ENDOSCOPIC APPROACH IN RESIDUAL COMMON BILE DUCT LITHIASIS

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Abstract. Treatment of the common bile duct lithiasis is a current challenge, constantly evolving and improving. Between 2004 and 2010, 177 patients with jaundice of lithiasic ethiology were operated on in our department. Suspicion of common bile duct lithiasis was sustained by clinical, biological and imagistic criteria, and confirmed by endoscopic retrograde cholangiopancreatography or intraoperative transcystic cholangiography. By introducing in the current practice the endoscopic interventions we observed a reduction of complications, both specific and nonspecific, simultaneously decreasing overall rates of morbidity and mortality, a decrease of hospitalization and of the social-economical costs.

Keywords: Common bile duct lithiasis, endoscopic retrograde cholangiopancreatography, endoscopic sphincterotomy, jaundice

Background

Treatment of common bile duct (CBD) lithiasis is a current challenge.

CBD stones can be classified into primary, secondary, residual (missing at the time of cholecystectomy, but detectable earlier than three years after surgery) and recurrent stones (developing in more than three years after surgery) [1].

Therapeutic approach for residual stones includes endoscopic sphincterotomy and conventional surgery, laparoscopic and open.

Objective

The aim of this study was to report the results of the endoscopic management of CBD stones in a unicentric series of patients.

Material and method

Design: Retrospective study on therapeutic management in consecutive patients with postoperative CBD lithiasis.

Setting: Dr. I. Juvara Department of Surgery, Dr. I. Cantacuzino Clinical Hospital

Patients: Between 2004 and 2008 we selected a total of 83 patients with postoperative CBD stones, suggested by jaundice, pain, impaired tests of liver function, imagistic confirmation of the gallstones, in patients with previous cholecystectomy.

All data collected (age, sex, clinical and biological data, previous investigation, type of intervention and outcomes) were entered into a Microsoft Excel database and processed.

Between 2004 and 2010, 177 patients with jaundice of lithiasic etiology were operated on, in our Department of Surgery, 94 cases in primary intervention and 83 in reintervention.

Diagnostic suspicion of CBD residual stones was supported by clinical criteria, the presence of angiocholitis, biohumoral changes and information obtained from standard abdominal ultrasound, and confirmation was obtained by intraoperative cholangiography (IOC) or endoscopic retrograde cholangiopancreatography (ERCP) and direct exploration of CBD in open surgery.

Results

Demographic

During 2004–2010, 177 patients with jaundice of lithiasic etiology were operated in our Department of Surgery, 94 cases in primary intervention and 83 in reintervention (Figure 1).

From the total of 83 patients with postoperative CBD stones, 34.94% were men and 65.06% women (ratio female / male = 1.86). It is known that the
CBD stones occur more frequently in women, associated with hormonal status, parity, obesity, important weight loss [2] (Table I).

<table>
<thead>
<tr>
<th>Number of patients</th>
<th>83</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age, years</td>
<td>56</td>
</tr>
<tr>
<td>Age limit, years</td>
<td>28-83</td>
</tr>
<tr>
<td>Ratio F / B</td>
<td>1.86</td>
</tr>
<tr>
<td>Elders</td>
<td>45.78%</td>
</tr>
<tr>
<td>Ratio F / B in elders</td>
<td>1.23</td>
</tr>
</tbody>
</table>

Table I. Demographics

The analysis of cases per decade of age (range 28 to 83 years) shows that almost half of the patients are older than 60 years, representing 45.78%, percentage which suggests a long delay to surgery, the long evolution of biliary pathology, associated with increased morbidity and mortality. In the elderly there is a near equal ratio of women / men (1.23) (Figure 2).

Figure 2. Decades of age

Diagnostic

Angiocholitis was present in most patients upon admission (Figure 3) and the most common symptoms reported were pain in 71 patients, followed by the presence of jaundice in 49.39% of cases.

