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Case Report
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Peritonitis Secondary to *Ligamentum Teres Hepatis Gangrene*: A Case Report and Review of the Literature

Nolasco Vaz J[1]*, Sousa M[1], Peixoto A[2], Rebelo dos Santos V[1], Fernandes S[1], Ferreira J[1], Marques J[1] and Coutinho J[1]

[1]*Department of General Surgery, Centro Hospitalar Universitário Lisboa Norte, Portugal*

[2]*Department of Radiology, Centro Hospitalar Universitário Lisboa Norte, Portugal*

Abstract

Ligamentum teres hepatis necrosis is a rare entity. Few surgeons are aware of its existence, and even fewer have clinically dealt with it. Its physiopathology is yet to be unraveled but might result from superinfection of an intra-abdominal focal fat infarction in the presence of biliopancreatic disorders.

We herein present a case report of a 63 year-old woman with acute peritonitis and septic shock resulting from falciform ligament gangrene, with initial diagnostic hypothesis of acute pancreatitis or perforated duodenal ulcer. Antibiotic and surgical management with complete round ligament excision was performed even though not achieving the desired outcome.

A review of the literature acknowledged 40 other case reports. Epidemiology and clinically relevant information was assembled. It has a female preponderance mainly presenting in the 7th decade of life.

Although computed tomography scan images are characteristic in 75% of the cases, the diagnosis was made pre-operatively in only 40%. In 51% there was an associated hepatobiliary condition (cholangitis, choledocholithiasis, and acute cholecystitis).

Conservative approach has a 50% failure rate and the treatment should consist in surgical resection of the ligament by open or laparoscopic approach, allowing exclusion of concomitant disorders. The mortality rate was 4.9%.

Keywords: Round ligament; *Ligamentum teres hepatis*; Falciform ligament; Abscess; Necrosis; Inflammation

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Correspondence:
Joana Nolasco Vaz, Department of General Surgery, Centro Hospitalar Universitário Lisboa Norte, Avenida Professor Egas Moniz, 1649035, Lisboa, Portugal, Tel: +351-963157940; E-mail: j.nolascovaz@hotmail.com

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Abbreviations

ALP: Alkaline Phosphatase; ALT: Alanine Transaminase; AST: Aspartate Transaminase; CRP: C Reactive Protein; CT: Computerized Tomography; *E. coli*: *Escherichia coli*; ERCP: Endoscopic Retrograde Cholangiopancreatography; FL: Falciform Ligament; GGT: Gamma-Glutamyltransferase; IFFI: Intra-Abdominal Focal Fat Infarction; LTH, *Ligamentum Teres Hepatis*

Introduction

Pathologic conditions of the Falciform Ligament (FL) are extremely rare. Isolated gangrene of the *Ligamentum Teres Hepatis* (LTH) has rarely been reported in the literature, and it is a perplexing cause of acute abdomen. Its diagnosis is rarely made pre-operatively because of common findings suggesting other causes of acute abdomen, but mainly due to the lack of knowledge of its existence. We reviewed the literature, identifying 40 case reports [1-39], and we present the 41st case.

Methods

The case report was described following the SCARE recommendations [40]. We searched the following bibliographic databases: PubMed, and specialty search engines Google Scholar and Research Gate. The search strategy included a combination of key words and MeSH terms: "*Ligamentum Teres Hepatis*", "round liver ligament", "falciform ligament" gangrene. We also searched gray literature sources (conference proceedings and abstracts) and screened reference lists of relevant articles. We also reviewed each paper bibliography for other cases that might not be found in the above mentioned search.

We conducted citation tracking using EndNote. We did not apply any date, language restrictions. Articles with pediatric population were excluded.

We included 40 adult population cases and performed a systematic review comparing demographics, clinical presentation, radiologic imaging, treatment and outcome and presented in Table 1 from the appendix.

