

Thoracic complications from retained abdominal gallstones after laparoscopic cholecystectomy: is it always mandatory a thoracic approach?

✉ Gennaro Perrone, M.D.,¹ ✉ Mario Giuffrida, M.D.,² ✉ Antonio Tarasconi, M.D.,¹
 ✉ Elena Bonati, M.D.,² ✉ Fausto Catena, M.D.¹

¹Department of Emergency and Trauma Surgery, Parma University Hospital, Parma-Italy

²Department of General Surgery, Parma University Hospital, Parma-Italy

ABSTRACT

BACKGROUND: Thoracic complications from retained abdominal gallstones are quite rare and the incidence rate ranges between 0.08% and 0.3%. Diagnosis and treatment of these complications are challenging due to the uncommon presentations and the debated role of the thoracic approach. This review of all cases reported in literature aims to discuss the best practice of this rare condition.

METHODS: A comprehensive literature search was performed for articles from January 1993 to May 2019 using PubMed, MEDLINE, Embase, ScienceDirect. The following mesh-words were used: “cholelithopthysis”, “thoracic”, “gallstones” “retained”, and “spilled”. All cases of thoracic complications from retained gallstones after laparoscopic cholecystectomy were extrapolated.

RESULTS: Twenty-four patients were included in this study. The most common symptoms were fever, hemoptysis and lithoptysis. Symptoms after laparoscopic cholecystectomy were presented after a mean time of 9.8 ± 14.2 months (range from one week to 60 months). Delayed diagnosis was found in fourteen patients (58.4%). Only four subjects were treated successfully with antibiotic therapy alone (16.7%), whereas 20 patients needed surgery or interventional radiology (83.3%). Seven patients (29.2%) were successfully managed with an abdominal approach. Three patients were managed using thoracentesis, thoracoscopic-thoracotomy drainage (12.5%). Right lung decortication and pulmonary wedge resections were necessary for ten patients (41.6%).

CONCLUSION: Clinicians always must inquire about the previous cholecystectomy for cholelithiasis related diseases in all patients suffering from recurrent right-sided pleural/lung affections, to improve diagnostic delay. The escalated approach must be performed: empirical antimicrobial therapy followed by targeted therapy as soon as microbiological data are available; afterwards, abdominal surgery is effective in approximately 30% of patients while the remaining patients have to be submitted to a thoracic approach.

Keywords: Abdominal complications; cholelithoptysis; laparoscopic cholecystectomy; retained gallstones; spilled; thoracic complications.

INTRODUCTION

Laparoscopic cholecystectomy is currently the gold standard surgical procedure for symptomatic cholelithiasis and cholecystectomy is the second most commonly performed abdominal operation.^[1,2] Cholecystectomy is not a risk-free procedure: the most common complications include retained common bile duct stones, bile duct injury, bile leaks, bleeding, pancreatitis, infections and bowel injury.

Gallbladder iatrogenic perforation (GIP) is a common intra-operative complication during cholecystectomy. It has been reported to occur with an incidence ranging from 10% to 40% in various series.^[3-5] History of acute or chronic cholecystitis, previous laparotomies, destructive inflammation of the gallbladder wall associated with fibrosis, preoperatively elevated ALT level, elderly, male sex and obesity have been advocated to an increased risk of GIP.^[6-8]

Cite this article as: Perrone G, Giuffrida M, Tarasconi A, Bonati E, Catena F. Thoracic complications from retained abdominal gallstones after laparoscopic cholecystectomy: is it always mandatory a thoracic approach?. *Ulus Travma Acil Cerrahi Derg* 2020;26:95-103.

Address for correspondence: Elena Bonati, M.D.

Via Gramsci 14 43125 Parma, Italy

Tel: 00390521702969 E-mail: ebonati86@gmail.com



Ulus Travma Acil Cerrahi Derg 2020;26(6):95-103 DOI: 10.14744/tjtes.2020.07280 Submitted: 31.08.2019 Accepted: 19.03.2020 Online: 08.12.2020
 Copyright 2020 Turkish Association of Trauma and Emergency Surgery

In laparoscopic cholecystectomy, GIP may occur by traction with grasping forceps during dissection of the gall bladder (75%), or during the extraction of the gallbladder (25%) through the port sites without endobag use.^[3,7]

Spillage of stones occurs less frequently than GIP. The true incidence of unretrieved stones is difficult to rate, but it is approximately 6–10%.^[9]

Gallstones left in the abdominal cavity may potentially lead to intraabdominal abscesses. Patients can present months to years with nonspecific symptoms after the original procedure. Complications that result from these spilled stones are rare and the incidence rate ranges between 0.08% and 0.3%.^[10,11] Thoracic complications from spilled gallstone are less frequent than abdominal complications: subphrenic abscess may lead to a fistulous tract through the diaphragm and gallstones may migrate into the lung parenchyma, leading to lung and pleural cavity affections.^[12]

Therapeutic management encloses a thoracic or abdominal approach. In this paper, we present a case of retained gallstone presenting as subdiaphragmatic abscess and right middle lobe consolidation with suspected diaphragmatic fistula and we report all other cases described in the scientific literature. Furthermore, we discuss the best management of this rare condition.

MATERIALS AND METHODS

A literature search was conducted until May 2019 using the combination of key terms “retained”, “gallstones”, “spilled”, “cholecystectomy”, “laparoscopic”, “thoracic”, “cholelithopthysis”, “transdiaphragmatic” and “spilled” consulting: Pubmed, Medline, Embase, ScienceDirect. All published papers (case reports, letters and reviews) describing intrathoracic complications from gallstones retained after laparoscopic cholecystectomy were included in this study. We also reported a further case of thoracic complication from spilled stones after laparoscopic cholecystectomy.

