Residual Gallbladder and Cystic Duct Stump Stone after Cholecystectomy: Laparoscopic Management

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Rezumat

Managementul laparoscopic al litiazei restante de bont cistic/veziculă biliară restantă după colecistectomie

Introducere: Colecistectomia reprezintă tratamentul standard pentru litiaza veziculară simptomatică, iar persistența simptomatologiei după intervenția chirurgicală definește sindromul post-colecistectomie. Printre cauzele biliare ale sindromului post-colecistectomie sunt incluse și colecistectomia subtotală și bontul cistic restant; cauze ce se întâlnesc cu o frecvență redusă, însă care presupun diagnostic și tratament provocator. Managementul laparoscopic a astfel de cazuri este recomandat, însă necesită echipe bine antrenate în chirurgia laparoscopică.

Metodă: Au fost analizate retrospectiv cazurile pacienților internați în Clinica de Chirurgie Generală a Spitalului Clinic Județean de Urgență Constanța, diagnosticate cu litiază restantă de bont cistic sau cu colecistectomii subtotale, care au necesitat completarea rezecției și care au fost operați pe cale laparoscopică.

Rezultate: În perioada ianuarie 2010-martie 2020 au fost internați 14 pacienți cu litiază restantă de bont cistic/colecistectomie subtotală care au necesitat intervenție chirurgicală. Toți pacienții au fost operați pe cale laparoscopică. Simptomatologia a fost dominată de colică biliară recurentă. Perioada dintre intervenția chirurgicală primară și intervenția chirurgicală de completare a rezecției a variat între 2-22 ani. Au existat 4 cazuri de colecistectomii subtotale și 10 cazuri de litiază restantă de bont cistic restant.

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Complicațiile intraoperatorii s-au întâlnit într-un singur caz (7.14%), numărul de zile de spitalizare a fost în medie 3 zile. Nici un pacient nu a mai prezentat simptome la urmărirea postoperatorie la 6 luni.

Concluzii: Sindromul postcolecistectomie este dificil de diagnosticat, pacienții simptomatici cu litiază restantă de bont cistic/colecistectomii subtotale care necesită intervenție chirurgicală sunt dificil de manageriat. Intervențiile chirurgicale laparoscopice sunt de preferat pentru avantajele pe care chirurgia laparoscopică le aduce, însă necesită un chirurg experimentat în tehnici avansate de laparoscopie.

Cuvinte cheie: colecistectomie subtotală, litiază restantă de bont cistic, colecistectomie, sindrom postcolecistectomie

Abstract

Background: Cholecystectomy is the standard treatment for symptomatic gallstones, and the persistence of symptoms after surgery defines postcholecystectomy syndrome. Biliary causes of postcholecystectomy syndrome include subtotal cholecystectomy and remnant cystic duct stump stone; causes that are encountered with a low frequency, but which require diagnosis and provocative treatment. Laparoscopic management of such cases is recommended, but requires well-trained teams in laparoscopic surgery.

Methods: This study is a retrospective analysis of patients who required surgical treatment for residual gallbladder and cystic duct stump stone after a cholecystectomy, hospitalized in the Surgery Department of Constanta County Hospital, who required completion of resection and were operated laparoscopically.

Results: Between January 2010 and March 2020, 14 patients were hospitalized with residual gallbladder and cystic duct stump stone that required surgery. All patients underwent laparoscopic surgery. Symptomatology was dominated by recurrent biliary colic (50%). The period between the primary surgery and the surgery to complete the resection varied between 2-22 years. There were 4 cases of subtotal cholecystectomies, and 10 cases of remnant cystic duct stump stones. Intraoperative complications were encountered in only one case (7.14%), the number of days of hospitalization was on average 3 days. No patient showed any symptoms at 6-month postoperative follow-up.

Conclusions: Postcholecystectomy syndrome is difficult to diagnose, symptomatic patients with remnant cystic duct stump stone/ subtotal cholecystectomy requiring surgery are difficult to manage. Laparoscopic surgery is preferred for the benefits that laparoscopic surgery brings, but requires an experienced surgeon in advanced laparoscopic techniques.

Key words: subtotal cholecystectomy, remnant cystic duct stump stones, cholecystectomy, post-cholecystectomy syndrome

Introduction

Gallstones are a condition with a frequency reported between 11-36% in the adult population, half of whom are symptomatic (1). The "gold standard" for symptomatic gallstones is laparoscopic cholecystectomy (LC) (2). For

some patients, the persistence of symptoms exists even after surgery, symptoms such as: abdominal discomfort, pain in the right hypochondrium, dyspepsia, jaundice. This context defines postcholecystectomy syndrome (PCS), due to biliary and nonbiliary causes, a syndrome that occurs in 10-40% of patients

anywhere between 2 days and 25 years (3-5). Common biliary causes include: remnant gallbladder or cystic duct stump, common bile duct stones (CBDS), sphincter of Oddi dyskinesia. Common nonbiliary causes are associated with liver or pancreatic disease, esophageal reflux, peptic ulcer. Biliary causes are uncommon, and the diagnosis for gallbladder / cystic duct stump is challenging and difficult (6,7).