Case Presentation

A 63-year-old female with history of arterial hypertension, myocardial infarction, chronic obstructive pulmonary disease, pulmonary embolism, hemodialysis for chronic kidney disease and obesity was admitted in the emergency department with 12 h complaints of fever, chills, abdominal pain and biliary vomit. Relevant blood analysis where suggestive of acute pancreatitis - amylase 1339 U/L, Aspartate Transaminase (AST) 1204 U/L; Alanine Transaminase (ALT) 561 U/L; total bilirubin 2.2 mg/dL; C Reactive Protein (CRP) 3,49 mg/dL - although the abdominal ultrasound could only identify a 17 mm hypoechogenic nodule in the left hepatic lobe (Figure 1). In 24 h the patient deteriorated showing hemodynamic instability and respiratory distress needing mechanical ventilation, antibiotherapy and admission to intensive care unit. A Computed Tomography (CT) (Figure 2) revealed free air in the hepatoduodenal ligament and FL, a hypodense collection in LTH, pancreatic head edema and left portal vein thrombosis. On exploratory laparotomy she was found to have purulent peritonitis and LTH gangrene with no other findings, and was submitted to LTH resection (Figure 3), abdominal *toilette* and drainage. On post-operative day 2, due to bilious drainage, Endoscopic Retrograde Cholangiopancreatography (ERCP) was performed detecting a small leak on a left secondary bile duct (Figure 4). Sphincterotomy was avoided due to coagulopathy, and a plastic stent was deployed, with resolution of the leak. The hospital stay was complicated with pneumonia and thrombosis of the right femoral-iliac axis, which led to the diagnosis of antiphospholipid syndrome with establishment of therapeutic anticoagulation.

On the 6th post-operative day, clinical deterioration was evident

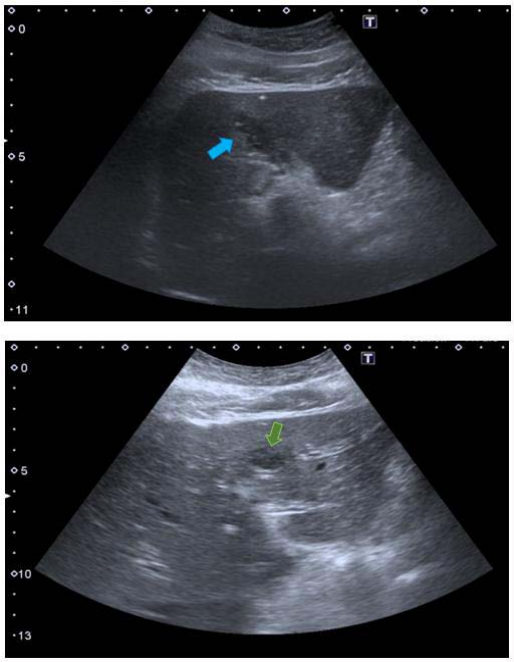

Figure 1: Abdominal US revealing heterogeneous and hypoechoic area in falciform ligament (blue arrow) and hepatic left lobe (green arrow).

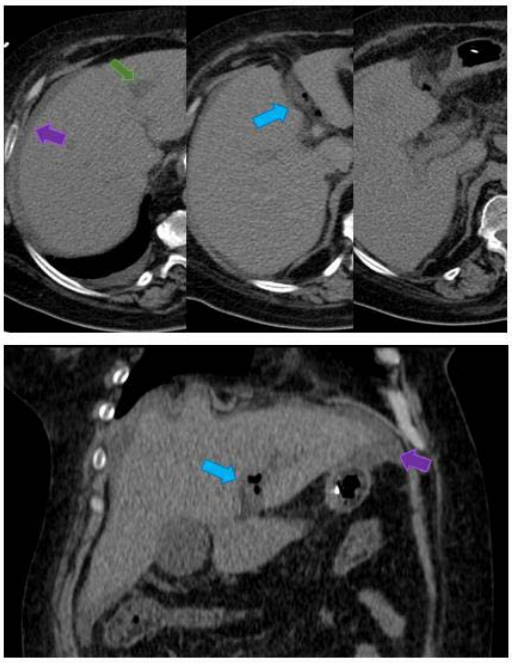

Figure 2: Abdominal CT revealing fat stranding and gas in LTH (blue arrow), hypodense area in the left hepatic lobe (green arrow) and free intraperitoneal fluid (purple arrow). a) Axial view b) Coronal view.

