

# Management Of Localised Postoperative Bile Collections

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## Abstract

The authors deal with their experience with conservative management of a rare complication after laparoscopic cholecystectomy – formation of biloma. Biloma is to be expected, when a patient after uneventful cholecystectomy starts to have mild temperatures, persisting upper abdominal pain and elevation of leukocytes number and level of CRP. It depends on the dynamics of the clinical picture and the size of bile collection, what kind of management would be the most appropriate in each specific case. Not always, the reoperation is necessary. It depends on the summary of all above mentioned results (CRP, Leukocytes count, temperature, evidence of peritoneal irritation or peritonitis, size of collection on US – CT imaging studies, interdisciplinary cooperation and discussion with radiologists and endoscopists). Of course when necessary, the invasive therapy is indicated with following possibilities: US or CT guided suction drainage, endoscopic stent or surgical approach – i. e. reoperation.

**Key-words:** Biloma; Laparoscopic cholecystectomy; Ultrasound; Management; Complication; Drainage; Size

## Introduction

With the increasing number of surgical procedures performed on gallbladder, bile ducts, and in the connection with pancreatico – hepatic surgery, as well as together with expanding range of invasive radiological and endoscopic interventions relating to the bile duct, we can notice a slight increase in the incidence of post interventional collections of bile, either diffuse or localized. Management of diffuse collections is without any doubt. In our article we will deal with management of the treatment of post interventional localised bile collections, which have occurred in our set of patients after surgery of gallbladder and bile ducts, which account for (mainly cholecystectomy) the most common operations in the departments of general surgery.

Bilomas are defined as localised collections of bile, which occur in the postoperative period or as a result of some other invasive procedure (radiology, endoscopy, biopsy of the liver, ...), in case of which originated injury to the bile duct, with a consequent bile leak and its accumulation in a specific anatomical localization. They usually tend to form in the

subhepatic localisation and according to different sources, their occurrence varies from 0% to 7% of cases as a complication of the above listed interventions on hepatobiliary tract. [1]

Bile leakage with following formation of biloma is most frequently encountered in the context of such operations as cholecystectomy – laparotomic or laparoscopic, liver resections and liver transplantation and biliodigestive anastomosis. Leakage may arise due to unrecognized intraoperative injury of normal bile ducts during the surgery, or due to injury of aberrant bile ducts, which occur in about 30% of the population. Aberrant bile ducts are variable and irregular connections between intrahepatic bile ducts and cystic duct, common bile duct or gallbladder.

Usually in these cases the problem originates due to insufficient ligature of stump of cystic duct, or due to iatrogenic injury of the common bile duct of minor extent, which stayed unrecognized during the primary surgery. Less frequently is the source of leak some aberrant bile duct (for example Luschka duct etc ...). [2]

Rarely, we can meet with bile leak after liver biopsy, percutaneous transhepatic cholangiography (PTC), after blunt or penetrative injuries of the abdomen, or in case of severe cholangitis and acute necrotizing pancreatitis [3]. Injury of the biliary tract (bile ducts) during laparoscopic cholecystectomy, in comparison with open cholecystectomy, remains easier unrecognized. Regardless of the etiology, the biliary leak leads to the formation of localised intraabdominal collection (biloma), abscess, fistula formation may occur or signs of biliary peritonitis are present, which lead to urgent and frequently life saving surgical procedure.

The formation of a bile collection as post interventional complication and its recognition lead to complex algorithm of clinical decisions, which often significantly affect post interventional (postoperative) morbidity and mortality of patients with occurrence of these complications.

Frequently, when the decision-making process is in progress, there must be applied multidisciplinary cooperation in order to reach the best possible management of the affected patient. The following four algorithms of acting come into account with regard to the clinical picture, inflammatory parameters, temperature, size, nature and location of the collection and, of course, the discussion among surgeon, x-ray specialist and endoscopist is necessary as far as further acting with the patient:

**1. Conservative** – expectant approach in case of good clinical condition, no presence of signs of peritonitis at abdominal examination, slight elevation of inflammatory markers (CRP, leukocytes) and just mild temperatures.

**2. SURGICAL** Intervention in the presence of a significant alteration of the overall condition of the patient, high levels of inflammatory markers, temperatures over 38 degree C and signs of peritoneal irritation, extensive biliary collection, ...

