 = 10, z = 1.96 (95% confidence interval) and Z= 0.84 (power 80%).

n= $2 x (1.96+0.84)^2 \times (8.33x91.67) / 10^2$ = 120. 60 patients will be included in each group

Exclusion criteria were the patients presenting with malignancy, immunosuppression or coagulopathy and conversion to open cholecystectomy.

All patients included in this study were informed about the study and its objectives. Written informed consent was taken. Privacy and confidentiality were maintained. Data collection was started after getting letter of permission from Institutional Research Committee of public health concern trust, Nepal. All patients meeting the inclusion criteria were included in the group. Non probability consecutive sampling was done. All patient undergoing dry mopping after bile spillage were included in group A and those undergoing saline irrigation were included in group B. In Group A patients with bile spillage during cholecystectomy underwent suction of all spilled bile and evacuation of all visible stones followed by dry mopping of the gallbladder fossa with a gauze swab through the epigastric port. In Group B after suction of all bile and visible stones, the gallbladder fossa was washed with 250 ml of saline, and fluid was aspirated through the epigastric port. The gallbladder in both groups was removed from the umbilical port. In both groups, a single, one-off dose of broad-spectrum intravenous (IV) antibiotic of same company and same batch was given intra-operatively.

Predesigned proforma were used to record demographic details, perioperative factors, operative findings, management technique (dry mopping versus saline irrigation), postoperative pain (VAS), need for analgesics, duration of hospital stay, surgical site infection (SSI), and intra-abdominal collections, follow up (1 week) visits focused on wound status and any complications.

Data were collected and entered using SPSS version 26 software. For categorical variables; sex, SSI, intra-abdominal collection, analgesic requirement) descriptive statistics, including frequency and percentage, were presented. Median and interquartile range were used to represent numerical data. The Chi-square test and fisher exact test were applied for inferential analysis. Mann-Whitney U test was used to compare between two independent groups. A p-value of <0.05 was considered statistically significant.

RESULTS

Our study included a total of 120 patients. The detailed demographic distribution among study groups (Table 1). Both study groups included patients aged 20 - > 60 years of age, with most patients age group between 41-50 years of age. Group A included, 66.6% female patients and 33.3% male patients whereas, Group B included 56.6% female and 43.3 % male patients.

Table 1. Demographic distribution among study groups (n=120)

Age (in years)	Dry Mopping (n=60)	Saline Irrigation (n=60)	Total
Median (IQR)	43.0 (38.0-49.0)	48.0(43.0-56.0)	45.0 (39.0-55.0)
20 to 30	8 (13.3%)	2 (3.3%)	10 (8.3%)
31 to 40	14 (23.3%)	12 (20.0%)	26 (21.7%)
41 to 50	24 (40.0%)	24 (40.0%)	48 (40.0%)
51 to 60	12 (20.0%)	14 (23.3%)	26 (21.7%)
>60	2 (3.3%)	8 (13.3%)	10 (8.3%)
Female	40(66.6%)	34(56.6%)	74(61.6%)
Male	20(33.3%)	26(43.3%)	46(38.3%)
Weight (Kgs)	64.5(66.0-69.0)	68.5(65.0-72.0)	66.5(59.2-71.0)

The duration of hospital stay was similar in both groups, i.e., 2 days. Duration of surgery differed significantly between two groups. Study group A had a shorter median duration of surgery of 64.5 minutes compared to study group B, which had median duration of 68.5 minutes (Figure 1). No postoperative intra-abdominal collections were observed in either group, clinically or radiological assessed after 7th postoperative days