Tests of liver function were performed as follows in Table II:

<table>
<thead>
<tr>
<th>Laboratory Tests</th>
<th>Increased values (% of patients)</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct bilirubin</td>
<td>74.69</td>
<td>0.07-7.93 mg/dl</td>
</tr>
<tr>
<td>Total bilirubin</td>
<td>66.26</td>
<td>0.41-10.98 mg/dl</td>
</tr>
<tr>
<td>GOT</td>
<td>80.72</td>
<td>16-864 U/L</td>
</tr>
<tr>
<td>GPT</td>
<td>86.74</td>
<td>17-1190 U/L</td>
</tr>
</tbody>
</table>

Table II. Tests of liver function

Abdominal ultrasound (US) was based on direct signs (suggestive image of hyperechoic mass with posterior shadow cone in the CBD, suggesting the presence of stones) and indirect signs (dilated biliary ducts), with the advantage of being fast, showing the gall bladder, liver, bile and pancreas ducts, with accuracy in highlighting the dilated biliary tract and not limited by the presence of jaundice. The major disadvantage is the difficulty of visualisation of the terminal portion of the CBD.

In the studied group ultrasound showed CBD stones in only 26 cases (Figure 4).
In the studied group, the indication for reoperation was supported in some cases by computer tomography (CT) scan or magnetic resonance imaging (MRI):

- for 4 patients the indication was supported by the MRI exam that showed the filling defect of CBD suggesting lithiasis and dilated intrahepatic biliary ducts (IHBD);
- in one case CT scan showed a distal CBD lithiasis;
- for one patient the preoperative ultrasound reveals moderately dilated IHBD, CBD (1 cm), CT scan confirming the dilatation of CBIH, with a CBD diameter of 1 cm which narrows in the terminal portion. MRI, also, confirms CBD stones.

Preoperative diagnosis remains problematic, despite the progress in imaging techniques, because in 20% of cases CBD lithiasis is completely asymptomatic.

**Treatment management**

Early reinterventions were defined as endoscopic interventions or open surgery in a period of time less than or equal to 30 days from the time of primary surgery. There were 44 early reinterventions, 42 endoscopic and 2 by open surgery performed in a mean time interval of 10 days (10.76) with a range between 2 and 30 days.

Late reinterventions were done in more than 30 days after the first intervention, representing 39 cases (35 solved endoscopically and 4 in open surgery), in a time interval between 4 months and 14 years (168 months), with an average of 67.71 months.

Open surgical approach was used in 6 patients for reinterventions (Table III); the causes varied as follows:

- increased diameter of the stone at CT scan examination (2cm), intraoperative cholangiography ascertaining a stone of 2.5 cm: 1 case;
- endoscopic retrograde cholangiopancreatography and endoscopic sphincterotomy failure: 3 cases (in one case because of the diameter of the stone);
- changes associated with cephalic chronic pancreatitis associated with CBD stones: 1 case;
- subhepatic abscess associated with CBD stones: 1 case.

<table>
<thead>
<tr>
<th>Reinterventions</th>
<th>Open surgery</th>
<th>6 cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endoscopic</td>
<td>77 cases</td>
<td></td>
</tr>
</tbody>
</table>

**Table III. Therapeutic approach of postoperative CBD stones**

We performed endoscopic retrograde cholangiopancreatography (ERCP) or intraoperative cholangiography (IOC) to obtain confirmation of the presence of gallstones for all the patients.

The number of residual lithiasis cases was 9 (7 after ERCP, 2 after open intervention). In the case of the 7 patients with residual stones after ERCP, 5 of them needed endoscopic reintervention and in 2 cases there was a spontaneous passage of the stone into the duodenum.

The total number of open or endoscopic procedures per patient was 1.6 (performed during the same hospitalization or during previous admissions, both in our Department of Surgery and in other hospitals) and in 9 cases during the same hospitalization.

In our group, there were 2 cases of post-procedural acute pancreatitis, both mild, no cases of angiocholitis and no perforation. In our group there was only one case of bleeding after ERCP, requiring endoscopic reintervention for hemostasis.

**Discussion**

Laboratory tests may be useful, but are not specific for the diagnosis of CBD lithiasis, some patients may be completely asymptomatic and without changes in biological values, but most of patients had abnormal values as we see in Table II.

Hyperbilirubinemia (over 30micromol / l) in patients over 50 years and dilated CBD on ultrasound, are significantly positive predictors for the stones of CBD, with values between 28-38% and raises to identify lithiasis at the CPER to 70% [3].

