DOI: https://doi.org/10.2298/SARH210402101K
UDC: 616.367-001.3-089

CASE REPORT / ПРИКАЗ БОЛЕСНИКА

Hepatolithiasis followed by recurrent cholangitis as a consequence of inadequate hepaticojejunostomy for common bile duct injury

Milana Kresoja Ignjatović[1,2], Dejan Lukić[1], Aleksandar Đermanović[1], Mladen Đurić[1,2], Mlađan Protić[1,2]

[1]Oncology Institute of Vojvodina, Department of Surgical Oncology, Sremska Kamenica, Serbia;
[2]University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia

SUMMARY

Introduction Hepatolithiasis (HL) is defined as gallstones present in bile ducts above the common bile duct confluence, regardless of the coexistence of gallstones in other parts of the biliary tract. HL is common among patients with recurrent pyogenic cholangitis. Chronic infection can lead to the development of malignancy.

Case outline A 65-year-old woman presented with intermittent fever, jaundice, abdominal pain, and nausea. Eighteen years previously, the patient had an open cholecystectomy due to acute cholecystitis. During the early post-operative days, the patient developed icterus. Intrahepatic biliary ductal dilatation was confirmed by abdominal ultrasound. Due to suspicion of iatrogenic common bile duct injury, the patient underwent a second operation, during which the said injury was confirmed. "Non-Roux-en-Y" hepaticojejunostomy (HJ) was performed as a problem-resolving procedure. Despite the performed biliary bypass, the patient continued to have episodes of recurrent cholangitis over the 18 years. Given the patient's recurrent symptoms and results of MRI consistent with HL, surgical treatment was indicated. A left hepatectomy was performed, with Roux-en-Y HJ biliary reconstruction. The post-operative course was uneventful, after which the patient has been symptom-free.

Conclusion The main purpose of treating HL is to eliminate infection which leads to recurrent cholangitis and subsequent hepatic fibrosis. Adequate solution of HL decreases the need for repeated interventions and prevents progression of the disease to cholangiocarcinoma.

Keywords: hepatolithiasis; cholangitis; bile duct stones; hepatectomy; Roux-en-Y hepaticojejunostomy; bile duct injury

INTRODUCTION

Hepatolithiasis (HL) is defined as gallstones present in the bile ducts above the common bile duct confluence, regardless of the coexistence of gallstones in other parts of the biliary tract. HL occurs most often in East Asia, while it is rare in Western countries [1].

HL was the third most common cause of emergency abdominal surgery at the University Hospital in Hong Kong during the 1960s. A downward trend has been observed over the years, possibly due to improved standards of living and westernized diet. Increasing incidence of HL has been noted in Western countries with increasing immigration from East Asia to the West [2, 3, 4].

Recurrent pyogenic cholangitis is frequently followed by HL. Common presence of bacteria in bile and gallstones indicates the possibility of pattern connection between bacterial infection and the formation of brown pigment stones. *Escherichia coli*, *Clostridium* and *Bacteroides* show beta-glucuronidase activity and are most common bacterial species isolated from the bile of patients with HL. Clinically, HL may present as acute obstruction and recurrent bacterial cholangitis with all its possible complications, such as liver abscess and septicemic shock, or with chronic complications, which refers to cholangiocarcinoma [4–8].

The main purpose of treating HL is to eliminate infection, which leads to recurrent cholangitis and subsequent hepatic fibrosis. Adequate solution of HL decreases the need for repeated interventions and prevents progression of the disease to cholangiocarcinoma.

The surgical treatment of HL implies removal of the affected hepatic segment(s). Complete removal of the diseased hepatic segment or lobe is crucial to preventing disease recurrence and further chronic consequences [9–13]. Best surgical approach for treating HL is based on high-volume experience from a single center in China that proposed a system of classification known as "Dong's Classification" (Table 1) [9].

Herein we present a case of HL followed by recurrent cholangitis as a consequence of inadequate hepaticojejunostomy (HJ) for common bile duct injury.