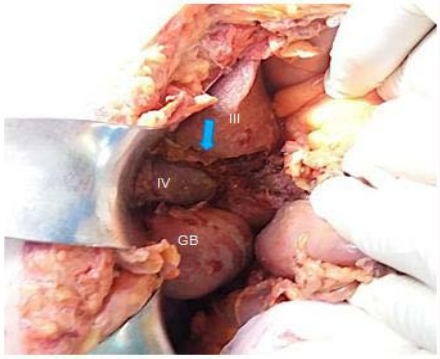

Figure 3: Intraoperative findings: isolate LTH gangrene (excised) extending to umbilical fissure (blue arrow). GB gallbladder; III segment III; IV segment IV.

Figure 4: ERCP revealing left secondary duct leak.

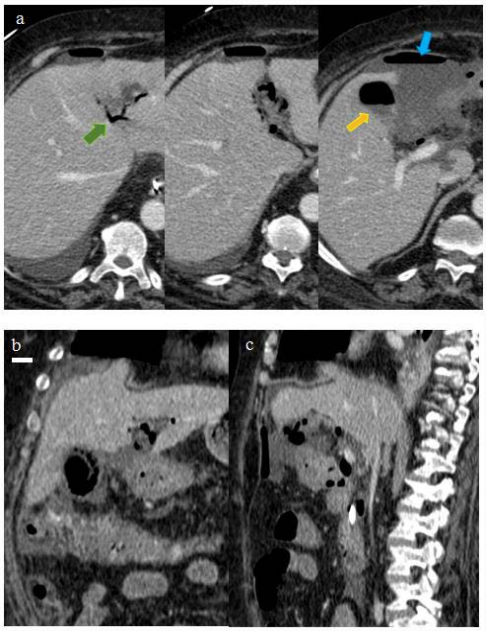

Figure 5: Abdominal enhanced CT revealing aerobilia (green arrow) and gas in the gallbladder (yellow arrow), left hepatic portal vein thrombosis, free intraperitoneal fluid and a collection in the falciform ligament area containing gas and liquid (blue arrow). a) Axial b) Coronal c) Sagital.

Table 1: Clinical findings.

Symptoms/signs	Patient's Nº (%)
Abdominal pain	41 (100%)
Fever	22 (53.7%)
Nausea/Vomiting	13 (31.7%)
Palpablemass	6 (14.6%)
Jaundice	3 (7.3%)
Anorexia	3 (7.3%)
Weight loss	1 (2.4%)
Fulness	1 (2.4%)
Umbilical bruise	1 (2.4%)

Table 2: Blood test results.

Laboratory test	Altered values/Available cases	Range of values (average)
Leukocyte	26/34 (76%)	2800-3300 (3050/µL) 12500-28100 (16350/µL)
CRP	14/19 (74%)	1.9- 40 (15,1 mg/dL)
ALT	10/25 (40%)	74-598 (229 U/L)
AST	11/25 (44%)	50-1204 (348 U/L)
Amylase	10/24 (42%)	205-2245 (1120 U/L)
Bilirubin	9/22 (41%)	1,25-17 (6,4 mg/dL)
GGT	6/16 (38%)	112-837 (361 U/L)
ALP	6/18 (33%)	262-604 (393 U/L)

and recrudescence of intra-abdominal pre-hepatic collection was identified and drained percutaneously with CT guidance (Figure 5). Maintenance of multi-organ failure led to new surgical exploration identifying an organized infected hematoma that was drained and an abdominal lavage system was applied. Despite all efforts the patient eventually died with refractory shock on the 13th hospitalization day. Both intra-abdominal and blood cultures tested positive for *Escherichia coli* (*E. coli*).

Table 3: Proposed diagnosis.

Differential diagnosis	Nº (%)
Ligamentum teres hepatis abscess	14 (40%)
Acute cholecystitis	10 (29%)
Perforated peptic ulcer disease	6 (17%)
Cholangitis	6 (17%)
Acute cholecystitis	6 (17%)
Tumor	1 (3%)
Hepatic metastasis	1 (3%)
Hepatic abscess	1 (3%)
Biliary peritonitis	1 (3%)
Internal hernia	1 (3%)
Acute mesenteric ischemia	1 (3%)
Ampullary carcinoma	1 (3%)

Table 4: Pus isolates.

