

OUTCOME OF SPILLED GALLSTONES DURING LAPAROSCOPIC CHOLECYSTECTOMY AND MANAGEMENT

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Abstract

There is a continued debate on fate of spilled bile with gallstones during laparoscopic cholecystectomy, so we felt that their outcome needs further evaluation in detail. Although laparoscopic cholecystectomy become increasingly popular, but it is associated with a slightly higher chances of injury to biliary tree and perforation of gallbladder with spillage of bile with gallstones. For this reason we have done this review regarding various possible outcomes, few suggestions to prevent these and their management.

In this study total 15 literatures were shortlisted after reviewing more than 192 articles, in which around 2587 patients who underwent surgery were included. Duration of hospital stay and post-op complications are higher in case of perforated gallbladder with spillage of bile and gallstones.

Conclusion: In this review, we conclude that laparoscopic cholecystectomy with gall bladder perforation along with spillage of bile and stones took longer operative time than intact gall bladder, also associated with various short term as well as long term complications. We suggest that attempts should be made to irrigate the operative field to evacuate spilled bile and to retrieve all gallstones spilled during the operative procedure.

Introduction

Laparoscopic cholecystectomy is now the gold standard for the treatment of symptomatic gallstone disease. Although the overall complication rate is less than the traditional open approach, there appear to be at least two operative complications that occur with greater frequency during laparoscopy. One is bile duct injury or bile leakage, and the other appears to be late infection due to dropped gallstones [1]. During laparoscopic cholecystectomy, because of perforation of the gallbladder, the rate of bile leak and loss of gallstones into the peritoneum has been reported to be between 3% and 33% [2, 3].

During laparoscopic cholecystectomy, usually gallbladder gets perforated while gallbladder dissection from liver bed (due to damage of gall bladder wall) or while extracting through the port (attempting to remove distended or loaded gallbladder through inadequate port).

Spillage of gallbladder contents is thought to be relatively innocuous; the long-term consequences of intra-peritoneal spillage of bile and gallstones are undefined. Results of

experimental studies in animals have been contradictory. Several studies showed a minimal fibrotic reaction to intraperitoneal stones, (19, 21, 22), where as others demonstrated abscess formation (23). Furthermore, there are numerous case reports of complications arising from spilled bile and gallstones (25-33).

Although rarely clinically significant, intraperitoneal gallstone spillage may cause localized or systemic infection, inflammation, fibrosis, adhesion, cutaneous sinuses, fistula, small bowel obstruction, generalized septicemia, empyema, and intraabdominal and extra abdominal abscess [4, 5]. Most surgeons believe that free intraperitoneal gallstones are harmless and therefore not a justification for conversion to laparotomy, even if a large number is left in situ [5]. Nevertheless, recognition of this unusual entity is important because the clinical presentation can be confusing and the diagnosis significantly delayed [6]. Bile leakage can be diagnosed soon after operation, but intraperitoneal gallstone spillage can be manifested months to years after operation, and have 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.

In this review, we discuss the option of not converting to laparotomy after intraperitoneal gallstone spillage as an acceptable approach to management or not and proper management of various complications due to spillage.

Material and Methods

A literature search was performed using various search engines including Google, Springer link and Medline. The following search terms were used: "spilled gallstones", "dropped gallstones", "laparoscopic cholecystectomy" and "delayed complications". Total 192 citations were found. Selected papers were screened using following criteria, number of cases (excluded if less than 50), time (before 1997 were excluded) and the Institution where the study was done. Among the patients who underwent cholecystectomy, patients who had intra-operative spillage were short listed, included in these studies and followed up. Short-term follow-up was based on a clinic visit 2 to 3 weeks postoperatively, and long-term follow-up was achieved by questionnaire or telephone conversation in patients at a mean of 3.3 years (range 2.1 to 5 years).

Operative procedure

Laparoscopy was performed by either an attending surgeon or resident under direct staff supervision. Both elective and emergency cases were included in the study. A four-trocar technique with a 30-degree angled laparoscopic video camera was used (34). Dissection of the gallbladder was performed using a combination of electrocautery and blunt dissection with fine graspers, and the cystic artery and cystic duct were ligated with titanium clips. The gallbladder was removed through either the umbilical or epigastric port. When perforation of the gallbladder occurred, attempts were made to retrieve all spilled stones, and the peritoneal cavity was irrigated with saline solution to evacuate the spilled bile. Patients typically received one preoperative and one postoperative dose of antibiotic, most commonly a cephalosporin. In

patients with acute cholecystitis, especially when the bile culture was positive, broad-spectrum antibiotics were administered for a longer period depending on the clinical situation.