CASE REPORT

A 65-year-old woman presented with intermittent fever, jaundice, abdominal pain, and

Received • Примљено: April 2, 2021
Revised • Ревизија: July 12, 2022
Accepted • Прихваћено: September 30, 2022
Online first: October 18, 2022

Correspondence to:
Milana KRESOJA IGNJATOVIĆ
Bulevar Oslobođenja 48
21000 Novi Sad, Serbia
milana.kresoja@mf.uns.ac.rs

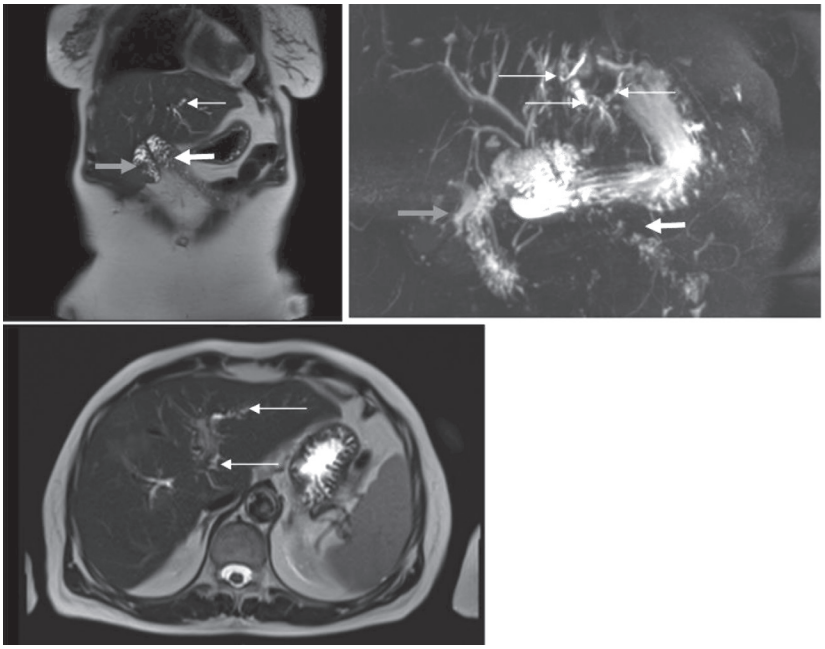


Figure 1. Abdominal magnetic resonance imaging and magnetic resonance cholangiopancreatography made before the problem-resolving operation: afferent jejunal limb of the non-Roux-en-Y hepaticojejunostomy (pointed out by a thick white arrow), efferent jejunal limb (pointed out by a gray arrow), and intrahepatic biliary calculi (pointed out by the thin white arrows)

nausea over a period of 18 years. During this period, the patient was admitted to hospital numerous times due to recurrent cholangitis.

Eighteen years previously, the patient underwent open cholecystectomy for acute cholecystitis. During the early post-operative days, the patient developed icterus. Intrahepatic biliary ductal dilatation was confirmed by the right upper quadrant abdominal ultrasound. Due to the suspicion of iatrogenic common bile duct injury, the patient underwent re-operation during which the said injury was confirmed. "Non-Roux-en-Y" HJ was performed as a problem-resolving procedure for the said injury. Despite performed biliary bypass, the patient continued to have episodes of recurrent cholangitis over a period of 18 years.

