

Safety and long-term outcomes of endoscopic papillary balloon dilation in children with bile duct stones

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Background: Although experience with diagnostic and therapeutic ERCP in children is growing, little is known about the safety and technical outcomes of endoscopic papillary balloon dilation (EPBD) in pediatric patients with bile duct stones (BDSs).

Objective: To assess the safety and long-term outcomes of EPBD in pediatric patients with BDSs.

Design: Case study.

Setting: Tertiary referral center.

Patients and Interventions: This study involved 5 children who had BDSs combined with gallstones who underwent EPBD.

Main Outcome Measurements: Successful EPBD, successful stone removal, procedure-related complications, and long-term outcomes.

Results: ERCP was successful in all cases, with cannulation and subsequent EPBD. Stone removal was performed in 1 session in all patients. No EPBD-related complications were observed in any patient. After EPBD, 1 patient subsequently underwent laparoscopic cholecystectomy for gallstones. The remaining 4 were followed without surgery. In 2 patients, gallstones were spontaneously passed from the bile duct into the duodenum. During the follow-up period, over a mean of 7.1 years (range 3.7-9.3 years), no recurrence of BDSs was observed in any patient.

Limitations: Small number of patients.

Conclusions: Although BDSs are rare in pediatric patients, EPBD may be a safe and effective technique for the management of such stones in some children.

Bile duct stones (BDSs) are rare in children except for those who have comorbid diseases such as hereditary spherocytosis or congenital bile duct dilation.¹ Surgery has been traditionally chosen for treatment in pediatric patients with BDSs.²⁻⁶ Currently, however, endoscopic treatment is regarded as a less-invasive treatment than surgery for the treatment of BDSs in pediatric patients as well as in adults.^{7,8} With regard to the endoscopic procedure, endoscopic sphincterotomy (EST) has been performed for the treatment of BDSs even in pediatric patients, despite pos-

sible complications including hemorrhage, pancreatitis, and perforation.^{7,9-11}

Endoscopic papillary balloon dilation (EPBD), which was first reported in 1983,¹² has the advantages of preserving sphincter of Oddi function and having a lower risk of hemorrhage and perforation compared with EST.^{13,14} These advantages raise the possibility that EPBD may be an alternative to EST in the treatment strategy for pediatric patients with BDSs. Although experience with diagnostic and therapeutic ERCP in pediatric patients is growing, little is known about the safety and technical outcomes of

Abbreviations: BDS, bile duct stone; EPBD, endoscopic papillary balloon dilation; EST, endoscopic sphincterotomy; LFT, liver function test; RCT, randomized, controlled trial.

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TABLE 1. Features of pediatric patients with bile duct stones treated with endoscopic papillary balloon dilation

Patient	Age, y/sex	Symptoms	Comorbid disease	CBD diameter, mm	Size of BDSs, mm	No. of BDSs	Balloon diameter, mm	Procedure time, min
1	11/F	Abdominal pain, jaundice	Hereditary spherocytosis	10	6	1	6	15
2	7/F	Abdominal pain	None	5	3	4	6	13
3	10/F	Abdominal pain	None	7	3	1	6	13
4	9/F	Vomiting	None	6	4	1	4	14
5	13/M	Abdominal pain	None	7	4	1	6	17

CBD, Common bile duct; BDSs, bile duct stones; F, female; M, male.

TABLE 2. Procedure-related complications and follow-up

Patient	LFT results on the pre-EPBD day	LFT results on the first post-EPBD day	Time to achieve normal LFT results, d	Serum amylase level (post-ERCP), IU/L	Hospitalization period, d	Procedure-related complications	Cholecystectomy	Follow-up period, y
1	Total bil, 8.8 mg/dL; ALP, 541 IU/L; AST, 76 IU/L; ALT, 142 IU/L	Total bil, 8.8 mg/dL; ALP, 590 IU/L; AST, 119 IU/L; ALT, 177 IU/L	5	515	7	None	None	9.3
2	Total bil, 0.5 mg/dL; ALP, 601 IU/L; AST, 28 IU/L; ALT, 10 IU/L	Total bil, 1.2 mg/dL; ALP, 626 IU/L; AST, 50 IU/L; ALT, 36 IU/L	3	452	9	None	None	8.6
3	Total bil, 0.4 mg/dL; ALP, 1567 IU/L; AST, 355 IU/L; ALT, 716 IU/L	Total bil, 0.8 mg/dL; ALP, 1432 IU/L; AST, 133 IU/L; ALT, 456 IU/L	17	551	8	PD contrast injection	None	8.2
4	Total bil, 1.2 mg/dL; ALP, 569 IU/L; AST, 30 IU/L; ALT, 58 IU/L	Total bil, 1.1 mg/dL; ALP, 916 IU/L; AST, 85 IU/L; ALT, 98 IU/L	6	77	21	None	+	3.7
5	Total bil, 1.5 mg/dL; ALP, 428 IU/L; AST, 62 IU/L; ALT, 68 IU/L	Total bil, 1.2 mg/dL; ALP, 438 IU/L; AST, 58 IU/L; ALT, 56 IU/L	5	124	7	None	None	5.5

Normal limits: total bilirubin, 0.2-1.2 mg/dL; ALP, 105-330 IU/L; AST, 8-38 IU/L; ALT, 4-44 IU/L; serum amylase, 37-125 IU/L. LFT, Liver function test; EPBD, endoscopic papillary balloon dilation; bil, bilirubin; ALP, alkaline phosphatase; AST, aspartate transaminase; ALT, alanine transaminase; PD, pancreatic duct.

EPBD in pediatric patients with BDSs. We report the long-term outcomes of 5 pediatric patients with BDSs who were treated with EPBD. This report demonstrates that EPBD may be recommended in selected cases as an effective treatment for BDSs in pediatric patients.

PATIENTS AND METHODS

A series of 5 pediatric patients with BDSs was retrospectively evaluated at our institution. The series consisted of 1 male and 4 female patients with a mean age of 10.0 ± 2.2 years (range 7-13 years) (Table 1). Presenting symptoms included upper abdominal pain in 4 of the patients and vomiting in 1 patient. Elevation of hepatobiliary enzymes was observed in all patients, with 1 patient manifesting jaundice. One patient had hereditary spherocytosis, whereas the other 4 had no remarkable underlying

diseases. All patients had gallstones without cholecystitis; the BDSs were small, with diameters of less than 6 mm, and the number of stones ranged from 1 to 4 (Tables 1 and 2). None of the patients had preexisting coagulopathy before the procedure.

All ERCPs were performed in the presence of pediatricians with the patients under deep sedation by using intravenous midazolam. Duodenum relaxation was obtained with scopolamine butylbromide. Blood pressure, pulse rate, and oxygen saturation were monitored before and during the procedure. All patients underwent EPBD with a conventional adult duodenoscope (JF-230, JF-240, and JF-260V; Olympus, Tokyo, Japan), with an outer diameter of 11.3 to 12.6 mm and accessory channel diameter of 3.2 to 3.7 mm. All EPBD procedures were performed by 3 experienced biliary endoscopists (H.M., K.T., S.T.), each of whom had performed more than 3000 ERCPs in adults.

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