Consequences of Spilt Gallstones During Laparoscopic Cholecystectomy

Suvi Virupaksha

Received: 27 January 2012 / Accepted: 5 June 2012 / Published online: 4 July 2012
© Association of Surgeons of India 2012

Abstract To document the incidence of spilt gallstones during laparoscopic cholecystectomy, the cause and consequences of such spillage. The study included 150 consecutive laparoscopic cholecystectomies performed between October 2007 and November 2008. Data was collected in a prospective manner in accordance to proforma. Follow up were performed at the end of 1 week, 1 month, 6 months and 1 year. The spillage of gall stones during surgery occurred in 19.04 % of the cases. Majority of the spillage occurred due to perforation of the gall bladder during dissection, followed by application of toothed grasper. Although all visible spilt stones were retrieved during surgery, complication rate of 0.66 % was observed. The incidence and complications secondary to the spillage of gall stones during standard laparoscopic cholecystectomy is low but avoidable. Various complications can occur, over a large period of time. Thus it is advisable to retrieve as many gallstones as possible short of converting to a laparotomy Dasari and Loan (JLS 13(1):73–76, 2009), Daradkeh and Suwan (World J Surg 22:75–77, 1998).

Keywords Laparoscopic cholecystectomy · Gall stone spillage · Unretrieved intraperitoneal gallstones

Introduction

Laparoscopic cholecystectomy (LC) has been the gold standard for symptomatic gallstones for 15 years. Over time, the

rate of common bile duct injuries from LC has declined. Unfortunately, the incidence of spillage of gallstones has remained unchanged.

Gallbladder perforation with stone spillage into the peritoneal cavity is more frequent with laparoscopic cholecystectomy as compared with open cholecystectomy. Early reports on laparoscopic cholecystectomy stated that stones left in the peritoneal cavity had no deleterious effect [1]. Although the incidence of spilt gallstones and their complications are low, they are of large variety [2]. Thus, it makes a significant problem. The variety of complications caused by lost gallstones [3–5] may range from simple surgical site infection to more serious forms like broncholithiasis.

The incidence of complications related to spillage of gallstones during laparoscopic cholecystectomy as per international data ranges between 2.3 and 7 %. This incidence increases by greater than twofold when the stones are unretrieved [3].

Aim

- To document the incidence of gallstone spillage during laparoscopic cholecystectomy
- To document the causes of gallstones spillage
- To document the consequences of spilt gallstones

Materials and Methods

The study includes 150 consecutive cases of laparoscopic cholecystectomy performed between October 2007 and November 2008. The surgeries were performed by six different consultant surgeons.

A prospective collection of data was obtained in accordance with the pro forma which documented patients' details,

Presentation Details Venue: Bangalore surgical society meet December 2010; Bellari surgical meet 2011 February

S. Virupaksha (✉)
Department of General and Laparoscopic Surgery, Sagar Hospital,
Jayanagar, Bangalore,
41 Sixcon Apts Flat 3G, Srinivagilu Main Road, Ejipura,
Bangalore 560047 Karnataka, India
e-mail: suvi_v@yahoo.com

Table 1 Ultrasound findings

Size of GB	88(normal)	58 (distended)	1 (contracted)
Presence of sludge	15		
Number of stones	3 (none)	10 (single)	135(multiple)
GB wall thickness	29(>3 mm)		
CBD size	15(>7 mm)		
Site of Stone	141(mobile)	4(impacted)	
Size of stone	130(<10)	24(11–20)	2(>20)

diagnosis, preoperative physical and ultrasound abdomen findings, intraoperative details such as technique, spillage of stones, cause for spillage, method and port of extraction of specimen, duration of surgery and postoperative events, and complications.

The follow-up was performed at the end of 1 week and 1 month, 6 months and 1 year postoperative. The reviews at 1 week were in the outpatient department, at 1 month some were outpatient visits, rest being telephonic interviews, and the remaining follow-up at 6 months and 1 year was performed by telephonic interviews.

Data collated were analyzed for incidence of spillage of gallstones and complications related to such events during laparoscopic cholecystectomy.