Patients with empyema or thoracic complications in the absence of gallstones or not linked to subphrenic abscesses were excluded from this study. All cases of intrathoracic complications from stones related not to laparoscopic cholecystectomy were also excluded.

To our knowledge, no cases of intrathoracic complications from spilled stones after open cholecystectomy were reported in the literature. All references in selected articles were further screened for additional articles. Papers were retrieved and analyzed according to the Preferred Items for Reporting of Systematic Reviews and Meta-Analyses guidelines (Fig. 1).

Quantitative data were expressed as mean or median \pm standard deviation (SD). The qualitative data were elaborated as frequency and percentage. Spearman rho test was performed to measure the linear relationship between two variables. Patients were divided into four main groups according to definitive treatment: thoracic surgery group, abdominal surgery group, interventional radiology group and antibiotic therapy group. In the first group, we included patients who were treated with thoracic surgery, lung parenchyma resections and lung decortication either with a thoracotomic or thoracoscopic approach. In the abdominal surgery group, we included patients treated with abdominal surgery. In interventional radiology group, we included patients treated with percutaneous abdominal drainage or thoracentesis. The last group included patients successfully treated with antibiotics alone. Twenty-two papers met the criteria and were included in the present review. Totally, we analyzed 24 patients (Table 1).

Case Report

A 78-years old male with a medical history of hypertension, coagulation factor II genetic mutation, benign prostatic hyperplasia (BPH) was admitted to the Emergency Surgery Department of Parma University Hospital in March 2019.

Previously, he had been admitted to laparoscopic cholecystectomy for acute calculous cholecystitis on October 2018: intraoperatively, it was reported that a gallbladder iatrogenic perforation with gallstone spillage, mostly of them were retrieved laparoscopically. The postoperative course was uneventful. The patient was asymptomatic for four months until he developed a fever and right upper quadrant pain. CT of the chest and abdomen revealed, respectively, RML consolidation, ground-glass opacity and subdiaphragmatic abscess

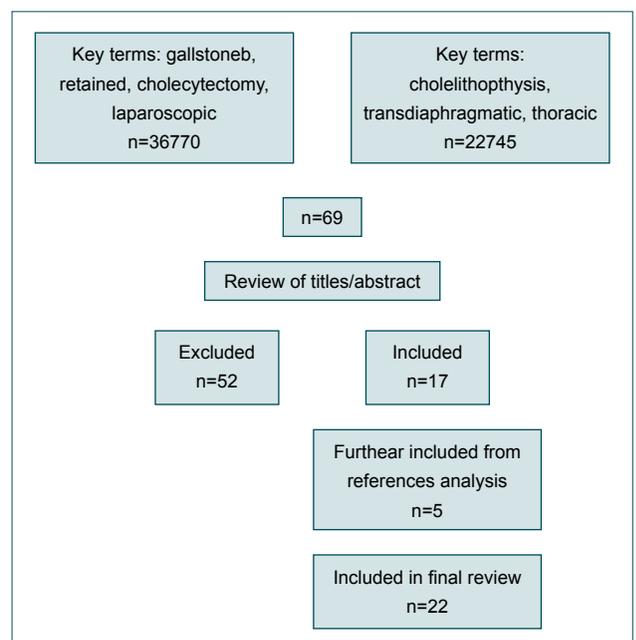


Figure 1. Literature search method.

Table 1. Papers included in literature systematic review

Reference	Gender	Age	Presenting symptoms	Complication location	Presenting time after LC	Time to diagnosis	Diagnostic test	C & S	Gallstones type	Treatment
Downie ^[13] (1993)	Female	59	Hemoptysis, lithoptysis, fever	RLL infiltrate and right subdiaphragmatic fluid collection.	3 mo	12 mo	Chest x-ray, bronchoscopy, Abdomen CT, ultrasound, ERCP	N/A	87% cholesterol	Antibiotic therapy
Lee ^[4] (1993)	Female	58	Fever, lithoptysis, weight loss, anorexia, weakness, hemoptysis	RML atelectasis, RLL bleeding. Subdiaphragmatic fluid collection	4 mo	4 mo	Chest x-ray, bronchoscopy, ERCP, ultrasound	Enterobacter cloacae	87% cholesterol	Laparotomy (abscesses drainage and gallstones removal)
Lee ^[4] (1993)	Male	52	Fever, lithoptysis, pain in right flank	RLL consolidation, multiloculated fluid collection extending from the retroperitoneum through the posterior abdominal wall, and sacral wound abscesses	8 mo	10 mo	Chest – abdomen CT, bronchoscopy, chest x-ray, ERCP	Klebsiella	95% calcium bilirubinate	Laparotomy (abscesses drainage and gallstones removal, Sacral abscess drainage)
Brazinsky ^[15] (1993)	Male	75	Chest pain	RLL fluid collection, subdiaphragmatic abscess. 2 cutaneous fistulas	4 mo	6 mo	Klebsiella pneumoniae and Escherichia coli	N/A	95% calcium bilirubinate	Antibiotic therapy, Thoracoscopy (pleural lavage and drainage)
Thompson ^[16] (1995)	Female	59	Fever, lithoptysis. Hemoptysis, anorexia and weight loss	RLL infiltrate and right subdiaphragmatic fluid collection.	N/A	1 mo	Chest x-ray, bronchoscopy, Chest CT, Ultrasound, ERCP	N/A	87% cholesterol	Antibiotic therapy, Exploratory laparotomy
Barnard ^[17] (1995)	Female	54	Right chest pain, hemoptysis	Right subphrenic abscess, RML gallstones and pneumonia	1 week	7 mo	Chest CT	N/A	Pigment	Thoracotomy (middle Lobectomy)
Willeks ^[18] (1996)	Female	83	RUQ pain, fever, right chest pain	Empyema, subphrenic abscess	17 mo	17 mo	Chest x-ray, Chest CT	Klebsiella oxytoca, Proteus mirabilis, Enterococcus faecalis	N/A	Antibiotic therapy, Toracotomy, (abscess evacuation, lung decortication)
Breslin ^[9] (1996)	Male	54	Lithoptysis hemoptysis, port-site infection	Port-site abscess, RLL consolidation	2 weeks	2 mo	ERCP, chest x-ray, chest CT, ultrasound, bronchoscopy, nuclear scan with technetium	N/A	Mixed cholesterol and pigment-type	Antibiotic therapy (cephalotin amoxiyilin)
Neumeyer ^[20] (1996)	Male	90	Dyspnea	Right Hydrothorax, Right pleural empyema, diaphragmatic abscess	4 mo	4 mo	Thoracentesis, chest x-ray, Chest CT, abdominal ultrasound	Negative	Pigment	Thoracentesis, Thoracoscopy (empyema drainage and lung decortication, Diaphragmatic incision and gallstones removal)
Noda ^[1] (1998)	Female	77	Fever, RUQ pain	RLL consolidation, liver abscess	14 mo	15 mo	Chest x-ray, chest-abdomen CT, bronchoscopy	Actinomyces israelii	N/A	Antibiotic therapy (cefuroxime-penicillin)- Abdominal CT-guided drainage- broncoscopic gallstones removal