**3. Endoscopic** management under specific circumstances and if the clinical situation and the possibilities of the department allow.

**4. Radiological** - also under specific circumstances and according to the possibilities of the department – with puncture and drainage of the collection under the control of relevant imaging methods (US, CT).

If the conservative approach does not lead to the desired effect and improvement of patient's condition, the relevant specialist commences with the above mentioned algorithm, choosing from three other options, those are under consideration. Surgical revision is not always the optimal solution. In this case commences acting the endoscopist specialist with endoscopic drainage of the bile ducts. In some cases neither surgery, nor endoscopy is possible or effective, and in these cases can be an interventional radiologic approach more effective and successful.

The role of the interventional radiologist in the management of bile duct injury is as follows:

1. The correct diagnosis of the biloma as well as the identification of the precise site of leakage of bile out of the bile ducts;
2. In the presence of biloma's infection, formation of bile stasis, or cholangitis, his task is to perform a percutaneous drainage of biloma or of the bile ducts to prepare the patient for surgical revision;
3. In some cases a definitive solution of presenting complication.

At clinical suspicion for arising of postoperative or posttraumatic complications connected with bile leaks and formation of biloma, are as basic imaging methods indicated ultrasonography and computed tomography of the abdomen. Their sensitivity at imaging of a fluid collection or presence of free fluid in the abdominal cavity is high, however, the differentiation of biloma from other intra-abdominal fluid collections (seroma, infected fluid collection, infected biloma, abscess) may be

problematic.

Among the non-invasive imaging methods to identify the site of biliary leak, is a hepatobiliary scintigraphy scan, which is able to depict the presence of leak from the bile ducts. The disadvantage of this method is, however, a poor spatial resolution, and thus problematic exact anatomical identification of the site of leak. Magnetic resonance cholangiography with the use of mangafodipir trisodium combines anatomic and functional image of the bile ducts and thus it could be possible to identify the presence of leak from the bile ducts as well as its precise anatomical localization. If there is a T-tube inserted, it is possible to perform a cholangiography through T-tube with displaying of intra- and extrahepatic bile ducts and their pathological changes.

Percutaneous drainage of biloma under USG or CT control is a basic technique, that is both diagnostic and therapeutic. This intervention is minimally invasive, safe, and can be performed in local anaesthesia. In case of anxious or pain sensitive patients the performance is possible to be done in the analgesation. Drainage of biloma can be a definitive solution of the problem in case that the defect of the wall of the bile duct was of small size and its spontaneous healing occurred. If the leak persists with the continuous filling of the biloma, there exists a possibility to introduce through the inserted drainage pig-tail catheter an iodine contrast substance to fill the biloma and even depict the communication between biloma and bile ducts as well as possible pathological changes of bile ducts (stricture, choledocholithiasis). In case of evidence of bile leak from insufficient ligature of stump of cystic duct after cholecystectomy, or from aberrant hepatic duct, it is possible to perform an attempt for catheterization of bile ducts through displayed fistula and their subsequent embolisation.

Percutaneous transhepatic cholangiography (PTC) is only rarely indicated, for the purpose of diagnostics of biliary leak. Percutaneous transhepatic cholangiography (PTC) is usually followed by percutaneous transhepatic drainage (PTD). PTD is less invasive alternative to surgical revision and is most frequently indicated in cases of post-operative biliary leaks. After identification of the site of leak, to be found in the range of major bile ducts (left and right hepatic duct, common bile duct), it is possible to perform bridging of the site of leak (defect) with drainage catheter, which is inserted into the duodenum, and is thought as the formation of an external-internal drainage of the bile ducts. A wider (10 - 12 French) drainage catheter is inserted, on which there is a good chance to heal the site of perforation of bile ducts without causing significant stenosis in the area of injury. The advantage of this strategy is as followed: in the first step the drainage of bile can be external and leads to quick release of the high pressure in the bile ducts, and subsequently can be converted to the external-internal drainage of bile into the duodenum with no loss of fluids and minerals. In case that the PTD depicts stricture of bile duct, it is possible to perform the dilation of the stricture with balloon catheter.

