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A Hospital Based Study on the Frequency of Bile and Gall Stone Spill during Laparoscopic Cholecystectomy and Its Significance in the Postoperative Period

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Abstract: *Laparoscopic surgery is now the gold standard in the management of gallbladderdiseases as for many other surgical conditions.[3] The advantages of laparoscopic overopen cholecystectomy are many as reported throughout the world and includes lesspost-operative pain, earlier return of bowel function, shorter length of hospital stay,earlier return to full activity, improved cosmesis and decreased overall cost.[3-7]Laparoscopic cholecystectomy is however not without drawbacks. Two operativecomplications, namely bile duct injury and complications due to spillage of stone/bilewithin the peritoneal cavity are reported to occur with greater frequency duringlaparoscopic cholecystectomy.[8-10] Several studies have shown that the incidence inspilled gallstones during laparoscopic cholecystectomy is about 5-40% of thesurgeries performed, while incidence of stone loss is unknown.[11] In our study wehave compared the demographic profile, preoperative and postoperative clinical,hematological, biochemical, radiological and intraoperative parameters in patientswith spillage of bile and/or gallstone with those not having any spillage.*

Aims and Objectives –

1. To study the frequency of bile and gall stone spillage during laparoscopic cholecystectomy in our setup in so called simple & difficult gall bladder.

2. To assess the significance of gall stone and bile spillage in post-operative patients after laparoscopic cholecystectomy.

Material and Methods – *The study was conducted in two years on a total of 300 patients of gall bladder disease admitted for laparoscopic cholecystectomy throughout patient department/Emergency in Subharti medical college in whom laparoscopic cholecystectomy wasattempted.*

Result - *This prospective study was conducted in the Department of General Surgery Subharti Medical College, Meerut (U.P) over a period of three years.300 patients satisfying the inclusion and exclusion criteria that underwent laparoscopic cholecystectomy were analyzed.Our efforts have been directed towards evaluating the frequency ofbile and gallstone spill during laparoscopic cholecystectomy and its significance in thepostoperative period of these patients for better management. Our study also reveals that there is extra time lag between simple and difficult laparoscopiccholecystectomy.*

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I. Introduction

Biliary tract disorders are one of the commonest abdominal conditions that the surgeons, gastroenterologists and radiologists come across,complications like bile duct injury and complications due to spillage of stone/bile within the peritoneal cavity are reported to occur with greater frequency during laparoscopic cholecystectomy. The sequelae of spilled gallstones after Laparoscopic cholecystectomy (LC) and the occurring complications may go unnoticed for a long time and can be a diagnostic challenge. The aim of this survey was to study the knowledge, attitude, and practices of surgeons regarding spilled gallstones during LC.Bile leakages can be diagnosed soon after operation, but intra-peritoneal gallstone spillage may be manifested months to years after operation, and has a confusing preservation, leading to further diagnostic

examinations. Most such diagnostic tests are time consuming and expensive because gallstone spillage can have long-term unwanted consequences, conversion to laparotomy as an instant management tool is one of the topics under discussion in laparoscopic cholecystectomy. we discuss the option of not converting to laparotomy after intra-peritoneal gallstone spillage as an acceptable approach to management and proper management of various complications due to spillage.Laparoscopic Cholecystectomy is preferred both by surgeons and patients. After this operation patients are usually ambulatory on the following day. They can be given normal diet and can be discharged in 24-48 hrs or even on the same day [47] the mortality rate in Laparoscopic Cholecystectomy is 1.9% versus 7.7% and overall complication rate is 1% versus 5% when compared to Open Cholecystectomy [48]. Conversion to Open Cholecystectomy is required in 7% of patients undergoing Laparoscopic Cholecystectomy [49]. Laparoscopic Cholecystectomy may be rendered difficult by various problems encountered during surgery such as difficulties in accessing the peritoneal cavity, creating a pneumo-peritoneum, bleeding, dissection of Calot's triangle, dissection of gallbladder wall, spillage of bile, spillage of stone, and difficulty of gallbladder extraction which may require conversion to open cholecystectomy. These may be due to acute inflammation, aberrant anatomy, adhesions, unexpected operative abnormal findings, iatrogenic injuries, obesity and equipment failure.