Table 1. Papers included in literature systematic review (continue)

Reference	Gender	Age	Presenting symptoms	Complication location	Presenting time after LC	Time to diagnosis	Diagnostic test	C & S	Gallstones type	Treatment
Clive ^[22] (1998)	Female	73	Dyspnea, chest pain	RLL empyema	1 mo	2 mo	Chest x-ray	Enterobacter and Escherichia Coli	N/A	Antibiotic therapy, chest drainage-thoracotomy (empyema drainage, lung decortication)
Chan ^[23] (1998)	Female	75	Sweat, lithoptysis	Subdiaphragmatic collection of fluid, fluid in the right pleura, pulmonary atelectasis	1 mo	6 mo	ERCP, Chest CT	N/A	Pigment	Antibiotic therapy
Chopra ^[24] (1999)	Female	64	Right upper quadrant and flank pain, fever, lithoptysis	Right sub- and supradiaphragmatic abscess	24 mo	30 mo	Chest-abdomen CT, MRI, bronchoscopy	Negative	95% cholesterol	Antibiotic therapy (trimetoprim sulfametaxazol)
Preciado ^[25] (1999)	Male	71	Fever, dyspnea	RLL empyema, subdiaphragmatic abscess	18 mo	18 mo	Chest x-ray, Chest CT	Klebsiella pneumoniae	80% cholesterol	Antibiotic therapy, thoracotomy (lung decortication, small stones and purulent fluid were drained)
Werber ^[26] (2001)	Female	64	Fever, weight loss, dyspnea hemoptysis	RLL abscess, subhepatic abscess	1 mo	7 mo	Chest-abdomen CT, chest x-ray, bronchoscopy	Initially negative- Klebsiella pneumoniae and Escherichia coli	Pigment	Antibiotic therapy (trovafloxacin), Thoracotomy (right lower lobe wedge resection, abdominal curettage and abscess drainage)
Hanna ^[27] (2004)	Female	54	Lithoptysis	RLL abscess	1 mo	12 mo	Chest x-ray, chest CT, Bronchoscopy, ERCP +	Negative	Cholesterol	Antibiotic therapy, Peritoneal lavage
Houghton ^[28] (2005)	Female	61	Hemoptysis	RLL mass (adenocarcinoma and spilled gallstones)	5 mo	42 mo	Chest CT, thoracentesis, bronchoscopy	Stenotrophomonas and Klebsiella pneumonia	Pigment	Antibiotic therapy-Thoracotomy (wedge resection of the mass, diaphragmatic defect suture)
Iannitti ^[29] (2006)	Male	70	Generalized pain	Subphrenic and pleural abscess	37 mo	42 mo	MRI, Abdomen CT, chest CT	Enterococcus	N/A	Antibiotic therapy, ultrasound-guided abscess drainage-Laparotomy (abscesses drainage)
Fontaine ^[30] (2006)	Male	73	Fever, hemoptysis	RLL infiltrate, diaphragm oval calcification	6 mo	12 mo	Chest CT, Bronchoscopy	N/A	N/A	Antibiotic therapy- mediastinoscopy (RLL, diaphragm resection)
Bergeron ^[31] (2007)	Female	72	Right chest pain	RLL infiltrate, pleural effusion, subphrenic abscess	1 mo	1 mo	Chest x-ray, ultrasound, chest CT	Enterococcus	N/A	Antibiotic therapy (ceftriaxone and metronidazole- vancomycin) – CT-guided drainage- thoracotomy (lung decortication)
Flores-Franco ^[32] (2013)	Female	76	Dyspnea, chest pain	Pleural empyema, subphrenic abscess	10 mo	12 mo	Chest x-ray, thoracentesis, MRI			Antibiotic therapy, thoracentesis
Quail ^[33] (2014)	Female	66	Hemoptysis	RLL abscess	60 mo	60 mo	Chest x-ray, chest CT, bronchoscopy	Klebsiella pneumoniae	Cholesterol	Antibiotic therapy (co-trimoxazole)- VATS (lung decortication, RLL wedge resection)
Gasteir ^[34] (2014)	Male	72	Cutaneous chest wall fistula	Peritoneopleurocutaneous fistula	1 week	5 mo	Chest CT	Escherichia coli and streptococcal	N/A	Thoracotomy (partial pulmonary decortication, portions of ribs 9 and 10 resections, gallstones removal)
Our case	Male	78	Fever, abdominal pain	Subhepatic abscess, RML consolidation	6 mo	6 mo	Chest-Abdomen CT, MRI	N/A	N/A	Antibiotic therapy- CT-guided drainage-Laparoscopy (abscess drainage, gallstones removal)

(9x9 cm) with suspected communication between abdomen and thorax through a diaphragmatic fistula caused by suspected retained stones (Fig. 2).