Pus culture	Nº/14 (%)
Escherichia coli	7 (47%)
Staphylococcus epidermidis	3 (20%)
Clostridium perfringens	3 (20%)
Enterococcus spp.	3 (20%)
Enterobacter spp.	2 (13%)
Klebsiella pneumoniae	2 (13%)
Bacteroides fragilis	1 (7%)
Klugaria spp.	1 (7%)
Citrobacter freundii	1 (7%)
Serratia marcescens	1 (7%)
Streptococcus anginosus	1 (7%)

Discussion

The FL connects the liver to the anterior abdominal wall and diaphragm where it divides into the two coronary ligaments. It contains the LTH (or round ligament of the liver), paraumbilical veins, and extraperitoneal fat [22,29]. The LTH runs in the free edge of the FL and is the remnant of the obliterated fetal umbilical vein [41].

Described LTH lesions include congenital ligament defects or cysts, abnormal vascularization secondary to portal hypertension, aberrant biliary ducts, internal hernia through the ligament and tumors [10,13,42-46]. The repermeabilization of para-umbilical veins, represents an important portocaval shunt in patients with portal hypertension [41,43,47], and spontaneous rupture of these veins with hematoma of the FL and hemoperitoneum has been described [48].

Extension of secondary tumors, in continuity, by lymphatic or hematogenous spread, mainly by the left portal branch have also been reported [19,49,50]. The umbilical node of Sister Mary Joseph is a well-known physical sign of metastasis, usually from digestive or gynecological origin that proves the importance and existence of the previously described route of spread [51,52].

Less frequently, the FL is affected with primitive tumors like lipomas [53-55], teratomas [56], leiomyosarcomas [57-59],

lymphangiomas, mesotheliomas, epithelioid cell tumors or clear cell myomelanocytic tumors [13,19,60].

Torsion or infarction of a lipomatous appendage of the FL, similarly with Intra-abdominal Focal Fat Infarction (IFFI) concerning mental or epiploic appendages, has been reported causing acute abdominal pain [44,61,62].

The space between both peritoneal layers of the FL represents a potential space for abscess collections [63], but isolated gangrene of the FL is extremely rare. Including our patient, in the present review we found 41 adult cases of LTH gangrene.

There seems to be a female preponderance (63% female; 37% male) and the average age of presentation was 63 (median of 65), ranging from 18 to 96 years old, with 29 patients (70%) being 60 or older.

The physiopathology of LTH necrosis/gangrene is still obscure, and the mechanisms are said to be either ischemic or infectious [16,17,23,28,29].

Some authors consider that an infectious pathology can be the origin of FL gangrene either spreading contiguously, hematogenously (by the repermeabilized umbilical veins), *via* lymphatic's or by the presence of an aberrant bile duct in the LTH [3,8,10,22,23,25,28,30,31]. In newborns and infants, omphalitis is a common condition and has been reported as a cause of septic involvement of the LTH [63,64]. This condition is rarely seen in adults [20], but the existence of other concomitant infectious syndromes, usually with biliary origin, strongly supports the infectious hypothesis [65]. Reported possible causes in the origin of LTH abscess where demonstrated in 51% (21) of reviewed cases: 8 with cholestasis (6 cholangitis and 2 choledocholithiasis); 4 with acute cholecystitis; 1 acute pancreatitis and 8 patients with cholelithiasis. Transient common bile duct obstruction with spontaneous calculi passage might explain bacterial spread, and this hypothesis is well demonstrated in Dosher et al. [3] case, where despite gallbladder pathology showing nothing but chronic changes, the same bacteria where isolated in the abscess pus and gallbladder bile. Although our resection was limited to the LTH a left secondary bile duct leak reinforces the possibility of an aberrant biliary duct in the origin of bacterial spread.

Ischemic events similar to appendagitis have been proposed but most IFFI of the FL show resolution with conservative measures, without progression to infection [61]. In our opinion, they might represent an initial phase of the same disorder, with posterior bacterial superinfection leading to LTH gangrene.

Excluding cirrhosis and malignant disease, sepsis is responsible for 10% to 25% of cases of portal vein thrombosis [21]. Pylephlebitis may be secondary to suppuration either in the region drained by the portal system (diverticulitis, appendicitis) or in contiguous structures (biliary tract infection, acute necrotizing pancreatitis) [21,66-68]. The extension of portal pyemia to the LTH *via* paraumbilical veins may be in the origin of the gangrene [25].

The embolization or thrombosis of the narrow artery or veins of the FL may explain the progression to ischemia and gangrene [29]. In our review, evidence of portal thrombosis was present in 15% of the cases (6 patients, 4 of them in the left portal branch), supporting a relation between this event and gangrene of the FL.