Results

Our study included 150 consecutive laparoscopic cholecystectomy patients between October 2007 and November 2008. Of these, 92 patients were female and the remaining 58 patients were male. The average age of the study group was 48 years. Of these 150 patients, 3 patients underwent conversion to open cholecystectomy due to the following:

- Extensive dense adhesions in 2 cases
- Inadvertent duodenal perforation in 1 case

Thus, it accounts for a conversion rate of 2 %.

Majority of the patients came with complaints of pain in the right upper quadrant and/or epigastric region. Second most frequently encountered complaint was that of nonspecific dyspepsia. A total of 39 patients had diabetes mellitus.

Of the total study group, 78 % patients had uncomplicated symptomatic gallstones, 3.33 % accounted for incidentally detected asymptomatic gallstones, 0.66 % had gallbladder polyps, 16.66 % accounted for gallstone complications (such as gallstone pancreatitis, cholecystitis, obstructive jaundice, Mirizzi's syndrome, mucocoele, and empyema gallbladder), and 1.33 % had acalculous cholecystitis.

Table 1 represents the preoperative ultrasound findings. In this table, the cut-off for normal thickness of gallbladder wall was taken as <3 mm and that for Common bile duct as <7 mm. Increased wall thickness implied inflammation. A dilated common bile duct implicated either a stone, a stricture in the distal CBD, or a passed stone. Majority of the patients exhibited multiple gallstones of <1 cm and mobile.

The duration of surgery was noted to be between 30 and 60 min in 87.75 % cases. Adhesions of varying degrees were noted in 71.8 % cases leading to conversion of 1.33 %. Minimal bleeding was noted in 51.35 % cases and moderate bleeding was noted in 37.16 % cases, while no bleeding was noted in 10.2 % cases. Gallstone spillage occurred in 19.04 % cases. In 67.85 % of these cases, three to five stones were spilt. In 32.14 % cases less than two stones were spilt, and in 7.14 % cases more than five stones were spilt. Peritoneal toileting was done in 53.74 % cases. All visible peritoneal stones were completely retrieved. Details of the intraoperative findings are shown in Table 2.

Table 3 represents mechanism for spillage of gallstones. It was apparent that gallbladder perforation led to spillage in all cases. The most common case for gallbladder perforation was dissection, followed by the application of tooth grasper to the gallbladder. The least traumatic method was application of nontooth grasper to the gallbladder.

Table 4 delineates the postoperative events and observations noted during follow-up. Prior to discharge two patients developed collections in the gallbladder fossa.

1. Hematoma secondary to slipped cystic artery clip which was corrected following a relook surgery.
2. A biliary leak from the cystic duct stump with loculated collection was encountered in another patient which was managed conservatively.

Table 2 Intraoperative finding

Surgery duration	6(<30 min)	129(30–60 min)	12(60–90mins)	2(>90mins)
Extension of incision	4			
Spilt stones	28			
Wash given(ml)	59(<250 ml)	20(>250 ml)		
Bleeding	15(none)	76(minimal)	55(moderate)	1(severe)
Port of extraction	91(umbilicus)	56(epigastrium)		
Adhesion	88(partial)	12(complete)	7(dense)	

Table 3 Mechanism for spillage

Mechanism of spillage	#
Tooth grasper	21
Non toothed grasper	2
During traction	15
During dissection (blunt & sharp dissection)	33

At the 1-week postoperative follow-up, one patient complained of pain and discharge at the umbilical port site. On removal of the suture, wound dehiscence was noted. Further exploration of wound on OPD basis revealed a gallstone in the subcutaneous plain. Another patient was readmitted for pancreatitis and found to have CBD sludge on investigations, which was managed by endoscopic retrograde cholangiopancreatography and sphincterotomy.

In our study, we observed a complication rate of 2.66 % for laparoscopic cholecystectomy; however, complication rate from spilt gallstones was 0.66 %. The world literature has documented complication rates for spilt gallstones to range between 1.3 and 2.3 % for retrieved stones and as high as 7 % for unretrieved stones.

No complaints related to the surgery were observed at 1, 6, and 12 months of postoperative follow-up. In our study, 5 patients were lost to follow-up, of which 3 patients had documented spillage of gallstones.