Both in open cholecystectomy, but especially in the laparoscopic approach (13.3% of cases) there are situations when a subtotal cholecystectomy is required, such as: inflammation in the Calot triangle difficult to approach and dangerous at the same time regarding possible lesions, acute complex cholecystitis, Mirizzi syndrome, adhesions, excessive bleeding in the cirrhotic liver, inexperienced surgeons (8-11).

The concept of "cystic duct remnant calculus" has been reported since 1912 by Florcken, later it was studied in detail and now returns as a concept with the development of the era of laparoscopic surgery (12,13). By definition, a cystic duct length ≥ 1 cm at the time of primary cholecystectomy is considered residual cystic (14).

Incomplete resection of the cystic duct may be due to: acute inflammation of the cystic pedicle, tight adhesions at that level, poorer visibility, incomplete dissection of the Calot's triangle, unclear anatomy, low insertion of the cystic duct, difficulties due to bleeding or may be due to surgeon caution (10,15-17). Cystic duct remnant calculus after cholecystectomy has an incidence of less than 2.5% and depends on how much time has passed from the initial cholecystectomy until the time of diagnosis. Thus, we can speak of two distinct entities: residual lithiasis (months until a 1 year), or relapse of lithiasis (years) (18-20).

Diagnosing and managing such a case is a challenge. Symptomatic patients with cystic duct stones after cholecystectomy require surgery. We will present our experience of laparoscopically solving gallbladder and cystic duct stump stone after cholecystectomy.

Material and Method

This study is a retrospective analysis of patients who required surgical treatment for residual gallbladder and cystic duct stump stone after a cholecystectomy, hospitalized in the Surgery Department of Constanta County Hospital during 2010-2020. Inclusion criteria: patients with a history of cholecystectomy with specific symptoms of PCS and who received laparoscopic surgery. Exclusion criteria: open surgeries. The indications for completion cholecystectomy were residual gallbladder stone or cystic duct stump stone; only 14 patients met the inclusion and exclusion criteria and were enrolled in the study.

Data on the initial procedure (type of cholecystitis, method of treatment, time elapsed since cholecystectomy), demographic data, operator and postoperative data were evaluated in all patients. Demographic and clinical data included age, sex, body mass index (BMI), symptoms on clinical presentation. Patients suffering from PCS were investigated by blood tests (liver function, serum amylase, renal function), abdominal ultrasound (US), upper gastrointestinal endoscopy, magnetic resonance cholangiopancreatography (MRCP). Endoscopic retrograde cholangiopancreatography (ERCP) was carried out for patients with CBDS secondary to residual gallbladder stone or cystic duct stump stone.

All patients received laparoscopic treatment. Patients who with a history of open surgery were induced pneumoperitoneum at Palmer's point or by using the open technique method. The standard ports for LC were inserted and after the exploration of the abdominal cavity, the adhesion was performed by blunt/ sharp dissection, subsequently the remnant gallbladder/ cystic duct was identified, and the Calot triangle was carefully dissected. After identification and milking of cystic ducts using gentle pressure at its junction with CBD, intraoperative cholangiogram (IOC) was carried out in some cases to delineate the anatomy, to detect CBDS or any residual stone. Data were recorded on the degree of adhesions, intraoperative complica-

tions, duration of surgery, postoperative complications, duration of postoperative hospitalization. Patients were followed for up to 6 months for persistent symptoms.

Results

Between January 2010 and March 2020, 5470 cholecystectomies were performed in the Surgery Department of Constanta County Hospital, of which 210 were performed open, and 14 patients were treated as having residual gallbladder stone/ cystic duct stump stone by using completion cholecystectomy using laparoscopic technique.

