

# The consequences of lost gallstones during laparoscopic cholecystectomy

R.J.L.F. Loffeld

Department of Internal Medicine, Zaans Medical Centre, Zaandam, the Netherlands,  
tel.: +31 (0)75-650 27 79, fax: +31 (0)75-650 23 79, e-mail: r.loffeld@chello.nl

## ABSTRACT

Laparoscopic cholecystectomy has become the preferred surgical technique for symptomatic gallstone disease. The technique generally is safe. Probably one of the most common intra-operative complications is gallbladder perforation with stones spreading into the peritoneal cavity. In this paper the sequelae of lost gallstones after laparoscopic cholecystectomy and the diagnostic problems facing the clinician are reviewed. Abscesses and fistula formation in the abdominal wall occur. A long delay can be present between the initial operation and the complications of the lost stones. Although rupture of the gallbladder is usually noticed during preparation and retrieval, the surgeon may not be aware of losing stones. Due to the long delay, the occurrence of intra-abdominal abscesses and fistula is often not linked to the prior procedure.

## KEYWORDS

Abscess, cholecystectomy, complication, fistula, laparoscopic lost gallstones

## INTRODUCTION

Laparoscopic cholecystectomy has become the preferred surgical technique for symptomatic gallstone disease. In experienced hands it is a safe procedure with low morbidity and mortality. However, complications do occur. Well-known are leakage from the cystic duct, injury to the major bile duct with the occurrence of bilomas, retained stones in the common bile duct and perforation of the gallbladder.<sup>1</sup> Probably one of the most common intra-operative complications is gallbladder perforation with stones spreading into the peritoneal cavity.<sup>2</sup> The sequelae of lost gallstones after laparoscopic cholecystectomy and the occurring complications may go unnoticed for a long time and can be a diagnostic challenge.

## PATHOLOGY OF LOST GALLSTONES

In the beginning of the era of laparoscopic cholecystectomy, retained stones in the peritoneal cavity were considered harmless. Animal models even suggested that loss of stones did not pose a clinically important problem.<sup>3</sup> No deleterious effects could be demonstrated and, hence, there was no indication for retrieval of lost stones.<sup>4</sup> On the other hand gallstones, whether or not contaminated by bacteria, led to formation of abscesses and adhesions in a mouse model.<sup>5</sup> Placing a gallstone in the peritoneal cavity together with bile and a culture of *E. coli* led to the formation of abscesses in 8 out of 40 mice. In control experiments abscess formation did not occur, even though inoculation with *E. coli* was also used in the control animals. In another experiment, gallstones were placed in the peritoneal cavity of rats, together with either saline and sterile or infected bile. In the control experiment, animals received an injection with saline, or sterile or infected bile, but without insertion of a gallstone. Only the group in which a gallstone with bile (sterile or infected) was inserted developed adhesions and intra-abdominal abscesses.<sup>6</sup> Contrary to this finding is the experiment in which only gallstones were placed in the abdomen. No adhesions nor formation of abscesses were noted during a follow-up of one year.<sup>7</sup> From these experiments it is clear that the combination of bile and stones can lead to deleterious effects. Sterile pigment concretions lead to mesenchymal reactions such as granulomas, whereas contaminated stones, especially with gram-negative bacteria, lead to abscess formation.<sup>8</sup> The gallstones behave like foreign bodies.