It is still necessary to determine what comes first: Is thrombosis enabling the infectious process, or is the infection leading to thrombosis? If thrombosis comes first, are coagulation disorders in the origin of this complication? Kanellopoulou et al. [66] found that 36% of patients with pylephlebitis had a thrombophilic disorder, but in the present review only our patient (2.4%) had a prothrombotic disorder.

Not all 41 articles were complete regarding personal disease history, laboratory and microbiologic results, among other information, limiting the data we could extract from them.

Of the 32 cases with information about past diseases, 13 (41%) had disorders that might have enabled LTH abscess: 7 diabetic, 2 epigastric/umbilical hernia correction, 1 antiphospholipid syndrome, 1 with recent ERCP for choledocholithiasis, 1 with previous history of pancreatitis, 1 on immunosuppressant's for aplastic anemia. Of the remaining, 4 were healthy and the others had diseases apparently non-related with FL gangrene (arterial hypertension, obesity, coronary artery disease, chronic obstructive pulmonary disease).

Most patients had complaints for a period of hours to 4 days before heading to the hospital, but up to 23% had an insidious presentation lasting for 1 week up to 6 months. The clinical presentation is quite expressive, overlapping an acute peritonitis, with 25% reporting septic shock. The onset is usually sudden, with acute abdominal pain, usually epigastric and/or in the right hypochondrium; some refer irradiation to the back [16,17,19,23,34]. Fever is present in as many as 53.7% of the cases with associated nausea/vomiting in 31.7%. In 14.6% of the patients it is possible to palpate an epigastric/RUQ tender mass and in one an umbilical bruise could be seen. Table 1 lists the most common findings.

Laboratory results were only available in some case reports, and the Table 2, summarizes the findings. Leukocyte count and CRP were abnormal in 76% and 74% of the cases reflecting an infectious process, and up to 41% revealed cholestasis in laboratory work-up.

The imagiological findings where described in 35 case reports, with 3 referring only abdominal radiography availability at the time. Findings with CT scan or ultrasound, some of them reporting back to 1981, are concordant in 75% of the cases, revealing a collection/infiltration/densification/phlegmon in the extension of the LTH.

Contrast-enhanced abdominal CT scan is the gold standard for diagnosis of intraperitoneal fat necrosis [29,62], and the same probably applies for LTH gangrene. Imaging plays a pivotal role, identifying or excluding other intra-abdominal septic foci and concomitant findings like FL pneumatosis, present in 11.4% of the cases.

Although CT findings are quite characteristic, only 40% reported a correct initial pre-operative diagnosis. Many had repeated CT scans or multiple image modalities before achieving the diagnosis. Among the 60% failed diagnosis, biliary infectious diseases, perforated peptic ulcer disease and acute pancreatitis where the most commonly proposed hypothesis (Table 3: there were multiple diagnosis proposed per patient in some cases).

Even in the sight of obvious clinical and imaging evidence, given the scarcity of this clinical entity it's easy to assume a more ordinary disorder (air in the hepatoduodenal space as a result of a hollow viscus perforation; abdominal pain with hyperamylasemia as acute pancreatitis).

In our review only 20 case reports mentioned the status of pus sample culture: 50% yielded monomicrobial infection, 25% polymicrobial and 25% where negative. Similarly to omphalitis, in children with FL gangrene, the most frequently isolated microorganisms are *Staphylococcus or Streptococcus* spp. [63,64]. In this review, these agents were present in 27% of the cases with isolates. The most frequent bacterial agent responsible for LTH abscess was *E. coli*. Out of the 10 case reports mentioning blood culture results, 50% yielded positive: 2 for *E. coli*, one for *Streptococcus anginosus*, one for *Klebsiella pneumonia* and one for Gram negative *bacilli* (Table 4).

Conservative measures have 50% failure rate, resulting in progressive clinical deterioration to septic shock or acute peritonitis. Although 2 cases [19,21] report successful treatment with antibiotic therapy, 3 authors [14,33,64] report recrudescence of the abscess even when associated with percutaneous drainage. Moon et al. [64], suggest that the paucity of vascular network hinders exposure to antibiotics.