The intervention is usually performed in the analgesation and is well tolerated by patients. The disadvantage of this method is the need for a longer-time lasting insertion of external-internal drainage in the bile ducts, average time been of 2,5 months. Possible complications include injury to the arteries in the river basin of hepatic artery (possible endovascular treatment) and cholangitis. In the case of imaging the biliary leak from the peripheral bile duct (in the resection area of the liver after liver resection, after liver injuries connected with fissures and lacerations of parenchyme, after liver biopsy, in case of cholangitis), it is possible to perform embolization of bile duct, which communicates with the biloma. There were described experiences with a number of embolisant substances, which were used on sealing of the bile duct communicating with biloma (fibrin glue, NBCA, spirals, AMPLATZER's occluder, sclerotherapy with ethanol, acetic acid).

Another option is the percutaneous transhepatic insertion (implantation) of reposable coated stent. Indication is the identification of biliary leak in the range of major bile ducts (right or left hepatic duct or common bile duct) or in the site of biliodigestive anastomosis and at the same time the presence of biliary strictures.

The methods of treatment of biloma performed by the invasive radiologist, are in general minimally invasive, performed usually in local anesthesia, or analgesation, they tend to be well tolerated by patients, and are little burdensome. In the case of failure or inability of surgical revision or endoscopic treatment, they are a very smart and useful alternative to surgery (and endoscopy).

## Material And Methods

Our set of patients, in which we evaluated the development of localized collections of bile after surgery, consists of a group of 324 patients operated for a period of 12 months. The cases of the diffuse presence of bile in the abdominal cavity were excluded. In 247 cases laparoscopic cholecystectomy was performed, in 59 laparotomic cholecystectomy and in 8 cases, the biliodigestive anastomosis from various reasons was indicated.

In this set of patients the occurrence of biloma was found in 9 patients, i. e. 2,77% of all operations.

At laparoscopic cholecystectomy biloma occurred 7 times, 1 time (once) at open cholecystectomy and 1 time (once) at biliodigestive anastomosis.

## Results

Management of localised bile collections in our set of patients was as follows: 2 cases were definitely cured with conservative treatment - conservative expectant therapeutic approach with the regular monitoring of biochemical, blood parameters, and ultrasound checking of the dynamics of the collections. In 3 cases the radiological interventional procedure was successful and in 4 cases was indicated the surgical revision.

In cases of surgical revisions was twice identified and ligated an aberrant bile duct and in another two cases was biloma evacuated and drained with subsequent healing after removing of the drainage in a sufficiently long period of time after operational revision.

Important is the fact, that the conservative approach was applied for patients in good clinical condition. The first of two conservative cases, was a 25-year old patient, who was admitted to the 1st Surgical Department, University Hospital Bratislava, for elective laparoscopic cholecystectomy with the history of recurrent biliary colics and verified non - functioning gall bladder on an ultrasound examination.

Perioperative and postoperative course was normal, without complications. The suction drain was removed on the second postoperative day with minimal serose production. On the third postoperative day the patient was in good clinical condition and without any subjective complaints discharged home.

At 11<sup>th</sup> postoperative day, the patient came to surgical emergency with pain in the right hypochondriac region, weakness, and mild nausea, which were linked to a possible dietary mistake. The ultrasound examination revealed fluid collection in subhepatic region of smaller size: about 44 x 22 mm.

Other findings did not demonstrate any significant pathological changes in the clinical picture: any increase in inflammatory parameters, normal levels of AST, ALT and bilirubin. Outpatient monitoring and ultrasound control in an interval of 7 days was recommended to the patient. At ultrasound control performed on the 18<sup>th</sup> postoperative day, there was found progression of biloma size: the extent was 78 x 34 x 44 mm. The collection was sharply demarcated, and with a thin strip communicated with another smaller intrahepatic collection - with the size of 19 x 10 mm approximately. As the patient was in a good general condition and compliant laboratory parameters were found, after consultation with the radiologists, it was decided to continue in the conservative therapeutical approach.