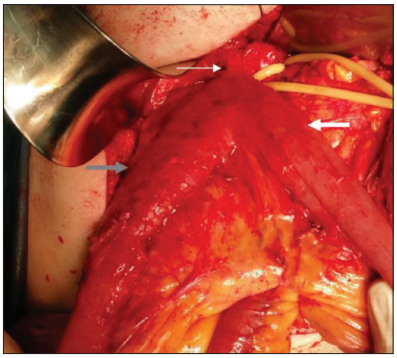


Figure 2. Cause of the disease: inadequate hepaticojejunostomy (non-Roux-en-Y) created at previous surgery (marked by a thin white arrow); efferent jejunal limb (marked by a gray arrow), and afferent jejunal limb (marked by a thick white arrow)

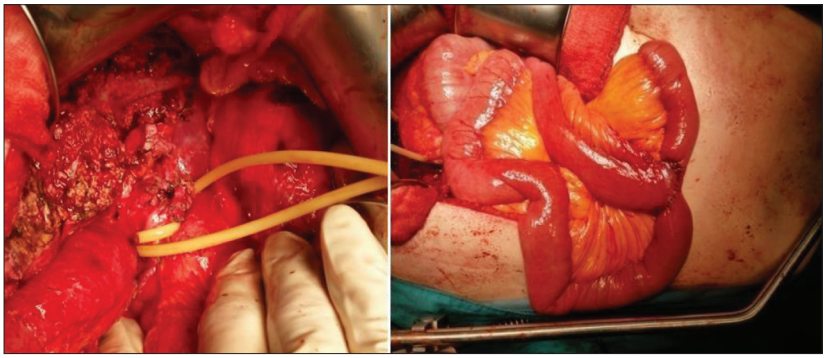


Figure 3. Treatment decision: left hepatectomy with Roux-en-Y hepaticojejunostomy reconstruction



Figure 4. Specimen photography made by the pathologist: multiple intra-hepatic biliary stones

Table 1. Dong's classification of hepatolithiasis [9]

Type	Definition or content
Type I	localized stone disease: unilobar or bilobar
Type II IIa IIb IIc	diffuse stone disease; no atrophy of the hepatic parenchyma or stricture of the intrahepatic bile ducts; segment atrophy or/and stricture of the intrahepatic bile ducts; biliary cirrhosis and portal hypertension
Aditional Type E Ea Eb Ec	 extrahepatic stones; normal sphincter of Oddi; relaxation of the sphincter of Oddi; stricture of the Sphincter of Oddi

At the time of the last hospitalization, the following blood test results were performed: hemoglobin 130 g/l, erythrocytes 4.82×10^{12}/L, leukocytes 5.2×10^{9}/L, platelets 194×10^{9}/L, total bilirubin 9.4 μmol/L, aspartate aminotransverase 14 U/L, alanine aminotrasferase 14 U/L, gamma-glutamyl transferase 54 U/L, and alkaline phosphatase 132 U/L. Serology for Hepatitis B and C viruses

was negative. Signs of HL were present on the pre-operative abdominal magnetic resonance imaging (MRI) and magnetic resonance cholangiopancreatography (MRCP) (Figure 1).

Surgical treatment was indicated considering the patient's complaints as well as the abdominal MRI findings that suggested HL.

The presence of intrahepatic biliary calculi within the left hepatic lobe were confirmed by the intra-operative ultrasound. Referring to Dong's Classification, the operation of choice was left hepatectomy with Roux-en-Y HJ biliary reconstruction (Figures 2 and 3). Tested intra-operative bile cultures came positive for *E. coli* and *Pseudomonas* sp.

Post-operative course was uneventful, and the patient has been symptom-free since. Histopathology showed findings consistent with chronic HL, chronic cholangitis, and secondary biliary cirrhosis (Figure 4).

This case report was approved by the institutional ethics committee, and written consent was obtained from the patient for the publication of the report and any accompanying images.

DISCUSSION

HL is defined as gallstones present in bile ducts above the common bile duct confluence, regardless of the coexistence of gallstones in other parts of the biliary tract. And regardless of whether the confluence is located intra- or extra-hepatically [1–4].

HL is most common in East Asia (Singapore 1.7%, Japan 2.2%, Hong Kong 3.1%, and Taiwan 50%). Once rare in Western countries, the rate of HL has been rising due to increased immigration from East to West (Western country prevalence < 1%). The highest incidence of HL occurs in the fifth to sixth decades of life and has been reported typically between the ages 30–70 years. The combination of intra- and extra-hepatic HL is more frequent in the older groups, while intrahepatic form of the disease occurs in the younger age groups [1–10].