Complete excision of LTH is necessary for septic focus control and was the adopted technique in all 93% operated patients. Laparoscopic resection was performed in 9 patients (24%) with good results added to the advantages of minimal invasive surgery.

Thirteen patients had simultaneous cholecystectomy (4 with pathologic characteristics of chronic cholecystitis), 1 a cholecystostomy, 6 eventually needed endoscopic retrograde cholangiopancreatography and 1 had simultaneous pancreaticoduodenectomy for ampullary carcinoma. The prognosis is usually favorable, with a 4.9% mortality rate.

Conclusion

FL gangrene is an extremely rare cause of acute abdomen, with an unknown physiopathology. This diagnosis should be considered in a patient with acute abdominal epigastric/RUQ pain and a characteristic CT scan image of hypoechogenic collection of the LTH.

The major challenge for the surgeon is to consider this diagnostic hypothesis and start aggressive treatment with antibiotic and surgery as soon as possible, with anticoagulation and ERCP if deemed suitable.

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APPENDIX

Table 1: Review of reported cases in literature.

Author	S/A	Previous M.H.	Signs/ Symptoms	Imageexams	Pus/HC	Proposed diagnosis	Associated findings	Time of diag.	Approach	R
1975 Zoria [1]	F 60	None	RUQ pain	-	-	Cholecystitis	None	Intra-op	LTH resection	FR
1976 Charuzi [2]	F 74	None	Fever + epigastricpain	-	neg/neg	Perforated PU	None	Intra-op	LTH resection	FR
1980 Doscher [3]	M 79	None	Fever + abdominal pain + vomiting + constipation	X-ray: dilated small and large bowel	*C.perfringens B.fragilis E.coli* / -	Mesentericischemia	CCC	Intra-op	LTH resection + cholecystectomy	†
1981 Sones[4]	M 71	-	RUQ pain + palpablemass	CT: LTH round/ cylindrical fluid density mass extending to porta hepatis + thick-walled gallbladder.	-	LTH abscess + cholecystitis + abdominal wall tumor	Ruptured gangrenous cholecystitis	Pre-op	ERCP (normal) + LTH resection + cholecystectomy	FR
1983 Sorensen [5]	F 49	None	Epigastricpain	-	-	Perforated PU	None	Intra-op	LTH resection	FR
1986 Eloev [6]	F 65	DM	Abdominal distention / pain	-	-	Pancreatitis	None	Intra-op	LTH resection	FR
1987 Chupryna [7]	F 74	None	RUQ pain	-	-	-	None	Intra-op	LTH resection	FR
1988 Migliaccio [8]	F old	DM; obesity	Fever + RUQ pain + palpable mass	-	-	Cholecystitis	None	Intra-op	LTH resection + cholecystostomy	FR
1988 Migliaccio [8]	F 28	-	RUQ pain + palpablemass	Cholecystography: suggestive of acute cholecystitis	-	Cholecystitis	None	Intra-op	LTH resection + cholecystectomy + choledochotomy	FR
1988 Watson [9]	F 84	Right HCT, AF, pancreatitis	Fever + abdominal pain + vomiting	CT: cholelithiasis + left liver lobe mass	neg/neg	Cholecystitis + livermetastasis	CCC	Intra-op	LTH resection + cholecystectomy	FR
1992 Brock [10]	F 96	-	Fever+ epigastric/ RUQ pain	CT: free air around LTH + inflamed acalculous gallbladder.	*C.perfringens S.epidermidis E.faecalis Enterobacter Klugaria*/ -	Perforated PU	None	Intra-op	LTH resection	-
1999 Pans [11]	F 69	GERD; epigastric hernioplasty	Epigastric/RUQ pain + vomiting	CT: cholelithiasis + IEHBD dilation + hepatic hypodense lesion	*E.coli Enterococcus K.pneumoniae* / -	None	Cholecystitis	Intra-op	LTH resection + cholecystectomy	FR