II. Material and Methods

The present study was conducted in two years on patients of gall bladder disease admitted for laparoscopic cholecystectomy throughout patient department /Emergency in CSSH, SMC in whom laparoscopic cholecystectomy was attempted. Data was entered in Excel Sheets, master chart prepared and multivariate statistical analysis was performed using Chi- Square test via SPSS 25.0 software.

INCLUSION CRITERIA

□ □ Patients withcholelithiasis proven by USG with at least one attack of upper abdominal pain and considered fit for laparoscopic cholecystectomy were included in the study

EXCLUSION CRITERIA:

□ □ The patient with suspected CBD stones on USG
□ □ The patient had clinical or USG suspected diagnosis of CA gall bladder
□ □ Pregnancy
□□ The patients not fit for general anesthesiadue to various medical illness and bleeding disorders.
□ □ Peritonitis
□ □ Converted to open surgery

PRE-OPERATIVE SCANNING:

The patients were worked up thoroughly and subjected to:
□ □ Detailed history and clinicalexamination.
□ □ Routine hematologicalinvestigation: Hb, TLC ,DLC, PT, APTT, INR
□ □ Biochemical investigation: RFT, RBS
□ □ Viral markers: HCV, HBsAg, HIV 1&2
□ □ Liver function test: S. Bilirubin, SGOT, SGPT, S. Alkaline phosphatase
□ □ Abdominal USG Features
□ □ GB distended / contracted
□ □ GB Wall thickness
□ □ USG Murphy's sign
□ □ Pericholecystic fluid
□ □ Stone:
o single or multiple
o Size of largest stone
o Impacted stone at Hartmann's pouch
□ □ ECG
□ □ Preanesthetic check-up.

PRE-OPERATIVE PREPRATION:

Case of Acute and chronic cholecystitis with cholelithiasis were included in the study. Viral marker for HBsAg and HCV were tested prior to surgery and informed consent for HIV testing was taken prior to HIV test. Informed consent for surgery was obtained. On pre-operative night tablet alprazolam 0.25mg, tab ranitidine

and bisacodyl (dulcolax) was given. The patients were kept fasting after mid night. On next morning in ceftriaxone 1gm i.v.as prophylactic antibiotic 1 hr. before induction of anesthesia was given, and patient being asked to void urine immediately before being shifted in OT.

OPERATIVE PROCEDURE:
Laparoscopic/open cholecystectomy was performed under general anesthesia with intubation and controlled ventilation with four port technique.

INTRA-OPERATIVE ANALYSIS:
During the procedure careful notes were made of:
1.Anaesthesia time

2.LAPROSCOPIC CHOLECYSTECTOMY
a. Simple
b. Difficult-
 Comorbidities
 Previous abdominal surgery
 Hematological abnormality
 Significant USG findings

Intra-op findings
 GB visualization
GB visualization out of liver margin>4cm.
GB adhered with omentum, intestine and
stomach.
Difficult grasping of GB fundus.
 Calot's triangle dissection
Impacted stone in neck of gall bladder.
Excessive fat over calot's triangle.
Posterior fold visualization.
 GB dissection from liver bed
o GB distended
o Gb inflamed
o Obesity
o Mirizzi syndrome
 GB extraction from the port
Single large stone.
Multiple stones.
Inflamed GB
3.a. Rupture of gall bladder with spillage of stone/ bile
b. Step of operation at which spillage occurred
o Calot's triangle dissection
o GB dissection from liver bed
o GB extraction from the port
4.If spill present then the method of cleaning used and if cleaning was complete or incomplete
5.Other findings if any.