The patient was treated using empiric antibiotic therapy and percutaneous CT-guided drainage.

After 3-days, the patient showed clinically significant improvement, but control MRI showed an increased subdiaphragmatic abscess (diameter 11 cm) with persistent retained stones and the unmodified presence of the RML consolidation with atelectasis. The hypothesis was that source control had not totally been effective without the retained stones removal.

The patient underwent laparoscopic exploration with drainage of the encapsulated subdiaphragmatic abscess. Multiple gallstones were found and removed. The patient was discharged from the hospital after six days without complications.

RESULTS

Twenty-four patients (including our case) with intraperitoneal gallstones retained from laparoscopic cholecystectomy and thoracic complications were reported: 15 patients were female and nine patients were male. The ratio of male to female was 0.6. The mean age was 67.9 ± 10 years (range 52–90). Emergency laparoscopic cholecystectomy for acute cholecystitis was documented in seven patients (29.2%). Fifteen patients underwent elective laparoscopic cholecystectomy (62.4%), while data about primary surgery were not available in two cases (8.4%).

Fever was the most common symptom of the first presentation, and it was present in 10/24 patients (41.7%).

More specific symptoms, such as hemoptysis and lithoptysis, were found respectively in nine (37.5%) and eight (33.4%) patients (Fig. 3).

Early symptoms ranged from one week to 60 months. The mean time for clinical onset after laparoscopic cholecystectomy was 9.8 ± 14.2 months (range 1 week-60 months). Chest CT scan was performed in 20 cases (83.4%); other diagnostic investigations included a chest x-ray, abdominal CT scan, abdominal ultrasound, ERCP (positive only in one case), bronchoscopy, MRI, diagnostic thoracentesis and nuclear scan with technetium.

In 12 cases (50%), to reach the final diagnosis, four or more diagnostic tests were performed.

The diagnosis of retained gallstones ranged from one to 60 months. The mean time for final diagnosis was 14 ± 15.5 months from laparoscopic cholecystectomy (range 1-60 months). A delayed diagnosis was found in 14 patients



Figure 2. CT-scan showed subdiaphragmatic abscess with suspected communication between abdomen and thorax through a diaphragmatic fistula caused by suspected retained stones.

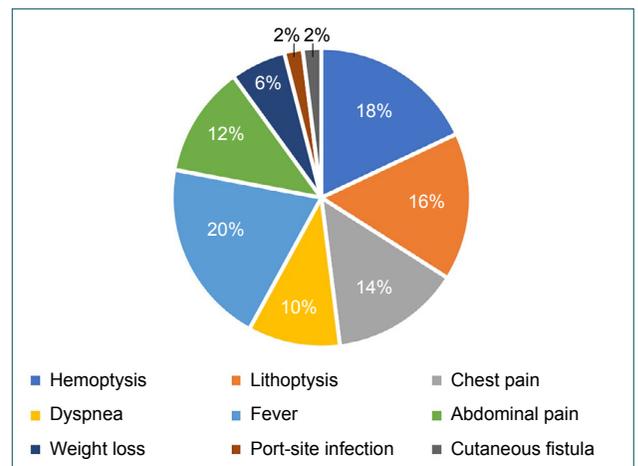


Figure 3. Clinical manifestations (distribution of symptoms).

(58.4%). From the symptoms onset to delayed diagnosis, up to 37 months were reported. Moreover, we found a statistically significant correlation between ultralate symptoms from index surgery and ultra-delayed diagnosis ($R^2=0.744$), which was related to underestimated cholecystectomy history and unspecific symptoms (Fig. 4).

Only five patients (20.8%) presented retained gallstones chest imaging findings without any abdominal findings. Fluid collections or abscesses in RLL were found in 15 patients (62.4%). Five patients (20.8%) presented pleural empyema and a peritoneo-pleuro-cutaneous fistula was found in one patient, while RML was involved in three cases (12.5%). In one case, an RLL mass with a single gallstone was associated with lung adenocarcinoma. Typical abdominal findings, such as subdiaphragmatic abscesses, were found in 14 cases (58.3%). The number of gallstones ranged from one to 60 and their size of gallstones ranged from 5 mm to 15 mm. Biochemical analysis of the stones revealed that they were cholesterol stones in seven cases (29.2%), pigment stones in six cases (25%) and mixed type in one case (4.2%).

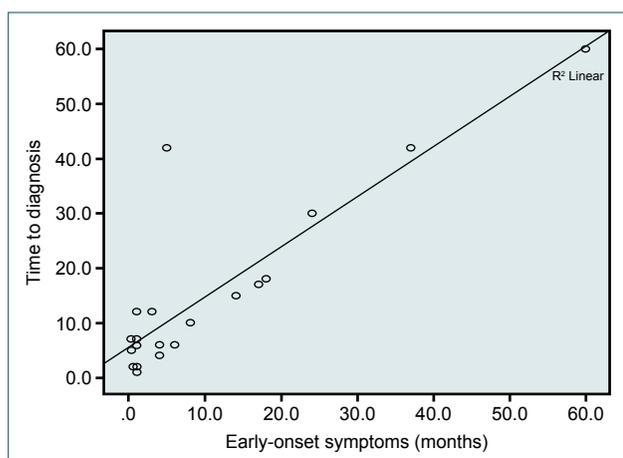


Figure 4. Comparison of symptoms onset and delayed diagnosis.