HL and recurrent pyogenic cholangitis are in thin connection since most patients with HL experienced symptoms of pyogenic cholangitis at least once during the period of the disease. The high incidence of bacteria infested bile and gallstones indicate that there is a close association between bacterial infection and the formation of intrahepatic stones. There are several scenarios how bacteria find route into the biliary tract. One of them is ascending infection through the sphincter of Oddi, followed by bacteribilia via the portal venous system. Also, transient infection due to biliary stasis is possible. The most common bacterial species isolated from the bile of patients with HL are *E. coli*, *Clostridium* and *Bacteroides* spp. This literature data matches the bacteriology results of our case [6–9].

The main purpose of treating HL is to eliminate infection which leads to recurrent cholangitis and subsequent hepatic fibrosis. Adequate solution of HL decreases the need for repeated interventions and prevents progression of the disease to cholangiocarcinoma.

Choice of the treatment strategy for HL needs to be based on the following: 1) the structure of the calculi (cholesterol or calcium bilirubinate); 2) the location of the calculi in the bile duct and the most feasible approach to them; 3) well planned treatment that includes resolving of the bile duct stenosis; 4) evaluation of liver function, the extent of liver resection, and residual liver volume; and 5) investigation of the presence of intrahepatic bile duct malignancy. Therapeutic strategy must be planned by taking into consideration the history, nature, and extent of biliary tract surgery [11, 12, 13]. According to the Clinical Guidelines for Cholelithiasis written by the Japanese Society of Gastroenterology, treatment selection should be based on the presence or absence of prior biliary tract surgery [10].

Untreated HL can lead to serious consequences, such as biliary cirrhosis and even cholangiocarcinoma. Resection of the affected hepatic lobe that contains strictures, atrophy, and multi-segmental distribution of intrabiliary calculi has been effective in reducing the disease recurrence and progression of liver disease [11]. Uchiyama et al. [12] performed a retrospective study which compared invasive and non-invasive treatments and procedures in HL treatment to analyze the rate of residual stones and complications, as well as the long-term outcome. Out of 105,062 patients with cholelithiasis treated between 1989 and 1992, 2353 (2.24%) patients were diagnosed with HL. The authors concluded that the most effective therapy was surgery. According to a report by Japanese multi-center-based surveys, there has been a progressive increase in treatment of patients with HL who had previously undergone biliary surgery [14].

We present a patient with an 18-year long history of recurrent cholangitis after cholecystectomy during which a bile duct injury was made. The patient underwent early reoperation and non-Roux-en-Y HJ. As it shows in early postoperative days, this form of biliary reconstruction was inadequate, given the absence of dysfunctional jejunum loop (Roux-en-Y) [15].

Safar et al. [16] investigated 12 patients to compare CT, MRI, and MRCP findings of HL. Although cross-sectional imaging with CT scan is a useful technique for screening for intrahepatic stones with a sensitivity of 80–90%, CT is less useful than MRCP for precise topographic localization of stones proximal to the biliary confluence [17]. MR cholangiography is a non-invasive test providing high quality multi projection images. It not only detects the stones, but also provides detailed information of the biliary anatomy, which is useful for surgical planning [16, 17].

Pre-operative abdominal MRI in the case we present showed that the gallbladder was surgically removed, while the common bile duct was accidentally resected, with stenosis of the non-Roux-en-Y hepaticojejunal biliary reconstruction. The intrahepatic biliary ducts of both hepatic lobes were dilated, with moderate dilatation noted on the extrahepatic biliary ducts (diameter of the left and right hepatic duct up to 7 mm). Intra- and extra-hepatic biliary ducts showed intense contrast-enhanced signal, primarily due to inflammation.

