Role of ERCP in the management of non-iatrogenic traumatic bile duct injuries in the pediatric population

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Iatrogenic biliary injuries are recognized postoperative complications of cholecystectomy and other hepatobiliary surgeries. Management of these injuries often involves surgical, radiologic, and endoscopic interventions. Endotherapy in the form of biliary sphincterotomy, transpapillary stenting, or both are accepted interventions for these patients.[1,2] Non-iatrogenic injuries to the bile ducts from abdominal trauma can be a source of significant short-term and long-term morbidity. Many of these patients undergo surgery for multiple-organ injuries, and ongoing bile leaks often lead to surgical reintervention. Therapy for biliary tract injuries in these patients can be challenging and complicated because of accompanying multiple-organ trauma and infection.

There is no consensus on the treatment of non-iatrogenic traumatic bile leaks, and decisions are often based on the extent and mechanism of injury, associated organ injuries, and local expertise. We and others have previously reported on the successful management of traumatic bile duct leaks in adults by ERCP with biliary sphincterotomy and stent placement.[3,4] However, there is limited published information on the role of ERCP in treating traumatic biliary injuries in children. The only case series includes 5 children,[5] whereas others have published case reports.[6-9] We, therefore, reviewed our experience with endoscopic management of biliary tract injuries resulting from abdominal trauma in children.

Abbreviations: ES, endoscopic sphincterotomy.

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PATIENTS AND METHODS

At a single, tertiary-care medical center, children with complex bile duct injuries were referred for ERCP by the surgical trauma service for the management of bile leakage after blunt or sharp abdominal trauma. The data were prospectively collected and included demographics, nature of trauma, type and location of bile duct injury, details of therapeutic intervention performed at ERCP, and final outcome, including timing of leak resolution and any complications.

After initial surgical or radiologic interventions, patients with continuing bile leakage, defined as bilious output from percutaneous drains or radiologic evidence of biloma, were referred for ERCP, to diagnose the site of bile leakage. Therapeutic interventions (endoscopic sphincterotomy [ES] with or without transpapillary stent placement) were performed during ERCP. Biliary stenting was performed with 5F or 10F plastic biliary stents. Bile leak resolution was defined as stoppage of bilious output from abdominal or chest drains, with normalization of liver function test results. Resolution of leakage was further confirmed by a repeat ERCP 6 to 8 weeks later, during which the previously placed transpapillary stents were removed.

All ERCPs and therapeutic interventions were performed by one senior faculty member (K.D.). The Human Research Review Committee of the Medical College of Wisconsin and the Human Rights Review Board of the Children's Hospital of Wisconsin approved this study.

RESULTS

Eight consecutive children with traumatic bile duct injuries and bile leakage were reviewed in this case series (Table 1). The patients were 5 boys and 3 girls, with a mean age of 12.5 years (range 3-17 years). Seven of the children sustained biliary injury from blunt abdominal trauma: motor vehicle accident (4), fall from a height (2), and injury by a school bus (1). One sustained a penetrating bile duct injury from a gunshot. Five (63%) underwent surgical intervention before ERCP for multiple-organ injury, during which primary repair of the bile ducts was not performed. All the patients had abdominal drains placed

TABLE 1. Patient characteristics and interventions performed to treat biliary leaks

Patient no.	Age, y	Sex	Injury	Intervention before ERCP	Location of bile leak	Intervention during ERCP	Days to leak resolution
1	14	M	Fall from height	Drain	Right intrahepatic	1: ES 2: ES and stent 3: Stent removal	20*
2	3	M	Hit by car	Ex-lap; drain	Right intrahepatic	1: ES and stent 2: Stent removal	10
3	17	F	MVC	Ex-lap; drain	Left intrahepatic	1: ES and stent 2: Stent removal	5
4	16	F	MVC	Drain	Hilar and left intrahepatic	1: ES and stent 2: Stent removal	3
5	10	M	Hit by car	Ex-lap; drain	Hilar	1: ES and stent 2: Stent removal	10
6	15	F	Fall from horse	Ex-lap; drain	Right intrahepatic	1: ES and stent 2: Stent removal	15
7	6	M	Run over by bus	Ex-lap; drain	Left intrahepatic	1: ES and stent 2: Stent exchange 3: Stent removal	10*
8	16	M	GSW	Drain	Right intrahepatic	1: ES and stent 2: Stent removal	20

M, Male; *ES,* endoscopic sphincterotomy; *Ex-lap,* exploratory laparotomy; *F,* female; *MVC,* motor vehicle crash; *GSW,* gunshot wound.
*Days after 2nd ERCP.

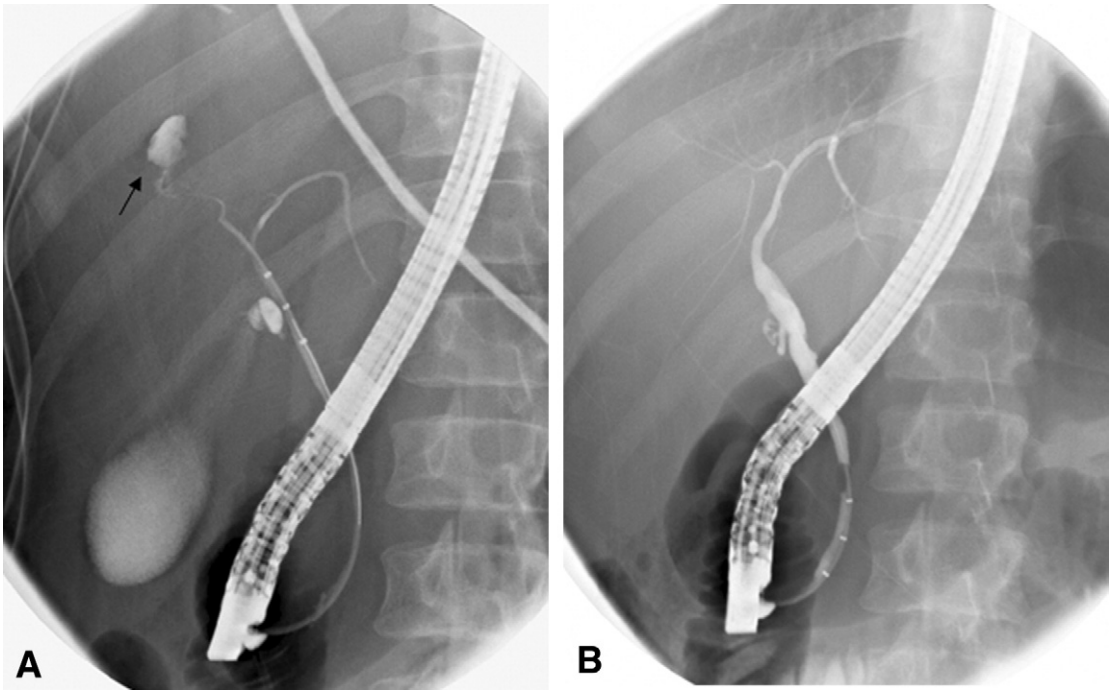

Figure 1. Representative patient 2 (age 3 years) who was hit by a car and sustained multiple-organ trauma. **A,** Right intrahepatic bile leak (*arrow*) managed by ERCP sphincterotomy and biliary stent placement. The leak resolved in 10 days, as determined by absent output from the percutaneous drain and imaging studies showing no biloma. **B,** Follow-up ERCP to remove the stent confirmed resolution of the leak.