POST OPERATIVE ANALYSIS
 Gall bladder Mucosa after operation
 Number of Stone/Type of stone/site of stone in the gall bladder.
 Post-operative clinical course of patient
 period after which oral intake was allowed
 post-operative problems such as nausea, vomiting
 Antibiotic coverage, painkiller and Proton pump inhibitor will be given.
 how many hours after surgery was patient mobilized.
 Any post-operative complications such as bile leak, jaundice, diarrhea, fever
, incision site pain, infection and drain content
 Day of drain removal

FOLLOW UP

Patient were called for follow up on weekly basis for next two weeks and surgical site were assessed.
The data collected was tabulated and the same were subjected to suitable statistical analysis as per Performa attached.

III. Results

The study was performed with a total of 300 patients out of which 227 patients underwent simple laparoscopic cholecystectomy and 73 underwent difficult laparoscopic cholecystectomy. This has been defined based on the following parameters i.e. Pre-operative scanning, Intra-operative Analysis and Post-operative analysis.

LAP CHOLECYSTECTOMY	NO.OF PATIENTS	PERCENTAGE
SIMPLE	227	75.66%
DIFFICULT	73	24.34%

Simple and difficult laparoscopic cholecystectomy was categorized due to various factors but our study is emphasized on the intra-op analysis which revealed the following data.

Intra-Op Findings		Patient Distribution	Percentage
Calot's triangle dissection	Simple	284	94.67%
	Difficult	16	5.33%
GB Dissection From Liver bed	Simple	274	91.33%
	Difficult	26	8.67%
GB Extraction From port	Simple	277	92.33%
	Difficult	23	7.67%

These intra-op findings lead to gall bladder rupture and show the frequency of spillage of bile and spillage of gall stone.

INTRA-OP		Patient Distribution	Percentage
GB Rupture	Present	63	21.00%
	Absent	237	79.00%
Bile spillage	Present	63	21.00%
	Absent	237	79.00%
Gall stone spillage	Present	56	18.66%
	Absent	244	81.33%

Furthermore this study also revealed the stage of spillage of bile and gall bladder stone.

Stage of spillage	Bile spillage	Percentage	Gb stone spillage	Percentage
Calot's dissection	2	3.17%	1	1.78%
Gb dissection from liver	55	87.30%	40	71.42%
Gb extraction from the port	6	9.52%	15	26.78%
Total	63	100%	56%	100%

Now our study is directed towards the post-op complications of laparoscopic cholecystectomy and also reveal the data that how bile spillage and gall bladder stone spillage are directly proportional to post-op complications which are categorized in the following table.

POST-OP COMPLICATIONS		Patient Distribution	PERCENTAGE
Incision site pain	Present	23	7.67%
	Absent	277	92.33%
Fever	Present	24	8.0%
	Absent	276	92%
Vomiting	Present	28	9.33%
	Absent	272	90.66%
Jaundice	Present	12	4.0%
	Absent	288	96%
Tachycardia	Present	31	10.33%
	Absent	269	89.67%

Post-Op Complications	Bile Spillage				Chi-Square Test	p - Value
	Present	%	Absent	%		
Incision Site Pain	18	78.26%	5	21.34%	49.231	00.000
Fever	17	70.80%	7	29.20%	39.050	00.000
Vomiting	18	64.28%	10	35.72%	34.878	00.000
Jaundice	3	13.63%	19	86.36%	00.776	00.378
Tachycardia	19	61.29%	12	38.71%	33.829	00.000

Post-Op Complications	Gall Stone Spillage				Chi-Square Test	p - Value
	Present	%	Absent	%		
Incision Site Pain	16	59.25%	7	40.75%	42.505	00.000
Fever	16	66.66%	8	33.33%	36.589	00.000
Vomiting	17	60.71%	11	39.29%	35.963	00.000
Jaundice	3	25.00%	9	75.00%	00.396	00.529
Tachycardia	17	54.83%	14	45.17%	29.795	00.000

STATISTICAL ANALYSIS

The Association between Post-op findings i.e. Incision Site Pain, Fever, Vomiting andTachycardia and Intra-op findings Gall Stone Spillage and Bile Spillage is statistically significant since the p– Value is less than 'α' (α = 0.05). It shows that the occurrence of Gall Stone Spillage and Bile Spillage in a patient (Intra-op) highly effects the occurrence of Incision Site Pain, Fever,Vomiting and Tachycardia in the patient Post-operatively.It also Shows that the Post-op Finding i.e. Jaundice and Intra-op Finding i.e. GallStone Spillage and Bile Spillageare not statistically significant since the p – Value is more than 'α' (α = 0.05). Itshows that the occurrence of Gall Stone Spillage and Bile Spillage in a patient Intra-operatively doesnot affect the occurrence of jaundice in the patient Post-operatively.