Symptoms on presentation for half of the patients were recurrent biliary colic, followed by dyspepsia, cholangitis, and fever. The median white blood cell (WBC) count was within normal limits, as were liver function and bilirubin levels (*Table 1*). The diagnoses of all cases were carried out by using abdominal ultrasound (US) and magnetic resonance cholangiopancreatography (MRCP). MRCP was able to identify remnant cystic duct calculus in all 14 patients (sensitivity 100%) (*Figs. 1, 2*). Endoscopic retrograde cholangiopancreatography (ERCP) is a valuable tool in the hands of surgeons for preoperative, intraoperative, and postoperative management of biliary obstruction; so ERCP and papillotomy

Table 1. Demographic and Clinical Data

Variable	
Age (years, mean)	43-81 (62)
Gender	
Male	5 (35.72%)
Female	9 (64.28%)
Environment	
Rural	3 (21.43%)
Urban	11 (78.57%)
BMI (kg/m ²)	24.62-34.92 (30.66)
Clinical presentation (no, %)	
Recurrent biliary colic	7 (50%)
Dyspepsia	4 (28.57%)
Cholangitis	2 (14.29%)
Fever	1 (7.14%)
Personal history of liver disease	
Hepatitis B (no, %)	1 (7.14%)
WBCs count	5.5-18/μL (8.75)
Serum bilirubin (mg/dL)	0.9-3.2 (1.08)
Conjugated bilirubin	0.2-0.55 (0.3)
Unconjugated bilirubin	0.7-2.65 (0.77)
Liver status (U/L)	
AST	9-179 (22.12)
ALT	11-122 (23.09)
CBD diameter by US (mm)	7-15 (9)
Preoperative ERCP (no, %)	2 (14.29%)
Subtotal cholecystectomy (no, %)	4 (28.57%)
Remnant cystic duct (no, %)	10 (71.43%)

BMI: body mass index, WBC: white blood cell, AST: aspartate transaminase, ALT: alanine transaminase, CBD: common bile duct, US: ultrasound, ERCP: endoscopic retrograde cholangiopancreatography

were carried out before completion of cholecystectomy in 2 cases, and CBD was cleared in all cases (*Fig. 3*).

Regarding the initial surgery, 6 (42.85%)

Figure 1. MRCP image showing dilated cystic duct

Figure 2. MRCP image showing dilated cystic duct with a calculus in situ

Figure 3. View during endoscopic retrograde cholangiopancreatography (ERCP) showing remnant gallbladder

patients had open cholecystectomies, and 8 (57.15%) patients had laparoscopic cholecystectomies, performed for acute cholecystitis in most cases (92.85%). The interval since the initial operation varied between 2 and 22 years with a median of 6 years (*Table 2*). Subtotal cholecystectomies were diagnosed in 4 (28.57%) cases, and 10 (71.43%) patients had a cystic duct remnant. Laparoscopic completion cholecystectomy was completed successfully in all cases. In all cases there were adhesions between the liver and the colon/ duodenum/ great omentum, to a greater degree after open surgery, and to a lesser degree after laparoscopic surgery (*Fig. 4*). Intraoperative cholangiogram was performed in only 3 (21.43%) cases. There were no intraoperative complications, except for one case of a patient with cirrhosis in whom there was a small amount of blood loss. The mean operative time was 97.5 min (75–180 min). The duration of hospitalization after surgery was between 2–5 days with a median of 3 days. For 9 (64.28%) patients a drain tube was fitted and was extracted on average after 2 days

Table 2. Primary procedures

Variable	
Interval of cholecystectomy (years)	2-22 (6)
Open cholecystectomy	6 (42.85%)
Laparoscopic cholecystectomy	8 (57.15%)
Cholecystectomy	
Anterograde	8 (57.15%)
Retrograde	2 (14.28%)
Unknown	4 (28.57%)
Cholecystitis	
Acute	13 (92.85%)
Chronic	1 (7.15%)

(1–5 days). All patients were asymptomatic at 6 months' follow-up (*Table 3*).

Discussion

Cholecystectomy, whether open or laparoscopic, is the standard of treatment for symptomatic gallstones. The persistence of symptoms after surgery is found in 10–30% of cases and defines PCS (21,22). Uncertain local anatomy, adhesions of the cystic pedicle, severe inflammation can lead to a partial cholecystectomy or a longer cystic duct. Partial cholecystectomy may be accompanied by remnant gallstones or new stones may form over time. Calculus in the cystic duct remnant can be retained or recurrent. Retained calculi are left behind on surgery, whereas recurrent calculi are formed because of biliary stasis (8,9). The length of the

Table 3. Operative Data

Variable	
Laparoscopic cholecystectomy	14
Grade of adhesions	
Grade 1	0
Grade 2	5 (35.72%)
Grade 3	3 (21.43%)
Grade 4	6 (42.85%)
Length of cystic duct remnant (cm)	2-5.5 (4.2)
Intraoperative complications	1 (7.14%)
Blood loss	1 (7.14%)
Intraoperative cholangiogram (no, %)	3 (21.43%)
Operative time (min)	75-180 (97.5)
Peritoneal drainage	
Yes (no, %)	9 (64.28%)
Drain amount (ml)	50-120 (67.5)
Drain removal (days)	1-5 (2)
Hospital stay after surgery (days)	2-5 (3)
Persistence of symptoms at 6 months	0