## THE CONSEQUENCES OF LOST GALLSTONES

Lost stones can be the source of potentially serious complications.<sup>9</sup> There are not many data on the occurrence of spilled gallstones in the literature. It is thought to occur in approximately 40% of laparoscopic cholecystectomies.<sup>10</sup>

However, lower numbers have been reported. Perforation of the gallbladder is reported in 10 to 32% of cases.<sup>11</sup>

In a published large analysis of laparoscopic cholecystectomies performed in many clinics, gallbladder perforation (20%) and stone spillage (9%) were the two most common complications. Stone spillage mainly occurred during the dissection (75%) and removal (25%) of the gallbladder. Predisposing factors for developing complications after stone spillage were older age, male sex, acute cholecystitis, spillage of pigment stones, number of stones (>15) or size of the stone (diameter >1.5 cm), and perihepatic localisation of lost stones.<sup>12</sup> In a study of more than 3500 laparoscopic cholecystectomies carried out in one centre, perforation of the gallbladder occurred in 17%. In 254 cases (7%) spillage of stones occurred. In the majority of cases, the stones could be retrieved.<sup>13</sup> In 40 cases it was not possible to retrieve the stones. Twelve of these patients developed complications: abdominal abscesses (n=4), intestinal obstruction (n=1), paraumbilical tumour (n=1), and stones in the port site (n=6).<sup>14</sup>

A specific risk factor for spilling stones and bile is rupture of the gallbladder during retrieval via the umbilical port. Due to the very small incision in the abdominal wall, retrieving the gallbladder can be problematic. This is especially true if the gallbladder contains large stones.

The problems occurring after lost gallstones can occur a long time after surgery.<sup>15</sup> The interval is reported to range from 4 days to 29 months.<sup>9</sup> But problems may occur many years after the operation.<sup>16</sup> More than 80 cases of gallstone-related complications after laparoscopic cholecystectomy have been reported.<sup>9</sup> Some of them are noted in *table 1*. Among the complications are transabdominal fistula and intra-abdominal abscesses.<sup>9</sup> Retained stones have been

described to form fistula towards the colon<sup>17</sup> or urinary bladder.<sup>11,18</sup> Even pleural empyema has been reported.<sup>19</sup> The most prevalent form is a transabdominal fistula through the umbilical canal. Also cholelithiasis of the ovary after loss of gallstones has been reported.<sup>20</sup>

Recently three patients were seen in our clinic with abscesses and fistula occurring seven weeks to almost ten years after laparoscopic cholecystectomy. All three patients underwent an endoscopic retrograde cholangiogram with papillotomy, because of stones in the common bile duct, prior to the operation. Only in one case was the surgeon aware of rupture of the gallbladder, in one case the pathologist noted a small hole in the fundus of the gallbladder, in the third patient the removed gallbladder was entirely intact. The surgeon is usually aware of rupture of the gallbladder during retrieval or preparation. All three patients developed abscesses or fistula in the vicinity of the umbilical port. The gallbladder usually ruptures in the umbilical canal during retrieval. In 30%, stones can be found in the port sites.<sup>13</sup> One of our patients also developed a fistula in a trocar port on the right side of the abdomen. The long delay is clearly demonstrated in the literature. Either the surgeon is not aware of losing stones or he thinks he retrieved all lost stones. Because of the long delay between the initial operation and the presentation with the abscesses or fistula, gallstones are not considered in the differential diagnosis of abdominal complaints. This is the reason for considerable diagnostic delay. Abscesses can be easily detected with ultrasound examination of the abdomen or computer tomography scanning. Gallstones are not always detected in the fistula or abscess. In one of our own cases both diagnostic modalities failed to detect gallstones as being responsible for abscesses and fistula formation.

**Table 1.** Reported cases of lost gall stones in the literature

Author	Number	Time after laparoscopic cholecystectomy	Complication
Botterill <sup>16</sup>	1	2-5 years	Abscesses
Van Hoecke <sup>15</sup>	1	5 years	Fistula
Weiler <sup>22</sup>	1	Immediately	Fistula
Daoud <sup>17</sup>	1	7 months	Fistula
Castro <sup>11</sup>	1	2-11 months	Fistula
Lutken <sup>18</sup>	1	9 months	Fistula
Patterson <sup>21</sup>	1	14 months	Abscess and fistula
Memon <sup>10</sup>	1	8 months	Fistula
Willekes <sup>19</sup>	1	17 months	Empyema
Catarci <sup>2</sup>	1	3 months	Fistula
Whiting <sup>23</sup>	1	12 months	Abscess
Vadlamidi <sup>24</sup>	1	20 months	Abscess
Lauffer <sup>25</sup>	1	3 months	Abscess
McDonald <sup>26</sup>	6	Immediately-18 months	Abscess and fistula
Groebli <sup>27</sup>	2	15 months/24 months	Abscess/abscess
Van der Lugt <sup>28</sup>	2	15 months/38 months	Abscess/abscess
Zaans Medical Centre	3	7 weeks-7 months/24 months/10 years	Fistula/abscess/fistula