On broad spectrum if we compare the difficulty of laparoscopic cholecystectomy and the post-op complications we get the following data.

Post-Op Complications	Laparoscopic Cholecystectomy				Chi – Square Test	P – Value
	Simple	%	Difficult	%		
Incision Site Pain	0	0%	23	100%	77.459	00.000
Fever	7	29.17%	17	70.83%	30.635	00.000
Vomiting	10	35.71%	18	64.29%	26.773	00.000
Jaundice	8	66.66%	4	33.33%	00.488	00.485
Tachycardia	7	22.25%	24	77.41%	52.916	00.000

STATISTICAL ANALYSIS

The Association between Post-op findings i.e. Incision Site Pain, Fever, Vomiting andTachycardia and the Difficulty Level of Laparoscopic Cholecystectomy is highlysignificant since the p – Value is less than 'α' (α = 0.05). It shows that DifficultyLevel of Laparoscopic Cholecystectomy highly effects the occurrence of Incision SitePain, Fever, Vomiting and Tachycardia in the patient Post-operatively.It also Shows that the Post-op Finding i.e. Jaundice and and the Difficulty Level ofLaparoscopic Cholecystectomy is not significant since the p – Value is more than 'α'(α = 0.05). It shows that Difficulty Level of Laparoscopic Cholecystectomy does noteffect the occurrence of Jaundice in the patient Post-operatively.

Our study also revealed that there is an extra time lag between simple and difficult laparoscopic cholecystectomy.

INTRAOP FINDING	Min Time	Max Time	Avg Time
Simple cholecystectomy	20 mins	42 mins	28.52 mins
Difficult Cholecystectomy with bile/stone spillage	30 mins	68 mins	49.00 mins

Thus this study is helpful giving data about frequency of bile spillage and gall stone spillage and its post-operative complications and the time lag between simple and difficult laparoscopic cholecystectomy. This study reflets that during surgery and after the surgery surgeon has to look for the complications followed by its corrective management.

IV. Discussion

Several factors have been found to categorize simple and difficult laparoscopic cholecystectomy, criteria include on pre-operative findings, intra-op findings and post-op complications. This prospective study was conducted in the department of general surgery of subharti medical college. 300 patients who satisfied the selection and exclusion criteria underwent laparoscopic cholecystectomy and factors that predict simple and difficult laparoscopic cholecystectomy were analysed also, such prediction may allow a surgeon to be better prepared, to take extra precautions to reduce intra-operative complications, post-op complications and reduced time period of surgery.

Presenting sign/symptoms and blood investigations:

In present study patient presenting with upper abdominal pain (100%), flatulence in 48.33%, vomiting in 19% and fever (10.33%), positive murphey's sign (25.33%), Abdominal Fullness in 41.33% with abnormal CBC count (13.67%) and deranged LFT (10.67%). This might be due to firmly adhesions that made dissections difficult and lack of plane of cleavage between gall bladder and liver bed.

Nanchang and supe et al (2005) [83]

Analyzed and co relate the relation between prior attacks of acute cholecystitis and acute pancreatitis with difficulty in laparoscopic dissection due to dense adhesions and fibrotic gall bladder

GABRIEL R et al (2009)[95]correlate duration of biliary colic and positive Murphy's sign with difficult dissection and poor visualizing the proper anatomy.