The proposed system for the classification of HL, "Dong's Classification," is utilized to determine the best surgical approaches to resolve this disease (Table 1) [9]. Considering hepatectomy, the best candidates are patients with Type I and Type IIb HL. Patients with type II HL have a high risk of stone recurrence, thus the best solution is biliary stone extraction along with Roux-en-Y HJ or hepaticocutaneous jejunostomy. For the treatment of type IIb HL with segmental atrophy and/or strictures of the intrahepatic bile ducts hepatectomy is considered the optimal approach. Complete removal of the affected lobe or segment is mandatory for preventing the recurrence of bile stones and progressive liver diseases, including fibrosis and malignancy [18, 19].

Most often, the removal of the affected hepatic segment(s) is the best possible surgical approach. Stone extraction, resolving of strictures and consequent biliary stasis, which is responsible for stone formation, is achieved by liver resection [20]. The criteria for segmental/lobe liver resection in HL include the following: 1) HL limited to one lobe, particularly left-sided; 2) cholangitis followed by atrophy, fibrosis, and multiple abscesses; 3) suspected existence of associated cholangiocarcinoma, and 4) multiple intrahepatic stones with biliary strictures that cannot be treated percutaneously or endoscopically. Complete removal of the affected liver segment/lobe is mandatory to prevent recurrence and progressive disease [21, 22].

In the case we presented, inadequate biliary-enteric anastomosis (absence of dysfunctional jejunum loop) leads to a reflux of the digestive juice into the intrahepatic bile ducts, followed by intermittent bacterial infection and recurrent cholangitis. The chronic recurrent infection led to biliary strictures, formation of intrahepatic stones, and the increased risk for neoplasia in the form of cholangiocarcinoma. Therefore, we performed left hepatectomy followed by Roux-en-Y HJ.

ACKNOWLEDGMENT

This case report was presented at the 12th Biennial Congress of the European-African Hepato-Pancreato-Biliary Association (E-AHPBA), May 23–26, 2017, Mainz, Germany in the form of poster presentation. DOI: https://doi.org/10.1016/j.hpb.2019.10.035. Available at: https://www.hpbonline.org/article/S1365-182X(19)30775-0/fulltext.

Conflict of interest: None declared.