If gallstone loss occurs, all efforts should be made to retrieve the lost stones.<sup>21</sup> Whether loss of stones is a reason for conversion to an open procedure is not clear. Lost stones can be collected laparoscopically. When numerous or large pigment stones are lost, which cannot be retrieved by laparoscopy, intraoperative conversion to open surgery can be justified.<sup>12</sup> As soon as the gallbladder is dissected off the liver it should be placed in a specimen bag in order to prevent spilling of stones while removing the gallbladder via the umbilical port opening. The risk for rupture depends on whether the gallbladder is inflamed or not. Gallbladder perforation is more frequent in acute cholecystitis.<sup>14</sup> Peroperative perforation of the gallbladder seems to carry no morbidity, provided a total and complete recovery of the lost stones and local treatment of bile contamination with local irrigation is carried out.<sup>14</sup> Our own patients started with complicated gallstone disease. Whether this poses an extra risk factor for losing stones is not obvious. However, two patients developed subhepatic abscesses immediately after the operation. The surgeon should always be aware of the consequences of lost stones. The occurrence of an abscess or fistula in the abdominal wall in a patient who has undergone a laparoscopic cholecystectomy in the past, even if the operation was performed many years ago, should lead to the differential diagnosis of lost stones even if rupture of the gallbladder was not obvious during the operation.