Ultrasonographical Findings:

In present study gall bladder distension was seen in 68 patients (22.67%) and GB contraction was seen in 232 patients (77.33%), thickened wall of the gallbladder>3mm seen in 299 patients (99.67%), pericholecystic fluid present in 41 patients (13.67%),mucocoele in 2% patients, empyema in 13%, and impacted stone in 6.33% measured pre-operatively by ultrasound associated with bleeding, difficult dissection, difficult extraction of gallbladder with more operative time

Gupta G et al (2015)[110] proved significantly association between gallbladder wall thickness, gallbladder stone size, impacted stone with difficult laparoscopic cholecystectomy and conversion,

Nanchang and supe (2005) [83] reported significant relation between difficult in gallbladder dissection, extraction of stone with gallbladder wall thickness and stone size>10mm and not with number of stones.

Nabil A.Abdelbaki (2006) [84] statically proved significance between solitary large stone, gallbladder wall thickness >3mm with prolonged operative time due to difficulty during grasping of gallbladder and gallbladder dissection.

Sharma SK et al (2007) [90] analysed that thickened wall of the gallbladder>3mm, size of the stone>10mm, and impacted stone measured pre-operatively by ultrasound associated with difficult laparoscopic cholecystectomy.

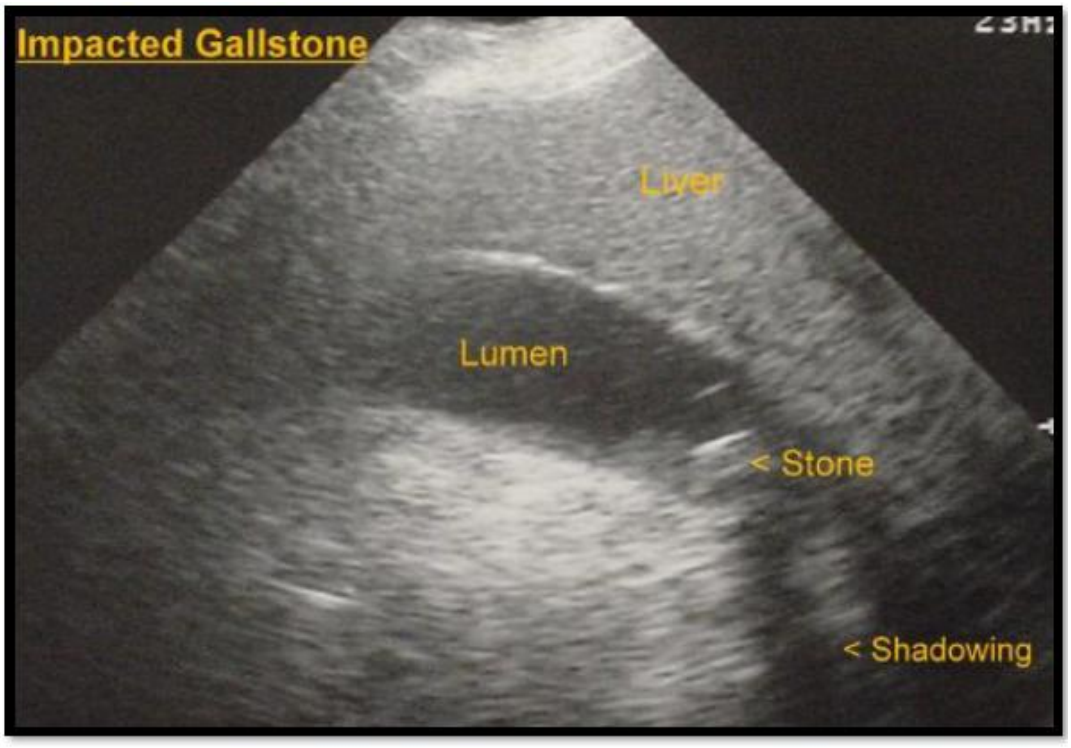

FIG 15: ULTRASOUND SHOWING IMPACTED GALLSTONE.