**Abdominal ultrasound** as a screening method is accurate in diagnosing gallstones, but the sensitivity of the method for detecting the CBD lithiasis is only 15 - 40% and CBD distension is identified in 80% of cases [3].

In the studied group ultrasound showed CBD stones in only 26 cases (31%).

**Endoscopic ultrasound** can be used, having a specificity of 97.8% and a sensitivity of 94.9% (both with values between 85-100% in several multicenter studies) [4, 5]. The method is more invasive than the abdominal ultrasound; the cost is amplified and increases the necessity of qualified endoscopic / ultrasound personnel.

To confirm the ultrasound findings we used computer tomography and magnetic resonance imaging, 6 cases in our group.

**Computer tomography** has specificity for detecting lithiasis of CBD between 84% (when performed without contrast agent) and 100%, and a sensitivity ranging from 65-93% [3]. Diagnostic advantages are represented by highlighting local anatomy of the gallbladder, liver, and extrahepatic biliary duct, allowing guided function of suspicious masses, providing high resolution images. A contraindication is intolerance to iodinated contrast agents.
Magnetic resonance imaging has a specificity and sensitivity of approximately 90%, compared with ERCP, which is the reference standard, although there are studies that suggest lower rates (thus decreasing the sensitivity of the method from 100% for detecting CBD stones over 1 cm, decreasing to 71% for those less than 5mm in diameter) and false positive results are common, in the presence of air in the biliary ducts [3]. Limitations of the method are due to metal clips, pacemakers, claustrophobia, morbid obesity (the last two are relative contraindications), but also due to cost and limited access of the method.

Therefore, the diagnosis of biliary obstruction is established with a high degree of accuracy with the initial screening (US, CT or MRI); with the cholangiography (endoscopic or direct) we establish the level and etiology of the obstruction [6].

Endoscopic retrograde cholangiopancreatography (ERCP) introduced in 1970, remains the minimally invasive method of choice for the treatment of CBD lithiasis.

ERCP has a success rate, according to the contrast agent used, between 76-95%, and the complication rate varies widely (depending on the center) between 0-16% [7]. Papilla catheterization is impossible to 2-5% of patients [8].

ERCP associated with endoscopic sphincterotomy (ES) is an intervention with its own morbidity and mortality, with non-specific general complications (drug related sedative, anticholinergic, contrast agent, desaturation, bronchoaspiration, cardiopulmonary events) and specific (pancreatitis, bleeding, perforation, infection), as we see in Table IV.

A recent audit of the British Society of Gastroenterology revealed that 48,000 ERCP are performed annually in UK. Considering the risk of complications approximately 5-10% and a mortality rate of 0.3 to 1%, it results that about 2400-4800 suffer complications and up to 480 of the patients die annually as a result of ERCP [9].

Acute pancreatitis (AP) is the development of post-procedural abdominal pain associated with amylase levels over three times higher than normal. Increased serum amylase post-ERCP occurs at approximately 75% of patients.

There are studies showing risk stratification of developing postprocedural pancreatitis according to pancreatic enzyme dosage (amylase and lipase) at 2 hours postoperatively, thereby lower values than 276 U/L of serum amylase and lower than 1000 U/L of serum lipase can exclude the suspicion of pancreatitis, with a negative predictive value of 0.97 and 0.98 respectively [14].

Risk factors are related to the patient: female gender, younger patient, personal history of AP, narrow CBD, periampullary diverticulum, sphincter of Oddi dysfunction, and technical related: difficult cannulation, amount/number of injections of contrast agent, time of the cannulation more than 10 minutes [15], pancreatic duct catheterization, „needle knife „ technique. In a descending order of risk factors the most frequently involved are: precut technique (20%), multiple cannulation attempts (14.9%), sphincterotomy for cannulation (13.1%), pancreatic duct cannulation (13%) the use of guide wire for cannulation (10.2%), pancreatic duct contrast injection (10%) [13].

In most patients in the studied group the serum amylase was determined at 24 hours after surgery. There were 2 cases of post-procedural acute pancreatitis, both mild. Symptomatic treatment with antisecretory and anti-inflammatory drugs, antibiotics, and fastening resulted in a positive evolution of these cases without complications.

