Long-term follow-up of common bile duct diameter after endoscopic sphincterotomy in patients with common bile duct stones

Shadi Kolahdoozan · Rasoul Sotoudehmanesh · Morteza Khatibian · Ali Ali-Asgari · Shadi Shahraeeni · Fatemeh Zeinali

Abstract

Background and Aims To determine the time to normalization of common bile duct (CBD) diameter after endoscopic sphincterotomy and stone extraction in patients with choledocholithiasis.

Methods Patients with CBD dilation due to choledocholithiasis were enrolled. CBD diameter was measured by transabdominal ultrasonography before, and repeated after one, three, six and twelve months after endoscopic sphincterotomy and stone extraction, until normalization of CBD diameter.

Results Of 115 cases enrolled over a 36-month period, CBD diameter reversed to normal in 71 (61.7%) patients after one month. Of the remaining 44 patients, CBD diameter reversed to normal in 36 patients (including 3 in whom repeat ERCP revealed choledocholithiasis) at the end of three months. CBD diameter had not reversed to normal diameter in 8 (18.2%) patients; none of these patients had symptoms. Two of them had asymptomatic dilated CBD after 6 months with no abnormal liver function tests (LFT); the duct reversed to normal at the last follow-up (month 12).

Conclusions Asymptomatic CBD dilation may persist in a minority of patients (18% at the end of 3 months) after removal of CBD stones. A dilated CBD can be attributed to retained choledocholithiasis within the first month, if it is associated with symptoms and abnormal LFT.

Keywords Cholangiopancreatography endoscopic retrograde, choledocholithiasis, sphincterotomy

Introduction

Endoscopic sphincterotomy (ES) and stone extraction is commonly used in the treatment of common bile duct (CBD) stones. After ES, the diameter of the CBD in patients with dilated CBD secondary to obstruction is expected to decrease. However, in some cases, the diameter does not change.1,2 Karincaoglu et al showed a significant decrease in the CBD diameter measured one week after ES and stone extraction. Persson et al showed that the absence of reduction or an increase in the diameter of the CBD could identify patients who might have persistent disease after ES. The aim of this study was to measure change in diameter of the CBD at 1, 3, 6 and 12 months after ES and stone extraction in patients with CBD stones and thus determine the time for normalization of CBD diameter.

Methods

This prospective study included 115 patients presenting to the Shariati Hospital, Tehran University of Medical Sciences with choledocholithiasis and CBD dilation. The diagnosis of choledocholithiasis was based on imaging findings including transabdominal ultrasonography (TUS), endosonography and magnetic resonance cholangiopancreatography (MRCP). We included patients after complete removal of stones from the CBD. The exclusion criteria were any contraindication to doing endoscopic retrograde cholangiopancreatography (ERCP), other causes of biliary dilation, history of gastrojejunostomy surgery, pregnancy, known hypersensitivity to contrast agents, age less than 12 years, history of previous sphincterotomy, and refusal of informed written consent.
After taking the medical history and conducting physical examinations, serum alkaline phosphatase (ALP), aspartate aminotransferase (AST), alanine aminotransferase (ALT) and bilirubin were measured. TUS was performed with a 3.5 – MHz convex probe (Aloka, Japan). One ultrasonographer performed all examinations. After an overnight fast, the diameter of the CBD at the proximal part, intrahepatic bile ducts and gall bladder were evaluated in all patients. CBD dilation was defined as CBD diameter more than 6.0 mm. ERCP was carried out with a video duodenoscope (TJF 200; Olympus Optical Co Ltd, Tokyo, Japan). Patients who had choledocholithiasis on ERCP underwent ES and stones were extracted with the use of a basket or balloon. The diameter of the largest part of the CBD was measured on X-ray taken during ERCP and corrected for the diameter of the duodenoscope. In cases with gallbladder stones cholecystectomy was recommended after stone extraction.