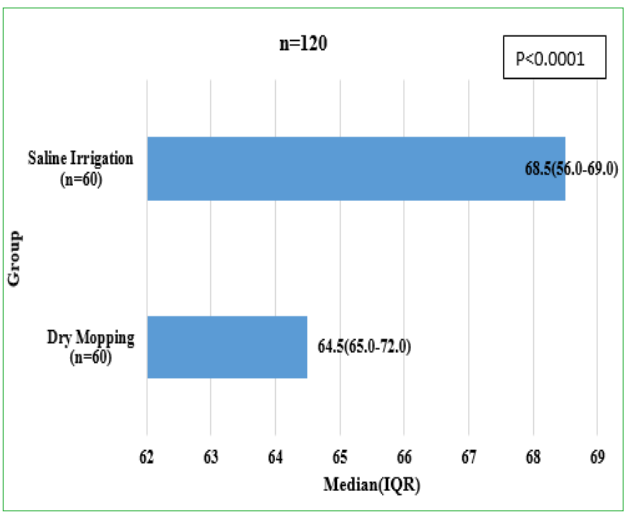

Figure 1: Comparison of duration of surgery between study groups.

In study group A, 2 patients (3.3%) developed SSI, compared to the study group B where 6 patients (10 %) developed SSI (Table 2). Although, the incidence of SSI was lower in study group A than study group B, the difference was not statistically significant (p= 0.272).

Table 2. Association of surgical site infection among study groups (n=120)

Surgical Site infection (SSI)	Groups		Total	P-value
	Dry Mopping (n=60)	Saline Irrigation (n=60)		
No	58 (96.7)	54 (90.0)	112 (93.3)	
Yes	2 (3.3)	6 (10.0)	8 (6.7)	0.272

DISCUSSION

In this study, the most common age of presentation was age group of 38.0-49.0 – median IQR 43 years in group A and 43-56 – median IQR 48 years in group B, with higher number of female patients compared to male patients in both groups, which is similar to the study.[2,8] This is explained by more prevalence of gall stones in 39-55 years and female gender.

In our study, the duration of hospital stay in both study groups was found to be equal, that is 2 days, which is not statistically significant (p value -1.000). However, in a study[2] showed, prolonged hospital stays in patients with saline irrigation due to pain and surgical site infection (p value-0.000).[2] In another study; bile spillage was associated with a longer hospital stay (median of 3 versus 2 days, p < 0.001).[12]

In the present study, as regard to bile spillage associated with SSI, SSI was observed in 3.3% (2) of patients in the dry mopping group (group A), compared to 10.0% (6) in the saline irrigation group (group B). Although the

difference was not statistically significant, the higher incidence of SSI in the saline irrigation group suggests a clinically important trend. This finding is consistent with existing literature, which indicates that bile spillage during laparoscopic cholecystectomy increases the risk of postoperative infection, particularly when bile dissemination within the peritoneal cavity is not adequately controlled.

In a randomized controlled trial comparing dry mopping and saline irrigation after bile spillage, reported a higher rate of port site infection in the saline irrigation group 6.6% (2), while the dry mopping group demonstrated no incidence of SSI, indicating better postoperative outcomes.[8] Their findings support the results of the present study and reinforce the hypothesis that saline irrigation may spread bile and bacteria over a wider peritoneal surface, thereby increasing the risk of SSI.

In a cross-sectional study comparing outcomes of patients following saline irrigation versus dry mopping, showed an increased incidence of SSI in saline irrigation group versus dry mopping group, which was statistically significant (p value 0.000).[2]

Similarly, the prevalence of surgical site infection (SSI) to be significantly, higher in bile spillage group compared to the non-spillage group, which was statistically significant ($p<0.05$).[10]Another study, showed there was no significant association between, surgical site infection and bile spillage and non-bile spillage groups (p value 0.584).[12]

In our study, both the study groups showed no evidence of post-operative intra-abdominal collection, indicating no statistical difference. In a study[8] one patient from dry mopping group experienced abdominal collection postoperatively, whereas in saline irrigation group, two patients had abdominal collection. Although these results are statistically insignificant, the study shows low incidence of complications following dry mopping after stone retrieval post biliary spillage.[8] Due to small sample size and shorter follow up, the findings of this study may not be generalizable to other studies. So, it is desirable that larger trials with a bigger sample size and longer duration of follow up for evaluating long term success rate of dry mopping versus saline irrigation after bile spillage during laparoscopic cholecystectomy.

CONCLUSION

Dry mopping to be better than saline irrigation in terms of increased surgical site infection however, it was not statistically significant. Further study with larger sample size can be done for further evaluation is recommended.

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