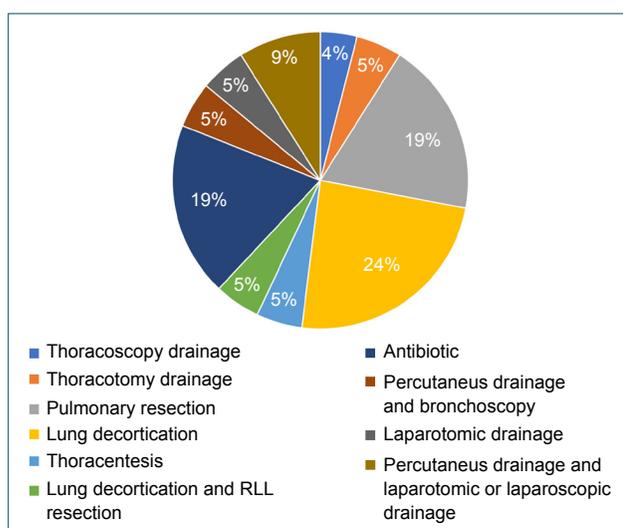


Figure 5. Treatments.

Bacteria culture test was performed 16 times (66.6%) and in only three cases, they were negative. The most frequent isolated were *Klebsiella Pneumoniae* in six cases (25%) and *Escherichia Coli* in three patients (12.5%).

In the thoracic approach group, 12 patients (50%) were included (pulmonary resection, lung decortication and abscess drainage via thoracotomy, thoracoscopy, mediastinoscopy and VATS). In the abdominal approach group, six patients (25%) (laparoscopic or laparotomic drainage) were included. In the interventional radiology group, were included two patients (8,2%) treated with thoracentesis or percutaneous abdominal drainage alone. In the antibiotic therapy group, four patients (16.8%) were included treated with antibiotics alone. Antibiotic therapy was performed in 19 patients (79.2%), eight with empiric antimicrobial therapy (33.4%) and 11 patients with target therapy based on cultures (45.9%): in four cases, it was successful (16.8%). Abscess drainage and gallstones removal were the main treatment in 15 patients (62.5%). Right lung decortication was performed six times (25%) while a pulmonary resection was necessary for five patients (20.8%).

Right lung decortication and RLL resection were both performed in one case (4.2%). Laparoscopic drainage was carried out in one case (4.2%), while laparotomic drainage was performed in five patients (20.8%). Ribs resection was associated with lung decortication and abscess drainage in one case (4.2%). Diaphragm partial resection for oval calcification was performed once with RLL resection (4.2%); diaphragmatic suture through thoracic access was performed in two patients (8.4%) (Fig. 5).

Therapeutic bronchoscopy and thoracentesis were performed twice (8.4%).

Treatment failure was observed in five patients (20.8%) treated using thoracentesis or percutaneous drainage. Complete resolution of symptoms was always obtained after thoracic surgery or abdominal surgery. Thoracic surgery or abdominal surgery was definitive treatments in 16 patients (66.7%).

Follow-up ranged from three to 36 months with a mean time of 9.7 ± 6.4 months. No recurrence during follow-up was documented.

DISCUSSION

Spilled stones related complications are rare, but gallstones may potentially lead to severe morbidity, especially if they are large, pigmented, numerous, fragmented, infected or associated with infected bile.^[35-37] Woodfield evaluated the risk of future complications after gallstone spillage in a complication rate of 2.3%, which is increased to 7% when gallstones are lost. Spilled stones complications onset has been documented from 10 days to 20 years, with a peak incidence of 4–10 months.^[9]

Adverse consequences of gallstones spillage after GIP during laparoscopic cholecystectomy may be minimized by accurate isolation of the gallbladder from its bed, which is probably the riskiest stage of cholecystectomy: a prompt retrieval of the spilled stones, abundant irrigation of the peritoneal cavity, routine use of endoscopic retrieval bags, and adequate prophylactic antibiotic therapy are also fundamental.^[7]

Abdominal cavity is the most common site where spilled stones may lead to the onset of many different complications as follows: granuloma, abscess, wound sinus/fistula, fibrosis, adhesions, small bowel obstruction, small bowel fistula, colonic fistula, generalized sepsis, diaphragmatic irritation and gynecological manifestations.^[9,38]

The first case of thoracic cholelithoptysis was described in 1955.^[39] After that, 24 cases after laparoscopic cholecystectomy were reported.

It is important to note that before laparoscopic cholecystectomy, cholelithoptysis and intrathoracic complications from gallstones were rare. Lithoptysis was associated with only the

broncholithiasis and the latter was associated with different conditions, such as tuberculosis, histoplasmosis, cryptococcosis, aspergillosis, silicosis, coccidioidomycosis, and actinomycosis.^[40]

Generally, thoracic complications of spilled stones are very rare and are linked to the inflammatory response against gallstones that may lead to the formation of an encapsulated inflammatory mass.