## REFERENCES

- Soper NJ, Flye MW, Brunt LM, et al. G. Diagnosis and management of biliary complications of laparoscopic cholecystectomy. *Am J Surg* 1993;165:663-9.
- Catarci M, Zaraca F, Scaccia M, Carboni M. Lost intraperitoneal stones after laparoscopic cholecystectomy: harmless sequela or reason for reoperation. *Surg Laparosc Endosc* 1993;3:318-22.
- Clinic RW, Poulos E, Clifford EJ. An assessment of potential complications caused by intraperitoneal gallstones. *Am Surg* 1994;60:303-5.
- Welch N, Hinder RA, Fitzgibbons RJ Jr, Rouse JW. Gallstones in the peritoneal cavity. A clinical and experimental study. *Surg Laparosc Endosc* 1991;1:246-7.
- Agalar F, Sayek L, Agalar C, Cakmakci M, Hayran M, Kavuklu B. Factors that may increase morbidity in a model of intra-abdominal contamination by gallstones lost in the peritoneal cavity. *Eur J Surg* 1997;163:909-14.
- Johnston S, O'Malley K, McEntee G, Grace P, Smyth E, Bouchier-Hayes D. The need to retrieve the dropped stone during laparoscopic cholecystectomy. *Am J Surg* 1994;167:608-10.
- Zisman A, Loshkov G, Negri M, Herbert M, Halpern Z, Lin G, Halevy A. The fate of long-standing intraperitoneal gallstone in the rat. *Surg Endosc* 1995;9:509-11.
- Hornof R, Pernegger C, Wenzl S, et al. Intraperitoneal cholelithiasis after laparoscopic cholecystectomy – behavior of “lost” concretions and their role in abscess formation. *Eur Surg Res* 1996;28:179-89.
- Gretschel S, Engelmann C, Estevez-Schwarz L, Schlag PM. Wolf in sheep's clothing: spilled gallstones can cause severe complications after endoscopic surgery. *Surg Endosc* 2001;15:98
- Memon MA, Jenkins HJ Jr, Fitzgibbons RJ Jr. Spontaneous erosion of a lost intra-abdominal gallstone through the back eight months following laparoscopic cholecystectomy. *JLS* 1997;1:153-7.
- Castro MG, Alves AS, Oliveira CA, Vieira Junior A, Vianna JL, Costa RF. Elimination of biliary stones through the urinary tract: a complication of the laparoscopic cholecystectomy. *Rev Hosp Clin Fac Sao Paulo* 1999;54:209-12.
- Brockmann JG, Kocher T, Senninger NJ, Schurman GM. Complications due to gallstones lost during laparoscopic cholecystectomy. *Surg Endosc* 2002;16:1226-32.
- Diez J, Arozamena C, Gutierrez L, Bracco J, Mon A, Sanchez Almeyra R, Secchi M. Lost stones during laparoscopic cholecystectomy. *HPB Surg* 1998;11:105-8.
- Barrat C, Champault A, Matthyssens L, Champault G. Iatrogenic perforation of the gallbladder during laparoscopic cholecystectomy does not influence the prognosis. Prospective study. *Ann Chir* 2004;129:25-9.
- Van Hoecke M, Lissens P, Vuylsteke M, Verdonk R. Lost gallstones: a relaparoscopic solution to laparoscopic pollution. *Acta Chir Belg* 2004;104:104-6.
- Botterill ID, Davides D, Vezakis A, McMahon MJ. Recurrent septic episodes, following gallstone spillage at laparoscopic cholecystectomy. *Surg Endosc* 2001;15:897.
- Daoud F, Awwad ZM, Masad J. Colovesical fistula due to a lost gallstone following laparoscopic cholecystectomy: report of a case. *Surg Today* 2001;31:255-7.
- Lutken W, Berggren P, Maltback J. Passing of gallstones via the urethra: a complication of laparoscopic cholecystectomy. *Surg Laparosc Endosc* 1997;7:495-7.
- Willekes CL, Widmann WD. Empyema from lost gallstones: a thoracic complication of laparoscopic cholecystectomy. *J Laparoendosc Surg* 1996;6:123-6.
- Tursi JP, Reddy UM, Huggins G. Cholelithiasis of the ovary. *Obstet Gynecol* 1993;82:653-4.
- Patterson EJ, Nagy AG. Don't cry over spilled stones? Complications of gallstones spilled during laparoscopic cholecystectomy: case report and literature review. *Can J Surg* 1997;40:300-4.
- Weiler H, Grandel A. Postoperative fistula of the abdominal wall after laparoscopic cholecystectomy due to lost gallstones. *Eur J Ultrasound* 2002;15:61-3.
- Whiting J, Welch NT, Hallissey MT. Subphrenic abscess caused by gallstones “lost” at laparoscopic cholecystectomy one year previously: management by minimally invasive techniques. *Surg Laparosc Endosc* 1997;7:77-8.
- Vadlamudi G, Graebe R, Khoo M, Schinella R. Gallstones implanting in the ovary. A complication of laparoscopic cholecystectomy. *Arch Pathol Lab Med* 1997;121:155-8.
- Lauffer JM, Krahenbuhl L, Baur HU, Mettler M, Buchler MW. Clinical manifestations of lost gallstones after laparoscopic cholecystectomy: a case report with review of the literature. *Surg Laparosc Endosc* 1997;7:103-12.
- McDonald MP, Munson JL, Sanders L, Tsao J, Buyske J. Consequences of lost gallstone. *Surg Endosc* 1997;11:774-7.
- Groebli Y, Hebert D, Tschanz P. The migrating spilled stone. *Int Surg* 1998;83:31-2.
- Van der Lugt JCT, de Graaf PW, Dallinga RJ, Stassen LPS. Abscesvorming door verloren stenen bij een laparoscopische cholecystectomie. *Ned Tijdschr Geneesk* 2005;149:2683-6.