REFERENCES

1. Pu T, Chen JM, Li ZH, Jiang D, Guo Q, Li AQ, et al. Clinical online nomogram for predicting prognosis in recurrent hepatolithiasis after biliary surgery: A multicenter, retrospective study. World J Gastroenterol. 2022;28(7):715–31. [DOI: 10.3748/wjg.v28.i7.715] [PMID: 35317276]
2. Lorio E, Patel P, Rosenkranz L, Patel S, Sayana H. Management of Hepatolithiasis: Review of the Literature. Curr Gastroenterol Rep. 2020;22(6):30. [DOI: 10.1007/s11894-020-00765-3] [PMID: 32383039]
3. Xiao Z, Huang Z, Gao J, Wang J, Lei J, Zhou F, et al. The imbalance of biliary microflora in hepatolithiasis. Microb Pathog. 2021;157:104966. [DOI: 10.1016/j.micpath.2021.104966] [PMID: 34023439]
4. Liang L, Zhuang D, Feng X, Zhang K, Zhi X. The postoperative choledochoscopy in the management of the residual hepatolithiasis involving the caudate lobe: A retrospective study. Medicine (Baltimore). 2021;100(35):e26996. [DOI: 10.1097/MD.0000000000026996] [PMID: 34477129]
5. Kokoroskos N, Alifieris K, Agorgianitis L, Zouglos S, Delis S. Surgical management of hepatolithiasis: an institutional experience of a rare disease. Int Surg J. 2021;8(3):1016. [DOI: 10.18203/2349-2902.isj20210939]
6. Lu Q, Yang J, Wang P, Liu J, Fan Y, Fang C. Digital Surgical Diagnosis and Management of Hepatolithiasis. In: Fang C, Lau WY, editors. Biliary Tract Surgery. Singapore: Springer; 2021. p. 239–310. [DOI: 10.1007/978-981-33-6769-2_12]
7. Wang X, Chen A, Fu Q, Cai C. Comparison of the Safety and Efficacy of Laparoscopic Left Lateral Hepatectomy and Open Left Lateral Hepatectomy for Hepatolithiasis: A Meta-Analysis. Front Surg. 2021;8:749285. [DOI: 10.3389/fsurg.2021.749285] [PMID: 34869557]
8. Tsui WM, Chan YK, Wong CT, Lo YF, Yeung YW, Lee YW. Hepatolithiasis and the syndrome of recurrent pyogenic cholangitis: clinical, radiologic, and pathologic features. Semin Liver Dis. 2011;31(1):33–48. [DOI: 10.1055/s-0031-1272833] [PMID: 21344349]
9. Zhao H, Lu B. Prediction of Multiple Serum Tumor Markers in Hepatolithiasis Complicated with Intrahepatic Cholangiocarcinoma. Cancer Manag Res. 2022;14:249–55. [DOI: 10.2147/CMAR.S344711] [PMID: 35082529]
10. Tazuma S, Unno M, Igarashi Y, Inui K, Uchiyama K, Kai M, et al. Evidence-based clinical practice guidelines for cholelithiasis 2016. J Gastroenterol. 2017;52(3):276–300. [DOI: 10.1007/s00535-016-1289-7] [PMID: 27942871]
11. Suzuki Y, Mori T, Momose H, Matsuki R, Kogure M, Abe N, et al. Predictive factors for subsequent intrahepatic cholangiocarcinoma associated with hepatolithiasis: Japanese National Cohort Study for 18 years. J Gastroenterol. 2022;57(5):387–95. [DOI: 10.1007/s00535-022-01868-6] [PMID: 35357571]
12. Uchiyama K, Onishi H, Tani M, Kinoshita H, Ueno M, Yamaue H. Indication and procedure for treatment of hepatolithiasis. Arch Surg. 2002;137(2):149–53. [DOI: 10.1001/archsurg.137.2.149] [PMID: 11822950]
13. Zhang J, Xu Z, Wang L, Hou C, Wang G, Cui L, et al. Long-term outcomes of surgical approaches for bilateral hepatolithiasis: A real-world six-decade experience at a single center. J Hepatobiliary Pancreat Sci. 2022;29(9):994–1003. [DOI: 10.1002/jhbp.1204] [PMID: 35794790]
14. Wang Y, Huang C, Zhang H, Cai Y, Shen Z, Hu X, et al. Correlation Among Psychological Resilience, Social Support, and Coping Style in Patients With Complicated Hepatolithiasis. Front Behav Neurosci. 2022;16:939512. [DOI: 10.3389/fnbeh.2022.939512] [PMID: 35783232]
15. Tang Z, Huan Q, Chen J, Zheng H, Shao C, Yu D. Treatment of retained and regenerate hepaticolithiasis with hepatectomy: clinical analysis of 136 cases. [Online] Wprim.whocc.org.cn. Available at: http://wprim.whocc.org.cn/admin/article/articleDetail?WPRIMID=414718&articleId=41 4718 [Accessed March 1, 2021].
16. Safar F, Kamura T, Okamuto K, Sasai K, Gejyo F. Magnetic resonance T1 gradient-echo imaging in hepatolithiasis. Abdom Imaging. 2005;30(3):297–302. [DOI: 10.1007/s00261-004-0262-8] [PMID: 15965778]
17. Xue B, Wu S, Zhang M, Hong J, Liu B, Xu N, et al. A radiomic-based model of different contrast-enhanced CT phase for differentiate intrahepatic cholangiocarcinoma from inflammatory mass with hepatolithiasis. Abdom Radiol (NY). 2021;46(8):3835–44. [DOI: 10.1007/s00261-021-03027-6] [PMID: 33728532]
18. Garcia F, Acosta M, Lamberto A, Fernandez D, Grondona J, Bracco R. Surgical therapy for hepatolithiasis. HPB. 2019;21(Supplement 3):S536–S537. [DOI: 10.1016/j.hpb.2019.10.061]