Discussion

Cholecystectomy has evolved from open to laparoscopic approach over the past decade [6], laparoscopy being the current gold standard for treating gallstone disease.

One of the issues that have come up in the recent years with laparoscopic cholecystectomy is the unchanged incidence of

Table 5 Comparison between our study and international data

Parameters	Our study	International data
Spillage of gall stones[5]	18.91 %	2 %–11 %
Complications related to spilt gallstones[22–26, 29–34]	0.66 %	2.3 % for retrieved stones 7 % for unretrieved stones
Gallbladder perforation[13, 18–21, 35]	18.26 %	11.6 % to 20 %
Unretrieved intraperitoneal stones[8, 10, 11]	0	2.4 % to 4 %
Follow-up period[13]	12 months	44.8 months (4.9 to 92.3)

bile and gallstone spillage into the abdominal cavity. The reason for this includes limited space for dissection, issues with instrumentation that causes laceration of the gallbladder wall, and the tendency to deal with acute friable gallbladders as the experience of surgeons for this procedure has increased.

The fate of spilt gallstones is not clearly known. In the earlier era of laparoscopic cholecystectomy, it was recommended that spilt gallstones are harmless and can be left alone [7, 8]. Earlier reports by Clinc in the beginning of the era of laparoscopic cholecystectomy claim no deleterious effect from spilt gallstones left in the peritoneal cavity through rat models [7]. Similar conclusions were drawn by Welch with animal models [8].

However as data accrued, several complications were reported. Brockmann's study published in 2002 included 116 papers derived from a Medline search looked into a total of 91 cases of gallstone complications following laparoscopic cholecystectomy over a period of 8 years. They concluded that gallbladder perforation and stone spillage might cause hazardous complications, and in case of loss of numerous or large pigmented stones conversion to open surgery may be justified [9].

Some of these complications are not so significant, while some others are very significant which include abscess in the abdominal wall, broncholithiasis, stone expectoration, cellulites, dyspareunia, erosion to the back, fat necrosis posterior of the rectus muscle, fever, fistula formation, gallstone granuloma, gluteal abscess, granulomatous peritonitis mimicking endometriosis, ileus, intestinal obstruction, implantation malignancy, incarcerated hernia, intra-abdominal abscess, jaundice, liver abscess mimicking malignancy, middle colic artery thrombosis, mimicking acute appendicitis, paracolic abscess, paraumbilical tumor, peritoneal abscess formation, pelvic abscess, pelvic stones, peritonitis, pleural empyema, fluid collections, pneumonia, port site stones, port site abscess, recurrent staphylococcal bacteremia, retrohepatic abscess, retroperitoneal abscess, retroperitoneal actinomycosis, right flank abscess, small bowel obstruction, stones in gastrocolic omentum, stones in hernia

Table 4 Postoperative details (As Inpatient)

Parameters	While in hospital	1 week post op	1 month	6 months	1 year
Fever	7	0	0	0	0
Pain abdomen	33	2	0	0	0
Referred pain to shoulder	10	0	–	–	–
Post-op WBC	2	1	0	0	0
Post-op ultrasound	3	1	0	0	0
Abnormal ultrasound	2	1	0	0	0
Average days in hospital	2.51	–	–	–	–
Discharge/Sinus	0	1	0	0	0
Intestinal obstruction	0	0	0	0	0
Lost for follow up	0	0	4	5	5

sac, stones of the ovary, stone of the fallopian tube, sub-hepatic abscess, subphrenic abscess, thoracoabdominal mycosis, trans diaphragmatic abscess, umbilical wound abscess, and vesical granuloma [3, 4, 9–16].

In this prospective study, we have documented the fate of spilt stones in our institution. The incidence of spilt gallstones was noted to be 18.91 % in our series. In the literature the incidence ranges between 2 and 11 % [5]. The reason for our incidence being higher is likely to be the policy of taking on all gallbladder disease irrespective of the state of acuteness and friability of the gallbladder.

The reported incidence of unretrieved gallstones is 0 % in our series, while an attempt was made to take out all the spilt stones diligently. It is difficult to claim no stone were left behind. Data suggest an incidence of 2.4–4 % [8, 17, 18].

