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Management of benign biliary strictures by percutaneous interventional radiologic techniques (PIRT)

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Abstract

Introduction. Some biliary strictures may be manageable by percutaneous interventional radiologic techniques (PIRT), but long-term efficacy of this approach is scarce. *Methods.* We reviewed retrospectively all patients with biliary strictures secondary to traumatic bile duct injury or strictured bilioenteric anastomoses. Patients in whom the initial management was by PIRT from 1998 through 2003 were selected. Subjects with sclerosing cholangitis, hepatic transplantation, or malignant strictures were excluded. Data were obtained from medical records and/or direct patient contact. Comparisons were made by Fisher's exact test and Wilcoxon rank-sum test. *Results.* Twenty-seven patients with biliary strictures were treated by PIRT. Mean age was 54 years (range 11–86). Most frequent etiology was laparoscopic cholecystectomy injury in 11 patients (41%). Eight patients (29%) had undergone biliary resection for malignancy, seven (26%) a pancreatoduodenectomy, and one for presumed ischemic cholangiopathy; no strictures were secondary to neoplastic recurrence. PIRT was successful in 10 of 11 patients (91%) with short, isolated bile duct strictures secondary to laparoscopic cholecystectomy and in seven of 15 patients (41%) with strictured bilioenteric anastomosis, but not in the patient with ischemic cholangiopathy. Twenty patients (74%) were stent-free at follow-up. Anastomotic biliary strictures were more likely to fail PIRT than isolated strictures secondary to laparoscopic cholecystectomy injury ($p = 0.02$). *Conclusion.* Percutaneous balloon dilatation and stenting can be an effective strategy for patients with bile duct strictures, especially short bile duct strictures after laparoscopic cholecystectomy. Anastomotic strictures are associated with less good results when managed by PIRT but are successful in up to 40% of patients.

Key Words: *biliary stricture, interventional radiology, endoluminal stent, bile duct injury*

Introduction

Percutaneous interventional radiologic techniques (PIRT) have had an increasingly important role in the multidisciplinary diagnosis and management of biliary strictures. Before interventional techniques (radiologic, endoscopic) were developed, operative intervention was the only option for definitive treatment of biliary strictures. While excellent results have been reported with a primary operative approach, some benign biliary strictures may be amenable to a non-operative, interventional approach, thereby avoiding the morbidity and mortality of an operative approach. In recent years, percutaneous transhepatic biliary interventional techniques have been used increasingly to evaluate and treat selected patients with complex biliary lesions; however, little data in the literature address the long-term efficacy of this approach. Indeed, there is no consensus regarding which patients are best treated by this form of interventional treatment.

Methods

We reviewed retrospectively all patients with biliary strictures secondary to traumatic operative bile duct injury or who had an operative bilioenteric anastomosis performed that strictured subsequently. We then selected all those patients managed by PIRT at Mayo Clinic Rochester between 1 January 1998 and 31 December 2003.

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Patients with a history of primary sclerosing cholangitis, hepatic transplantation, or malignant strictures were excluded. Demographic, clinical, histopathologic, treatment, survival, and outcome variables were collected and analyzed. Clinical notes, imaging studies, operative reports, and pathology reports were reviewed to determine the etiology and type of stricture whenever possible. Clinical symptoms, pre and post-intervention cholangiograms, results of liver function tests, and need for continued intervention were used to assess outcome. Data were obtained from the hospital record or by direct patient contact via a mailed, written questionnaire. The results were defined arbitrarily as "excellent" when the patient was asymptomatic, had normal liver function tests, and required no further treatment; "good" if mild symptoms were present and liver function tests were mildly abnormal (serum activities of γ-glutamyl-transferase, aminotransferases, or alkaline phosphatase equal to or less than 1.5 times the upper limit of the reference range) but no further intervention was needed; "fair" when the stricture was ultimately managed non-operatively, but the patient still had ongoing symptoms (e.g. intermittent cholangitis) or abnormal liver function tests (serum activities of γ-glutamyl-transferase, aminotransferases, or alkaline phosphatase greater than 1.5 times the upper limit of the reference range); or "poor" if a stricture recurred, was symptomatic, required active interventional treatment, or was managed ultimately by operative intervention.

We decided specifically not to describe the level of the strictures according to available classification systems (i.e. Bismuth, Strasberg) due to the heterogeneity of the lesions and the different mechanisms by which the strictures occurred (primary/iatrogenic vs. anastomotic).

This study was approved by the Mayo Clinic Institutional Review Board and complied with the HIPPA and Minnesota State regulations.

Clinical management

All patients underwent percutaneous transhepatic cholangiography (PTC) followed by placement of percutaneous biliary drainage catheters (PBD). This procedure was performed in a standard fashion and is described briefly below. All patients were treated with intravenous antibiotics before the procedure. Intravenous conscious sedation was administered by anesthesiology personnel consisting either of diprivan or a combination of midazolam and sublimazime. Using the right midline, transaxillary approach, a 22-gauge Chiba needle (Cook, Inc., Bloomington, IN) was inserted, and iodinated contrast material was injected to opacify the intrahepatic bile ducts and to define the level and nature of the bile duct lesion. Based on the percutaneous cholangiogram, an appropriate intrahepatic duct was selected and punctured, often a right, laterally oriented duct. When the injury was at or near the bifurcation, both right and left hepatic ducts were accessed. Attempts were made to cross the injury at the time of initial tube insertion. At our institution, the initial catheter and guide wire combination used most frequently was a five-Fr glide head catheter (Boston Scientific, Boston, MA) and an angled 0.035″ hydrophilic Glidewire (Boston Scientific). This combination was manipulated intraductally through a small percutaneous sheath. Other catheter and guide-wire combinations were used when this initial approach failed. After crossing the biliary lesion, the stricture was dilated with an appropriately sized (usually 6–8 mm diameter), high-pressure balloon. Finally, a locking-loop biliary drainage catheter (either 8.5 or 10 Fr size) (Cook Inc.) was inserted with its tip coiled beyond the site of obstruction. After the procedure, the catheter was placed initially to gravity drainage. The patient was discharged to home when clinically stable often with the catheter capped and internalized.

At two- to three-month intervals, patients returned to our institution on an outpatient basis for routine biliary catheter exchanges, balloon dilatation of the underlying stricture, and re-evaluation of hepatic function and overall clinical status. The overall duration of biliary intubation was determined by the location of the injury, the patient's clinical course, and follow-up cholangiograms. Prior to removal of the stenting catheters, most patients underwent a clinical trial with the tube capped for two weeks prior to removal.

For the purposes of analysis, the results were grouped into two categories: Group A: patients with a good response to PIRT (excellent and good outcomes) and Group B: patients who failed PIRT (fair and poor outcomes). Data were analyzed by descriptive statistics, and comparisons between groups were performed using Fisher's exact test and Wilcoxon rank-sum test with SPSS 13.0 statistical package (Chicago, IL). Differences were considered clinically important at $p \leq 0.05$. Data are presented as $x \pm SD$ unless specified otherwise.

Results

Patients

A total of 27 patients with biliary strictures met our criteria for inclusion during the time period. There were 15 men (56%) and 12 women (44%) with an age of 54 ± 19 years (range 11–86). The most frequent etiology of biliary stricture (Table I) was ductal injury during laparoscopic cholecystectomy in 11 patients (41%).

Eight patients (30%) had undergone biliary resection for cholangiocarcinoma, and seven patients