At the 21<sup>st</sup> postoperative day the situation has changed, with worsening of upper abdominal pain and mild temperatures - i.e. subfebrilities, and the patient was admitted to hospital. Ultrasound finding on the 22<sup>nd</sup> postoperative day showed well demarcated collection, with the size of 68 x 36 mm, with persistent thin strip communication with satellite intrahepatic collection, which size was 15 x 7 mm. Laboratory investigations detected increase of inflammatory parameters: Leukocytes count 11.46 x10<sup>9</sup> / l, CRP 35.71 mg / l, ALP 2.58 ucat/ l. But there were no signs of peritoneal irritation.

During this hospital stay were performed biochemic controls and ultrasound examinations of subhepatic collection at regular intervals. The therapy was managed in close cooperation between surgeons and radiologists and it was decided to go on with conservative treatment. During the next days the collection began gradually diminish. Similarly, decrease of liver enzyme parameters was present; CRP decreased from 30 to 20, leukocyte

count was normalized. Bilirubin and AMS levels were normal through the whole postoperative period. The ultrasound test performed 25th day, showed discrete reduction of the size of fluid collection in the gallbladder bed, the size about 64 x 27 mm, with persistent communication with the intrahepatic collection of about 12 x 9 mm (Figure 1). Patient was without fever, with no subjective complaints, and on the base of this positive dynamics, she was released home after 4 - day lasting hospitalization with instructions to come to the outpatient ultrasound control by 7 days.



**Figure 1:** US imaging of biloma 25<sup>th</sup> postoperative day

The US examination on the 32nd postoperative day (7th day after the last discharge from hospital) found progressive diminishing of the size of biloma and complete disappearance of intrahepatic collection. When checking in another one - week interval - 38th postoperative day - there was found an almost complete regression of biloma at ultrasound finding (Figure 2). Since then, the patient is completely without any complaints more than one year after the operation.



**Figure 2:** US imaging of biloma 38<sup>th</sup> postoperative day

To make the summary of the first case and to justify the decision of conservative approach, we have to stress: the clinical status of this patient was good during the whole interval of postoperative follow-up. The temperatures were maximally 37, 3

grades Celsius, there were present no signs of peritoneal irritation, the maximal leucocytes count was  $11.46 \times 10^9 / l$ , decreasing to normal levels  $9.48 \times 10^9 / l$ , CRP levels were maximally 35.71 mg / l, but this level lasted only one day, decreasing next days to 32, 35 mg / l, 21, 99 mg / l and later returned to normal ranges. The collection was ultrasonographically followed at regular intervals as mentioned above and close cooperation between surgeons and experienced radiological staff was established not to miss the right interval to switch to invasive therapeutical approach. And it was this close cooperation and permanent interdisciplinary discussion, which enabled the success of conservative management of this case and to avoid the reoperation, which was a great benefit for the patient.

The second case managed conservatively, was a 43 - year old patient, who was admitted to hospital on purpose of elective cholecystectomy with persistent and recurrent biliary colics and ultrasound finding of multiple gall stones. Acute colic was present for about 2 days before the admission, so the patient felt persisting pain in the right hypochondric region. The postoperative course of this patient was complicated with the production of bile into the suction drain from the first postoperative day (that means in very early postoperative period).

The ultrasound test performed at 5<sup>th</sup> postoperative day showed discrete amount of free fluid in the postcholecystectomy bed. Patient's condition was improving; the production of bile into the drain had a tendency to spontaneous regression. The control ultrasound test at 8<sup>th</sup> postoperative day showed almost complete regression of the amount of free fluid in the postcholecystectomy bed. It was decided to cancel the active suction drainage (because of theoretical possibility of active stimulation of bile leak from the postcholecystectomy bed by negative pressure in suction drain) and the drain was removed.

At 10<sup>th</sup> postoperative day, the patient's condition deteriorated slightly. The patient felt a slight pain under the right rib arch, the laboratory findings showed increased levels of CRP - from 9.04 postoperatively to 33.55 mg / l, AST increased from 0.9 to 1.13 ukat/l, ALT increased from 0.63 to 1.21 ucat / l, ALP levels increased from normal level to 2.41 ucat / l, but on the other hand the leukocytes count decreased from 20.35 postoperatively to  $17.14 \times 10^9 / l$ , bilirubin and AMS were within the normal range throughout the whole postoperative follow - up of this patient. The ultrasound control test performed at 11th postoperative day showed an anechoic fluid collection in the postcholecystectomy bed of size approximately 26 x 22mm - and the radiologist specialist characterized this collection for the first time as a smaller biloma.