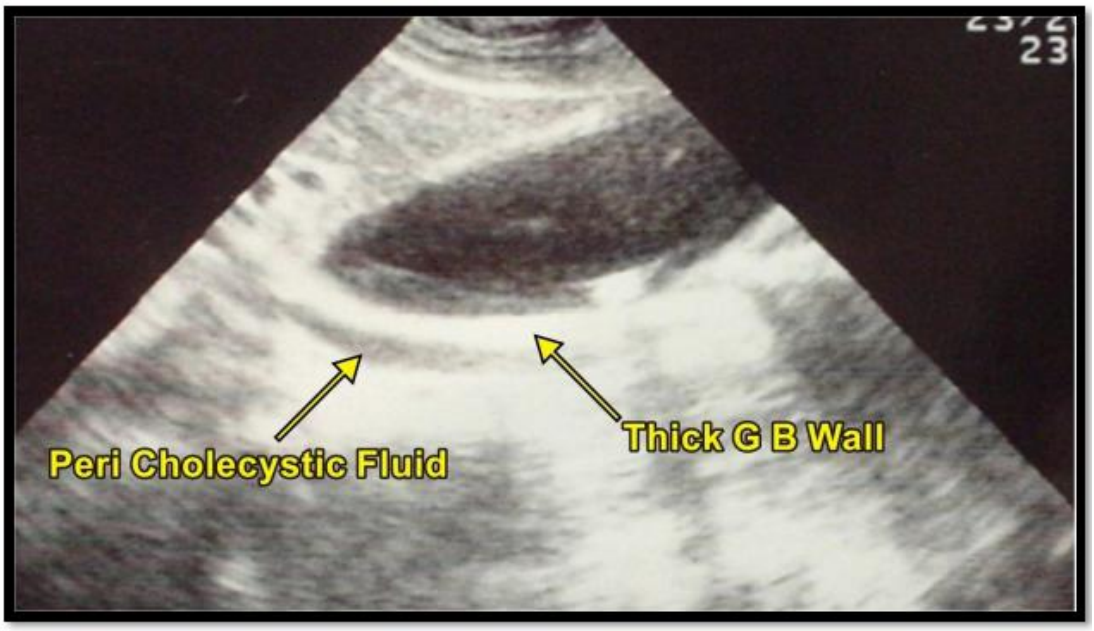

FIG 16: ULTRASOUND SHOWING PERI CHOLECYSTIC FLUID AND THICK G B WALL.

FIG 17: ULTRASOUND SHOWING DISTENDED GALL BLADDER WITH DISTAL ACOUSTIC SHADOW.

FIG 18: ULTRASOUND SHOWING DISTENDED GALL BLADDER WITH MULTIPLE DISTAL ACOUSTIC SHADOWS.

INTRA OP FINDING

In present study of 300 patients, number of cases of gall bladder rupture was 63(21%), occurrence of bile spillage was 63(21%) and gall stone spillage was 56(18.66%).

Rice DC, et al (1997) [44]. Dense adhesions around the gallbladder make dissection potentially more difficult, and a tense, distended gallbladder that has not been decompressed is at risk of perforation. This may occur when the gallbladder is manipulated by laparoscopic instruments or during dissection from the liver bed.

Spilled stones may also be caused by the slipping of the cystic duct clip or the tearing of the gallbladder when it is being retrieved from the port site.

Jasim D Saud(2011)[100] If spillage occurs, first and foremost thing to do is to do normal saline irrigation of peritoneal cavity and aspiration. All attempts should be made to retrieve all gall stones laparoscopically. It should not be considered as an indication to convert the procedure to open one. Following steps are recommended during laparoscopic cholecysctectomy in case of spillage: Informed consent from patient and family should be obtained. They should be told that dropped stones are common depending on the size of stones and condition of the gallbladder wall and liver bed.