The incidence of complication from retained stones in our series is very low at 0.66 %. The literature suggests 2.3 % for retrieved stones and 7 % for unretrieved stones [19]. These data were produced by Woodfield who included six studies, covering 18,280 laparoscopic cholecystectomy cases. The low incidence in our study is likely to be a fortuitous occurrence. Also, in our study the number is limited and the follow-up is of short duration compared to other series with an average follow-up of 44.8 months [20].

Thus, it can be said that there is a significant incidence of spilt gallstones during laparoscopic cholecystectomy, particularly when cases are not selective. While our study showed a small complication rate, the recommendation is that every attempt must be made to extract all spilt stones. If however this process entails damage to the surrounding structures, the occasional gallstone may be left behind. In such a case, it is important to document it.

It is important to note that spillage itself should be prevented to the extent possible. The operative steps suggested to prevent spillage are as follows:

- Careful dissection [20, 21]
- Making sure not to cause gallbladder perforation [22–28]
- Suctioning out gallbladder content prior to starting dissection in a fully distended turgid gallbladder
- Use of appropriate instruments such as nontoothed graspers
- Diligent application of clips to close the cystic duct well
- Liberal use of irrigation and endobags to avoid port-site complications [26]

Table 5 shows a comparison between observations of our study and those of international data.

Conclusion

Incidence and complications secondary to the spillage of gallstones and bile during standard laparoscopic cholecystectomy are low and avoidable. When spillage occurs,

removal of the stones and peritoneal toileting is the key step to avoid complications.

In our study, complications due to spilt and unretrieved gallstones account for 0.66 % of all the cases, which is much lower than described in available international data. As noted by international data, the rate of complications range are around 2.3 % for retrieved intraperitoneal gallstones and 7 % for unretrieved gallstones [19]. It is therefore advisable to retrieve as many gallstones as possible during LC, short of converting to a laparotomy [17, 27].

Acknowledgement Dr K Lakshman; Late Dr Venkatesh Murthy; Dr M Muni Reddy; Dr R C Subhash; Dr Aashish R Shah; Dr P S Eashwarnath

References

1. Welch N, Hinder R (1991) Laparoscopic capture of escaped gallstones. *Surg Lap Endosc* 1:42–46
2. Jörg Z, Andreas S, Wolfgang W (2007) Lost gallstones in laparoscopic cholecystectomy: all possible complications. *Am J Surg* 193:73–78
3. Diez J, Arozamena C, Gutierrez L (1998) Lost stones during laparoscopic cholecystectomy. *HPB Surg* 11(108–10):9
4. Johnston S, O'Malley K, McEntee G (1994) The need to retrieve the dropped stone during laparoscopic cholecystectomy. *Am J Surg* 167:608–610
5. Memon MA, Deeik RK, Maffi TR (1999) The outcome of unretrieved gallstones in the peritoneal cavity during laparoscopic cholecystectomy. A prospective analysis. *Surg Endosc* 13:848–857
6. De U (2004) Evolution of cholecystectomy: A tribute to Carl August Langenbuch. *Indian J Surg* 66:97–100
7. Clinc RW, Poulos E, Clifford EJ (1994) An assessment of potential complications cause by intraperitoneal gallstones. *Am Surg* 60:303–305
8. Welch N, Hinder RA, Fitzgibbons RJ (1991) Gallstones in the peritoneal cavity. A clinical and experimental study. *Surg Lap Endosc* 1:246–247
9. Brockmann JG, Kocher T (2002) Complications due to gallstones lost during laparoscopic cholecystectomy. *Surg Endosc* 16:1226–1232
10. Dasari BVM, Loan W (2009) Spilled gallstones mimicking peritoneal metastases. *JSLs* 13(1):73–76
11. Gooneratne DL (2010) A rare late complication of spilled gallstones. *N Z Med J* 123(1318):62–66
12. Pappas AV, Lagoudianakis EE (2011) The last place you would expect to find a gallstone. *JSLs* 15(2):248–251
13. Karabulut N, Tavasli B, Kiroğlu Y (2008) Intra-abdominal spilled gallstones simulating peritoneal metastasis: CT and MR imaging features. *Eur Radiol* 18(4):851–854
14. Irkorucu O, Tascilar O (2008) Missed gallstones in the bile duct and abdominal cavity: a case report. *Clinics* 63(4):561–564
15. Hussain MI, Al-Akeely MH (2010) Abdominal wall abscess following laparoscopic cholecystectomy: an unusual late complication of lost gallstones. *J Coll Physicians Surg Pak* 20(11):763–765
16. Arishi AR, Rabie EM (2008) Spilled gallstones: the source of an enigma. *JSLs* 12(3):321–325
17. Wilton P, Peters J, Thomas C (1993) Laparoscopic cholecystectomy. Leave no spilled stone unturned. *Surg Endosc* 7:537–538