Regarding to relatively good clinical status of the patient, it was decided to continue in conservative treatment and in another four days, i.e. 15th postoperative day, the ultrasound finding showed a fluid collection in unchanged topographic position, but several septa inside the collection were added, and the size of collection was slightly enlarged - approximately 47x34 mm, extrahepatic bile ducts were of normal diameter As

the patient was without temperature and the overall condition of the patient was stable with slight improving, it was decided to discharge the patient for outpatient monitoring of the health status.

After a week of outpatient treatment at 23<sup>rd</sup> postoperative day, the patient came to control ultrasound examination, which found a regression of fluid collection in the postcholecystectomy bed with the size of 32 x 20 mm. The patient was in a good clinical condition and did not mention any complaints. No pain, no temperature, no problems with gastrointestinal passage were present.

The last ultrasound test in another fourteen days – i. e. 37<sup>th</sup> postoperative day, showed no presence of fluid collection in the subhepatic area. Nine months after operation the patient was completely healthy.

To make the summary of the second case and to justify the decision of conservative approach in the second presented case, we can point, that clinical status of the second patient was quite good during the whole interval of post - operative follow-up except of slight worsening of clinical status at 10<sup>th</sup> postoperative day, when there was found increase of CRP levels from 9.04 postoperatively to 33.55 mg / l, AST increased from

0.9 to 1.13 ukat/l, ALT increased from 0.63 to 1.21 ucat / l, ALP levels increased from normal level to 2.41 ucat / l, but the leukocytes count decreased from 20.35 postoperatively to 17.14 x 10<sup>9</sup> / l. Next days the levels of CRP decreased to 26.02 mg/l and 9.04 mg/l, leukocytes count decreased to 13.13 x 10<sup>9</sup> / l. The temperature was never higher than 37 degrees of Celsius and the clinical finding on abdomen showed no evidence of peritoneal irritation. The interdisciplinary cooperation and follow-up again enabled the successful conservative management of the second case at last.

As far as the radiological invasive approach, so in all three remaining cases was achieved definite successful healing after evacuation and drainage of collections under the CT control. The drain was removed after complete decline of production to the drain in the range of 1-3 weeks from the time of drain insertion. Subsequent clinical and ultrasound controls noticed the full normalisation of the situation. The success of the drainage under the CT control are shown in the following three pictures. The first picture is the CT identification of biloma after open cholecystectomy, the second picture shows drainage of the collection and the third picture shows the image after disappearance of biloma and removal of inserted drain (Figure 3,4,5).

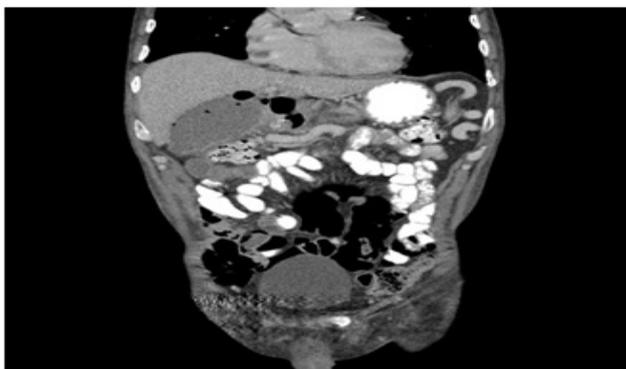


Figure 3: CT scan of biloma after open cholecystectomy



Figure 4: CT scan of drainage of biloma



Figure 5: CT scan after removing of drainage and disappearance of collection

### Conclusion

The occurrence of bilomas after cholecystectomy, either open or laparoscopic, is certainly more frequent than depict the reported numbers. But, as smaller collections are often asymptomatic, it is hard to think of the probability of their formation, and no postoperative ultrasound or other imaging tests are performed. Until a certain level of postoperative problems brings the patient back to the surgeon. Not every of such

patients require further surgical intervention, but monitoring with laboratory and ultrasound control tests are inevitable. The presented cases point at the possibility of conservative therapy of this complication in specific cases of good clinical status and low inflammatory response, and the importance of expectant approach in management of such patients. Of course, when the indicative criteria are filled, the need of invasive approach, reoperation or drainage procedure, is evident as shown on pictures 3, 4 and 5. We believe that in cases, where there was no injury of common bile duct or did not occur improper cystic duct treatment, and the most probable source of a leak is from aberrant bile duct, conservative management is the method of choice. Ultrasound monitoring of size and the dynamics of collection of bile (i. e. biloma) can be in these cases a satisfactory imaging method.