Figure 4. (A) Right hypochondrium adhesion syndrome after cholecystectomy; (B) Cystic duct stump separated from liver, operative finding; (C) Operative photo revealing residual gallbladder with dissection of Calot's triangle; (D) Calculus exposed after opening the cystic duct remnant

remaining cystic duct was and still is a topic debated in the literature; lengths of less than 1 cm are allowed, although in the era of laparoscopy the tendency is for the dissections to be performed near the gallbladder and not at the junction of the cystic duct with CBD (14).

Palanivelu et al. reported an incidence of remnant cystic duct calculi of 4.19% in patients undergoing laparoscopic cholecystectomy as compared with an incidence of 0.02% in patients undergoing conventional open cholecystectomy (23). A common reason for leaving a long cystic duct remnant is failure to identify the gall bladder-cystic junction and is even more common in patients with acute cholecystitis (23,28). This situation can be prevented by correctly identifying cystic duct and bile duct junction and safely dividing the cystic duct keeping the cystic duct length shorter than 1 cm. In our experience, most

cases of PCS have occurred in patients who underwent laparoscopic surgery many years before, when the laparoscopic technique was being developed in tertiary centers in the region, which may partly explain the lack of experience in surgery, fear of the inexperienced surgeon and first of all the advanced forms of cholecystitis that imposed a less aggressive and safer technique.

The diagnosis of PCS is not easy to suspect or make, it requires certain specific investigations. Laboratory testing may demonstrate leukocytosis along with derangements in liver function tests (total and direct bilirubin, aspartate aminotransferase, and alanine aminotransferase) (24). In our case, most patients had normal blood tests, except those who developed jaundice as a symptomatology. Abdominal US, CT scan, MRCP, ERCP are effectively used to provide a diagnosis of

causes of PCS (14,25). Abdominal US is a first-line investigation, but can miss the diagnosis in almost 50% of cases, compared with MRCP which has a sensitivity between 85% to 100% to demonstrating biliary anatomy and stones (26). Another alternative would be endoscopic ultrasound, its sensitivity and specificity are similar to those of MRCP, but in our center it cannot be achieved. Abdominal CT may also be considered as an alternative in institutions where MRCP is not available. It is prudent to evaluate the entire biliary tree radiologically to avoid missing any other conditions like common bile duct calculus. Stones in the cystic duct stump are usually difficult to extract by means of ERCP, which depends on anatomical factors, diameter of the cystic duct, position of the stone in the duct, degree of impaction/ size of stones and the angle between the cystic duct and CBD (17).

Once a patient has been diagnosed as having residual stone and PCS, surgical intervention should be undertaken to resolve the symptoms and avoid potentially life-threatening complications (Mirizzi syndrome, recurrent cholangitis, mucocele formation, carcinoma) (4,6). The re-exploration rates in laparoscopic and open cholecystectomy were found similar in the latest study (27). A laparoscopic surgery to complete the resection is a challenge for any surgeon and requires good experience. Modern surgical instruments, current laparoscopic equipment, and surgical teams trained in advanced laparoscopic techniques lead to the recommendation of the laparoscopic approach of such cases (23).

Walsh et al (15) stated that the retained gallbladder and cystic duct calculi can be prevented by the accurate identification of the gallbladder cystic duct junction on cholecystectomy in their review of seven cases. The remnant gallbladder/ cystic duct stump stone is difficult to identify in Calot's triangle, the adhesion syndrome and the local inflammation after an incomplete cholecystectomy, makes laparoscopic reoperation difficult (21,28). The use of ICG during laparoscopic cholecystectomy enables a better, easier, and faster identification of the biliary tree

anatomy thereby increasing the safety of cholecystectomy by reducing the risk of bile duct injury (29).

Residual GB remnant or cystic duct stump stone is a preventable condition and every effort must be made to minimize its incidence by: meticulous dissection of the cystic duct up to CBD, defining the stone junction, trial milking of the cystic duct toward the GB before clipping especially in patients with a history of calculous obstructive jaundice and pancreatitis (17,20,30).

Conclusions

Residual gallbladder or cystic duct stump stone is a preventable and correctable cause of PCS. Patients with a retained stone in the residual gallbladder should undergo surgery and even though they are technically difficult, such surgeries can be carried out laparoscopically. In this sense, we recommend that such surgeries be performed only by trained, experienced teams in laparoscopic surgery.

Conflict of Interest

The authors declare no conflicts of interests.

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