One month after stone extraction, CBD diameter was measured on TUS and liver function tests (LFT) were done. In patients with symptoms (abdominal pain, jaundice, fever), abnormal LFT and CBD dilation, ERCP was performed again and in the presence of choledocholithiasis stone extraction was done. These patients were considered as new cases and were followed up again. Other patients with CBD dilation were re-evaluated 3 months after the initial ERCP by TUS and LFT. If the CBD diameter did not reverse to normal, these tests were repeated at 6 and 12 months after the initial ERCP.

The study was approved by the institutional review board of the Digestive Diseases Research Center of Tehran University of Medical Sciences, according to the declaration of Helsinki. A written informed consent was obtained according to the guidelines of the institute.

For statistical analyses, the SPSS statistical program SPSS version 13 (SPSS Inc., Chicago, Illinois, USA) was used. Quantitative variables were presented as mean (standard deviation). Qualitative variables were expressed as number and percent. Pearson’s correlation coefficient was used to assess the correlation of CBD diameter on TUS and ERCP. Changes in the CBD diameter as measured on TUS before and after ES at months 1, 3, 6 and 12 were compared by using a t test for paired samples. A p value less than 0.05 was taken as significant.

Results

Initial presentation

During 36 months, 115 patients were enrolled in the study. Table 1 shows the baseline characteristics of patients. The mean (SD) of CBD diameter on TUS was 11.6 (3.7) mm at presentation. ERCP demonstrated the presence of CBD dilation with choledocholithiasis in all patients. The mean (SD) of the CBD diameter measured on ERCP was 12.5 (3.4) mm. There was good correlation between CBD diameter measured on TUS and on ERCP (Pearson’s r=0.73). The patient flow diagram is shown in Fig. 1.

Follow-up at month 1

One month after ERCP, levels of ALP, AST and ALT decreased significantly compared to levels measured prior to ERCP (p<0.001). Mean (SD) CBD diameter on TUS was 6.3 (2.0) mm (3–13 mm), which was lower as compared to baseline values (p<0.001). CBD diameter had not become normal in 44 (38.3%) patients. Sixteen (36.5%) of these patients had abnormal ALP levels and 10 had abnormal AST or ALT. Repeat ERCP was suggested to 8 patients: five (11.4%) had abdominal pain, two (4.5%) had jaundice with hyperbilirubinemia and one (2.3%) had fever and chills. Two patients with abdominal pain did not agree to repeat the ERCP and were followed up month 3. Three patients had choledocholithiasis in the repeat ERCP (two with abdominal pain and one with fever) while ERCP was normal in other three patients.

Follow-up at month 3

None of the remaining 44 patients were symptomatic at the three-month follow-up period. Serum level of ALP remained elevated in one patient with normal CBD. CBD dilation was found in 8 (18.2%) patients, who were followed up at month 6, but ERCP was not considered because they were asymptomatic. CBD diameter in patients who were considered for ERCP at month one were: normal in those with normal ERCP (n=3); one of three patients with choledocholithiasis had a dilated CBD; and one of

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Baseline characteristics of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean [SD])</td>
<td>60.9 (16.6)</td>
</tr>
<tr>
<td>Female gender (n [%])</td>
<td>64 (55.7%)</td>
</tr>
<tr>
<td>Previous cholecystectomy (n [%])</td>
<td>57 (49.6%)</td>
</tr>
<tr>
<td>History of pancreatitis (n [%])</td>
<td>6 (5.2%)</td>
</tr>
<tr>
<td>Clinical symptoms (n [%])</td>
<td></td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>104 (90.4%)</td>
</tr>
<tr>
<td>Jaundice</td>
<td>75 (65.2%)</td>
</tr>
<tr>
<td>Fever</td>
<td>53 (46.1%)</td>
</tr>
<tr>
<td>Nausea and vomiting</td>
<td>66 (57.4%)</td>
</tr>
<tr>
<td>Pruritus</td>
<td>40 (34.8%)</td>
</tr>
<tr>
<td>Liver biochemistry (mean [SD])</td>
<td></td>
</tr>
<tr>
<td>Aspartate aminotransferase (IU/L)</td>
<td>114.2 (149.3)</td>
</tr>
<tr>
<td>Alanine aminotransferase (IU/L)</td>
<td>138.9 (158.8)</td>
</tr>
<tr>
<td>Alkaline phosphatase (IU/L)</td>
<td>753.6 (659.5)</td>
</tr>
<tr>
<td>Total bilirubin (mg/dL)</td>
<td>4.2 (5.0)</td>
</tr>
</tbody>
</table>
two patients, who did not consent for a repeat ERCP, had dilated CBD.