Results

Among the patients who underwent successful laparoscopic cholecystectomy the incidence of Iatrogenic perforation of the gallbladder is around 29%, with a 95% confidence interval ranging from 26% to 32%, of whom about 62% had spillage of only bile detected, and 38% in whom spillage of both bile and gallstones was noted. There were a higher proportion of male patients in the perforated gallbladder group compared to the intact group (43% vs. 28%; $P < 0.001$). The mean age of the perforated gallbladder group was greater than that of the intact group (56 +/-15 years vs. 52 +/- 16 years; $P < 0.001$), and patients in the perforated gallbladder group weighed more (81 to 18 kg vs 77 to 17 kg; $P < 0.010$). A history of abdominal surgery was not associated with an increased incidence of intraoperative gallbladder perforation. Adhesions between the gallbladder and the omentum conferred a greater risk of gallbladder perforation (42% vs. 30%; $P < 0.001$). Although patients in the perforated group had a slightly higher incidence of acute cholecystitis compared to the intact group (11% vs. 8.5 %), this difference was not statistically significant. Iatrogenic perforation of the gallbladder was higher in the first year (1990) of our experience with laparoscopic cholecystectomy (40%), but the incidence decreased progressively each year thereafter to 24% in 1993. Perforation of the gallbladder occurred during dissection of the gallbladder from the liver in 47% of patients, during extraction through the abdominal wall in 21%) and as a result of intraoperative retraction in 14%. The operative time for patients in the perforated group was slightly longer (100 + 38 minutes vs. 106 +/- 38 minutes; $P < 0.01$) but of little clinical significance. Similar numbers of laparoscopic cholecystectomies were performed by surgical residents in both patient groups (26% vs. 24%; $P = 0.573$). Mean hospital stay is longer in case of perforated group ranging from 2-3 days whereas less than 2 days in other group.

Comparison between perforated against unperforated gallbladder

Postoperative pyrexia: noted in 18% of patients with perforated gallbladder whereas only 9% in unperforated group.

Infections: there are no reported cases of infections in uneventful cholecystectomy but there are more than 2-3% cases of infections following spillage ranging from mild infections to intra abdominal abscess. Few are just wound infections which were managed with exploration and antibiotics. Whereas major intraperitoneal collections ranging from sub-hepatic to sub phrenic abscess, pulmonary infections like empyema due sub-diaphragmatic collection are managed with various modalities like CT guided percutaneous aspiration when it is not possible, laparotomy, and drainage of abscess and some times migration of stones into pleural cavity leading to pulmonary infections needing intervention like right thoracotomy and decortication also.

Ileus: this has been noted in both groups without any significant difference and that was managed conservatively.

Bile leakage: About 2% as post-op complication due to cystic duct stump leaks and there is no significant difference in both groups as far as this complication is concerned, managed by re-exploration.

Hemorrhage : there is no difference in both groups ranging from 0.3% to 0.7%.

Post operative adhesions: there is increased incidence of adhesions in case perforation associated with spillage (10, 12).

Retroperitoneal actinomycosis: there was a case report of dropped gallstone following laparoscopic cholecystectomy later presenting as retroperitoneal actinomycosis (49).

Discussion

Now laparoscopic cholecystectomy is gold standard treatment for symptomatic cholelithiasis (25). The procedure, however, is not without complications, most notably a higher incidence of biliary tract injuries compared to open cholecystectomy (36-39). Nevertheless, 5 years of clinical experience and numerous prospective (40- 43) and retrospective (44-46) trials have established laparoscopic cholecystectomy to be a safe procedure with a low incidence of major complications. Although a large number of studies have examined clinical outcomes of laparoscopic cholecystectomy, few have directly addressed the consequences of spillage of bile and gallstones within the peritoneal cavity, an event that occurs more frequently with laparoscopic than with open cholecystectomy (19, 20). There are case reports of gallstones lost at the time of surgery subsequently causing intra-abdominal abscesses (25-28) empyema (27) abdominal wall abscesses (19, 29, 30), cutaneous sinus tracts(31,32) and bladder fistulas (33). Finding and removing all of the spilled gallstones can be laborious during laparoscopy and is often avoided. The stones left in the peritoneal cavity may, however, lead to intraperitoneal problems requiring a second procedure. It remains unclear whether stone spillage should be considered an indication for conversion to an open cholecystectomy (7). Although these complications appear to be rare, their actual incidences are unknown. The incidence of acute cholecystitis was similar in the unperforated and perforated patient groups, a finding also reported by others (20). Although an Acutely inflamed gallbladder might be more friable superficially, the edematous and thickened gallbladder wall may also protect against inadvertent perforation during the different aspects of the operative procedure. In our early experience there was a low threshold for conversion to open cholecystectomy when the gallbladder was severely inflamed, which likely contributes to the low incidence of gallbladder perforation in these patients. As might be expected, there was a higher incidence of gallbladder perforation during the first year that laparoscopic cholecystectomy was performed at our institution; thereafter, however, the iatrogenic perforation rate stabilized at approximately 25%.