18. Targarona EM, Cifuentes A, Balagu A (1995) The spilled stone, a potential danger after laparoscopic cholecystectomy. *Surg Endosc* 9 (7):768–773
19. Woodfield JC, Rodgers M, Windsor JA (2004) Peritoneal gallstones following laparoscopic cholecystectomy Incidence, complications, and management. *Surg Endosc* 18:1200–1207
20. Daradkeh SS, Suwan Z (1998) Preoperative ultrasonography and prediction of technical difficulties during laparoscopic cholecystectomy. *World J Surg* 22:75–77
21. Cacdac R, Lakra Y (1993) Abdominal wall sinus tract secondary to gallstones. A complication of laparoscopic cholecystectomy. *J Lap Surg* 3:509–515
22. Cuschieri A, Dubois F, Mouiel J (1991) The European experience with laparoscopic cholecystectomy. *Am J Surg* 161:385–387
23. Leopoldo S, Nicola P (1999) Gallbladder perforation during laparoscopic cholecystectomy. *World J Surg* 23:1186–1190
24. Jones DB, Dunnegan DL, Soper NJ (1995) The influence of intraoperative gallbladder perforation on long-term outcome after laparoscopic cholecystectomy. *Surg Endosc* 9:977–980
25. Assaff Y, Matter I, Sabo E (1998) Laparoscopic cholecystectomy for acute cholecystitis and the consequence of gallbladder perforation, bile spillage, and “loss” of stones. *Eur J Surg* 164:425–431
26. Hui TT, Giurgiu DI, Margulies DR (1999) Iatrogenic gallbladder perforation during laparoscopic cholecystectomy: etiology and sequelae. *Am Surg* 65:944–948
27. Leslie K, Raukin R, Duff J (1994) Lost stones during laparoscopic cholecystectomy: are they really benign? *Can J Surg* 37:240–242
28. Kent RB, Stahl Y (1991) Laparoscopic Retrieval of spilled stones. *Surg Lap Endosc* 2:152–154
29. Alcayir I, Yerdel MA, Kubasioglu U (1995) Clinico-pathological outcome of intraperitoneally retained gallstones with different characteristics. *H P B Surgery* 5:95
30. Wetscher G, Schnaub G, Feud F (1994) Subcutaneous abscess due to gallstones lost during laparoscopic cholecystectomy. *Surg Endosc* 26:324–325
31. Catarci M, Zaraca F, Scaccia MY (1993) Lost intraperitoneal stones after laparoscopic cholecystectomy: Harmless sequela or reason for reoperation? *Surg Lap Endosc* 3:318–322
32. Dittrich K, Weis H (1995) Ileus of the small intestine caused by a lost gallstone: A late complication of laparoscopic cholecystectomy. *Chirurg* 66:443–445
33. Guy PR, Watkin DS, Thompson Y (1993) Late discharge of stones after laparoscopic cholecystectomy. *Br J Surg* 80:1052
34. Castellón-Pavón CJ (2008) Complications due to spilled gallstones and surgical clips during laparoscopic cholecystectomy. *Cir Esp* 84 (1):3–9
35. Soper NJ, Dunnegan DL (1991) Does intraoperative gallbladder perforation influence the early outcome of laparoscopic cholecystectomy? *Surg Laparosc Endosc* 1:156–161