**Follow-up at months 6 and 12**

None of the 8 patients was symptomatic at month 6 of follow-up. Liver enzymes had returned to normal in all. One patient with normal CBD but elevated ALP was also followed up and ALP levels returned to the normal. CBD dilation was found in 2/8 patients. These patients were asymptomatic with normal LFT and had a normal CBD diameter at 12 months follow-up.

**Discussion**

We investigated changes in the diameter of the CBD measured on transabdominal ultrasonography in patients with CBD dilation due to stones. We showed that after ERCP and stone extraction, persistence of CBD dilation alone does not mean the presence of retained stone. Numerous studies have studied various predictors for the presence of choledocholithiasis by biochemical, clinical and radiologic data; no single factor was reliable. This observation was confirmed by a recent meta-analysis. The most accurate single predictor for retained CBD stone was the presence of cholangitis, followed by a CBD stone visualized on ultrasonography, preoperative jaundice and a dilated CBD on ultrasonography. In a similar study by Sgourakis et al., high values (≥2 × normal) of AST, ALP and conjugated bilirubin and CBD diameter of 10 mm on ultrasound, were all predictive of choledocholithiasis.

The present study showed that abnormal LFT or ALP with abdominal pain or fever may predict the presence of choledocholithiasis in patients with dilated CBD after ERCP and stone extraction. On the other hand, after sphincterotomy and CBD stone extraction, symptom of jaundice...
alone, was not a reliable predictor of presence of cholec-docholithiasis, even in the presence of elevated ALP and dilated CBD.

To our knowledge, there has been no study that has assessed the predictors of retained stones after ES. However the low number of retained stones in our study precludes such an analysis. Karincaoglu et al. showed that by day 5 after ERCP and stone extraction, the diameter of the CBD should be closer to the normal value or at least 35% smaller than before the ES. This approach led to a repeat ERCP in 13% of our patients. Our study shows that, after complete stone extraction, reversibility of CBD dilation may take up to 12 months. In 44 patients (38.2%), CBD did not reverse to normal, but only in 3 patients did repeat ERCP show presence of a retained stone. There may have been some patients with asymptomatic retained stones in our study, but our approach led to only 8 repeat ERCPs (6.9%).

Persson et al. investigated changes in the diameter of common hepatic duct and CBD 10 days after ES in 100 patients with dilated CBD due to stones and papillary stenosis. Although the reversibility of CBD diameter after ES is probably different in patients with papillary stenosis, diameters of CBD and common hepatic duct decreased in 83 and 73 patients, respectively on cholangiography. Considering high sensitivity and non-invasiveness of TUS in detecting CBD dilation, sonography is recommended in preference to invasive procedures such as ERCP. In addition, as we also showed in the current study, there is a strong correlation between CBD diameters measured on TUS and those measured on ERCP in other studies. There are few studies that have evaluated the differences between TUS and ERCP in the assessment of CBD diameter. Depending on the features of these two imaging modalities, values may vary. This difference may be related to the effect of the contrast medium injected into the bile duct under high pressure. In addition, it has been shown that the CBD has the ability to dilate and collapse in a short period of time.

In summary, after complete removal of chole-
docholithiasis and in the absence of retained stones, the reversibility of CBD diameter to normal size will occur in most cases within a month. A dilated CBD can be attributed to the previous cholecdocholithiasis upto 12 months, and may not require any intervention; however if it is associated with symptoms and raised ALP, repeat ERCP should be considered.

Acknowledgement

This research was supported by a grant (number 82/2) from Digestive Diseases Research Center of Tehran University of Medical Sciences & Health Services.

References