In other 23 cases there was an increase of amylase of a maximum value of 100 U/L postoperatively, but not clinically significant.

Another complication is angiocholitis, especially with biliary stasis. Prevention of infectious complications after ERCP is possible with antibiotics and by ensuring good drainage of the CBD at the end of the procedure.

In the studied group there were no cases of angiocholitis.

Bleeding from the sphincterotomy site is a possible complication, perhaps the most feared, with an incidence of 2-5% and mortality of 0.3%. It can be identified by decreased hemoglobin and hematocrit and/or exteriorization of blood on the nasogastric tube. If the biochemical parameters do not improve after specific measures, endoscopic reintervention is necessary. Retrospective studies have found three predictors for bleeding: a history of hemodialysis, prolonged APTT and bleeding at the time of ES; also, impacted stones, the presence

<table>
<thead>
<tr>
<th>Authors</th>
<th>Complications</th>
<th>Pancreatitis</th>
<th>Angiocholitis</th>
<th>Bleeding</th>
<th>Perforation</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andriulli</td>
<td>6.85%</td>
<td>3.47%</td>
<td>1.44%</td>
<td>1.34%</td>
<td>0.6%</td>
<td>1.33%</td>
</tr>
<tr>
<td>Williams</td>
<td>5.0%</td>
<td>1.6%</td>
<td>1.0%</td>
<td>0.9%</td>
<td>0.4%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Masci</td>
<td>4.95%</td>
<td>1.8%</td>
<td>1.13%</td>
<td>0.57%</td>
<td>0.57%</td>
<td>0.12%</td>
</tr>
<tr>
<td>Vandervoort</td>
<td>11.2%</td>
<td>7.2%</td>
<td>0.72%</td>
<td>0.8%</td>
<td>0.08%</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

Table IV. Frequency of ERCP complications
of a periampullary diverticulum, reintervention after a previous ES [16]. In most cases the treatment is conservative or endoscopic with injection of epinephrine or sclerosing agents; in case of failure, therapeutic angiography (vasopressin injection, embolization) and surgical reintervention can be recommended.

In our group there was one case of bleeding after ERCP, requiring endoscopic reintervention for hemostasis.

Duodenal perforation occurs due to excessive insufflations or instrumental manipulation during catheterization; it is a serious complication that requires emergency surgery.

In the studied group there were no cases of perforation.

As a cardiopulmonary complication, ischemia and arrhythmia were obvious on ECG in 9.3% cases (24% in patients over 65 years), arterial hypoxemia with lower episodic oxygen saturation <90% in 16.2% of cases (21.4% to elderly) and the risk of developing pancreatitis after ERCP was associated with desaturation and myocardial ischemia. Monitoring of troponin I is necessary in patients with increased cardiovascular risk [17].

Multicentric prospective studies support the possibility to discharge the patients in the same day of the procedure, given that most complications occur a few hours after surgery [18].

A study of 126 elderly patients over 90 years, who underwent 147 ERCP (1-5 procedures/ patient) showed a 92.4% tolerance of the procedure, the overall rate of complications did not exceed 2.5% and the mortality rate was 0.7% suggesting that the ERCP is practicable in the elderly population, maintaining low complication rate and high therapeutic efficacy [19].

In the group of patients undergoing endoscopic interventions, there were no non-specific complications and elderly patients tolerated well these procedures.

Postoperative hospitalization varies depending on the intervention: for patients undergoing ERCP average hospitalization was 5 days and the time interval is extended to 12 days for open intervention. In the group of patients with complications, average length of hospital stay increases up to 23 days.

Conclusions

By introducing in our current practice the endoscopic intervention, we observed a reduction in complications, both specific and nonspecific, while decreasing overall morbidity and mortality rates, a decrease in duration of hospitalization, and of the social and economic costs.

ERCP is a difficult procedure associated with a substantial risk of complications and even death. This led to the decrease number of ERCP by rigorous patient selection and use of alternative methods of investigation.

Despite many complications and limitations, ERCP is a safe technique when performed by an experienced operator.

References

16. Erik C. Van, Patrick S. Kamath, Christopher J. Gostout,