## Discussion

The first case of a biloma was reported in 1979 by Gould and Patel [4]. Every longer lasting abdominal pain, temperatures or elevation of leukocytes after laparoscopic cholecystectomy is a matter for attention and an abdominal ultrasound is mandatory to exclude any intraabdominal collection. And although biloma is a rather unusual complication after laparoscopic cholecystectomy, it should be kept in mind by a surgeon.

Treatment of bilomas with a smaller diameter (a few centimetres) is not always necessary. They can be observed. However major or infected bilomas require invasive treatment. Surgery used to be the main approach in their treatment, but nowadays there is a wider range of therapeutic modalities aimed at their management: percutaneous catheter drainage, endoscopic sphincterotomy, endoscopic nasobiliary drainage, endoscopic drainage. Surgery is performed in cases of persistent bile leak or septic complications or for treatment of underlying disease [5].

Biloma formation is encountered most frequently in connection with previous surgery or trauma involving the biliary tract, but also few cases of spontaneous biloma formation are described in literature. The most frequent cause of spontaneous biloma is choledocholithiasis; very rare are neoplasms of biliary tree, acute cholecystitis, hepatic infarction or abscess, obstructive jaundice and tuberculosis [6].

Large or symptomatic bilomas are treated by percutaneous drainage, in some cases coupled with a biliary drainage procedure to divert bile from the site of injury. External biloma drainage is continued until the bile output through the drain ceases. Catheter injection often shows the site of leakage. Some patients may require percutaneous biliary drainage or ERCP to identify the site of the bile leakage along with drainage to divert bile for definitive treatment [7]. Very rare complication, but possible, is a creation of hepatic subcapsular biloma, which can arise after both laparoscopic and open cholecystectomy and can be managed by US or CT guided subcutaneous drainage if necessary [8].

Surgery is only required for a part of patients - in those in whom endoscopic retrieval of common bile duct stones fails, in those who require definitive treatment for biliary tumors, or when there is persistent active bile leakage in spite of percutaneous drainage [9].

A few cases of biloma have been reported as complications of cholangiocarcinoma or acute cholecystitis or in connection with a non-obstructive malignancy of the pancreas. There was published a case of patient with pancreatic carcinoma, who developed a spontaneous intrahepatic biloma 8 months after making this diagnosis. Biloma was identified following a 1-week history of fever, rigors and icterus. The biloma was identified on computed tomography and subsequently drained under ultrasound guidance. Forty-eight hours later, a stent was inserted endoscopically into his common bile duct and he made an uneventful in-hospital recovery without operation [10].

Post-traumatic bilomas have been rarely described also in children, but are still the subject of isolated case reports [11]. The CT or ultrasound guided needle aspiration and drainage have been established as effective therapeutic tools in cases on posttraumatic bilomas, even in the presence of a documented intrahepatic biliary fistula [12]. Very important for justifying the conservative and expectant approach to management of bilomas and other similar conditions, is the following fact published in the year of 2006 in the context with blunt abdominal injuries and especially liver trauma: The realization that the majority of laparotomies for blunt abdominal trauma were non-therapeutic, paved the way for the evolution of non-operative methods of treatment. Reported advantages of the conservative approach include a reduction in mortality, a lower rate of complications, fewer transfusion requirements and shorter in-hospital stays [13].

Spontaneous rupture of the biliary tree and formation of biloma is rarely observed, sometimes being associated with choledocholithiasis. The detergent activity of bile acids provokes chronic inflammation that, on its turn, causes adhesions, leading to a possible loculated appearance of the collection as in majority of other causes of biloma. Clinical picture is similar as in other causes of biloma formation: abdominal pain, distention, peritonitis, jaundices and, in more severe cases, sepsis may occur. The mean time between symptoms onset and the diagnosis is one to two weeks [14].

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