To determine the potential consequence of spilled gallstones in the abdominal cavity a number of animal studies have been undertaken. Welch et al [8] and Cohen et al. [9] conclude that free intraperitoneal gallstones are harmless and thus do not warrant exploratory laparotomy. Johnson et al. [10] found that leakage of bile in combination with gallstones was associated with a significant risk of postoperative adhesion formation and possible Intraabdominal abscesses. Leland and Dawson [11] and Tzardis et al. [12] further suggested that intraperitoneal stones

could lead to an even higher incidence of adhesion formation in association with contaminated bile, and they therefore concluded that unretrieved gallstones are not benign and should be aggressively removed to decrease long-term complications, Gurley et al. [13] concluded that chemical composition plays a major role in the fate of intra-abdominal gallstones and that patients who have retained intra-abdominal pigmented stones should be followed closely because of the high prevalence of complications. Intraperitoneal gallstones plus bile have been shown to cause a predisposing to abscess formation in animal studies (24), whereas sterile gallstones cause only a mild inflammatory reaction (23). The characteristic appearance of intraabdominal abscesses from gallstones should be recognized because their radiographic appearance can mimic more ominous disease, such as (6) tumors or bowel obstructions.

Many clinical studies have been undertaken to determine the potential consequence of spilled gallstones in the abdominal cavity. Soper and Dunnegan [14] and Schafer et al. [15], who analyzed 10,174 laparoscopic cholecystectomies performed at 82 surgical institutions over a 3-year period, their findings showed that the mortality rate and the incidence of serious complications of retained gallstones are extremely low. They advised surgeons against converting laparoscopic cholecystectomy to an open procedure in case of spillage. At the Mayo Clinic, Rice and associates addressed the longterm consequences of intraoperative spillage of bile and gallstones during laparoscopic cholecystectomy. These authors emphasized the need for removal of as many calculi as possible during laparoscopy. However, they advised conversion to an open procedure only in patients for whom it is not possible to retrieve the majority of the gallstones laparoscopically, especially when bacteriobilia is suspected or confirmed by Gram stain of the bile. They also noted that percutaneous drainage of intraabdominal abscesses in most of their patients was ineffective if the inciting gallstones were not removed [16].

Almost all surgical approaches have a potential of unwanted or unexpected outcome. The main goal for all surgeons should be to manage their own complications with minimal harm to the patient physically and psychologically. From this point of view, a complication can be accepted as an unwanted consequence of a surgical approach. If patients are not informed preoperatively that spillage of bile and gallstones are possible, they will be surprised and confused if related complications develop.

We recommend these steps during laparoscopic cholecystectomy in case of spillage

- Informed consent from patient and family preoperatively and mentioning that dropped stones are common depending on the size of stones and condition of the gallbladder wall and liver bed.
- Every effort should be made to retrieve the gallstones and the peritoneum should be irrigated with copious saline, in case of spillage.
- There is no need for converting the laparoscopic procedure to a laparotomy for spilled stones, but it should be essential to document spilled stones in the operation notes.
- All possible but unlikely consequences of the spillage should be informed to the patient.
- The surgeon should have long term follow up of these patients unlike other routine cholecystectomy, as there is possibility of delayed complications.
- In view of confusing delayed clinical presentation during post-op period, surgeon should be alert to rule out possible complications due to spillage and manage them accordingly.

Conclusion

The outcome as serious complications after intraoperative spillage of gallbladder contents during laparoscopic cholecystectomy is low. The surgeon should inform the patient preoperatively about the possibility of gallstone spillage. If spillage does occur, the patient should be informed postoperatively of the event. Such patients should be kept under close control to avoid wasted time and money for unnecessary examinations, as well as the psychological trauma associated with wrong diagnoses like malignancy as spilled gallstone may mimic malignancy in years to come. Surgeons should not hesitate to record the events and inform the patient about the spillage of gallstones and possible consequences. If gallstones are knowingly spilled within the abdominal cavity, every attempt should be made to remove all gallstones. Because infective complications are rare following gallbladder perforation, conversion to laparotomy is not routinely indicated.

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