Thoracic manifestations of retained stones include: pleural empyema, abscess, atelectasis, cutaneous chest wall fistula, lung parenchyma consolidation, diaphragm's or lung's calcification, pneumonia.^[2,32,33]

Pigmented and cholesterol gallstone types are both involved in cholelithoptysis process without significant differences in the present series. It is supposed that two different pathophysiological mechanisms may lead to thoracic complications. The early mechanism starts during surgery when the overflow of gallstones in the subphrenic space may migrate into the thoracic cavity through diaphragmatic weakness and forming an inflammatory mass. In a late pathophysiological mechanism, subdiaphragmatic gallstones may lead to erosive damage of the diaphragmatic surface with the formation of a diaphragmatic fistula where gallstones may migrate into the lung parenchyma, causing lung pathological manifestations, such as abscess, cholelithoptysis, or hemoptysis, or they can pass into the pleural cavity, causing empyema. This latter mechanism could explain the late onset of spilled stones complications up to 20 years.^[9,38,41]

In the beginning, presenting symptoms may be specific, making an initial diagnosis can be quite difficult and often delayed, with the need of different diagnostic tests to achieve the final diagnosis (more than four imaging tests were performed in 50% of patients reported in the present review).

We also found a direct correlation between late symptoms and delayed diagnosis, with an increased time to diagnosis in patients with delayed symptoms after laparoscopic cholecystectomy.^[19,28,29]

Symptoms like hemoptysis and lithoptysis after laparoscopic cholecystectomy can help the physician to suspect this condition. Clinicians should always inquire about cholelithiasis and GIP in patients suffering from right-sided pleural or lung affections (particularly of RLL). Obviously, surgeons should always describe in their reports gallbladder iatrogenic perforation with stones spillage.

Abdominal and thoracic CT should always be considered as the diagnostic gold standard to evaluate suspected thoracic cholelithoptysis and to detect the presence of a subphrenic abscess, diaphragmatic fistula and other right pleural and lung pathological findings.

Thoracic involvement was prevalently in the RLL (62.4%), but also RML (12.5%) can be affected and five patients (20.8%) presented pleural empyema. Bronchoscopy is optimal to exclude any other endobronchial lesions, to remove gallstones and to perform escreate culture test.^[21]

In the thoracic surgery group, only four patients (16.8%) benefited from invasive treatments as second-line therapy after antibiotics, thoracentesis or percutaneous drainages. Six patients were treated using a thoracic approach as first-line therapy without considering other treatments, such as proper antibiotic therapy, thoracentesis, percutaneous abdominal drainage or abdominal surgery approach.

Two patients underwent respectively to RLL wedge resection for suspected lung adenocarcinoma (histologically confirmed) and to partial pulmonary decortication and resection of portions of ribs 9 and 10 for peritoneopleurocutaneous fistula.

Laparoscopic drainage was carried out in one case (4.2%), while laparotomic drainage was performed in five patients (20.8%) with complete resolution of symptoms. Results of abdominal and thoracic approaches are stackable in the present review.

Although seven patients were treated with thoracentesis or percutaneous abdominal drainage, only two patients were successfully treated and included in the interventional radiology group. Bronchoscopy and percutaneous abdominal drainage were successfully performed one time.

Early empiric antimicrobial therapy is essential to control infections and prevent sepsis; the complete resolution was successfully obtained in four patients.

In conclusion, in case of thoracic complications, due to spilled gallstones, the first-line therapy should include targeted antibiotic therapy based on cultures eventually associated with interventional procedures, such as bronchoscopy, thoracentesis and percutaneous CT/ultrasound guided drainage.

Laparoscopic abdominal drainage and gallstones retrieval should be performed as second-line therapy in non-responsive patients. Lung decortication or pulmonary parenchyma resection using thoracotomy, thoracoscopy, VATS and mediastinoscopy should be considered only for non-responsive patients to second-line abdominal surgery: in particular, lung decortication and lung resection should be performed in selected cases when other minor thoracic interventions have not resulted in clearance of the infection. This because lung decortication and lung resection are associated with increased morbidity and mortality, longer hospital stay and postoperative complications, including pneumonia, acute respiratory failure, prolonged air leak, bleeding. Thus, lung decortication and lung resection should be performed in selected cases as third-line therapy.^[42-44]

Finally, it is essential to stress the mandatory significance to report GIP and stones spillage in operative notes. Patients should also be informed about these rare but possible late complications linked to retained gallstones.^[41]

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Internally peer-reviewed.

Authorship Contributions: Concept: G.P., F.C.; Design: A.T.; Supervision: G.P., M.G., A.T., E.B., F.C.; Resource: M.G., E.B.; Materials: M.G., E.B.; Data: M.G., E.B.; Analysis: M.G., F.C.; Literature search: M.G., E.B.; Writing: G.P., M.G.; Critical revision: G.P., M.G., A.T., E.B., F.C.

Conflict of Interest: None declared.

Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

- Schäfer M, Krähenbühl L, Farhadi J, Büchler MW. Cholelithiasis-laparoscopy or laparotomy?. [Article in German] *Ther Umsch* 1998;55:110–5.
- Chekan EG, Pappas TN. Minimally invasive surgery. In: Townsend CM Jr, editor. *Sabiston Textbook of Surgery: The biological basis of modern surgical practice*. Philadelphia: WB Saunders; 2001.p.292–310.
- Brockmann JG, Kocher T, Senninger NJ, Schürmann 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, et al. Lost stones during laparoscopic cholecystectomy. *HPB Surg* 1998;11:105–8; discuss 108–9.
- Memon MA, Deek RK, Maffi TR, Fitzgibbons RJ Jr. The outcome of unretrieved gallstones in the peritoneal cavity during laparoscopic cholecystectomy. A prospective analysis. *Surg Endosc* 1999;13:848–57.
- Mohiuddin K, Nizami S, Fitzgibbons RJ Jr, Watson P, Memon B, Memon MA. Predicting iatrogenic gall bladder perforation during laparoscopic cholecystectomy: a multivariate logistic regression analysis of risk factors. *ANZ J Surg* 2006;76:130–2.
- Usuba T, Nyumura Y, Takano Y, Iino T, Hanyu N. Clinical outcomes of laparoscopic cholecystectomy with accidental gallbladder perforation. *Asian J Endosc Surg* 2017;10:162–5.
- De Simone P, Donadio R, Urbano D. The risk of gallbladder perforation at laparoscopic cholecystectomy. *Surg Endosc* 1999;13:1099–102.
- Woodfield JC, Rodgers M, Windsor JA. Peritoneal gallstones following laparoscopic cholecystectomy: incidence, complications, and management. *Surg Endosc* 2004;18:1200–7.
- Ladic A, Petrovic I, Augustin G, Puretic H, Skegro M, Gojevic A, Nikolic I. Hemoptysis as an early symptom of abdominal actinomycosis with thoracic extension ten years after cholecystectomy with retained gallstone. *Surg Infect (Larchmt)* 2013;14:408–11.
- Horton M, Florence MG. Unusual abscess patterns following dropped gallstones during laparoscopic cholecystectomy. *American J Surg* 1998;175:375–9.
- Stock CT, O'Donnell T, Barie PS. Retained gallstone after laparoscopic cholecystectomy. *Surg Infect (Larchmt)* 2012;13:341–2.
- Downie GH, Robbins MK, Souza JJ, Paradowski LJ. Cholelithoptysis. A complication following laparoscopic cholecystectomy. *Chest* 1993;103:616–7.
- Lee VS, Paulson EK, Libby E, Flannery JE, Meyers WC. Cholelithoptysis and cholelithorhea: rare complications of laparoscopic cholecystectomy. *Gastroenterology* 1993;105:1877–81.
- Brazinsky SA, Colt HG. Thoracoscopic diagnosis of pleuroolithiasis after laparoscopic cholecystectomy. *Chest* 1993;104:1273–4.
- Thompson J, Pisano E, Warshauer D. Cholelithoptysis: an unusual complication of laparoscopic cholecystectomy. *Clin Imaging* 1995;19:118–21.
- Barnard SP, Pallister I, Hendrick DJ, Walter N, Morrill GN. Cholelithoptysis and empyema formation after laparoscopic cholecystectomy. *Ann Thorac Surg* 1995;60:1100–2.
- Willekes CL, Widmann WD. Empyema from lost gallstones: a thoracic complication of laparoscopic cholecystectomy. *J Laparoendosc Surg* 1996;6:123–6.
- Breslin AB, Wadhwa V. Cholelithoptysis: a rare complication of laparoscopic cholecystectomy. *Med J Aust* 1996;165:373–4.
- Neumeyer DA, LoCicero J 3rd, Pinkston P. Complex pleural effusion associated with a subphrenic gallstone phlegmon following laparoscopic cholecystectomy. *Chest* 1996;109:284–6.
- Noda S, Soybel DI, Sampson BA, DeCamp MM Jr. Broncholithiasis and thoracoabdominal actinomycosis from dropped gallstones. *The Annals of Thoracic Surg* 1998;65:1465–7.
- Kelty CJ, Thorpe JA. Empyema due to spilled stones during laparoscopic cholecystectomy. *Eur J Cardiothorac Surg* 1998;13:107–8.
- Chan SY, Osborne AW, Purkiss SF. Cholelithoptysis: an unusual complication following laparoscopic cholecystectomy. *Dig Surg* 1998;15:707–8.
- Chopra P, Killorn P, Mehran RJ. Cholelithoptysis and pleural empyema. *Ann Thorac Surg* 1999;68:254–5.
- Preciado A, Matthews BD, Scarborough TK, Marti JL, Reardon PR, Weinstein GS, et al. Transdiaphragmatic abscess: late thoracic complication of laparoscopic cholecystectomy. *J Laparoendosc Adv Surg Tech A* 1999;9:517–21.
- Werber YB, Wright CD. Massive hemoptysis from a lung abscess due to retained gallstones. *Ann Thorac Surg* 2001;72:278–80.
- Hanna SJ, Barakat O, Watkin S. Cholelithoptysis: an unusual delayed complication of laparoscopic cholecystectomy. *J Hepatobiliary Pancreat Surg* 2004;11:190–2.
- Houghton SG, Crestanello JA, Nguyen AQ, Deschamps C. Lung abscess due to retained gallstones with an adenocarcinoma. *Ann Thorac Surg* 2005;79:e26–7.
- Iannitti DA, Varker KA, Zaydfudim V, McKee J. Subphrenic and pleural abscess due to spilled gallstones. *JLS* 2006;10:101–4.
- Fontaine JP, Issa RA, Yantiss RK, Podbielski FJ. Intrathoracic gallstones: a case report and literature review. *JLS* 2006;10:375–8.
- Bergeron E, Beaulieu C, Passerini L, Ratte S. Dropped gallstones causing transdiaphragmatic migration and thoracic empyema. *Ann Thorac Surg* 2007;84:1760–2.
- Flores-Franco RA. Thoracic empyema due to migrated gallstones. *Ann Hepatol* 2013;12:325–6.
- Quail JF, Soballe PW, Gramins DL. Thoracic gallstones: a delayed complication of laparoscopic cholecystectomy. *Surg Infect (Larchmt)* 2014;15:69–71.
- Gaster RS, Berger AJ, Ahmadi-Kashani M, Shrager JB, Lee GK. Chronic cutaneous chest wall fistula and gallstone empyema due to retained gallstones. *BMJ Case Rep* 2014;2014:bcr2013010159.
- Agalar F, Sayek I, Agalar C, Cakmakçi M, Hayran M, Kavuklu B. Factors that may increase morbidity in a model of intra-abdominal contamination caused by gallstones lost in the peritoneal cavity. *Eur J Surg*