2000 Goti [12]	F 32	-	Epigastric/RUQ pain	TC: LTH inflamatorymass	-	Internal hernia	None	Intra-op	Laparoscopic LTH resection	FR
2002 Losanoff [13]	M 18	None	Fever+ epigastric pain	X-ray: air-fluid level	*E.coli*/ neg	Perforated PU	None	Intra-op	LTH resection + cholecystectomy	FR
2003 de Melo [14]	M65	-	Fever + RUQ pain + palpable mass + fulness	TC: cylindrical mass along LTH extending to porta hepatis	-	Hepatic abscess	Cholecystitis	Intra-op	PD à relapseà LTH resection + cholecystectomy	FR
2004 Martin [15]	F 52	Obesity	Epigastric/RUQ pain + vomiting	US: cholelithiasis + thick-walled gallbladder		Cholecystitis	Cholelithiasis	Intra-op	Laparoscopic LTH resection	FR
2005 Tison [16]	M86	Status post melanoma	Jaundice + abdominal pain irradiating to right scapula	CT: RUQ collections extending to the abdominal wall	neg/neg	Biliary peritonitis	CBD calculi	Intra-op	ERCP + LTH resection	FR
2006 Aoun [17]	M62	DM, dyslip.., MI; Parkinson	Fever+ epigastricpain dorsal irradiation	TC: peripancreatic fat stranding à TC: LTH collection + pneumatosis	*E.coli*/ *E.coli*	LTH abscess + pancreatitis	None	Pre-op	LTH resection	FR
2008 Ito [18]	F 71	Immuno-suppressants; aplastic anemia	Fever+ epigastric/ RUQ pain + vomiting	TC: mild pancreatic edema à CT: upper intra - abdominal midline tumor	*E.cloacae*/ -	Pancreatitis + LTH abscess	Pancreatitis	Pre-op	LTH resection	FR
2008 Novellas [19]	M 88	AH	Fever+ epigastricpain + dorsal irradiation	CT: LTH collection + IEHBD dilation + cholelithiasis + right portal vein thrombosis	N/A / *Bacillum*G.neg	LTH collection + cholangitis	Cholangitis + right portal v.thrombosis	N/A	AB + AC	FR
2008 Tsukuda [20]	F 70	recent CBD calculi + pancreatitis + ERCP	Fever+ Abdominal pain	CT: CBD calculi à CT: LTH abscess	*S.epidermidis* / -	LTH abscess	CBD calculi	Pre-op	LTH resection + cholecystectomy	FR
2009 Arakura [21]	M63	Cholelithiasis	Fever+ epigastricpain + chills	CT: LTH abscess + cholelithiasis + left portal vein thrombosis	*S.anginosus* / *S.anginosus*	LTH abscess + cholangitis	Cholangitis + left portal v.thrombosis	N/A	ERCP + AB + AC	FR
2010 Czymek [22]	F 44	Cholelithiasis	Fever+ epigastricpain	CT: LTH inflammation + cholelithiasis	*S.epidermis*/ -	LTH inflammation	Cholelithiasis	Pre-op	Laparoscopic LTH resection	FR
2010 Ghariani [23]	M62	DM; COPD	Fever +epigastricpain dorsal irradiation	CT: LTH gangrene	-	LTH gangrene	None	Pre-op	LTH resection	FR
2011 Sar [24]	F 70	DM; stroke; warfarin	Fever+ RUQ pain + nausea+ palpablemass	US: Acalculous thick-walled gallbladder + RUQ fluid	-	Cholecystitis	None	Intra-op	LTH resection	FR
2012 Warren [25]	M73	AH; MO	Jaundice+RUQ pain + nausea + anorexia	CT: LTH collection + IHBD dilation à CT: left portal vein thrombosis	neg / -	LTH collection + Ampullary Ca + cholangitis	Ampullary Ca + cholangitis + left portal v.thrombosis	Pre-op	ERCP à LTH resection + DPC	FR
2013 Ito [26]	F 82	Cervical Ca; ovariancyst	RUQ pain	CT: LTH swelling + peripancreatic fat stranding	*K.pneumoniaeC. perfringens*/ *K.pneumoniae*	LTH abscess + cholangitis + pancreatitis	Cholangitis + pancreatitis	Pre-op	LTH resection	FR