FIG 21: SPILLAGE OF BILE

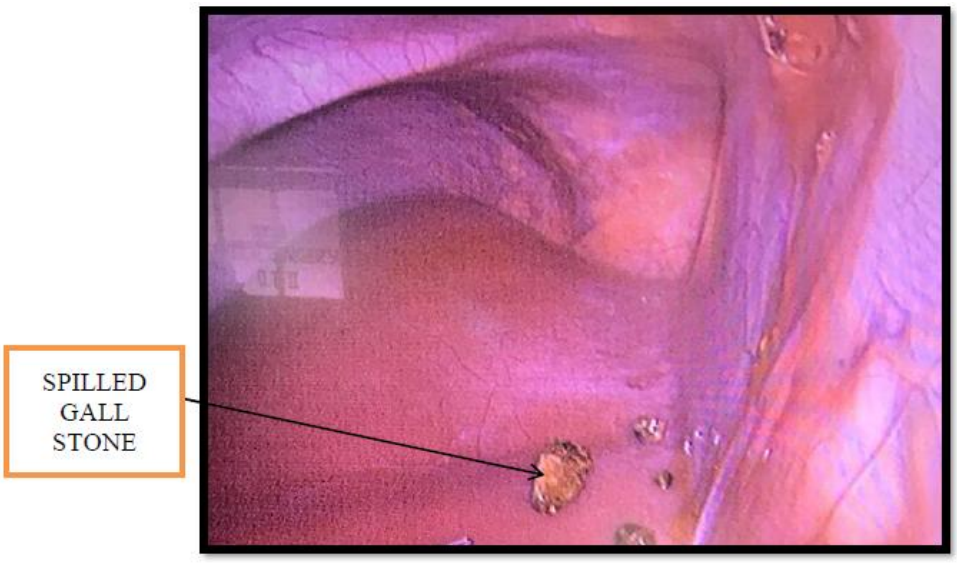

FIG 22: SPILLAGE OF GALL STONE IN PERITONAL CAVITY

POST OPERATIVE COMPLICATION

In present study of 300 patients, incision site pain occurred in 7.67%, fever occurred in 8.0%, vomiting occurred in 9.33%, jaundice occurred in 4.0% and tachycardia occurred in 10.33%.

Statistical analysis was done to find out the association between the Post-Op Complications and the Intra-Op Findings. Chi-Square Test and Automated Computer Software SPSS (ver 25.0) was used to calculate the p – value. 'α' was taken as 0.05.

On analysis the Post-op Complications Incision Site pain, Fever, Vomiting and Tachycardia showed strong Association with the Intra-Op Findings Bile Spillage, Gall Stone Spillage and a Difficult Laparoscopic Cholecystectomy. On the other hand, the Intra-Op Complication of Jaundice showed no association with Bile spillage and Gall Stone Spillage Intra-operatively or Difficult Laparoscopic Cholecystectomy.

V. Conclusion

In conclusion, gallstones are still a major cause of undergoing surgery worldwide. Gallstones can be classified according to their composition into cholesterol, mixed, or pigment gallstones. Symptomatic cases usually present with right upper quadrant pain that is associated with fatty meals and more common at night.
Biliary colic and the presence of stones on imaging confirm the diagnosis of chronic cholecystitis.

Complications of gallstones can include choledocholithiasis, gallstone ileus, and acute gallstone pancreatitis.

Normally, treatment is only indicated for symptomatic patients, unless other risk factors for disease progression are present. The general management and treatment of gallstones have not changed much recently. However, the methods and techniques have improved dramatically. Laparoscopic cholecystectomy is considered today as one of the most important interventions in treating gallstones.

Our study has shown that frequency of bile spillage is 21% and gall stone spillage 18.66% during laparoscopic cholecystectomy. Study also reveals that gall bladder rupture leads to bile spillage in every patient, but it isn't essential that gall bladder rupture will always show gall stone spillage.
Hence incidence of bile spillage will always be more than gall bladder stone spillage.

Intra operative analysis like calot's triangle dissection, gall bladder from liver bed and gall bladder extraction from the port with other co-factors like co-morbidities, previous abdominal surgery, raised ALP, abnormal USG findings etc help us to determine whether laparoscopic cholecystectomy is simple or difficult.
Bile spillage and gall stone spillage during laparoscopic cholecystectomy commonly give rise to post-operative complications like pain at the port site, fever, port site injection. Occasionally vomiting, jaundice and tachycardia may also be seen. Our study also reveals that there is an extra 41%-time lag between simple and difficult laparoscopic cholecystectomy (bile/stone spillage). This study also reflects that after surgery, surgeon must look for post-operative complication followed by its corrective management.

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