19. Rabbi H, Rashid M, Hakim H, Ahmed A, Chowdhury A, Sarder M, et al. Recurrent pyogenic cholangitis with hepatolithiasis – 10 yrs surgical experience in Bangladesh. HPB. 2018;20(Supplement 2):S460. [DOI: 10.1016/j.hpb.2018.06.2881]
20. Mansilla-Vivar R, Alonso-Lázaro N, Argüello-Viudez L, Ponce-Romero M, Bustamante-Balen M, Pons-Beltrán V. New management of hepatolithiasis: Can surgery be avoided? Gastroenterol Hepatol. 2020;43(4):188–92. [DOI: 10.1016/j.gastrohep.2019.11.008] [PMID: 32122681]
21. Jia CK, Weng J, Chen YK, Yang QZ, Fu Y, Qin QF, et al. Hepatectomy with primary closure of common bile duct for hepatolithiasis combined with choledocholithiasis. World J Gastroenterol. 2015;21(12):3564–70. [DOI: 10.3748/wjg.v21.i12.3564] [PMID: 25834321]
22. Maharjan N, Joshi Lakhey P, Ghimire B, Kansakar PB, Bhandari RS. Multidisciplinary Management of Hepatolithiasis at a Tertiary Care Center in Nepal. JIOM Nepal. 2020;42(2):54–8. [DOI: 10.3126/jiom.v42i2.37538]

Хепатолитијаза праћена рекурентним холангитисима као последица неадекватне хепатикојејуностомије услед повреде заједничког жучног канала

Милана Кресоја Игњатовић[1,2], Дејан Лукић[1], Александар Ђермановић[1], Младен Ђурић[1,2], Млађан Протић[1,2]

[1]Институт за онкологију Војводине, Клиника за хируршку онкологију, Сремска Каменица, Србија;
[2]Универзитет у Новом Саду, Медицински факултет, Нови Сад, Србија

САЖЕТАК

Увод Хепатолитијаза се дефинише као присуство камена-ца у жучним водовима рачве заједничког жучног вода, без обзира на присуство каменаца у другим деловима жучног тракта. Често је присутна код болесника са рекурентним холангитисом. Присуство хроничне инфекције може довести до развоја малигнитета.

Приказ болесника Приказана је 65-годишња болесница са тегобама у виду повремене температуре, жутице, болова у трбуху и мучнине. Болесници је 18 година раније начињена отворена холецистектомија због акутног холецистиса. У раном постоперативном току болесница развија иктерус. Ултразвуком абдомена потврђена је дилатација интрахепатичних жучних водова. Индикована је поновна операција услед сумње на јатрогену повреду заједничког жучног вода, која је интраоперативно потврђена. У циљу решавања повреде начињена је хепатикојејуностомија по типу „не-*Roux-en-Y*" анастомозе. Упркос начињеном билијарном бајпасу, болесница је наредних 18 година имала епизоде рекурентних холангитиса. На основу тегоба болеснице и налаза магнетне резонанце који су указивали на хепатолитијазу индиковано је оперативно лечење. Начињена је лева хепатектомија са *Roux-en-Y* хепатикојејуностомијом. Постоперативни ток је протекао уредно и од тада је болесница без тегоба.

Закључак Примарни циљ лечења хепатолитијазе је ерадикација постојеће инфекције која доводи до рекурентног холангитиса и последичне хепатичне фиброзе. Адекватан третман хепатолитијазе доводи до смањења потребе за понављаним лечењем и спречава настанак холангиокарцинома.

Кључне речи: хепатолитијаза; холангитис; каменци жучних водова; *Roux-en-Y* хепатикојејуностомија; повреде жучних водова