2013 Yuceler [27]	F 68	-	RUQ pain	US + CT: LTH heterogeneous hypodense mass	-	-	None	Intra-op	LTH resection	FR
2014 Bourguiba [28]	F 76	AH	Fever+ abdominal pain	CT: LTH hypodense infiltration + cholelithiasis.	-	Pancreatitis	None	Intra-op	LTH resection + cholecystectomy	FR
2014 Ozkecec [29]	F 64	-	Fever+ RUQ/ epigastricpain + vomiting	CT: LTH heterogeneous mass + pneumoperitoneum	neg / neg	Perforated PU	None	Intra-op	LTH resection	FR
2015 Qurrat al Ain [30]	M40	-	Epigastric pain + palpable mass + weight loss + vomiting + anorexia	CT: LTH phlegmon + tick-walled duodenum	-	Malignancy	None	Intra-op	LTH resection	FR
2016 Senm [31]	M40	DM	Jaundice + fever + RUQ pain + palpable mass	MRCP: LTH abscess + cholelithiasis + CBD calculi + left portal vein thrombosis	*E.coli*/ -	LTH abscess + Cholangitis	Cholangitis + left portal v.thrombosis	pre-op	PD + ERCP + AC à Laparoscopic LTH resection + cholecystectomy	FR
2017 Koca [32]	M38	None	RUQ pain	CT: LTH inflammation	-	-	None	intra-op	Laparoscopic LTH resection	FR
2017 Maeda [33]	F 77	HF	RUQ pain	CT + MRCP: LTH swelling	*Citrobacter freundii* / -	LTH abscess + cholangitis	Cholangitis	Pre-op	AB à LTH resection	FR
2018 Jain [34]	F 65	None	Epigastric pain back irradiation + vomiting	US: cholelithiasis	-	Cholecystitis	CCC	Intra-op	Laparoscopic LTH resection + cholecystectomy	FR
2018 Ozdeniz [35]	F 46	-	RUQ pain + vomiting	US: cholelithiasis	-	Cholecystitis	Cholelithiasis	Intra-op	LTH resection + cholecystectomy	FR
2018 Trik [36]i	F 56	AH	Fever + RUQ pain	US + CT: LTH infiltration + cholecystitis	-	LTH abscess + cholecystitis	Cholecystitis	Pre-op	Laparoscopic LTH resection + cholecystectomy	FR
2019 Kawak [37]	M 70	CAD	Fever + epigastricpain + nausea + anorexia + umbilical bruise	CT: LTH inflammatoryprocess	*E.faecium* *E.coli* / -	-	Portal thrombosis	Intra-op	Laparoscopic LTH resection + AC	FR
2020 Bhatt [38]	M53	AH; DM; COPD; OSA; umbilical herniarepair	RUQ / epigastricpain + chills	US + CT: LTH fat stranding + cholelithiasis	-	-	CCC	Intra-op	Laparoscopic LTH resection + cholecystectomy	FR
2020 Fujikawa [39]	F 86	osteoporosis	Fever + RUQ pain	CT: LTH abscess	*S. marcescens*/ -	LTH abscess	None	N/A	PD + AB	FR
Present Report	F 63	AH; obesity; PE; MI; COPD; HD for CKD	Fever+ chills + abdominal pain+ vomiting	US left hepatic hypoechogenic nodule CT: LTH hypodense collection and pneumatosis + pancreatic head edema + left portal vein thrombosis	*E.coli*/ *E.coli*	Pancreatitis / perforated PU	Left portal v.thrombosis + APS	Intra-op	LTH resection + AD à ERCP à PD à peritoneal *toilette*	†

S/A: sex/age; M.H.: medical history; HC hemoculture; Diag: diagnosis; R: result; FR fully recovered; †: deceased; -: not specified; N/A not applicable; F: female; M: male; US: ultrasound; CT: computed tomography ERCP: Endoscopic retrograde cholangiopancreatography; MRCP Magnetic resonance cholangiopancreatography; RUQ right upper quadrant; CCC: chronic calculous cholecystitis; CBD common bile duct; IEHBD: intra and extrahepatic biliary ductal dilatation; PD: percutaneous drainage; AB: antibiotic; AC: anticoagulation; Ca: carcinoma; DM Diabetes mellitus; AF: atrial fibrillation; HCT: hemicolectomy; CAD: coronary artery disease; MI: myocardial infarction; AH: arterial hypertension; HF: heart failure; MO: morbid obesity; PU peptic ulcer; Dyslip.: dyslipidemia; GERD: Gastroesophageal reflux disease; COPD: Chronic obstructive pulmonary disease; OSA: obstructive sleep apnea; PE pulmonary embolism; HD: hemodialysis; CKD: chronic kidney disease; APS: antiphospholipid syndrome; x-ray: radiography.