- 1997;163:909–14.
36. Hornof R, Pernegger C, Wenzl S, Bittermann G, Brinninger G, Tessadri R, et al. Intraoperative cholelithiasis after laparoscopic cholecystectomy-behavior of 'lost' concretions and their role in abscess formation. *Eur Surg Res* 1996;28:179–89.
37. Yerdel MA, Alacayir I, Malkoc U, Baba F, Erverdi N, Pak I, et al. The fate of intraperitoneally retained gallstones with different morphologic and microbiologic characteristics: an experimental study. *J Laparoendosc Adv Surg Tech A* 1997;7:87–94.
38. Zhang Q, Wang X, Yan C, Mu Y, Li P. Gallstone ectopia in the lungs: case report and literature review. *Int J Clin Exp Med* 2014;7:4530–3.
39. Adams HD. Pleurobiliary and bronchobiliary fistulas. *J Thoracic Surg* 1955;30:255–64.
40. Antao VC, Pinheiro GA, Jansen JM. Broncholithiasis and lithoptysis associated with silicosis. *Eur Respir J* 2002;20:1057–9.
41. Sathesh-Kumar T, Saklani AP, Vinayagam R, Blackett RL. Spilled gall stones during laparoscopic cholecystectomy: a review of the literature. *Postgrad Med J* 2004;80:77–9.
42. Tong BC, Hanna J, Toloza EM, Onaitis MW, D'Amico TA, Harpole DH, et al. Outcomes of video-assisted thoracoscopic decortication. *Ann Thorac Surg* 2010;89:220–5.
43. Stéphan F, Boucheseiche S, Hollande J, Flahault A, Cheffi A, Bazelly B, et al. Pulmonary complications following lung resection: a comprehensive analysis of incidence and possible risk factors. *Chest* 2000;118:1263–70.
44. Sengupta S. Post-operative pulmonary complications after thoracotomy. *Indian J Anaesth* 2015;59:618–26.

ORİJİNAL MAKALE - ÖZET

Laparoskopik kolesistektomi sonrası kalan safra taşlarından kaynaklanan torasik komplikasyonlar: Torasik bir yaklaşım her zaman zorunlu mudur?

Dr. Gennaro Perrone,¹ Dr. Mario Giuffrida,² Dr. Antonio Tarasconi,¹ Dr. Elena Bonati,² Dr. Fausto Catena¹

¹Parma Üniversitesi Hastanesi Acil ve Travma Cerrahisi Bölümü, Parma-İtalya

²Parma Üniversitesi Hastanesi, Genel Cerrahi Bölümü, Parma-İtalya

AMAÇ: Kalan safra taşlarından kaynaklanan torasik komplikasyonlar oldukça nadirdir; insidansları %0.08 ile %0.3 arasında değişmektedir. Bu komplikasyonların tanı ve tedavisi, nadir görülen prezentasyonları ve torasik yaklaşımın tartışmalı rolü nedeniyle zordur. Literatürde bildirilen tüm olguları içeren bu yazı, bu nadir duruma dair en iyi uygulamayı tartışmayı amaçlamaktadır.

GEREÇ VE YÖNTEM: PubMed, Medline, Embase, ScienceDirect kullanılarak, Ocak 1993'ten Mayıs 2019'a kadar makaleler için kapsamlı bir literatür taraması yapıldı. Taramada şu tıbbi konu başlıkları (MeSH (Medical Subject Headings)) kullanıldı: "kolelitoptizi", "torasik", "safra taşları" "kalmış", "dökülmüş". Laparoskopik kolesistektomi sonrası kalan safra taşlarından kaynaklanan torasik komplikasyonları olan tüm vakalar ekstrapole edilmiştir.

BULGULAR: Çalışmaya 24 hasta dahil edildi. En yaygın semptomlar ateş, hemoptizi ve litoptiziydi. Semptomlar laparoskopik kolesistektomi sonrası ortalama 9.8±14.2 ay (1 hafta ile 60 ay arası) sonra ortaya çıktı. On dört hastada (%58.4) gecikmiş tanı saptandı. Sadece dört hasta tek başına antibiyotik tedavisi ile başarılı bir şekilde tedavi edildi (%16.7); 20 hasta ise cerrahi veya girişimsel radyolojiye ihtiyaç duydu (%83.3). Yedi hasta (%29.2) abdominal yaklaşımla başarıyla tedavi edildi. On hastada (%41.6) sağ akciğer dekortikasyonu ve pulmoner kama rezeksiyonu gerekti.

TARTIŞMA: Klinisyenler, tanısal gecikmeyi önlemek için, tekrarlayan sağ taraflı plevral/akciğer rahatsızlıkları olan tüm hastalarda, kolelitiazis ile ilişkili hastalıklar için önceki kolesistektomi hakkında her zaman bilgi almak zorundadır. Arttırılmış yaklaşım uygulanmalıdır: ampirik antimikrobiyal tedavi ve ardından mikrobiyolojik veriler elde edilir edilmez hedefe yönelik tedavi; daha sonrasında yapılan abdominal cerrahi hastaların yaklaşık %30'unda etkiliyken, geri kalan hastalarda torasik bir yaklaşım gerekir.

Anahtar sözcükler: Abdominal komplikasyonlar; dökülmüş; kalan safra kesesi taşları; kolelitoptizi; laparoskopik kolesistektomi; torasik komplikasyonlar.

Ulus Travma Acil Cerrahi Derg 2020;26(6):95-103 doi: 10.14744/tjtes.2020.07280